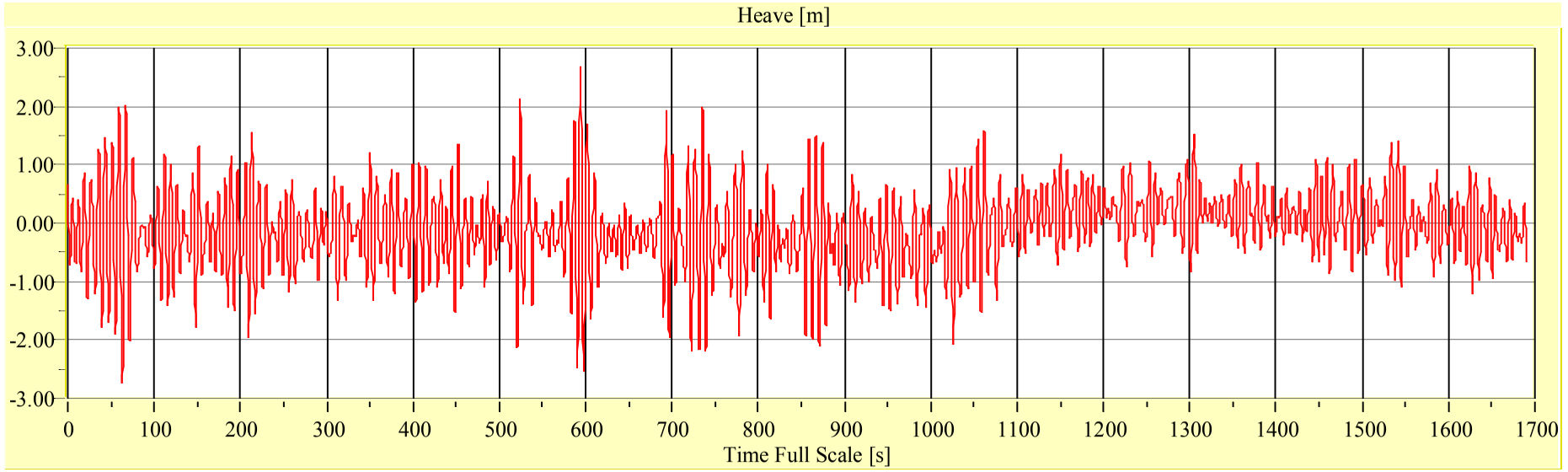
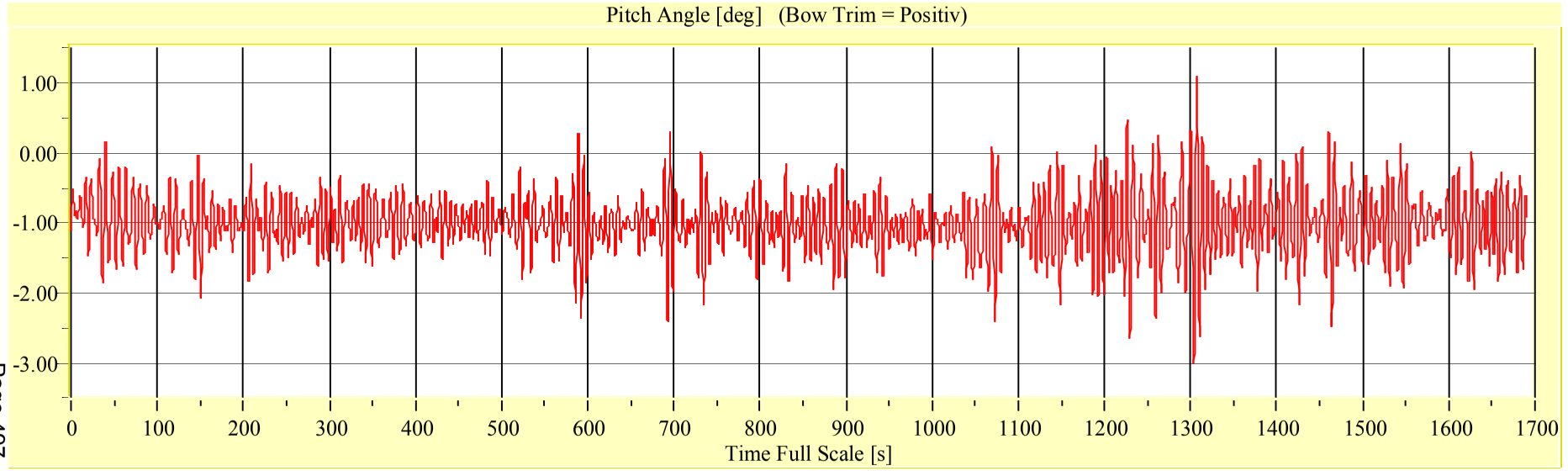
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-04 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



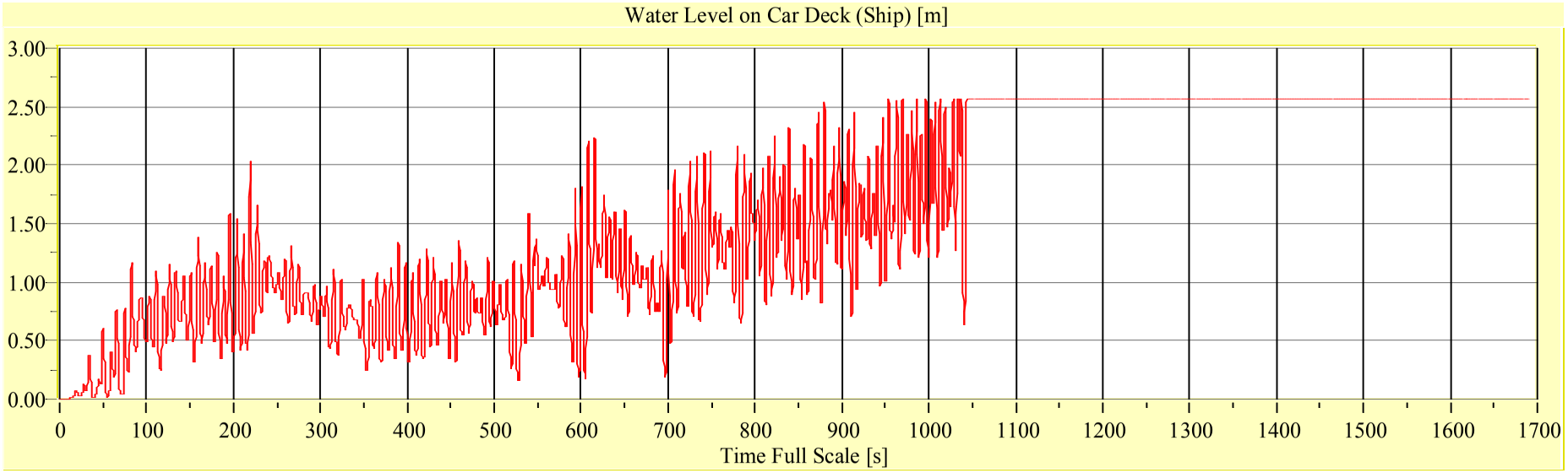



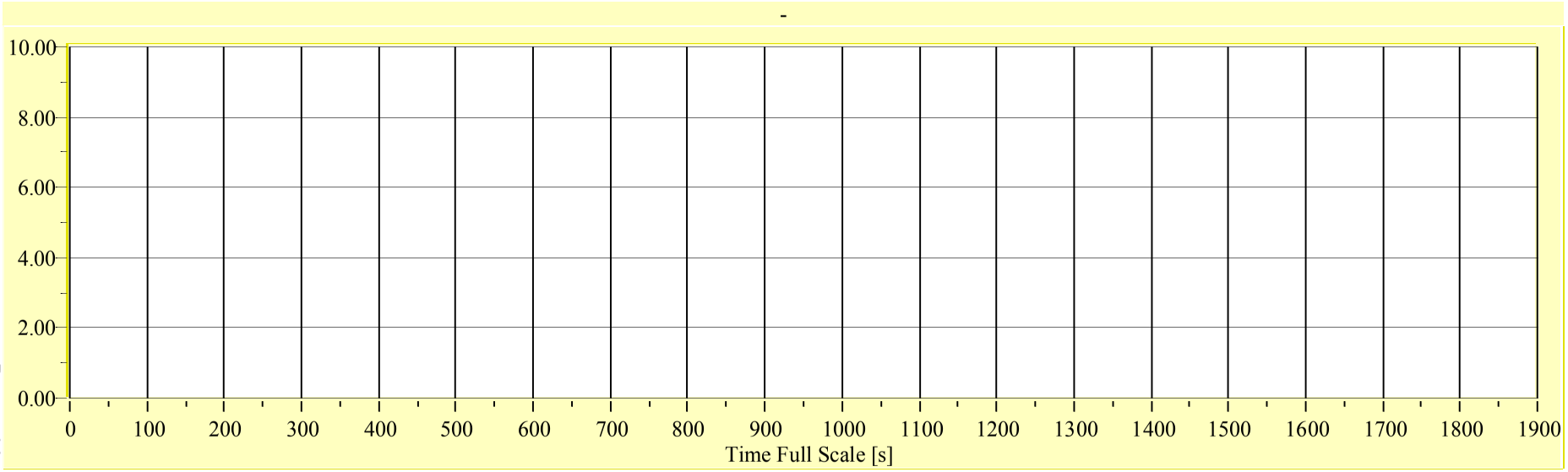



| Date: 28.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-04 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



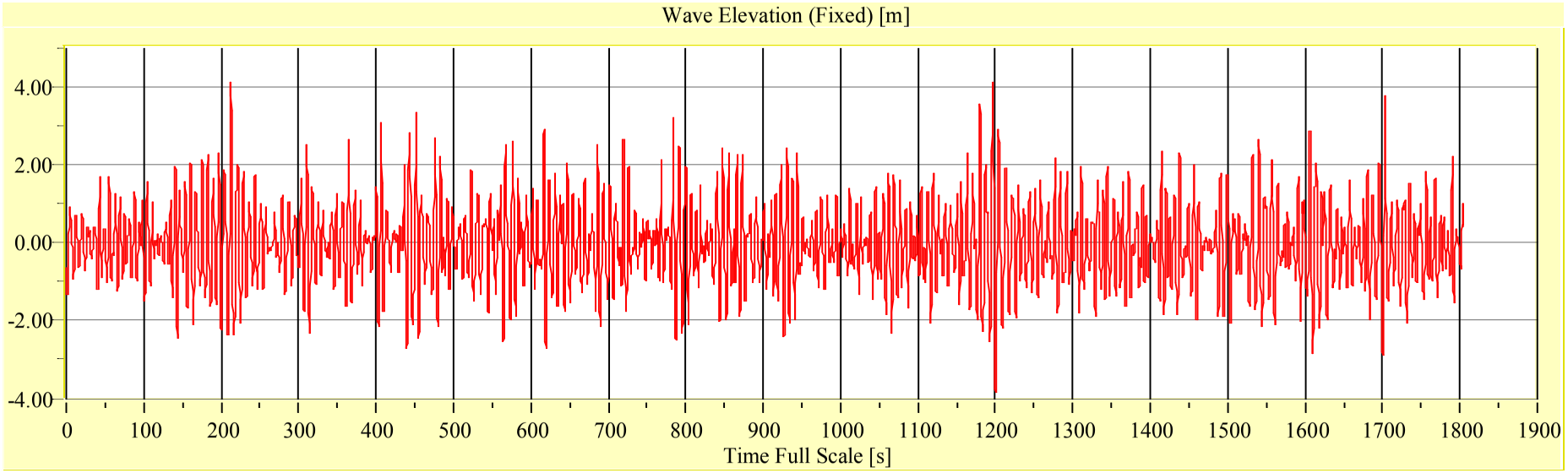



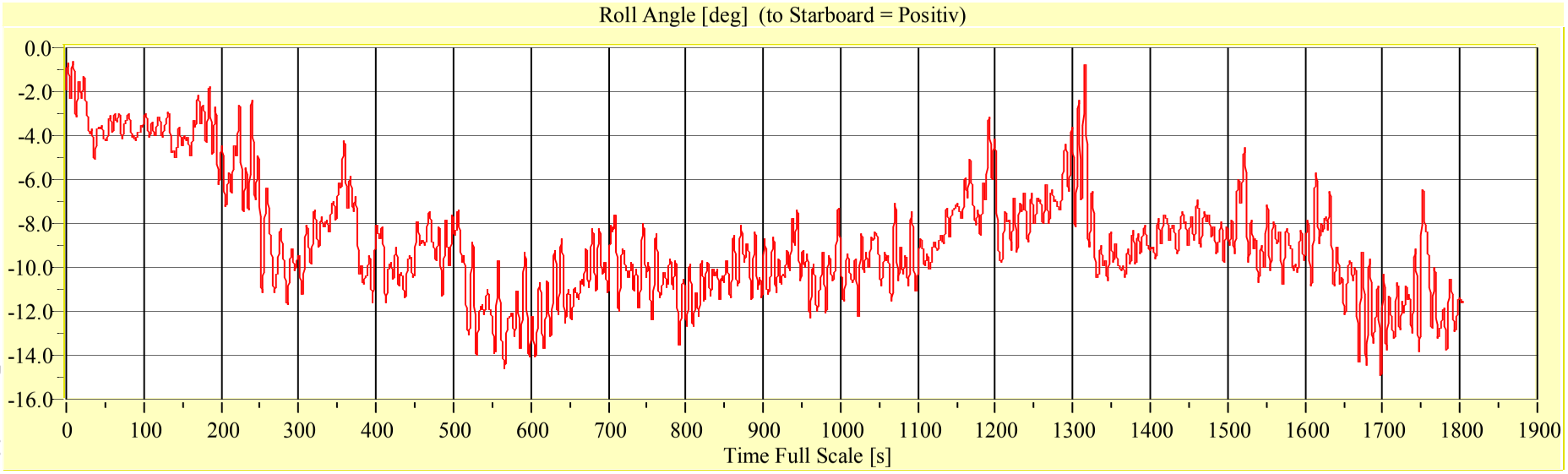



| Date: 28.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-05 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



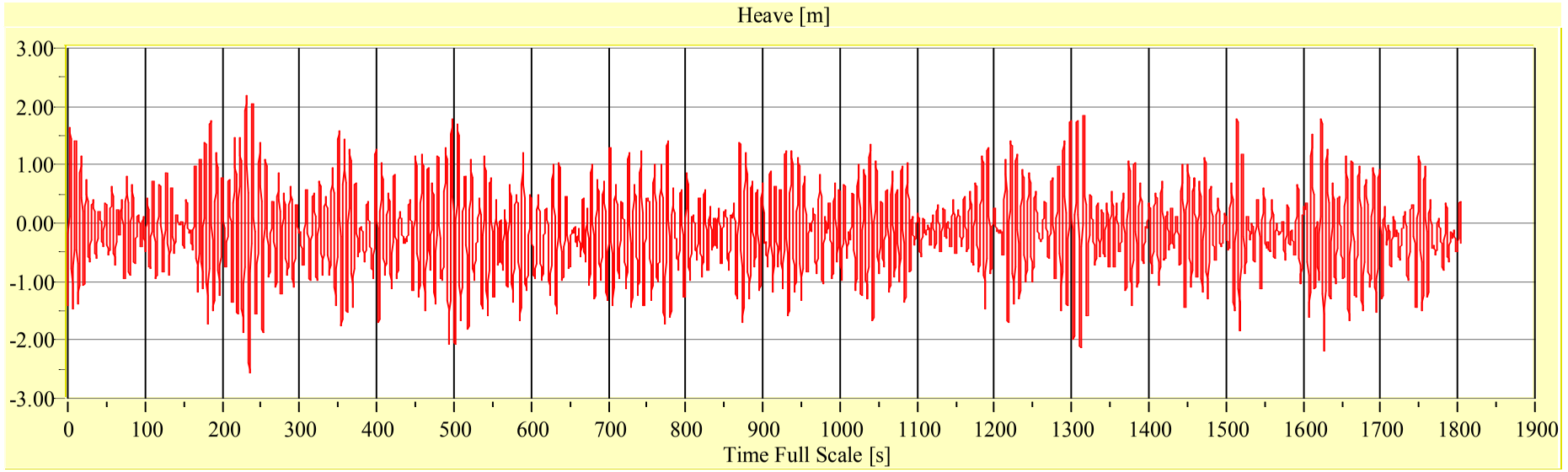



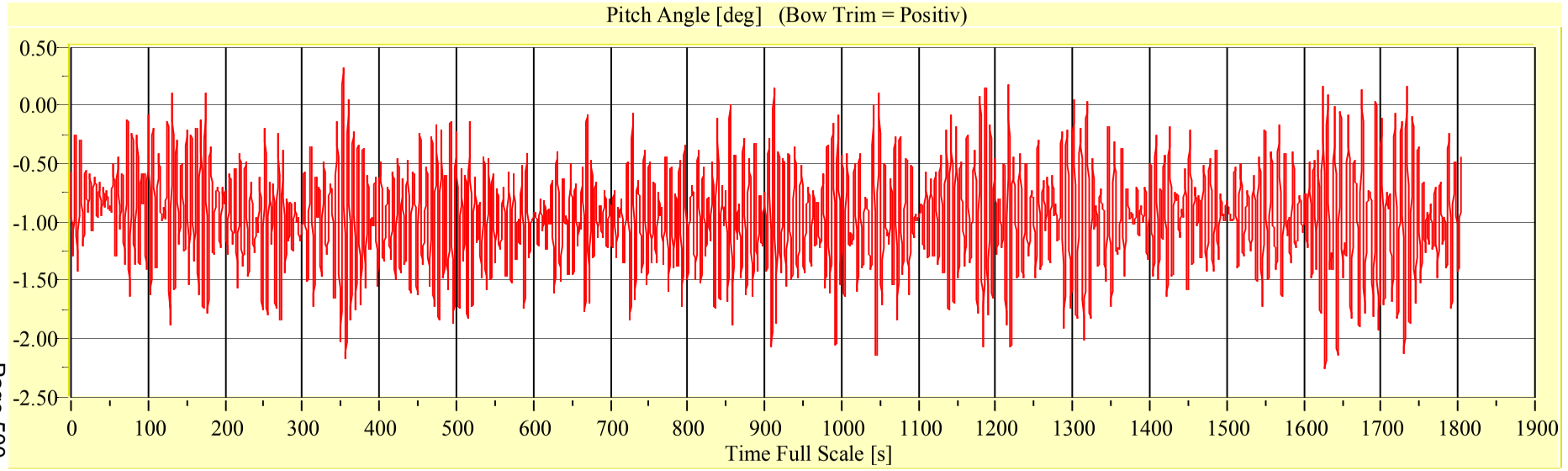



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-05 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



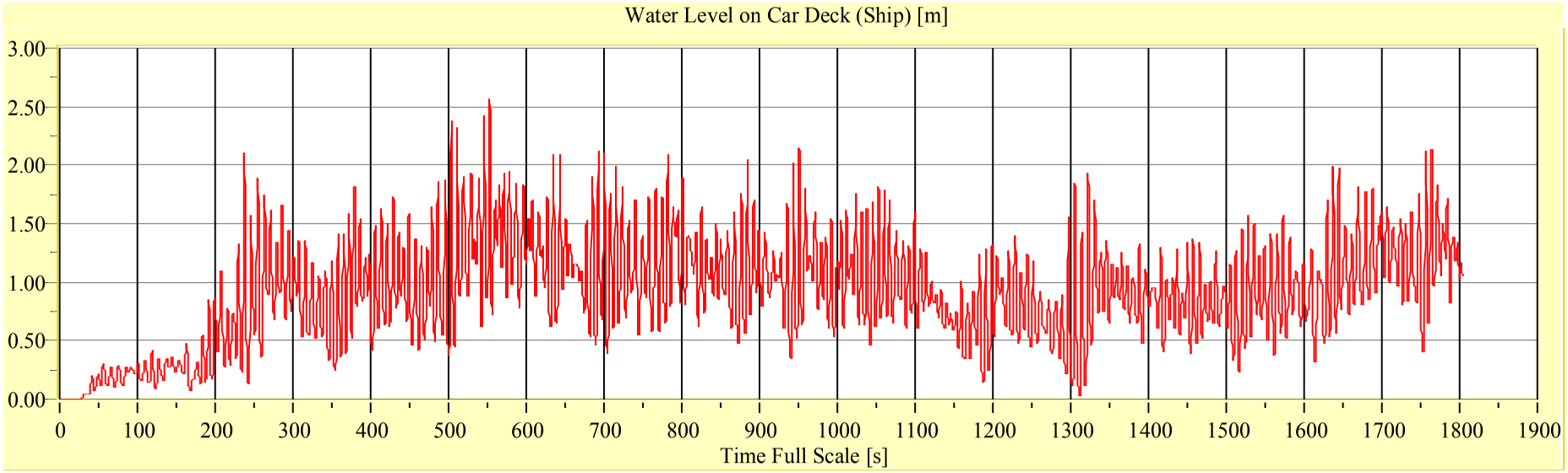



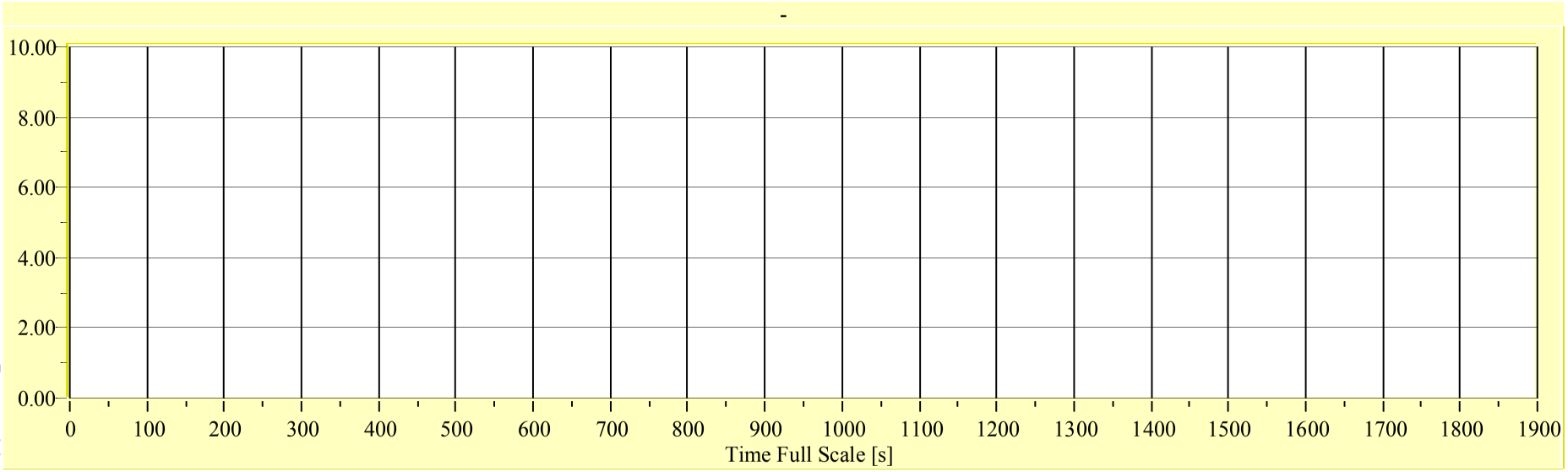



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-05 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



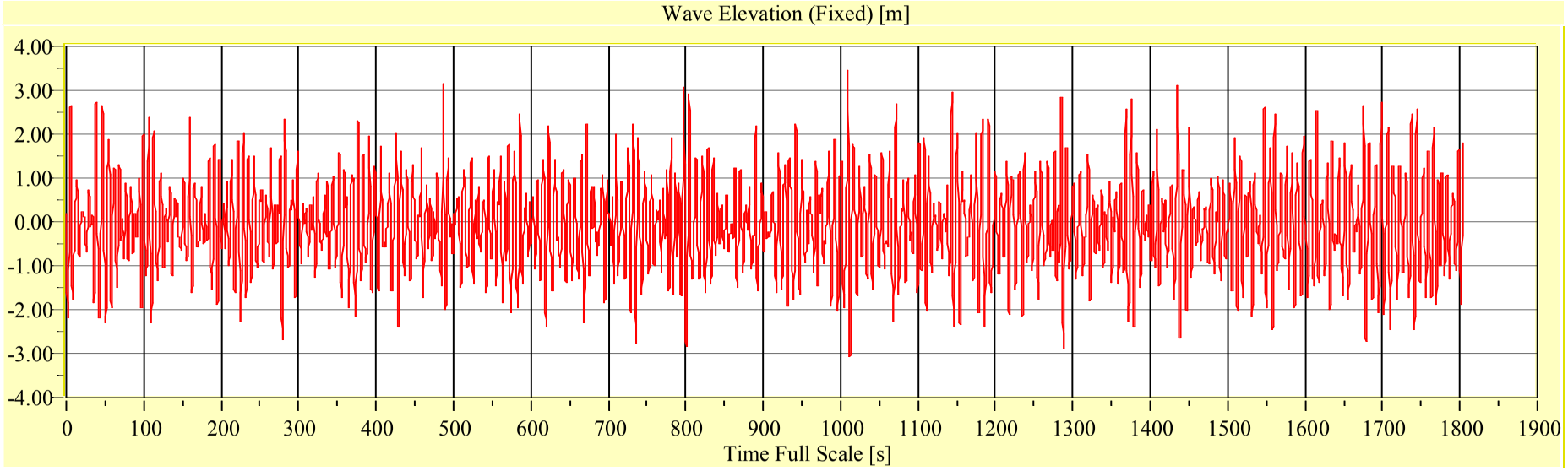



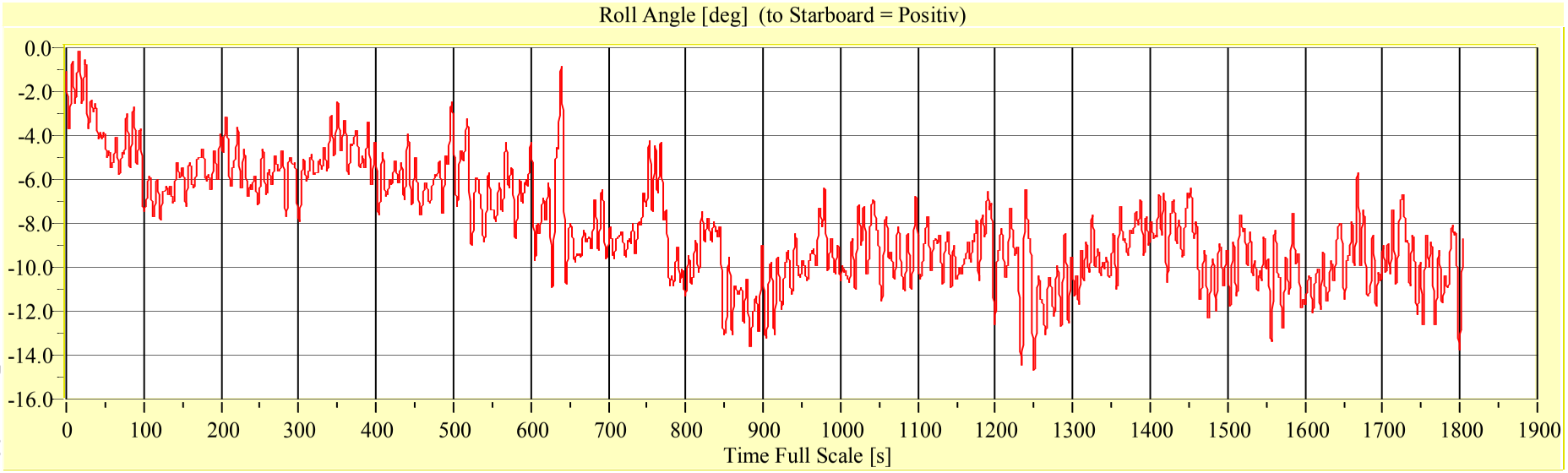



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-06 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



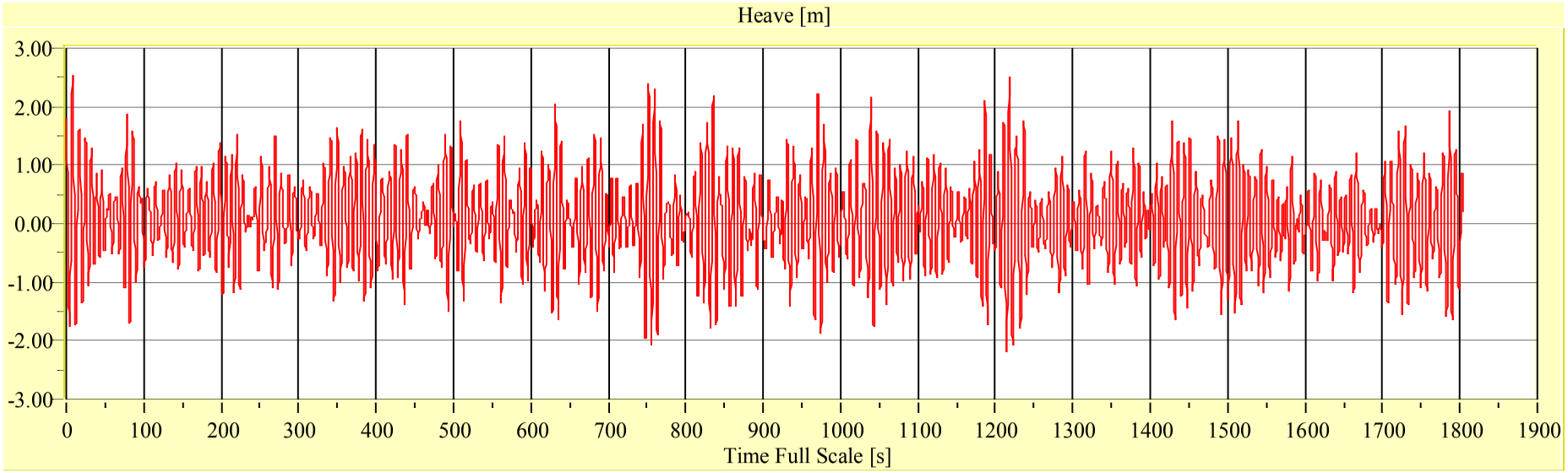



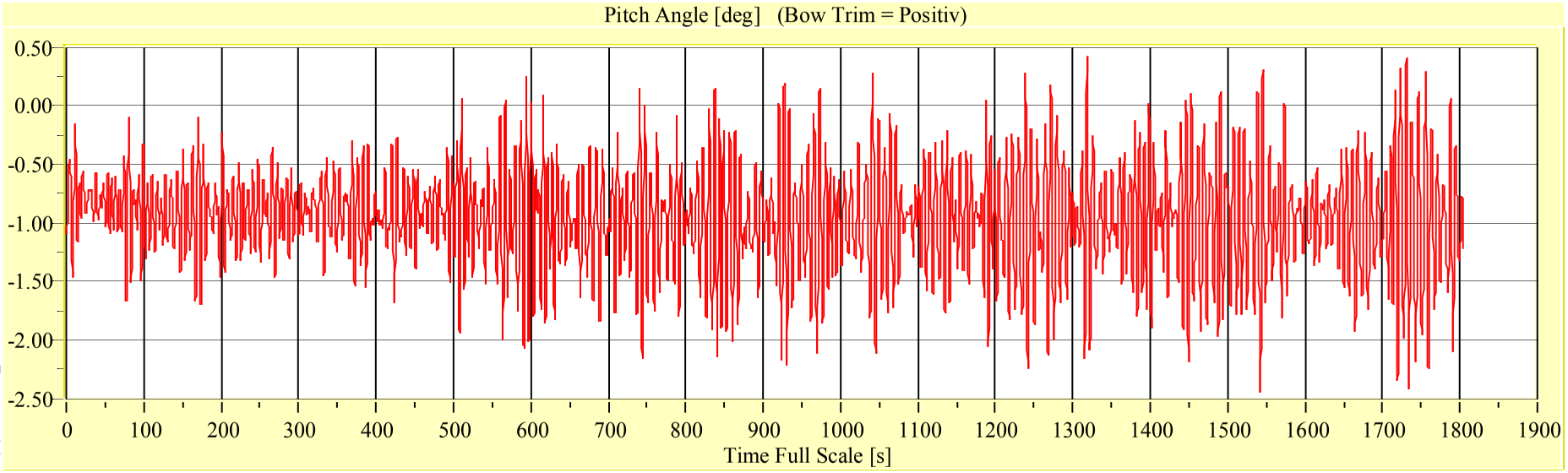



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-06 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



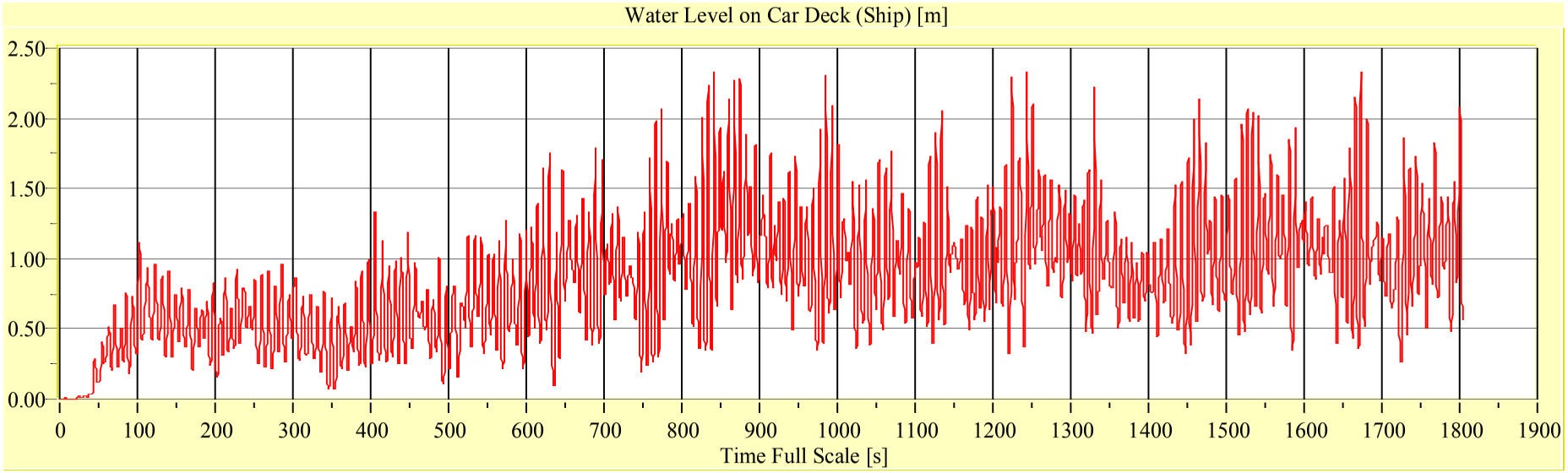



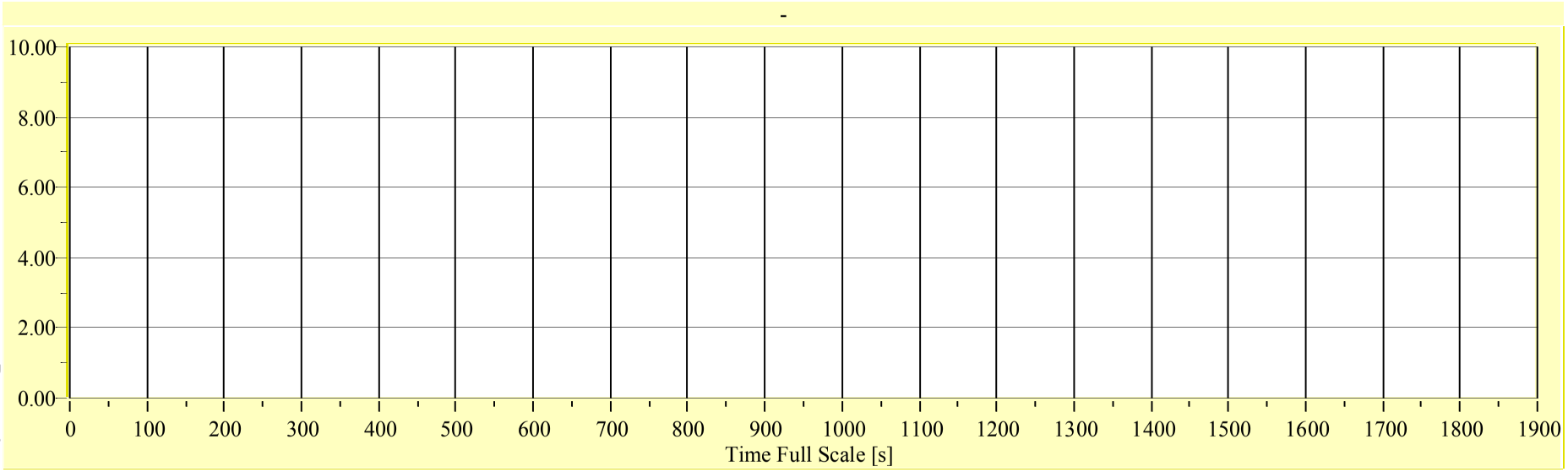



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-06 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



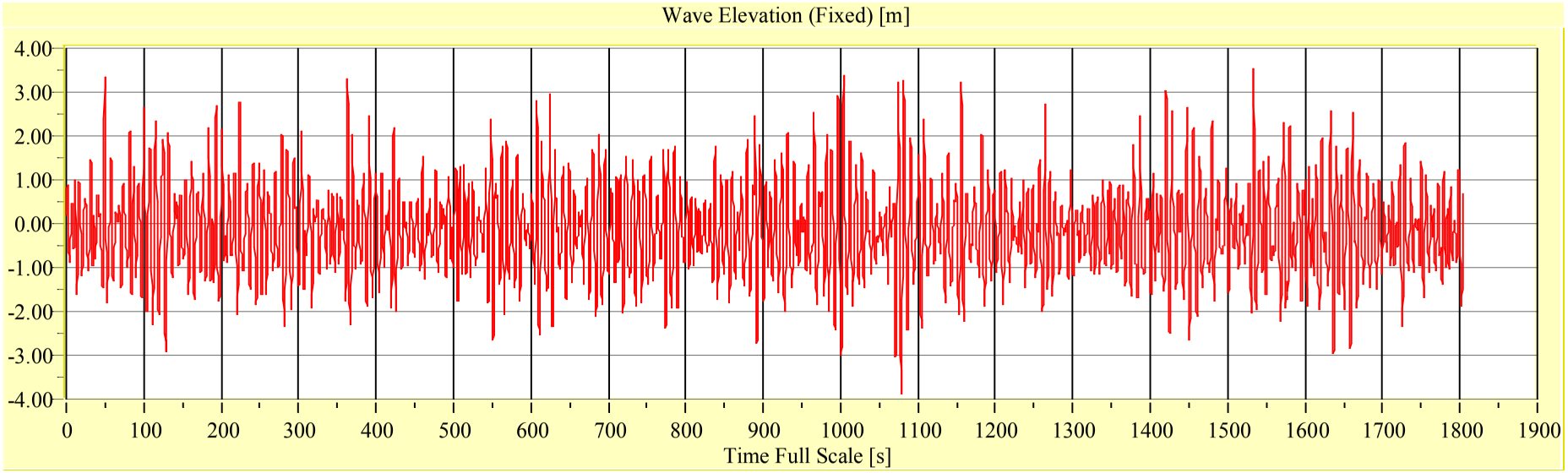



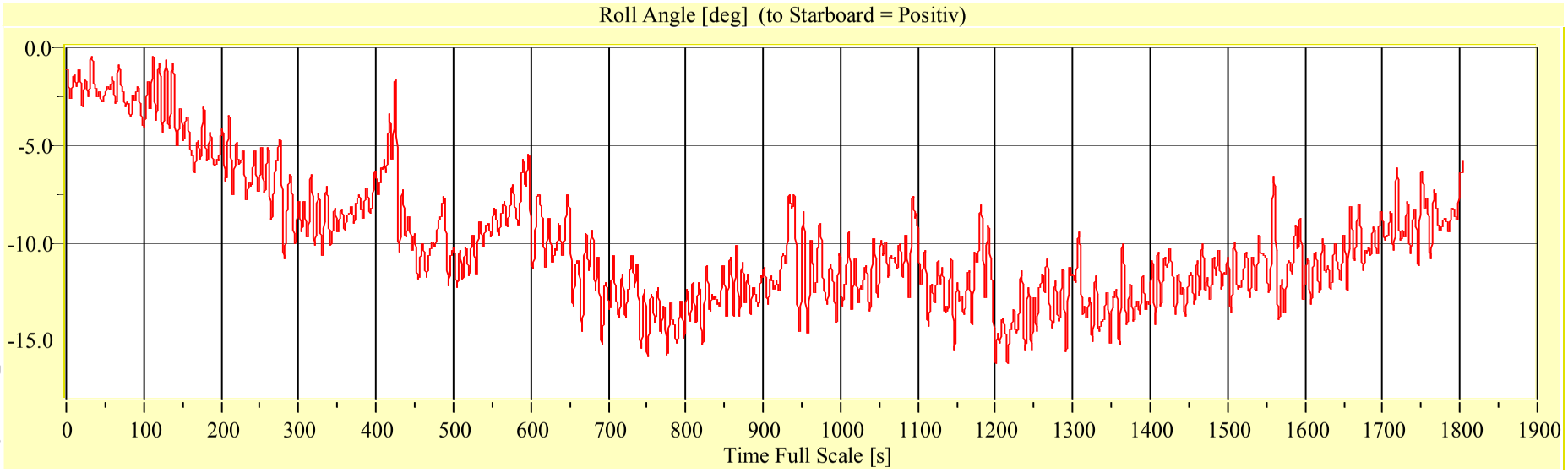



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-07 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



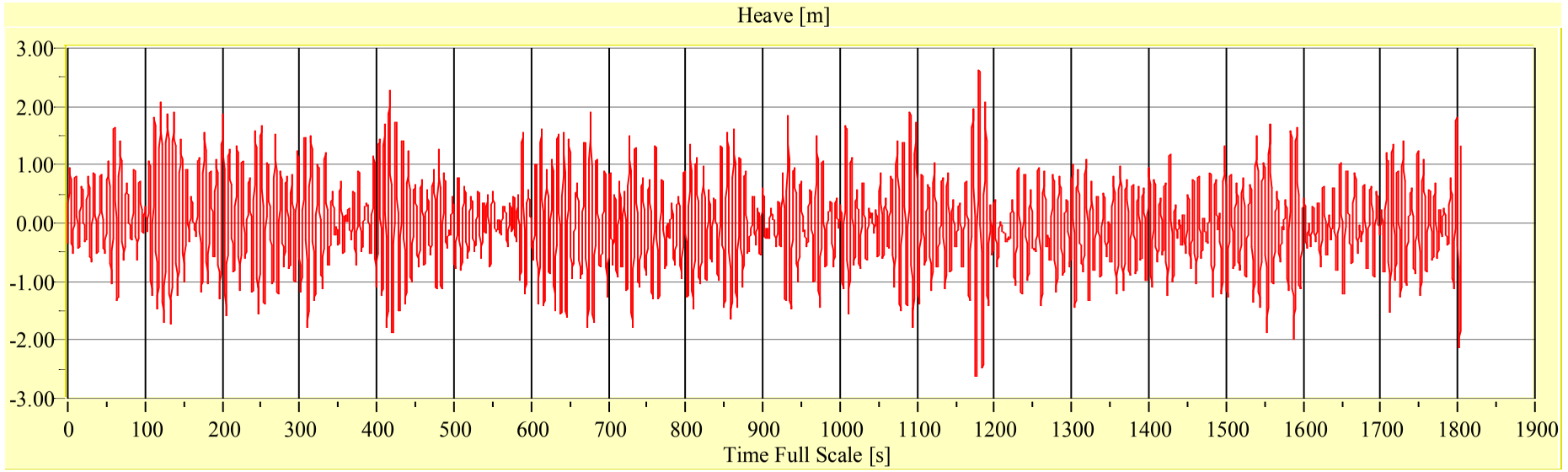



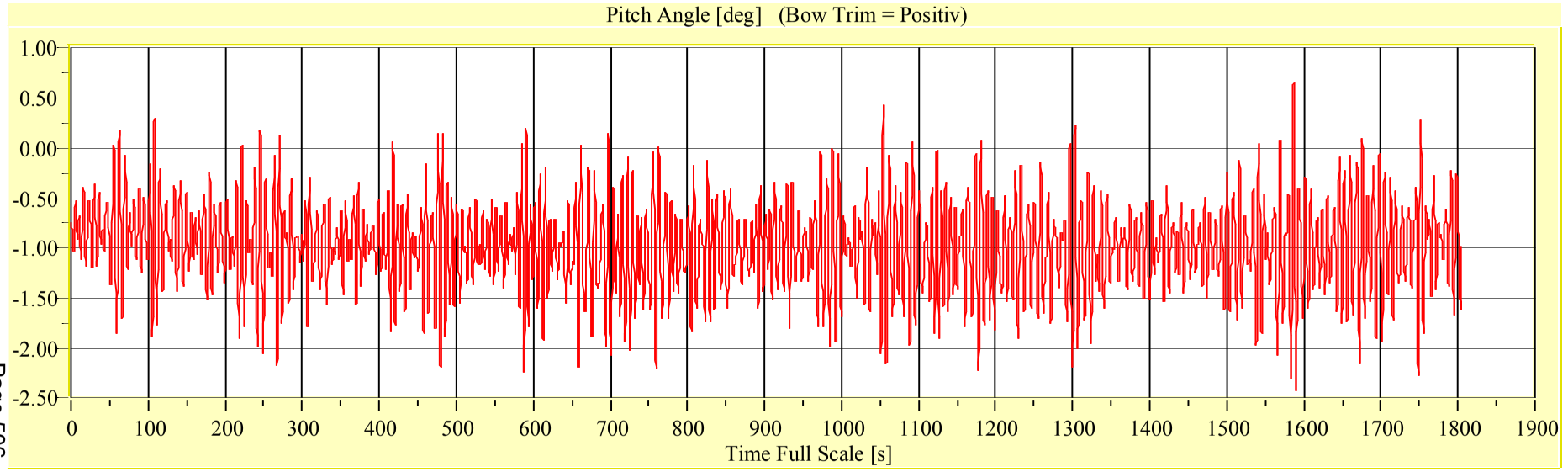



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-07 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



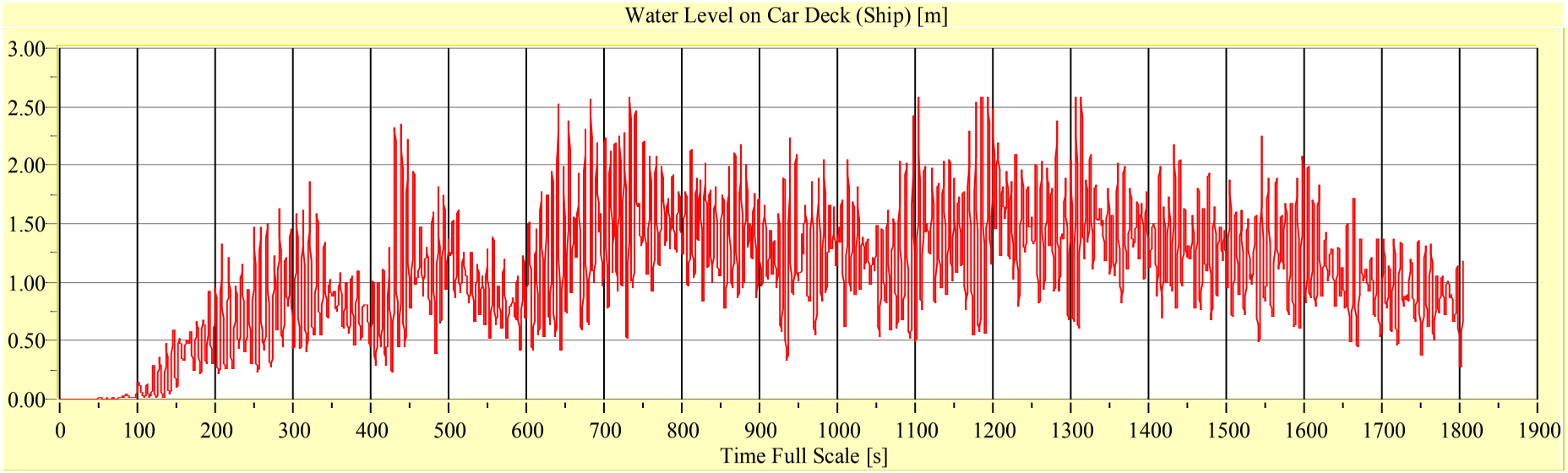



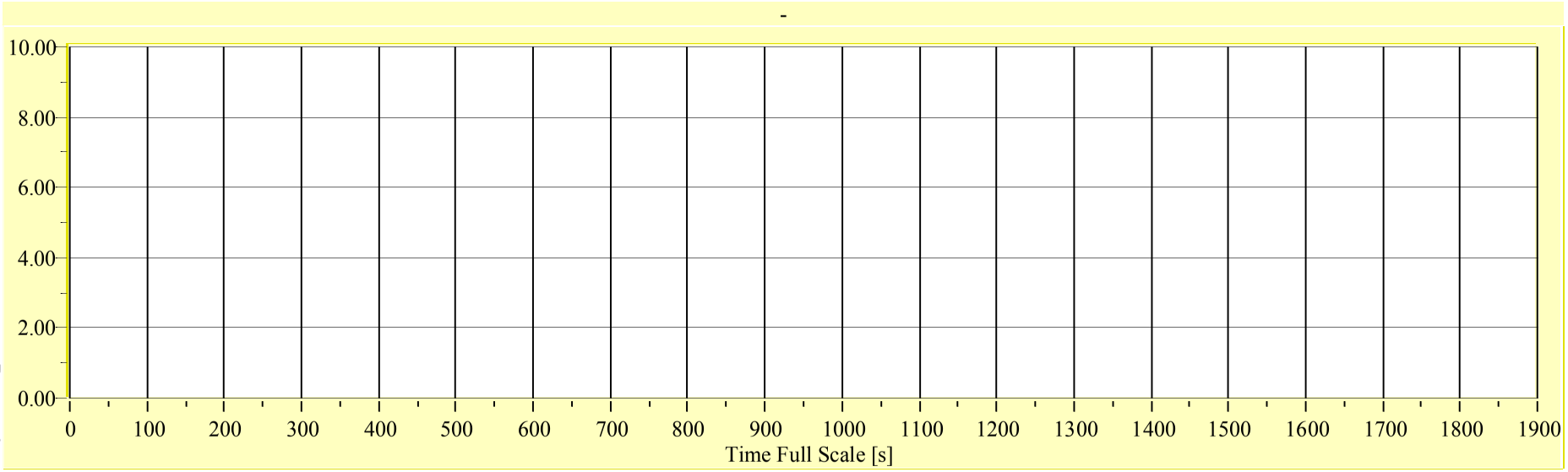



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-07 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



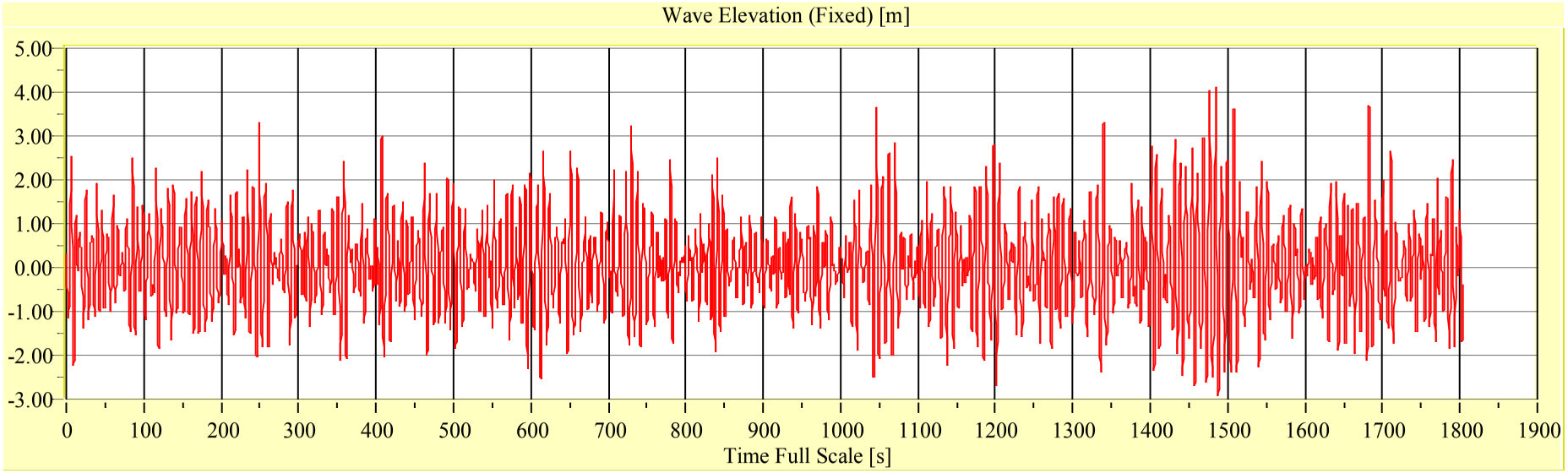



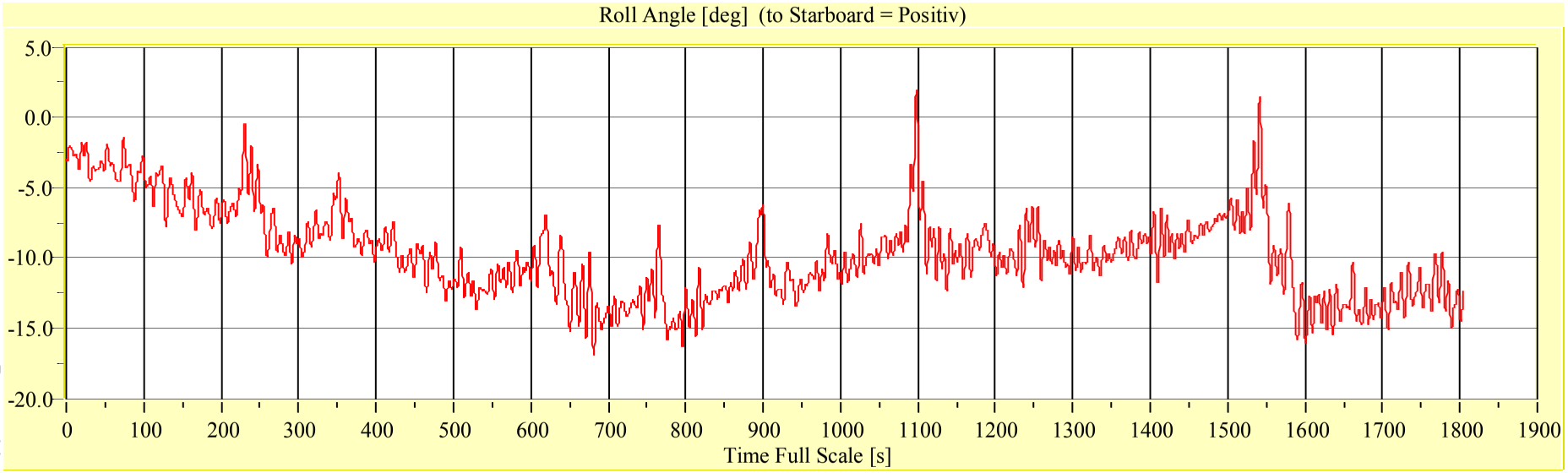



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-08 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



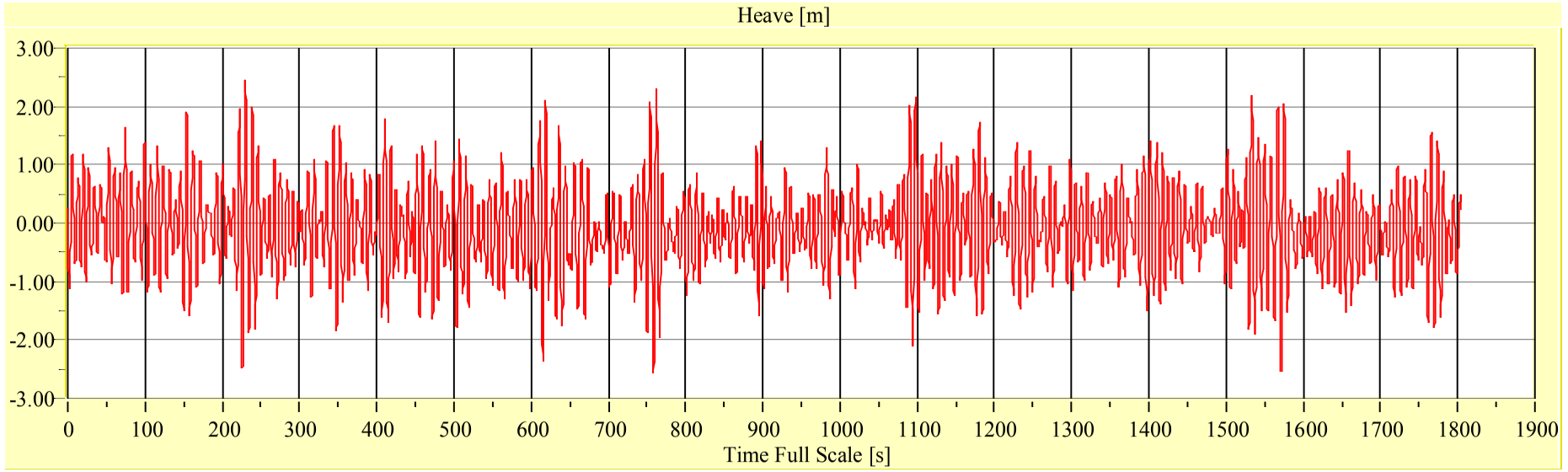



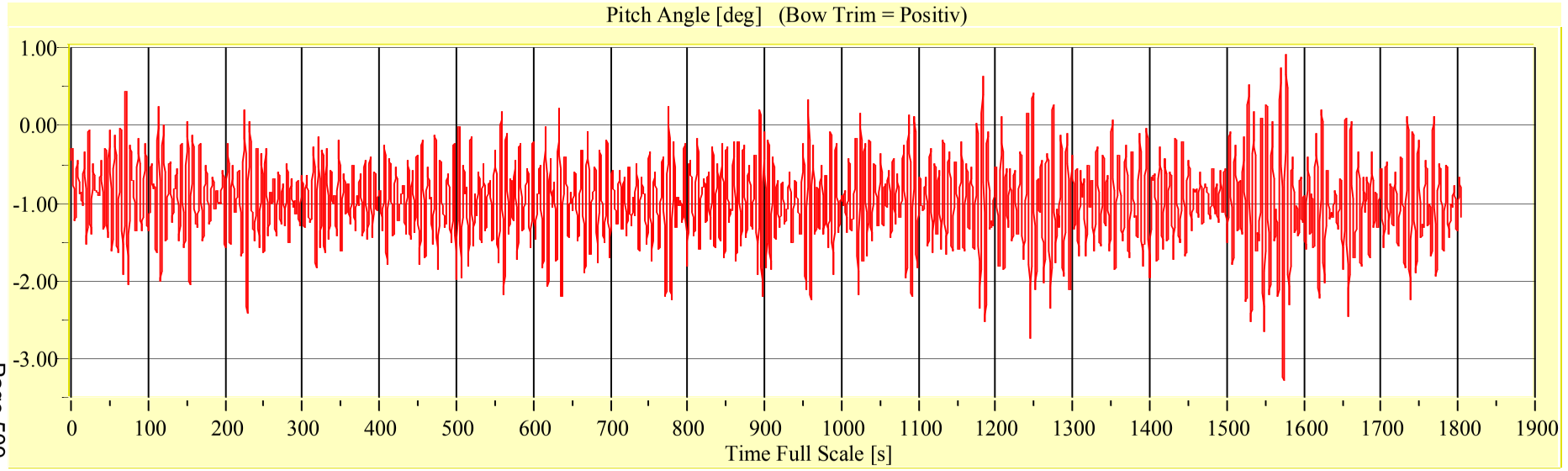



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-08 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



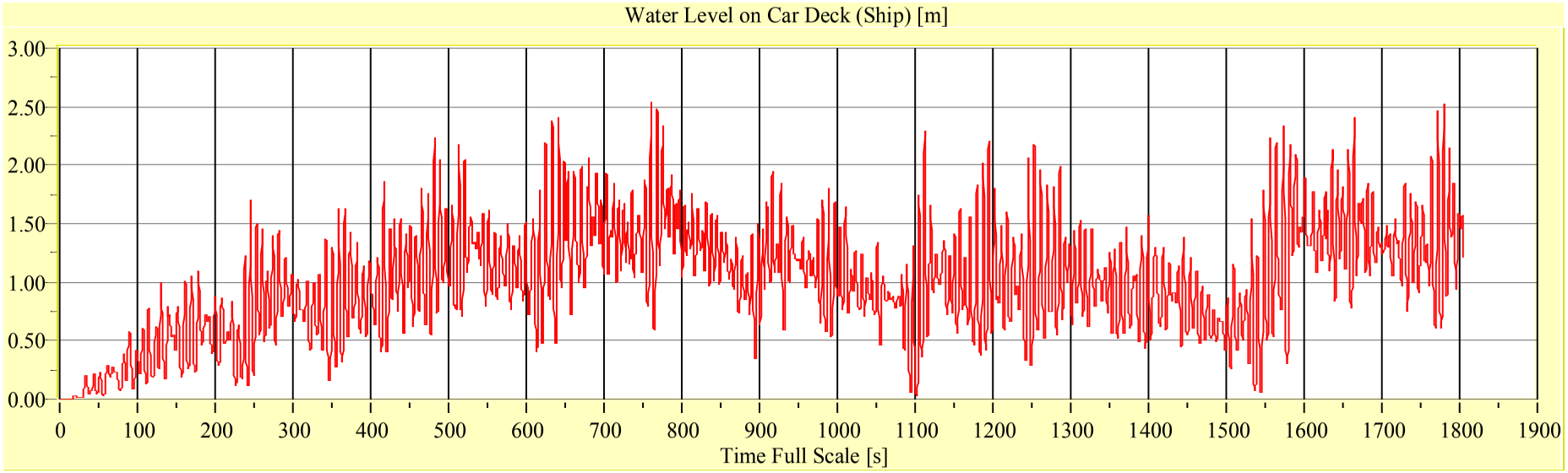



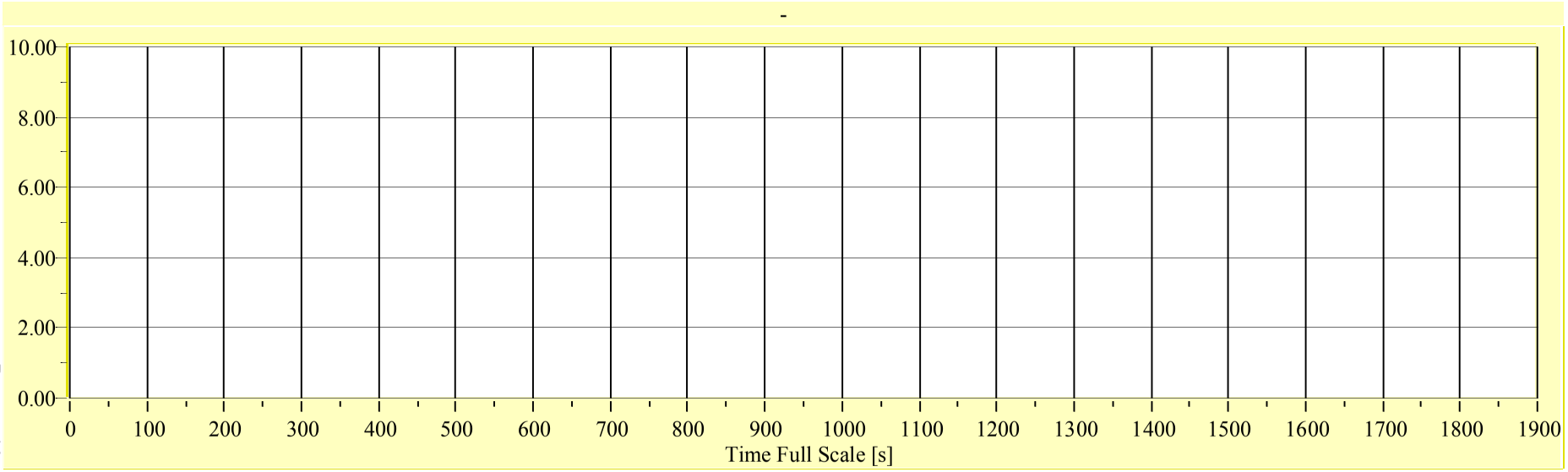



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-08 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



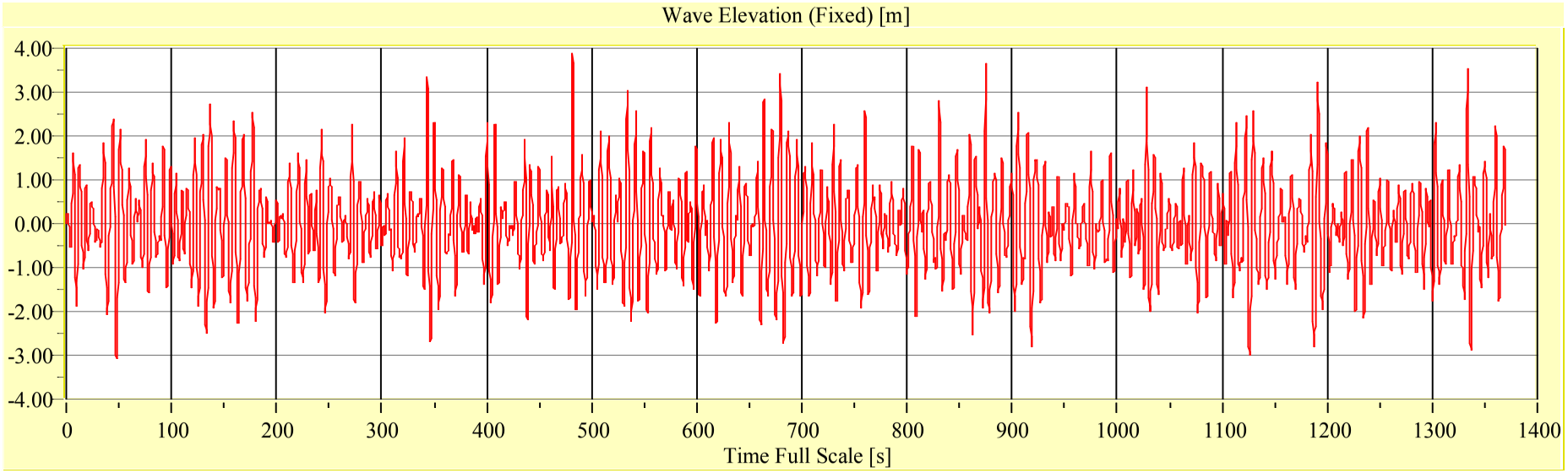



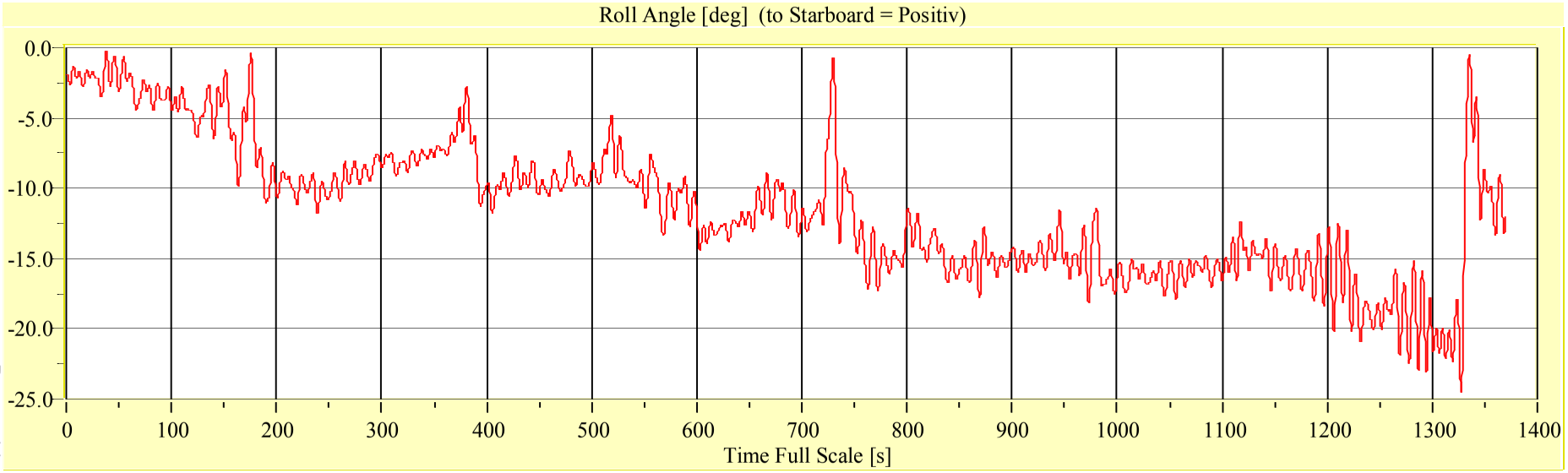



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-09 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



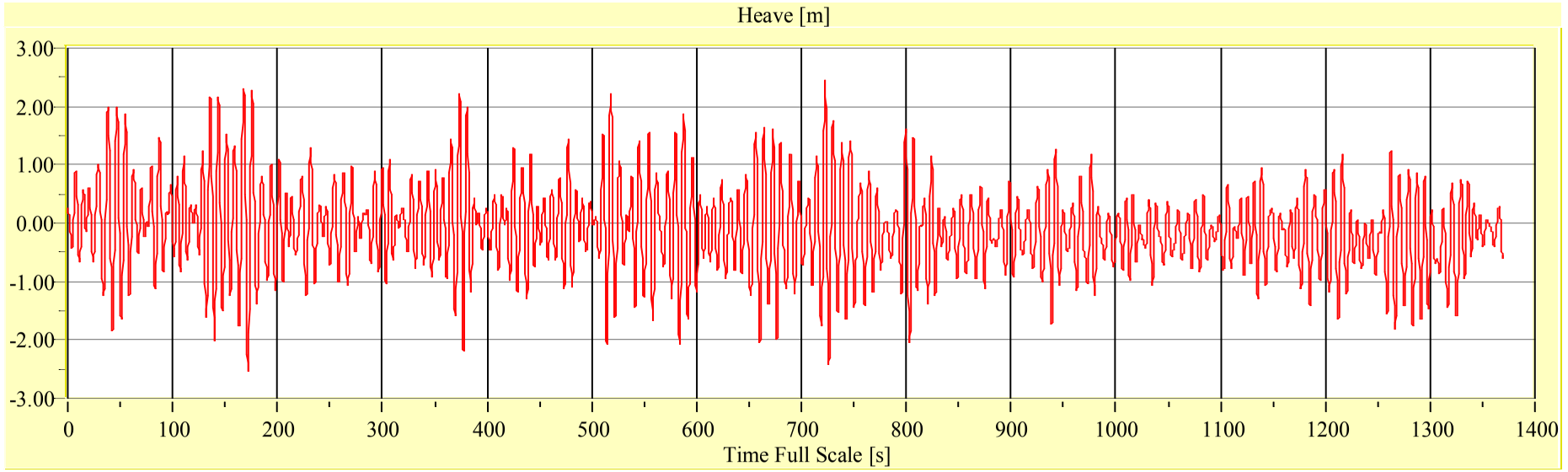



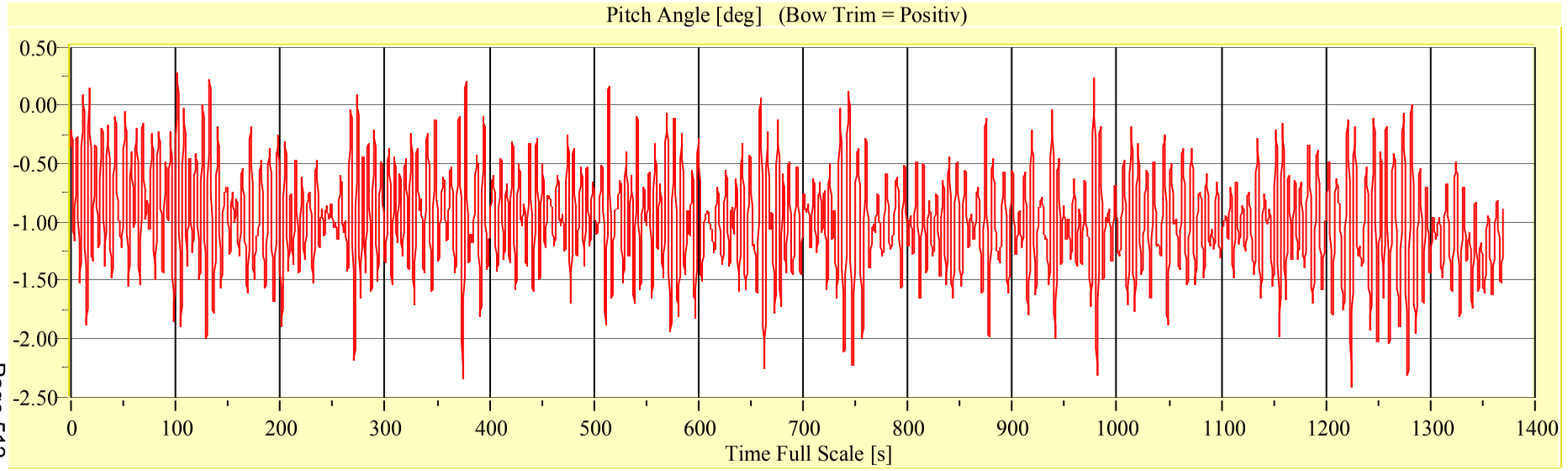



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-09 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



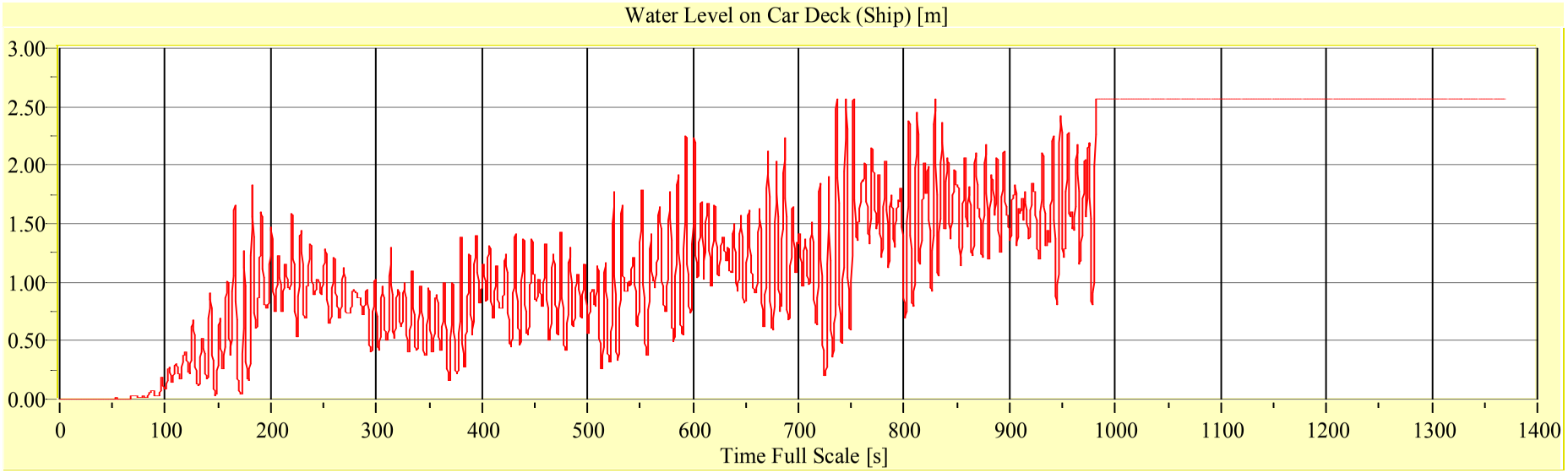



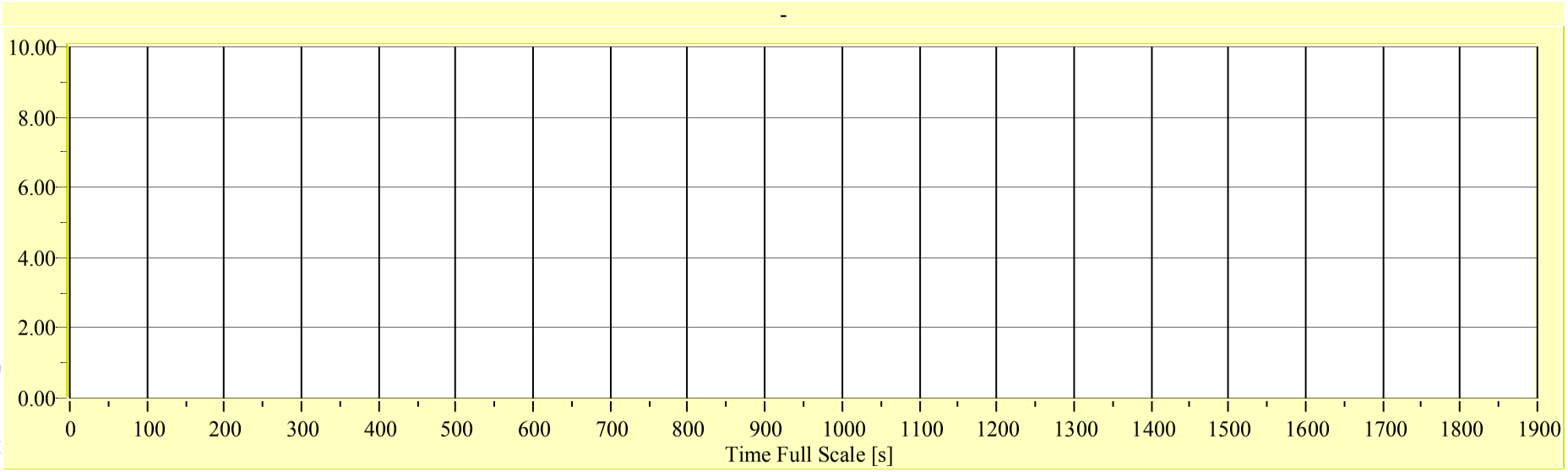



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-09 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



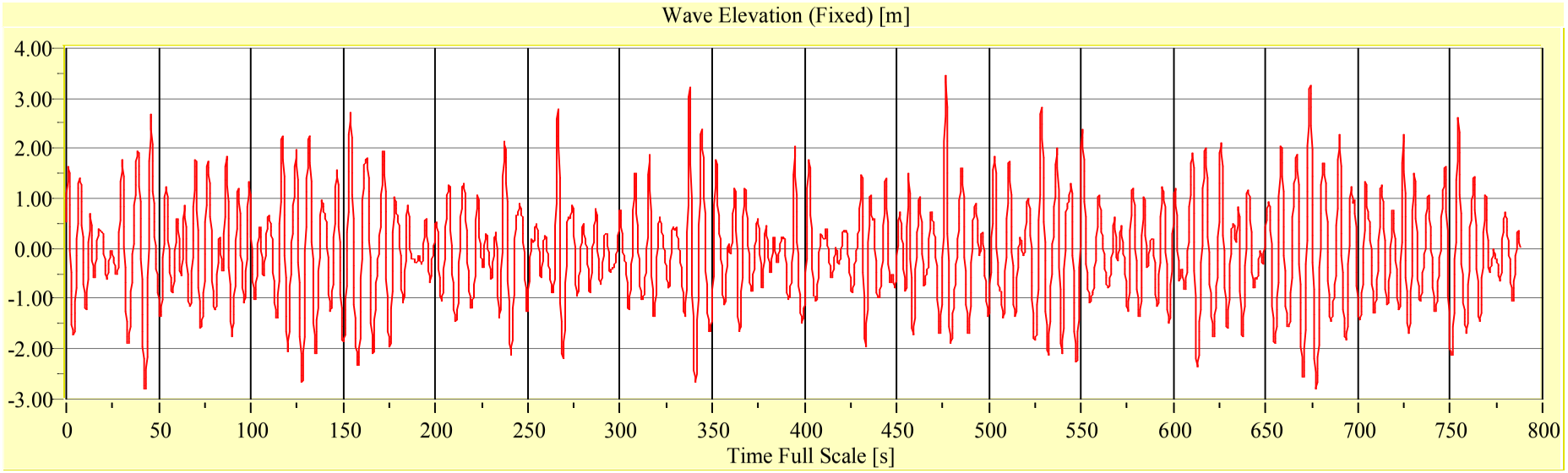



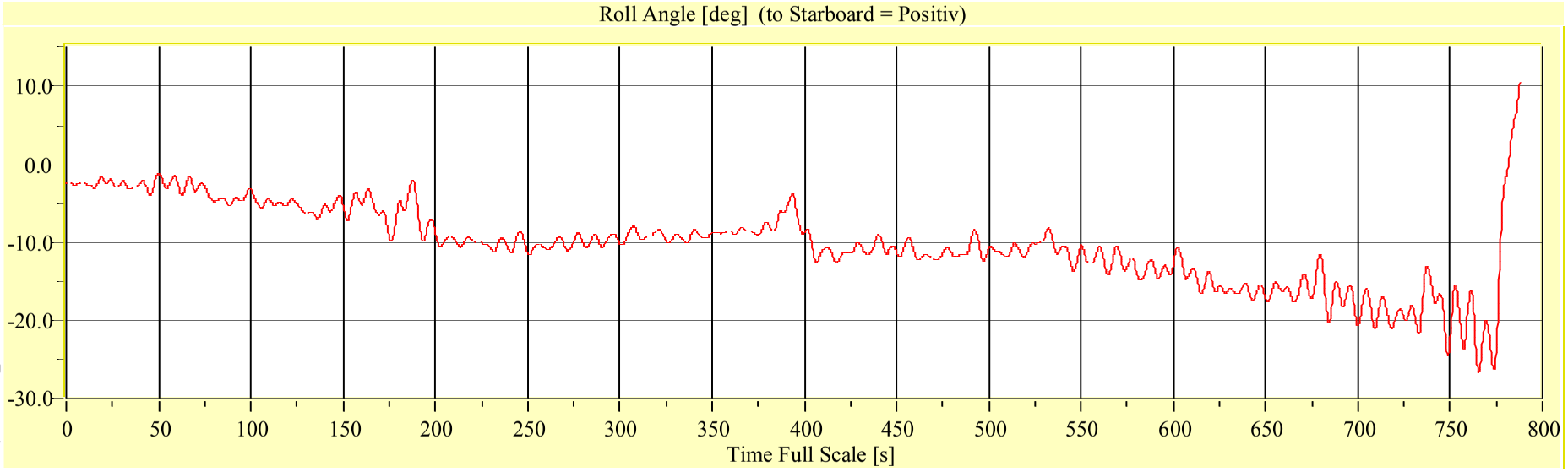



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-09.1 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



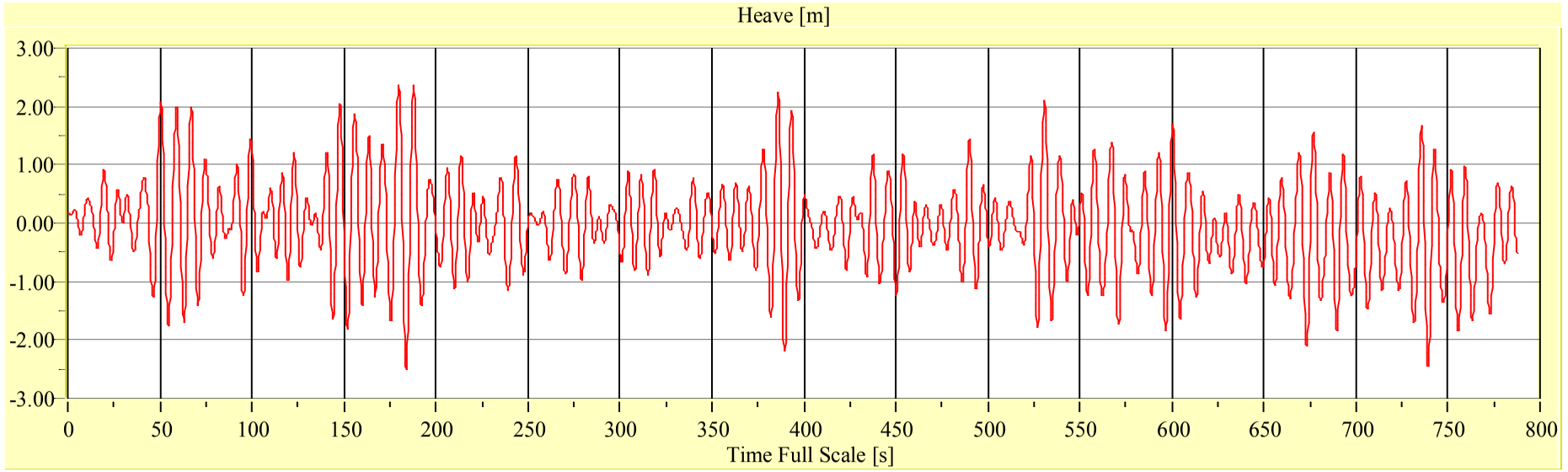



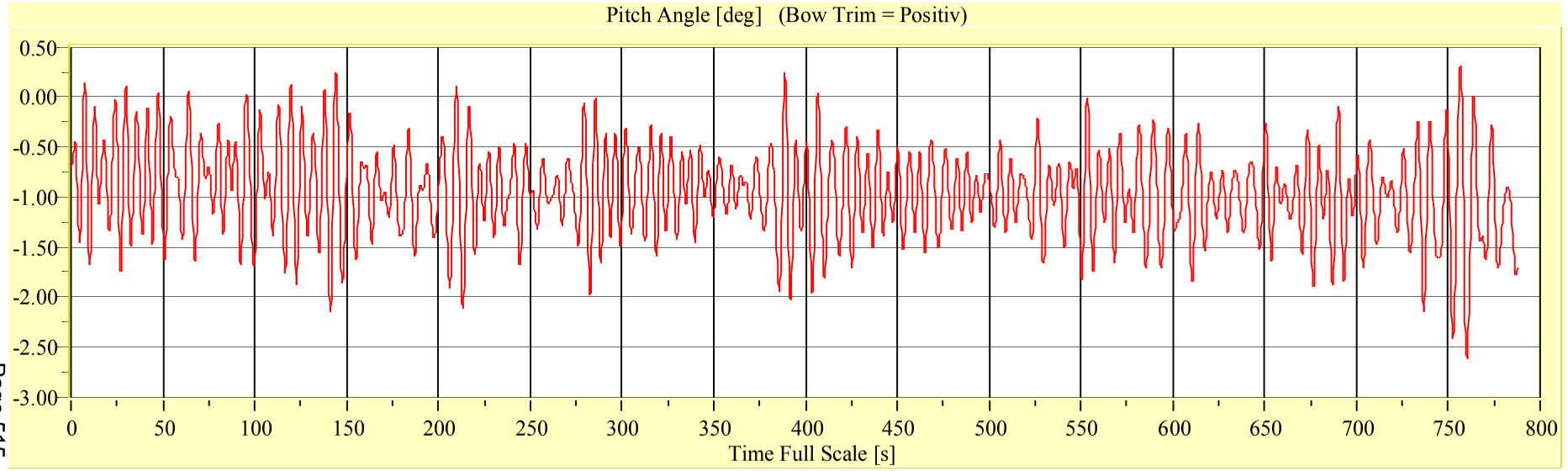



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-09.1 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



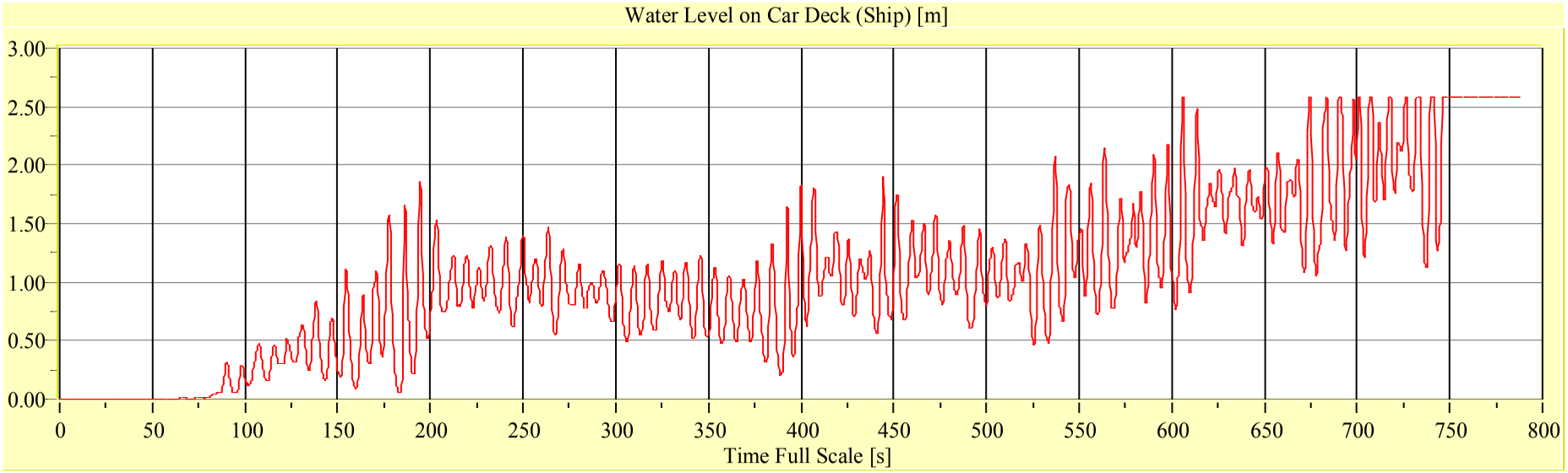



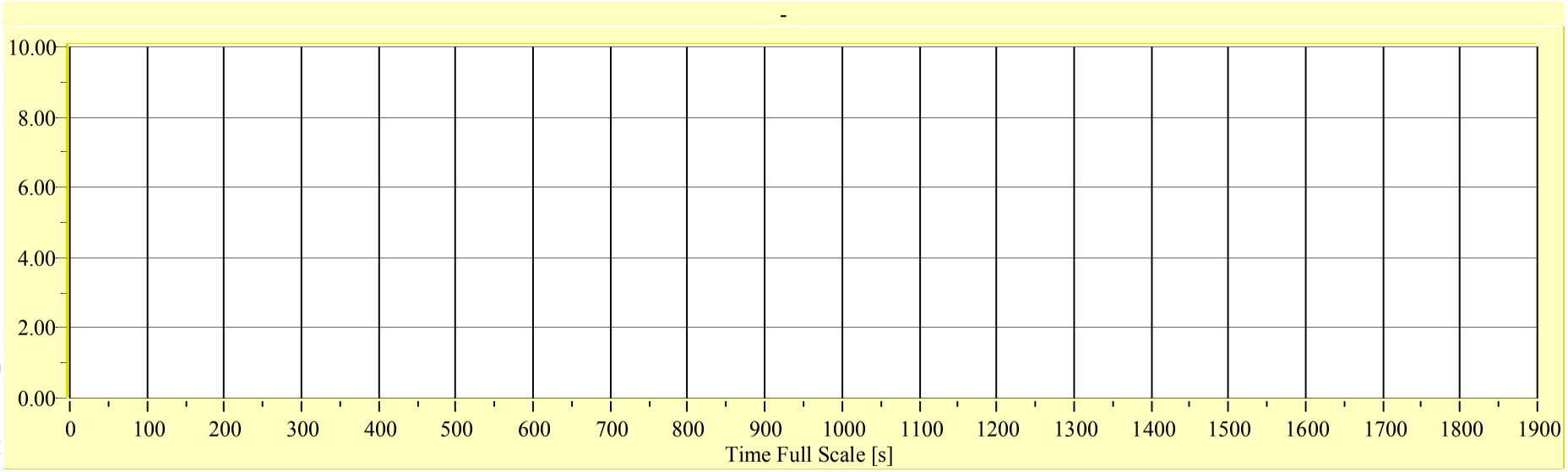



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-09.1 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



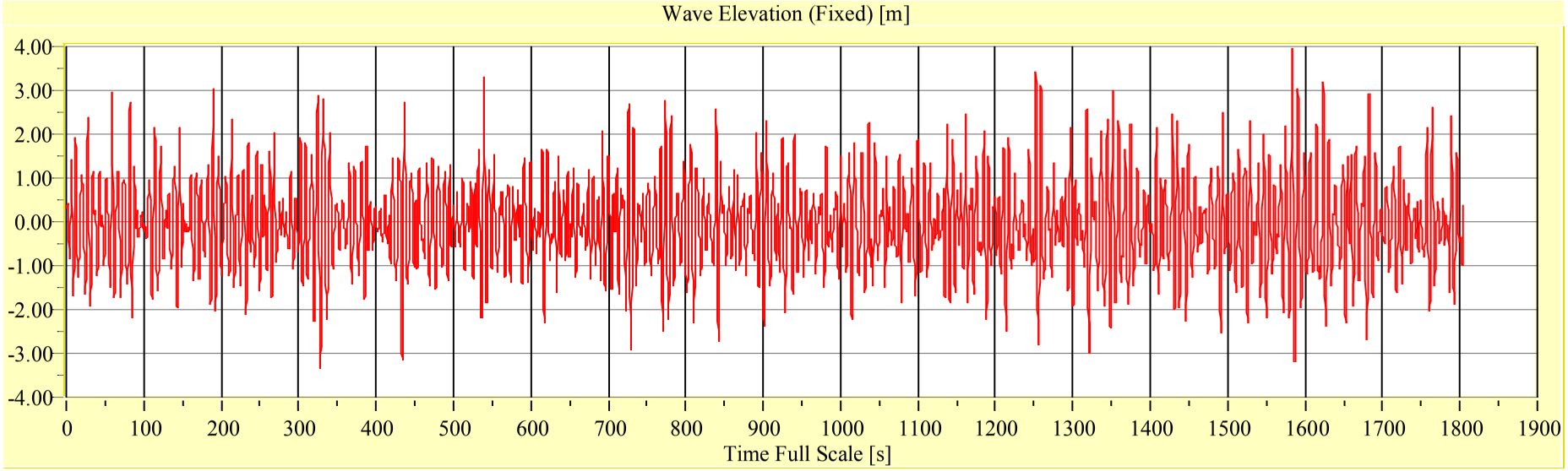



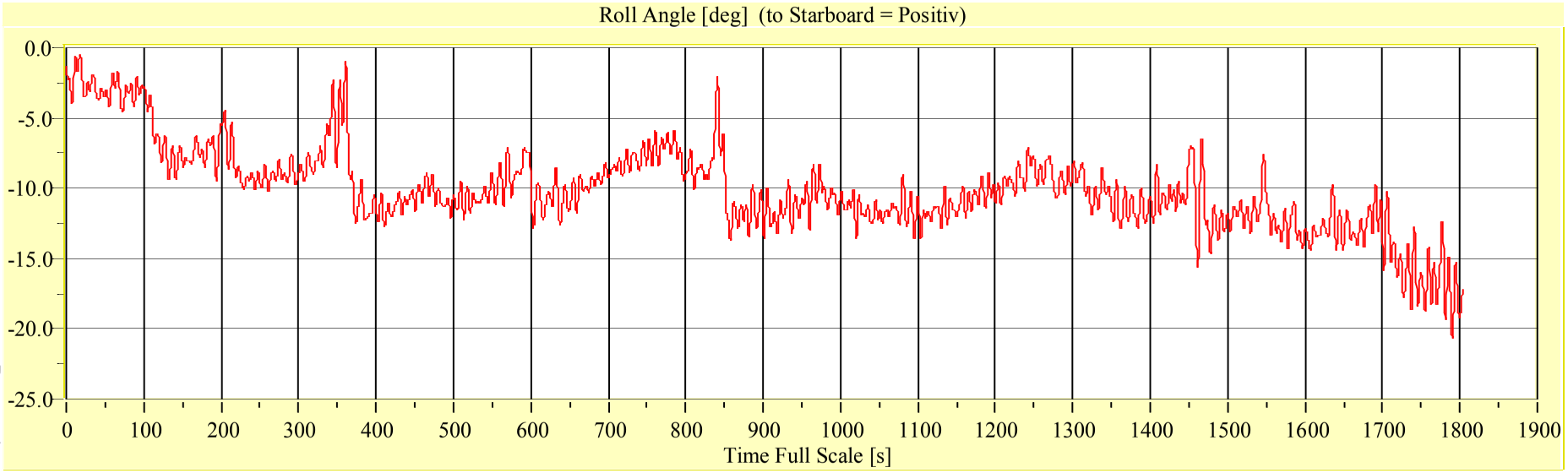



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-10 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



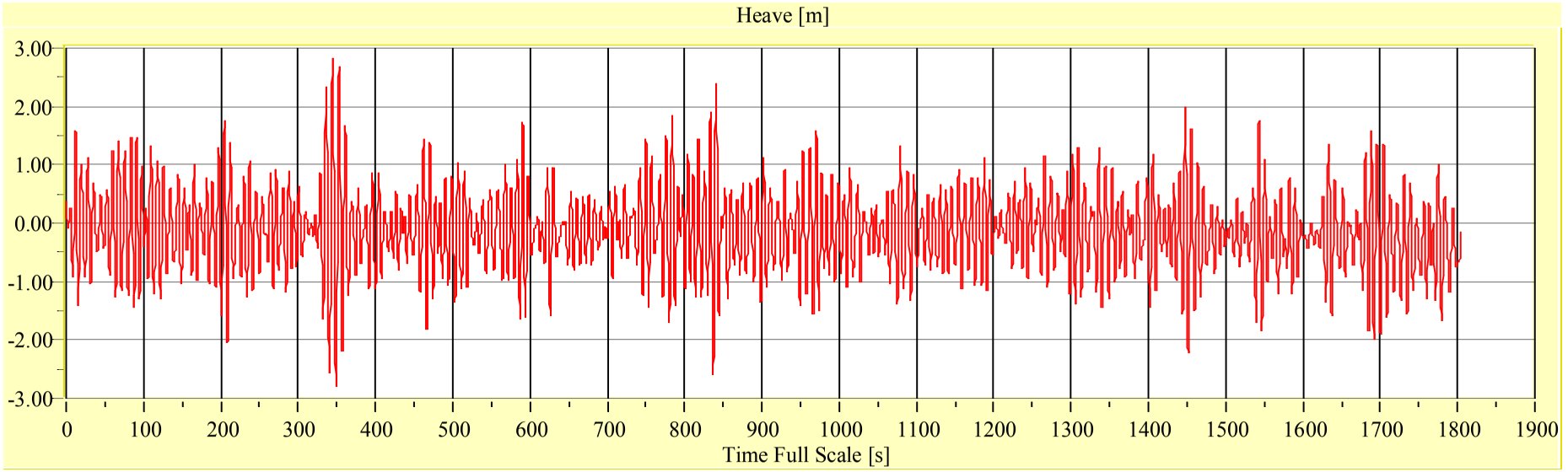



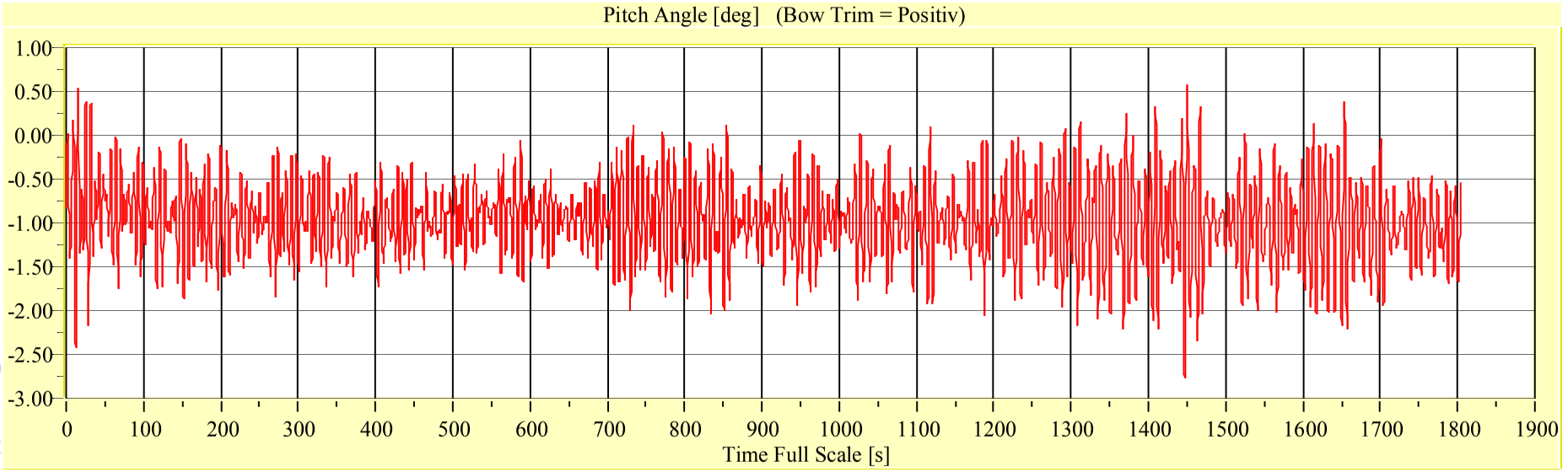



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-10 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



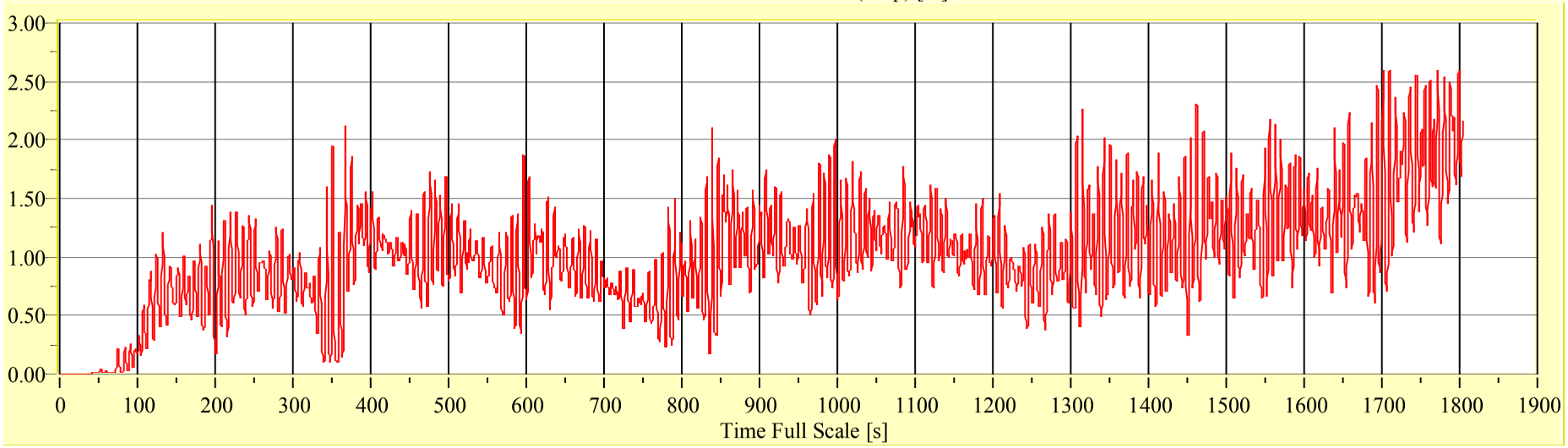



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

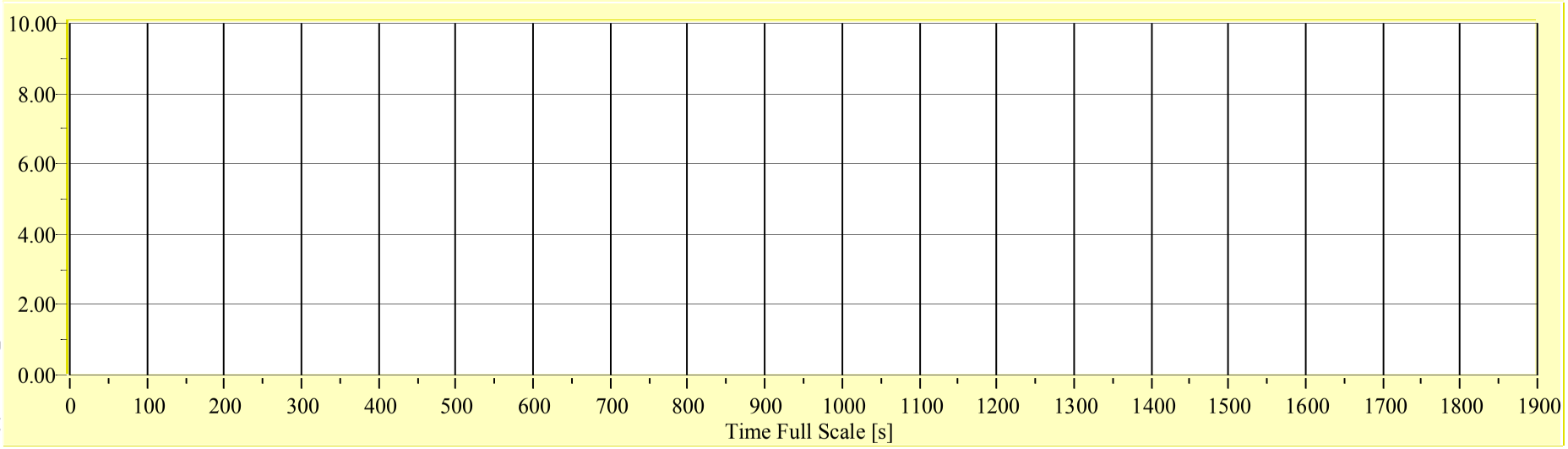
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29663-10 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|

Water Level on Car Deck (Ship) [m]




-

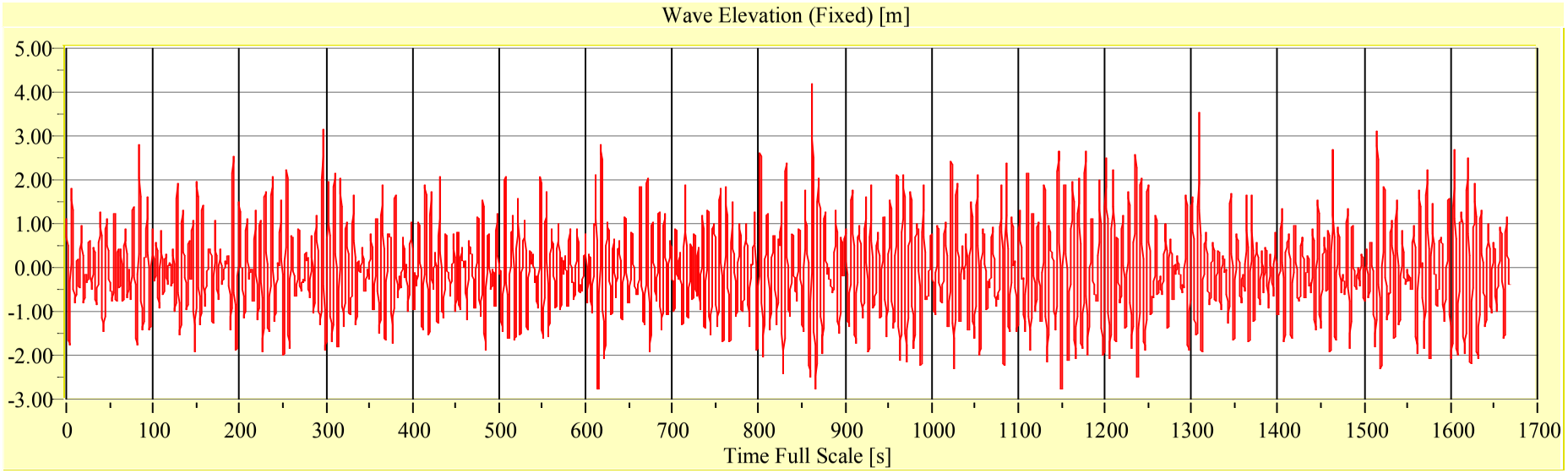


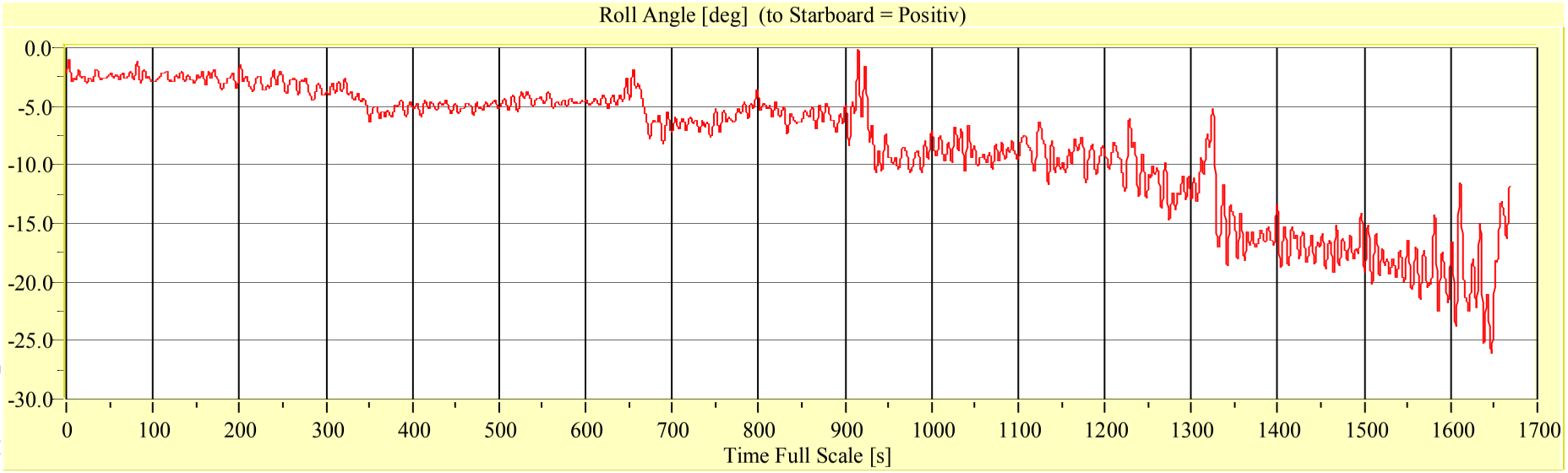



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-01 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



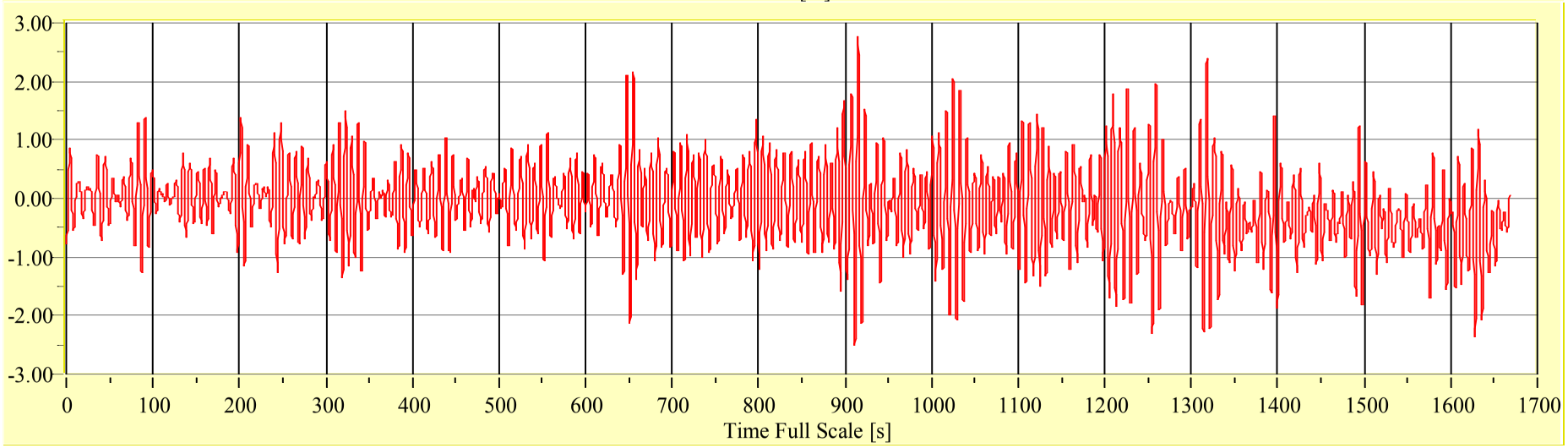



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

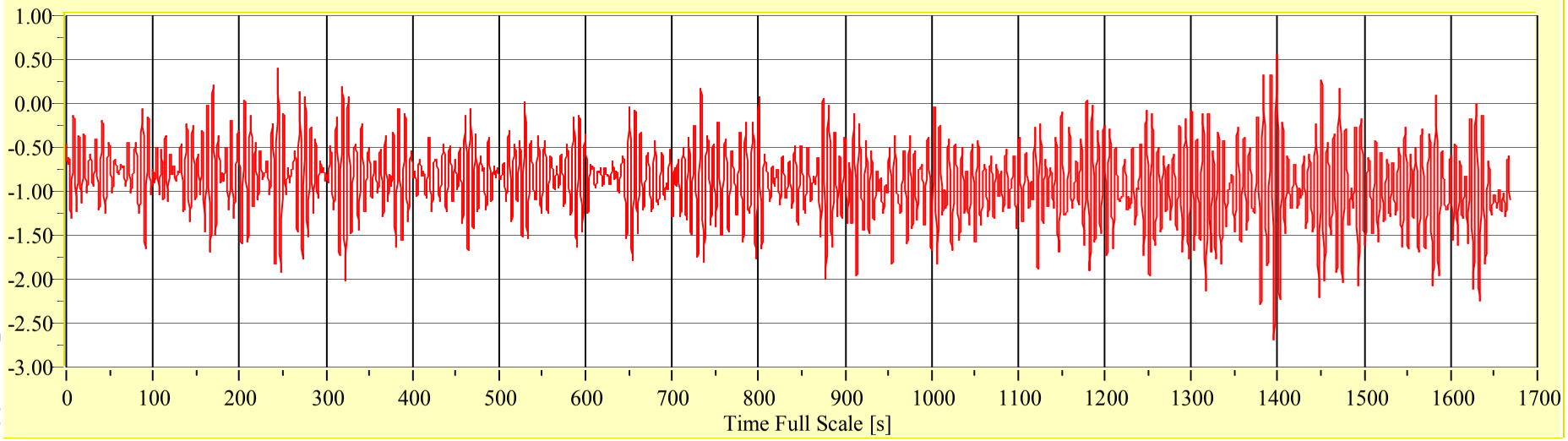
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-01 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

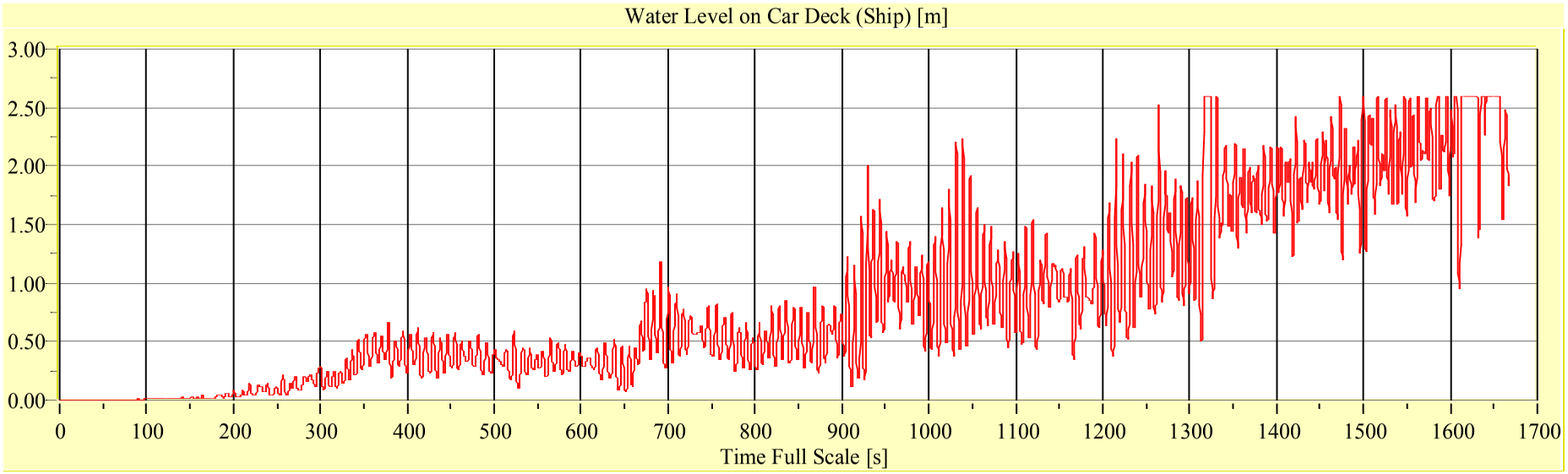


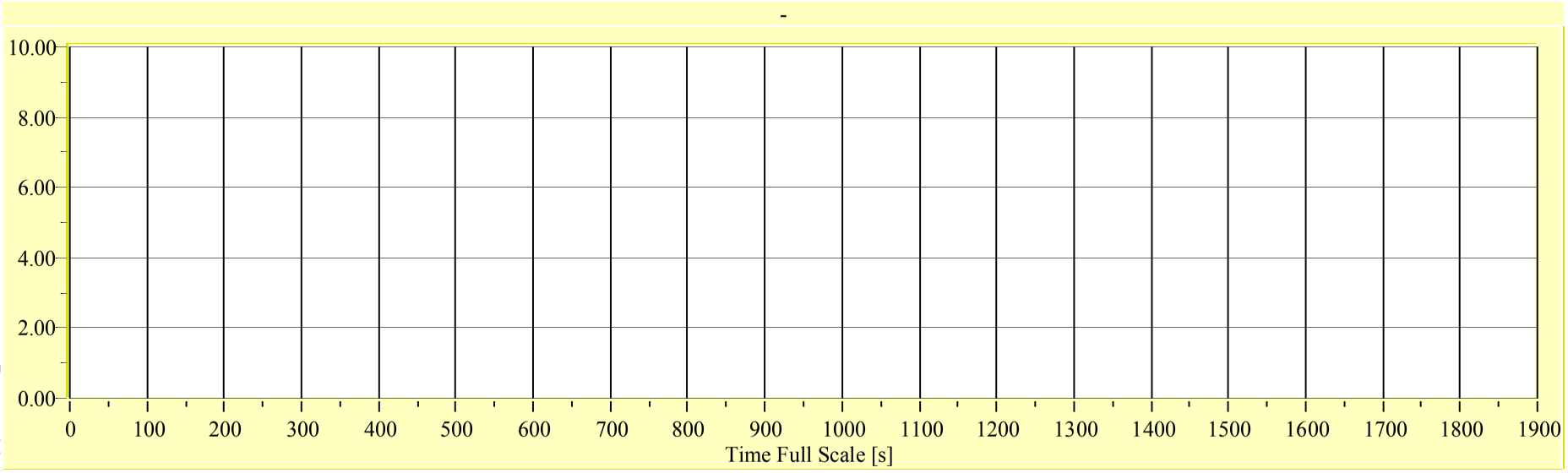



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-01 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



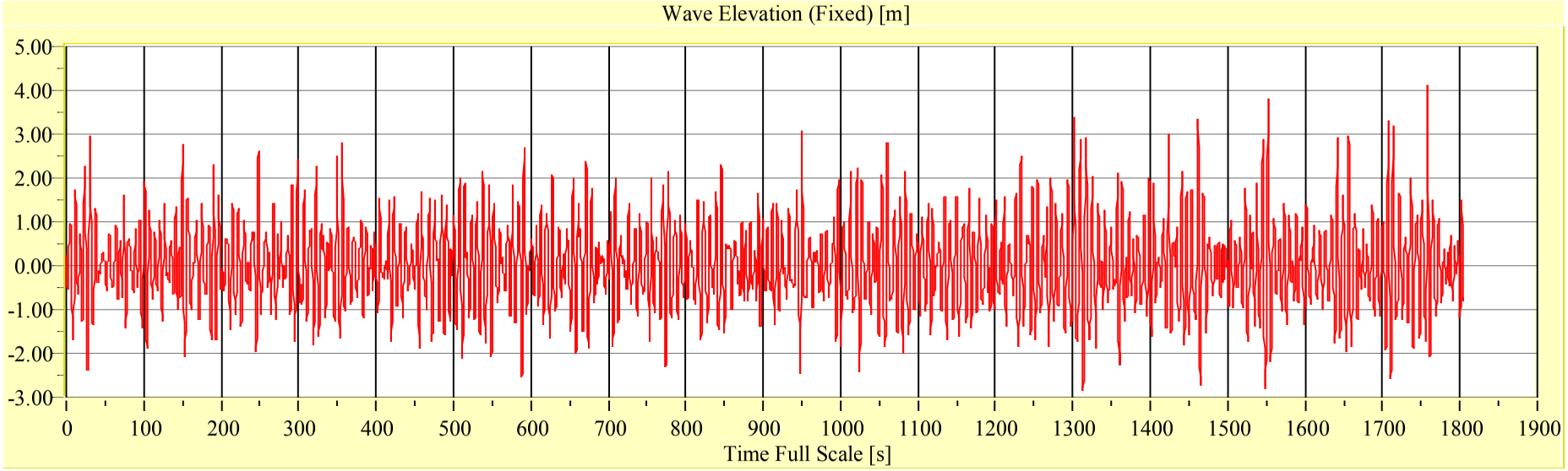



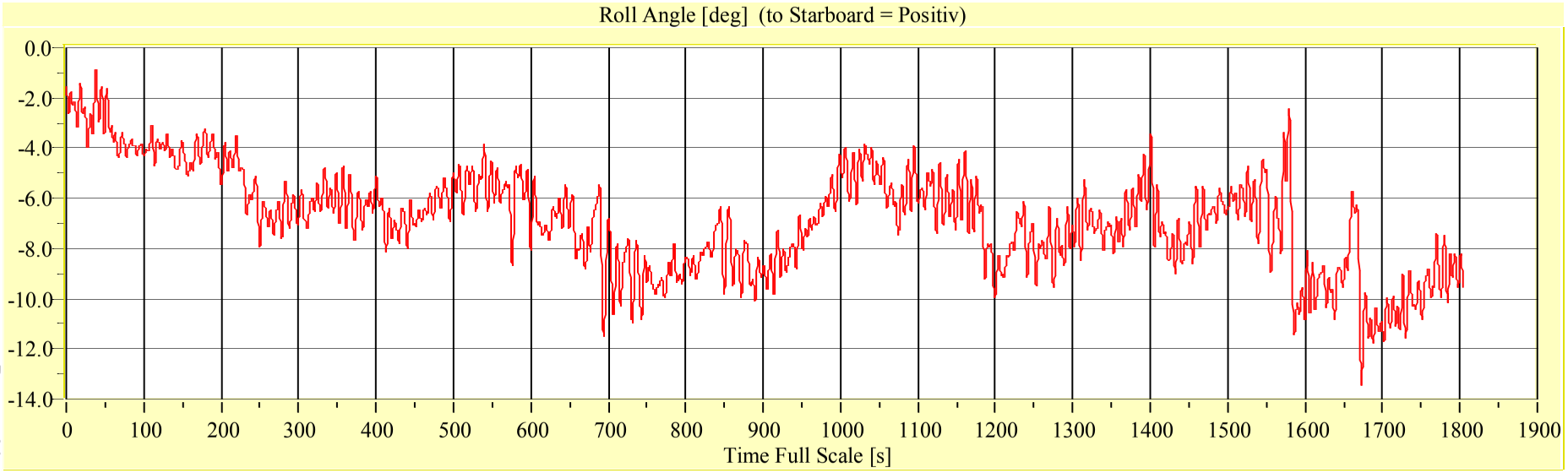



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-02 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



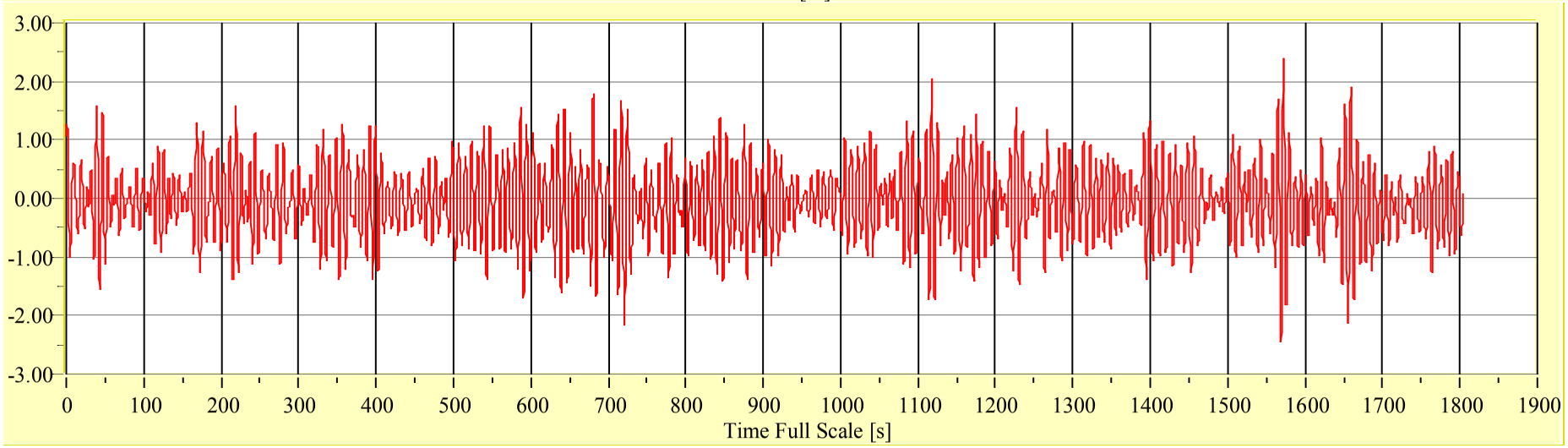



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

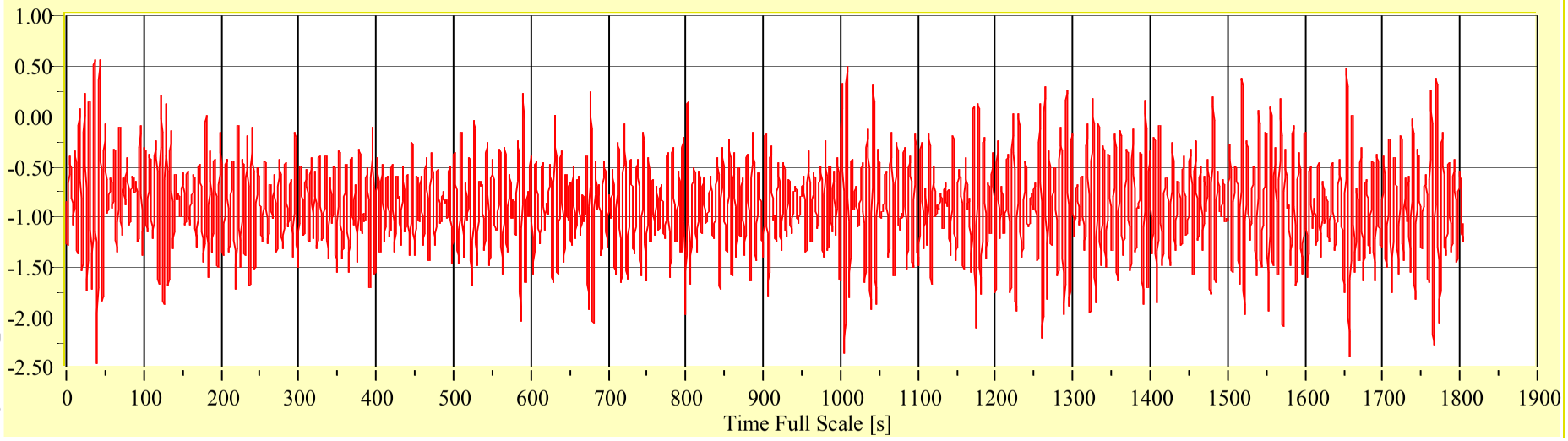
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-02 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

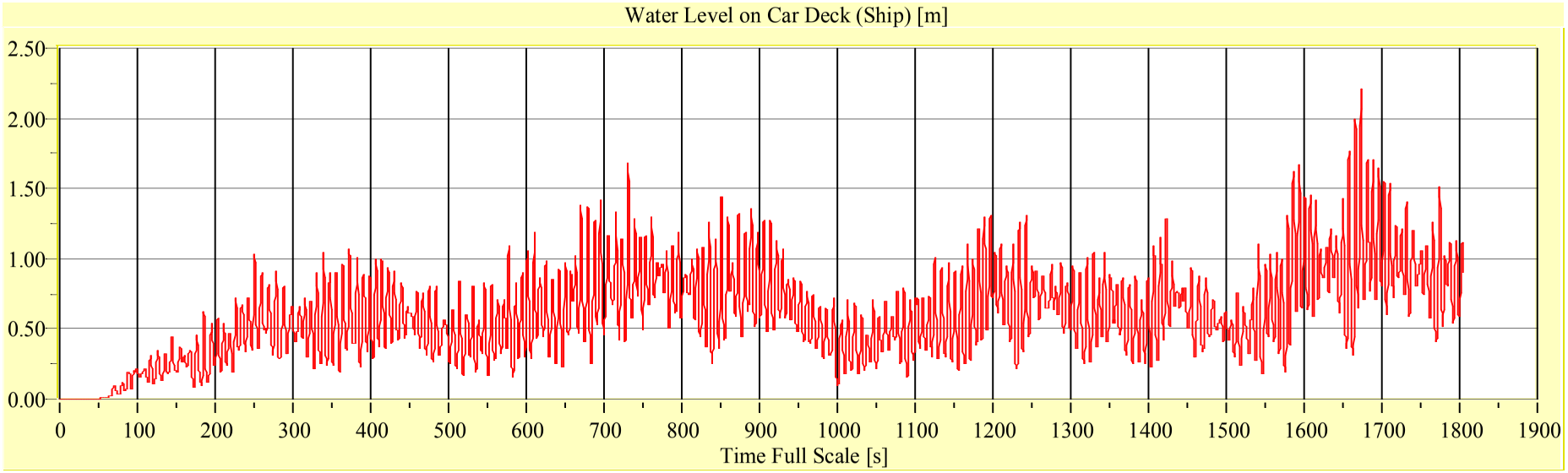


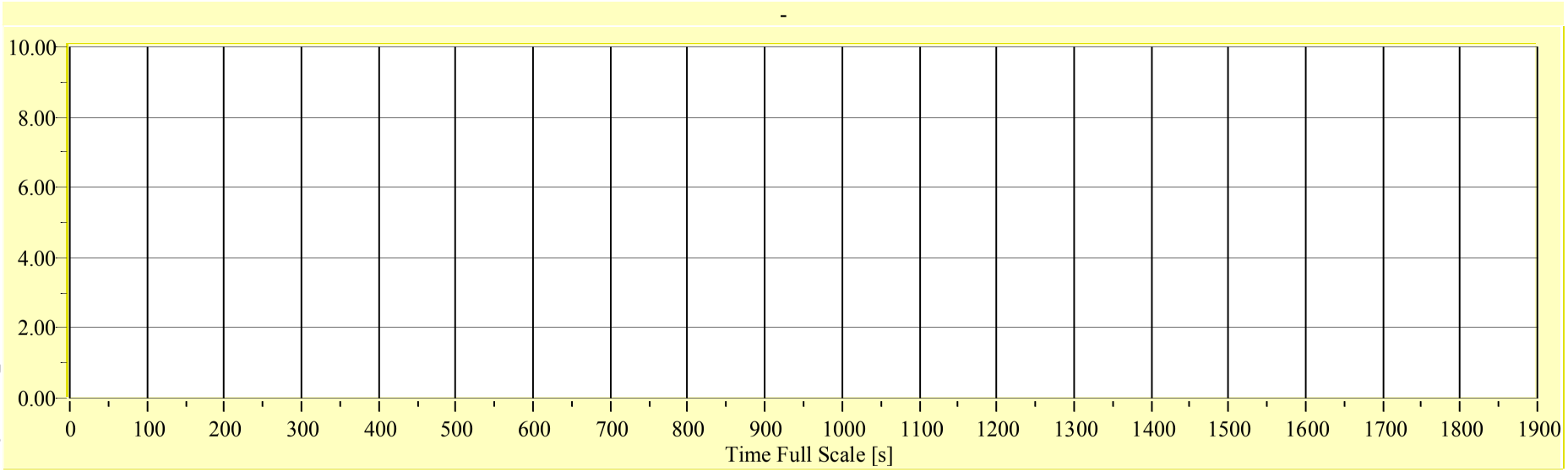



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-02 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



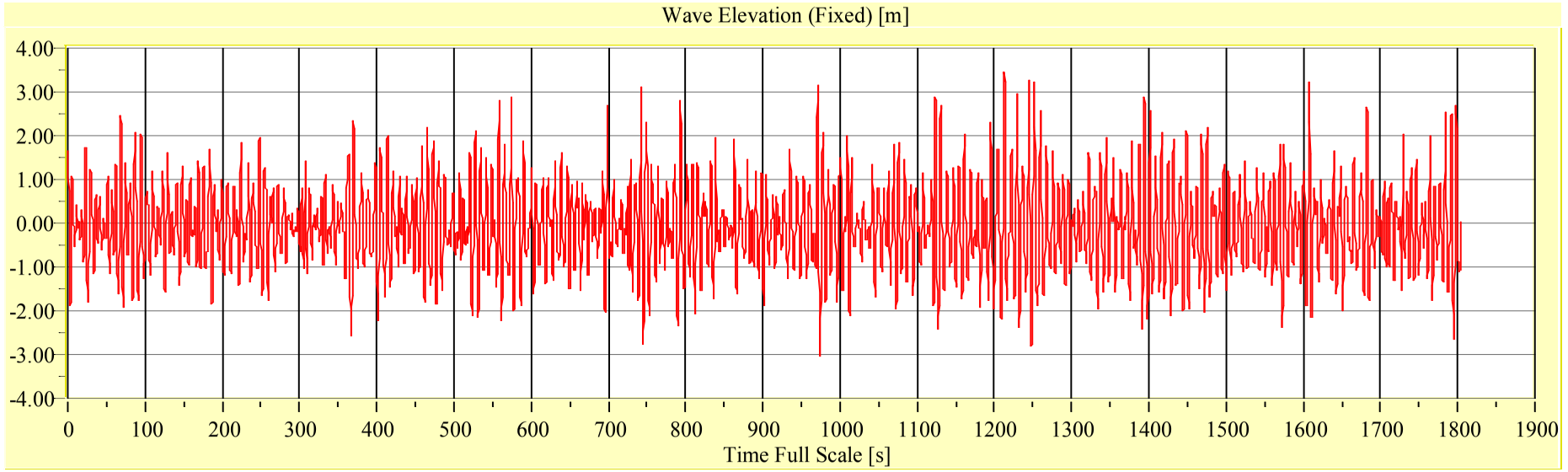



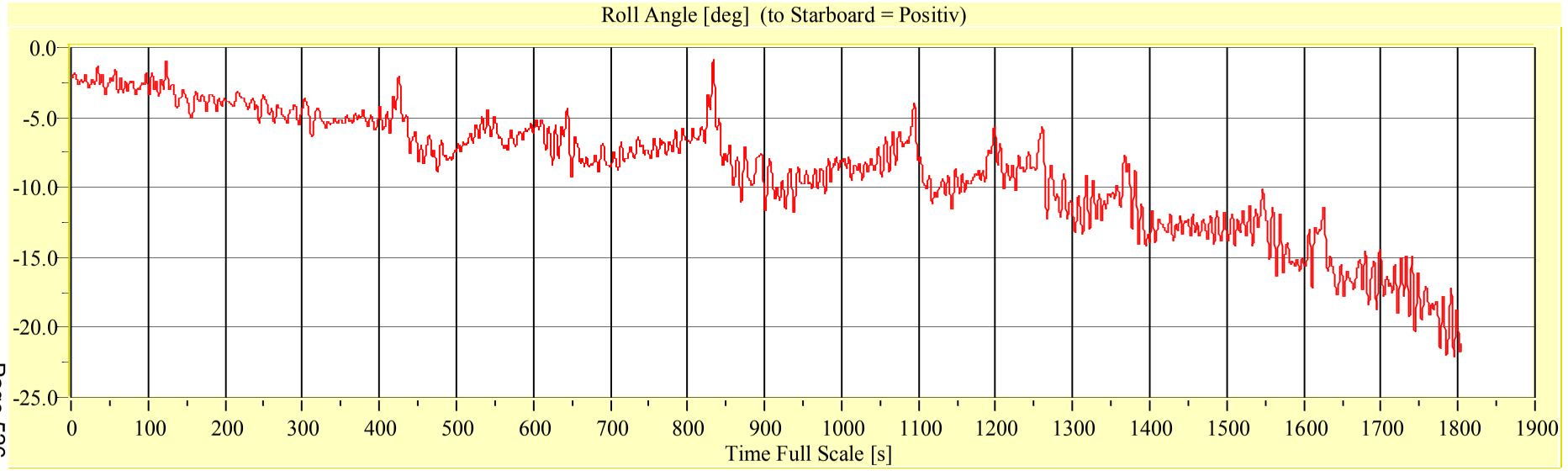



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-03 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



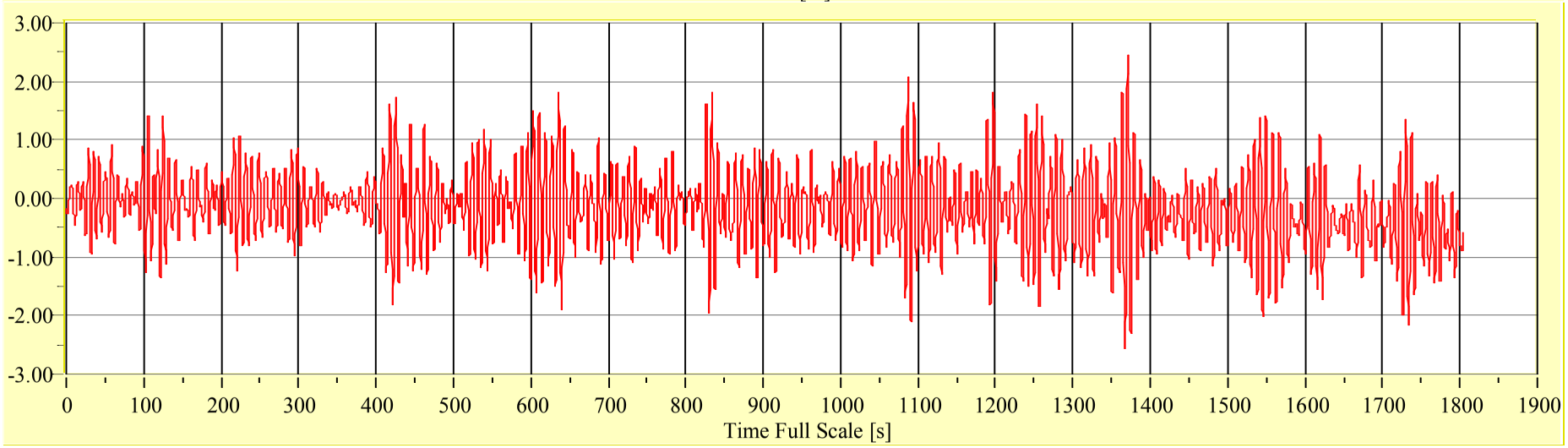



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

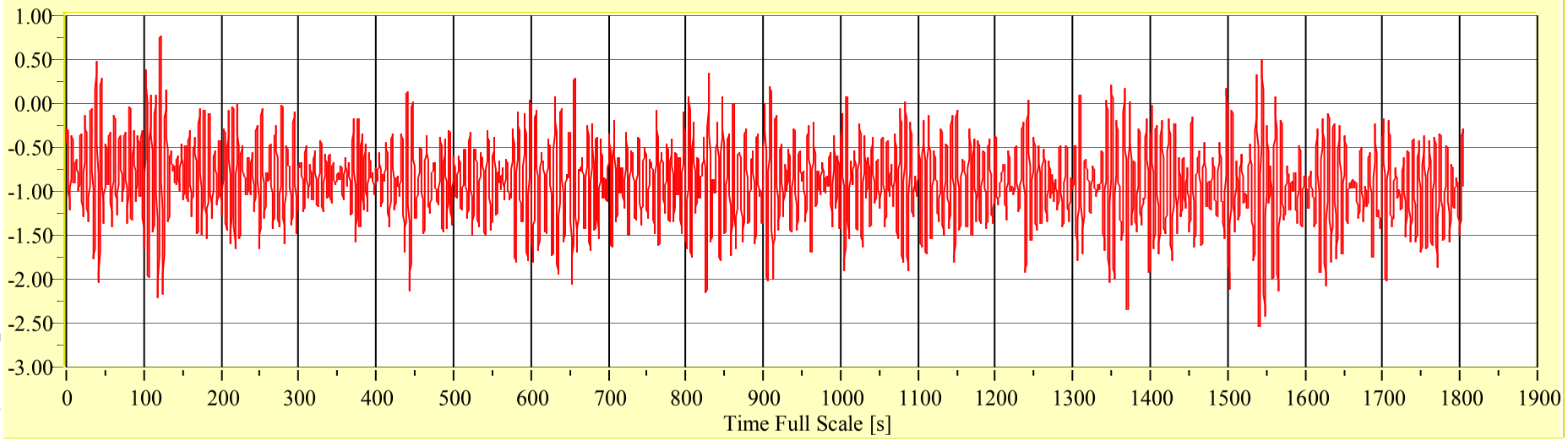
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-03 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

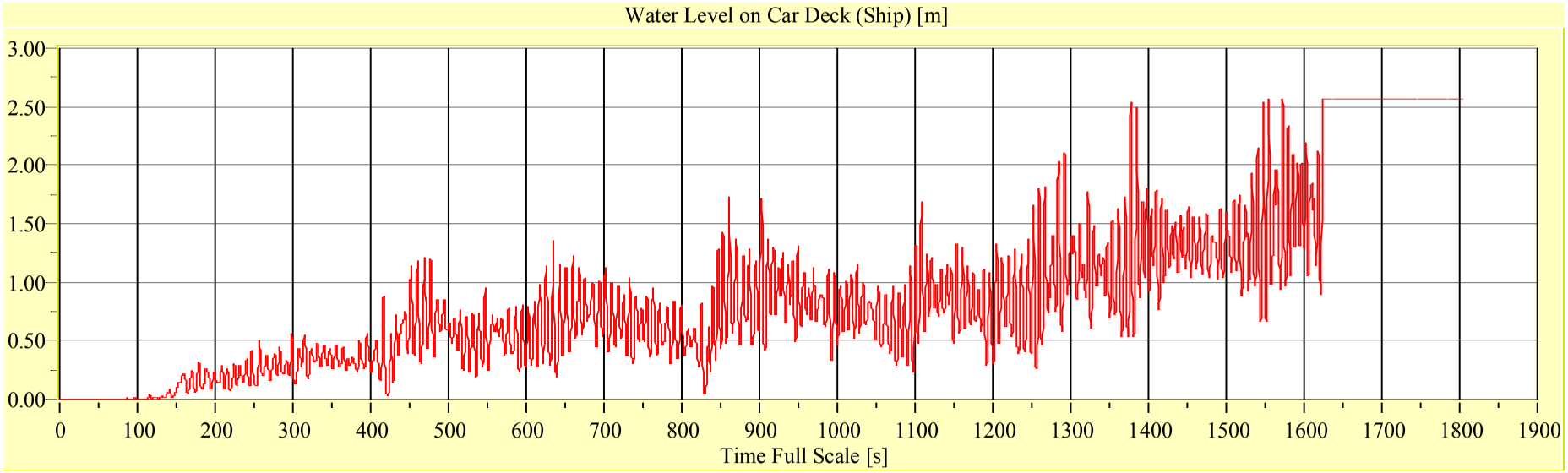


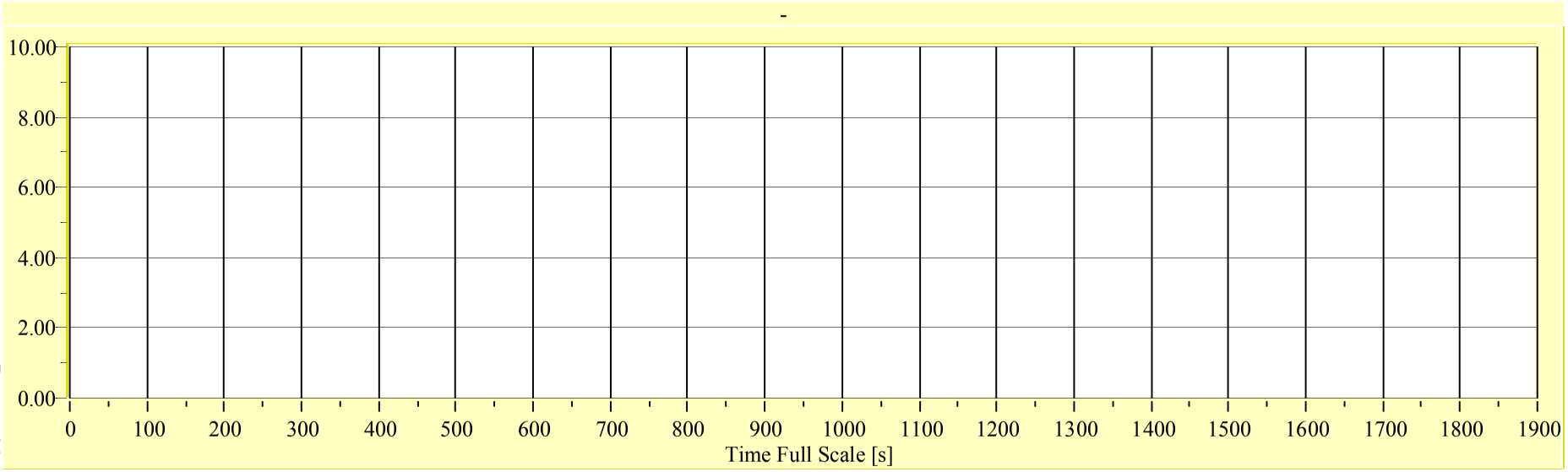



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-03 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



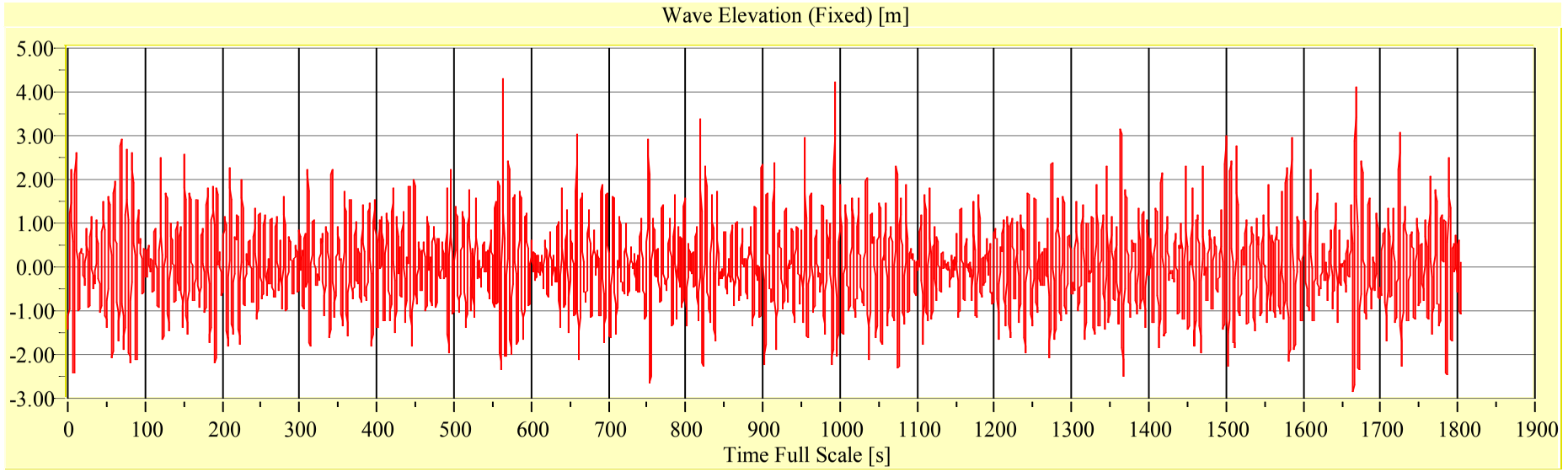



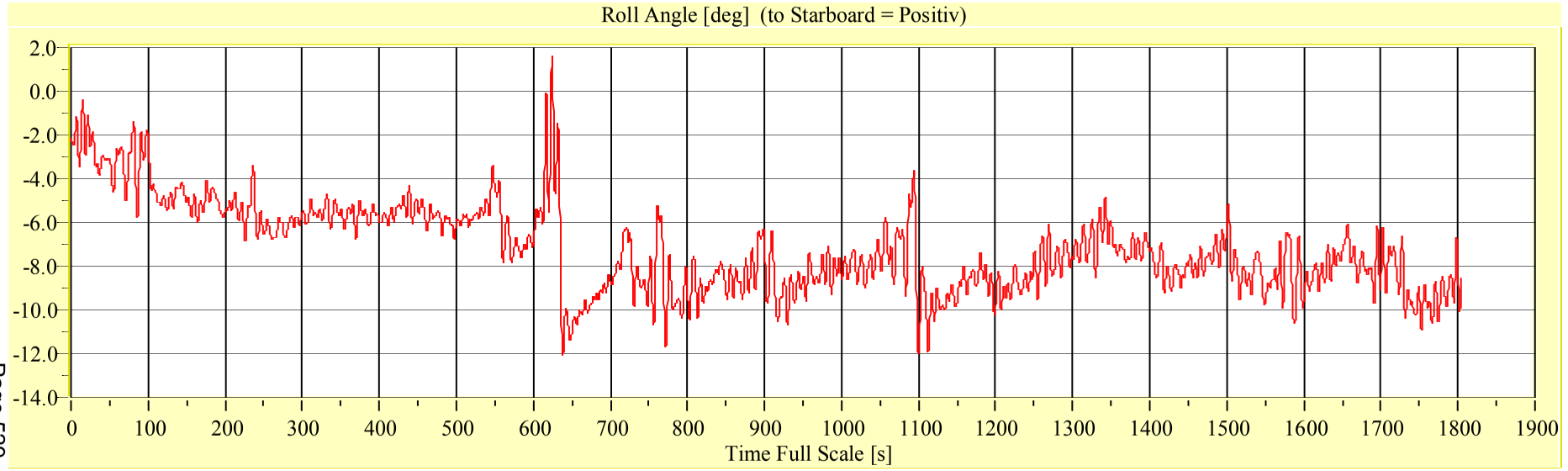



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-04 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



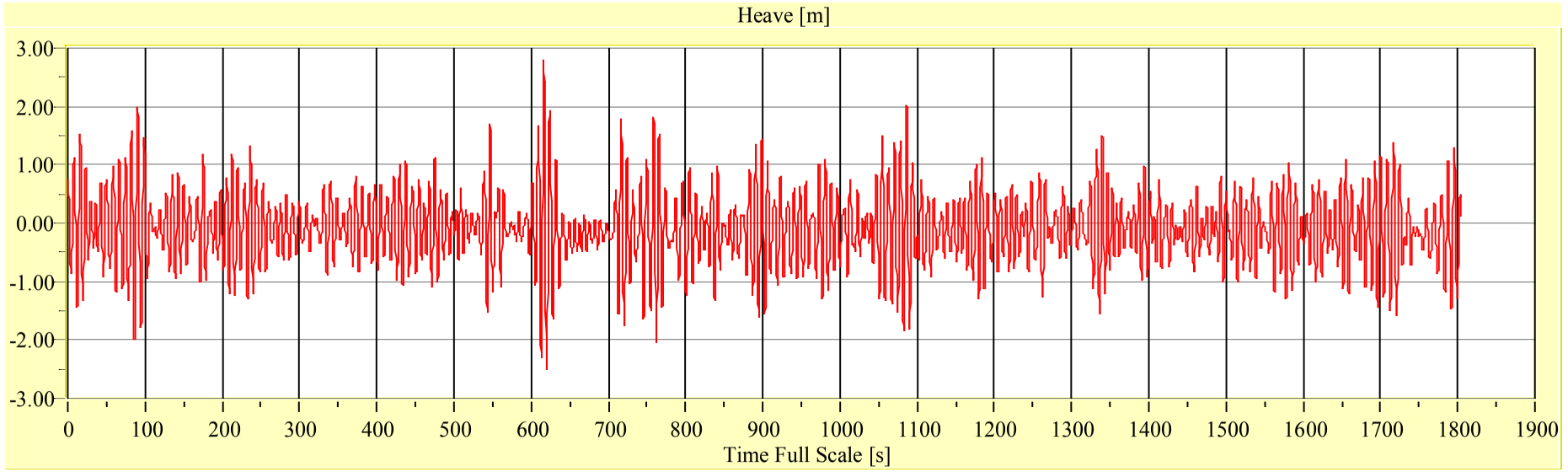



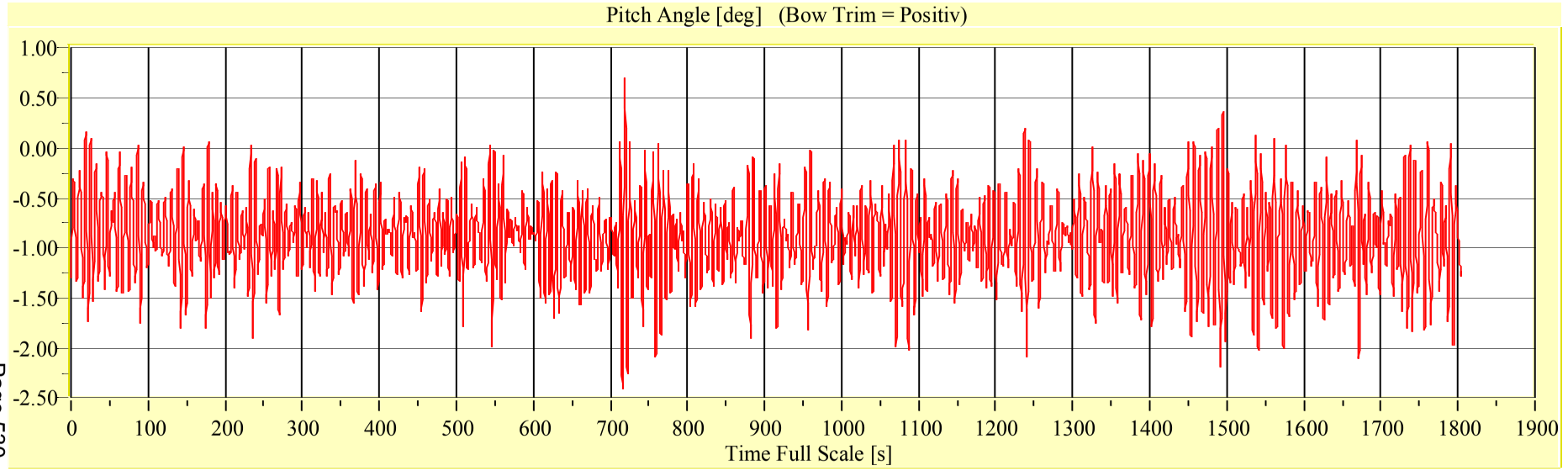



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-04 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



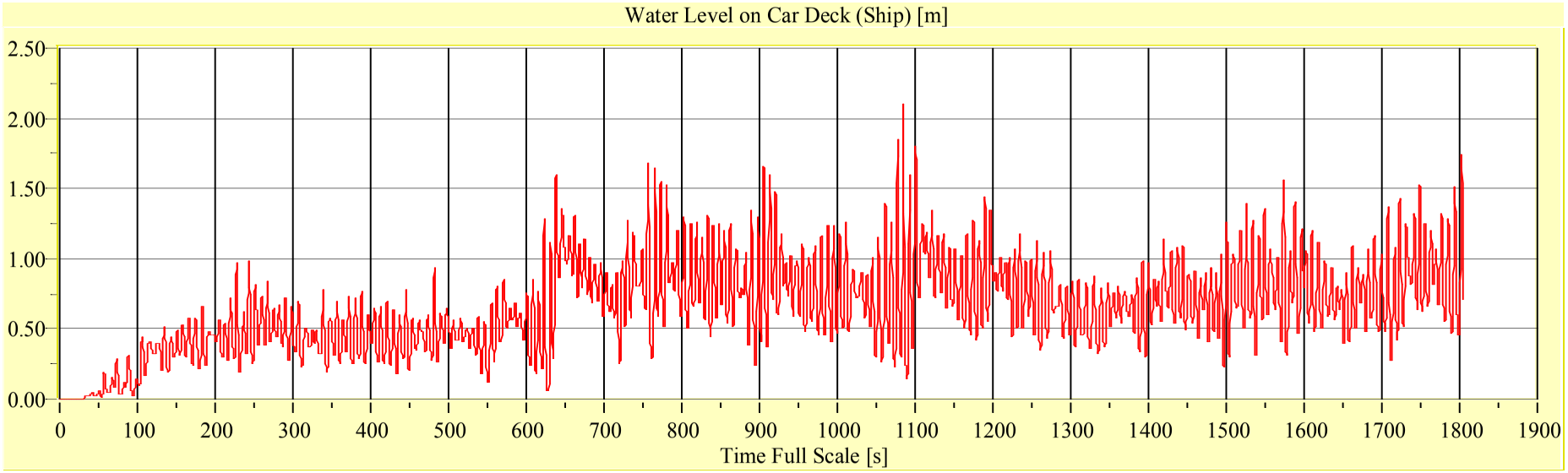



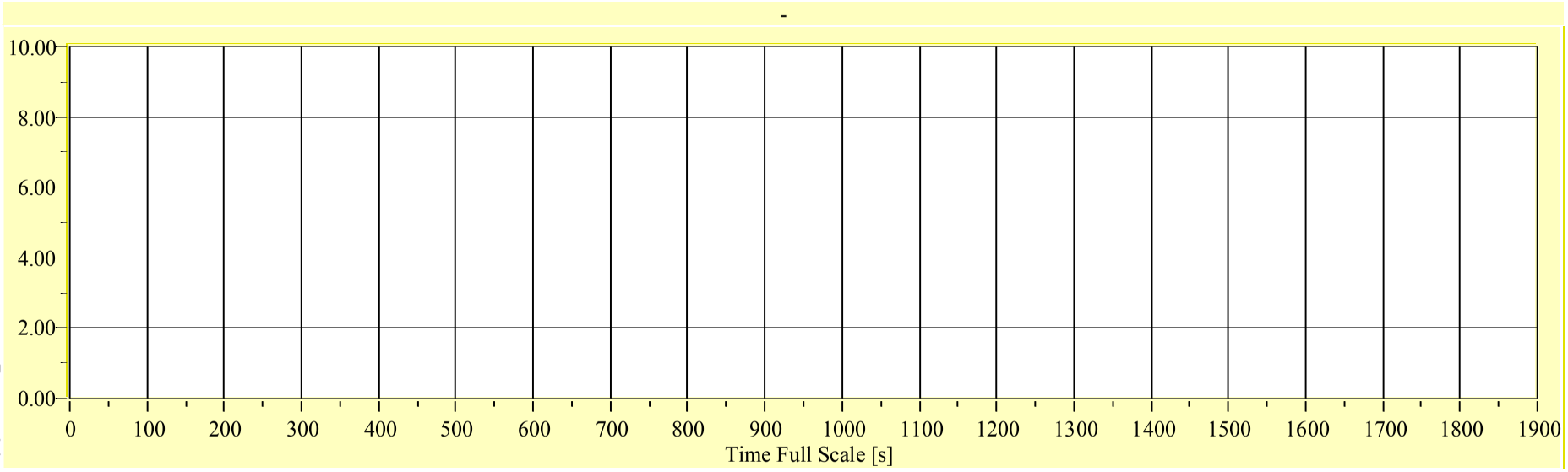



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-04 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



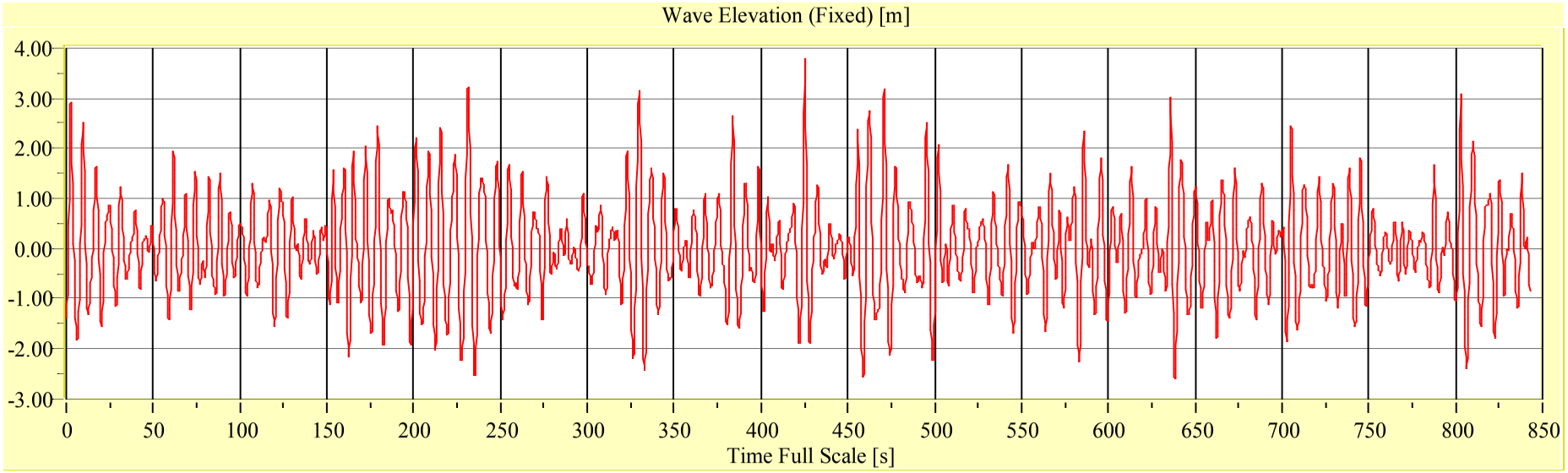



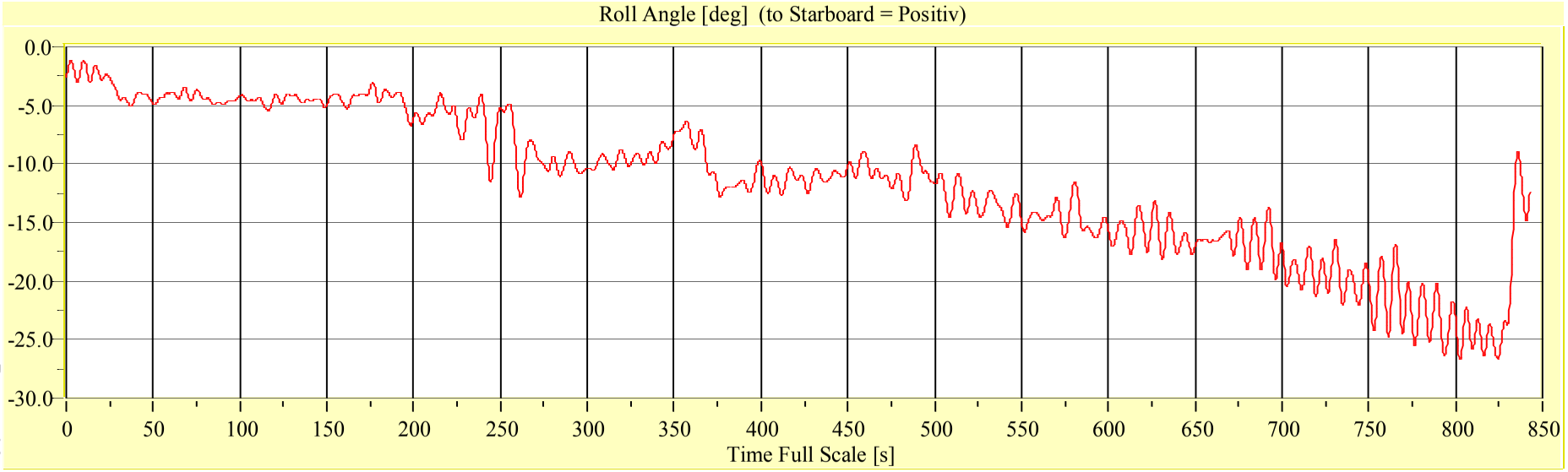



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-05 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



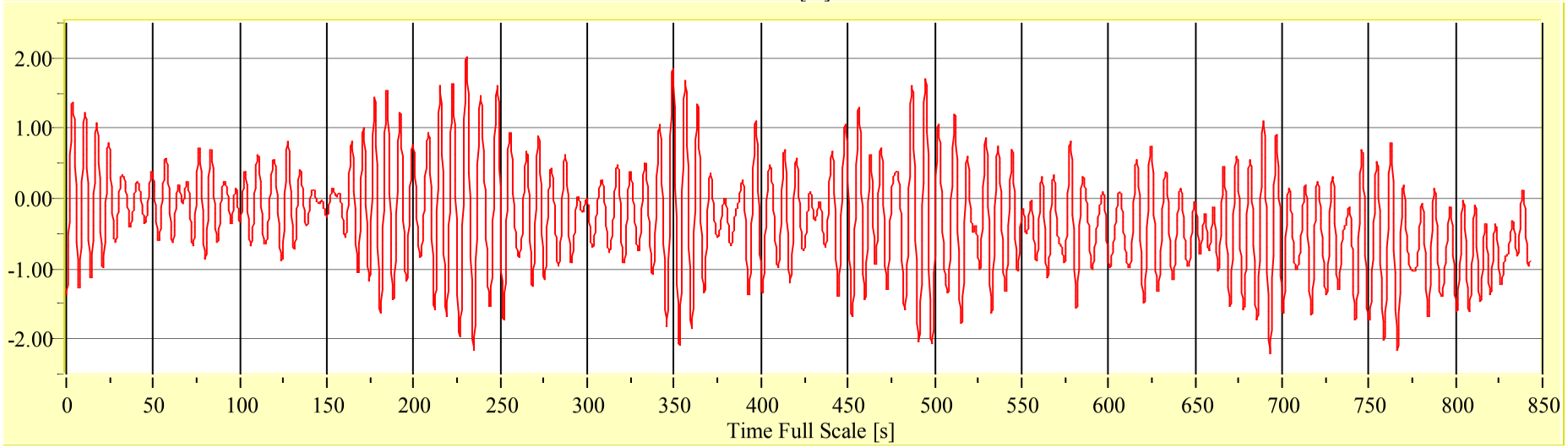



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

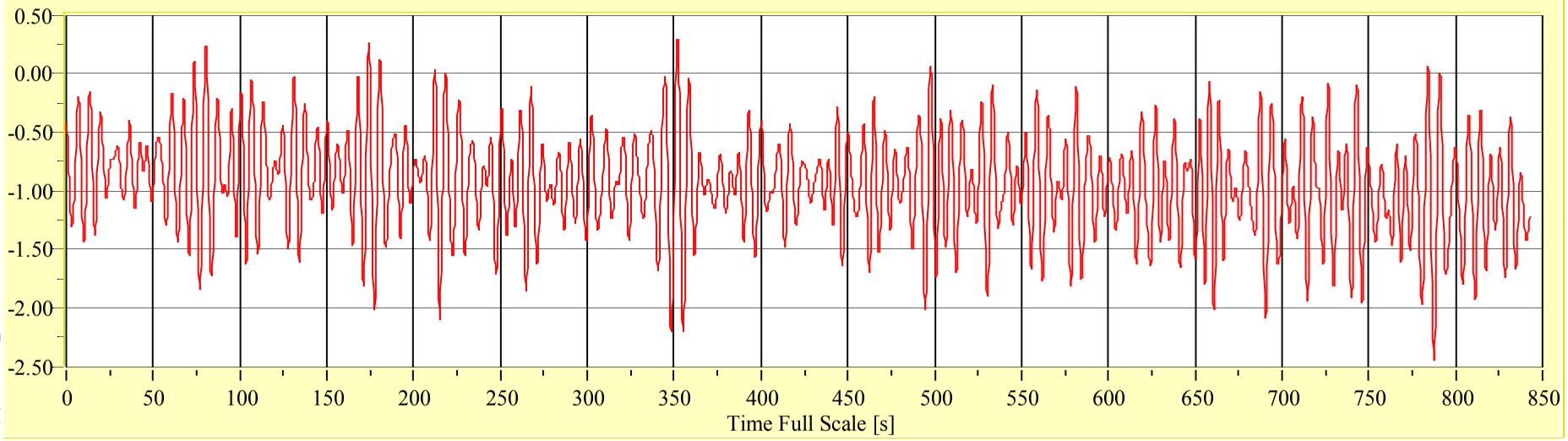
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-05 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

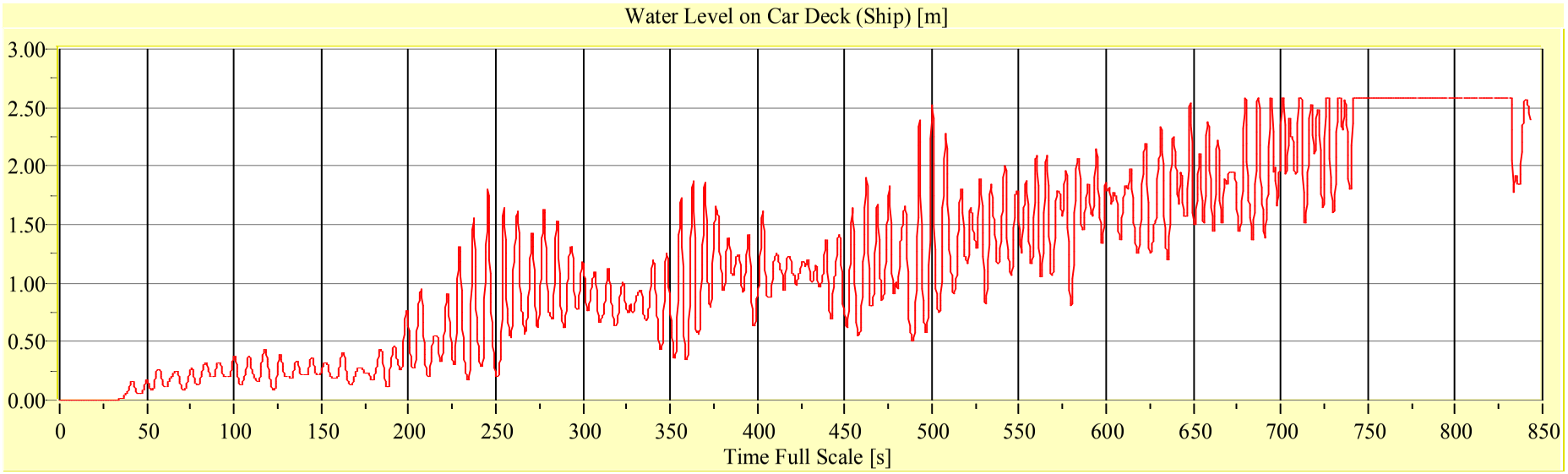


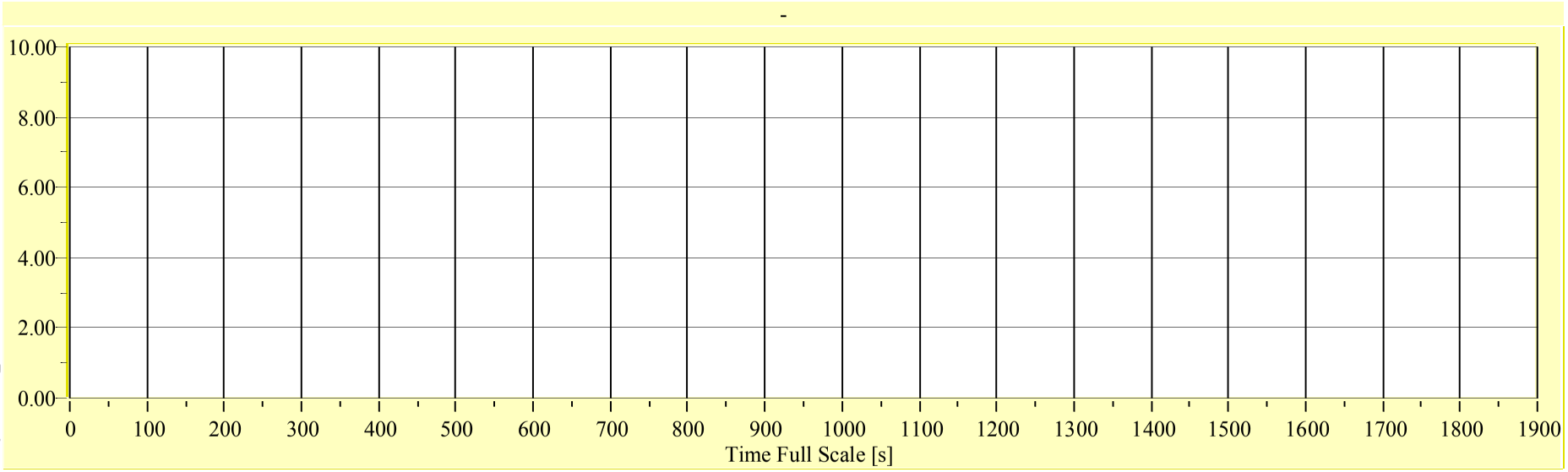



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-05 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



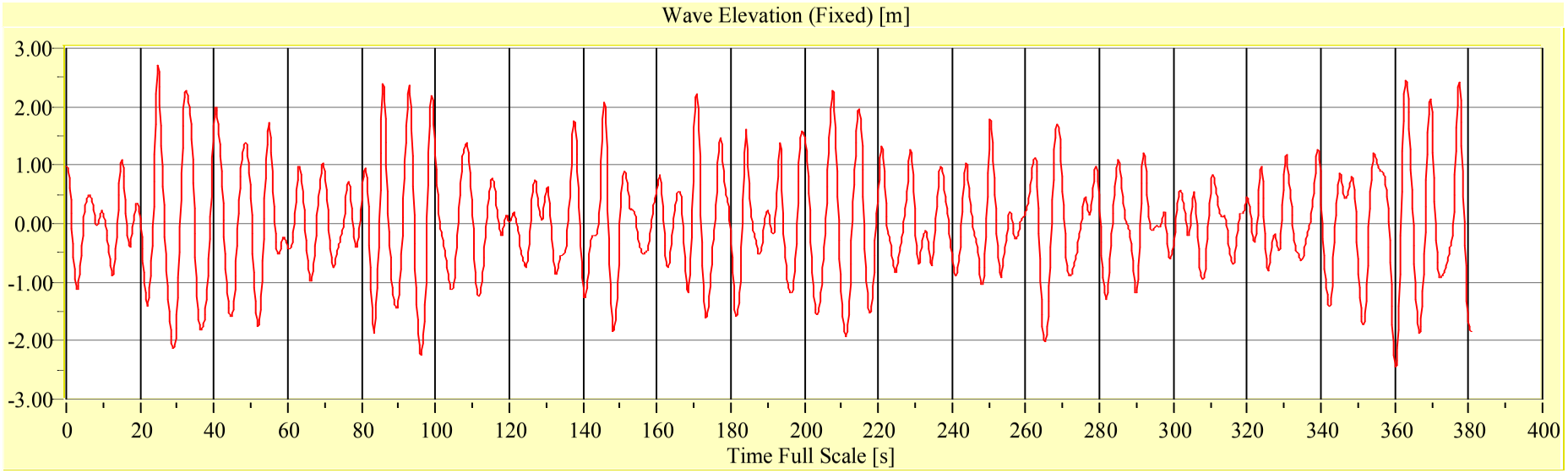



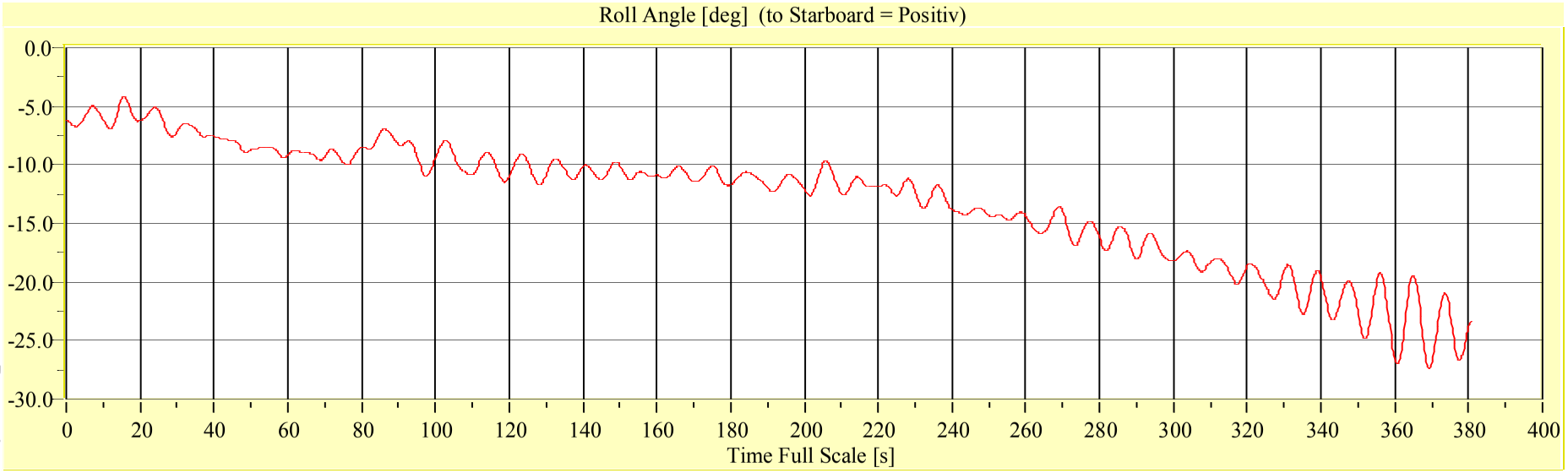



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-06 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



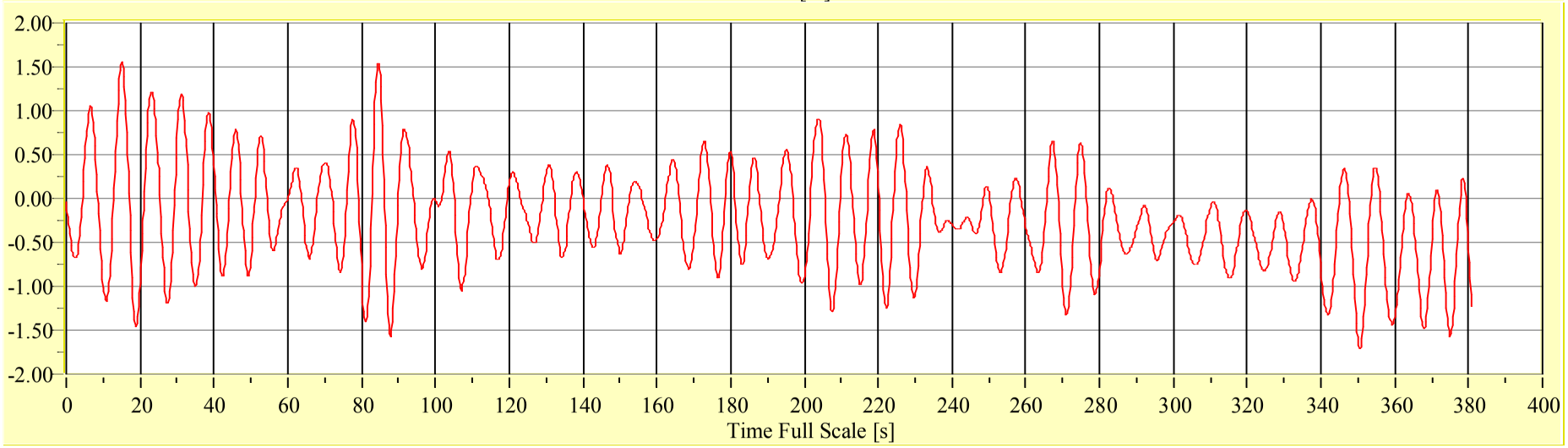



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

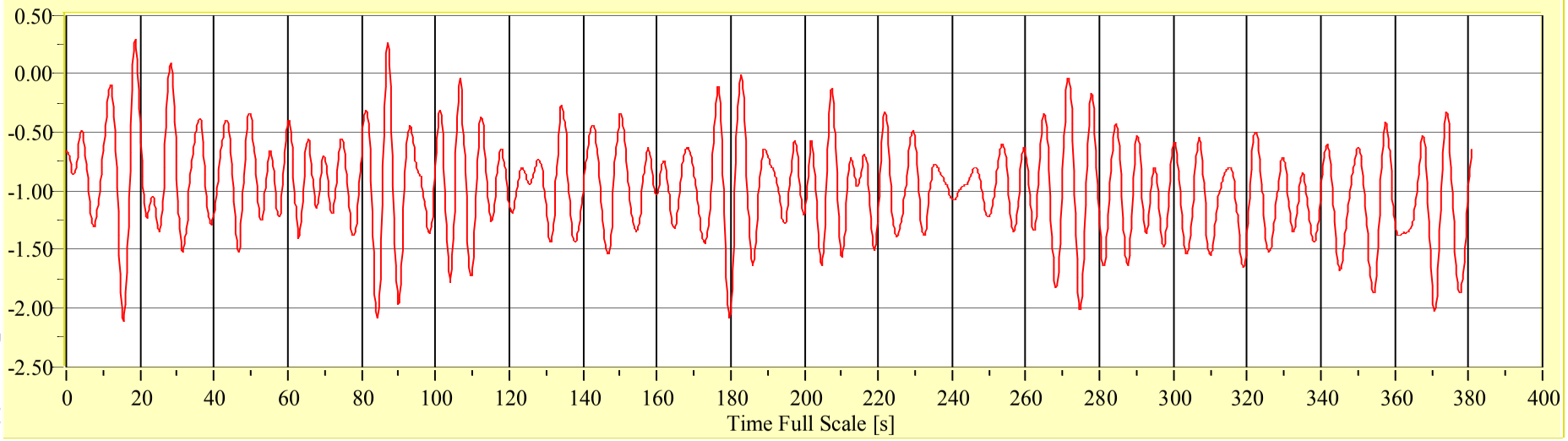
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-06 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

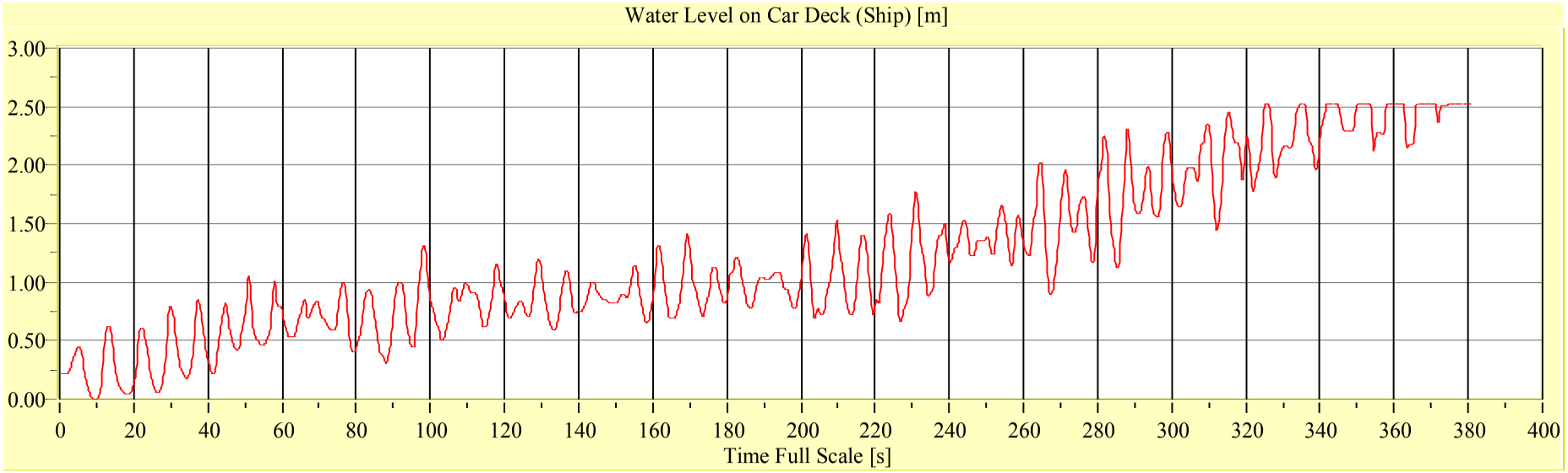


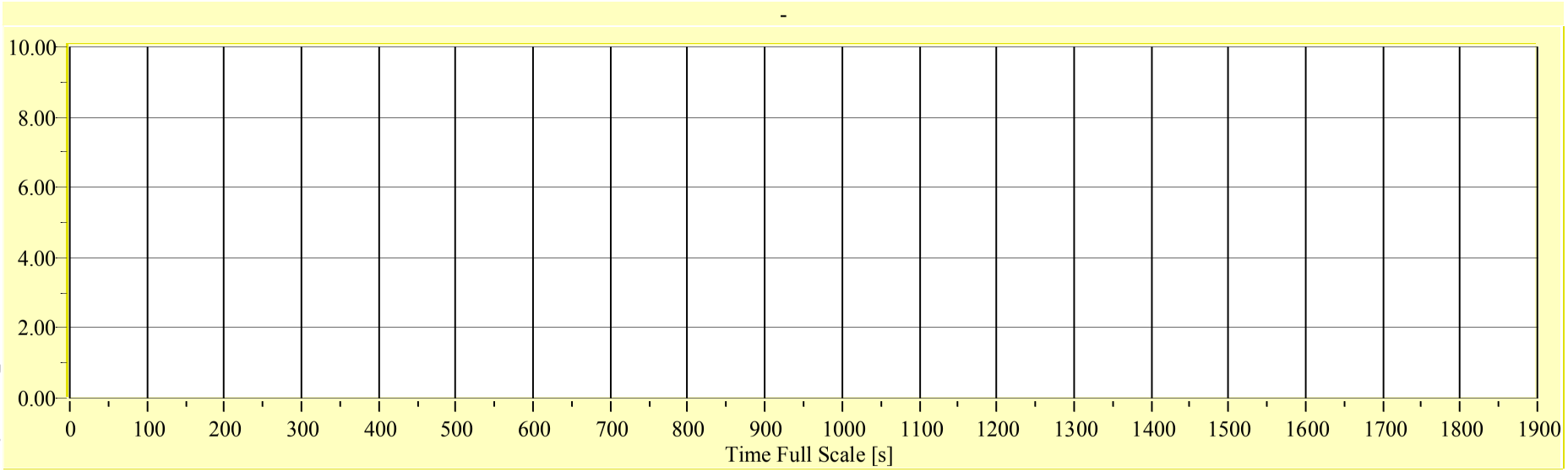



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-06 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



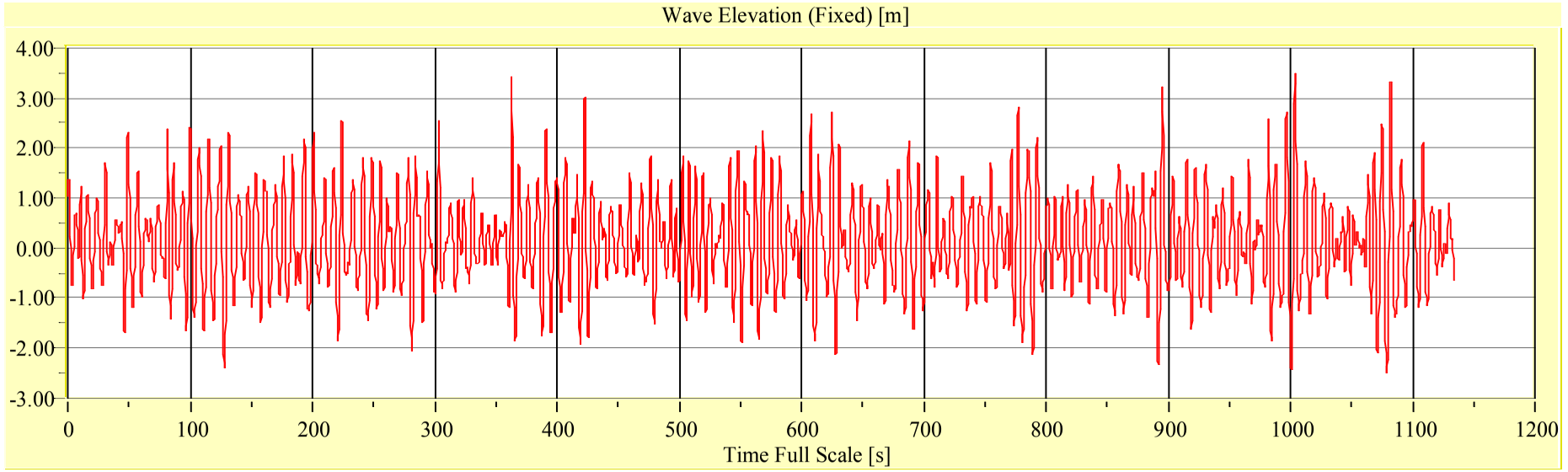



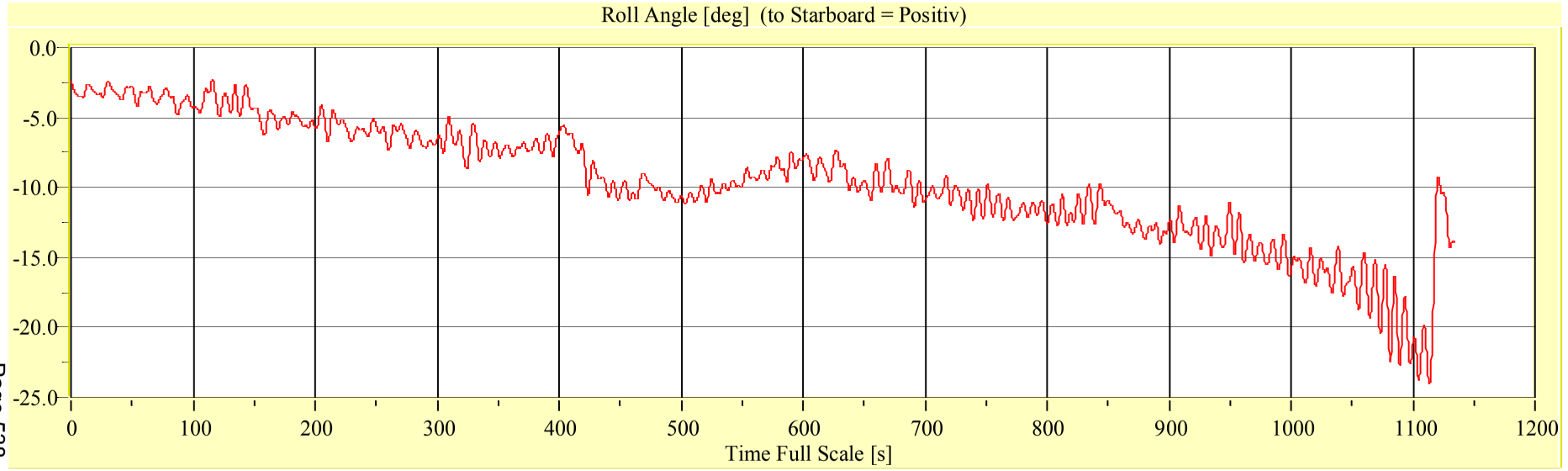



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-07 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



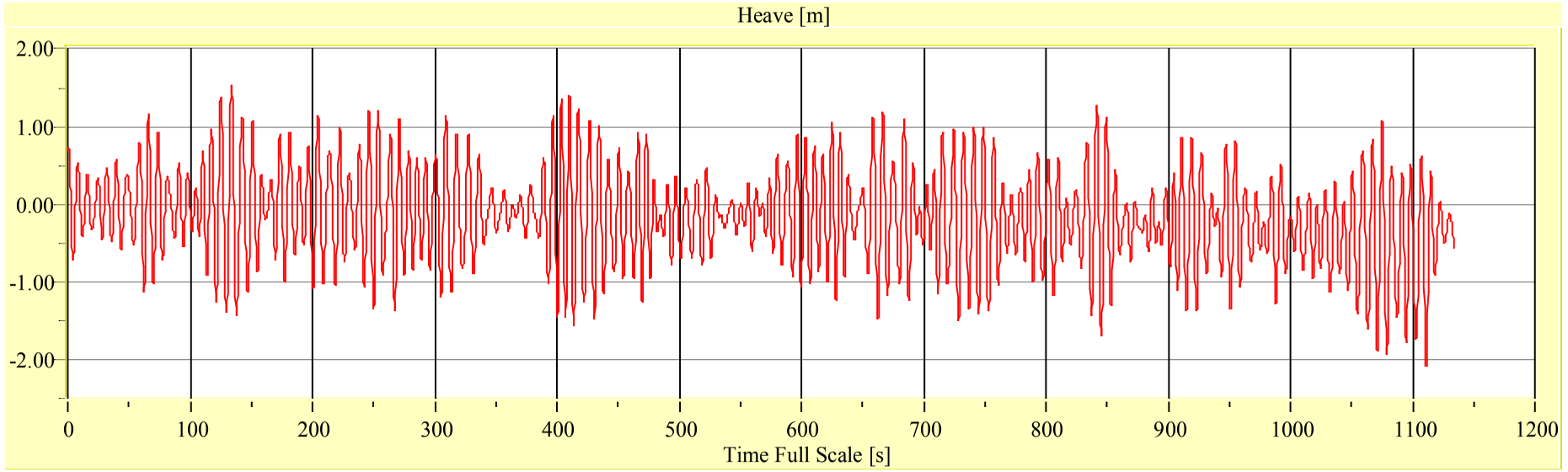



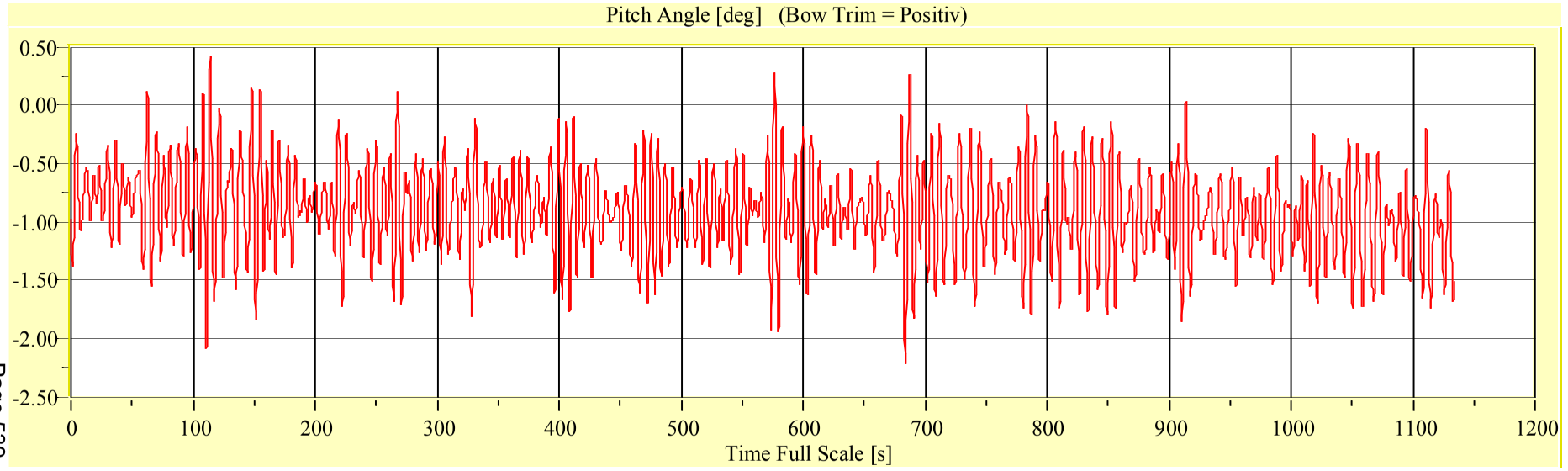



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-07 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



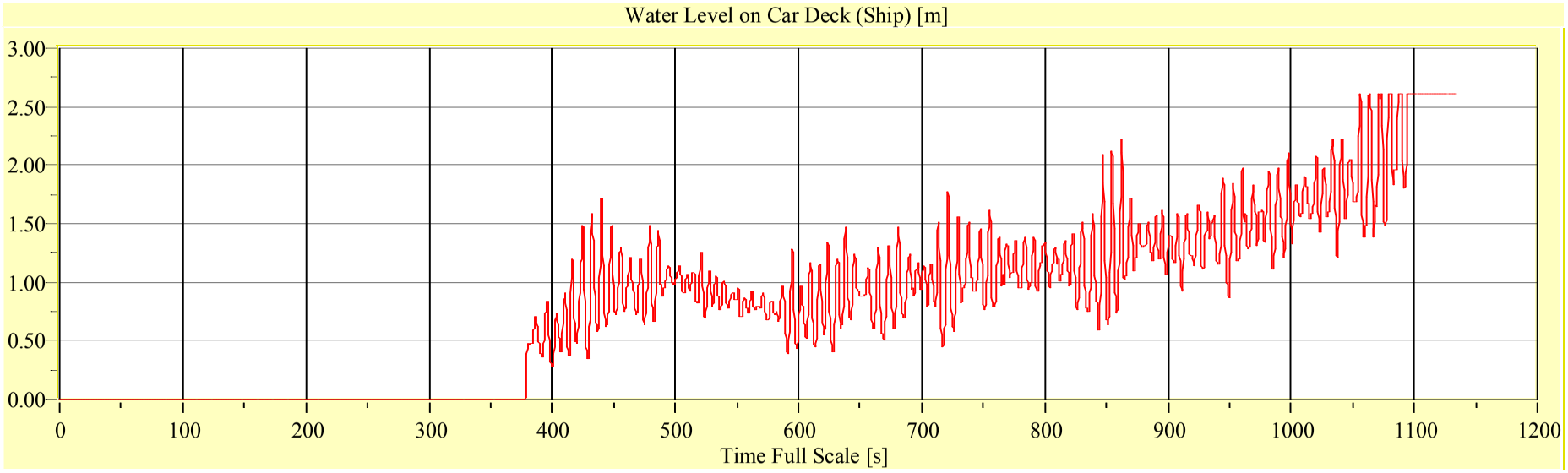



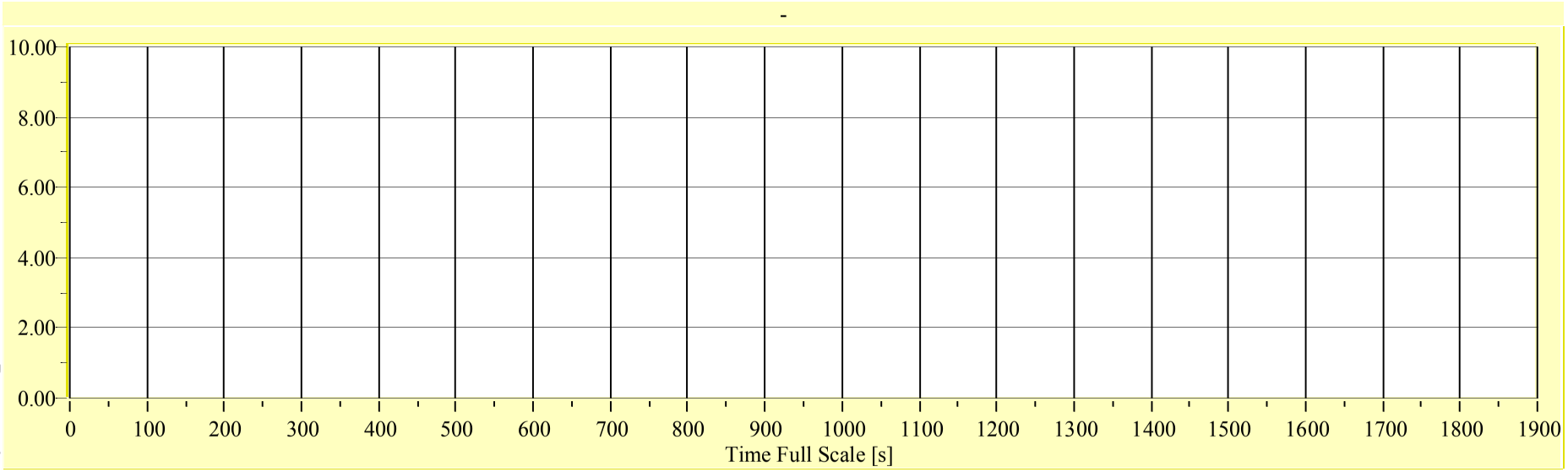



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-07 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



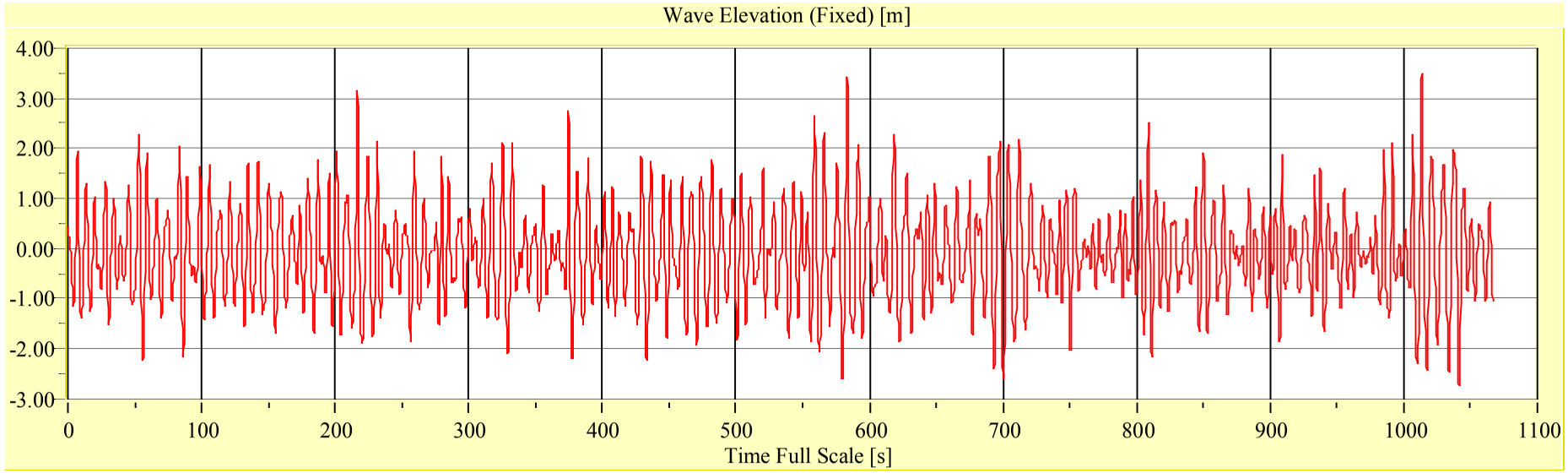



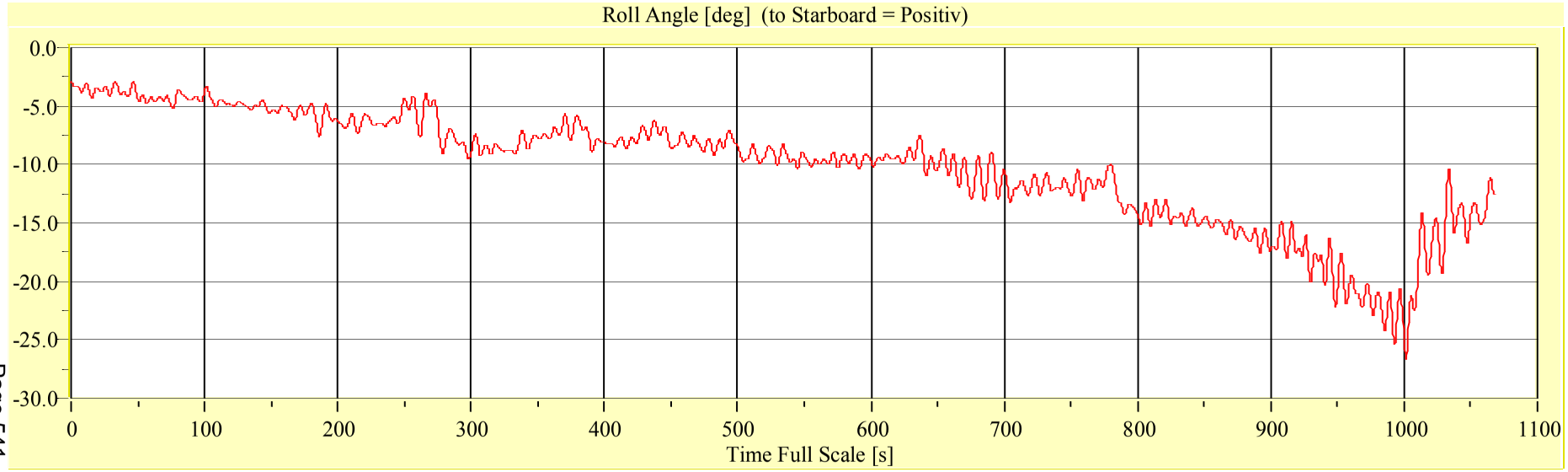



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-08 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



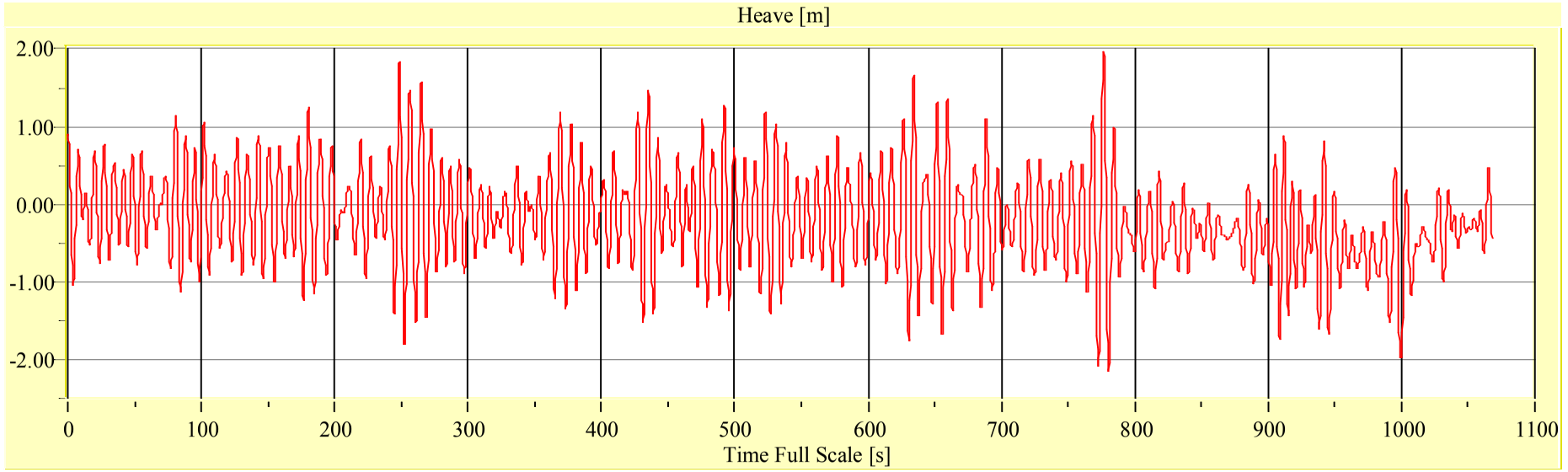



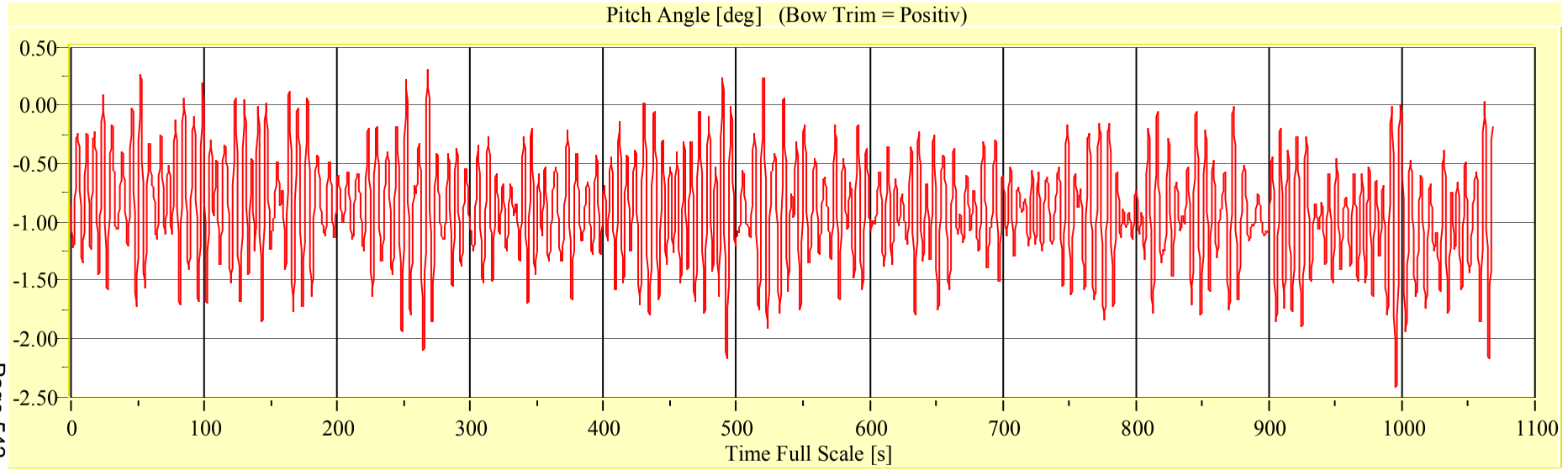



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-08 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



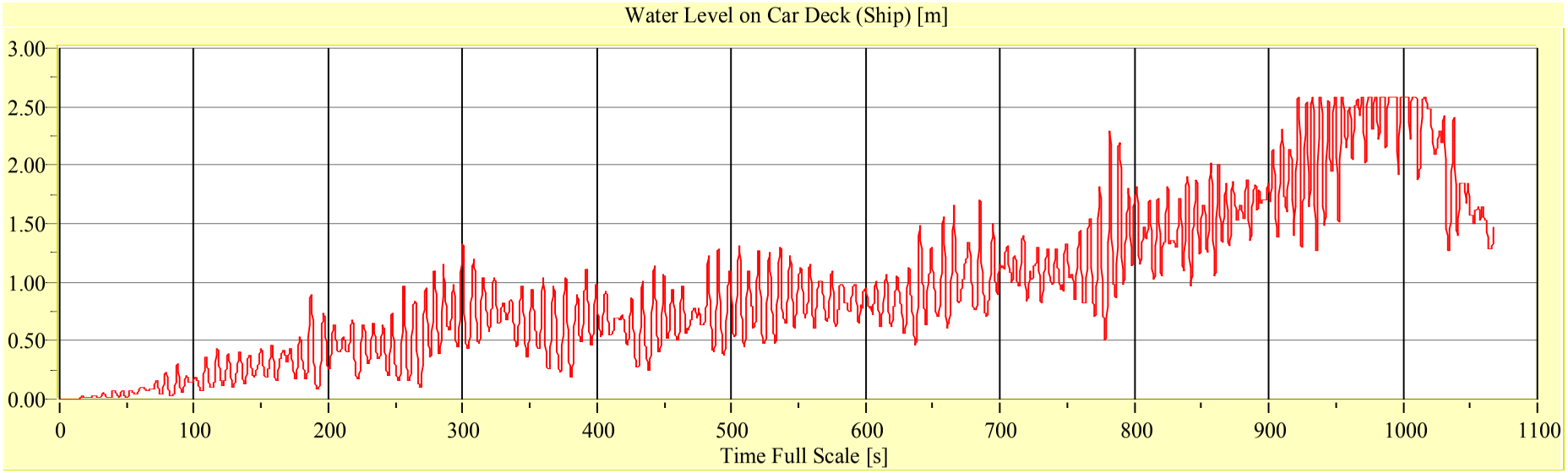



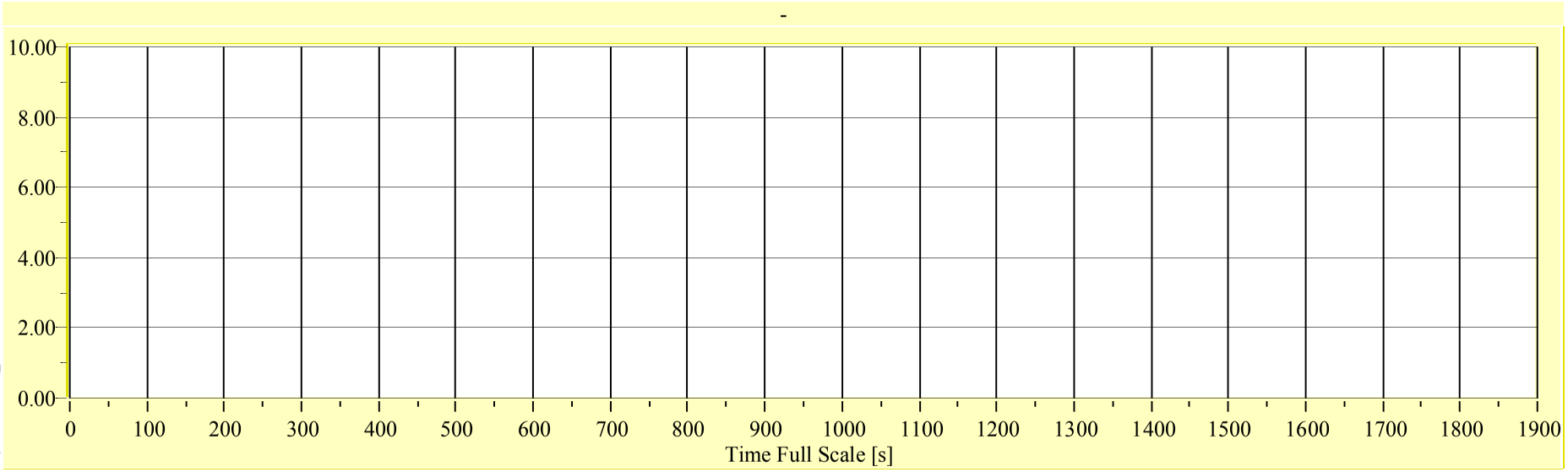



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-08 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



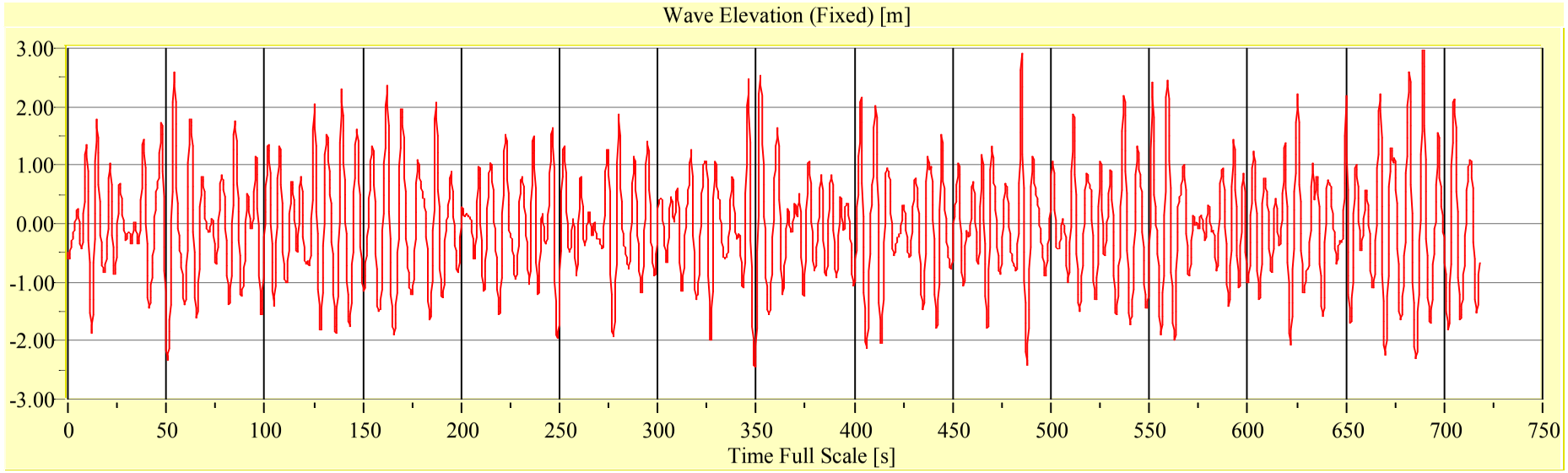



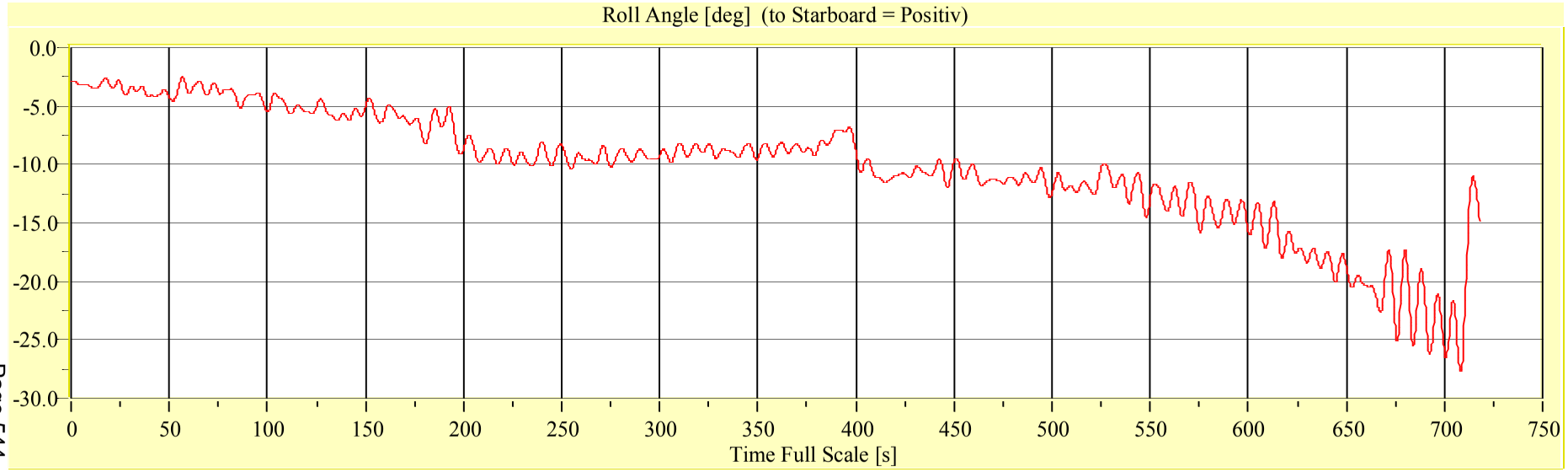



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-09 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



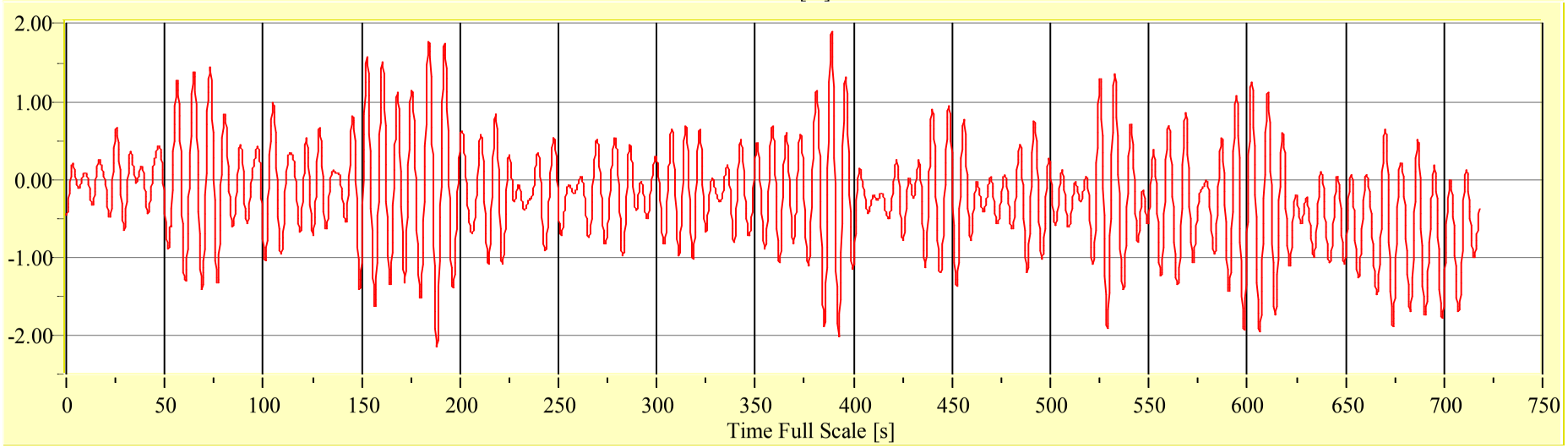



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

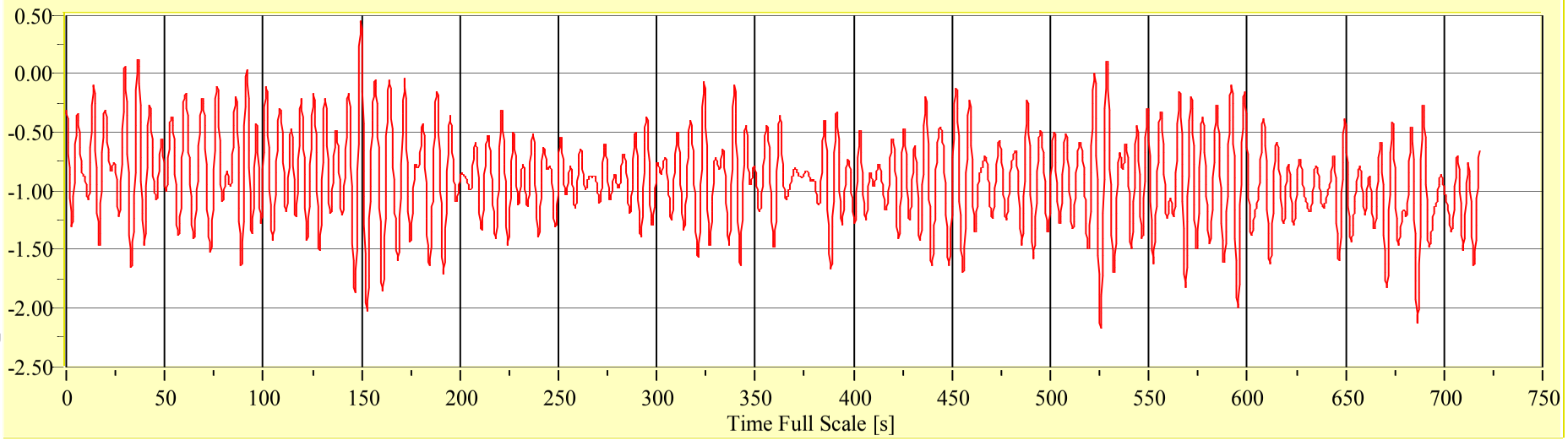
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-09 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

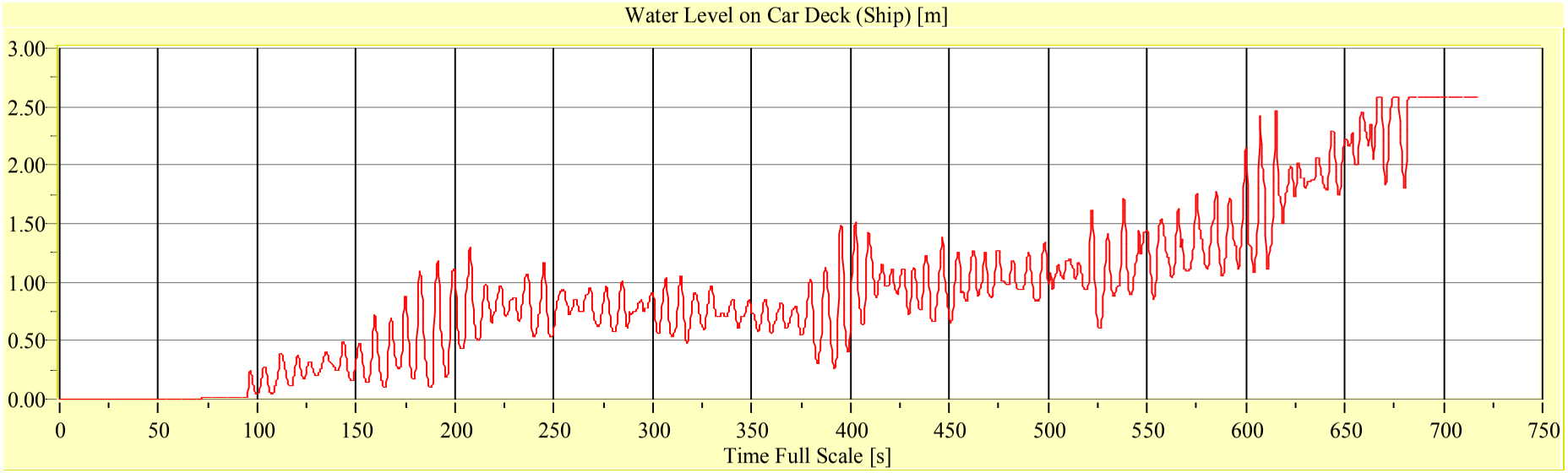


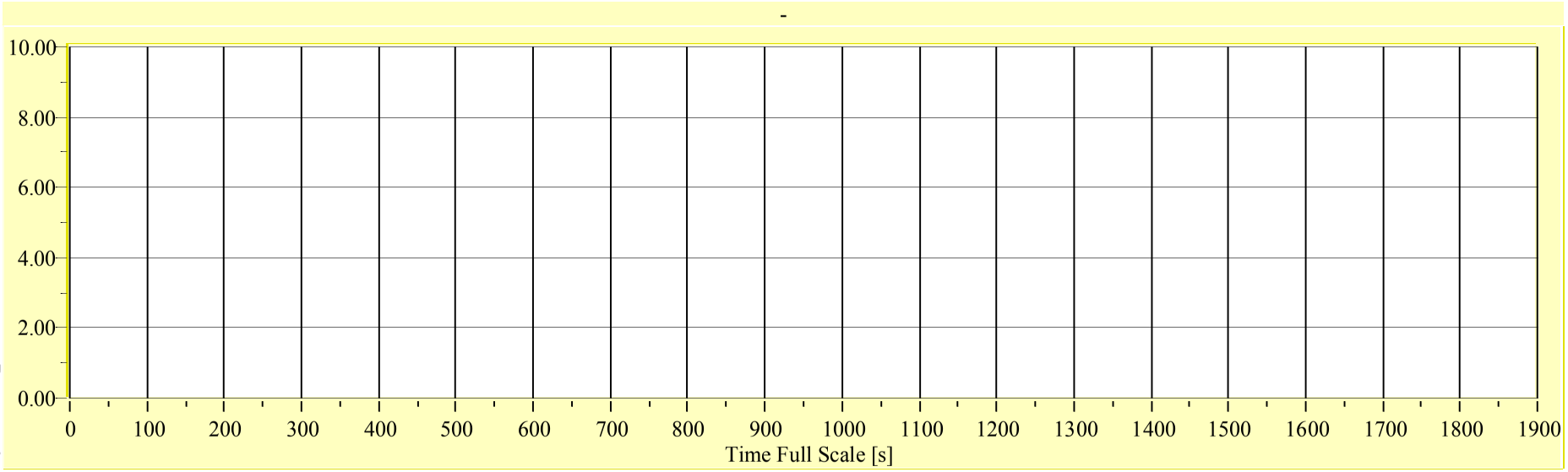



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-09 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



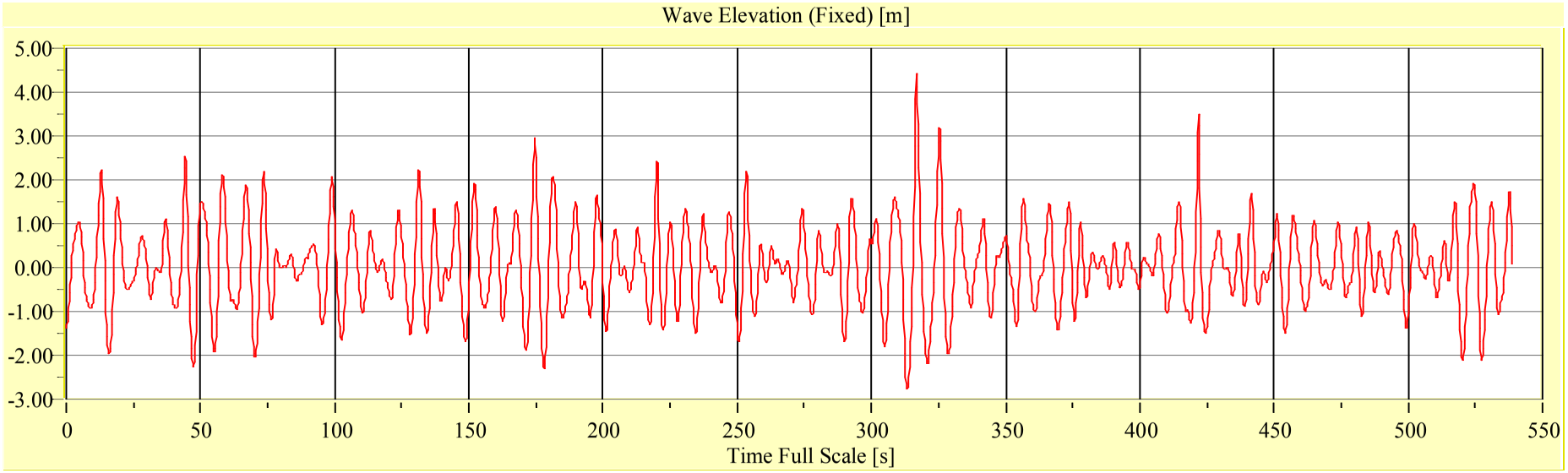



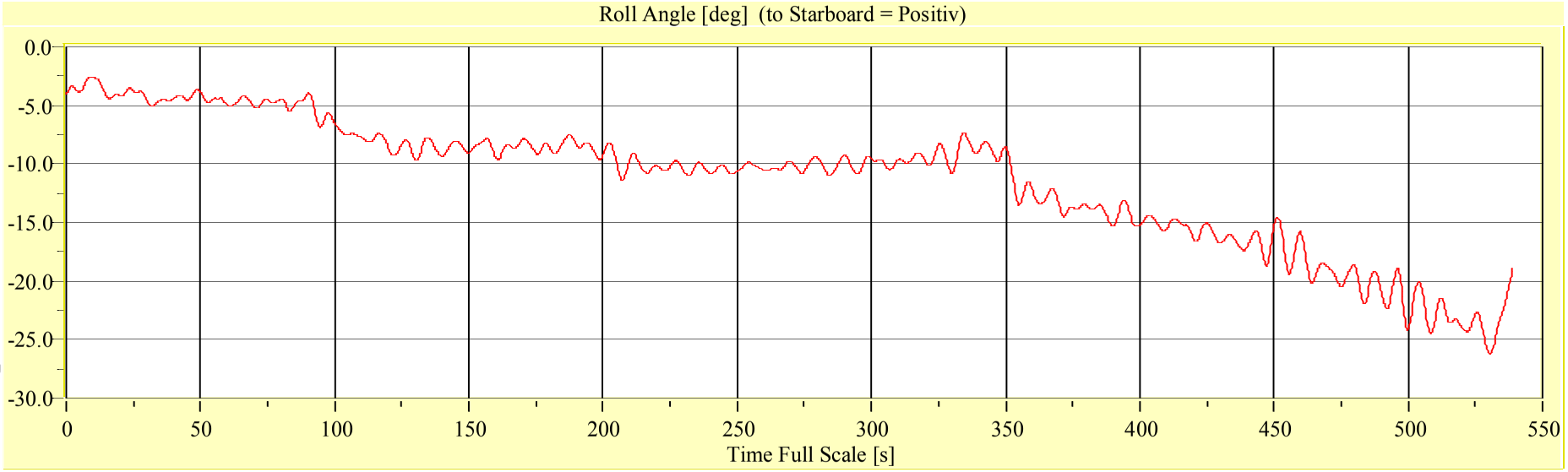



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-10 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



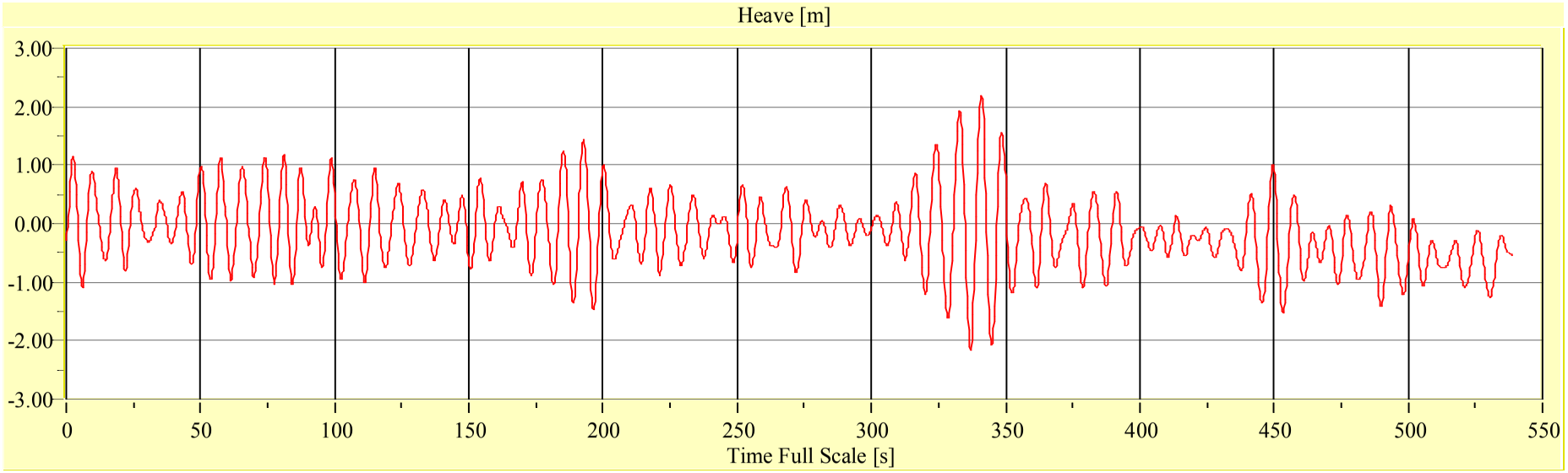



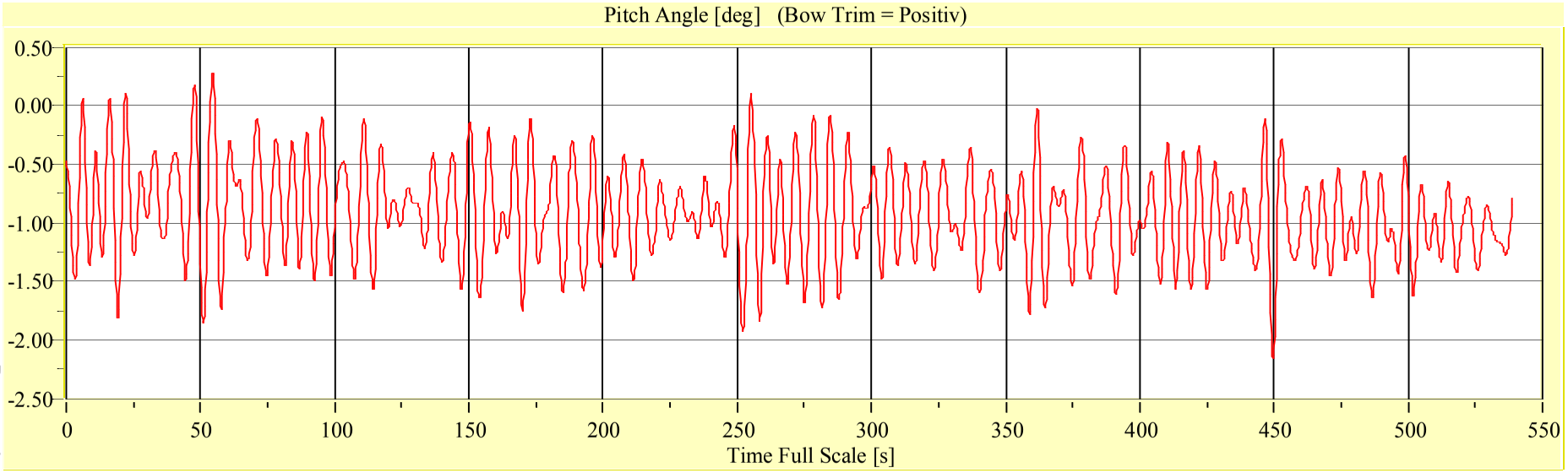



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-10 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



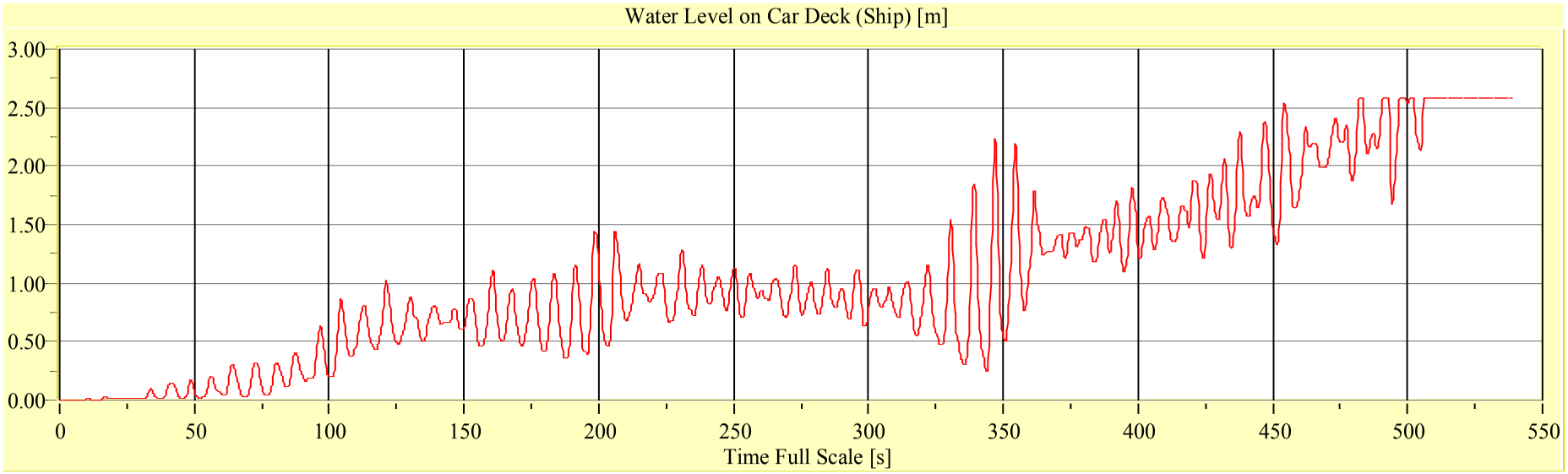



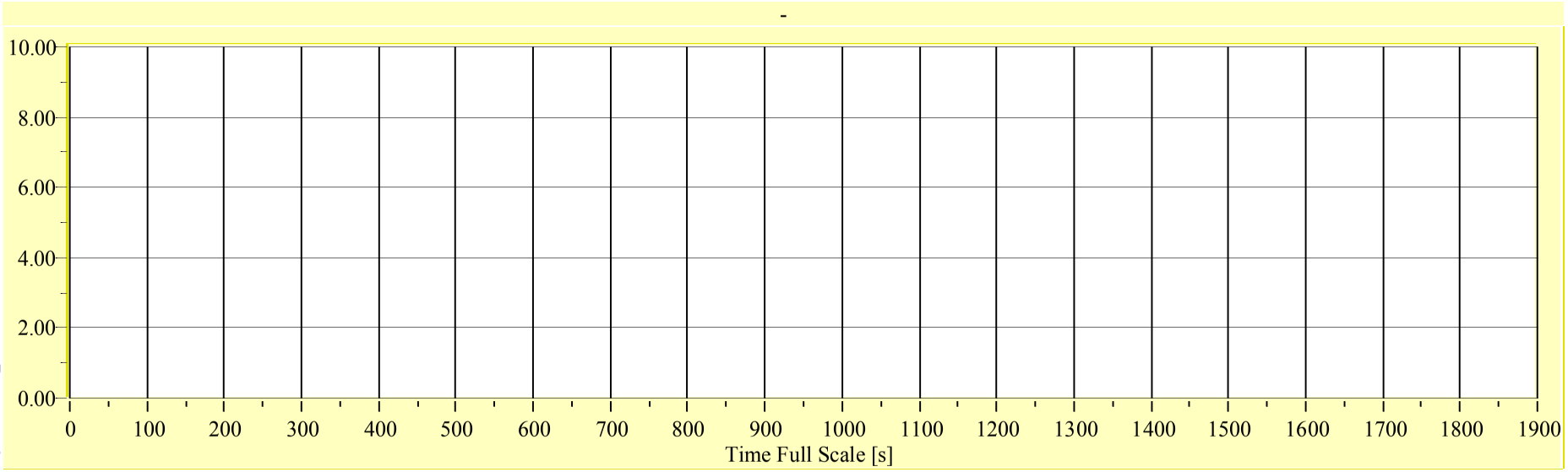



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29664-10 | Target Waves: Hs = 3,75 m Tp = 7,746 s | gamma = 3,3 |
|---|---|---|---|---|



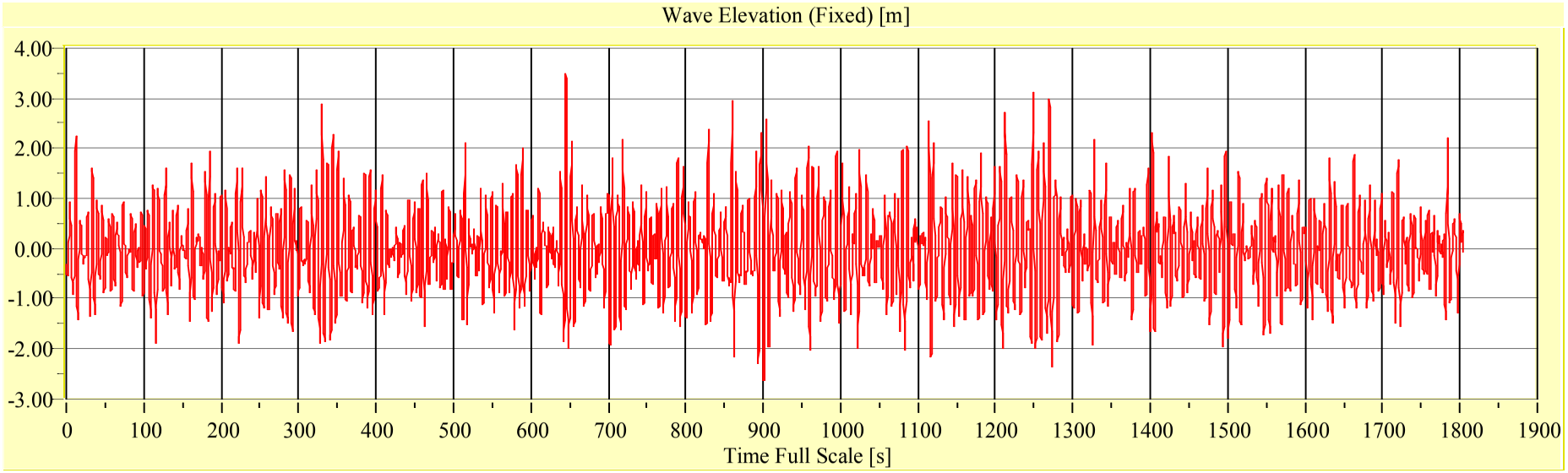



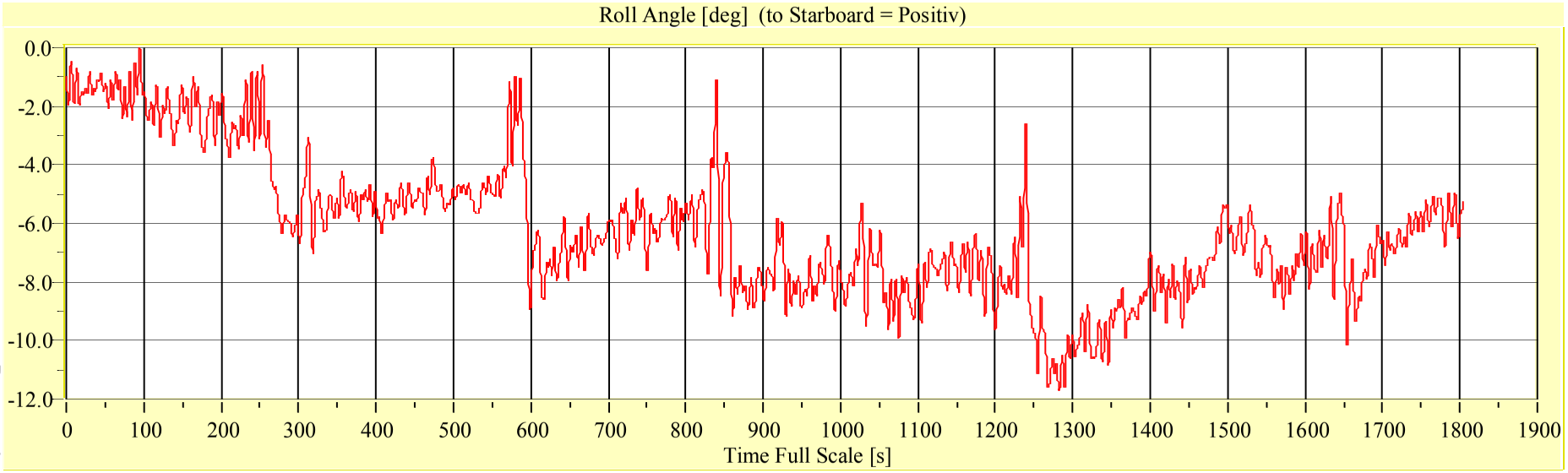



| Date: 29.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-01 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



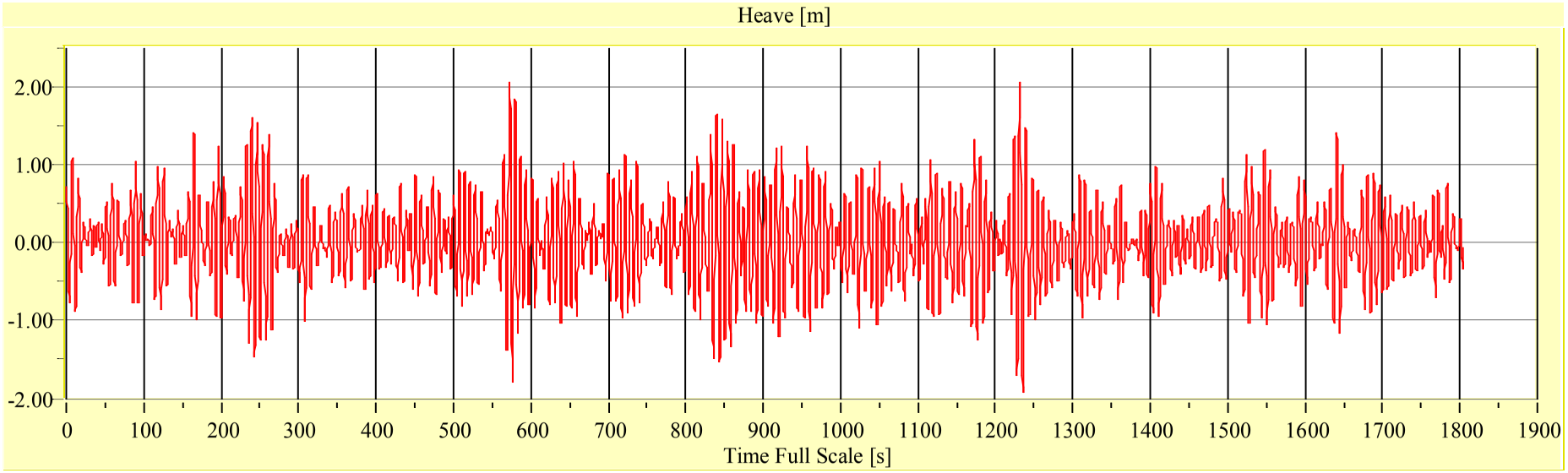



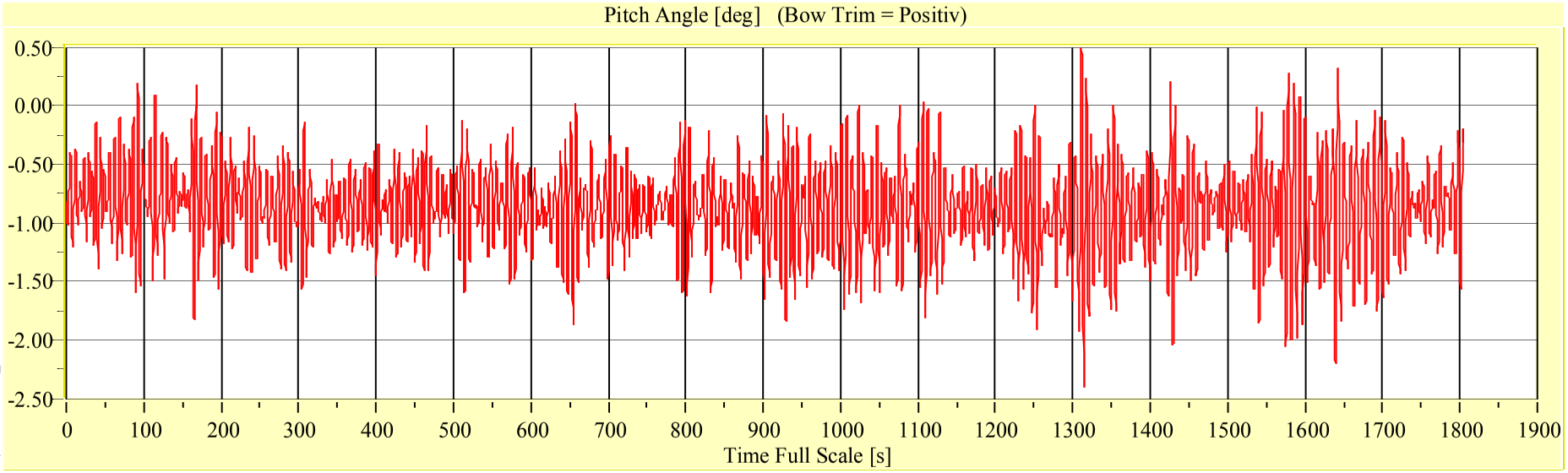



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-01 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



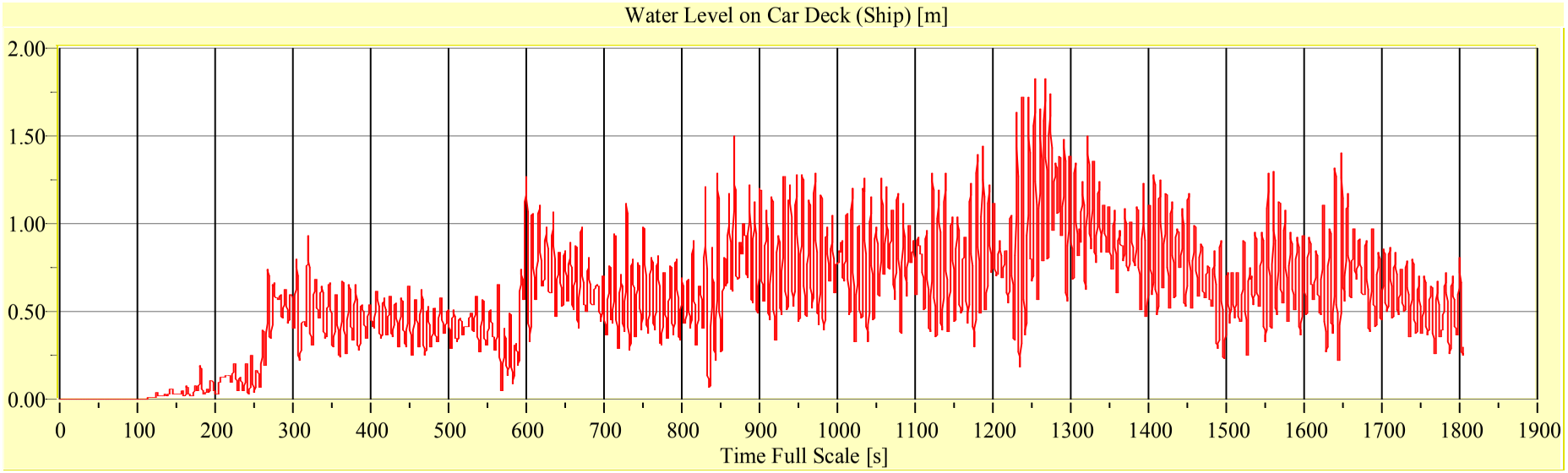



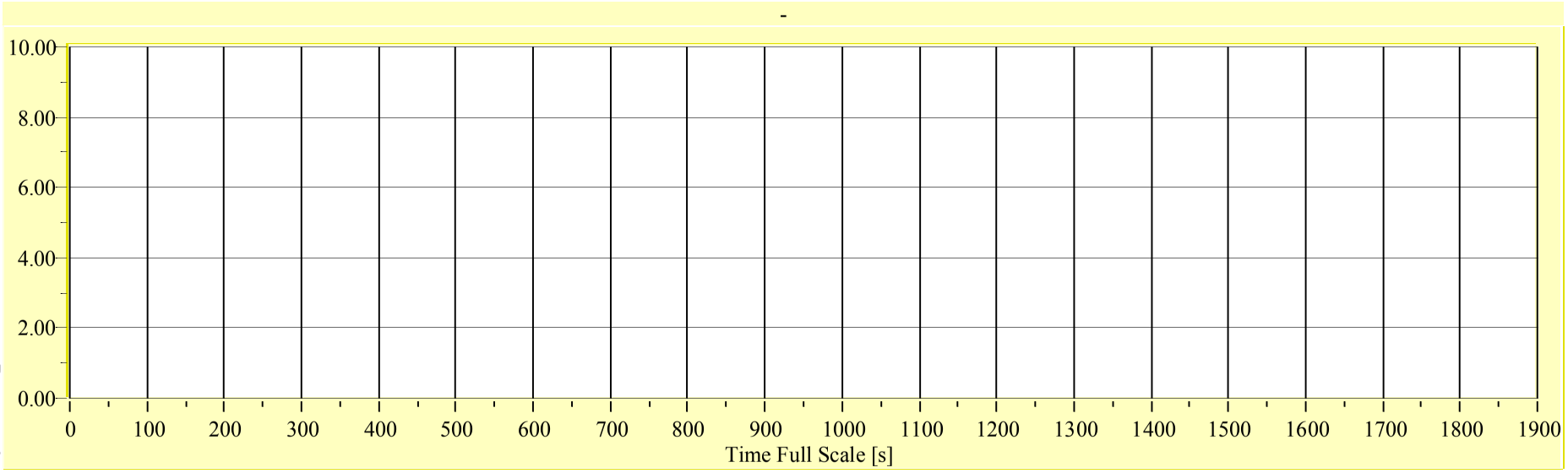



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-01 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



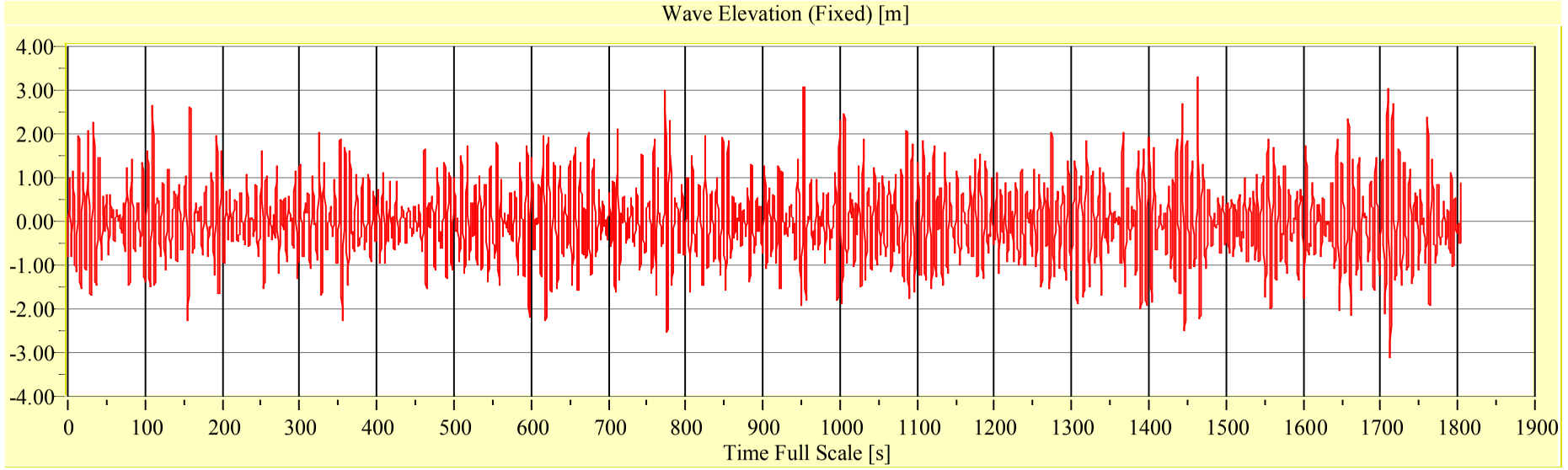



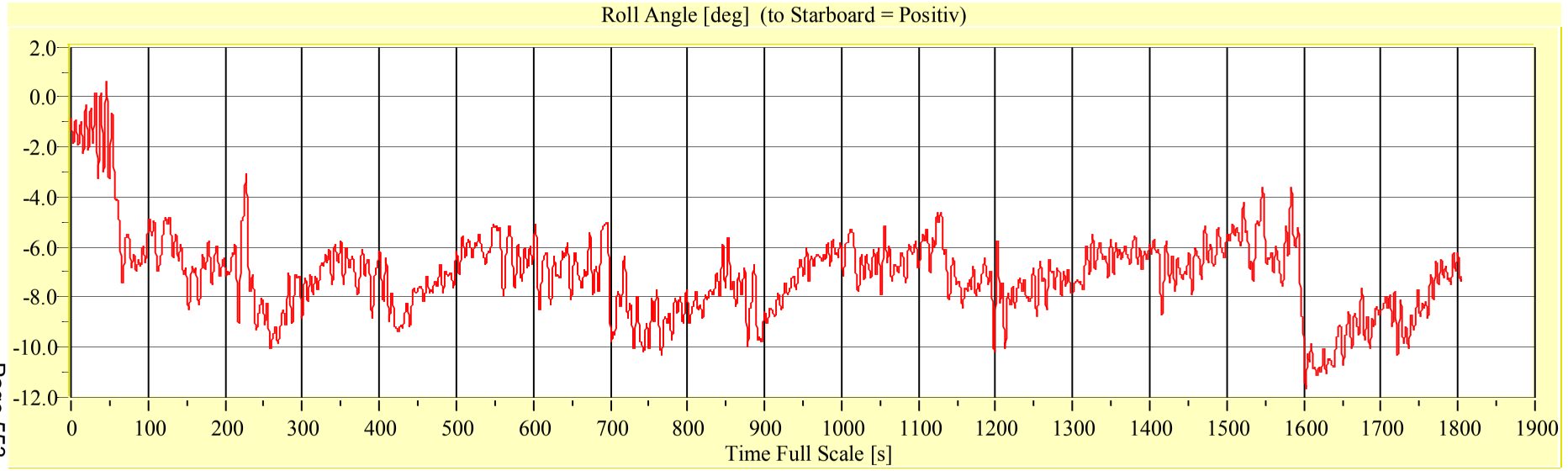



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-02 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



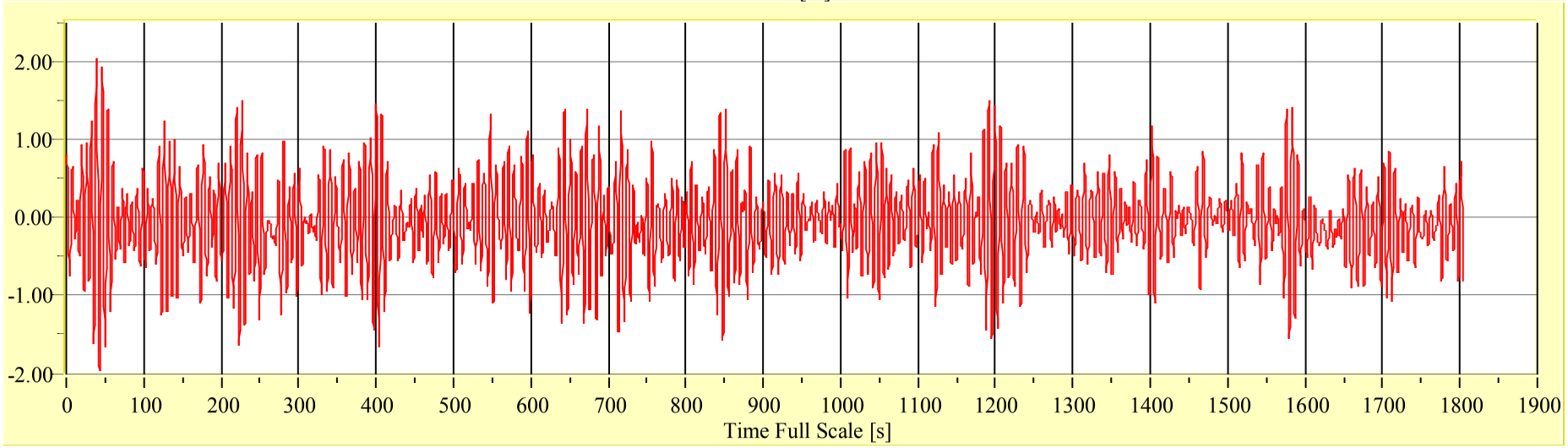



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

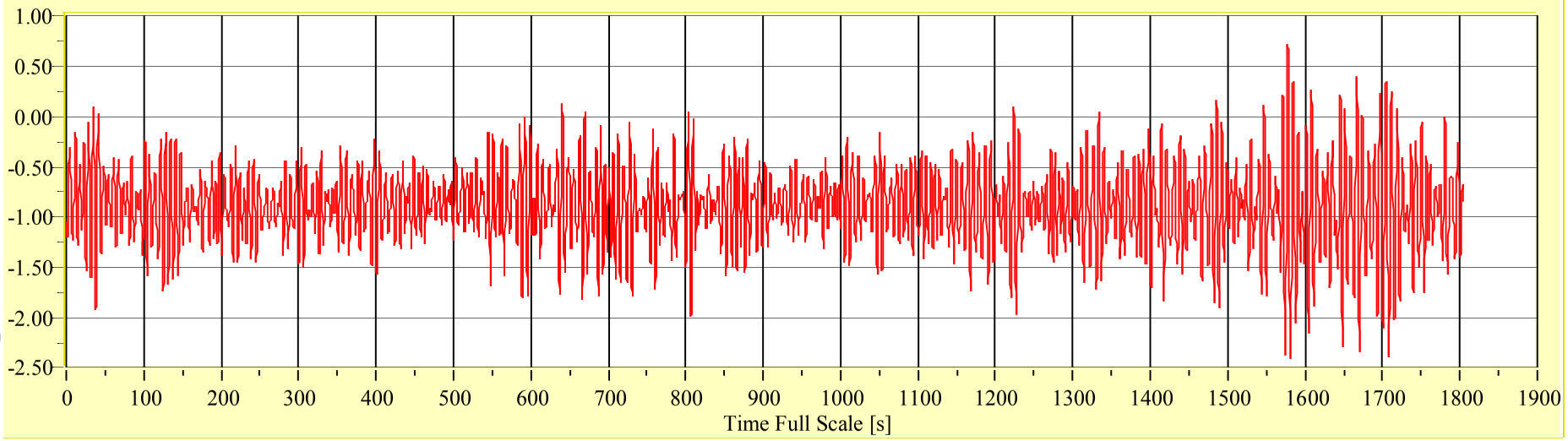
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-02 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

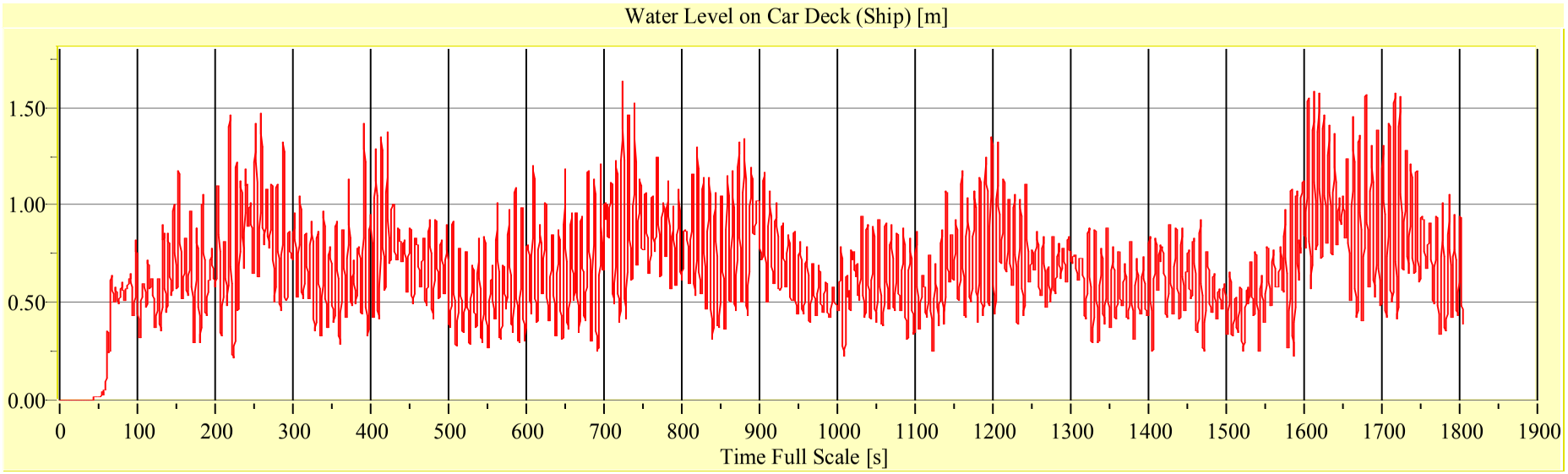


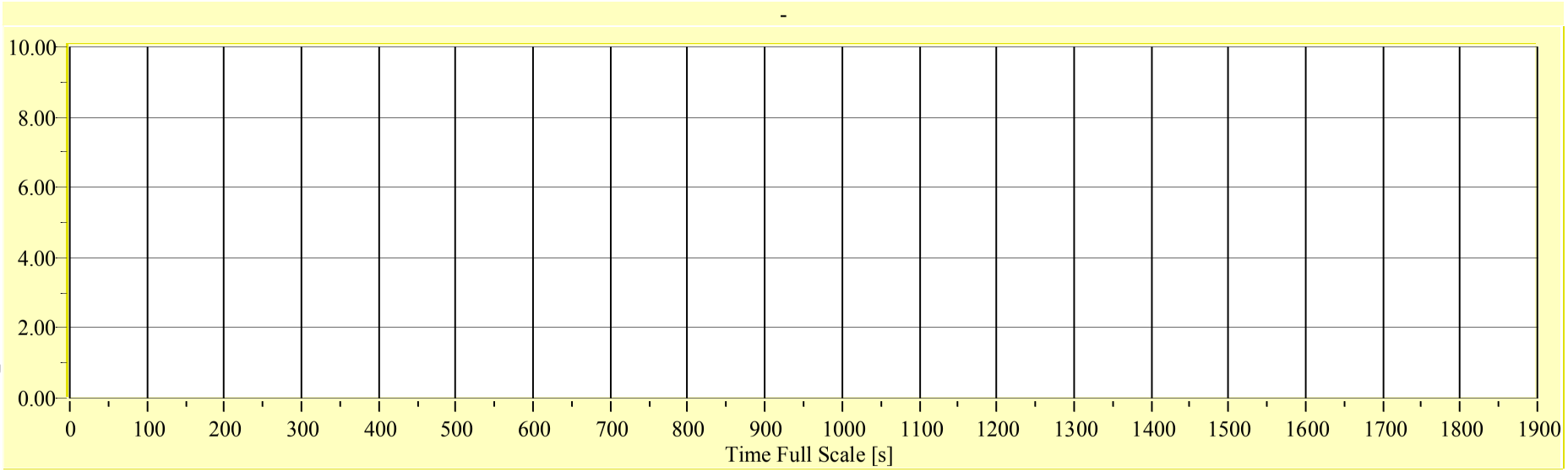



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-02 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



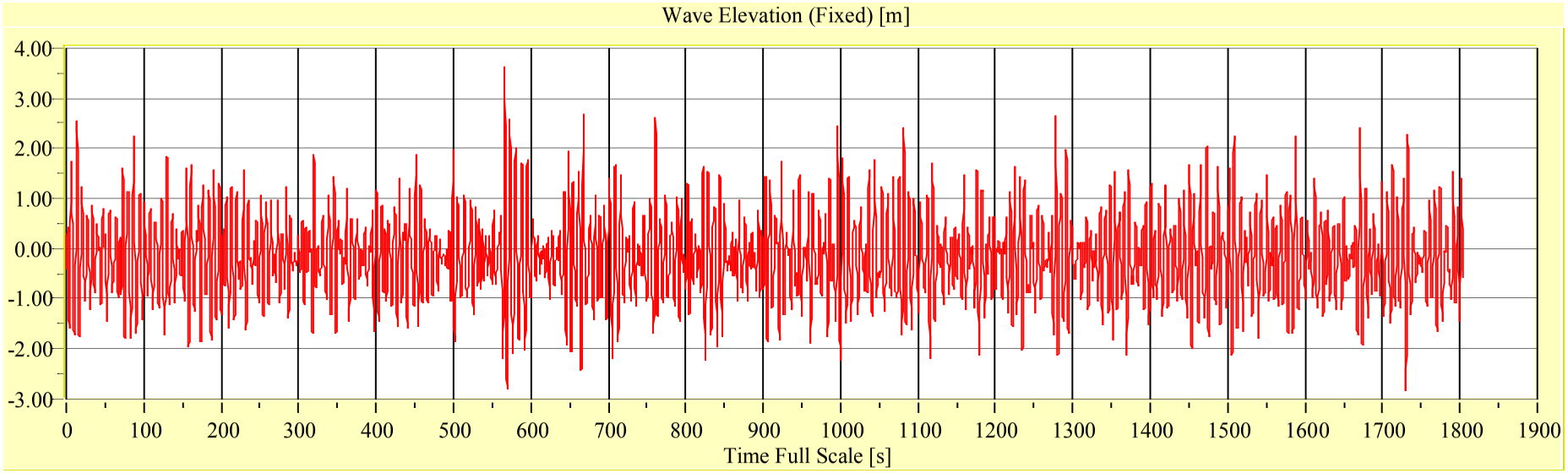



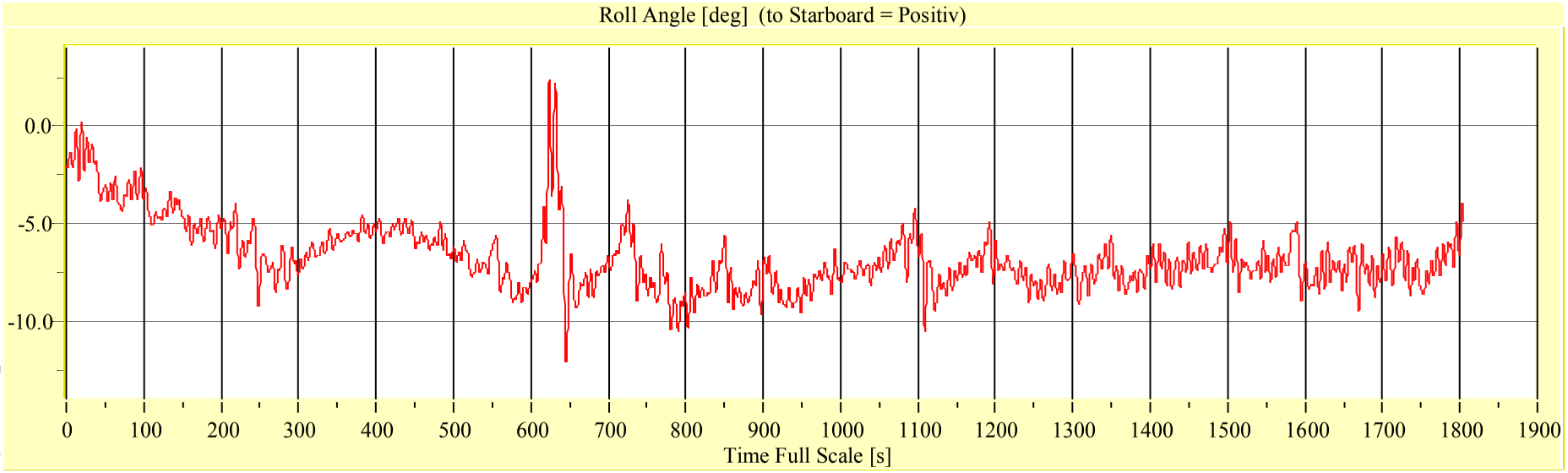



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-03 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



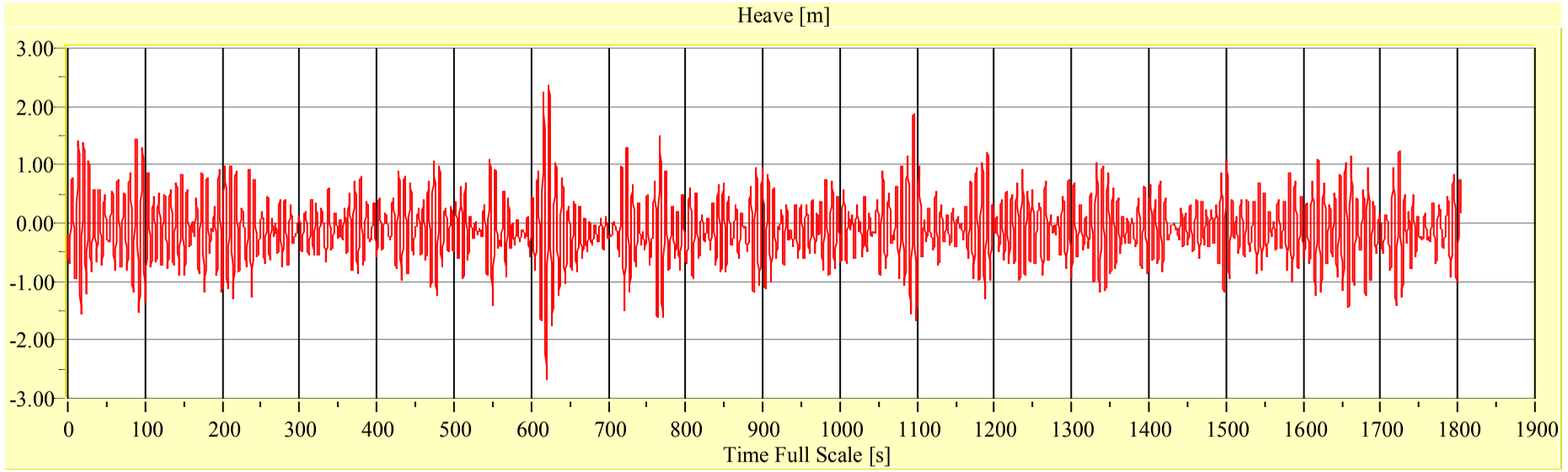



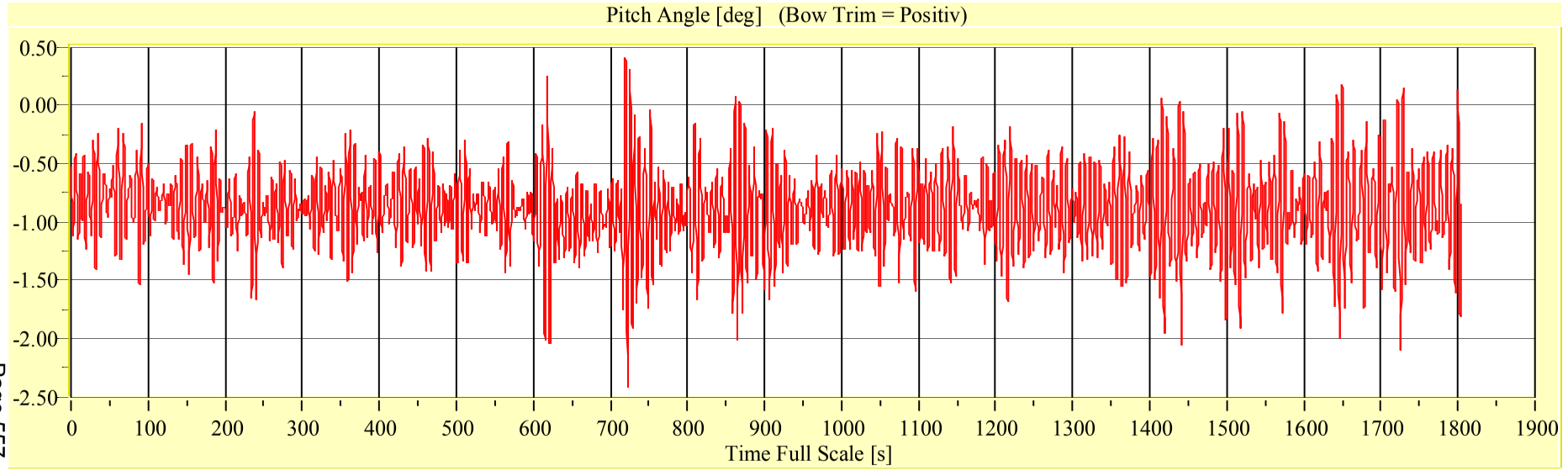



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-03 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



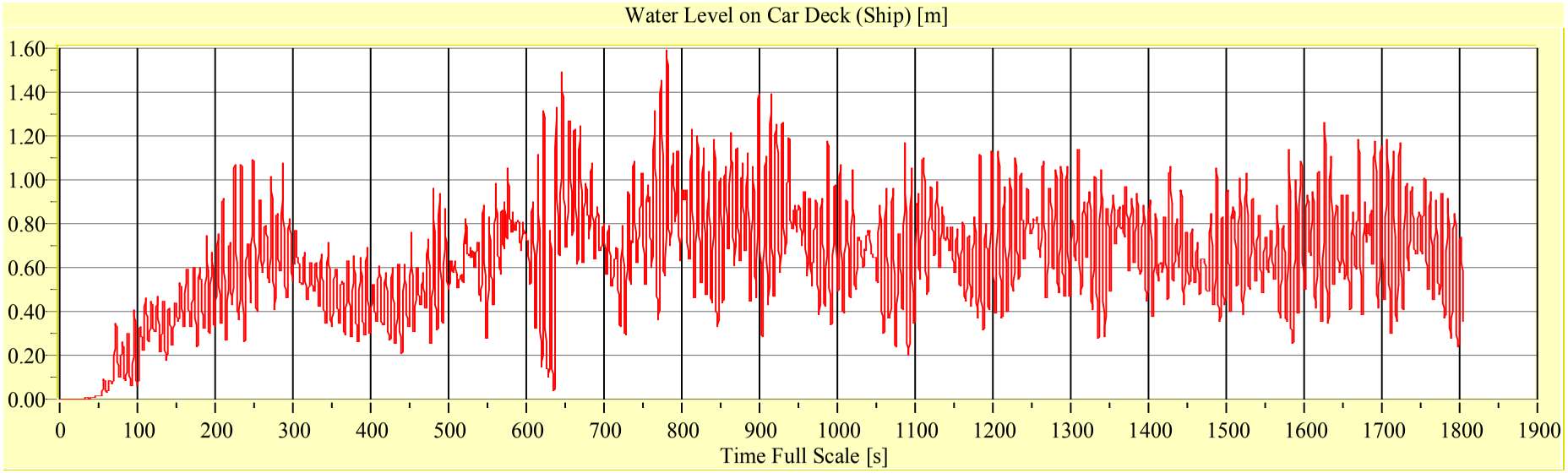



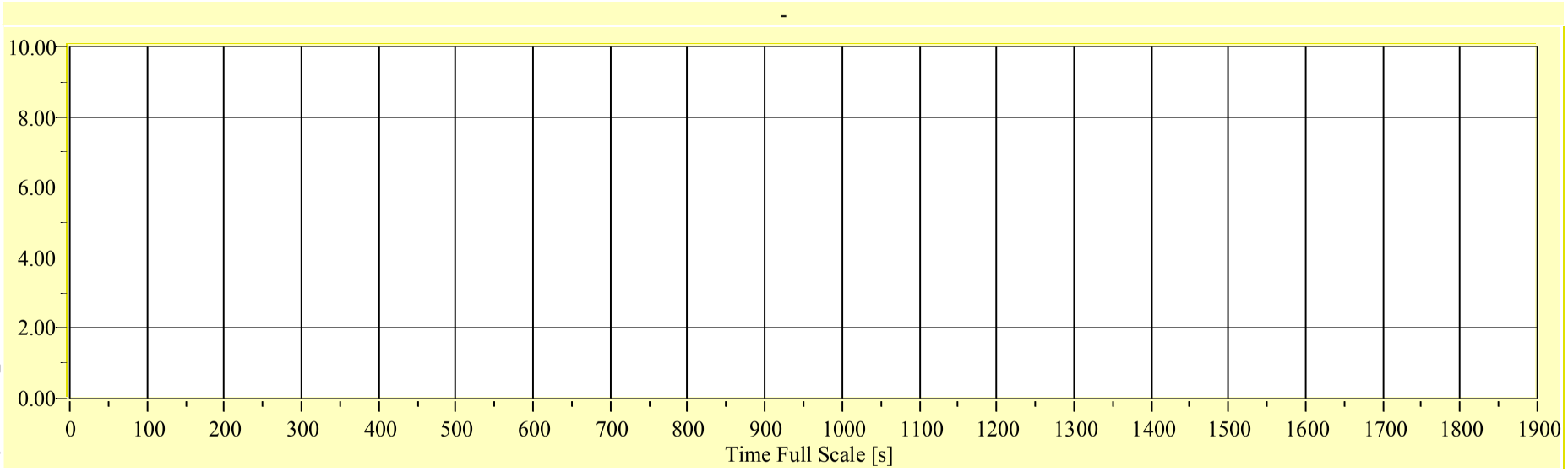



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-03 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



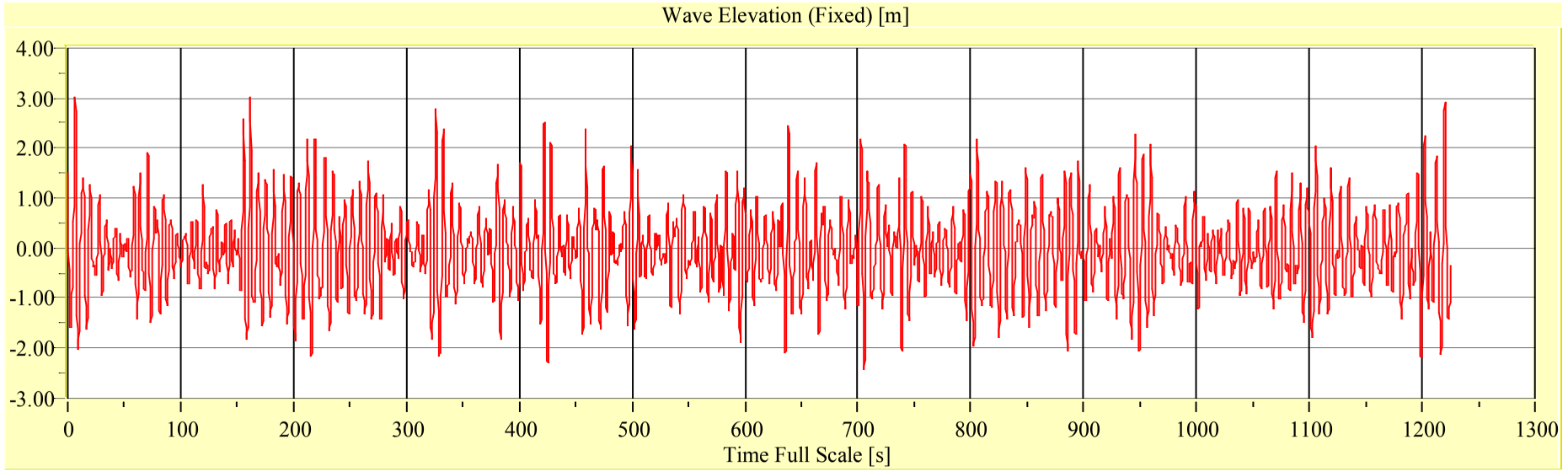



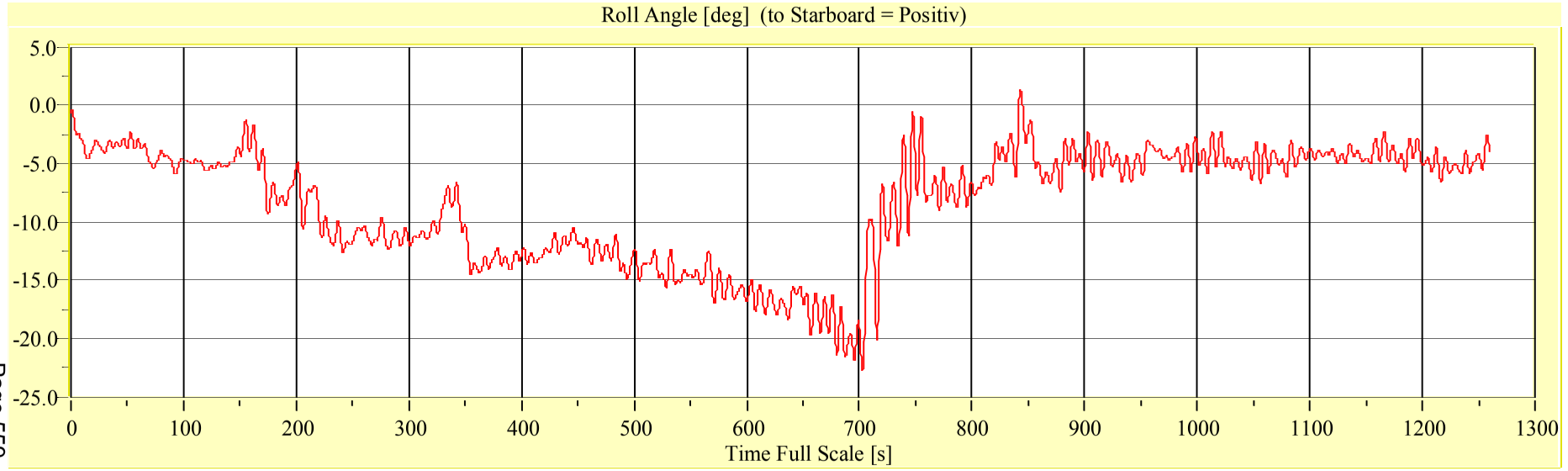



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-04 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



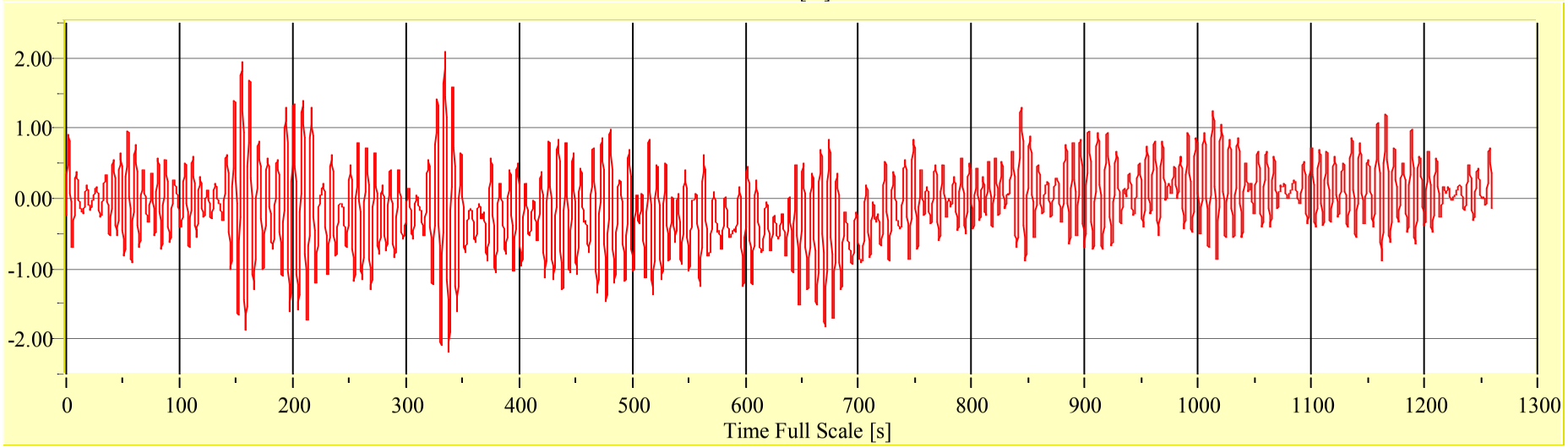



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

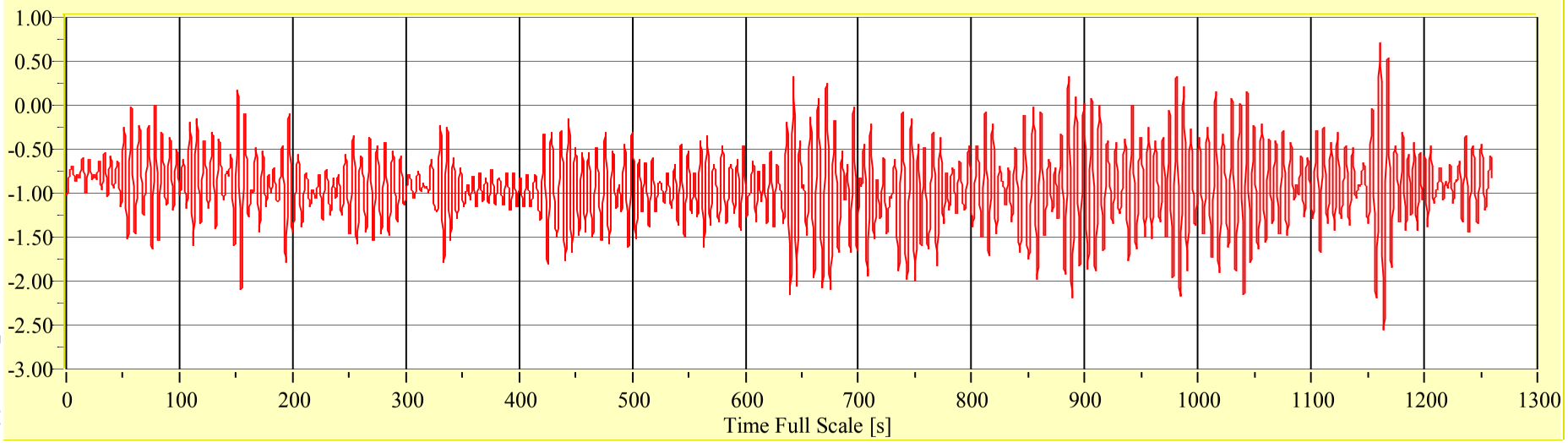
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-04 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

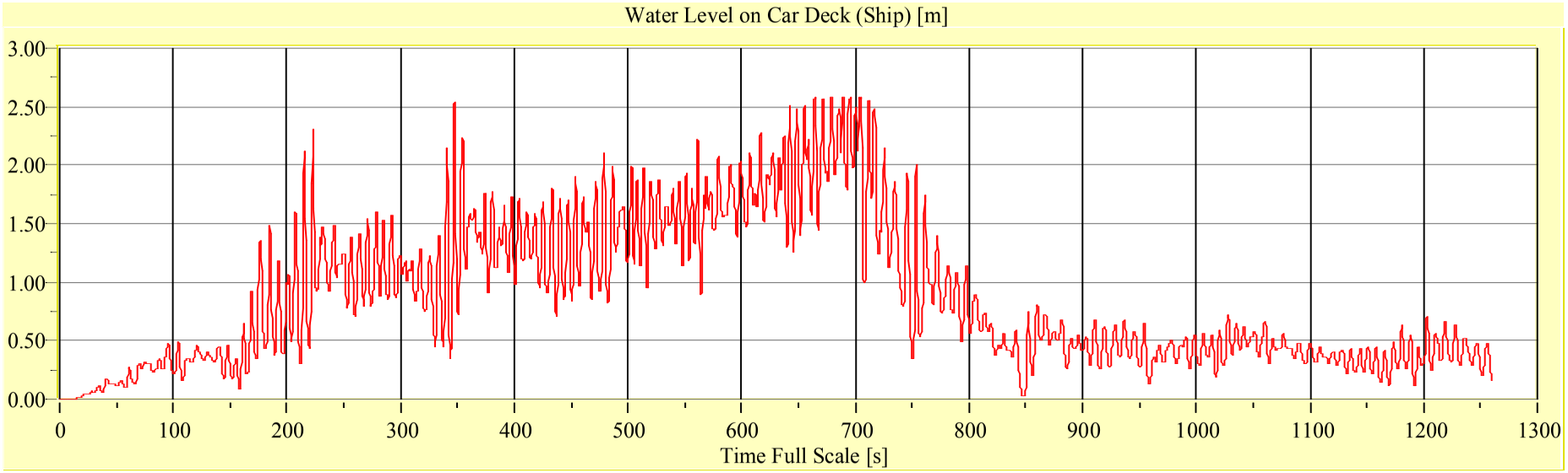


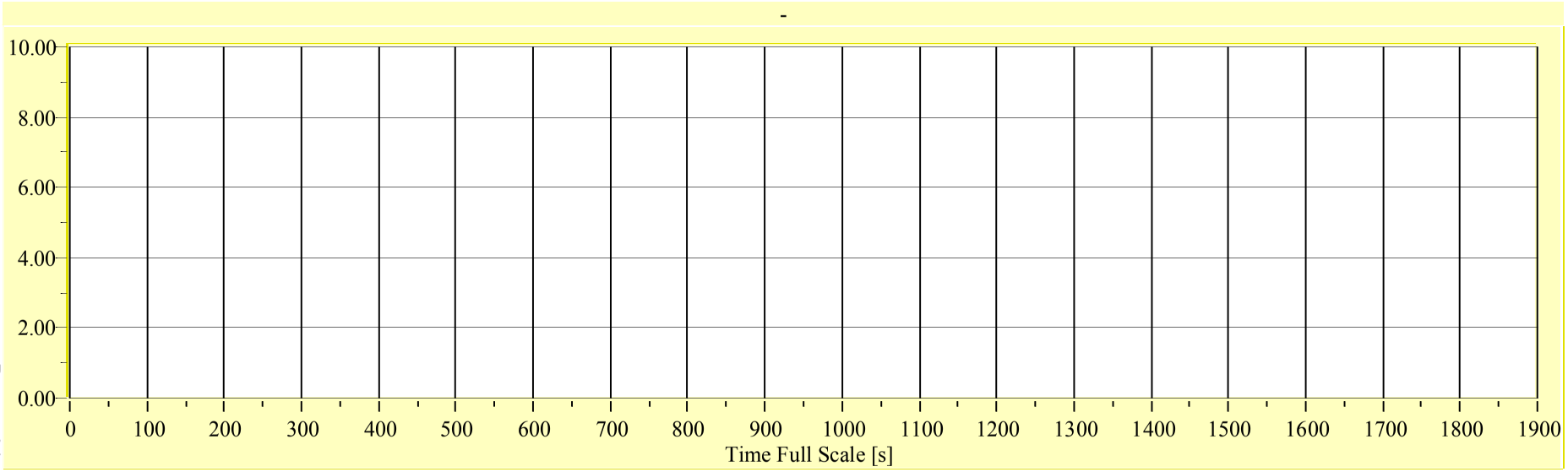



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-04 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



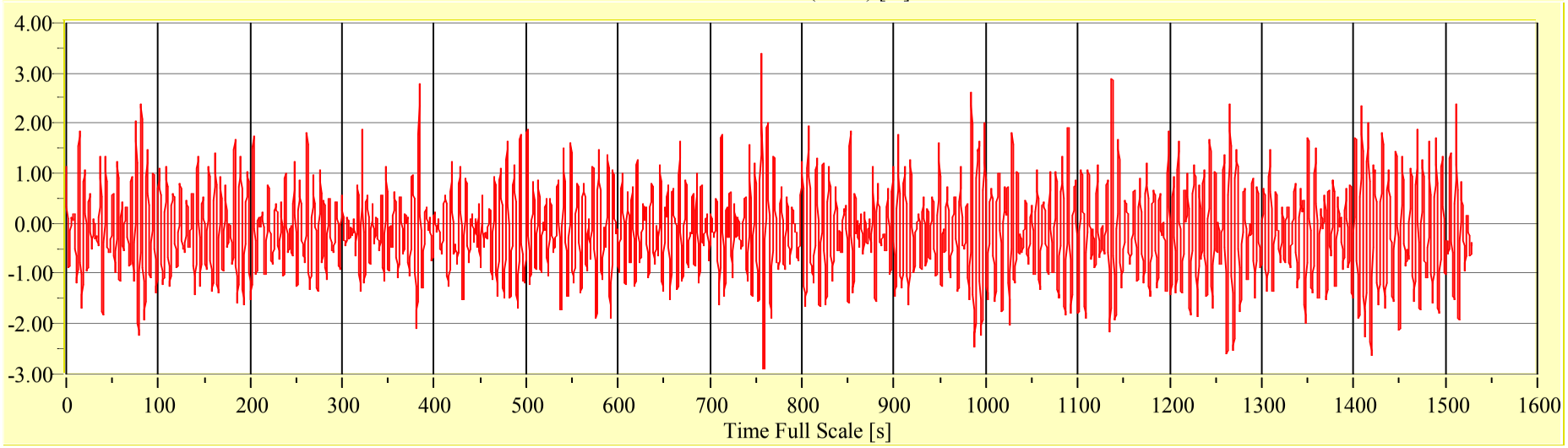



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

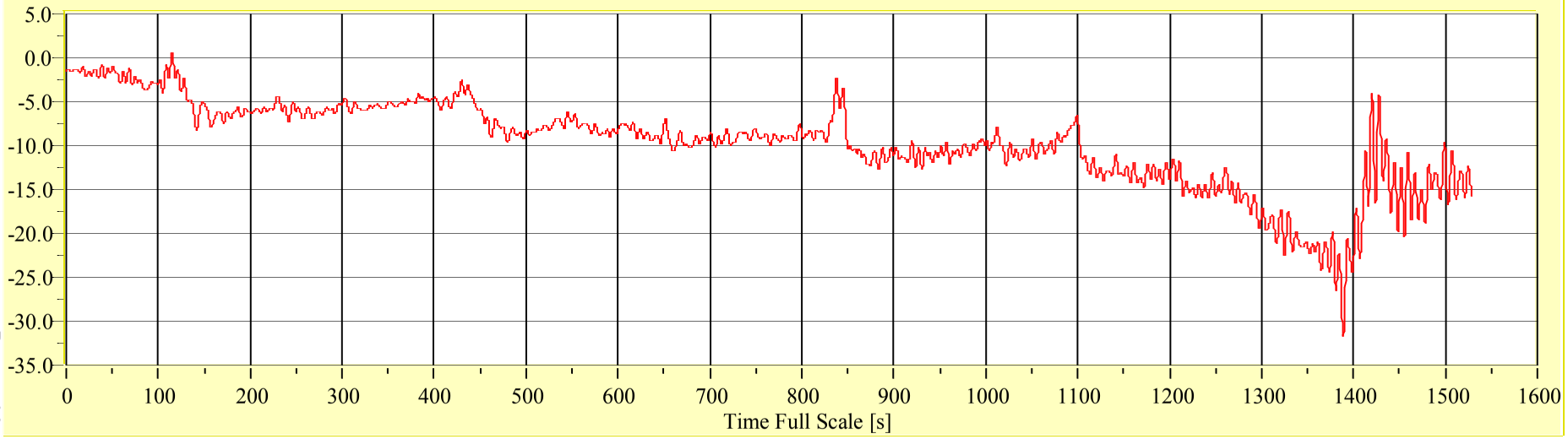
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-05 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to Starboard = Positiv)



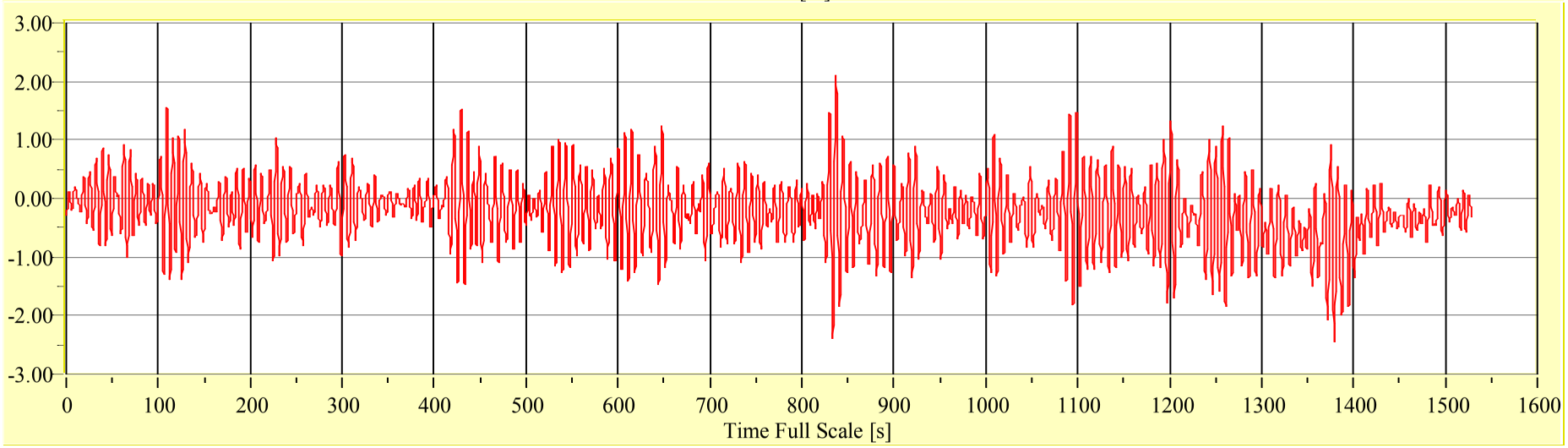



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

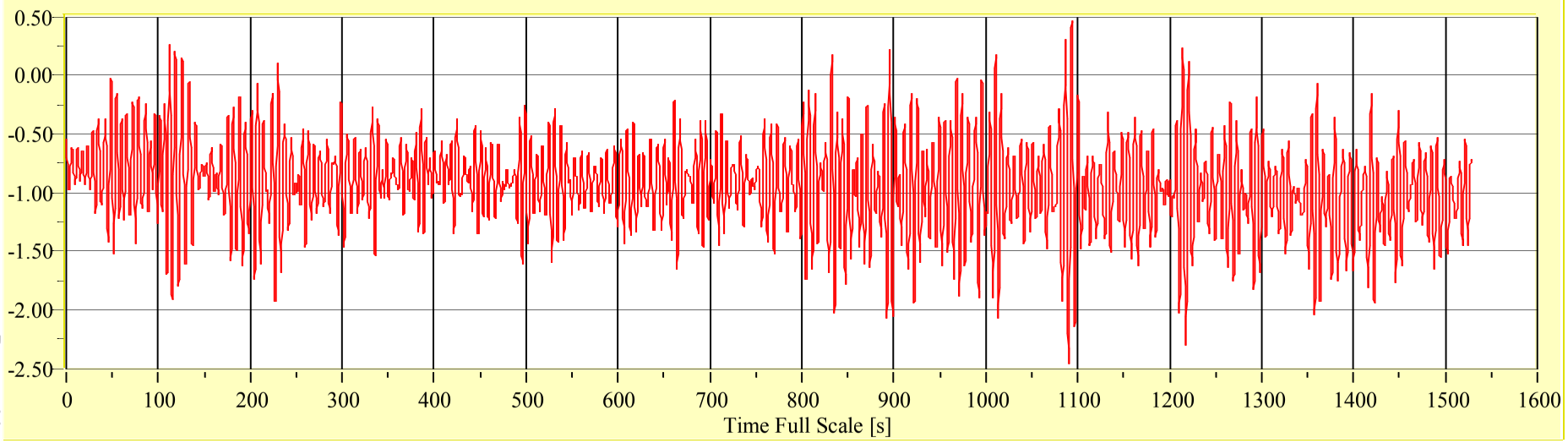
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-05 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

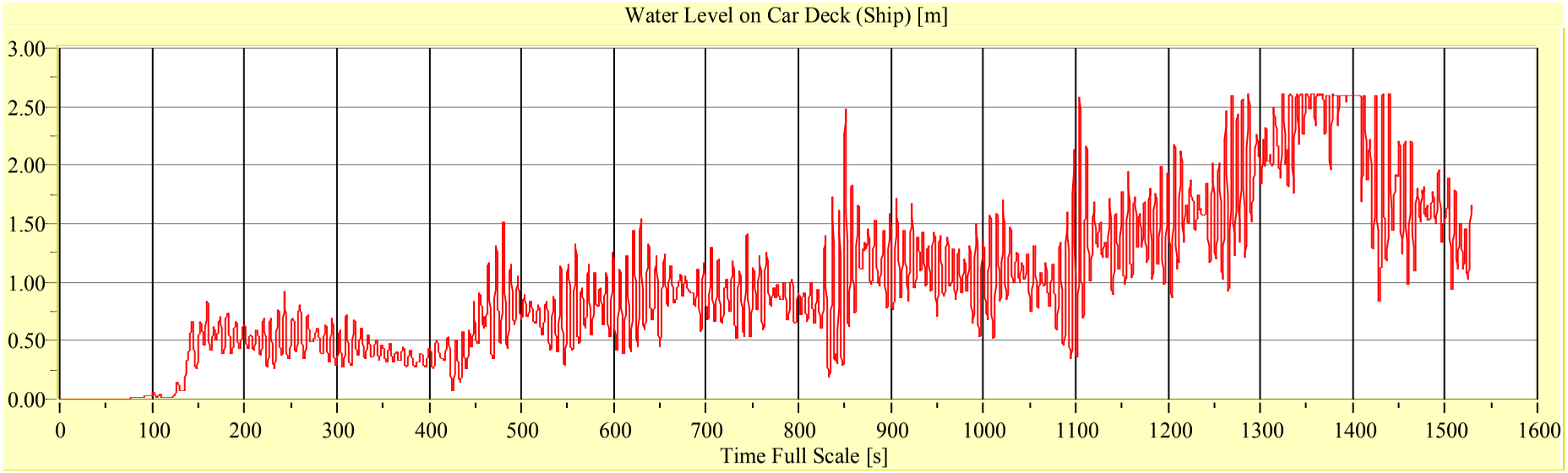


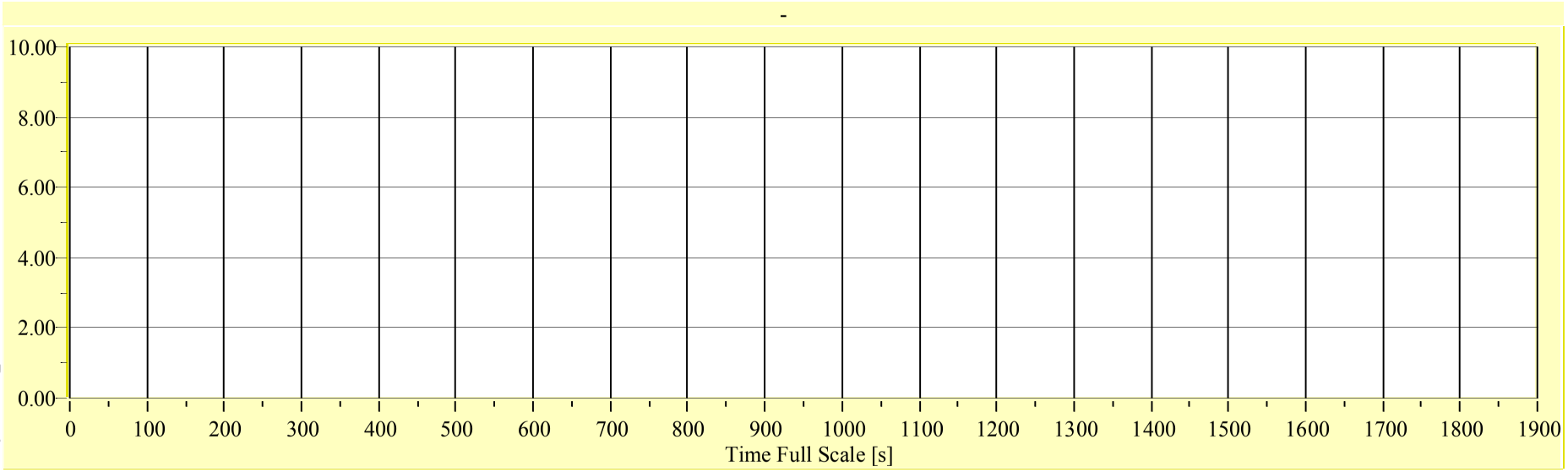



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29665-05 | Target Waves: Hs = 3,25 m Tp = 7,211 s | gamma = 3,3 |
|---|---|---|---|---|



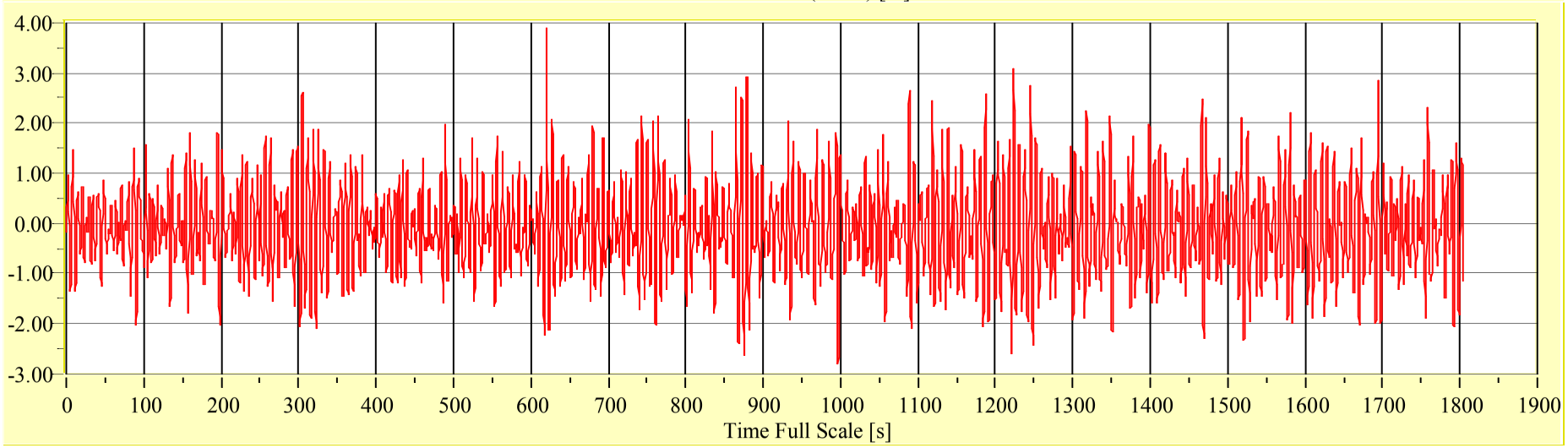



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

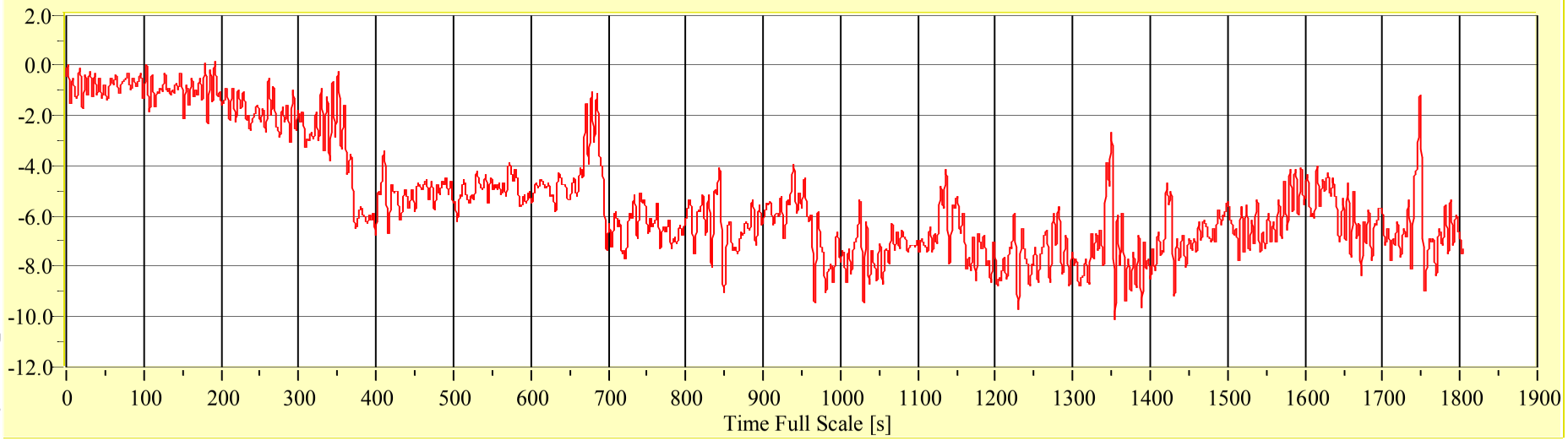
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-01 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to Starboard = Positiv)



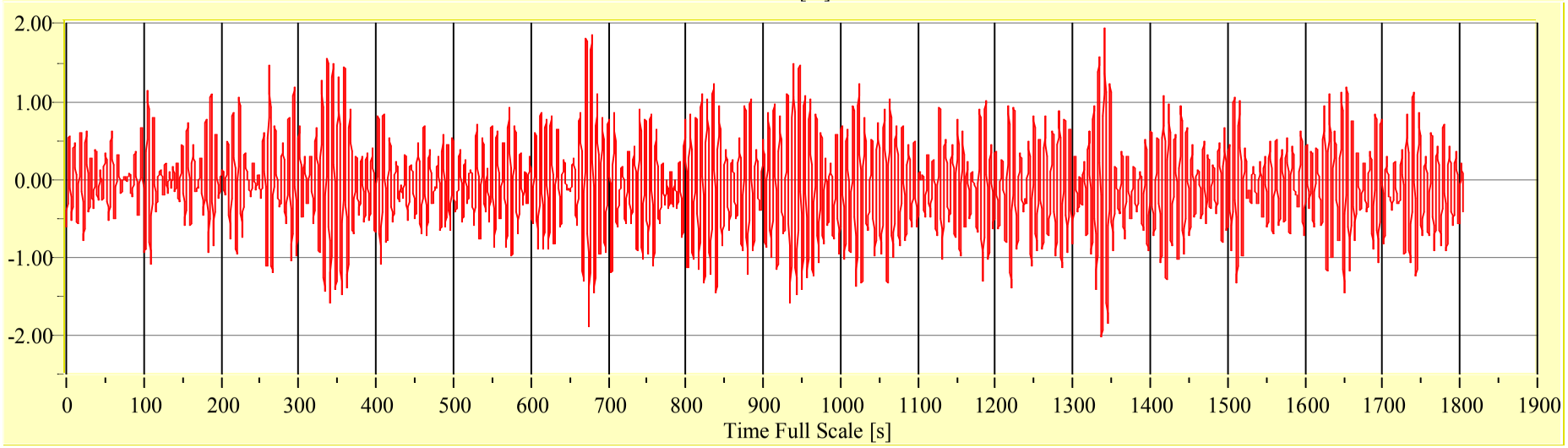



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

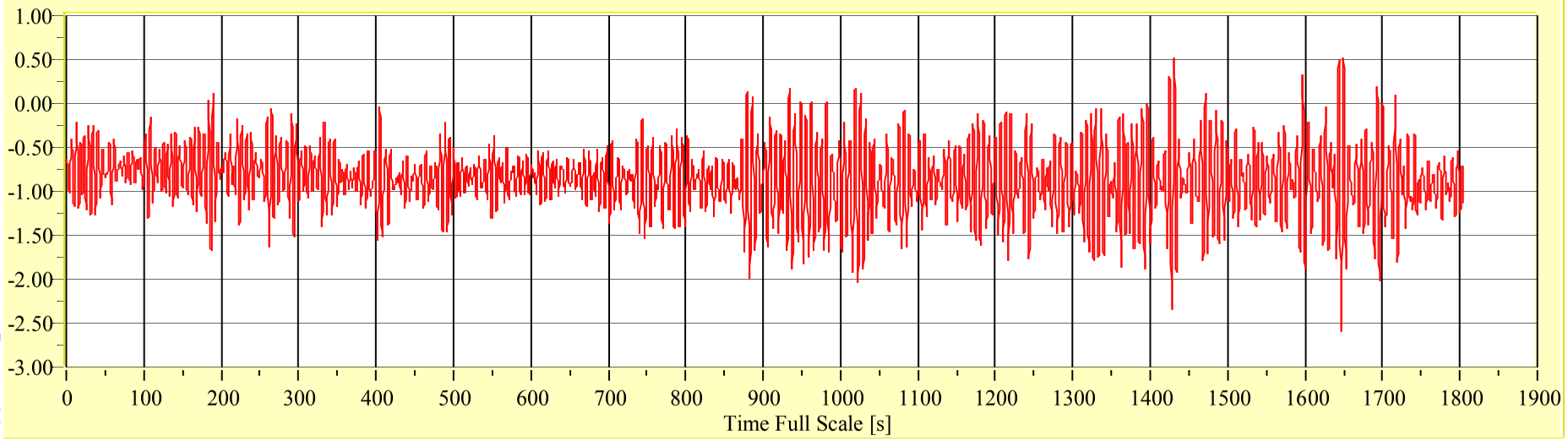
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-01 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

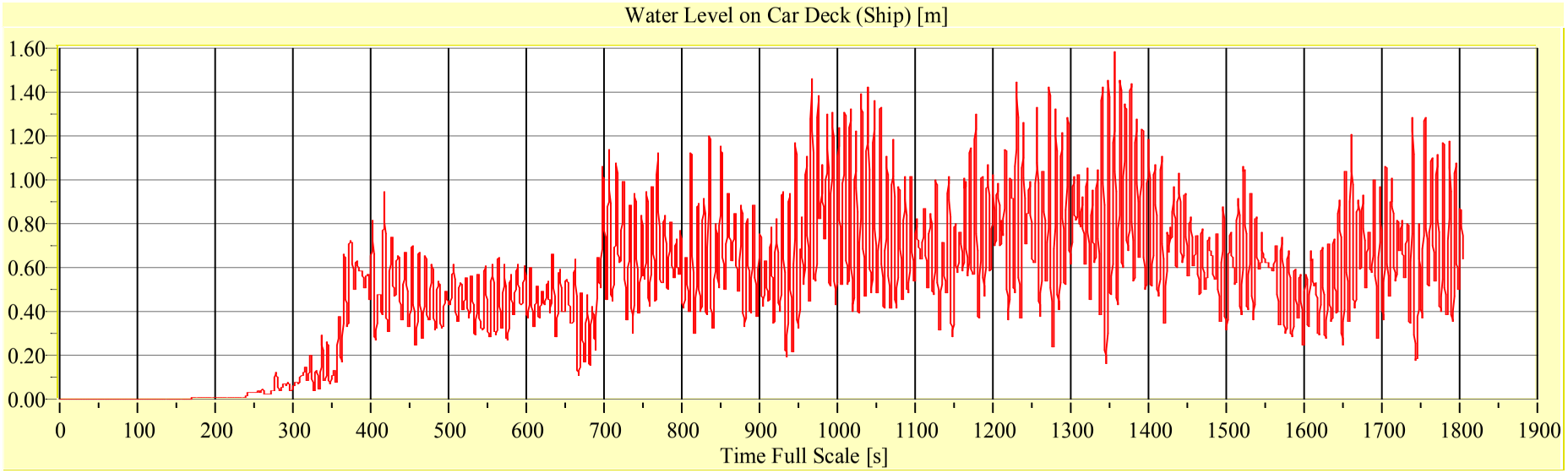


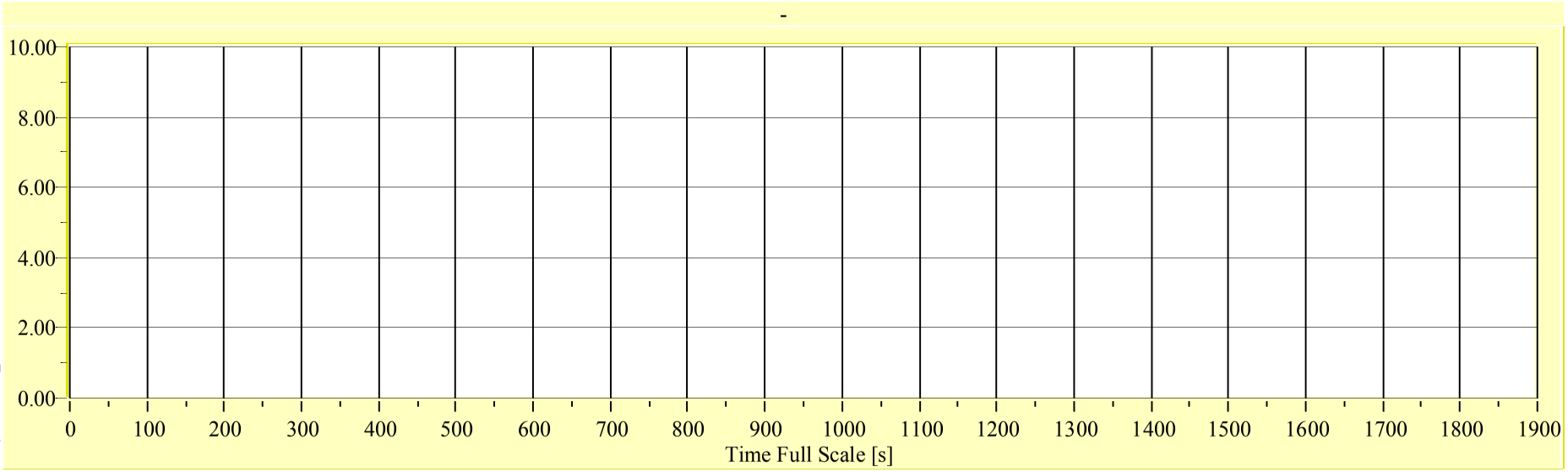



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-01 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



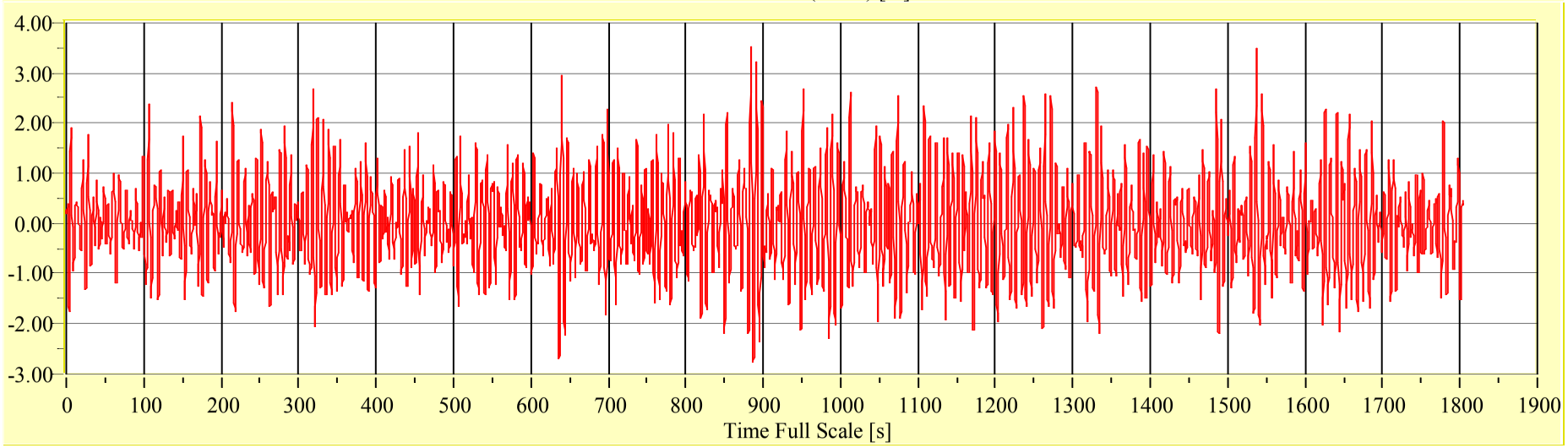



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

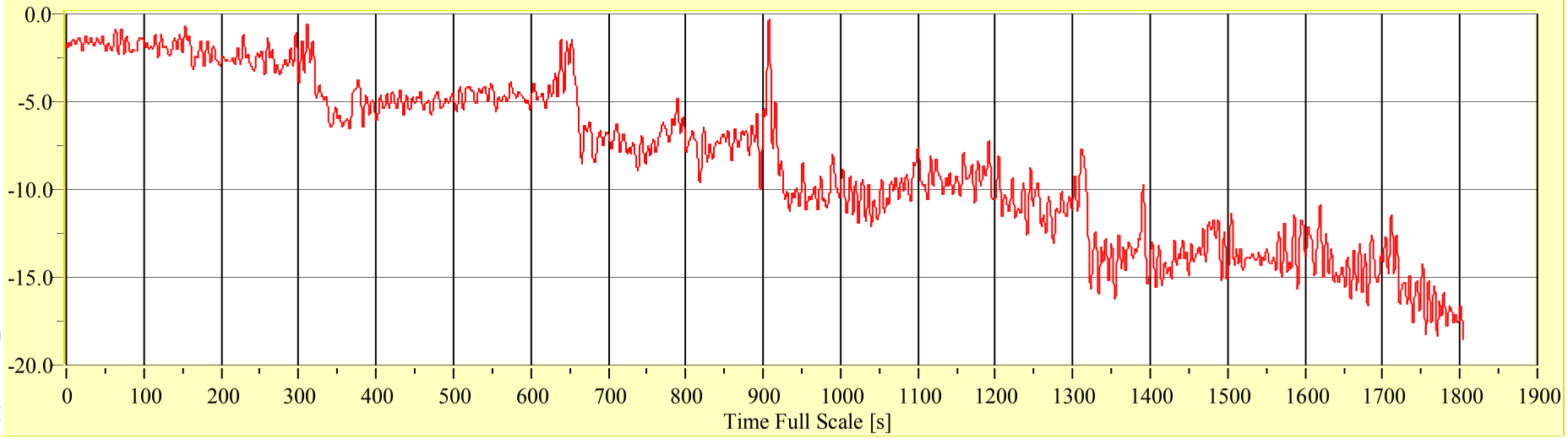
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-02 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to Starboard = Positiv)



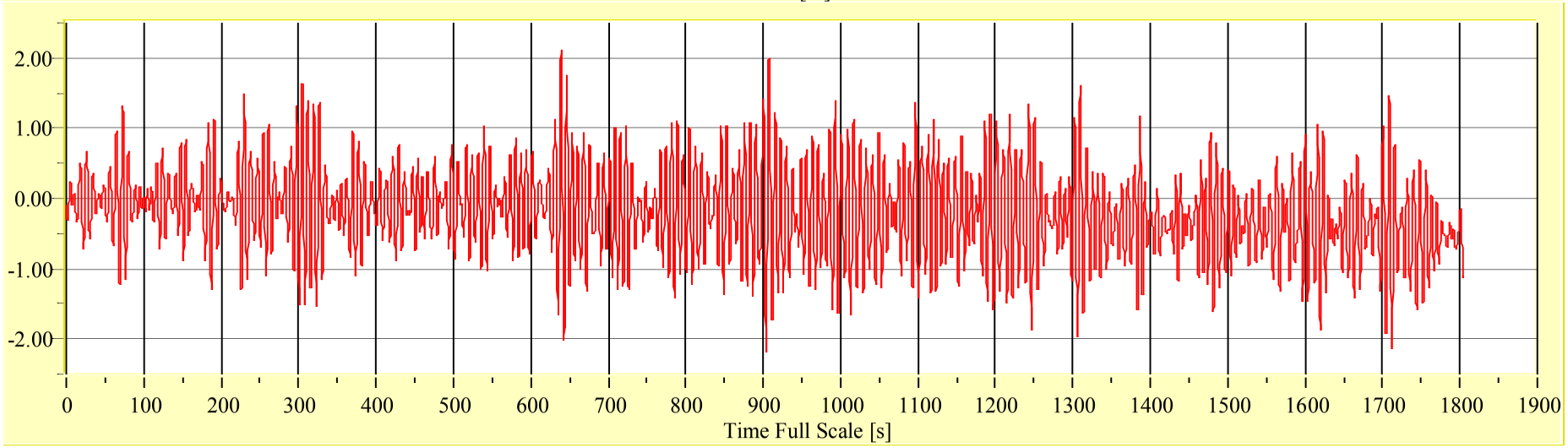



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

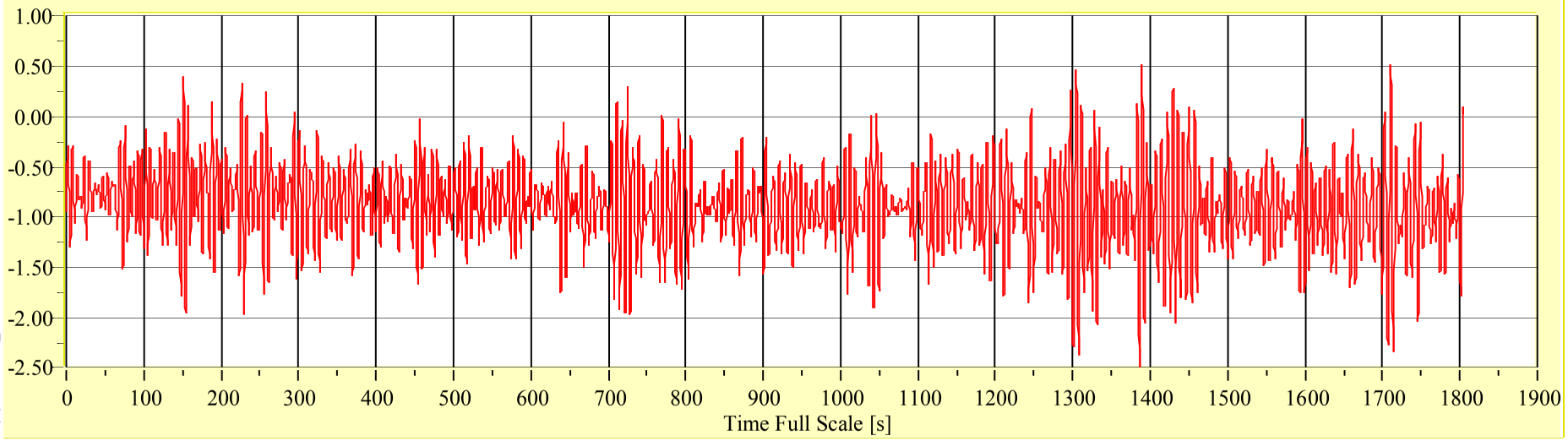
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-02 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

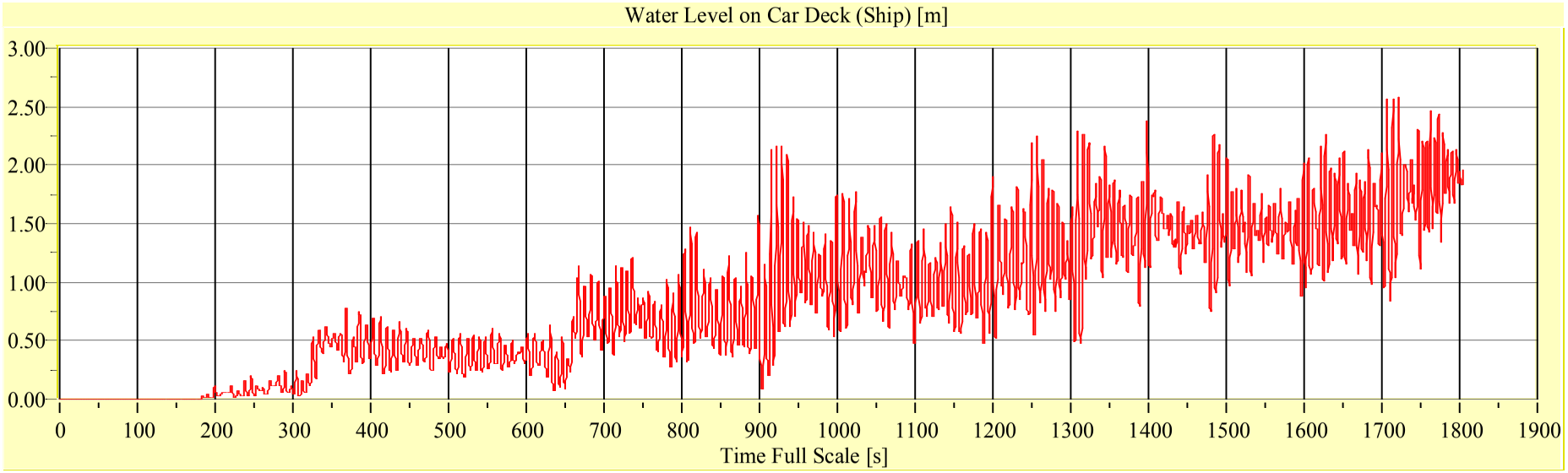


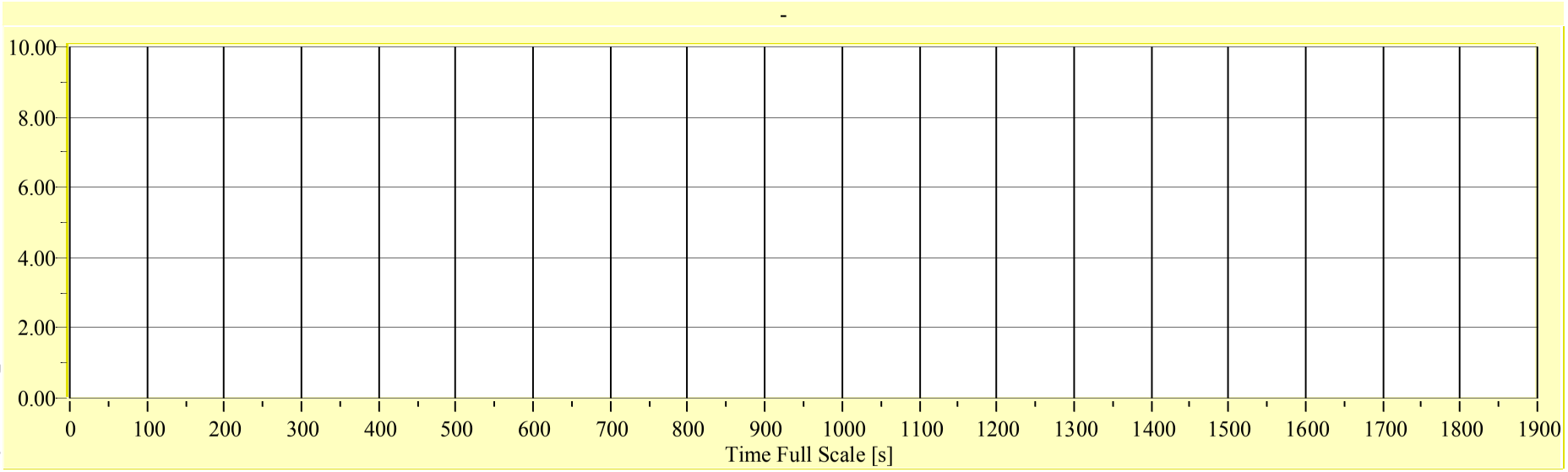



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-02 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



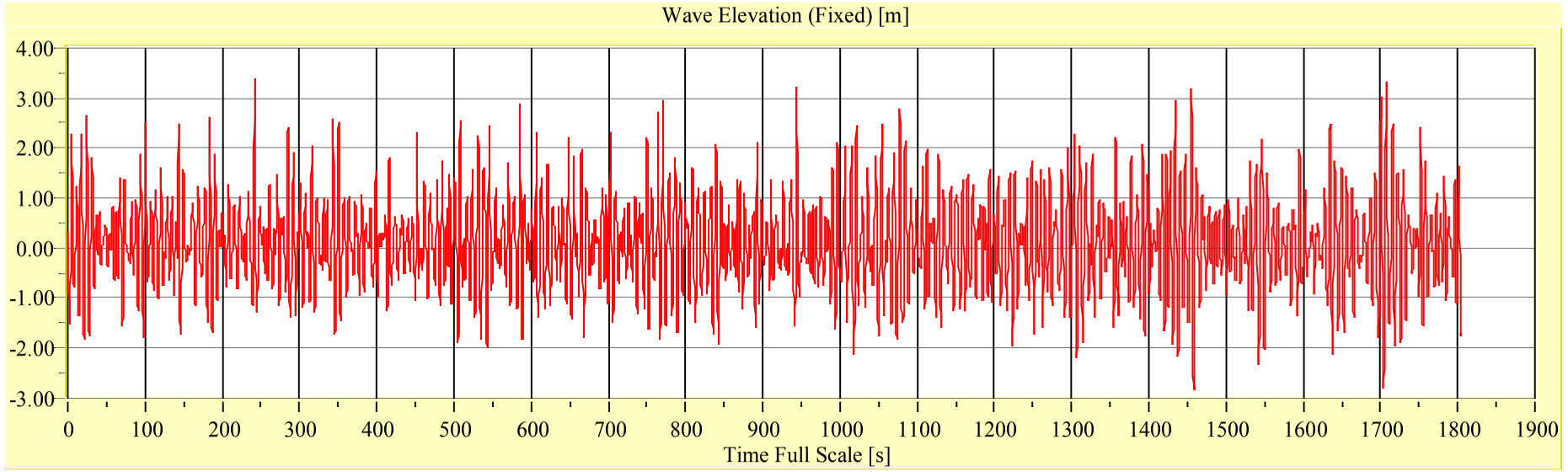



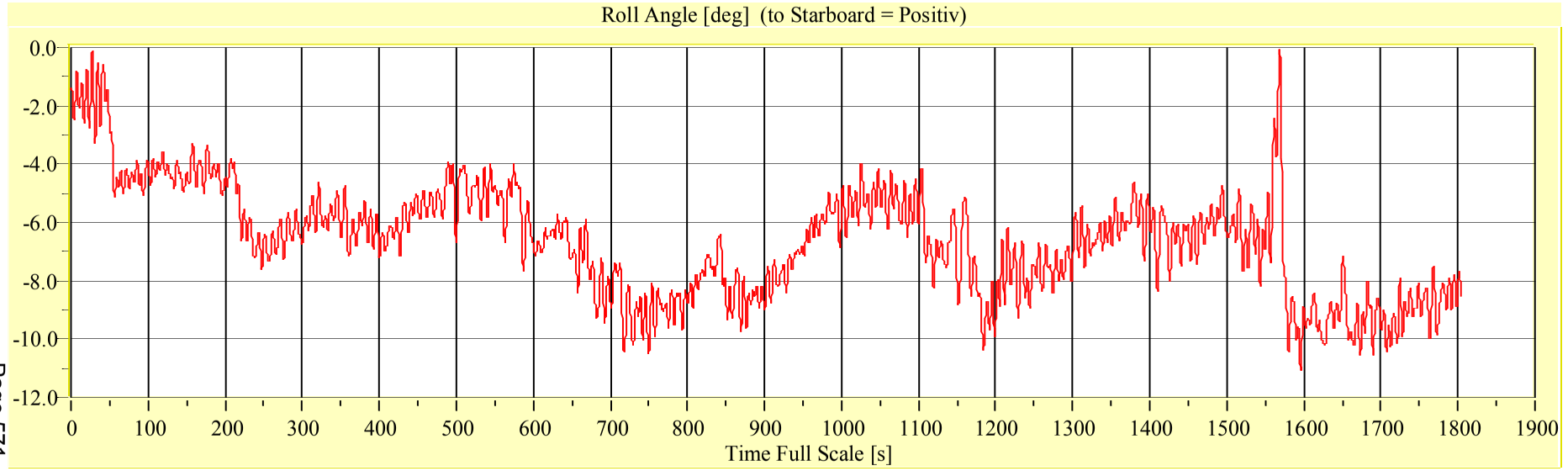



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-03 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



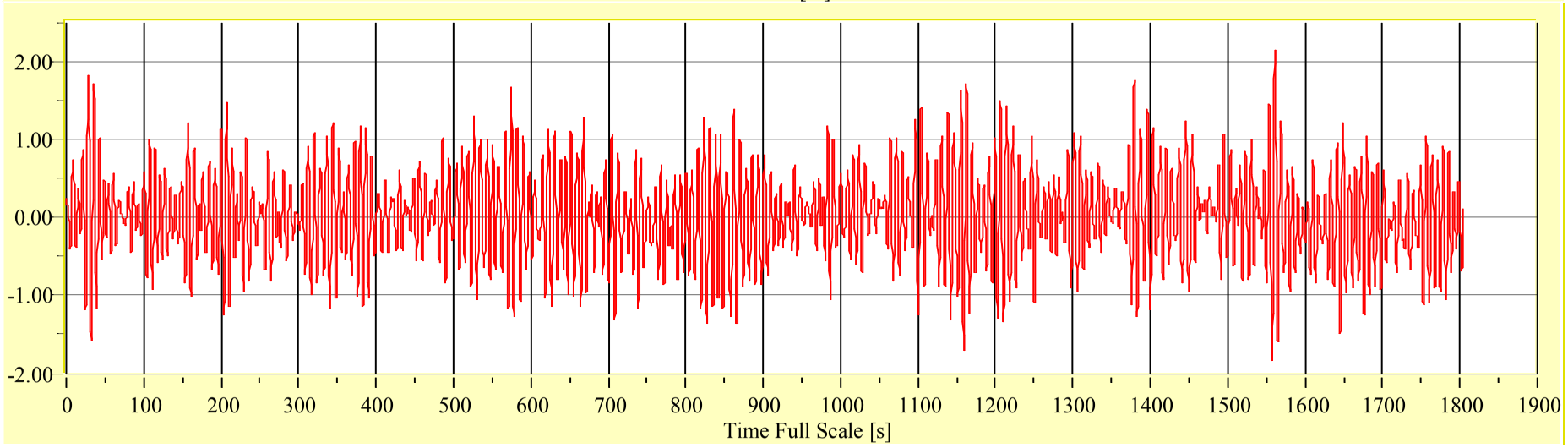



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

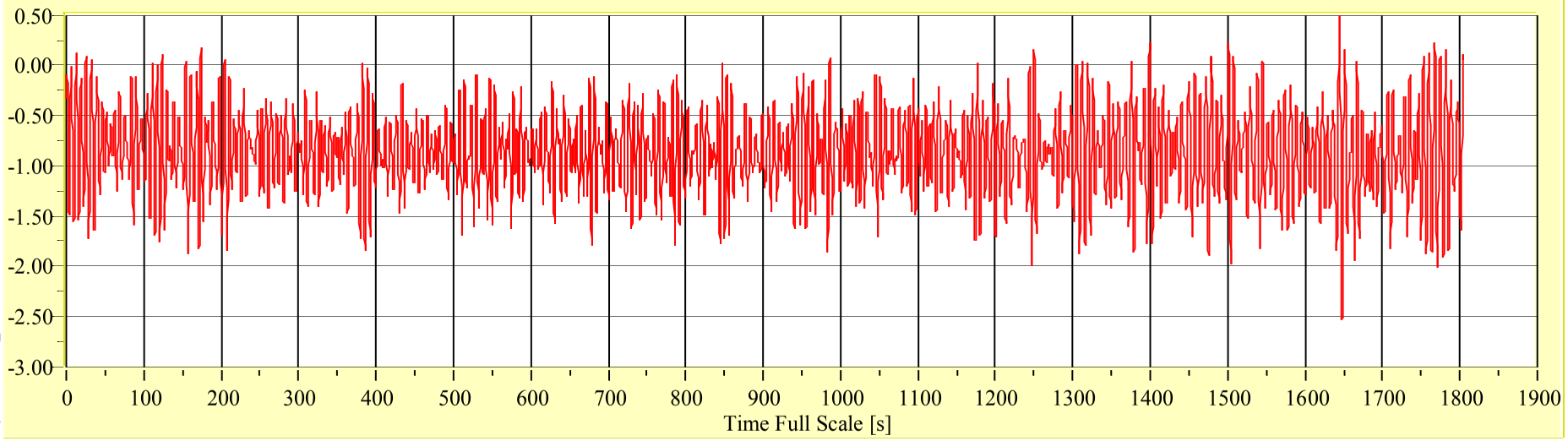
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-03 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

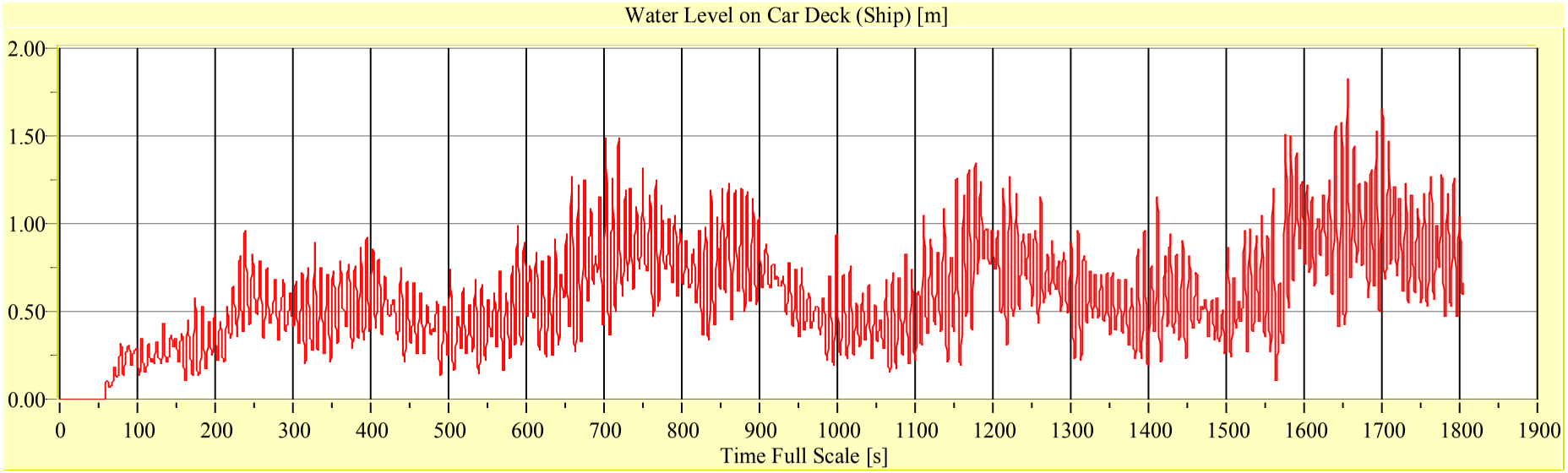


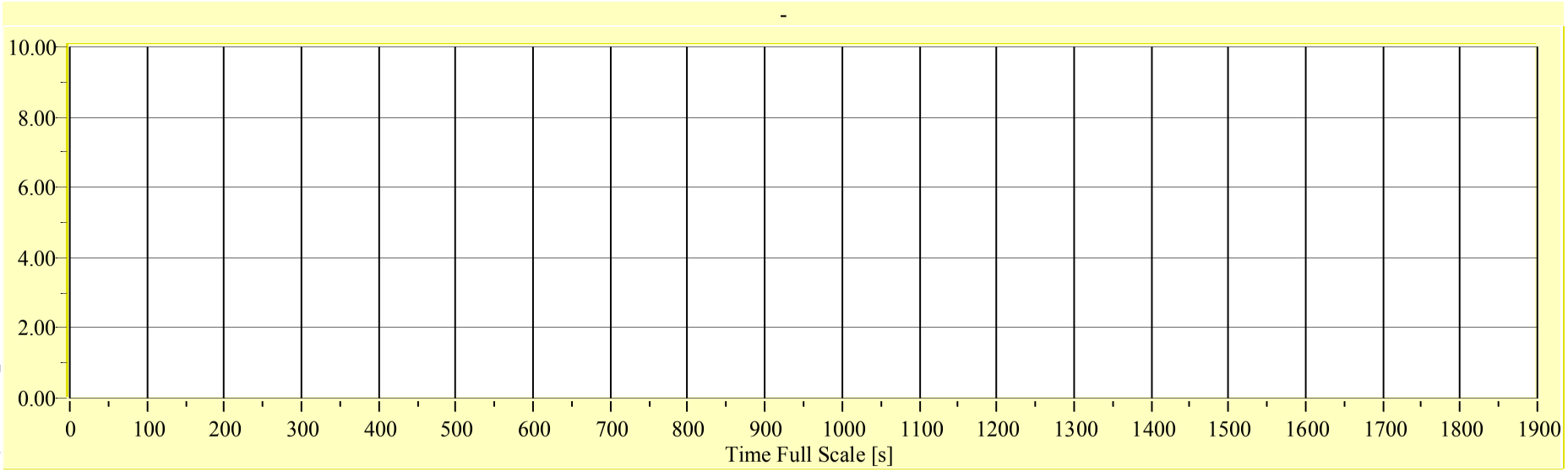



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-03 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



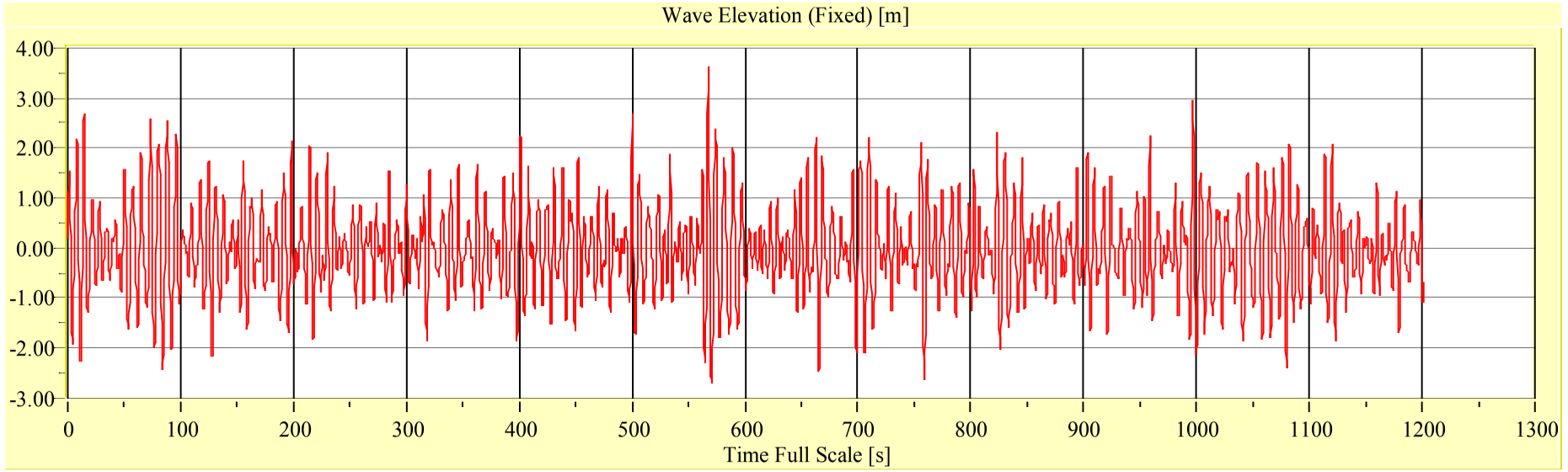



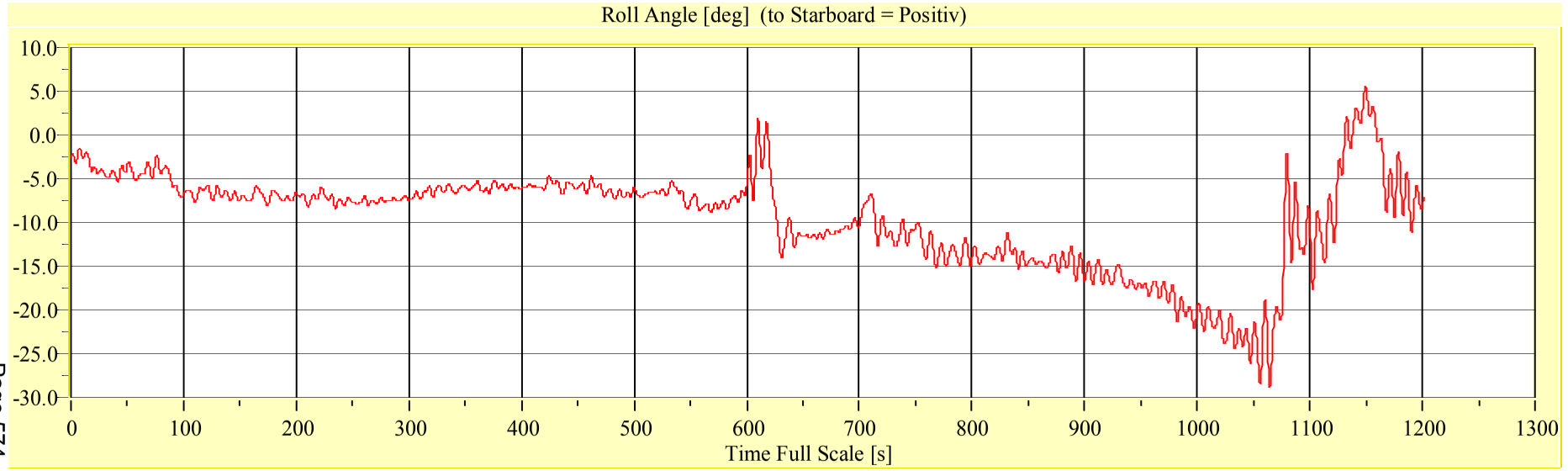



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-04 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



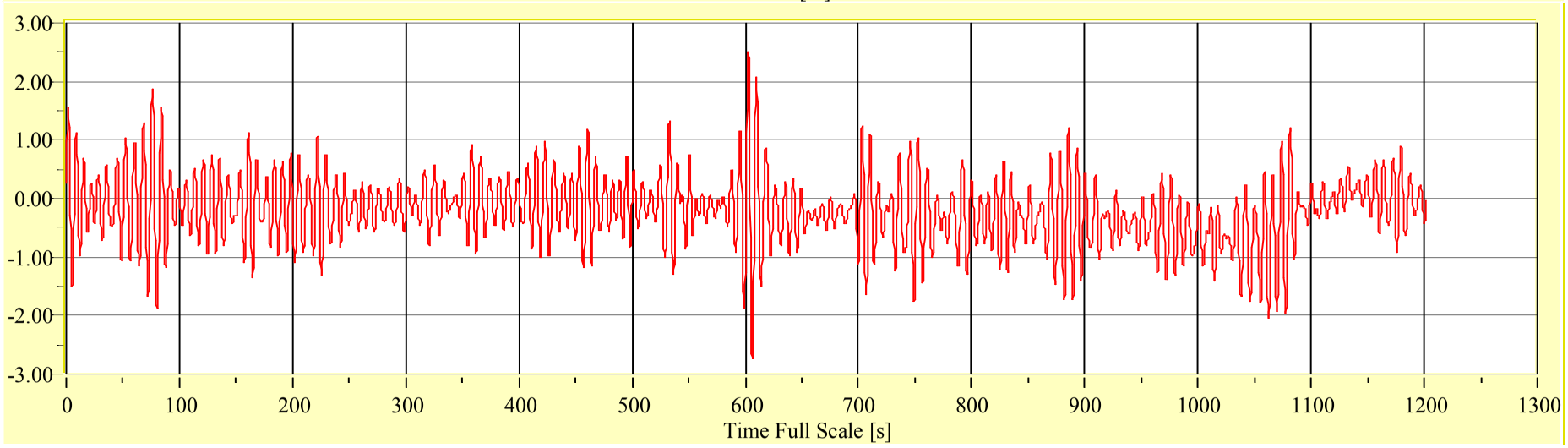



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

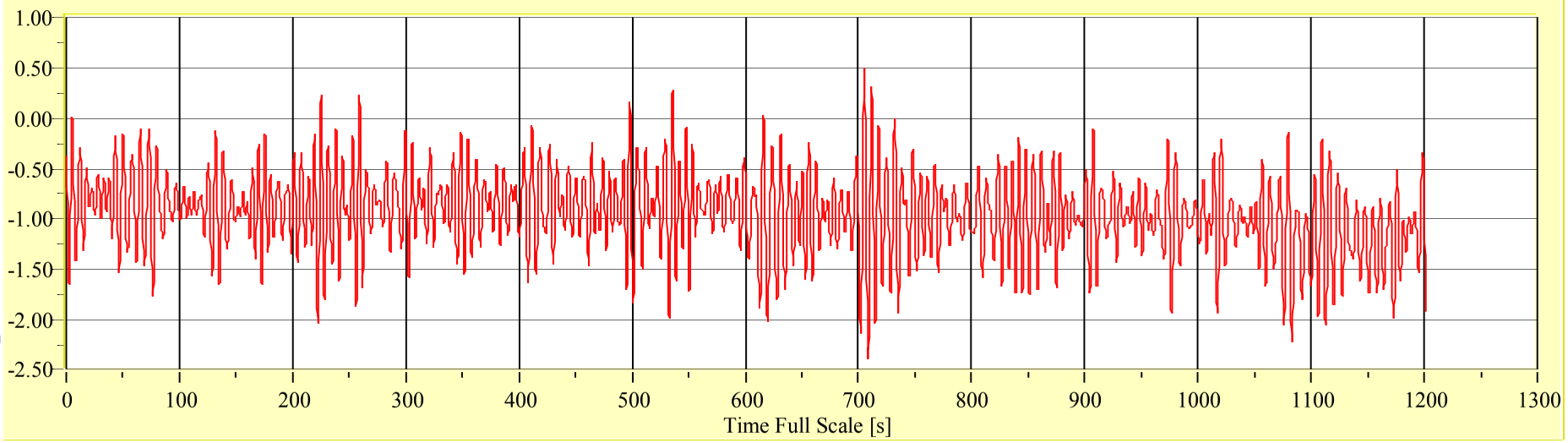
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-04 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

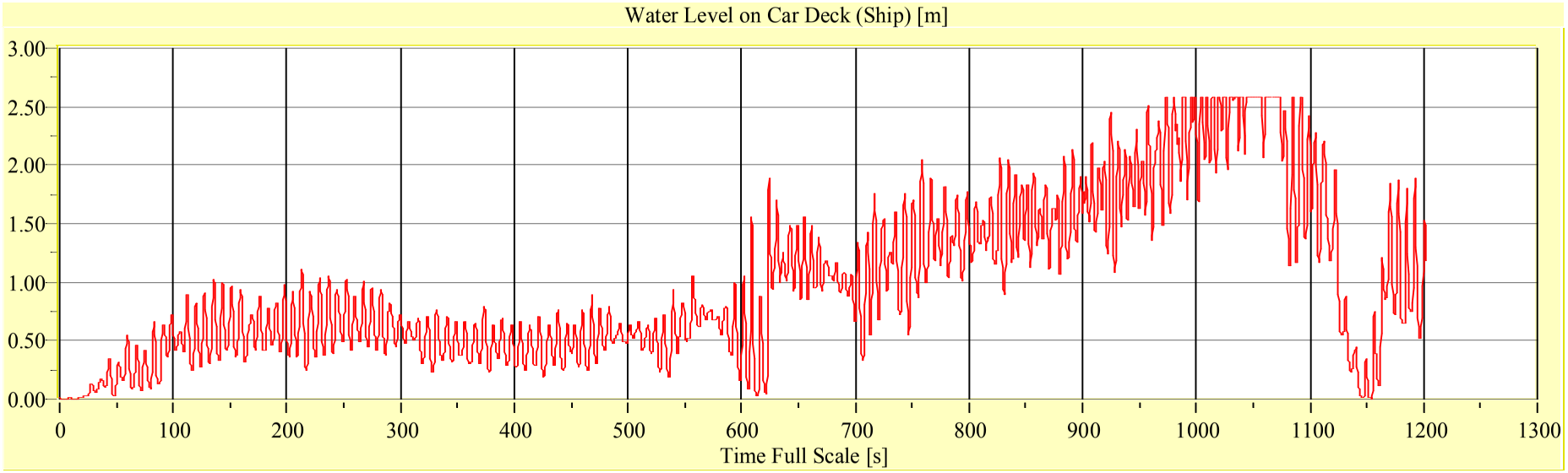


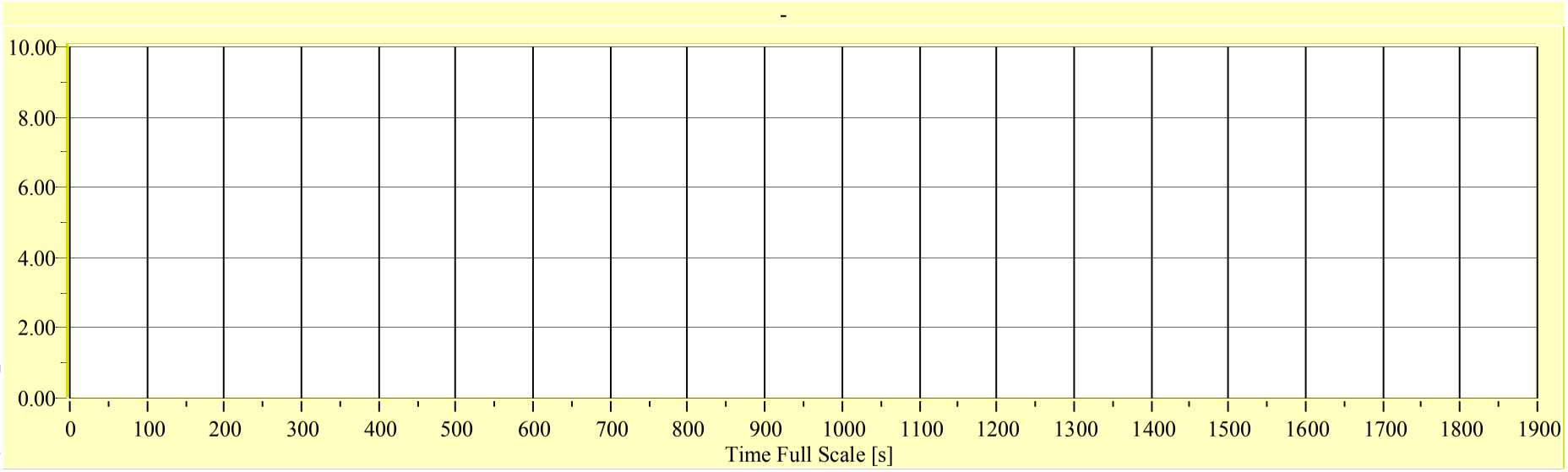



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-04 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



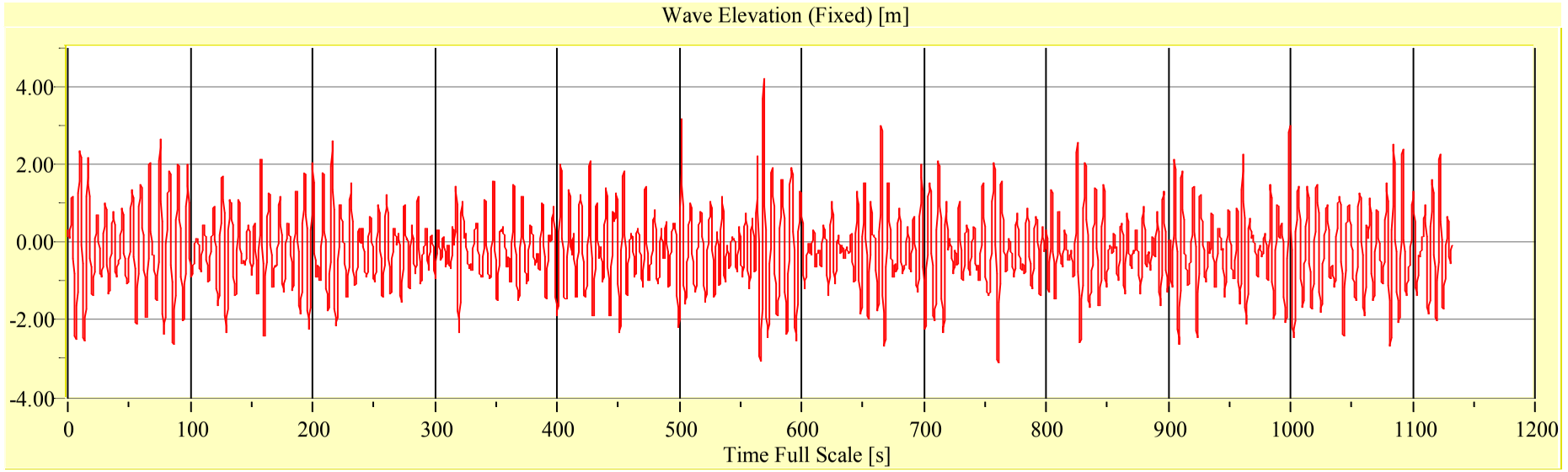



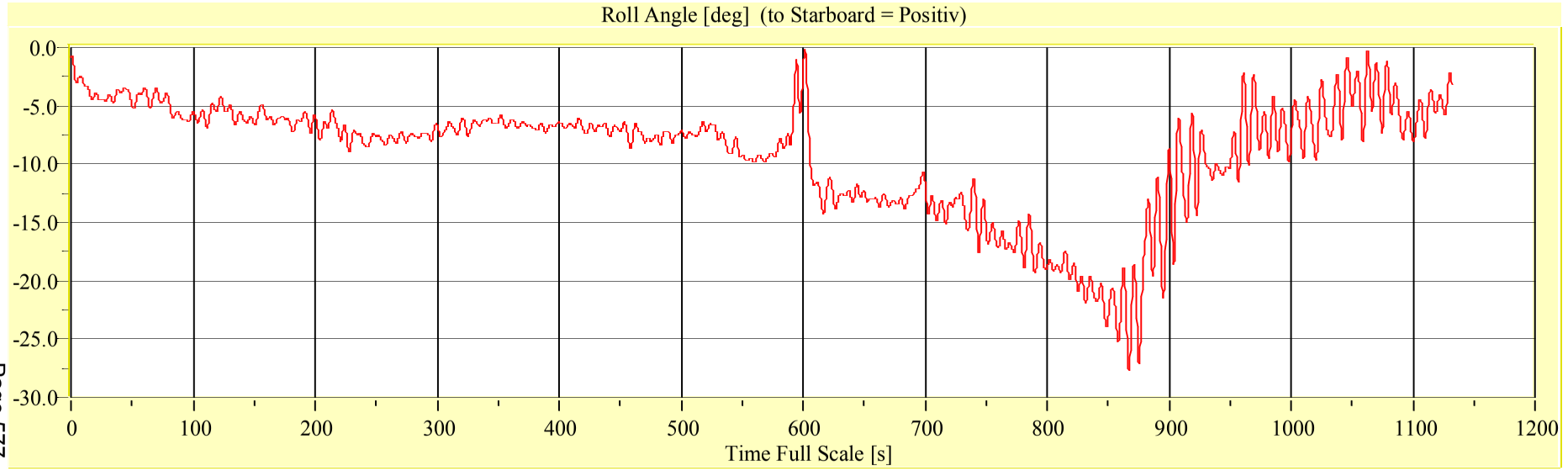



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-05 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



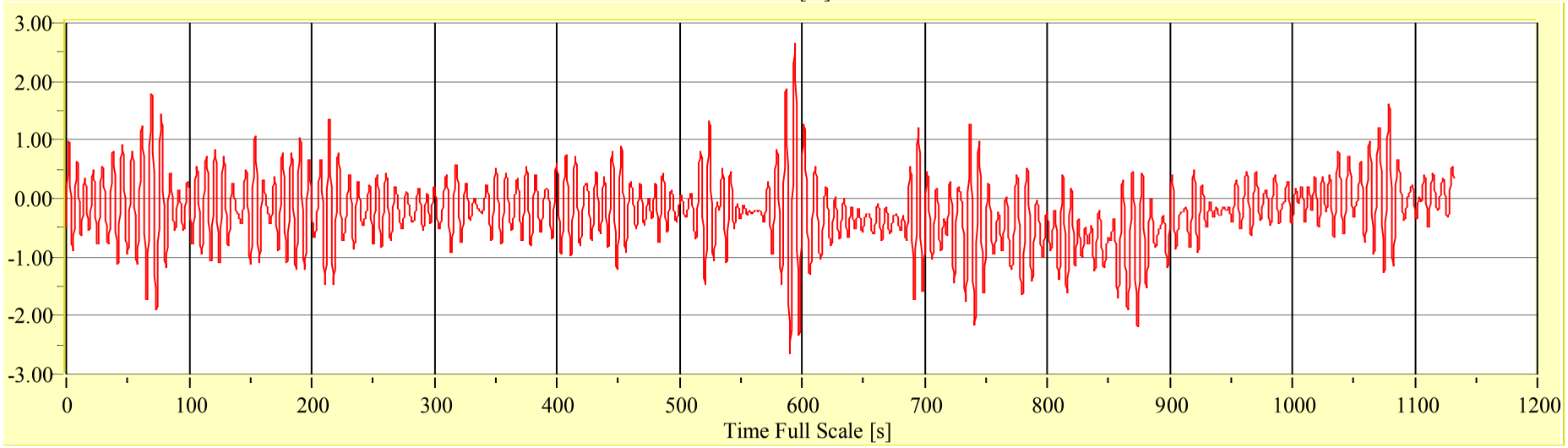



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

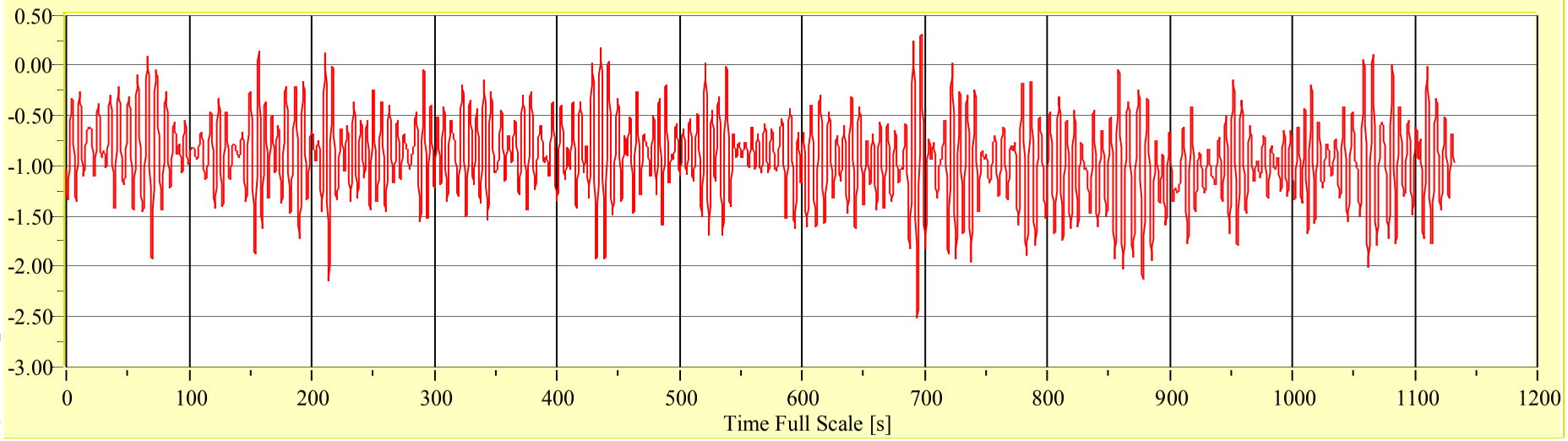
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-05 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

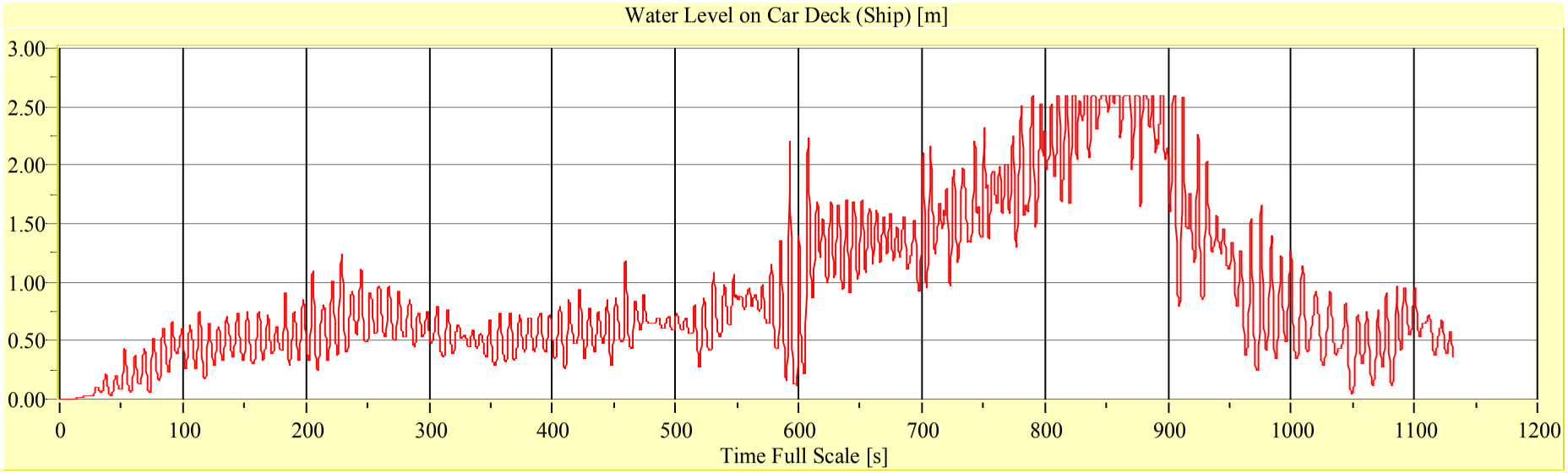


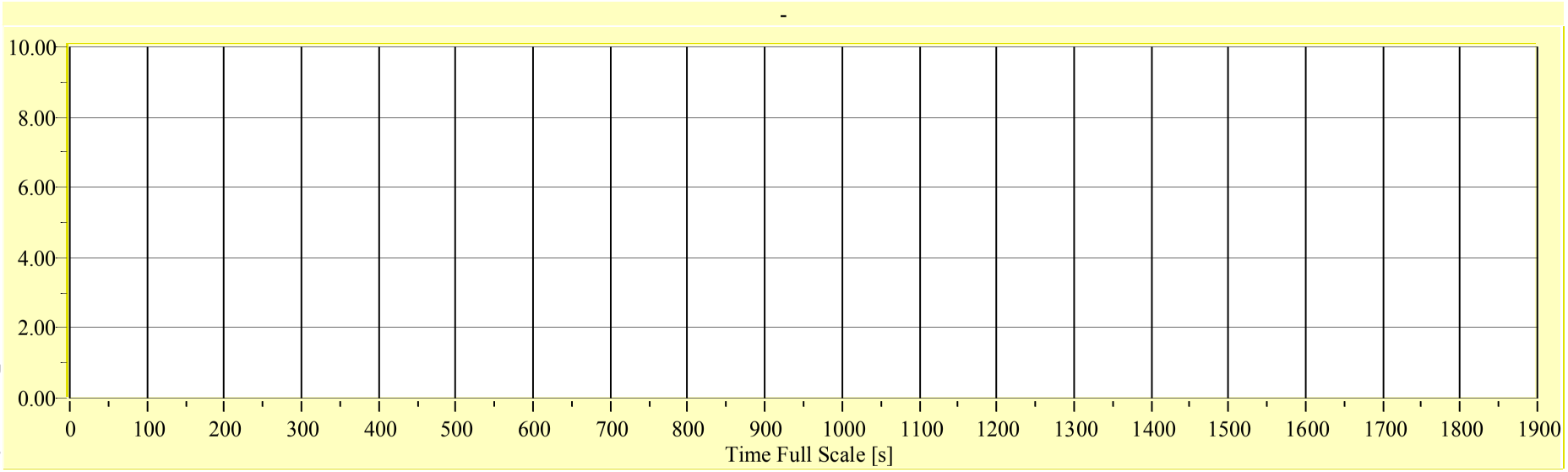



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29666-05 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



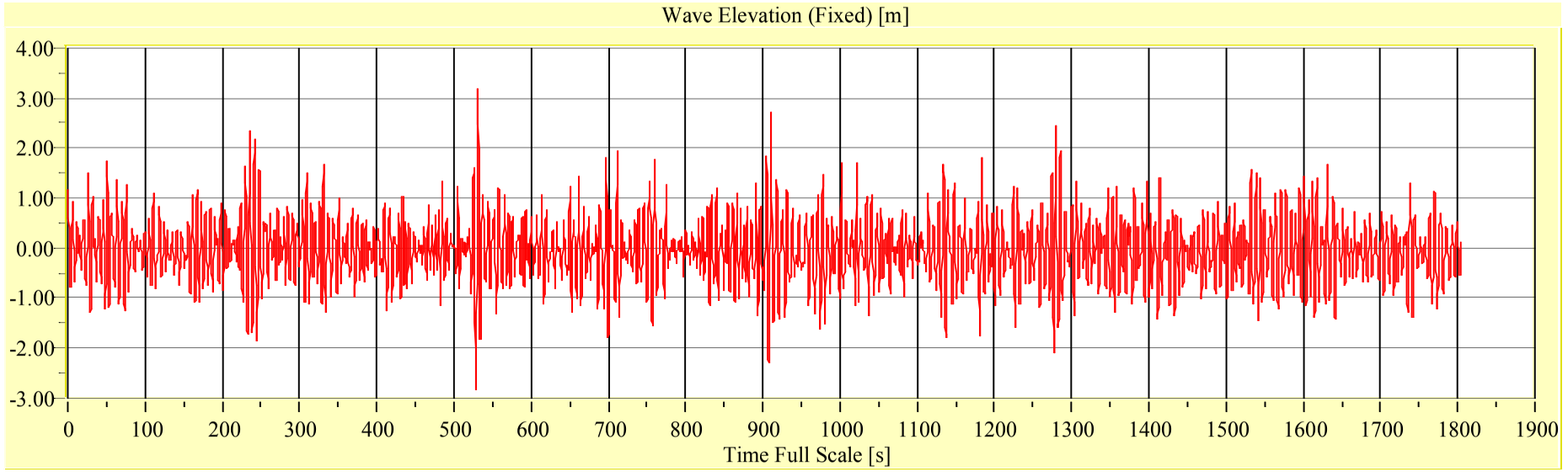



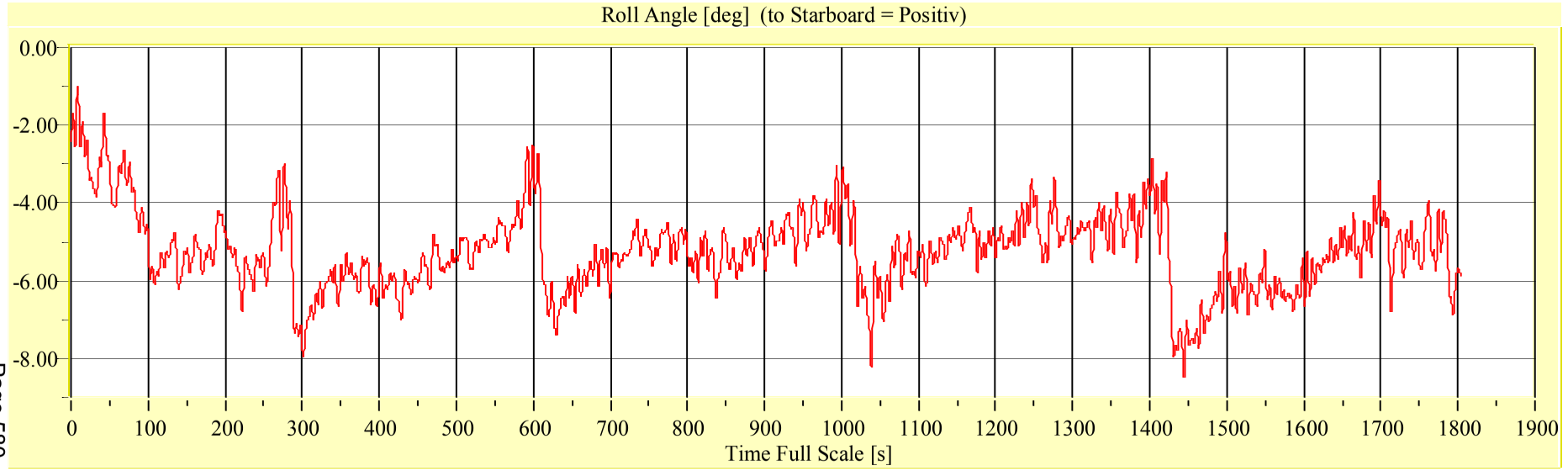



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-01 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



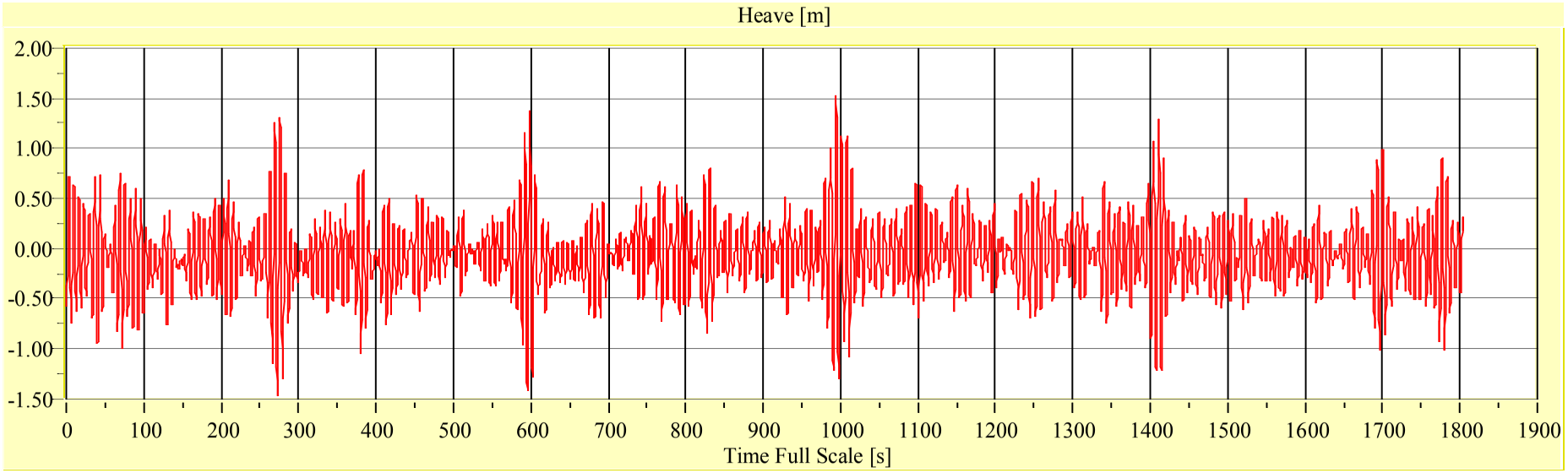



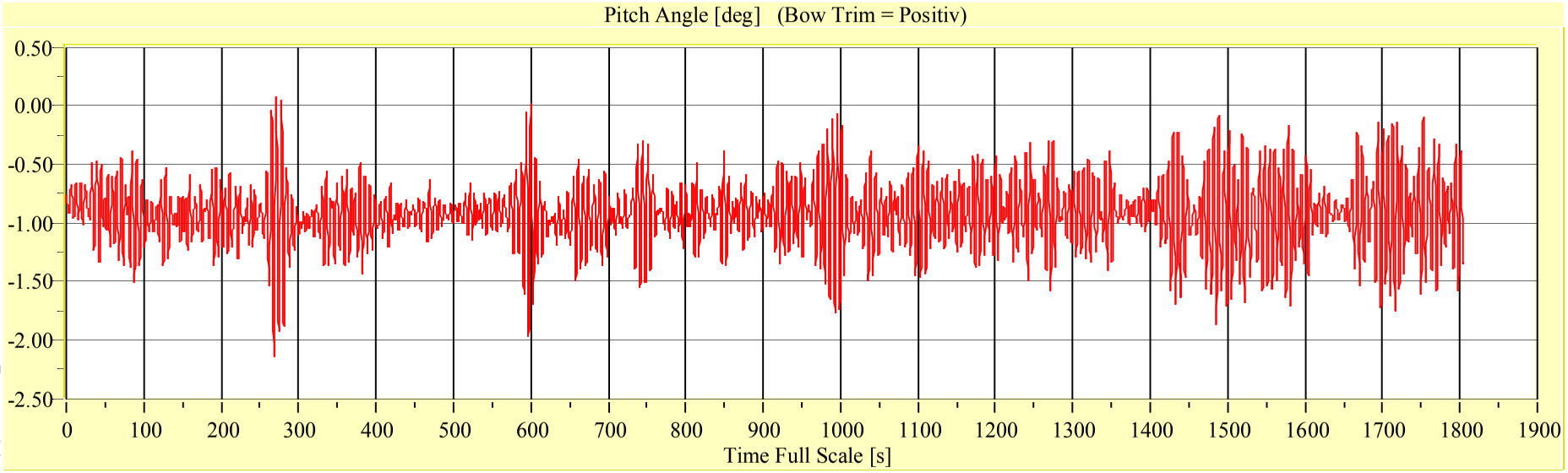



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-01 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



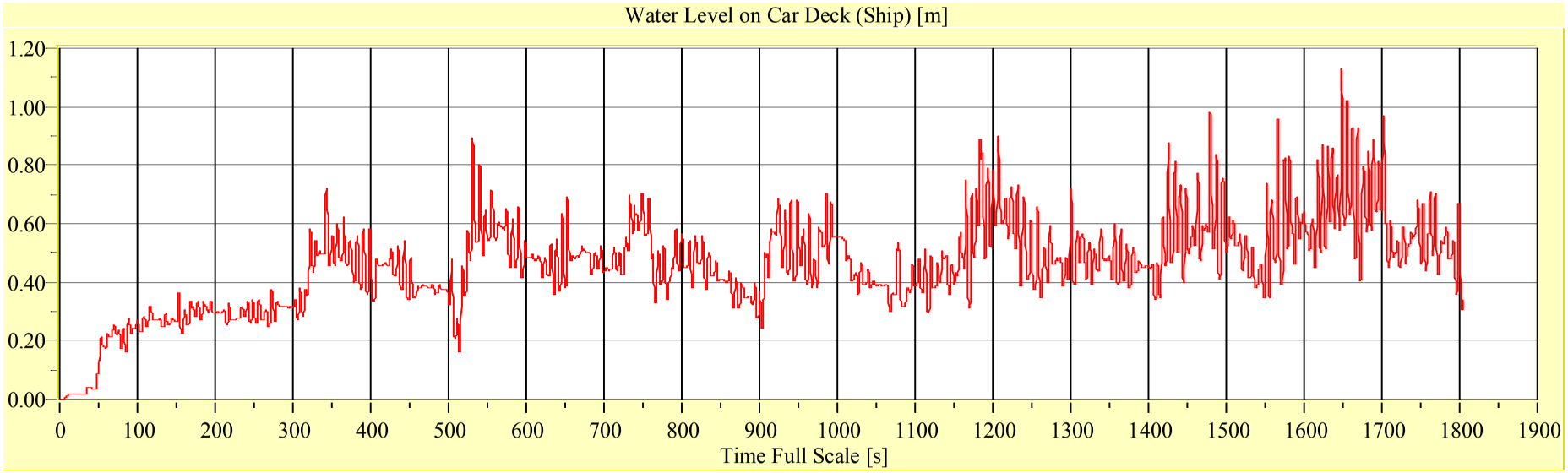



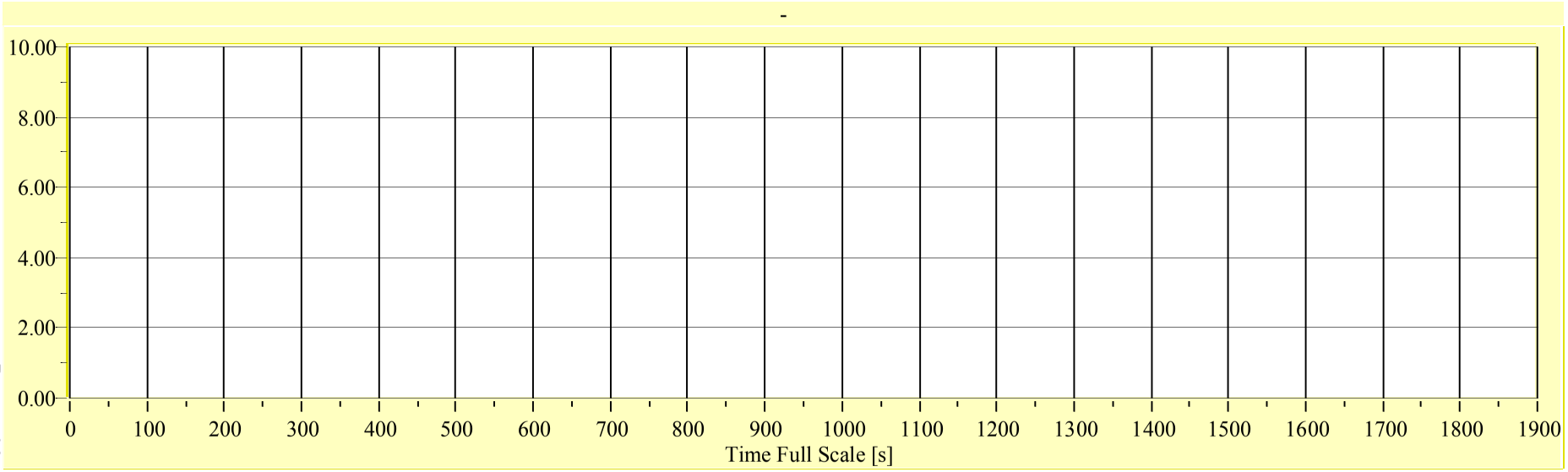



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-01 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



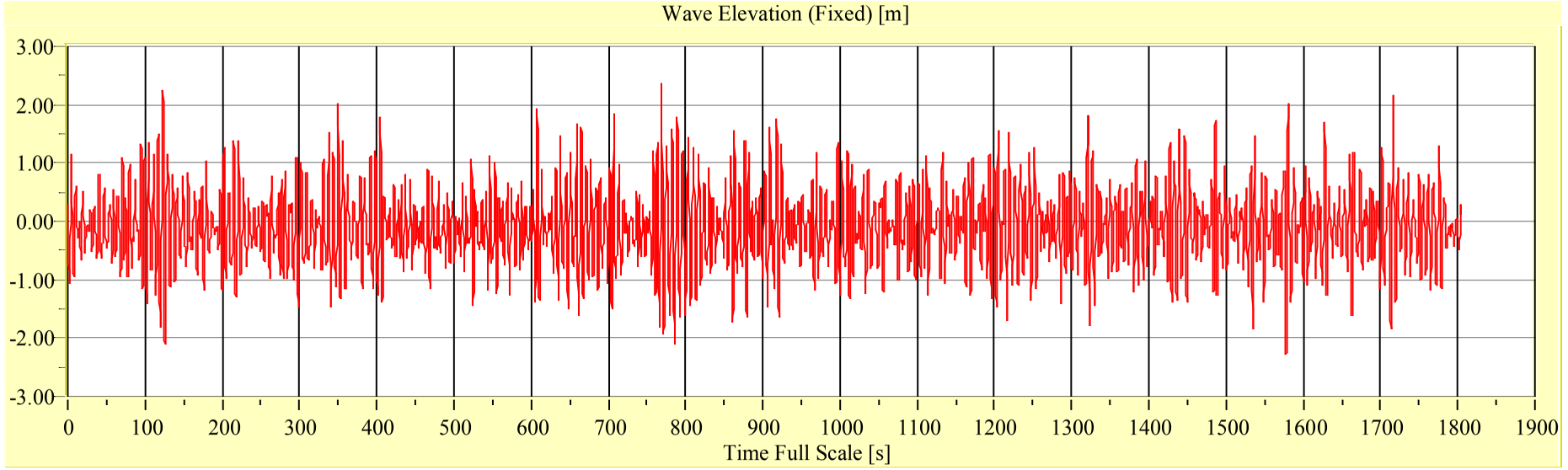



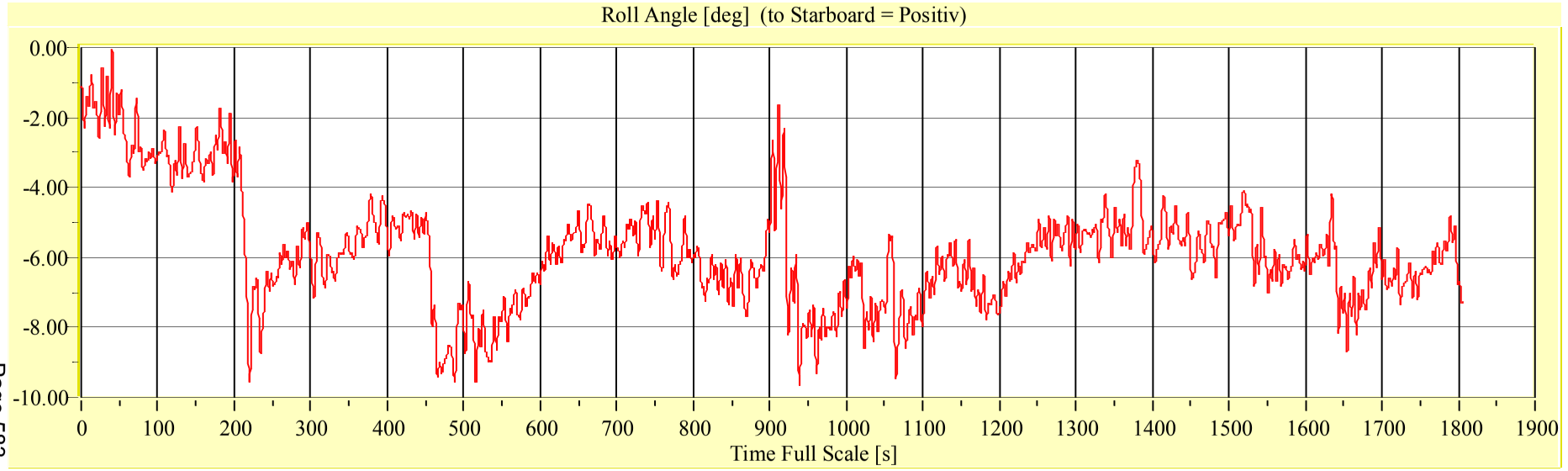



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-02 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



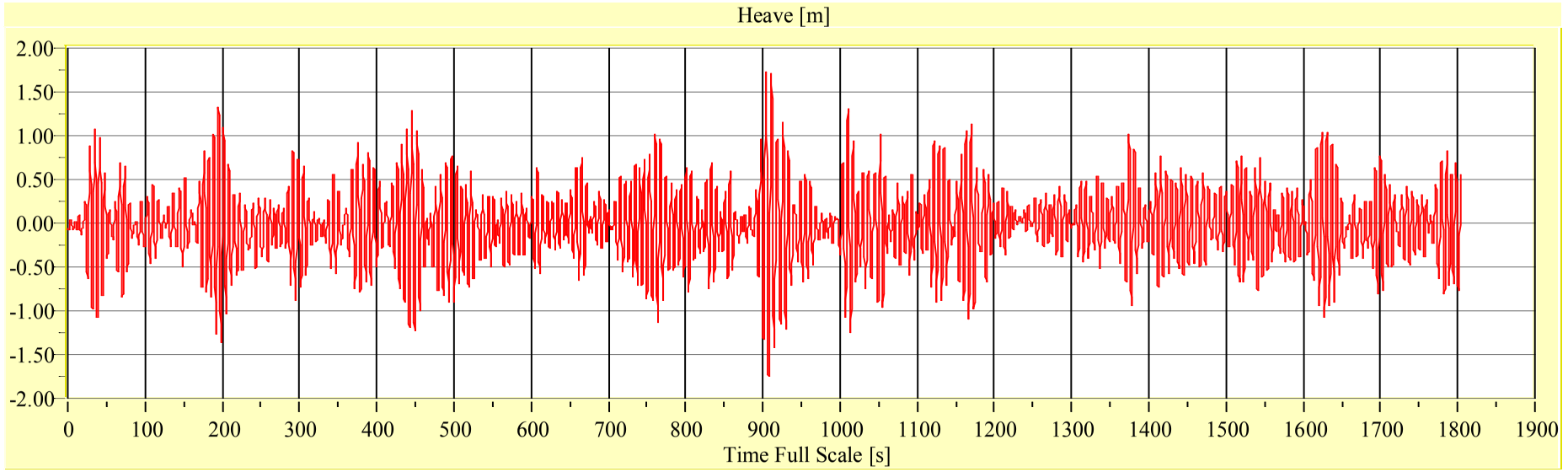



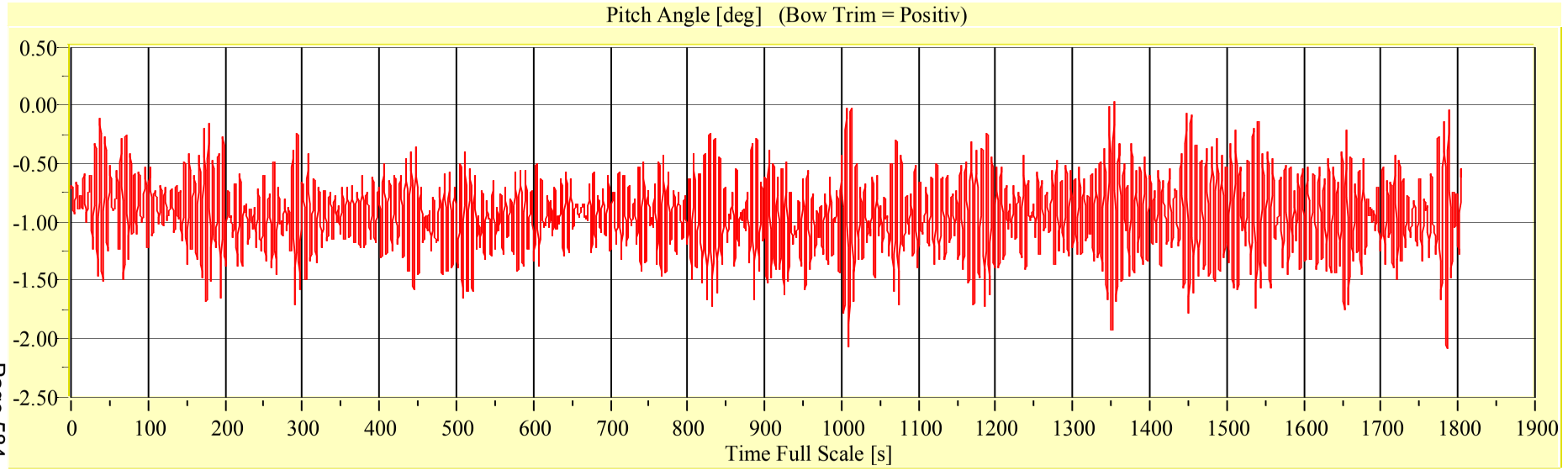



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-02 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



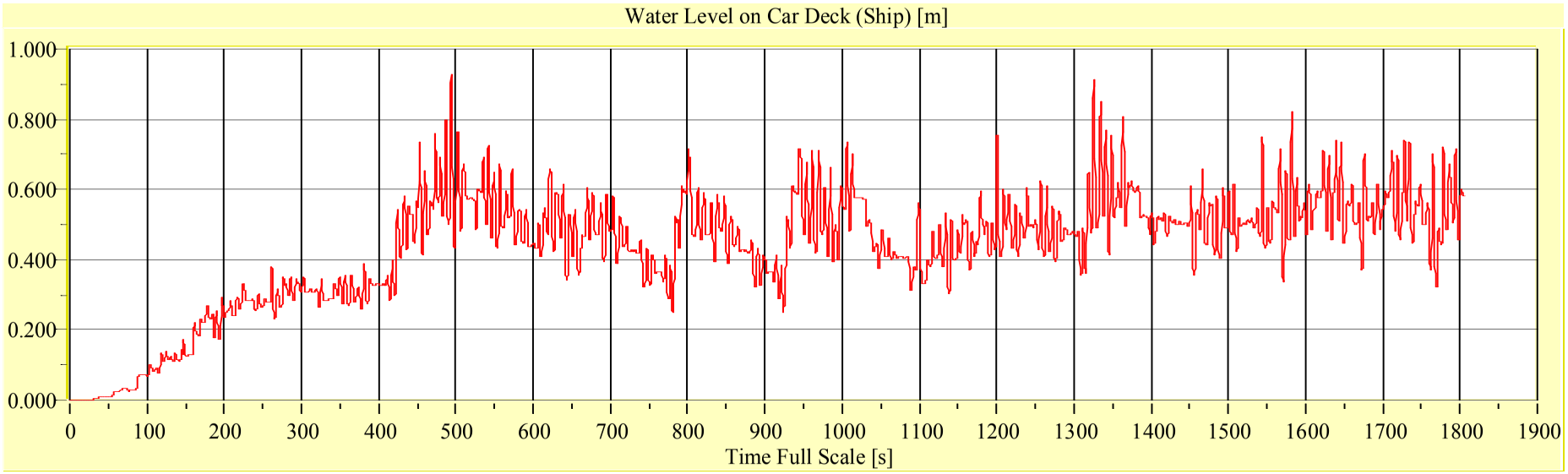



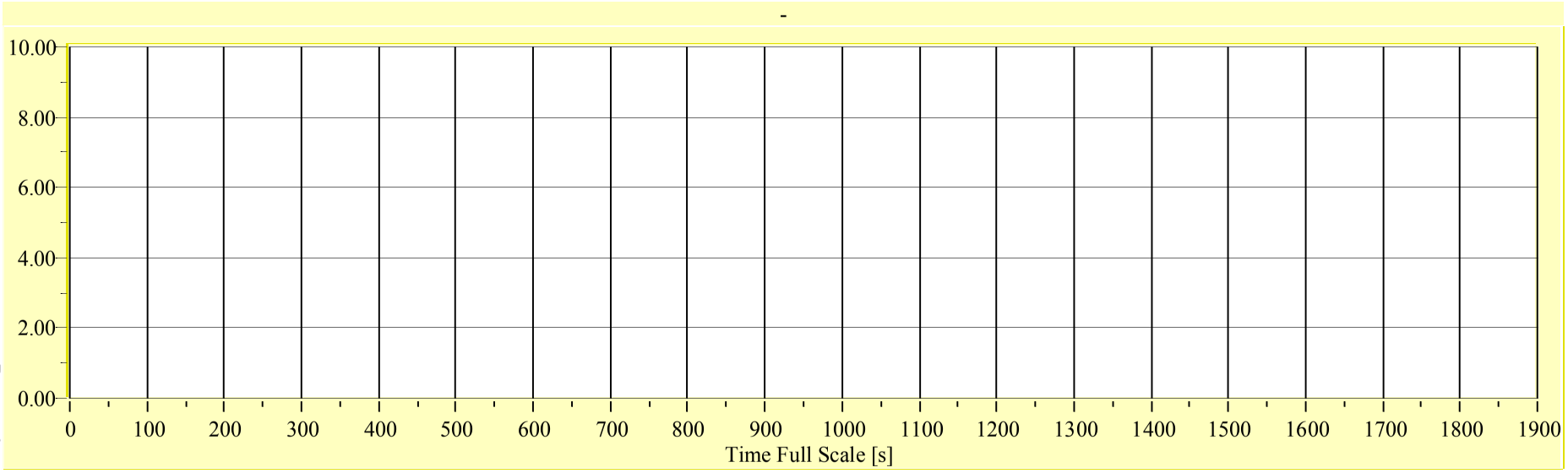



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-02 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



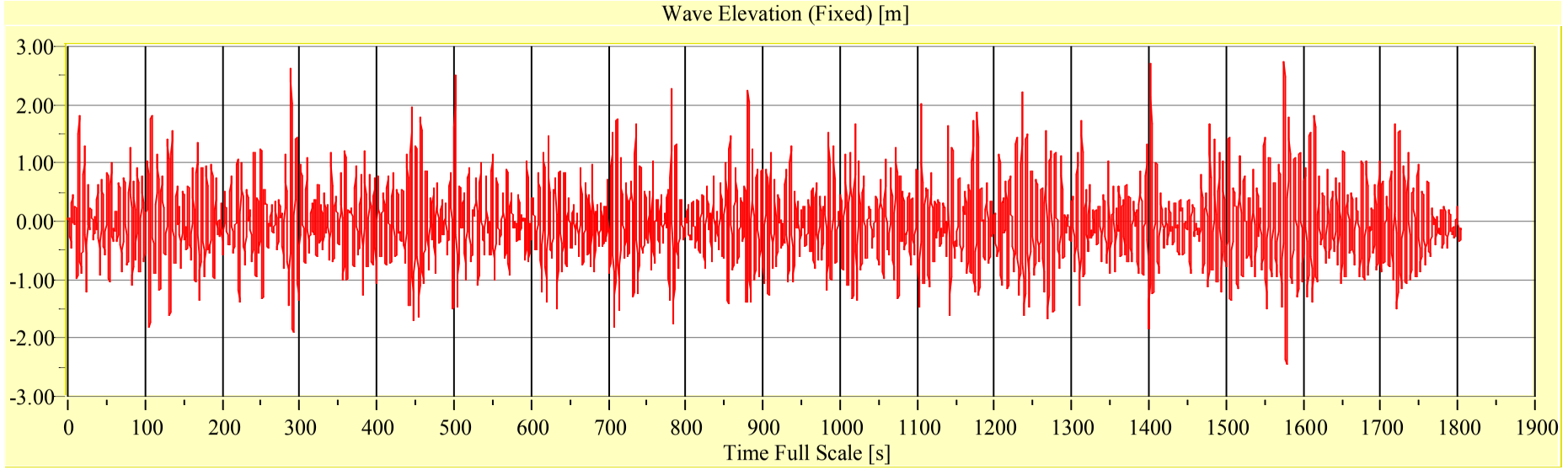



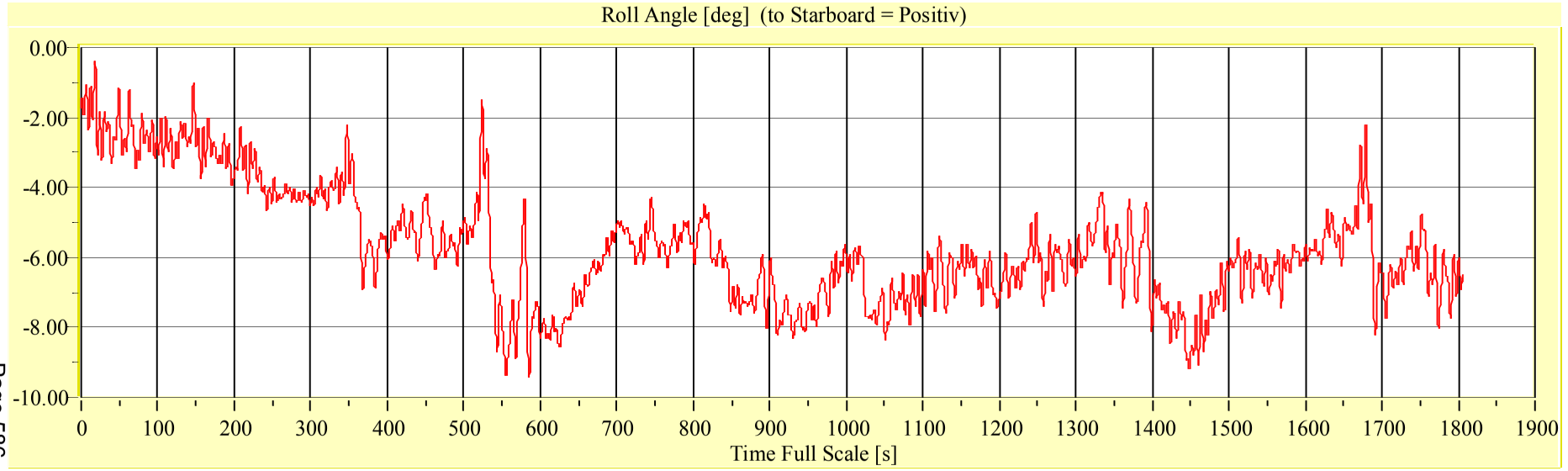



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-03 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



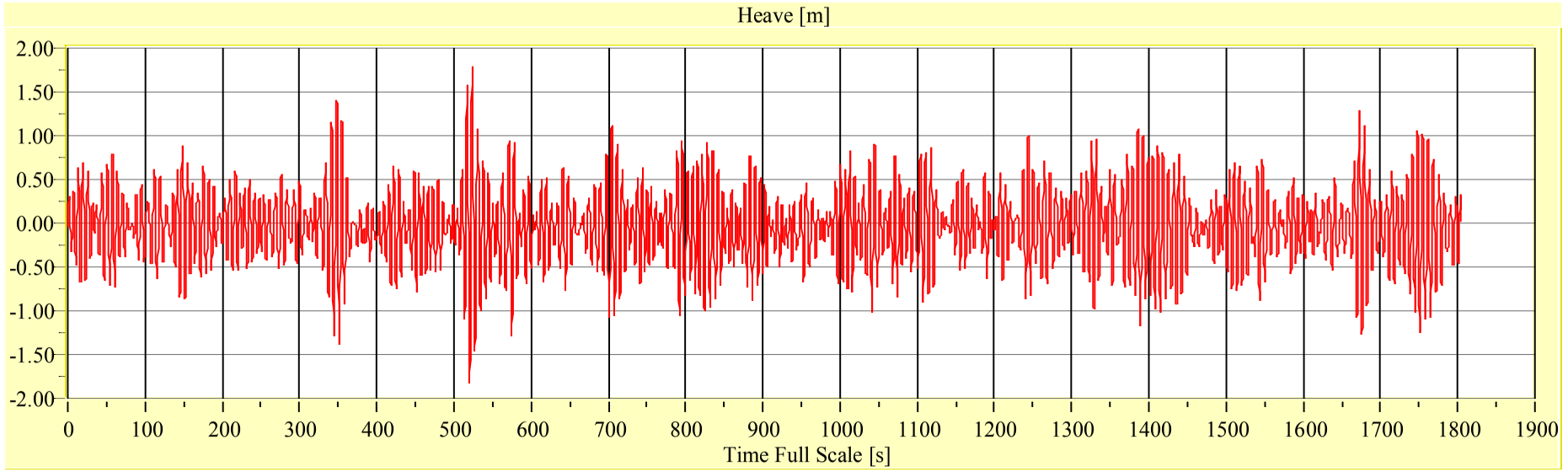



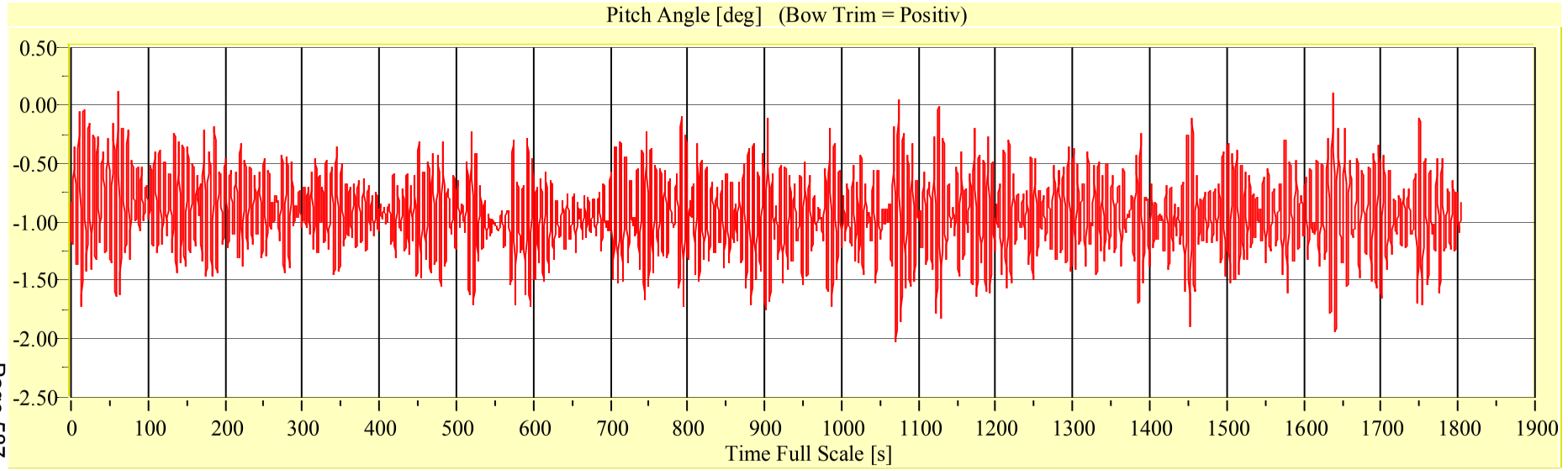



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-03 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



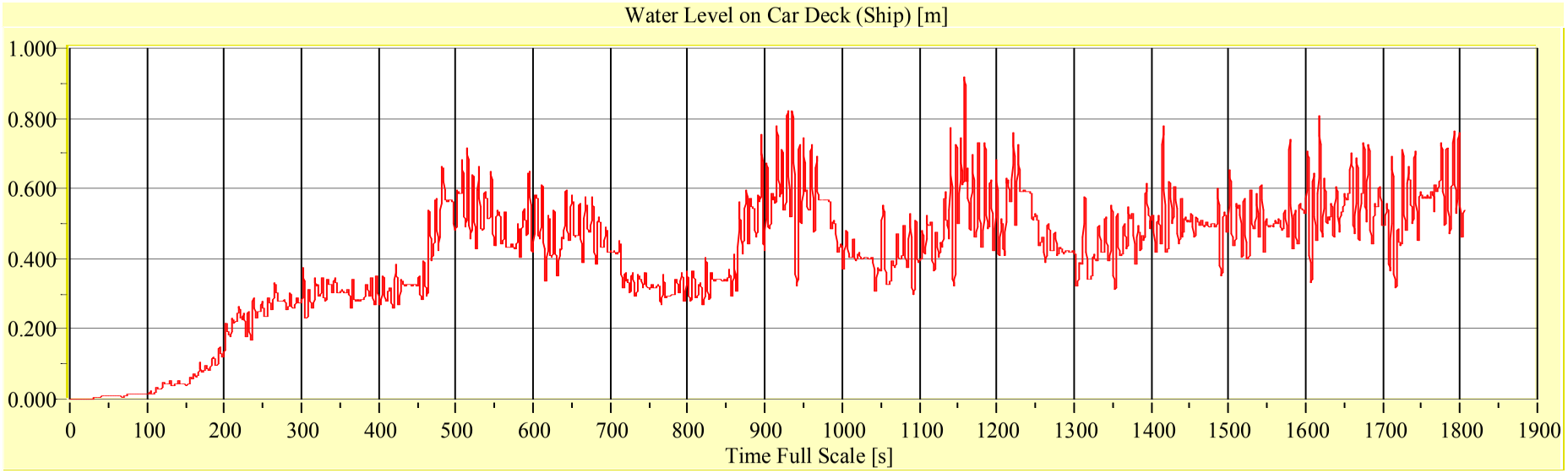



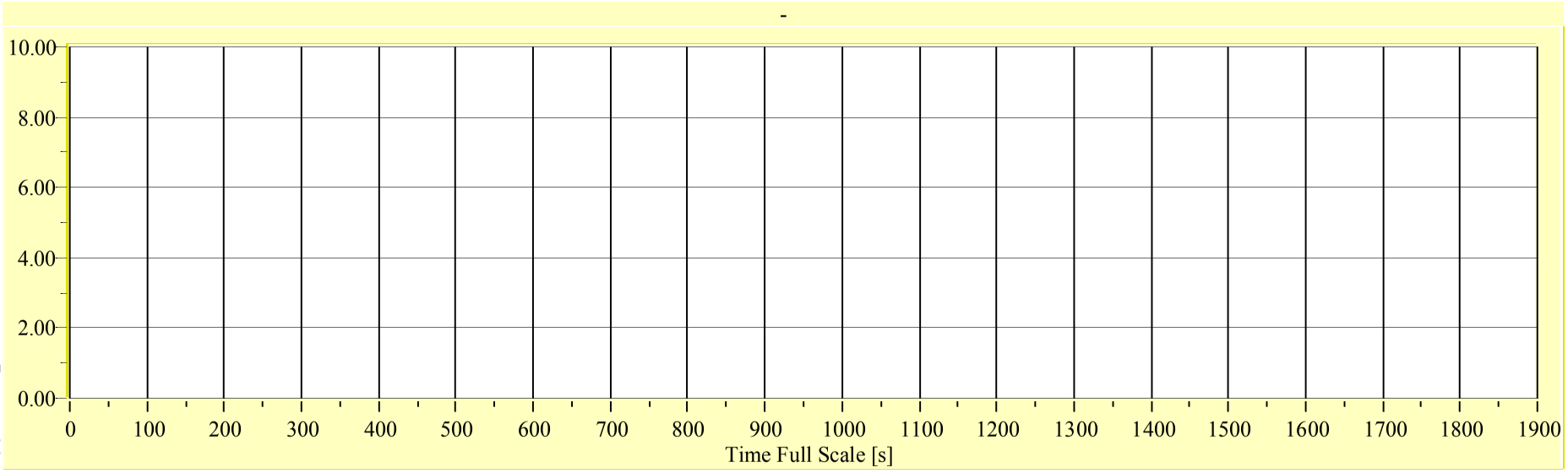



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-03 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



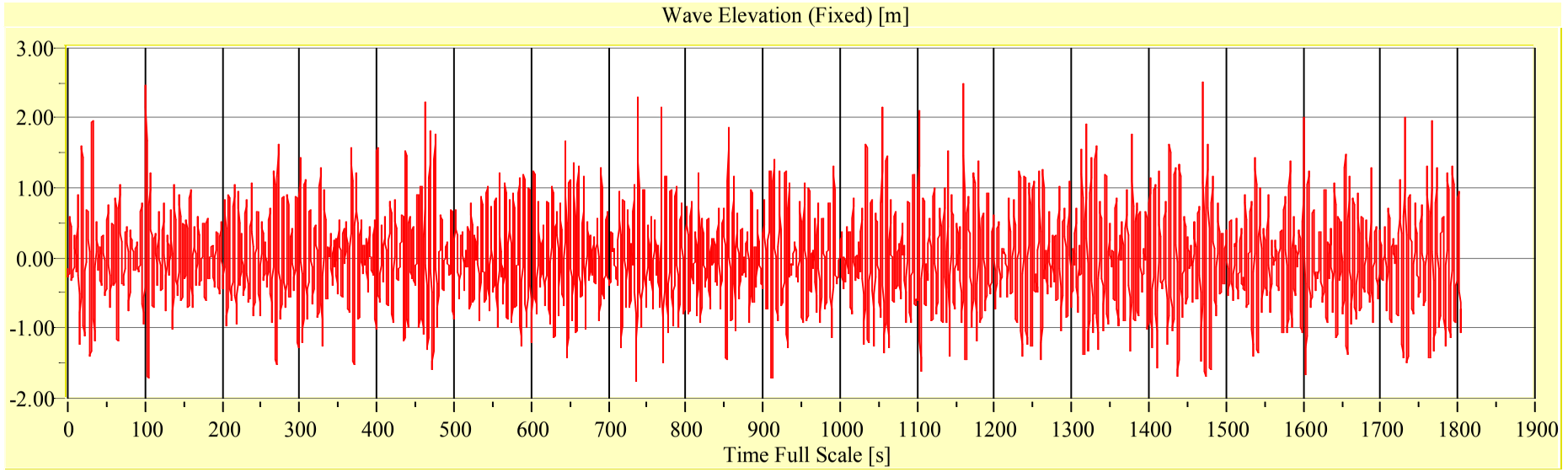



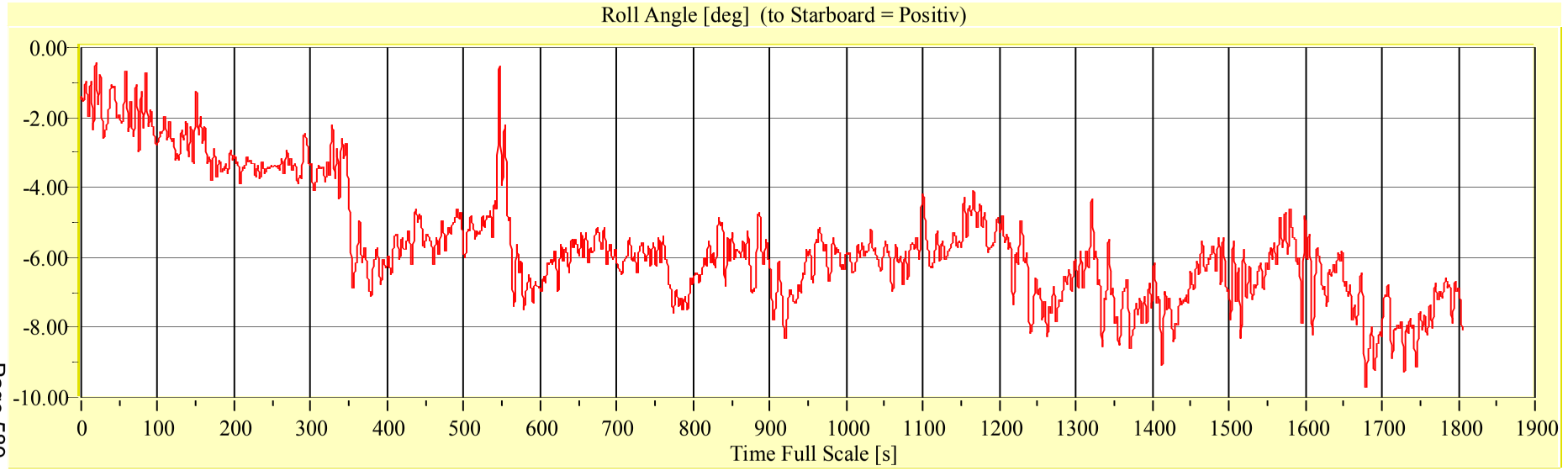



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-04 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



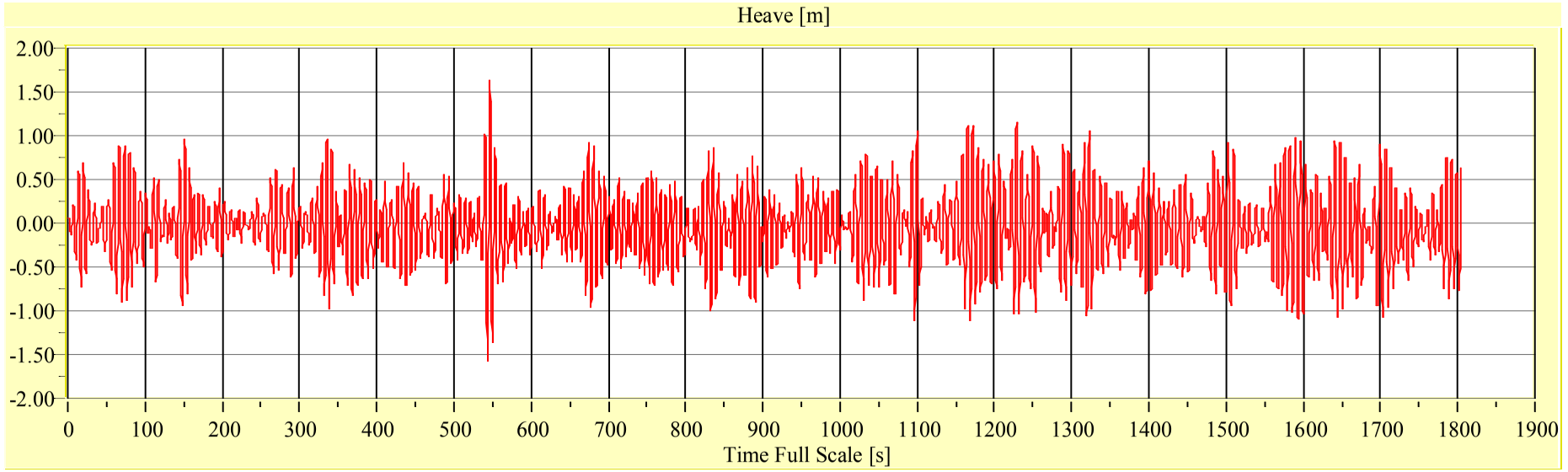



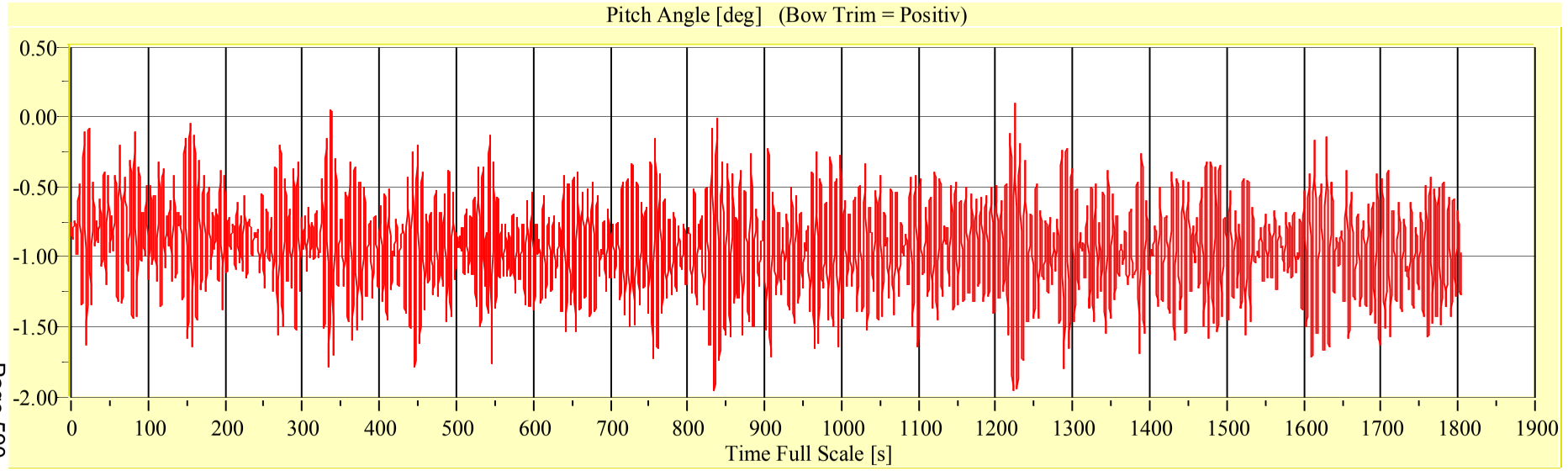



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-04 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



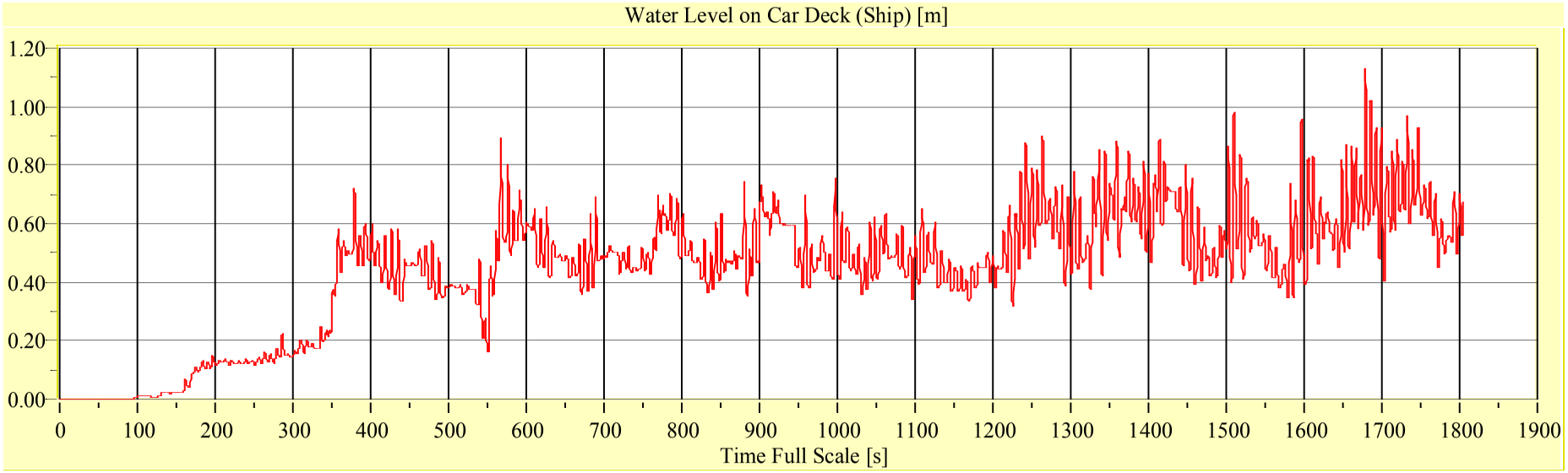



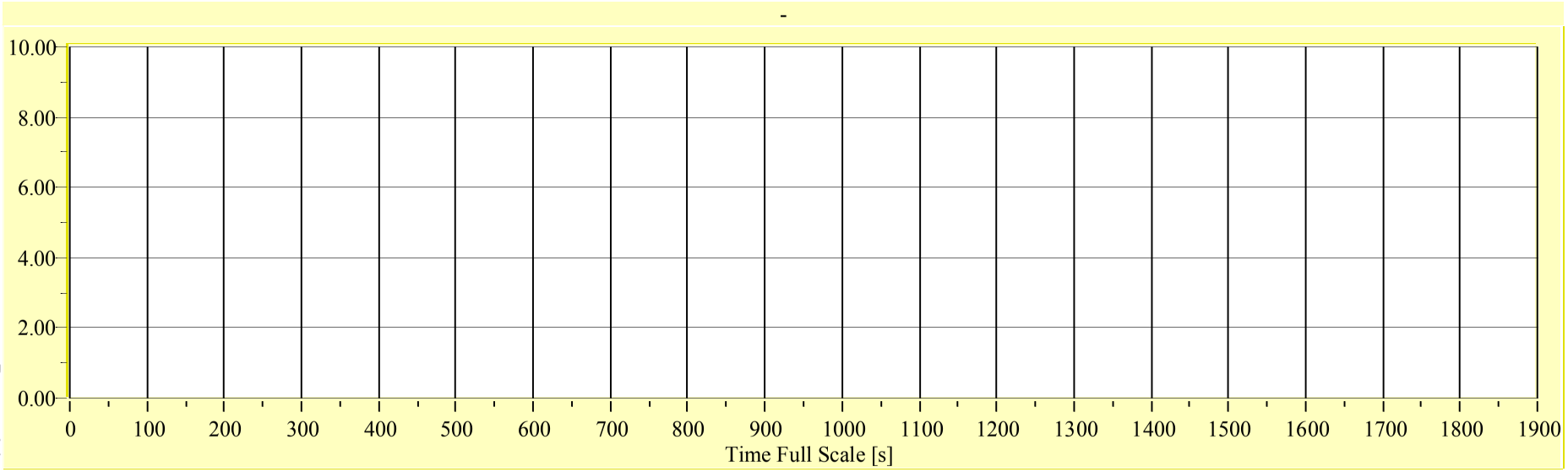



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-04 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



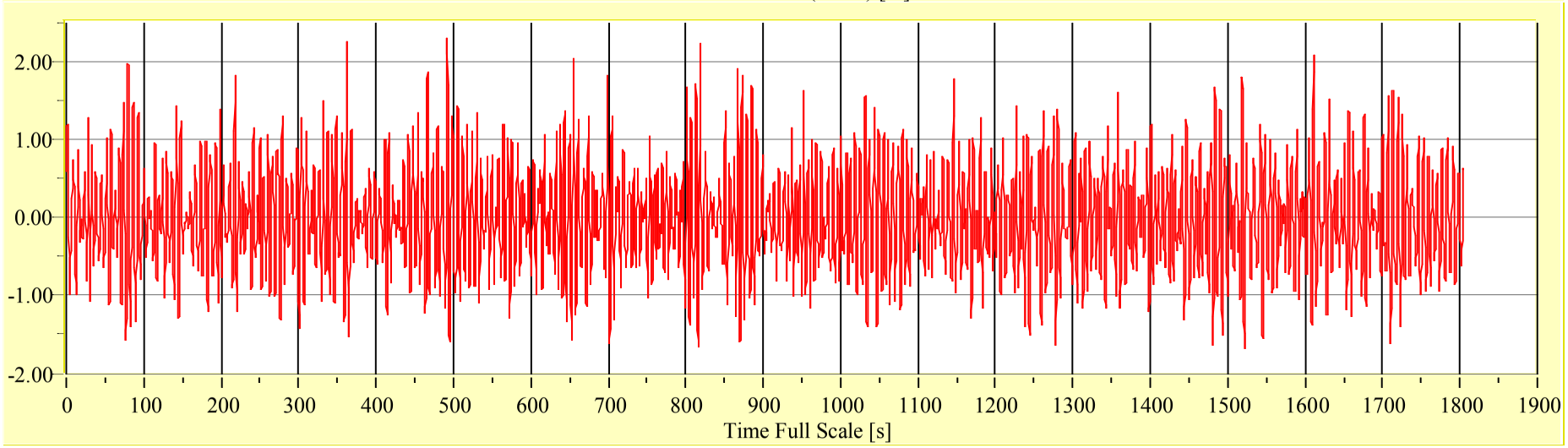



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

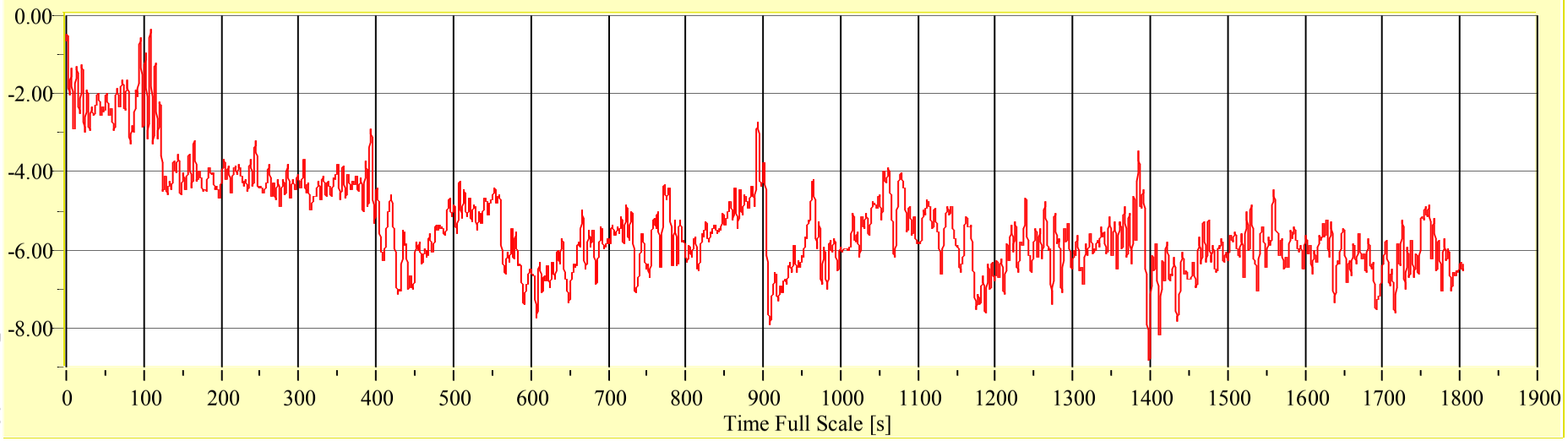
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-05 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to Starboard = Positiv)



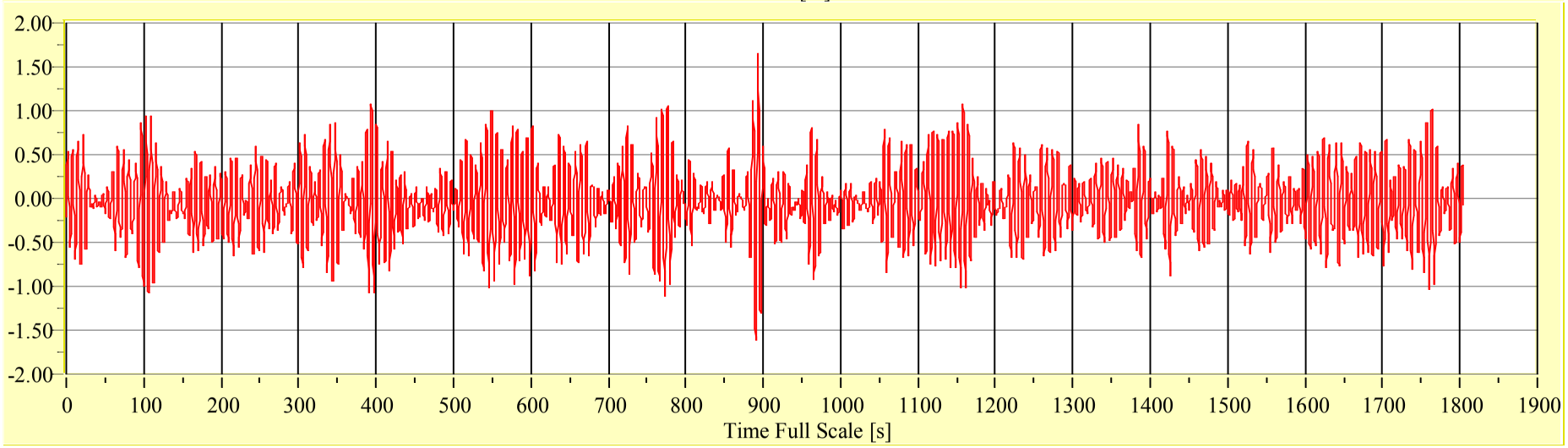



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

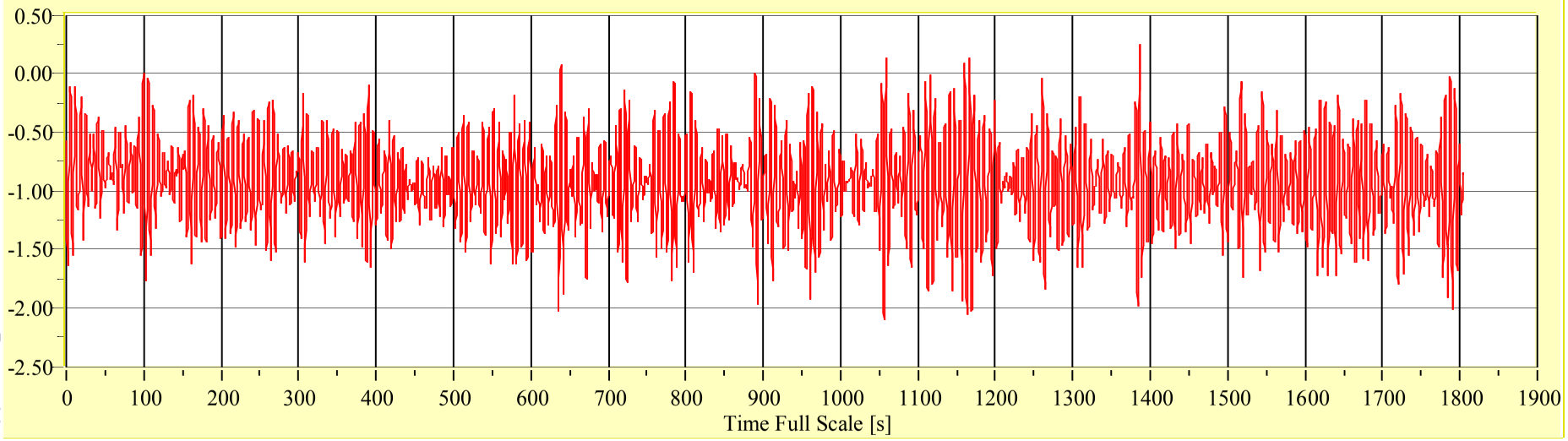
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-05 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

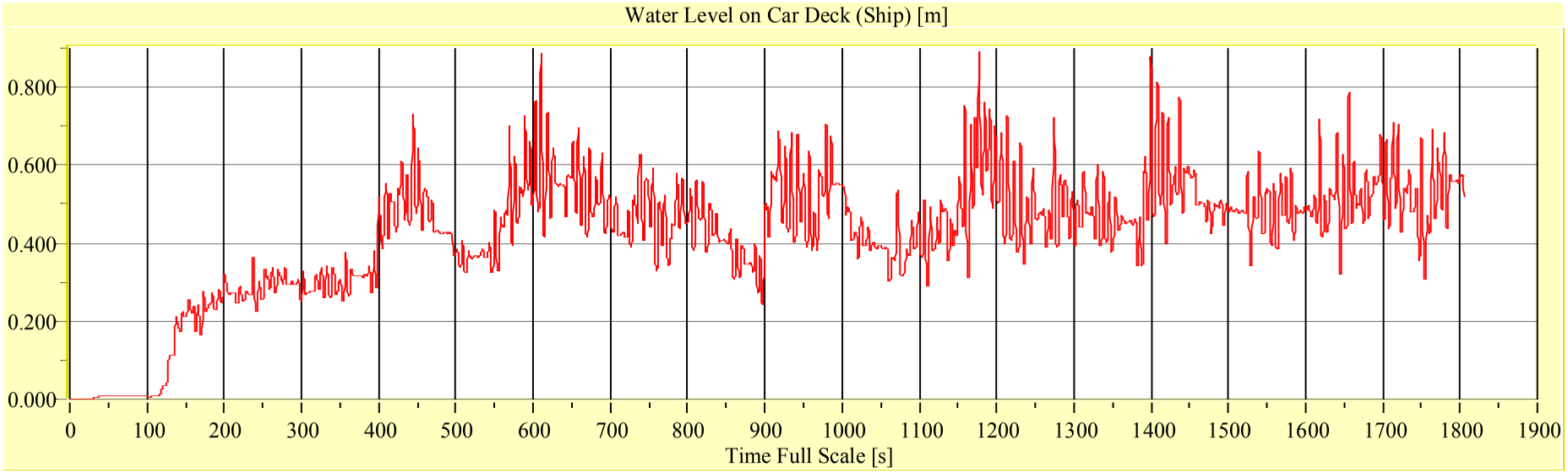


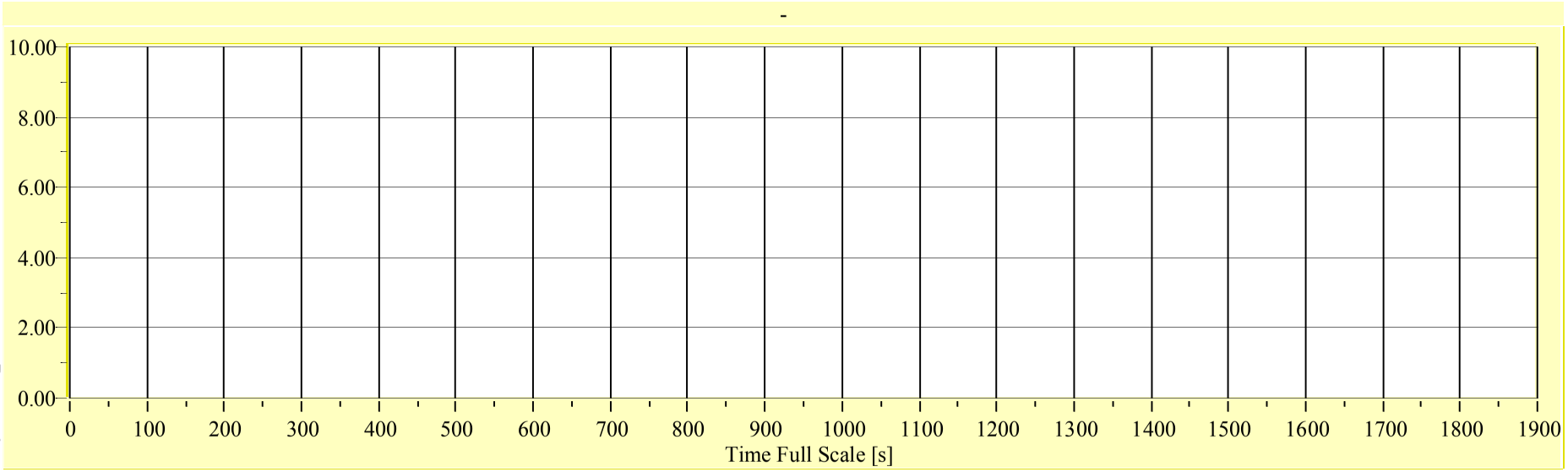



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29675-05 | Target Waves: Hs = 2,50 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



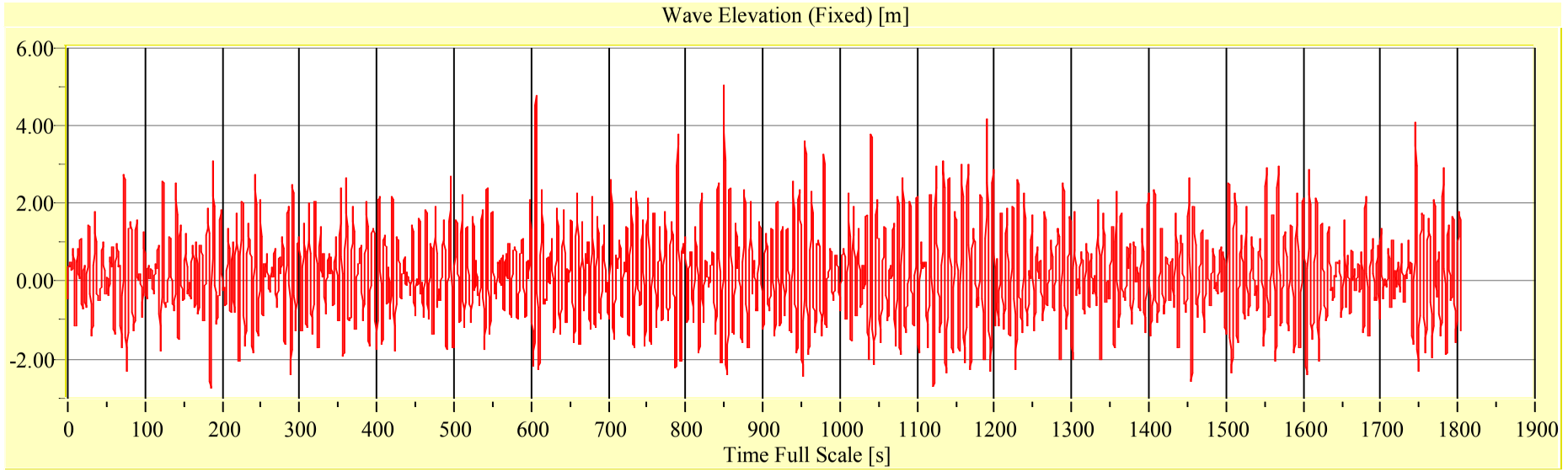



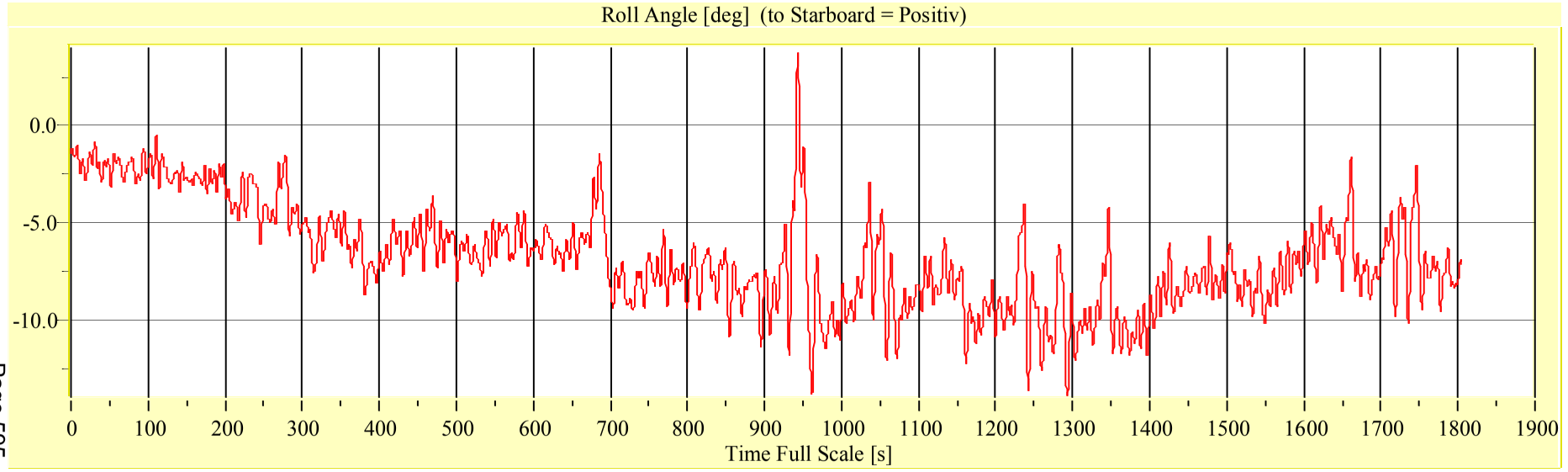



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-01 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|



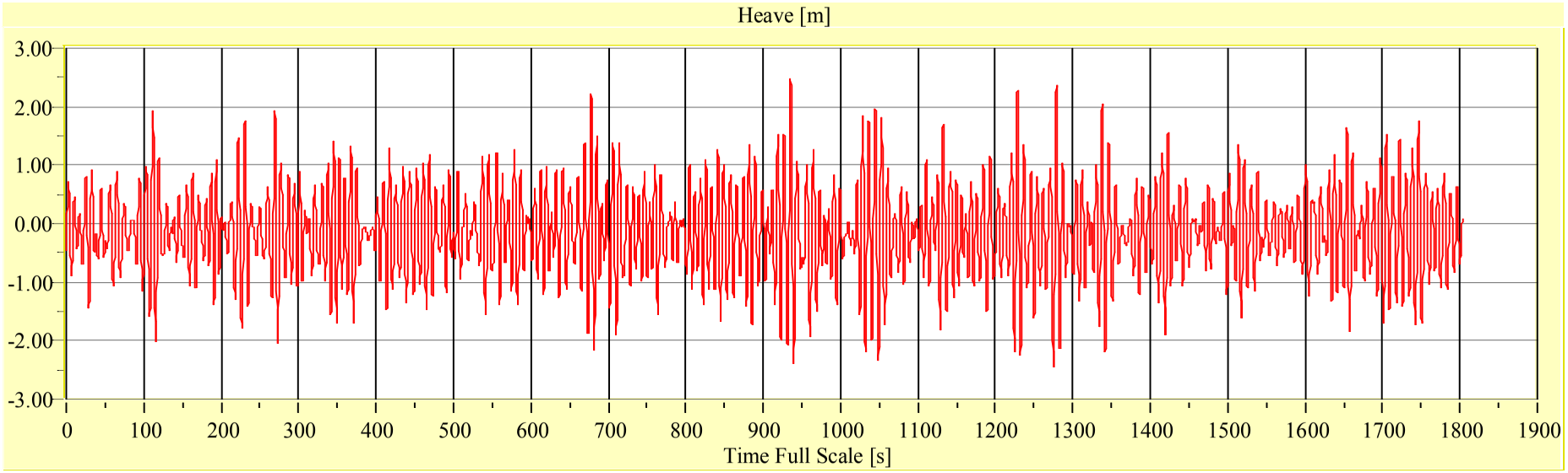



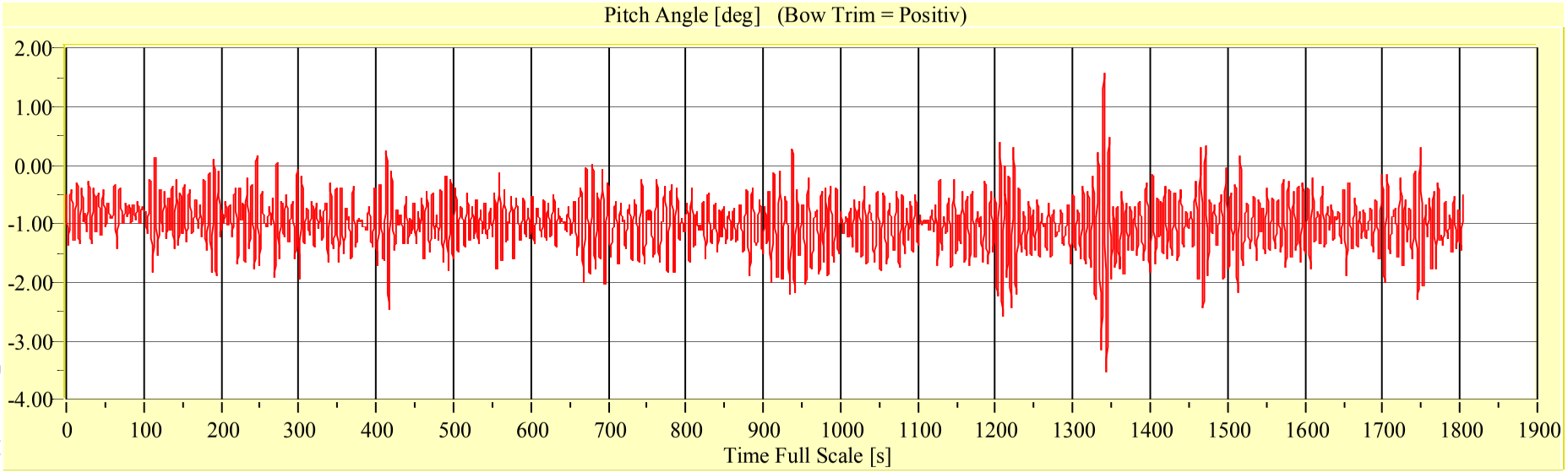



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-01 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|



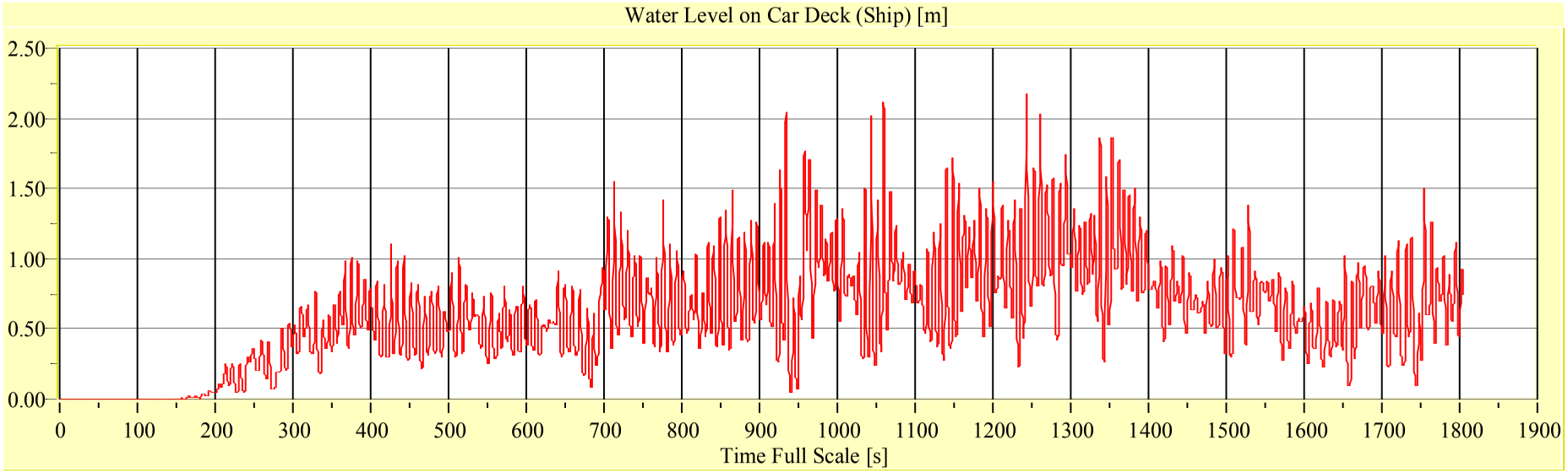



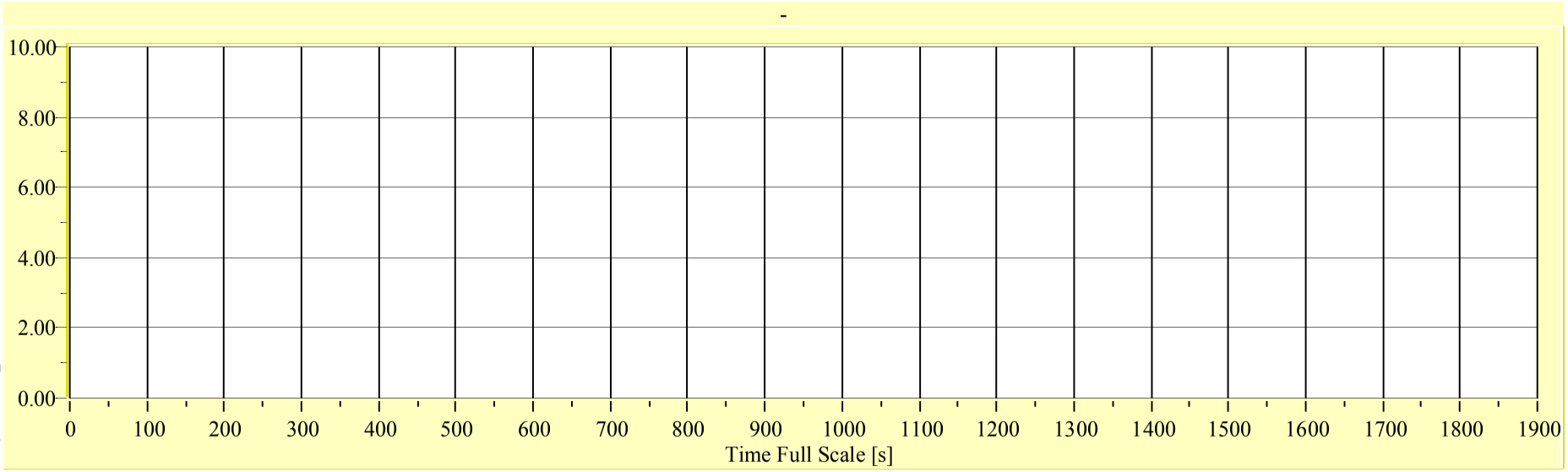



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-01 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|



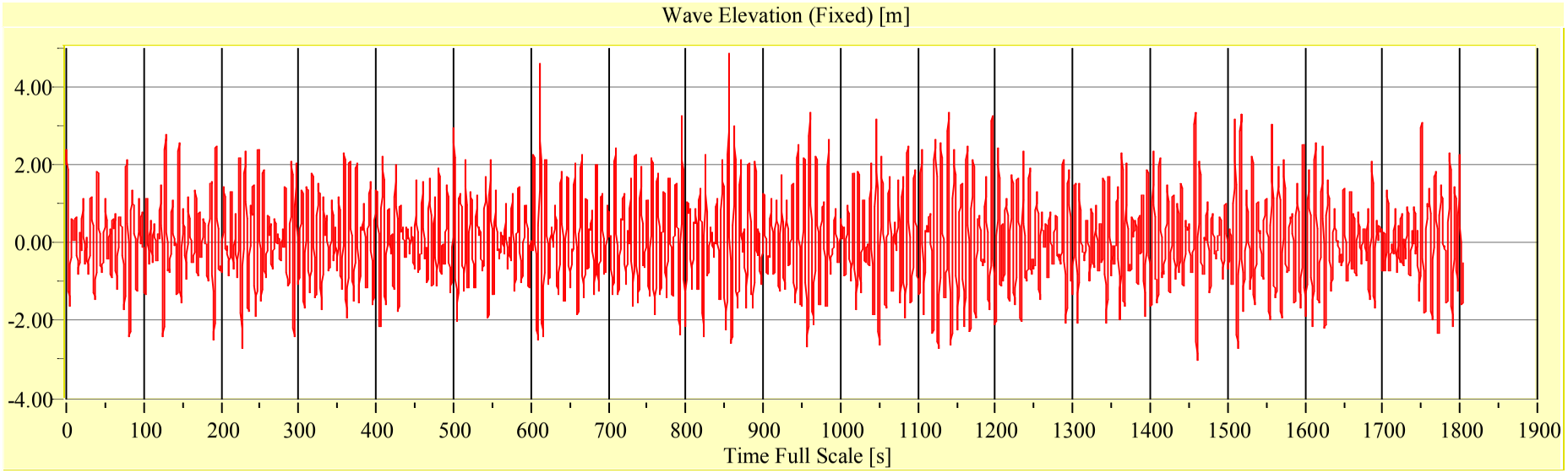



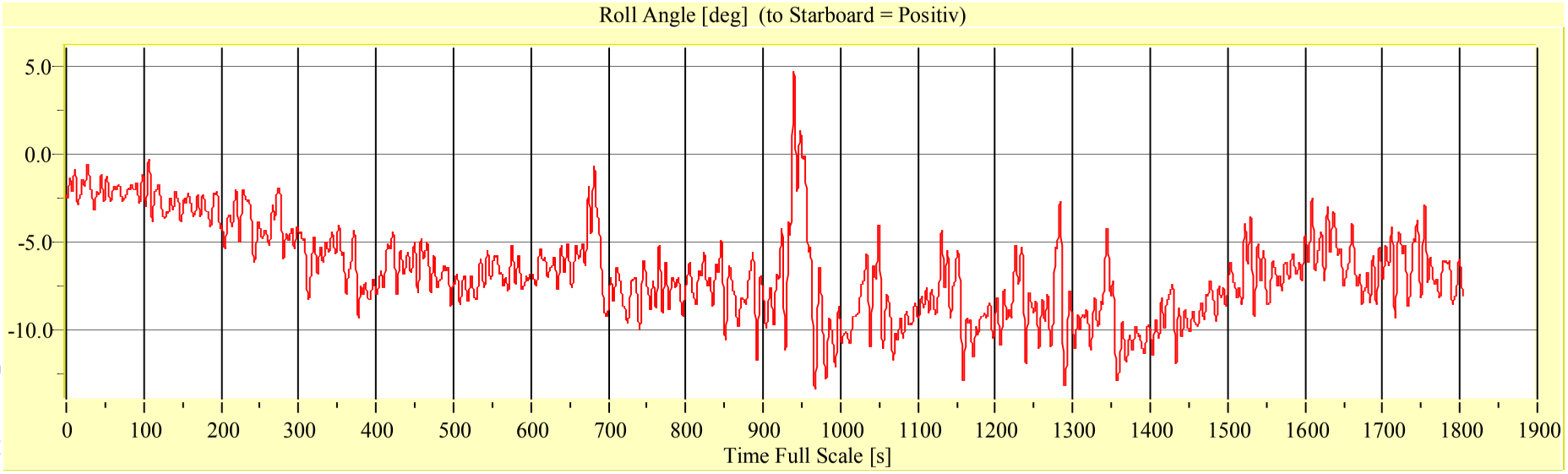



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-02 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|



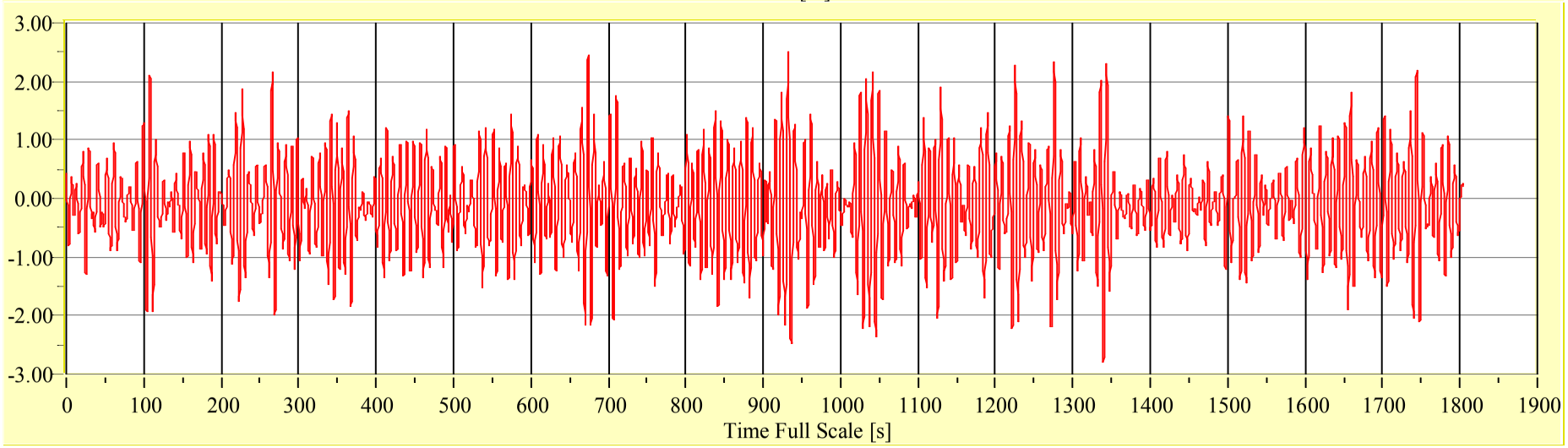



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

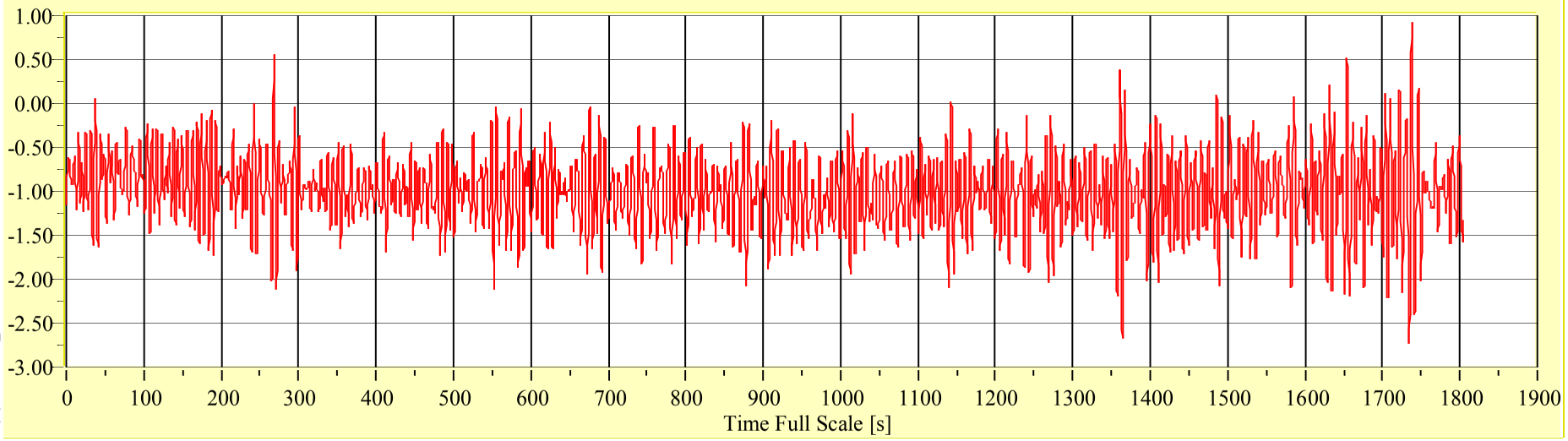
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-02 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

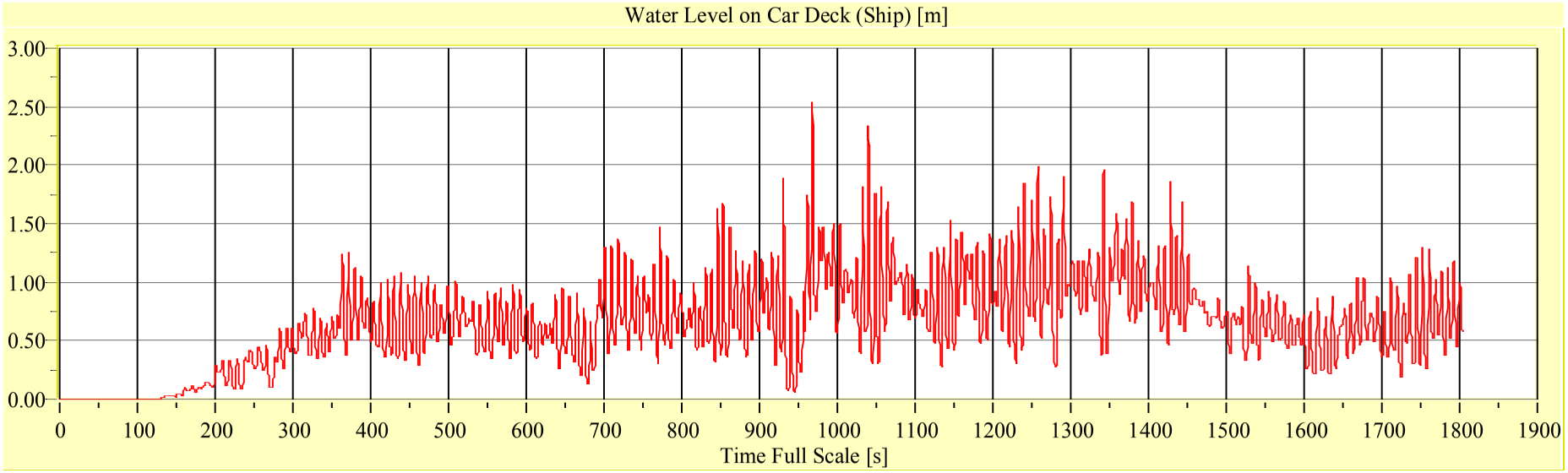


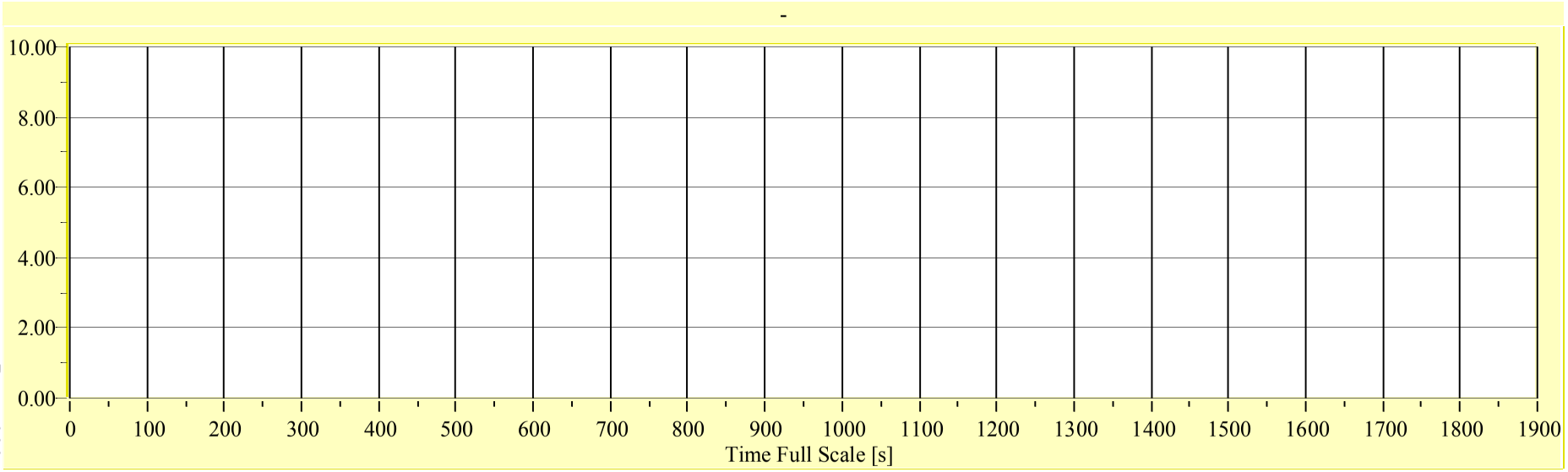



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-02 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|



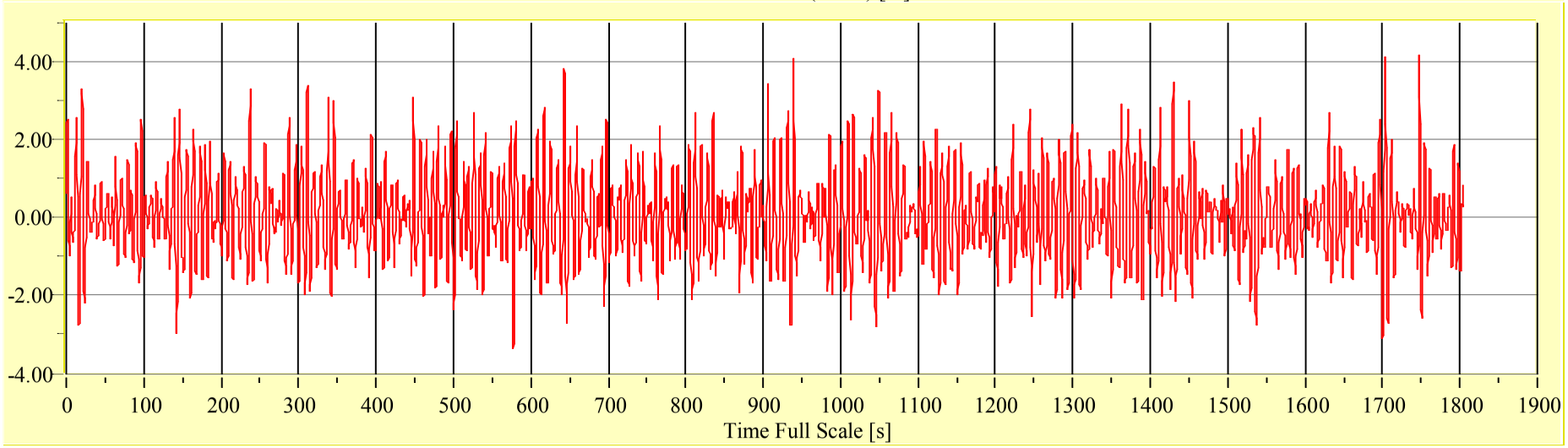



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

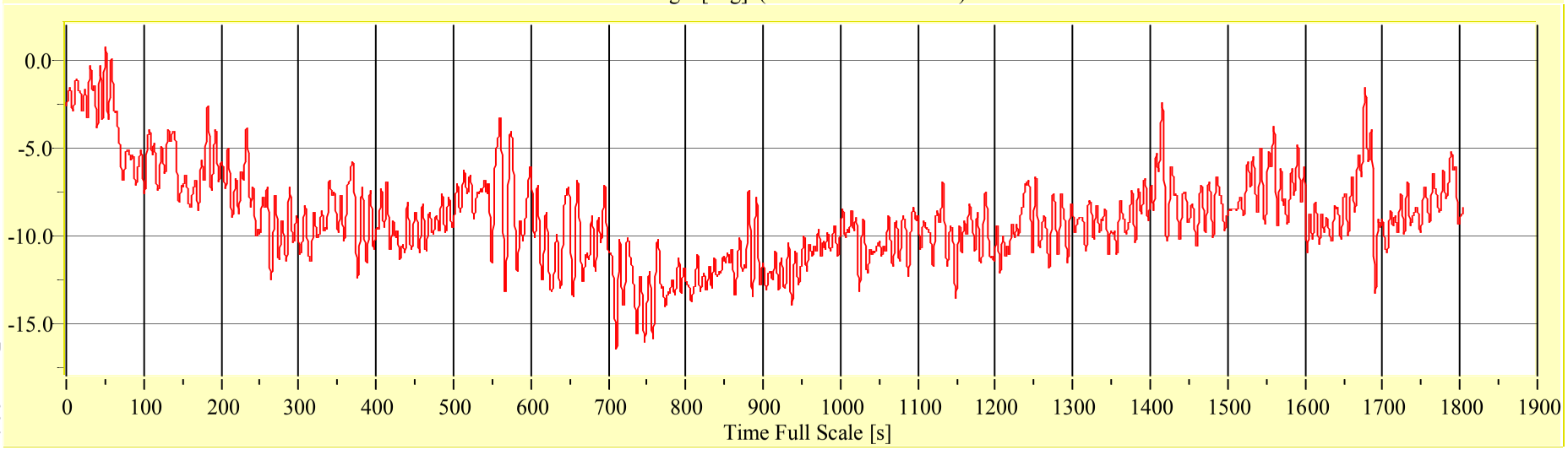
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-03 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to Starboard = Positiv)

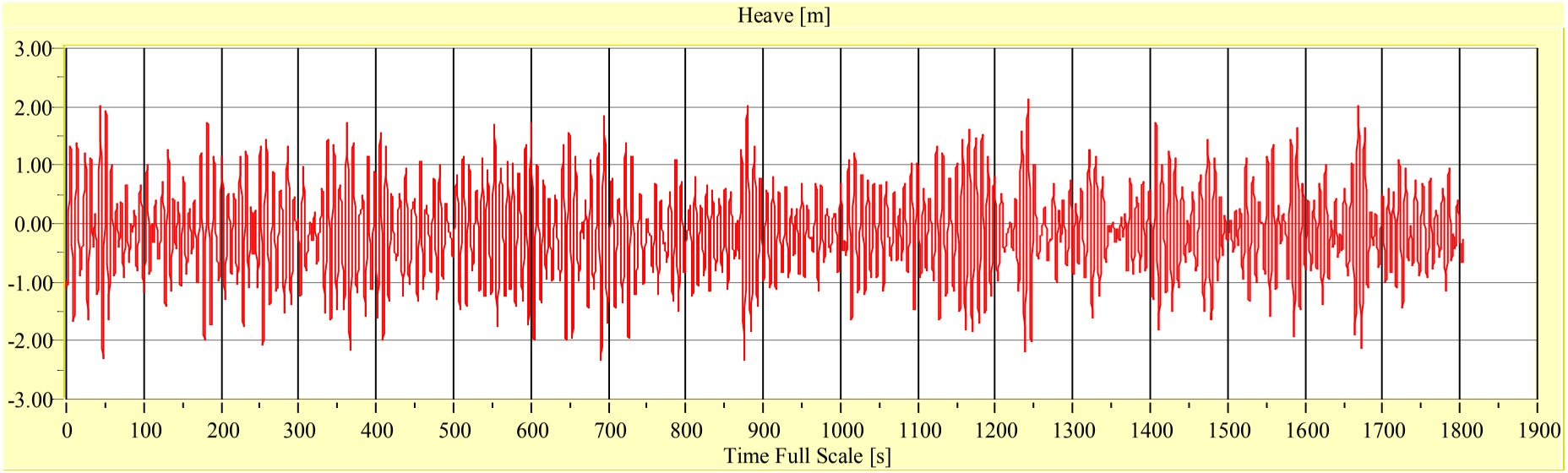


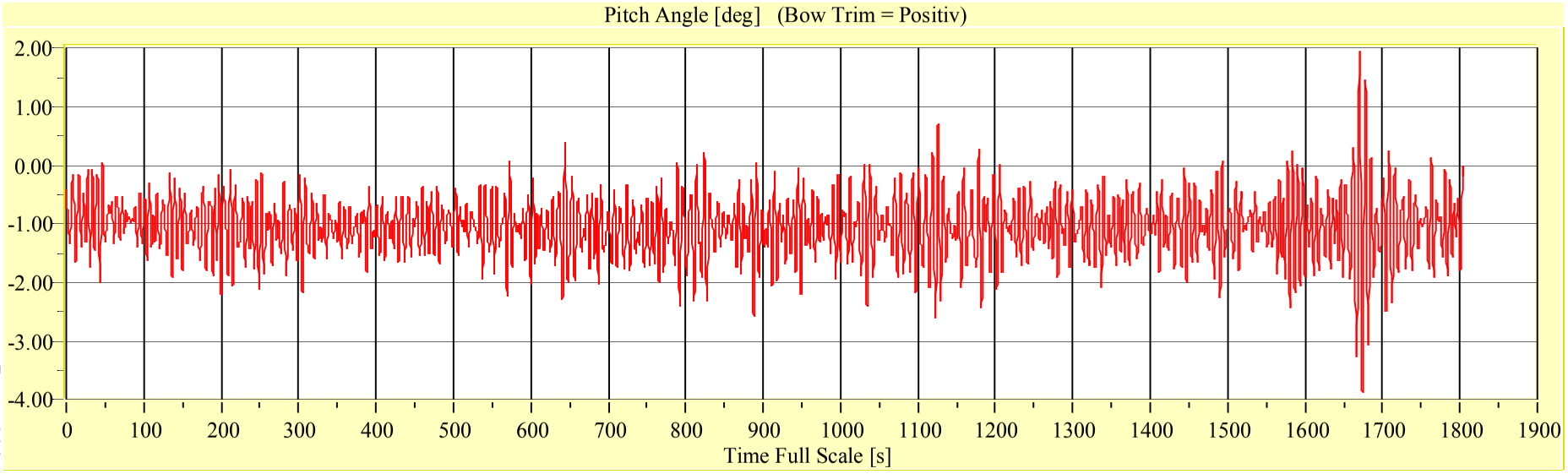



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-03 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|



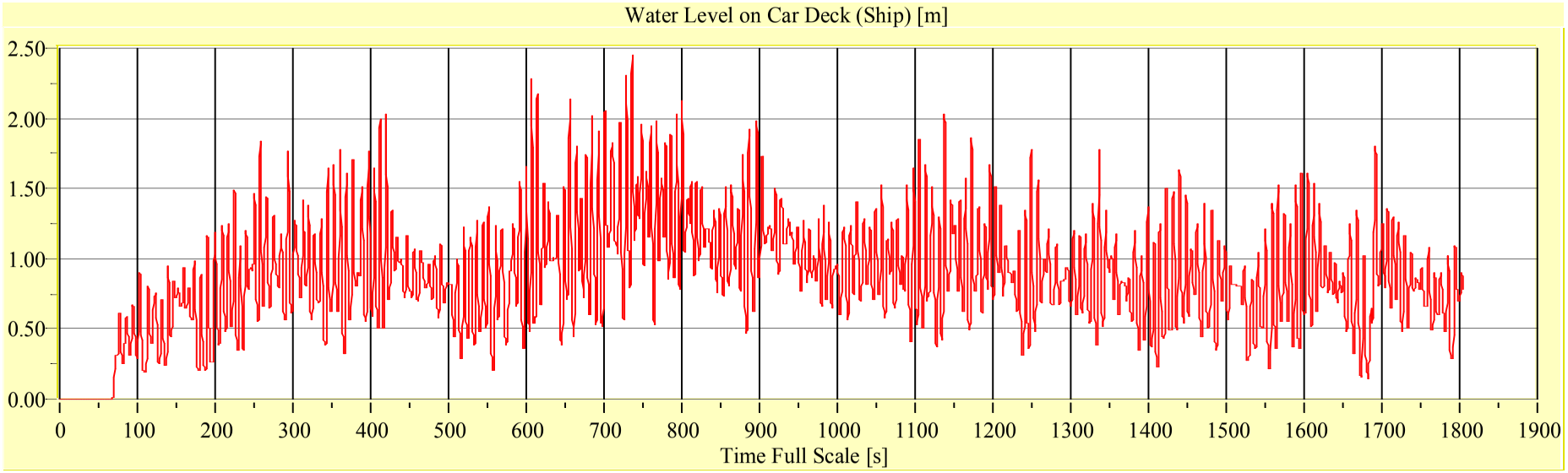



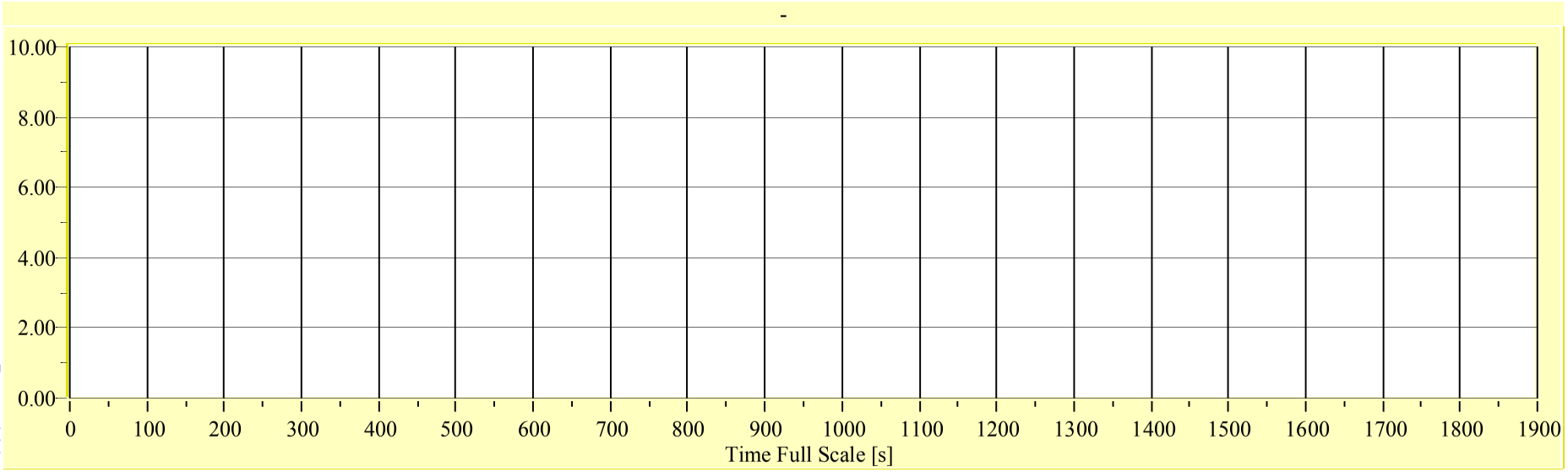



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-03 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|



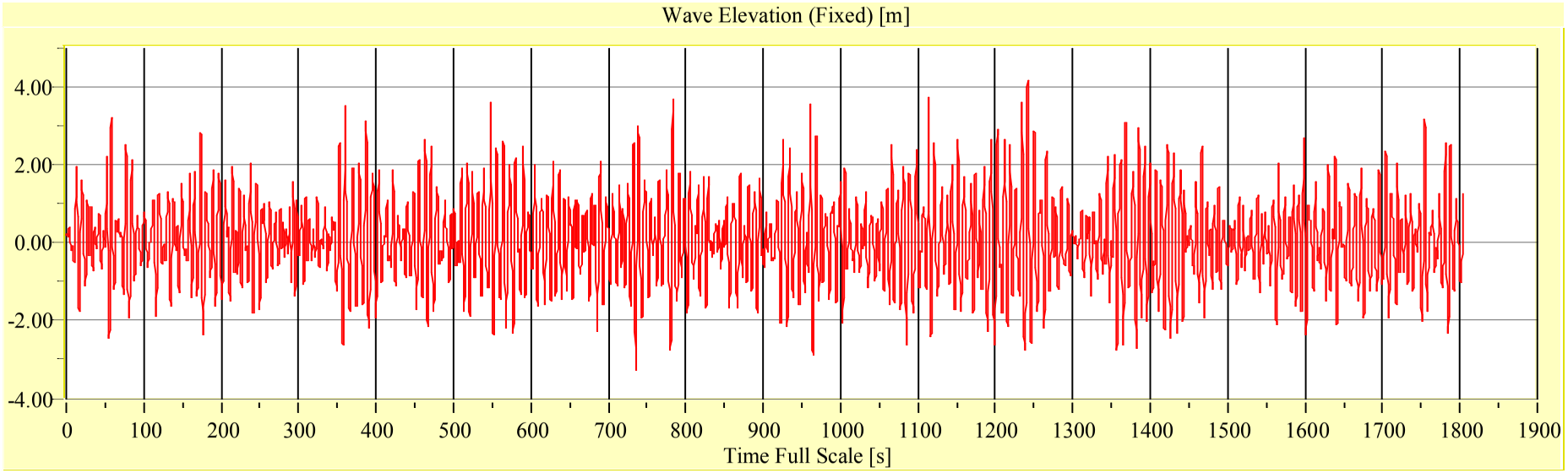



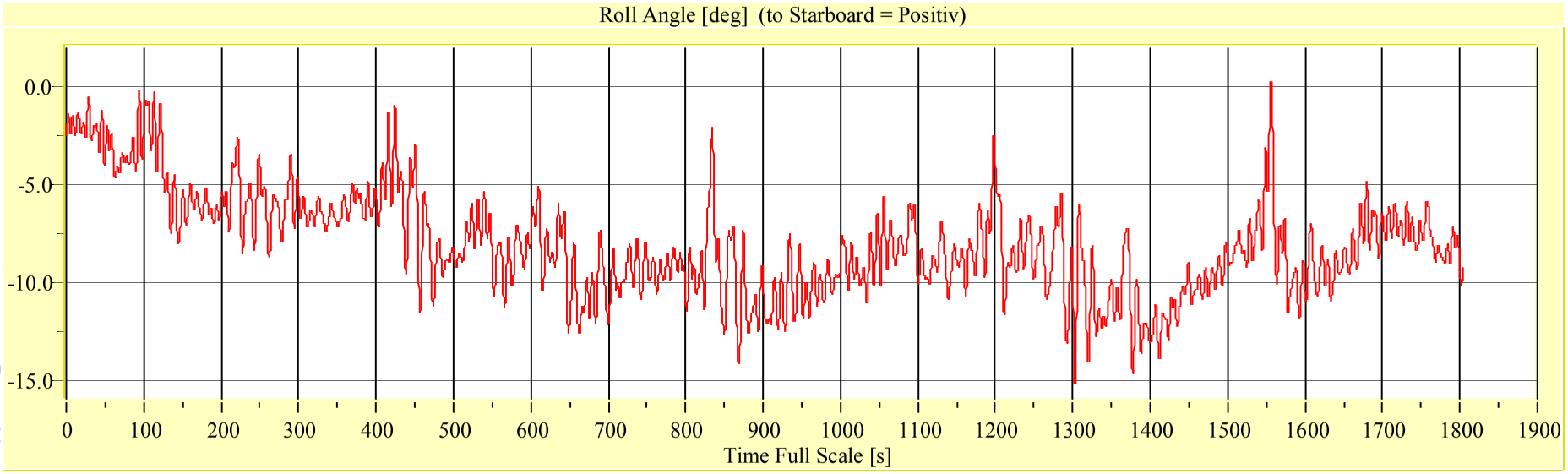



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-04 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|



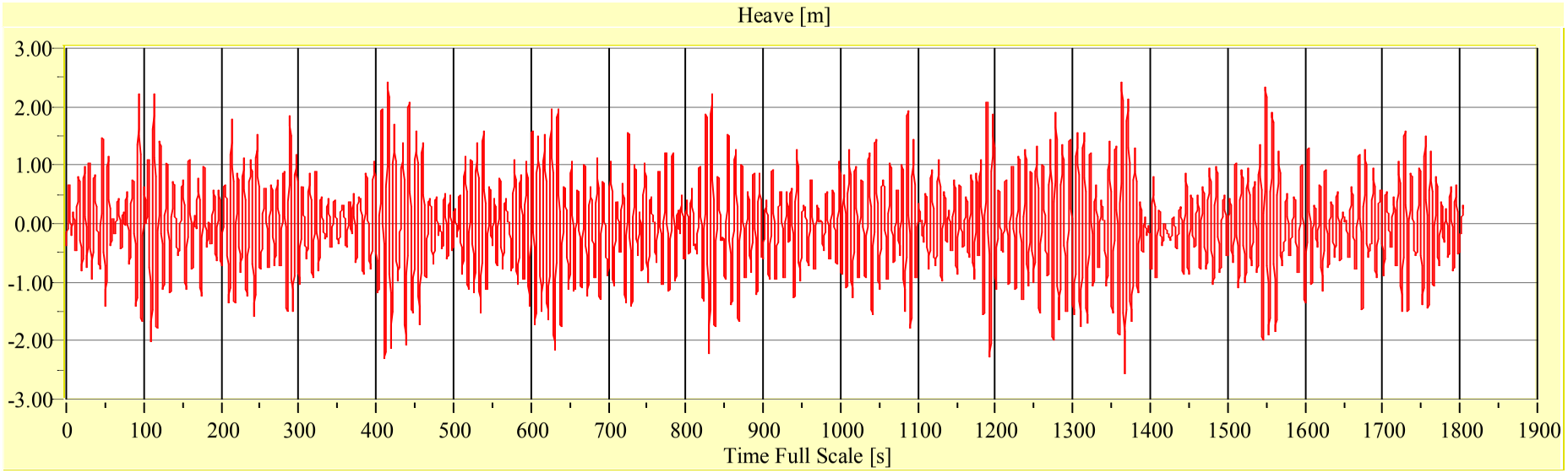



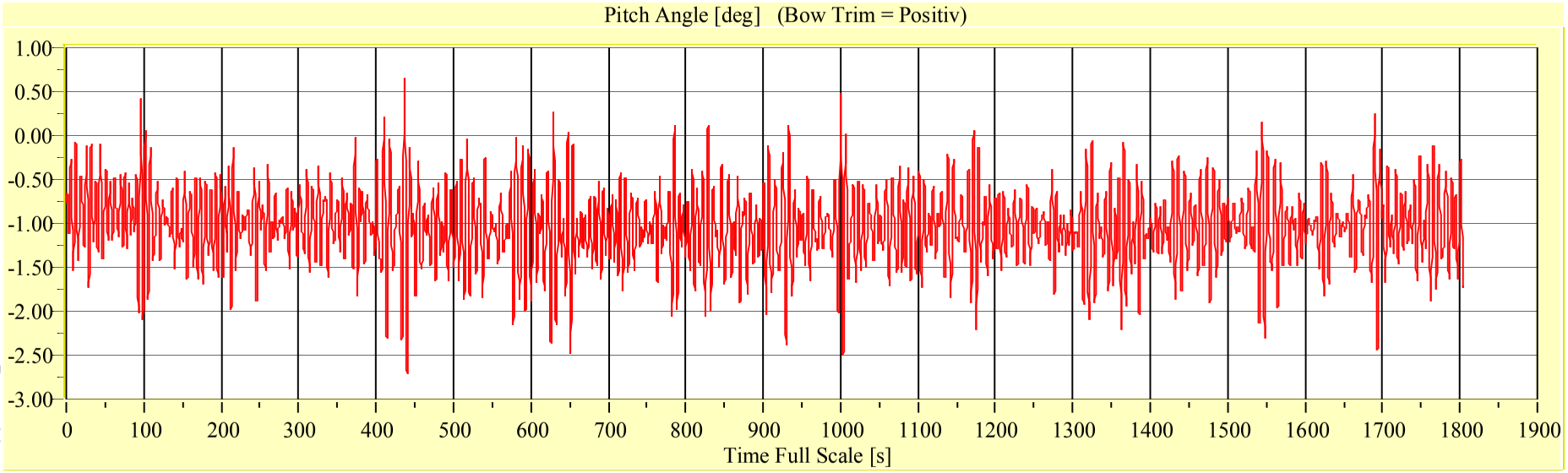



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-04 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|



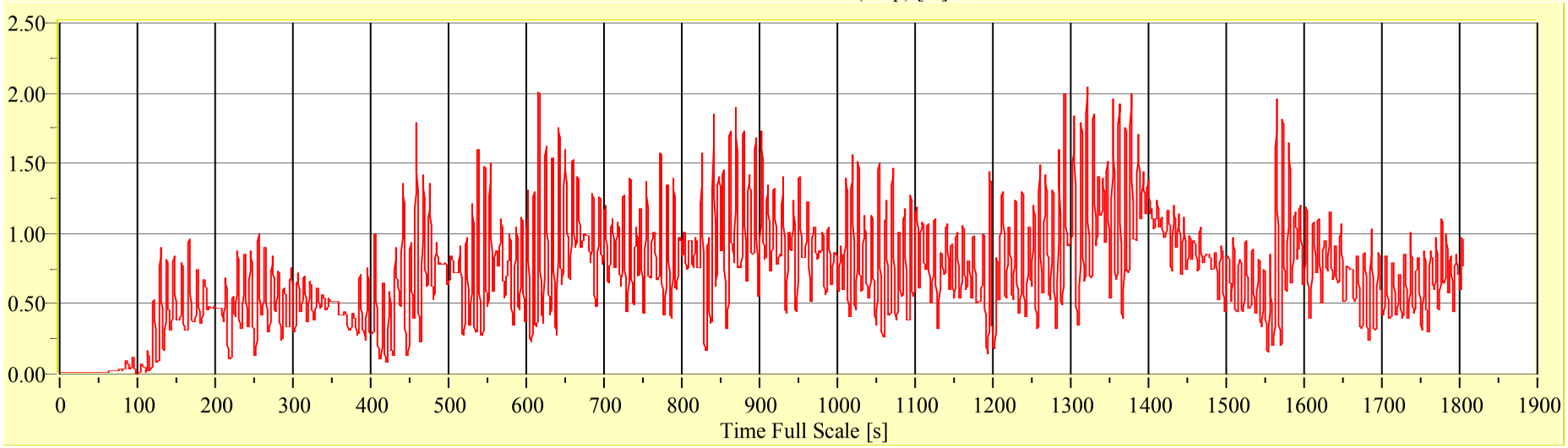



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

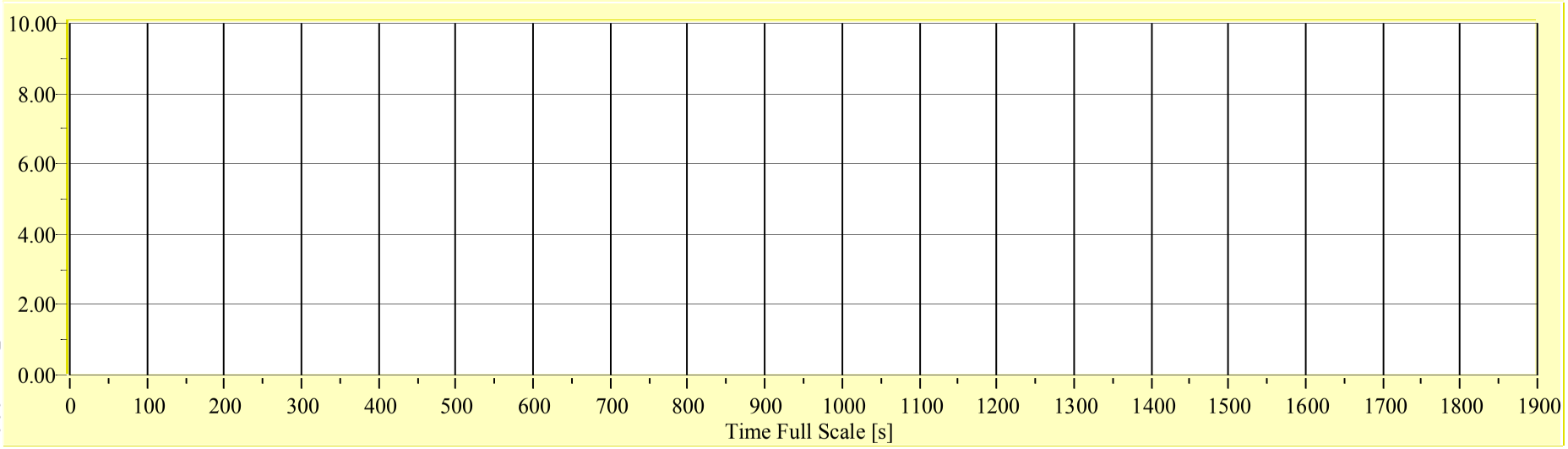
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-04 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|

Water Level on Car Deck (Ship) [m]




-



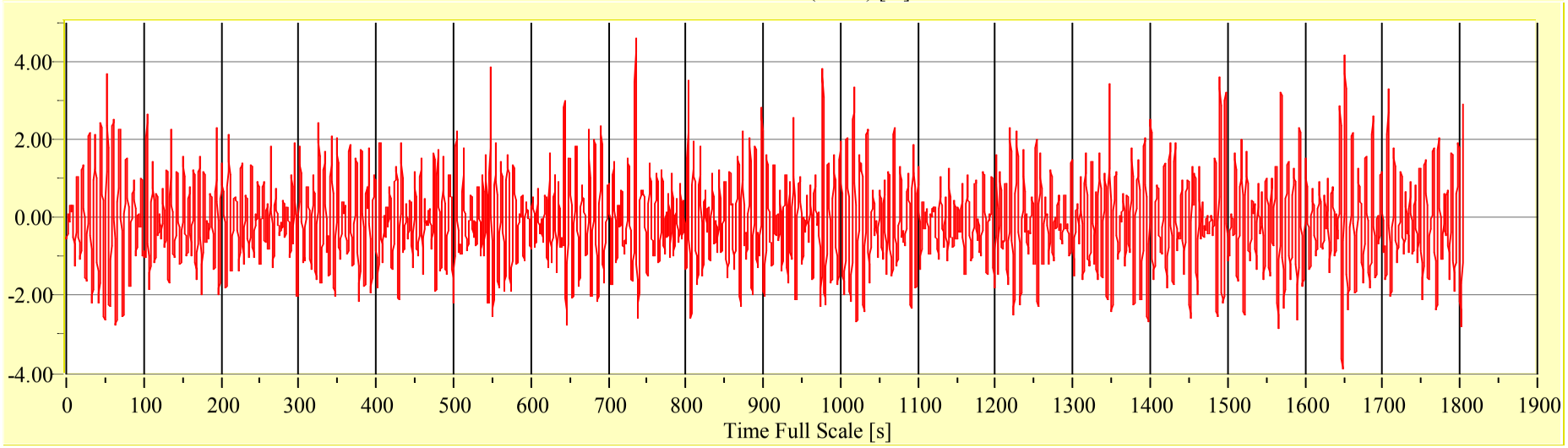



| Date: 06.05.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

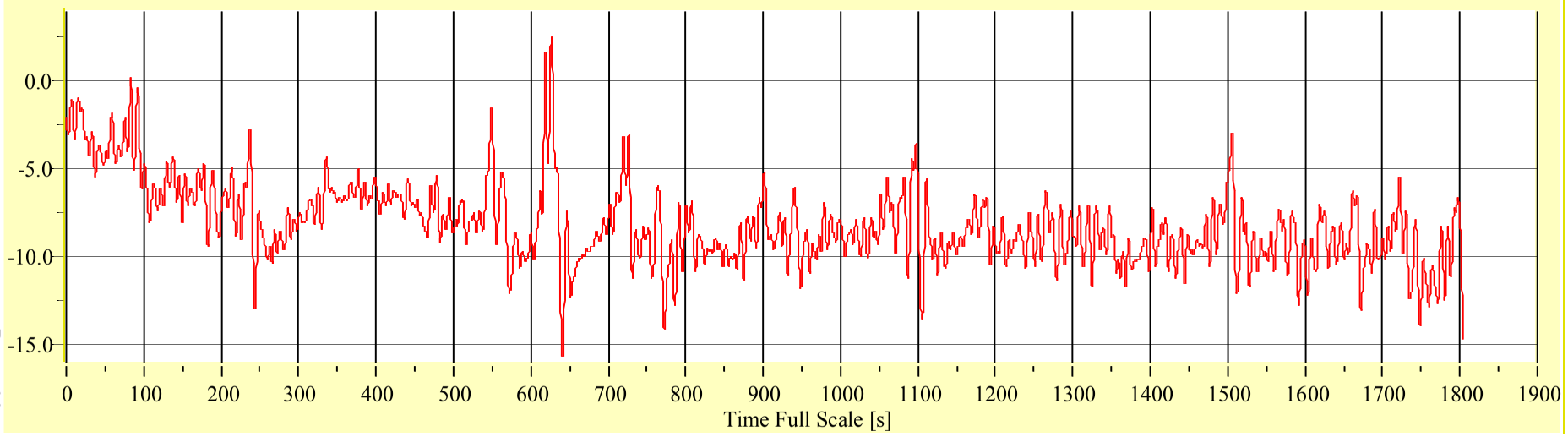
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-05 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to Starboard = Positiv)



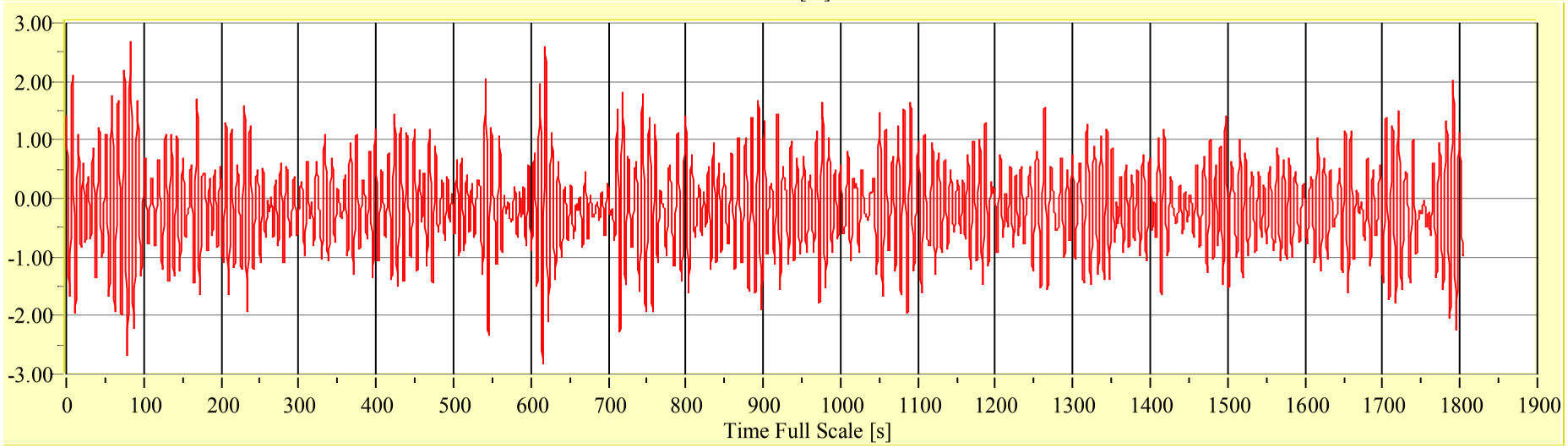



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

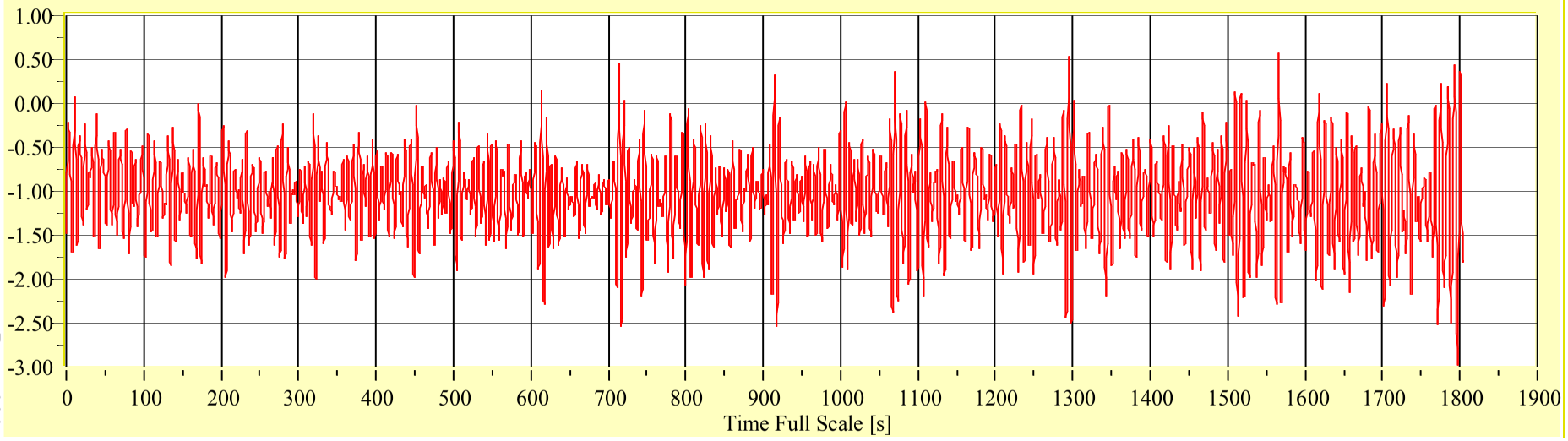
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-05 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

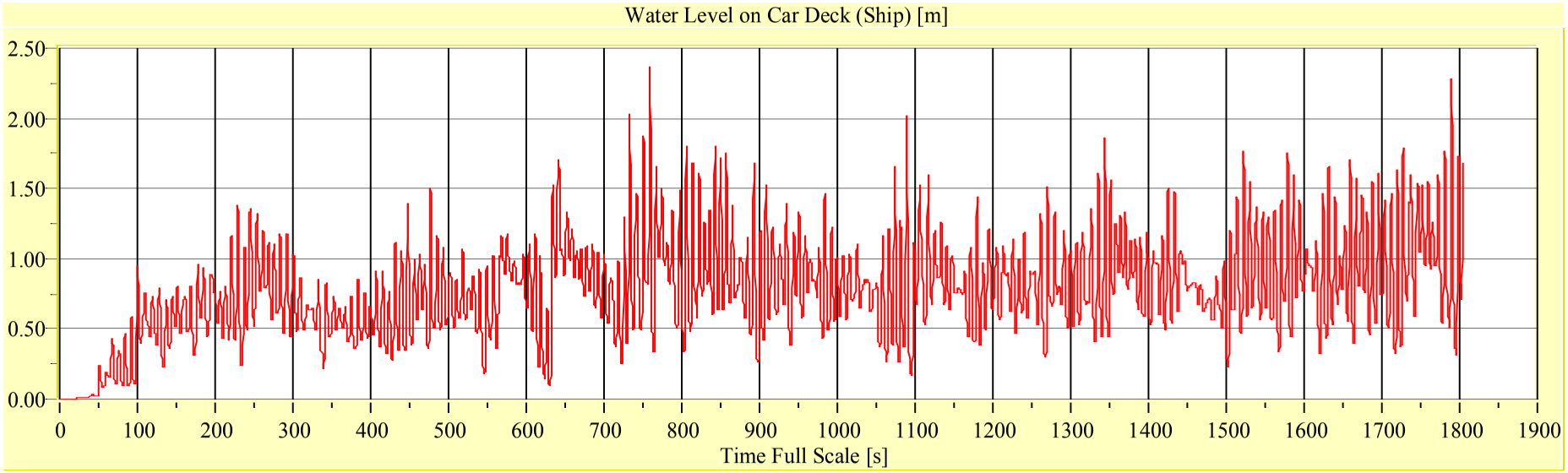


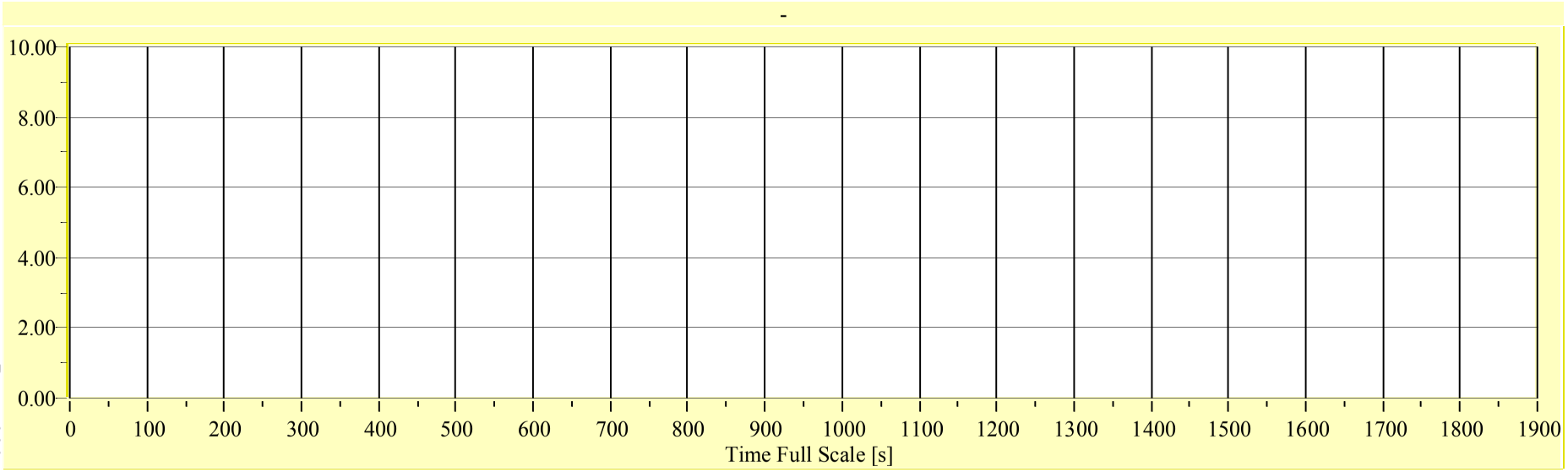



| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446 | Test No. 29676-05 | Target Waves: Hs = 4,25 m Tp = 8,246 s | gamma = 3,3 |
|---|---|---|---|---|






| Date: 30.04.2010 | Project: EMSA 1 | Damage 2: R7_P6-7.4.0 |
|---|---|---|

# APPENDIX D2

# STATISTICS OF WAVES AND ROLL MOTIONS

## Model No. 2446A

## Project: “EMSA 1”

**Damage Case R7M2_P5-7.4.0-1**

**Roll Test in Air Measurements**

**Pitch Test in Air Measurements**

**Roll Test in Water Measurements (Intact Condition)**

# Roll in Air Measurements

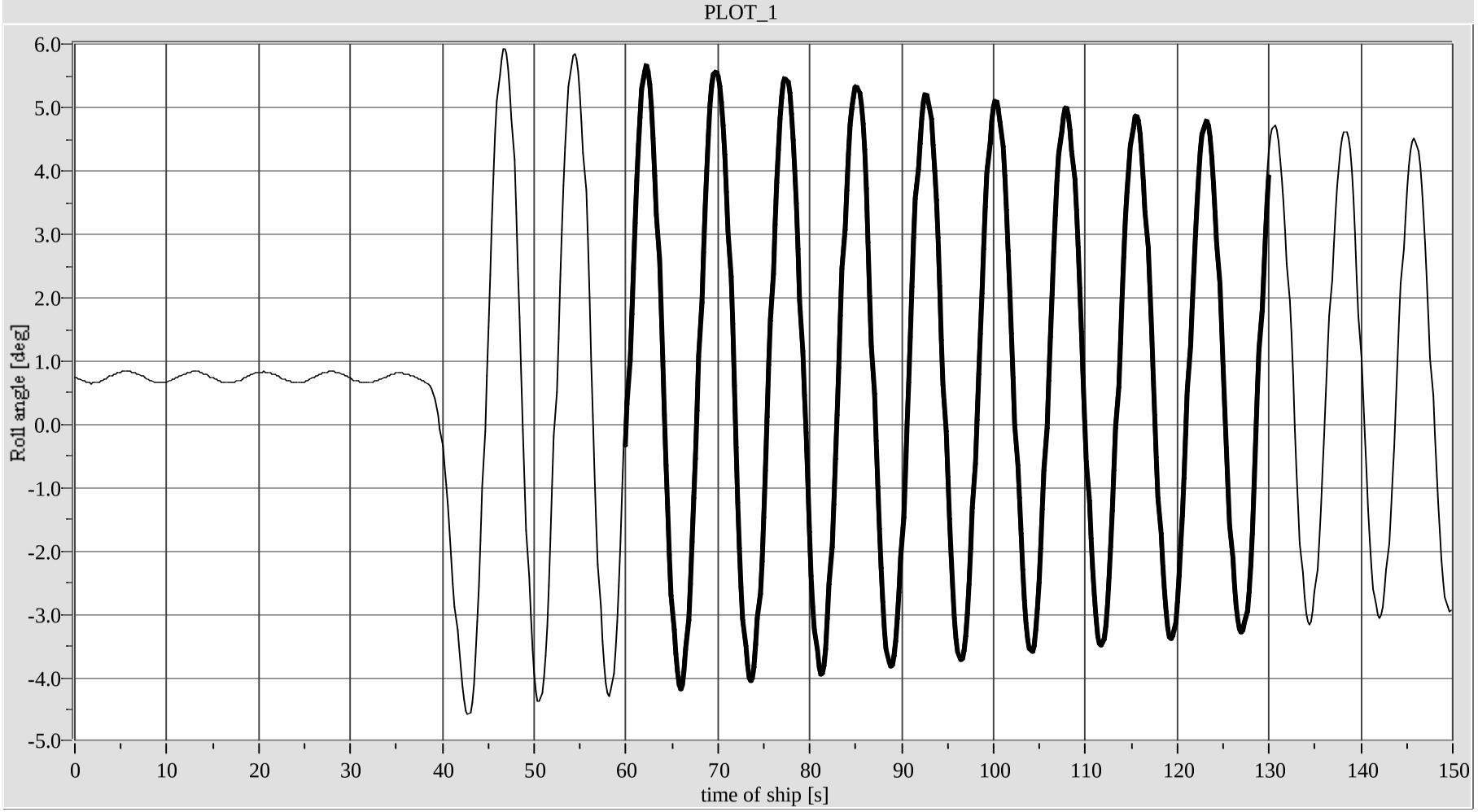
# Model No. 2446A

# Project: “EMSA 1”

**Damage Case R7M2_P5-7.4.0-1**

| Vienna Model Basin Ltd. | Roll Test in Air |
|---|---|

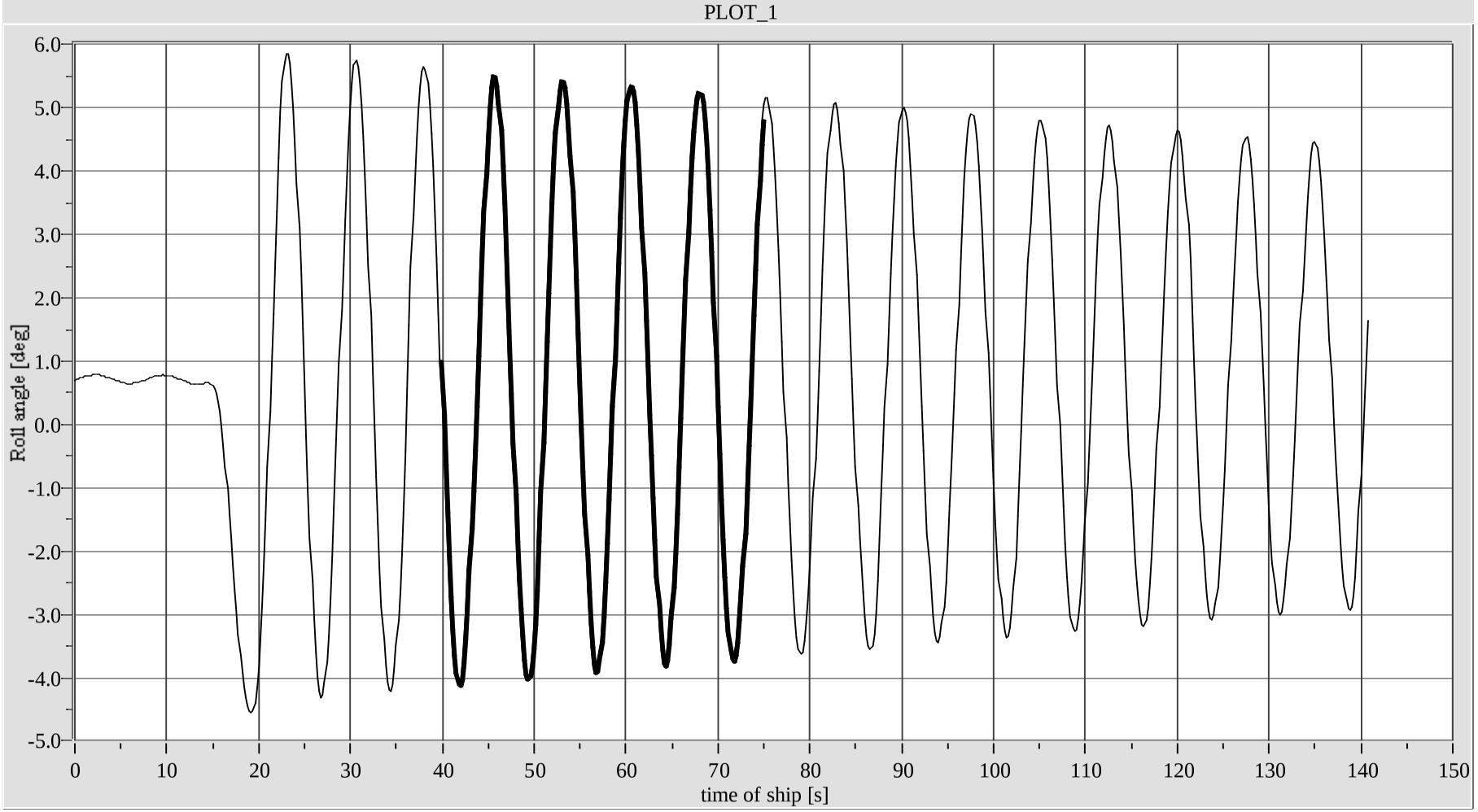
| Model No. 2446A | Test No. 29967-02 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 1.5250 s / 7.6250 s | Project: EMSA 1 | Damage: R7M2_P5-7.4.0-1 |
|---|---|---|

| Vienna Model Basin Ltd. | Roll Test in Air |
|---|---|

| Model No. 2446A | Test No. 29968-03 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 1.4933 s / 7.4667 s | Project: EMSA 1 | Damage: R7M2_P5-7.4.0-1 |
|---|---|---|

# Pitch in Air Measurements

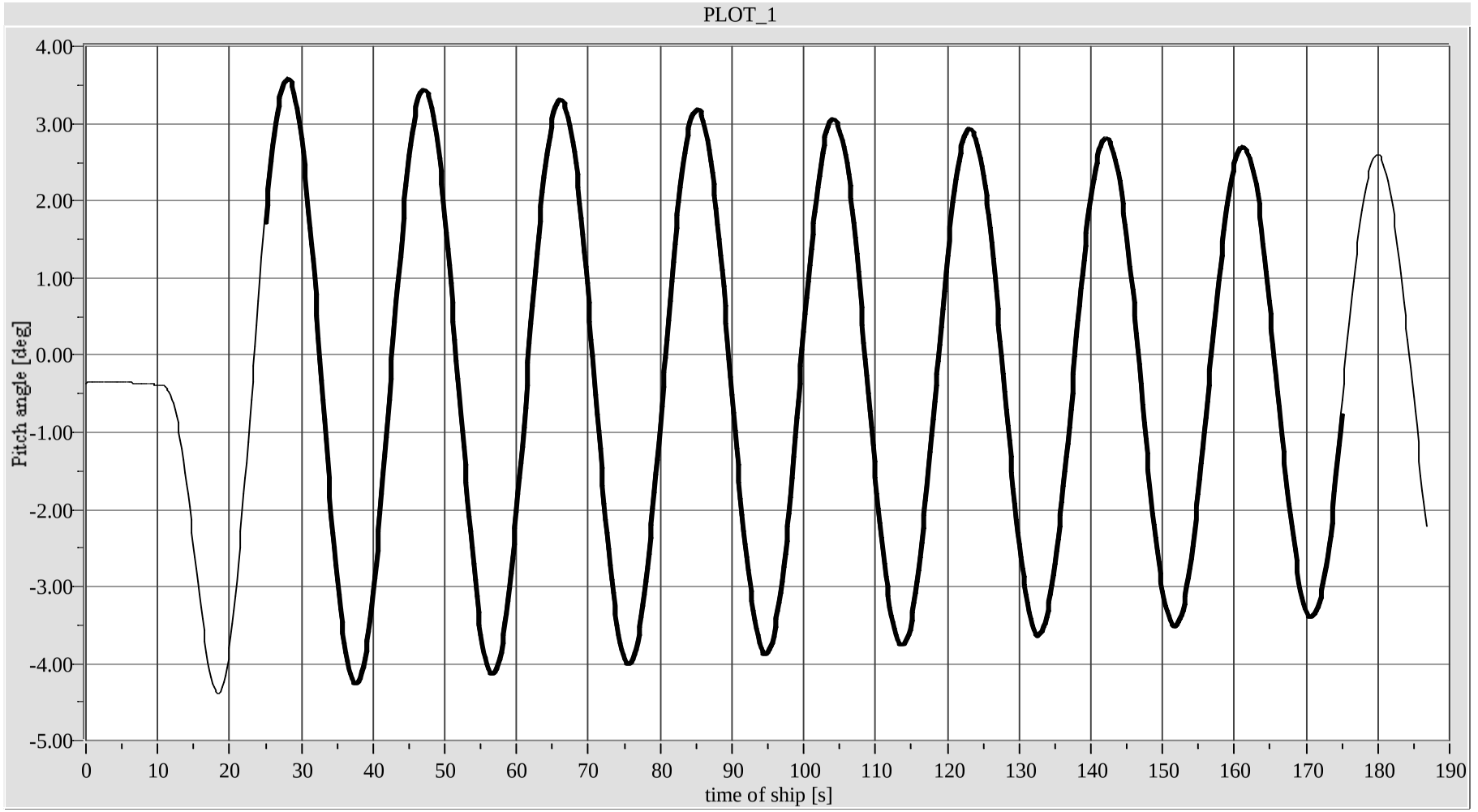
# Model No. 2446A

# Project: “EMSA 1”

**Damage Case R7M2_P5-7.4.0-1**

| Vienna Model Basin Ltd. | Pitch Test in Air |
|---|---|

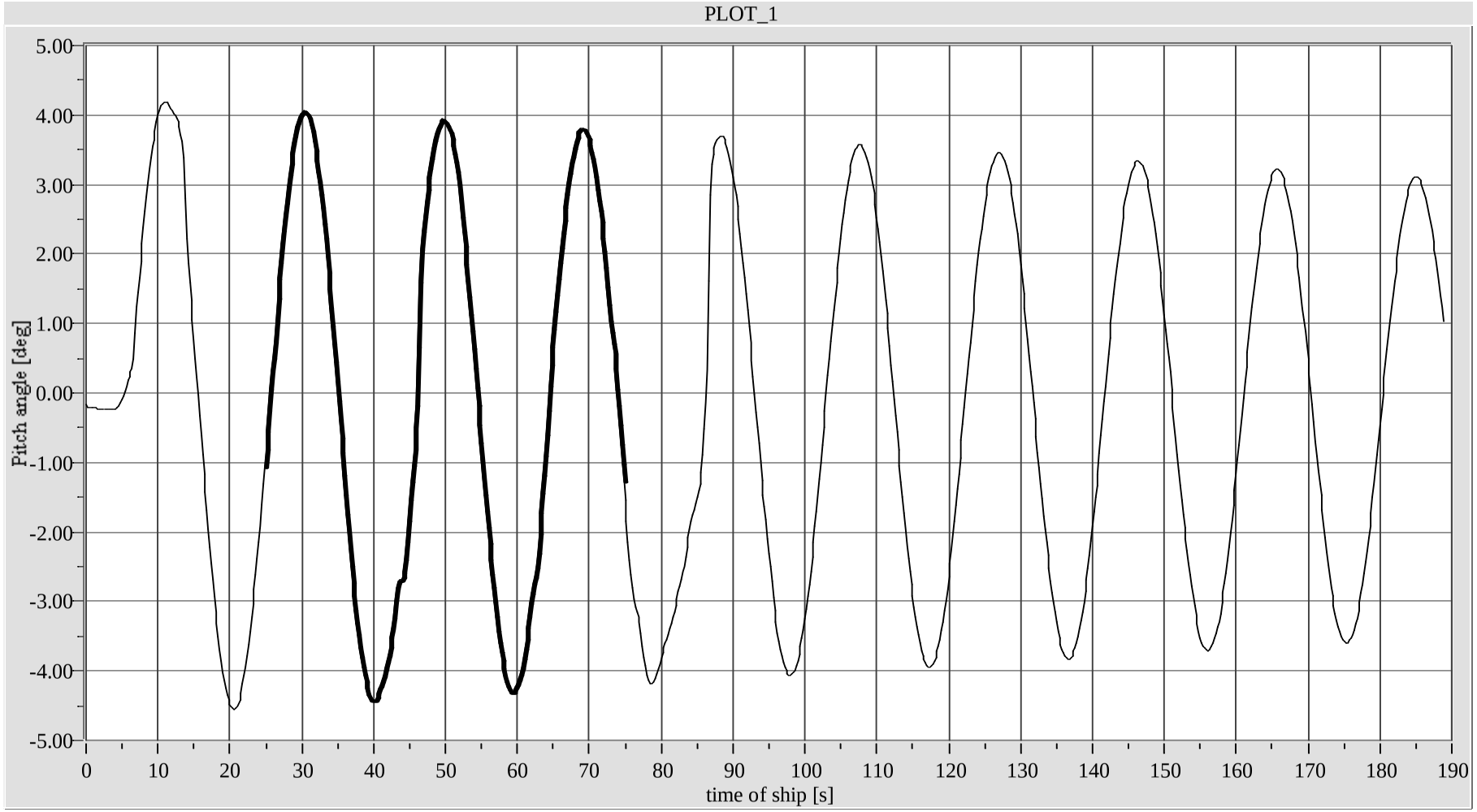
| Model No. 2446A | Test No. 29967-03 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 3.8000 s / 19.0000 s | Project: EMSA 1 | Damage: R7M2_P5-7.4.0-1 |
|---|---|---|

| Vienna Model Basin Ltd. | Pitch Test in Air |
|---|---|

| Model No. 2446A | Test No. 29968-04 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 3.8800 s / 19.4000 s | Project: EMSA 1 | Damage: R7M2_P5-7.4.0-1 |
|---|---|---|

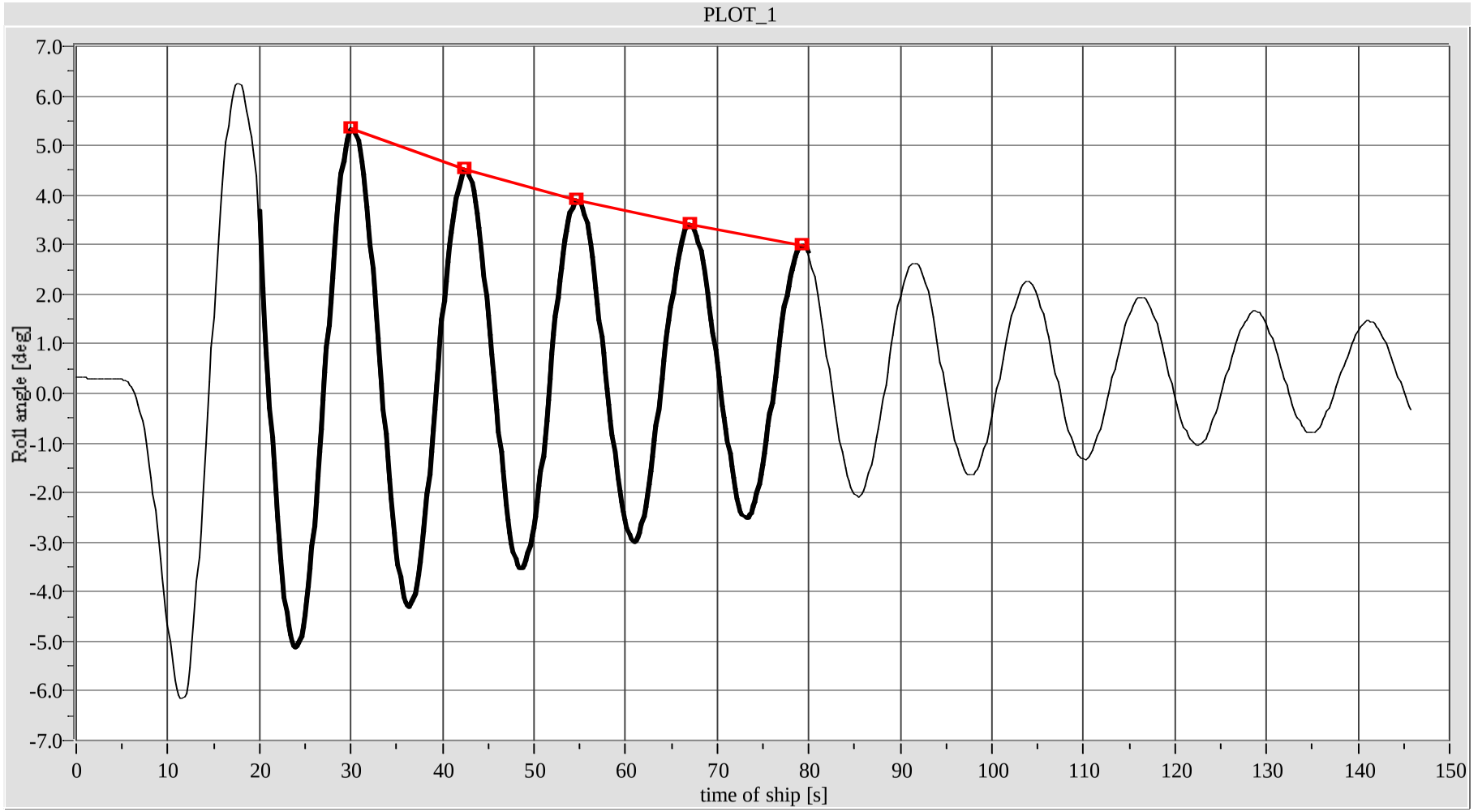
# Roll in Water Measurements (Intact Condition)

# Model No. 2446A

# Project: “EMSA 1”

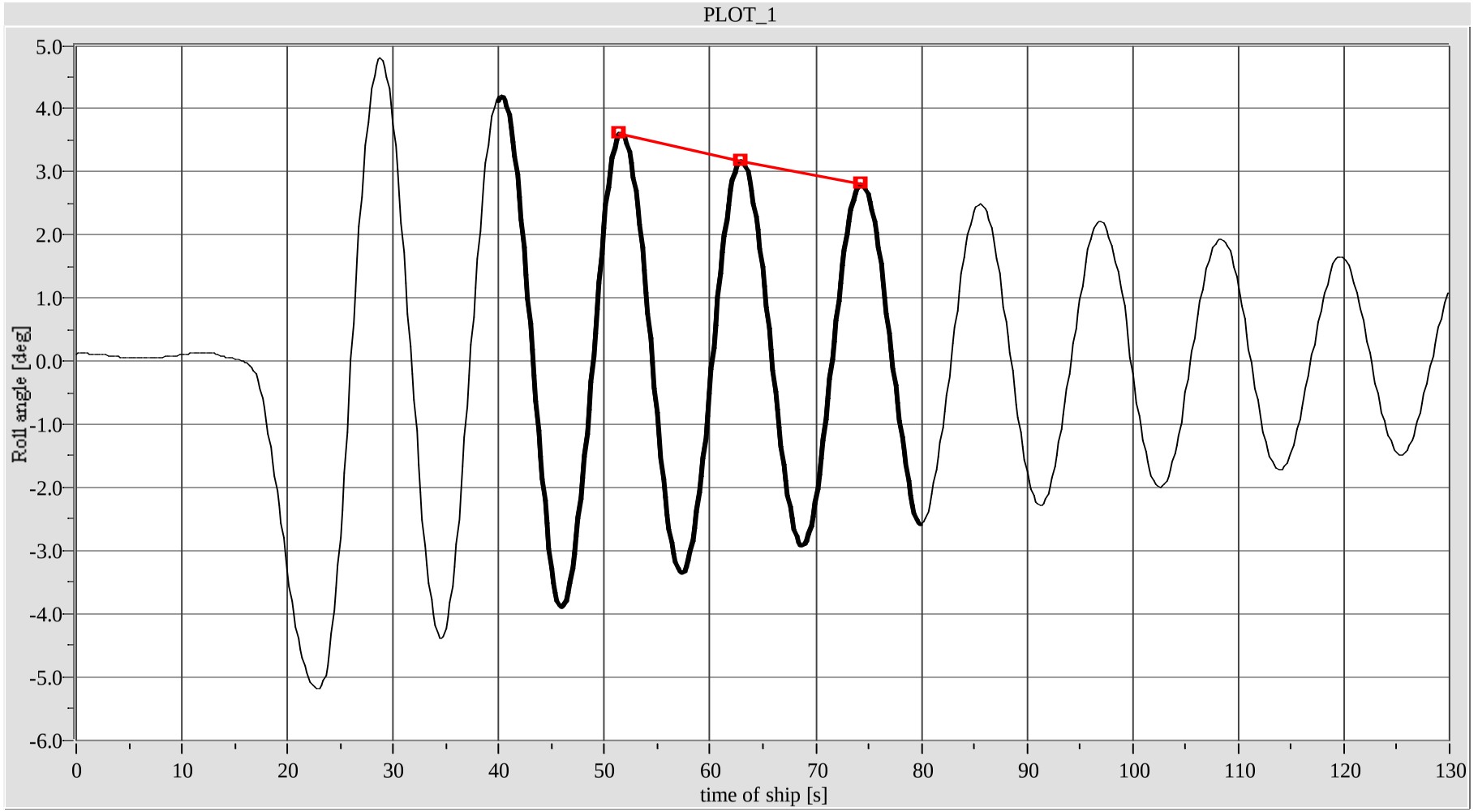
**Damage Case R7M2_P5-7.4.0-1**

| Vienna Model Basin Ltd. | Roll decay test in water (intact condition) | | | |
|---|---|---|---|---|
| Model No. 2446A | Test No. 29967-04 | GMT = 2,3154 m | Kxx / B = 0,3927 | with bilge keels |




| Natural Roll Period (Ship) = 12.3000 s | Project: EMSA 1 | |
|---|---|---|

| Vienna Model Basin Ltd. | Roll decay test in water (intact condition) | | | |
|---|---|---|---|---|
| Model No. 2446A | Test No. 29968-02 | GMT = 2,3154 m | Kxx / B = 0,3927 | with bilge keels |




| Natural Roll Period (Ship) = 11.4000 s | Project: EMSA 1 | |
|---|---|---|

# APPENDIX C3

# MODEL TEST PROTOCOL

## Model No. 2446B

## Project: “EMSA 1”

**Damage Case-R7M2_P4-6.1.0-1**

Details of the dimensions and the damage conditions

SHIP 1 Re-tested. March 10-11, 2011 Vienna

## GENERAL PARTICULARS

Model Scale = 1: 25

| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **MAIN DIMENSIONS** | | | | |
| LMOD | 111.900 | 4476.0 | No change, OK | LAZS |
| LBP | 104.400 | 4176.0 | " | LAZS |
| BMLD | 18.600 | 744.0 | " | LAZS. |
| **LONGITUDINAL POSITION OF DAMAGE 1 R7M2_P4-6.1.0-1** | | | | |
| Aft Bulkhead | 19.200 | 768.0 | No change, OK | LAZS |
| Mid Bulkhead | 26.400 | 1056.0 | " | LAZS |
| Fwd Bulkhead | 38.400 | 1536.0 | 1536 | LAZS |
| Fwd Upper Vehicle Deck Barrier | 64.800 | 2592.0 | No change, OK | LAZS |

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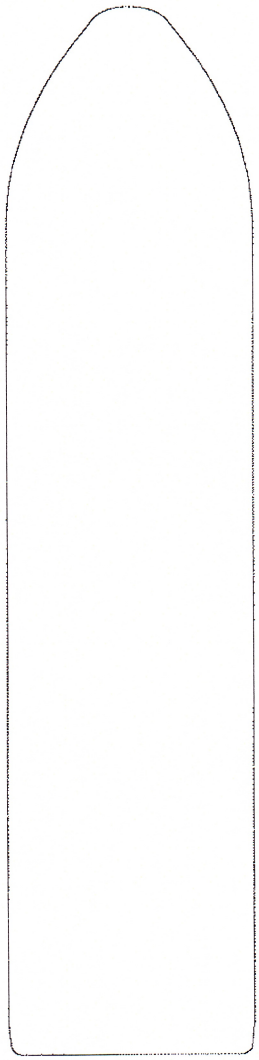
## INTACT DRAUGHTS - DAMAGE 1

| FP | |
|---|---|
| Full Size | 4.500 m |
| Model | 180.0 mm |
| Check | 180 mm |

ALS

**Port**

**Starboard**



| Midship | |
|---|---|
| Full Size | 4.500 m |
| Model | 180.0 mm |
| Check | 180 mm |

ALS

| Midship | |
|---|---|
| Full Size | 4.500 m |
| Model | 180.0 mm |
| Check | 180 mm |

ALS

| Quarter | |
|---|---|
| Full Size | 4.500 m |
| Model | 180.0 mm |
| Check | 180 mm |

ALS

| Quarter | |
|---|---|
| Full Size | 4.500 m |
| Model | 180.0 mm |
| Check | 180 mm |

ALS

| AP | |
|---|---|
| Full Size | 4.500 m |
| Model | 180.0 mm |
| Check | X mm |

not accessible ALS

| AP | |
|---|---|
| Full Size | 4.500 m |
| Model | 180.0 mm |
| Check | X mm |

not accessible ALS

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## DAMAGE DRAUGHTS - DAMAGE 1

| FP | |
|---|---|
| Full Size | 4.342 m |
| Model | 173.7 mm |
| Check | 173.7 mm |

ALS

| Static Heel | |
|---|---|
| 1.000 | degree(s) |

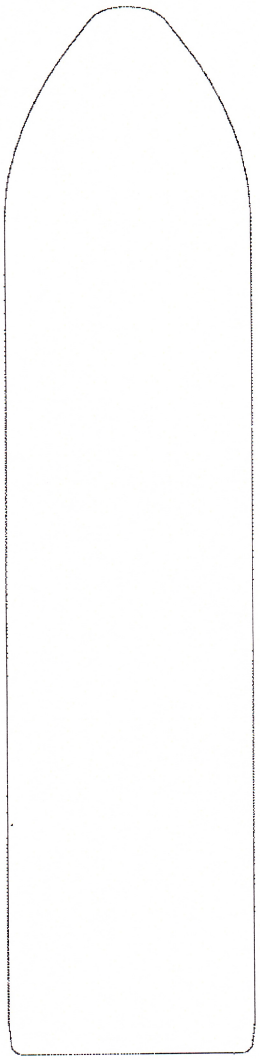
ALS

to Port.

| FP | |
|---|---|
| Full Size | 4.364 m |
| Model | 174.6 mm |
| Check | 174.6 mm |

ALS

**Port**



| FP | |
|---|---|
| Full Size | 4.319 m |
| Model | 172.8 mm |
| Check | 172.8 mm |

ALS

**Starboard**

| Midship | |
|---|---|
| Full Size | 5.291 m |
| Model | 211.6 mm |
| Check | 211.6 mm |

ALS

| Midship | |
|---|---|
| Full Size | 4.966 m |
| Model | 198.6 mm |
| Check | 198.6 mm |

ALS

| Quarter | |
|---|---|
| Full Size | 5.684 m |
| Model | 227.4 mm |
| Check | 227.4 mm |

ALS

| Quarter | |
|---|---|
| Full Size | 5.360 m |
| Model | 214.4 mm |
| Check | 214.4 mm |

ALS

| AP | |
|---|---|
| Full Size | 6.078 m |
| Model | 243.1 mm |
| Check | 243.1 mm |

ALS

| AP | |
|---|---|
| Full Size | 5.753 m |
| Model | 230.1 mm |
| Check | 230.1 mm |

ALS

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## DAMAGE OPENING - DAMAGE 1

| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **DAMAGE OPENING** | | | | |
| $D_{MLD}$ | 6.300 | 252.0 | Cardeck at V | ALS OK |
| Length | 6.240 | 249.6 | 3%Ls + 3.0 | ALS OK |
| Dist from AP | 26.400 | 1056.0 | | ALS OK |
| B/5 | 5.580 | 223.2 | from CL | ALS OK |
| | 3.720 | 148.8 | from $B_{MLD}$ at FoS | ALS OK |

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## INTACT STABILITY CHARACTERISTICS - DAMAGE 1

| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **VESSEL WEIGHT** | | | | |
| Displacement (fresh water) | 5384.60 tonnes | 344.6 kg | 344·6 | ALS |

| **INTACT STABILITY CHARACTERISTICS** | | | | |
|---|---|---|---|---|
| GMT | 1.600 | 64.0 | 63·3 (IE)* | ALS |
| KG | 8.591 | 343.6 | 344·3 | ALS |
| KM | 10.191 | 407.6 | from hydros | ALS |
| LCB (from AP) | 49.150 | 1966.0 | From AP (#0) Level trim | |

* GM = 4·953 × 250 / 344·6 × tan θ
θ meas = 3·25°
∴ GM = 63·3 mm
Pessimistic - OK.

| **RADIUS OF GYRATION CHARACTERISTICS** | | | | |
|---|---|---|---|---|
| Kxx/B (Roll) | N/A | 0·3641 | Allowable 0.35 - 0.40 | ALS |
| Kyy/LOA (Pitch) | N/A | 0·2498 | Allowable 0.20 - 0.25 | ALS |

| **INCLINE DATA** | | | | |
|---|---|---|---|---|
| Incline Weight | N/A | 4·953 | kg | ALS |
| Lever | N/A | 0·250 | m | ALS |

| **MEASURED ROLL PERIOD** | | | | |
|---|---|---|---|---|
| Intact (in water) | 12·6167 secs | 2·5233 secs | | ALS |
| Damage (in water) | | 3·665 secs | | ALS |

**DAMAGE GZ CHECK**

Weight 4·953 kg

| LEVER (cm) | Heel (Check 1) | Heel (Check 2) | Heel (Check 3) | Heel (Check 4) |
|---|---|---|---|---|
| 5 P | −2·20 | | | |
| 10 P | −3·40 | | | |
| 5 S | + 0.30 | | | |
| 10 S | + 1.51° | | | |
| 15 S | + 2·7° | | | |
| 20 S | + 3.9° | | | |

| LEVER (cm) | Heel (Check 5) | Heel (Check 6) | Heel (Check 7) | Heel (Check 8) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

initial 0.9° (see curves attached)

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FRIDAY 11/3/2011 09.25 - 11.50; 10 RUNS

## MODEL TEST EXPERIMENTS - DAMAGE 1

MODEL Nº 2446 B

30000

| RUN | Hs TARGET | Hs FIX | TIME TO CAPSIZE | COMMENTS |
|---|---|---|---|---|
| 01 | 4.0 | 4.0329 | DNC | Survived; some WOD; max. roll 7°P (x6) |
| 9.25 | | | (did not capsize) | Twice rolled to sbd but quickly returned. |
| (start) | | | | Water accumulated in port aft quarter |
| | | | | in a triangular wedge but kept draining |
| | | | | off; steady 4°P at end of run. |
| 02 | 4.0 | 4.0385 | DNC | Similar; max roll 8°P (x1) 7°P (x1) |
| 9.40 | | | | " " 2°S (x1) |
| | | | | Equilibrium heel (mean) 4°P reached |
| | | | | after approx. 50 secs |
| | | | | |
| 03 | 4.0 | 4.1373 | DNC | Reached mean of 4°P after 100 secs |
| 9.55 | | | | Max roll (P): 8° (x1) at 160 secs |
| | | | | " " " 7° (x1) at 120 secs |
| | | | | " " (S) 2° (x2) at 160 & 300 secs |
| | | | | |
| 04 | 4.0 | 4.0420 | DNC | Reached mean of 4°P after 100 secs |
| 10.10 | | | | Max roll (P) 8.2° (x1) at 220 secs |
| | | | | " " " 7.8° (x2) at 350 secs |
| | | | | " " (S) 2.0° (x1) at 120 secs |
| | | | | |
| 05 | 4.0 | 4.0426 | DNC | Av. 2°P for 40 secs, then rolled 1°S; |
| 10.20 | | | | then 7°P & back to 1°S after 50 secs |
| | | | | then 8°P after 60 secs; then settled to |
| | | | | around 4°P (av.); then 7.5°P (x2) after |
| | | | | 110 secs; settled then 7°P (270 secs) |
| | | | | & 7°P after 325 secs |
| | | | | |
| 06 | 4.0 | 4.0305 | DNC | Fairly even; 4°P after 40 secs |
| 10.40 | | | | Max roll (P) 8.8° (260 secs) |
| | | | | " " - 7° (160, 180, 260 & 320) |
| | | | | " " (S) 1.5° (25 secs) |
| | | | | 0° (350 secs) |
| | | | | |
| 07 | 4.0 | 4.036 | DNC | Steady increase to 5°P after 80 secs |
| 10.55 | 8 | | | then went to sbd (1st 2.5° until 100 secs |
| | | | | then 6°S until 120 secs). At 125 secs |
| | | | | went to 10°(P) v. quickly but returned |
| | | | | to 4°(P) after 165 secs & steadied. |
| | | | | Went to 10°(S) after 230 secs. and |
| | | | | 8°P after 240 secs; re-settled to 4°(P) |

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## MODEL TEST EXPERIMENTS - DAMAGE 1

| RUN | Hs TARGET | Hs FIX | TIME TO CAPSIZE | COMMENTS |
|---|---|---|---|---|
| 08 | 4.0 | 4.0073 | DNC | Max Roll (P) 8° (60 s + 325 secs) |
| 11.10 | | | (did not capsize) | " " " 7° (190 + 225 secs) |
| (start) | | | | " " (S) 1° (125, 190 & 225 s) |
| | | | | 2° (310 s.) |
| | | | | Otherwise steady around 4° P, |
| | | | | reached after 60 secs. |
| | | | | |
| 09 | 4.0 | 4.0530 | DNC | Max Roll (P) 10° (30 secs) |
| 11.25 | | | | " " (S) 20° (25 secs & 110, 140, 200) |
| | | | | |
| | | | | Otherwise steady around 4° P |
| | | | | |
| 10 | 4.0 | ? | DNC | Max Roll (P) 8° (60 secs) |
| 11.40 | | | | " " (S) 20° (175 secs) |
| | | | | |
| 11.50 | END | | | |

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# APPENDIX D3

# STATISTICS OF WAVES AND ROLL MOTIONS

## Model No. 2446B

## Project: “EMSA 1”

**Damage Case R7M2_P4-6.1.0-1**

**Roll Test in Air Measurements**

**Pitch Test in Air Measurements**

**Roll Test in Water Measurements (Intact Condition)**

**Roll Test in Water Measurements (Damaged Condition)**

**Spectral Characteristics of the Target and Measured Waves**

**Summary of the Measured Wave and Roll Time Realisations**

# Roll in Air Measurements

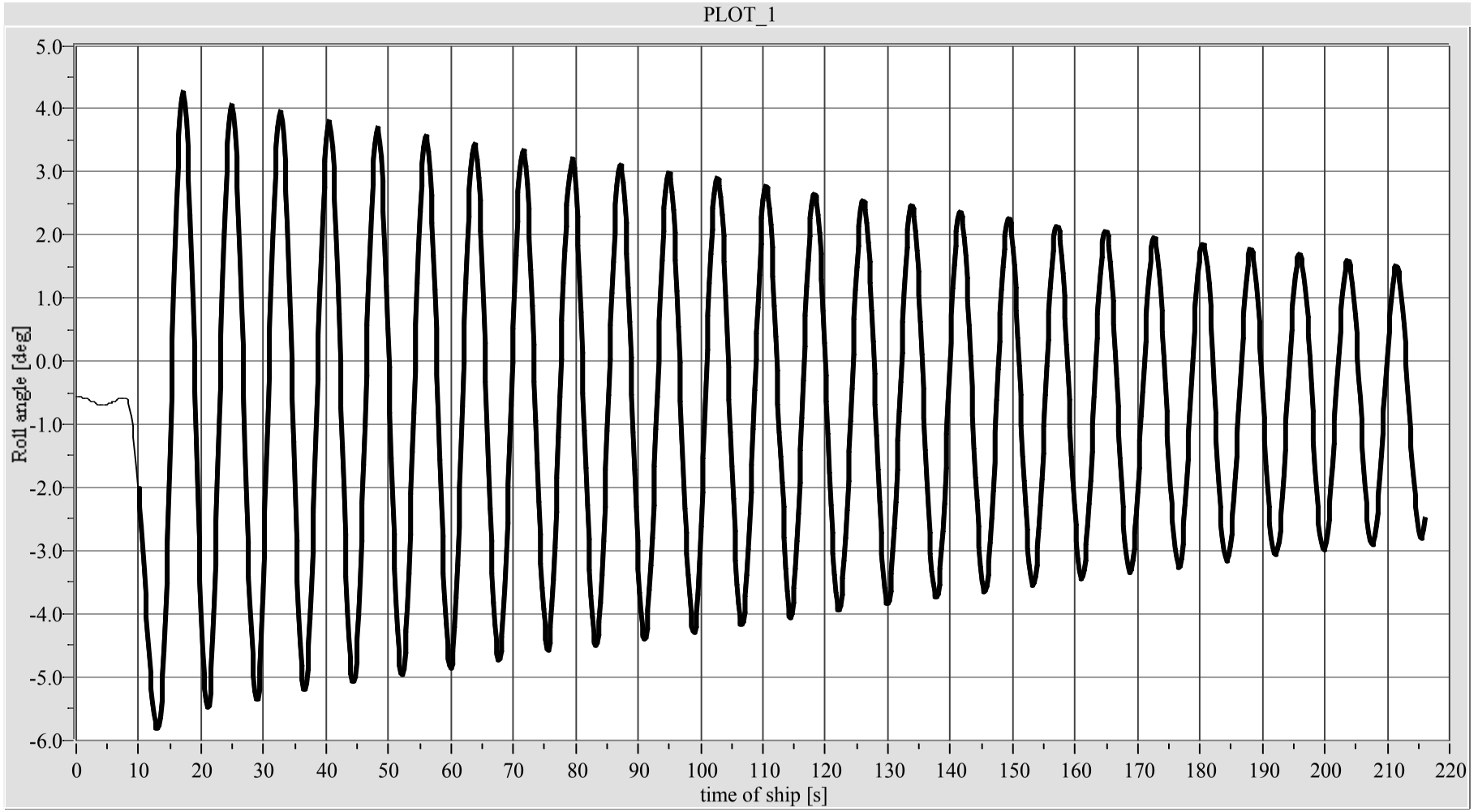
# Model No. 2446B

# Project: “EMSA 1”

**Damage Case R7M2_P4-6.1.0-1**

| Vienna Model Basin Ltd. | Roll Test in Air |
|---|---|

| Model No. 2446B | Test No. 29999-02 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 1.5552 s / 7.7760 s | Project: EMSA 1 | |
|---|---|---|

# Pitch in Air Measurements

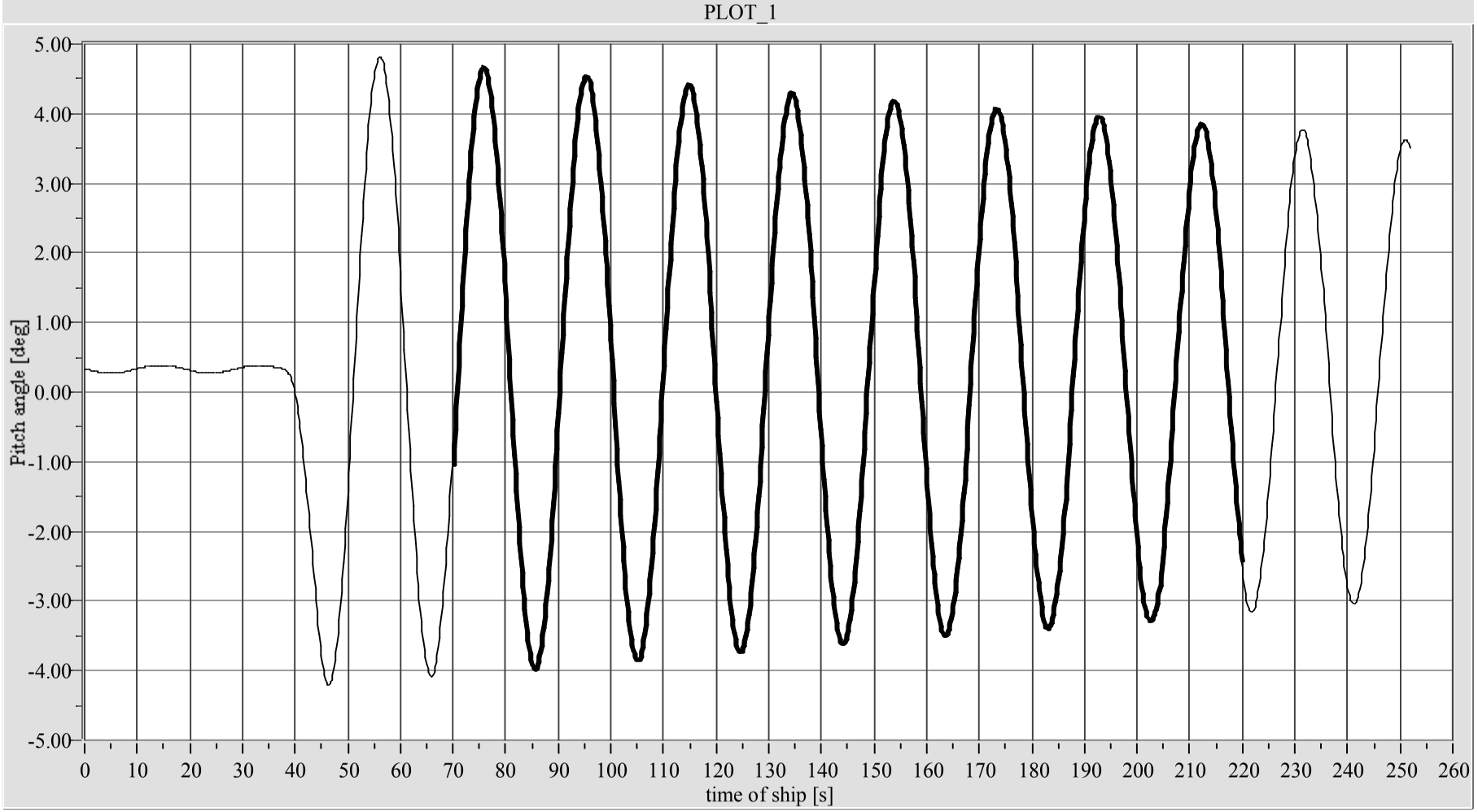
# Model No. 2446B

# Project: “EMSA 1”

**Damage Case- R7M2_P4-6.1.0-1**

| Vienna Model Basin Ltd. | Pitch Test in Air |
|---|---|

| Model No. 2446B | Test No. 29999-04 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 3.8971 s / 19.4857 s | Project: EMSA 1 | |
|---|---|---|

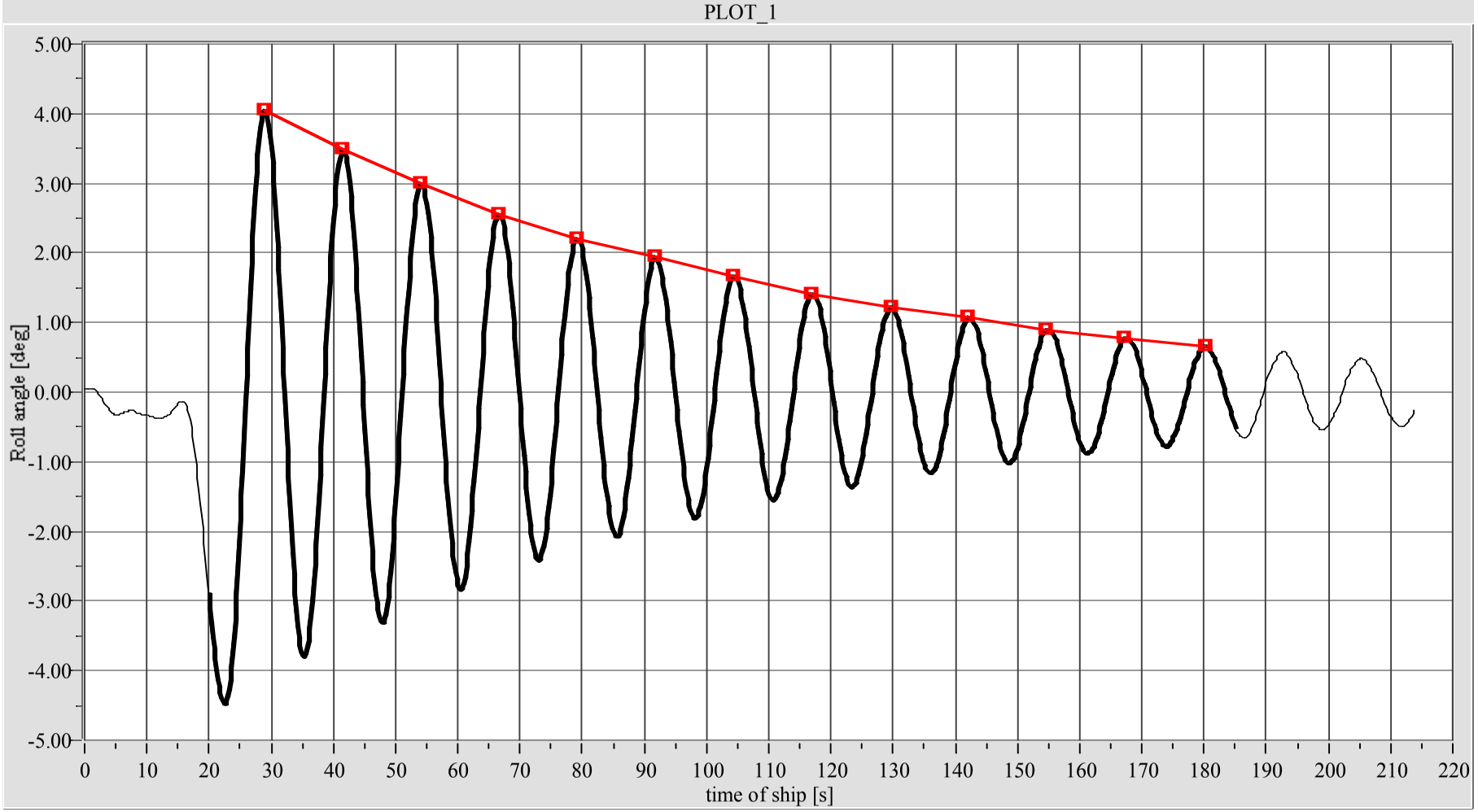
# Roll in Water Measurements (Intact Condition)

# Model No. 2446B

# Project: “EMSA 1”

**Damage Case R7M2_P4-6.1.0-1**

| Vienna Model Basin Ltd. | Roll decay test in water (intact condition) | | | |
|---|---|---|---|---|
| Model No. 2446B | Test No. 29999-03 | GMT = 1,5797 m | Kxx / B = 0,4249 | no bilge keels |




| Natural Roll Period (Ship) = 12.6167 s | Project: EMSA 1 | Draught = 4,5 |
|---|---|---|

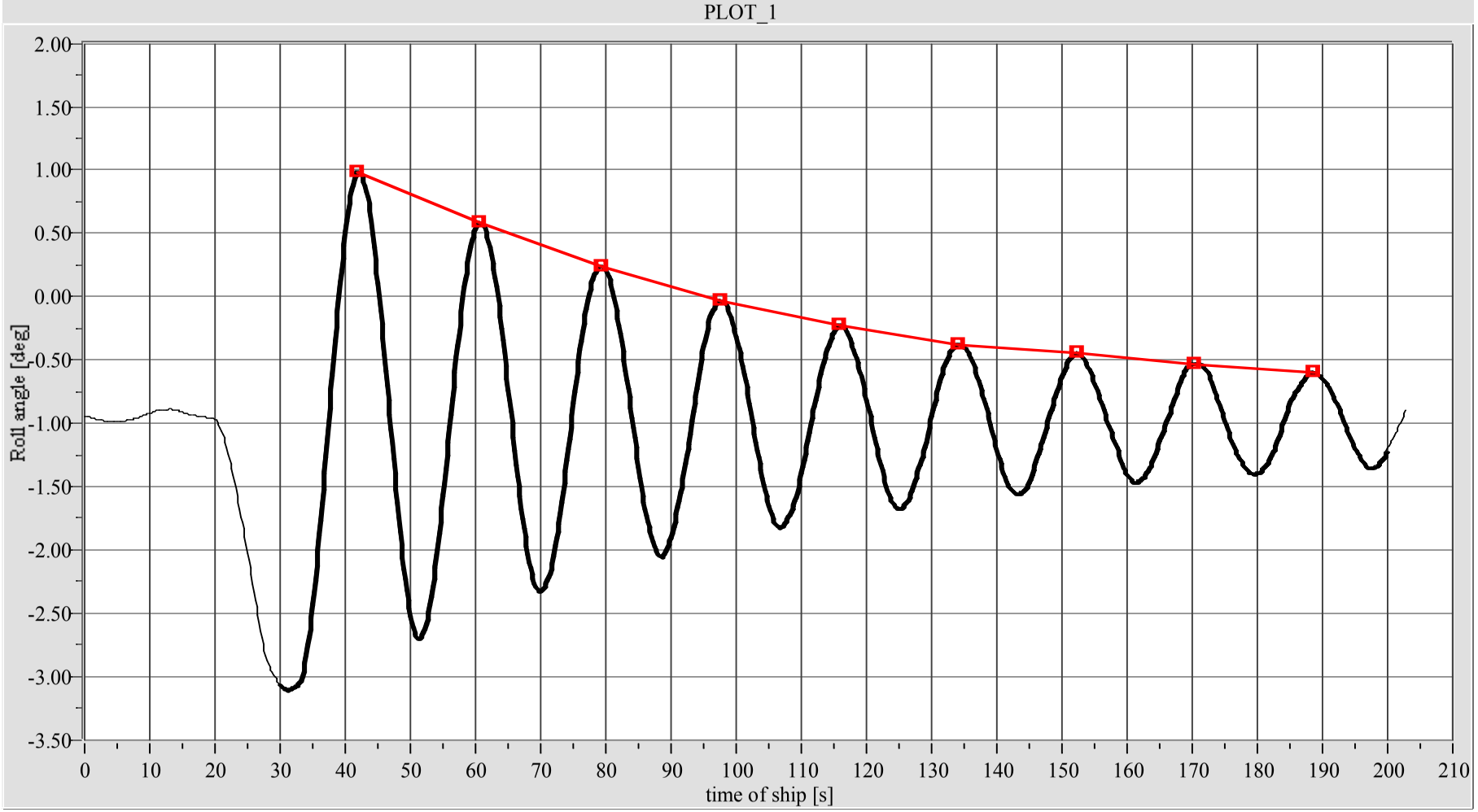
# Roll in Water Measurements (Damaged Condition)

# Model No. 2446B

# Project: “EMSA 1”

**Damage Case R7M2_P4-6.1.0-1**

| Vienna Model Basin Ltd. | Roll decay test in water (damaged condition) | | | |
|---|---|---|---|---|
| Model No. 2446B | Test No. 29999-06 | GMT = 1,5797 m | | no bilge keels |




| Natural Roll Period (Ship) = 18.3250 s | Project: EMSA 1 | Draught = 4,5 |
|---|---|---|

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2446B

## Project: “EMSA 1”

**Damage Case-R7M2_P4-6.1.0-1**

**Hs = 4.00 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

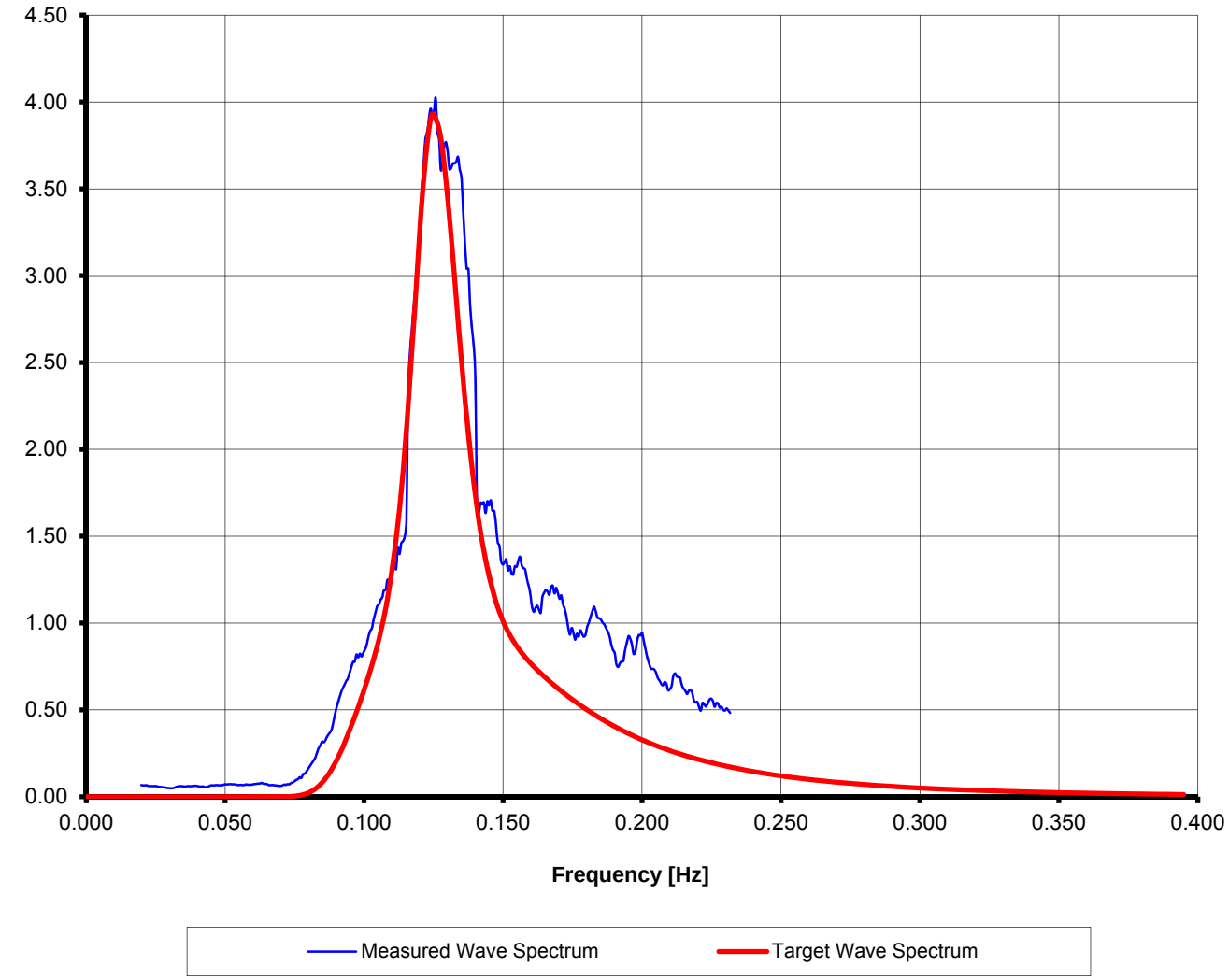
**Model No.: 2446**
**Test No.: 30000-01 to 10**
**Project: EMSA 1**
**Damage 3: R7M2_P4-6.1.0-1**
**Wave Type: Jonswap**
**Scale: 25.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **4.000** | m |
| gamma | 3.300 | |
| $T_P$ | 8.000 | s |
| $T_Z$ | 6.226 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2446
**Test No.:** 30000-01 to 10
**Project:** EMSA 1
**Damage 3:** R7M2_P4-6.1.0-1
**Wave Type:** Jonswap, $\gamma = 3.3$
**Damage 3:** R7M2_P4-6.1.0-1

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 4.000 | 8.000 | 6.226 | 4.000 - 4.100 | 7.800 - 8.200 | 5.914 - 6.537 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 30000-01 | 30000-01 | 4.0329 | 7.820 | 5.945 | | | | | | |
| -02 | -02 | 4.0385 | 8.125 | 6.419 | | | | | | |
| -03 | -03 | 4.0373 | 8.124 | 6.419 | | | | | | |
| -04 | -04 | 4.0420 | 7.815 | 5.937 | | | | | | |
| -05 | -05 | 4.0426 | 8.157 | 6.470 | | | | | | |
| -06 | -06 | 4.0305 | 8.185 | 6.514 | | | | | | |
| -07 | -07 | 4.0360 | 8.041 | 6.289 | | | | | | |
| -08 | -08 | 4.0473 | 8.019 | 6.256 | | | | | | |
| -09 | -09 | 4.0510 | 8.143 | 6.448 | | | | | | |
| -10 | -10 | 4.0359 | 8.010 | 6.242 | | | | | | |

# Summary of the Measured Wave and Roll Time Realisations

## Model No. 2446B

## Project: “EMSA 1”

**Damage Case-R7M2_P4-6.1.0-1**

# Sea Keeping Test in Irregular Seas (Statistics)

**Evaluation of Damage (Ship Values)**

**Model No.: 2446B** **Hs [m] = 4.00**

**Test No.: 30000-01 - 10** **Damage: R7M2_P4-6.1.0-1**

**Project: EMSA** **Scale = 25.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 30000-01 | Roll Angle [deg]* | 1.482 | 5.928 | 0.954 | -7.621 | -3.022 | 803.1 | 30 |
| | Pitch Angle [deg]** | 0.433 | 1.731 | 0.515 | -3.006 | -1.112 | | |
| | Heave | 0.668 | 2.671 | 2.536 | -2.630 | -0.191 | | |
| | Wave Elevation (fix) [m] | | | 4.086 | -3.388 | -0.317 | | |
| -02 | Roll Angle [deg]* | 1.256 | 5.022 | 1.710 | -8.312 | -3.407 | 814.1 | 30 |
| | Pitch Angle [deg]** | 0.496 | 1.984 | 0.522 | -3.013 | -1.140 | | |
| | Heave | 0.663 | 2.651 | 2.056 | -2.130 | -0.059 | | |
| | Wave Elevation (fix) [m] | | | 3.475 | -3.413 | -0.056 | | |
| -03 | Roll Angle [deg]* | 1.318 | 5.273 | 1.872 | -7.996 | -3.501 | 767.4 | 30 |
| | Pitch Angle [deg]** | 0.484 | 1.934 | 0.587 | -3.283 | -1.146 | | |
| | Heave | 0.694 | 2.777 | 2.229 | -2.199 | -0.023 | | |
| | Wave Elevation (fix) [m] | | | 3.872 | -3.360 | -0.059 | | |
| -04 | Roll Angle [deg]* | 1.511 | 6.045 | 1.854 | -8.424 | -3.460 | 790.4 | 30 |
| | Pitch Angle [deg]** | 0.499 | 1.998 | 0.839 | -3.193 | -1.151 | | |
| | Heave | 0.738 | 2.950 | 2.494 | -2.604 | -0.056 | | |
| | Wave Elevation (fix) [m] | | | 4.245 | -3.199 | -0.010 | | |
| -05 | Roll Angle [deg]* | 1.452 | 5.806 | 1.375 | -8.096 | -3.642 | 795.4 | 30 |
| | Pitch Angle [deg]** | 0.467 | 1.867 | 0.522 | -2.614 | -1.154 | | |
| | Heave | 0.722 | 2.886 | 2.805 | -2.661 | -0.070 | | |
| | Wave Elevation (fix) [m] | | | 4.471 | -4.453 | -0.016 | | |
| -06 | Roll Angle [deg]* | 1.362 | 5.447 | 1.681 | -8.752 | -3.643 | 800.2 | 30 |
| | Pitch Angle [deg]** | 0.479 | 1.916 | 0.918 | -3.391 | -1.156 | | |
| | Heave | 0.729 | 2.918 | 2.477 | -2.313 | -0.004 | | |
| | Wave Elevation (fix) [m] | | | 4.030 | -3.242 | -0.007 | | |
| -07 | Roll Angle [deg]* | 2.935 | 11.739 | 8.262 | -9.864 | -3.038 | 879.0 | 30 |
| | Pitch Angle [deg]** | 0.516 | 2.065 | 0.598 | -2.873 | 1.186 | | |
| | Heave | 0.747 | 2.987 | 2.767 | -2.333 | 0.004 | | |
| | Wave Elevation (fix) [m] | | | 4.377 | -3.082 | -0.022 | | |
| -08 | Roll Angle [deg]* | 1.665 | 6.662 | 2.246 | -8.968 | -3.496 | 818.0 | 30 |
| | Pitch Angle [deg]** | 0.546 | 2.184 | 1.552 | -4.054 | -1.155 | | |
| | Heave | 0.719 | 2.878 | 2.646 | -2.434 | -0.001 | | |
| | Wave Elevation (fix) [m] | | | 4.346 | -3.027 | -0.016 | | |
| -09 | Roll Angle [deg]* | 1.773 | 7.093 | 3.272 | -9.598 | -3.393 | 896.0 | 30 |
| | Pitch Angle [deg]** | 0.527 | 2.107 | 0.601 | -3.071 | -1.165 | | |
| | Heave | 0.735 | 2.940 | 2.402 | -2.520 | 0.009 | | |
| | Wave Elevation (fix) [m] | | | 4.000 | -3.349 | 0.002 | | |
| -10 | Roll Angle [deg]* | 1.729 | 6.914 | 2.264 | -8.489 | -3.638 | 864.4 | 30 |
| | Pitch Angle [deg]** | 0.519 | 2.076 | 0.752 | -3.290 | -1.168 | | |
| | Heave | 0.710 | 2.838 | 3.011 | -2.499 | -0.010 | | |
| | Wave Elevation (fix) [m] | | | 4.356 | -3.427 | 0.013 | | |

# APPENDIX E3

# TIME HISTORIES OF THE EXPERIMENTS

# WAVE AND ROLL TIME HISTORIES

## Model No. 2446B

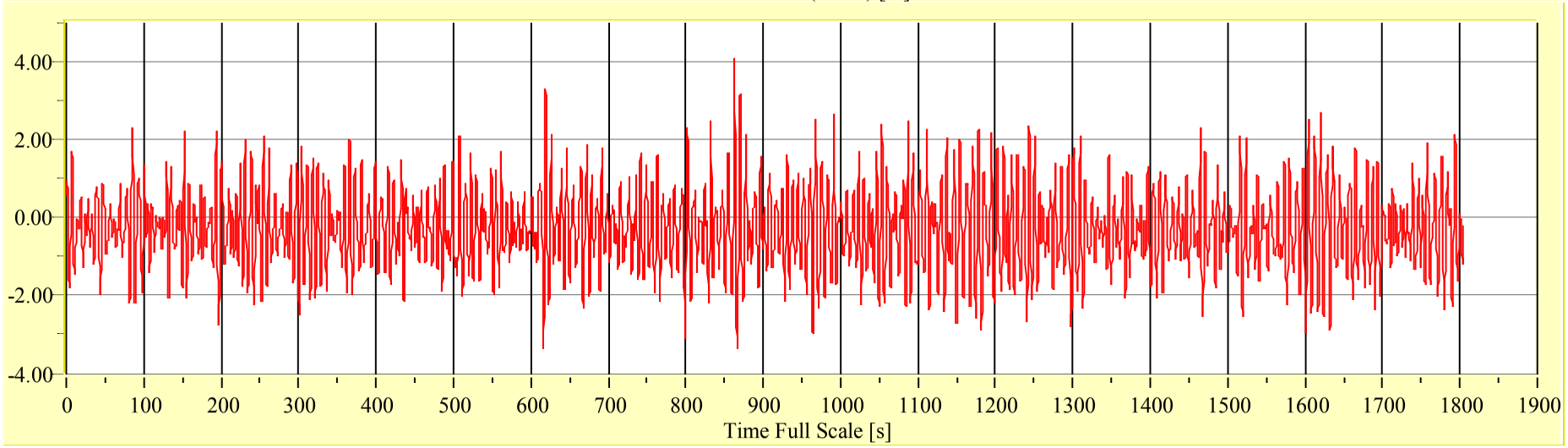
## Project: “EMSA 1”

**Damage Case- R7M2_P-6.1.0-1**

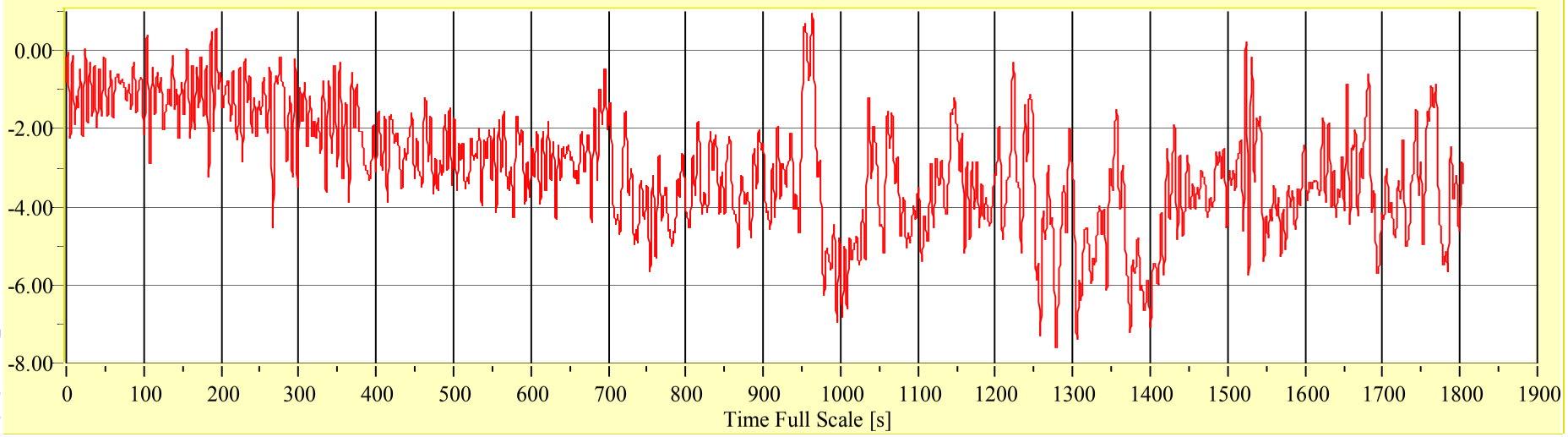
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-01 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to Starboard = Positiv)

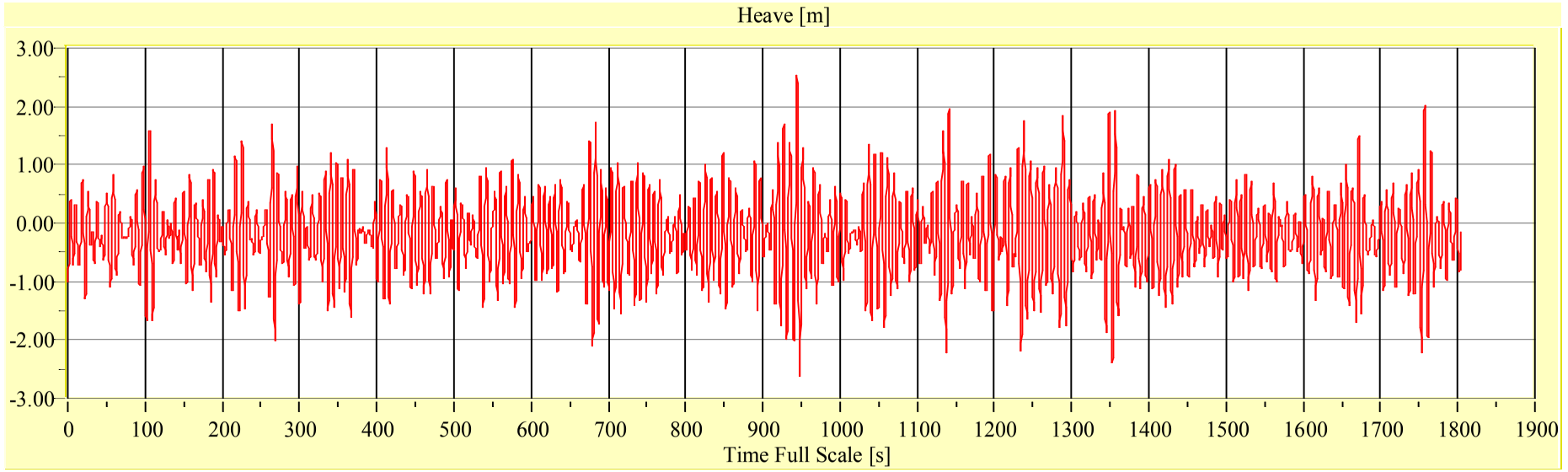


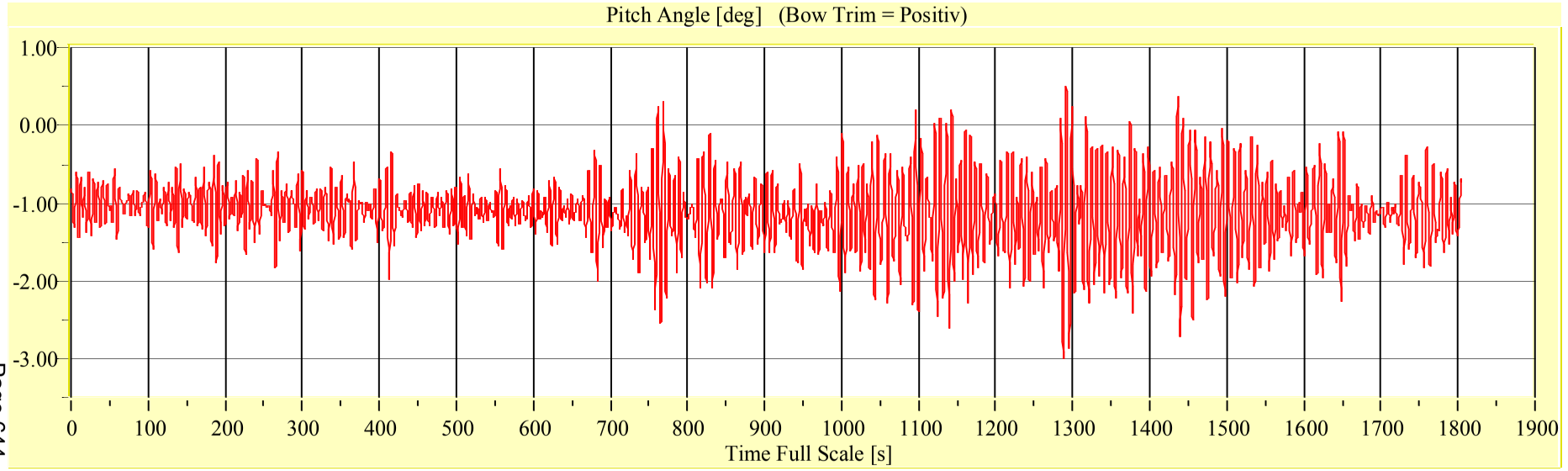



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-01 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



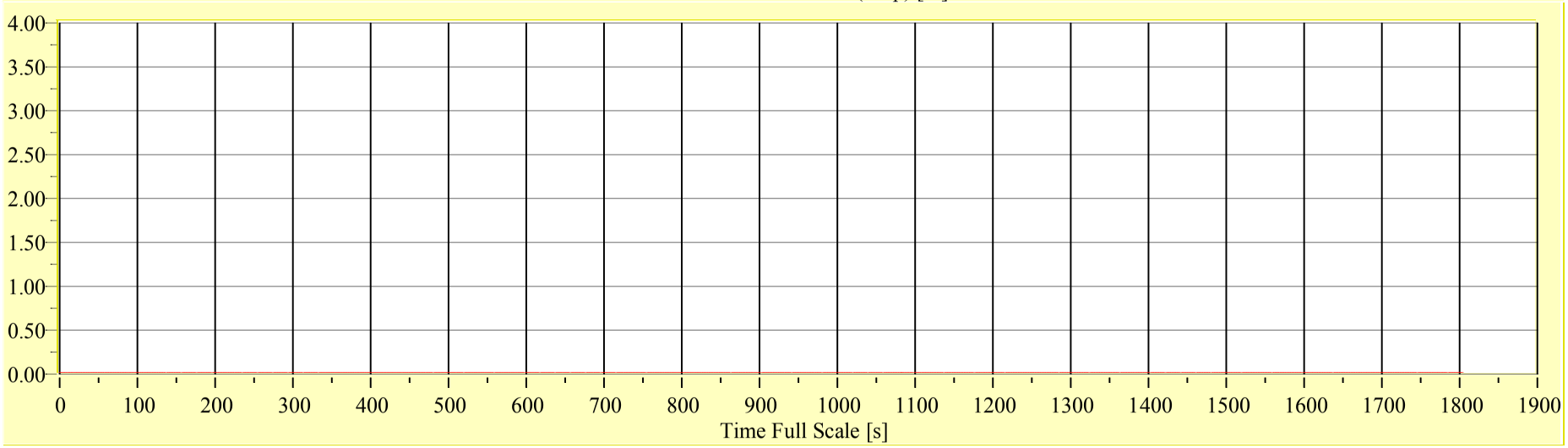



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

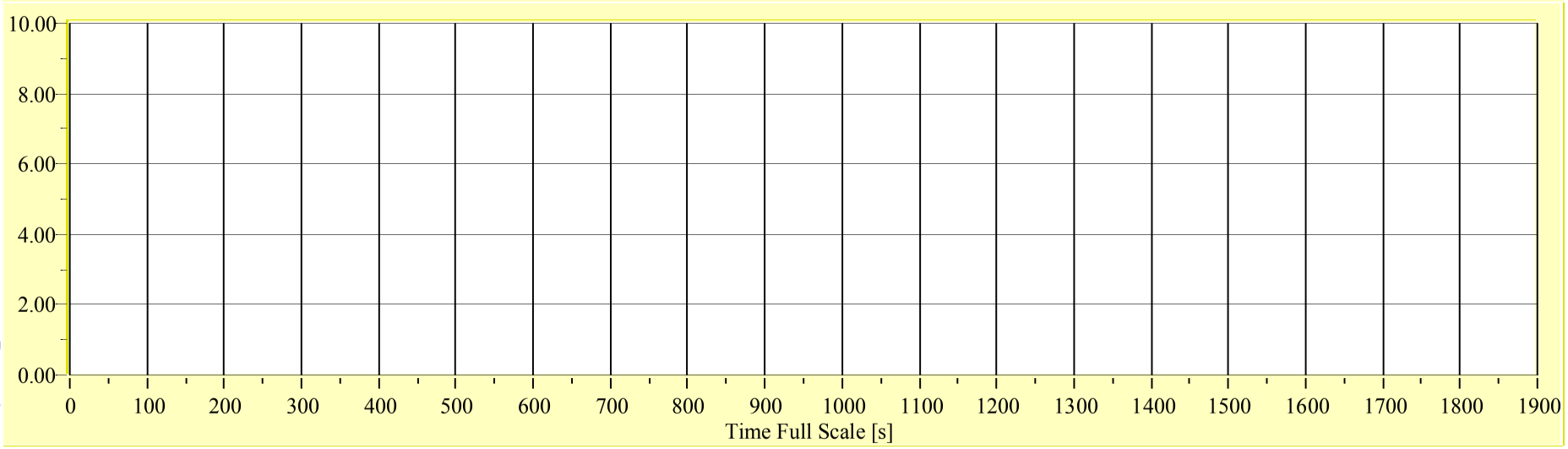
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-01 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Water Level on Car Deck (Ship) [m]




-

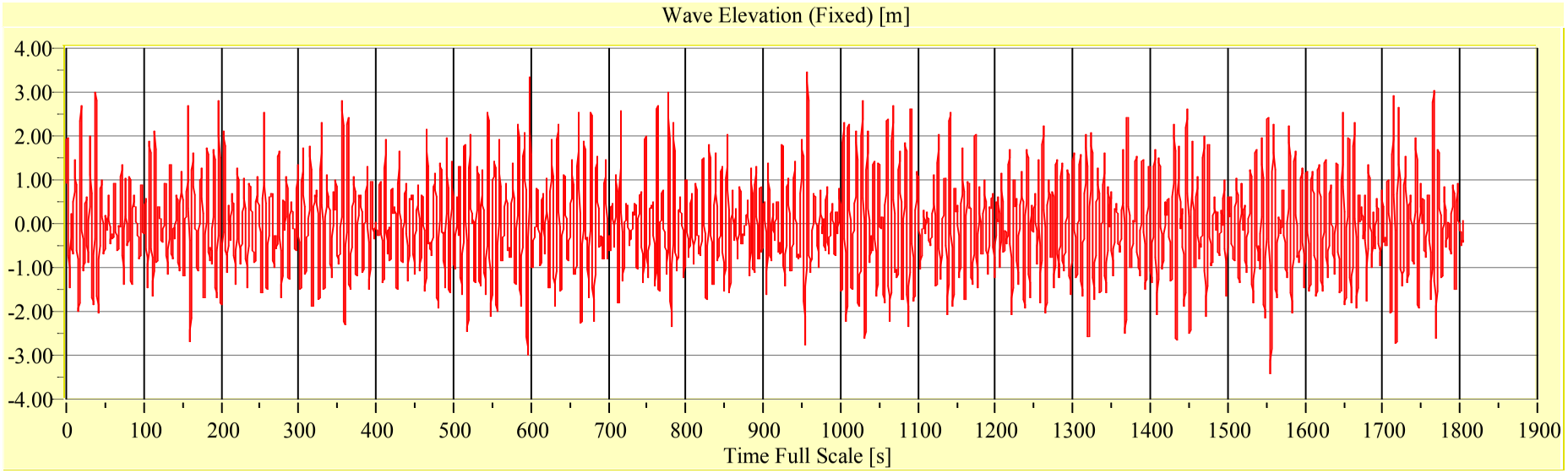


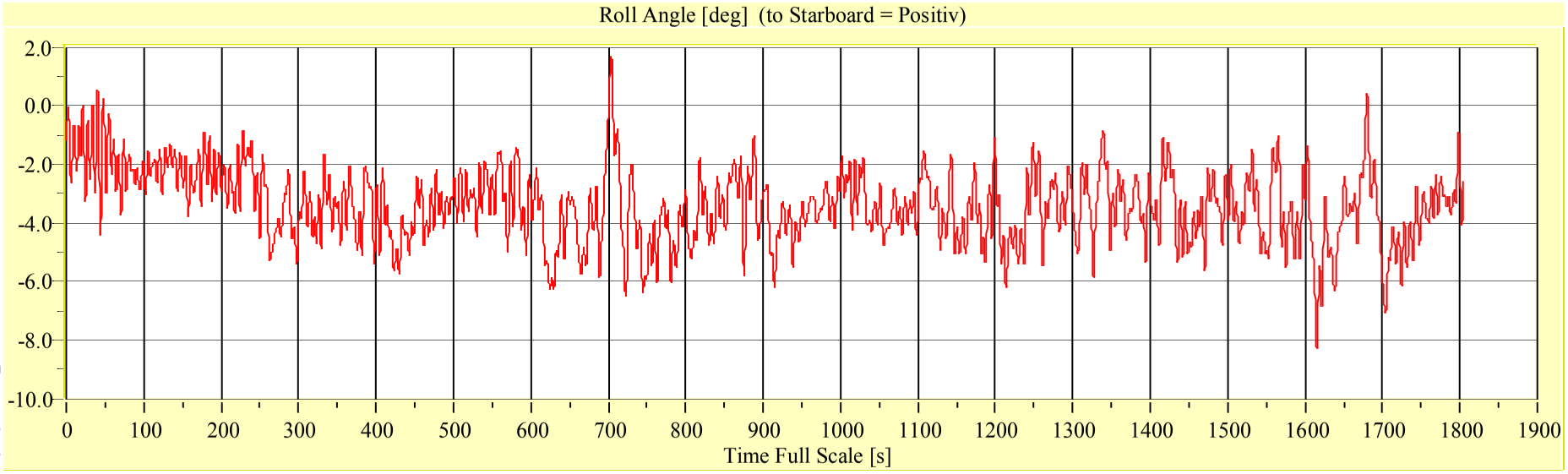



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-02 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



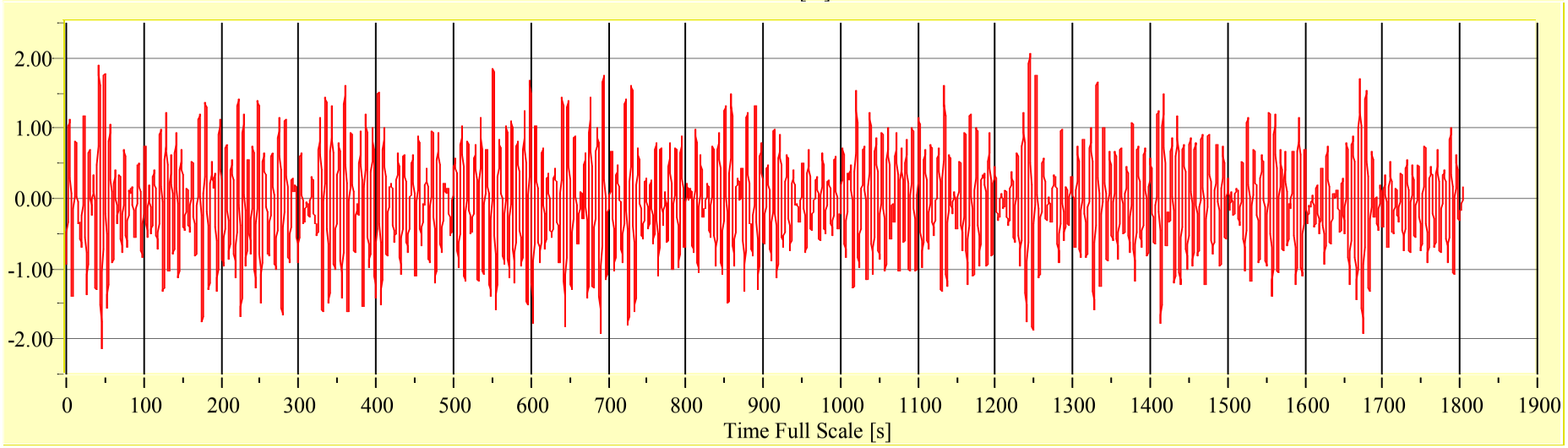



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

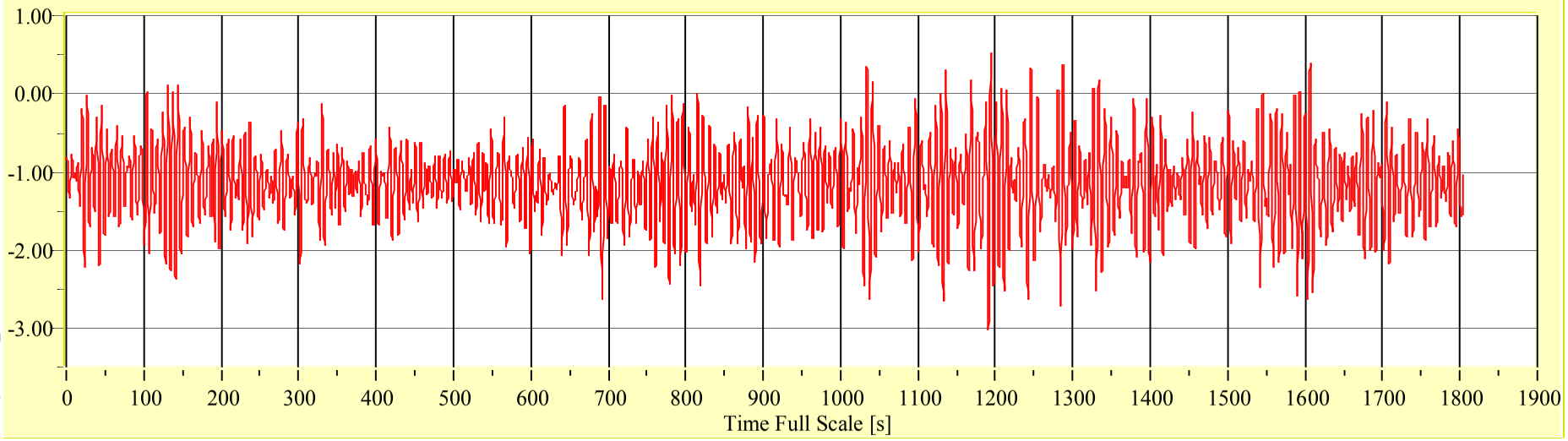
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-02 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

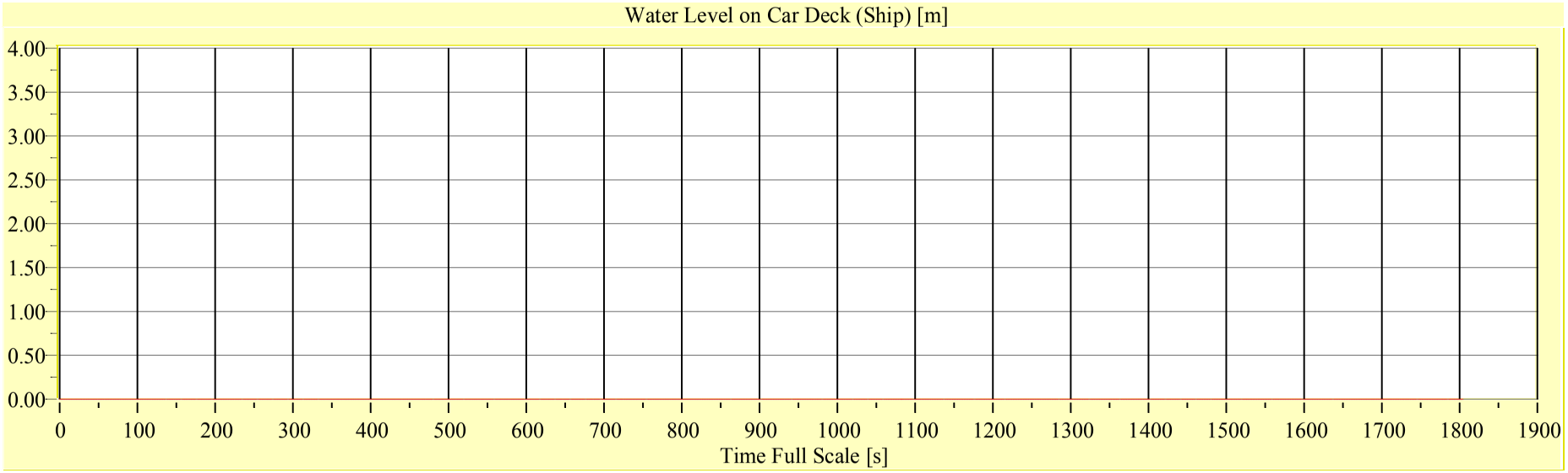


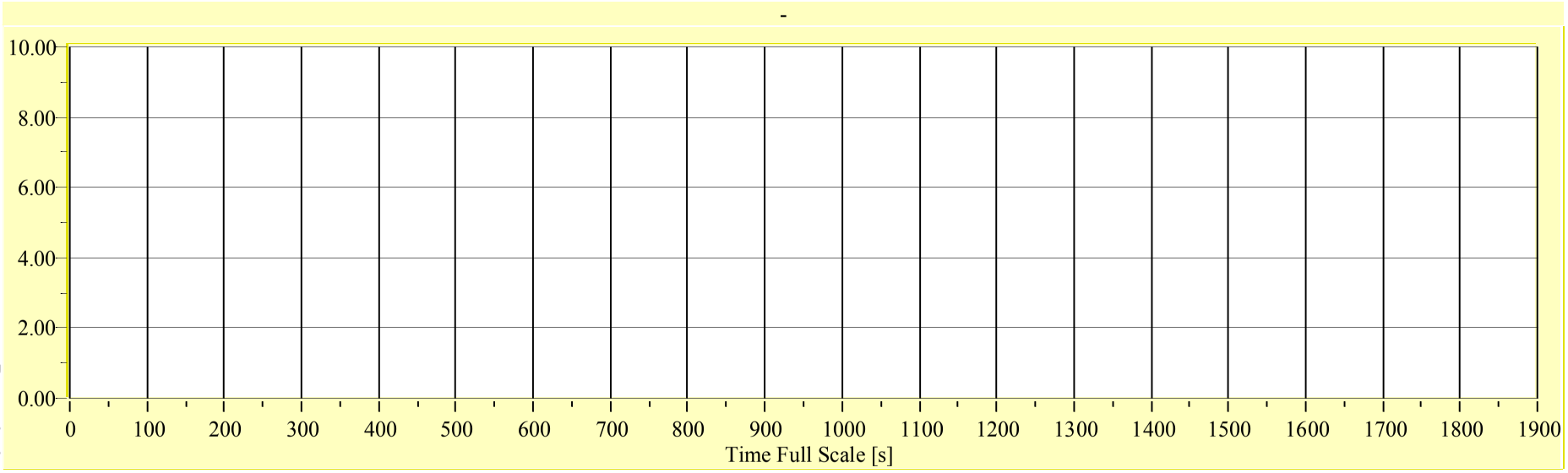



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-02 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



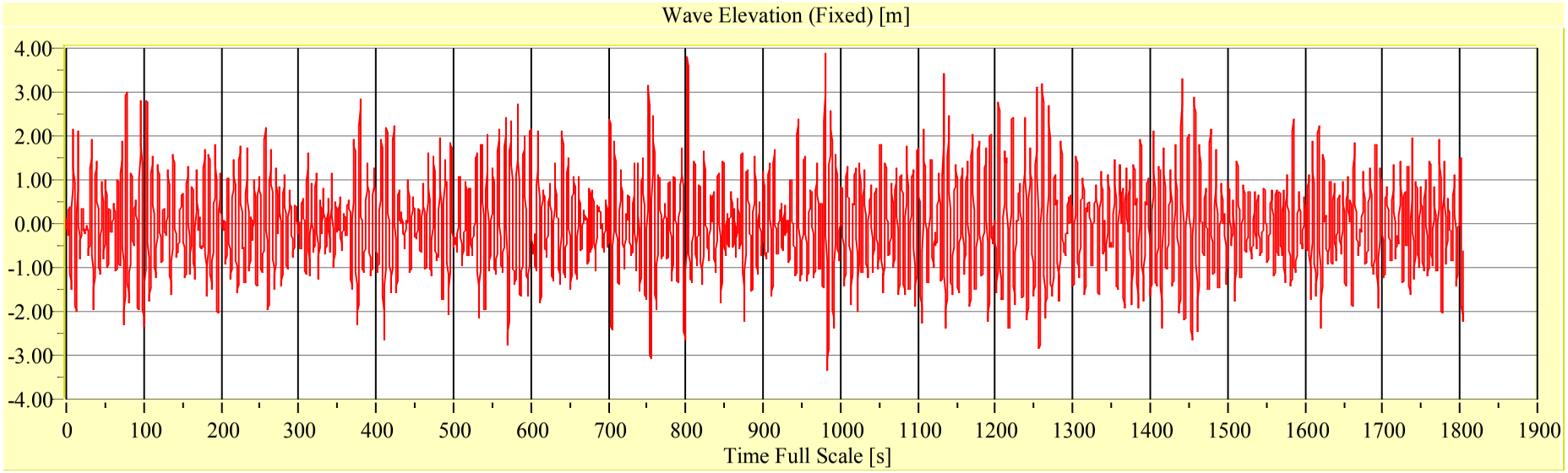



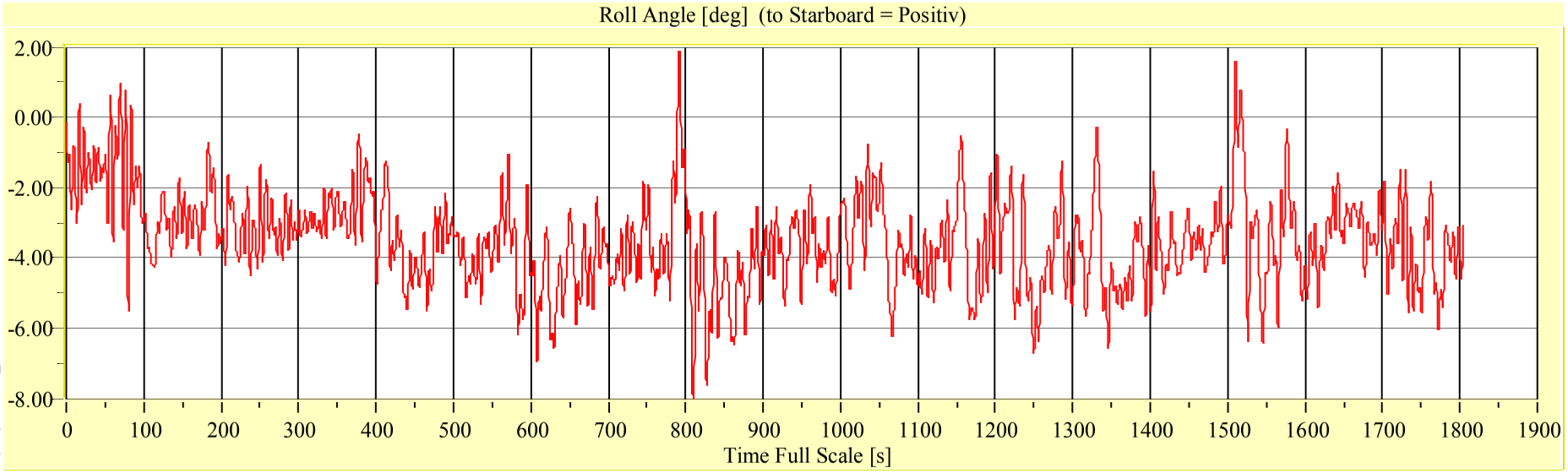



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-03 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



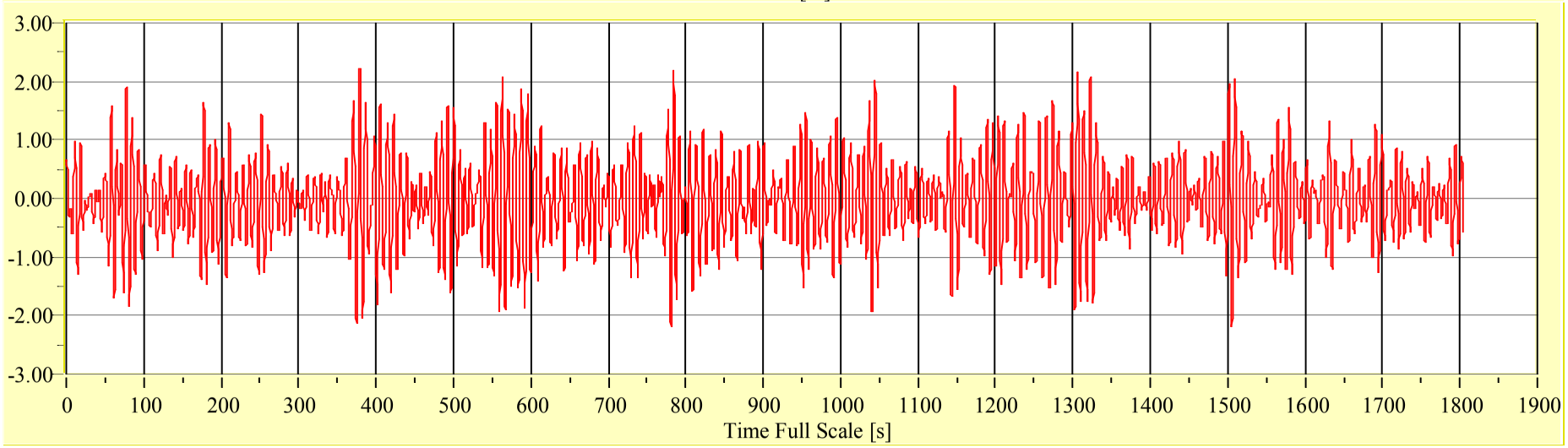



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

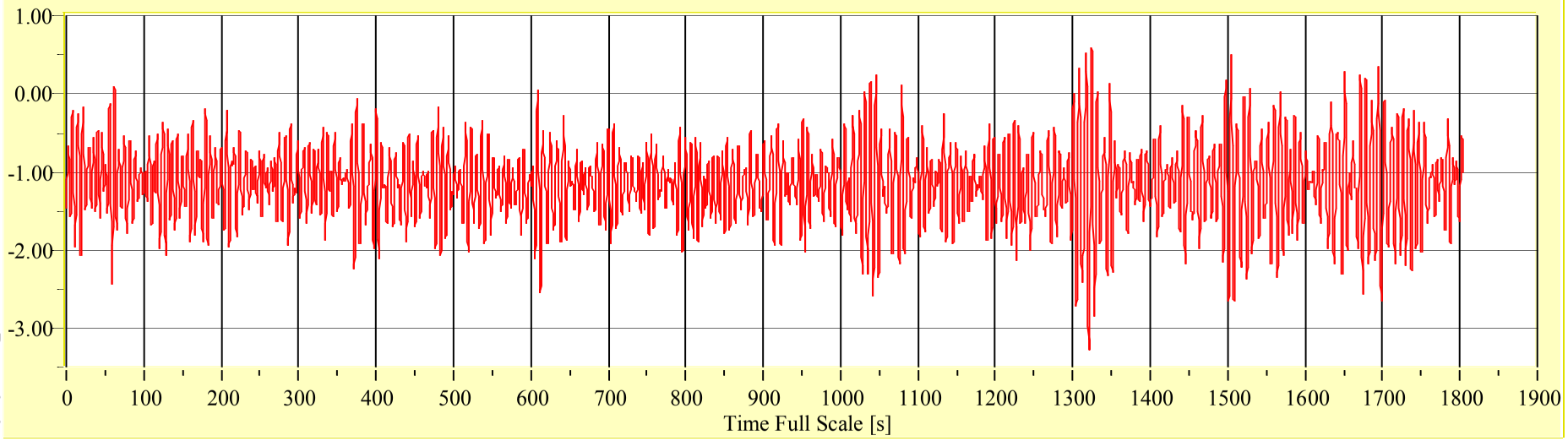
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-03 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)



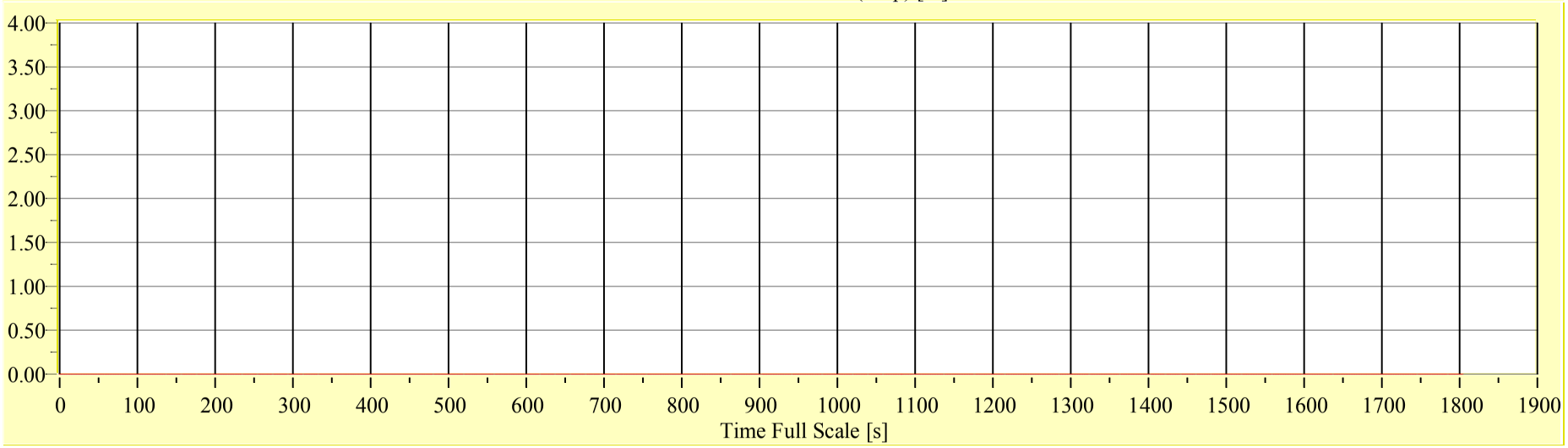



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

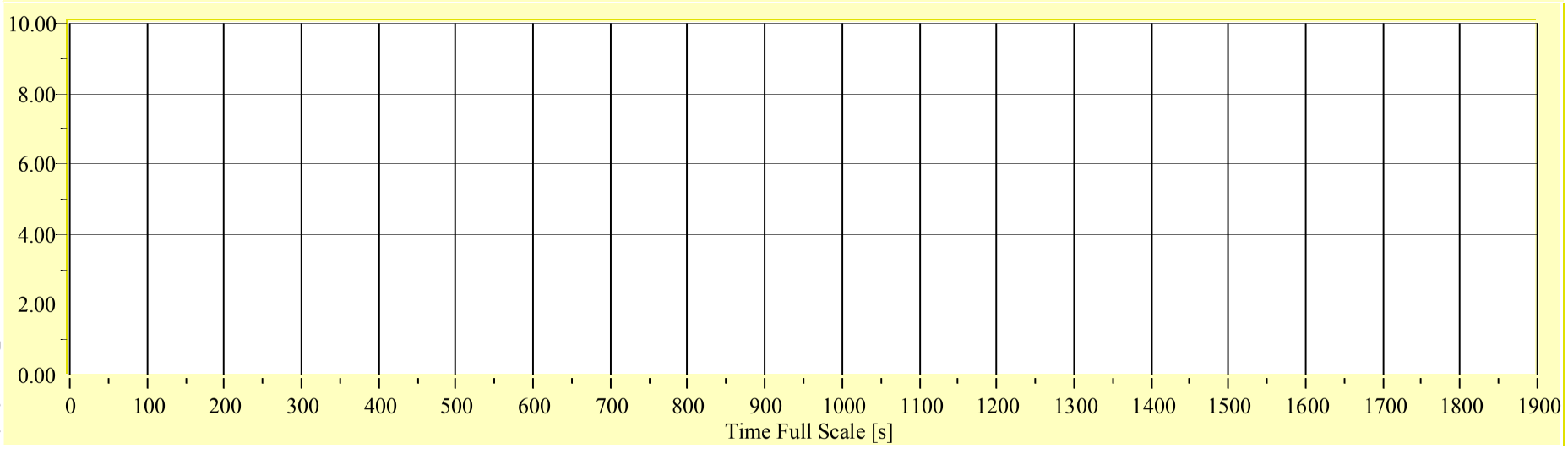
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-03 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Water Level on Car Deck (Ship) [m]




-

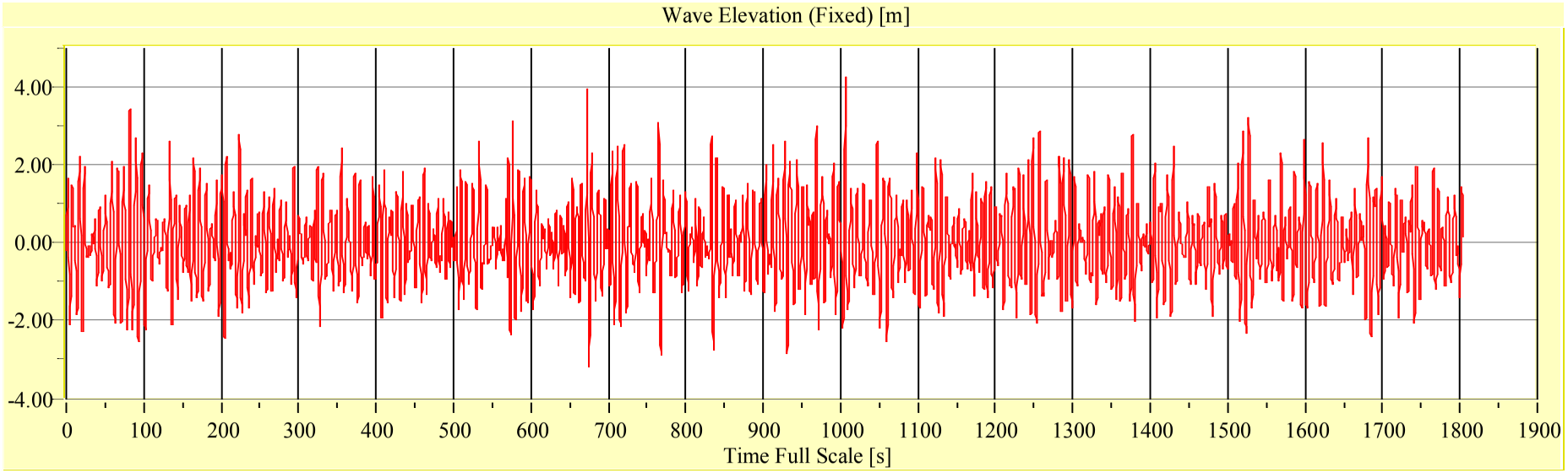


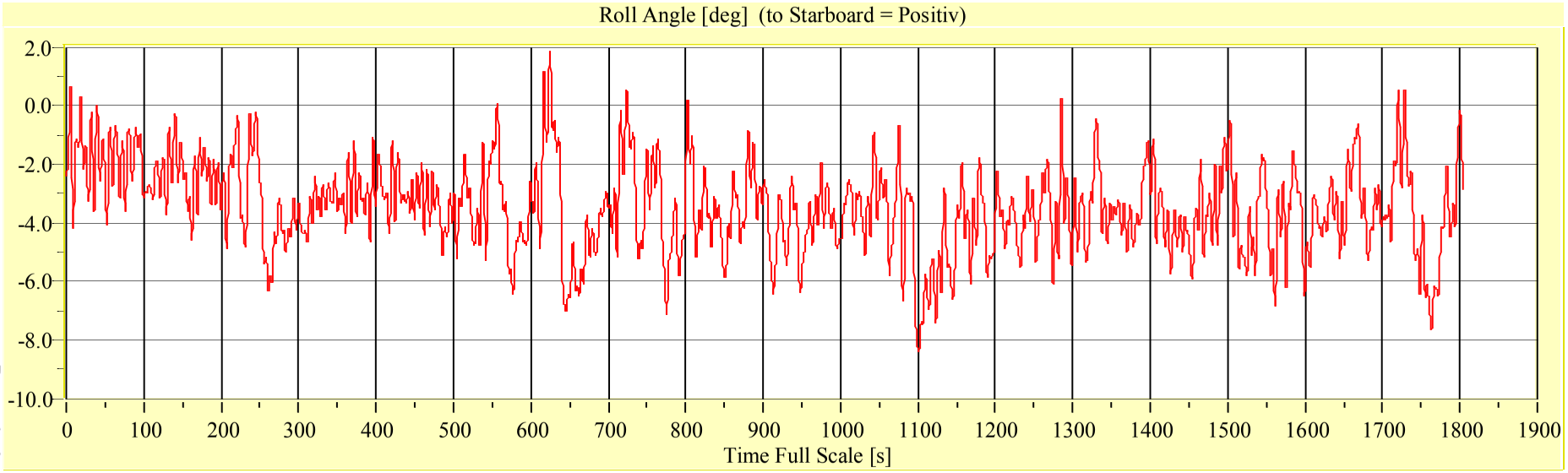



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-04 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



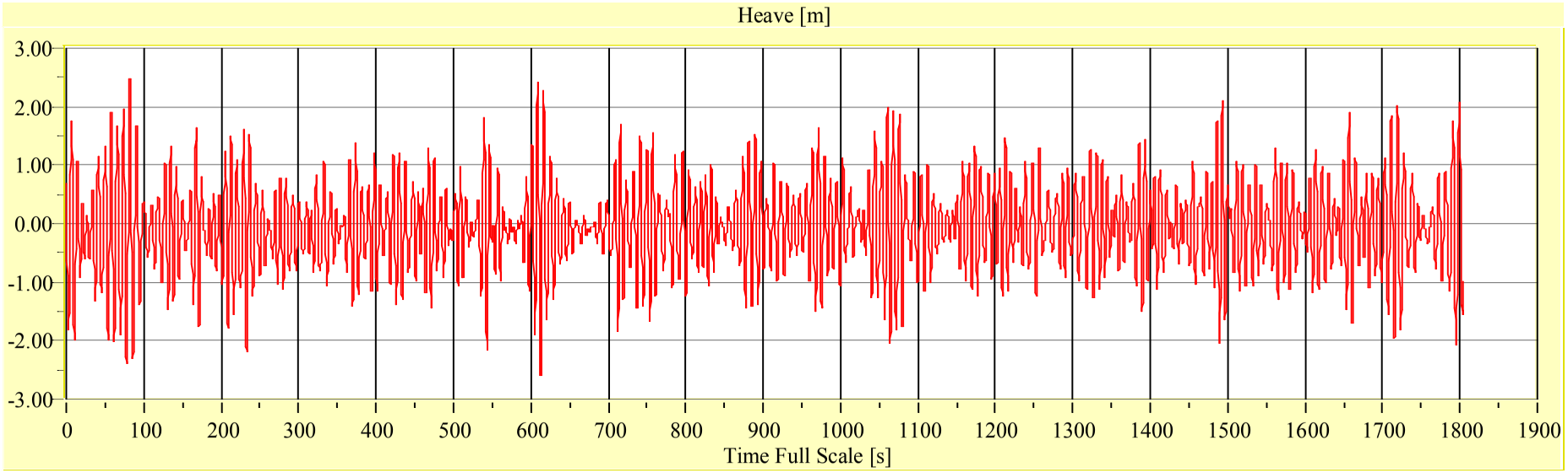



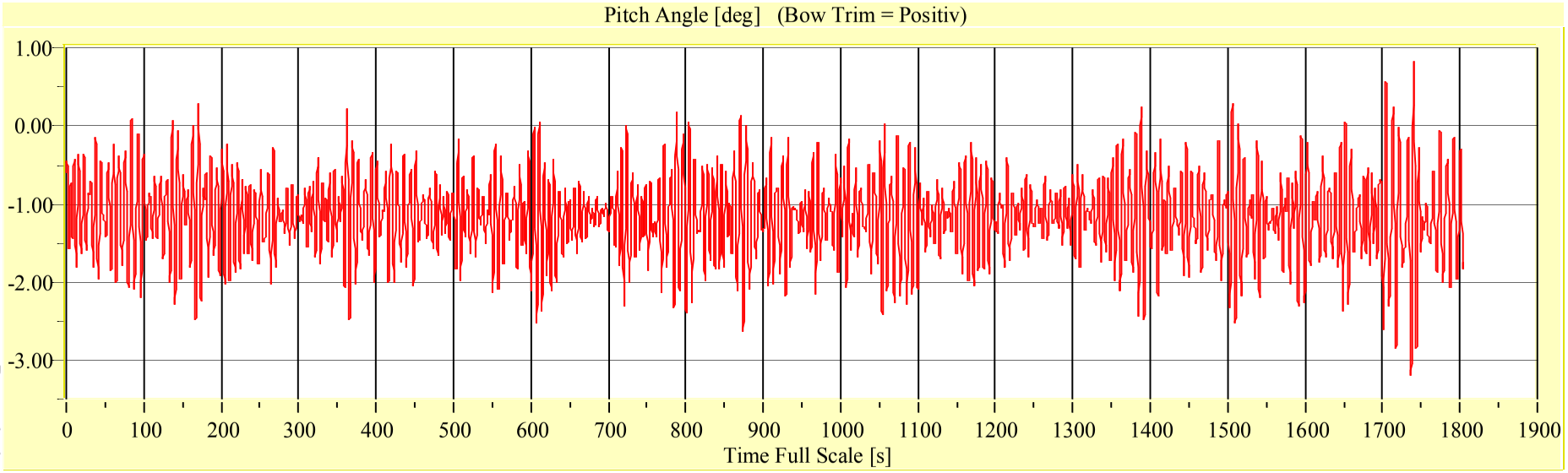



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-04 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



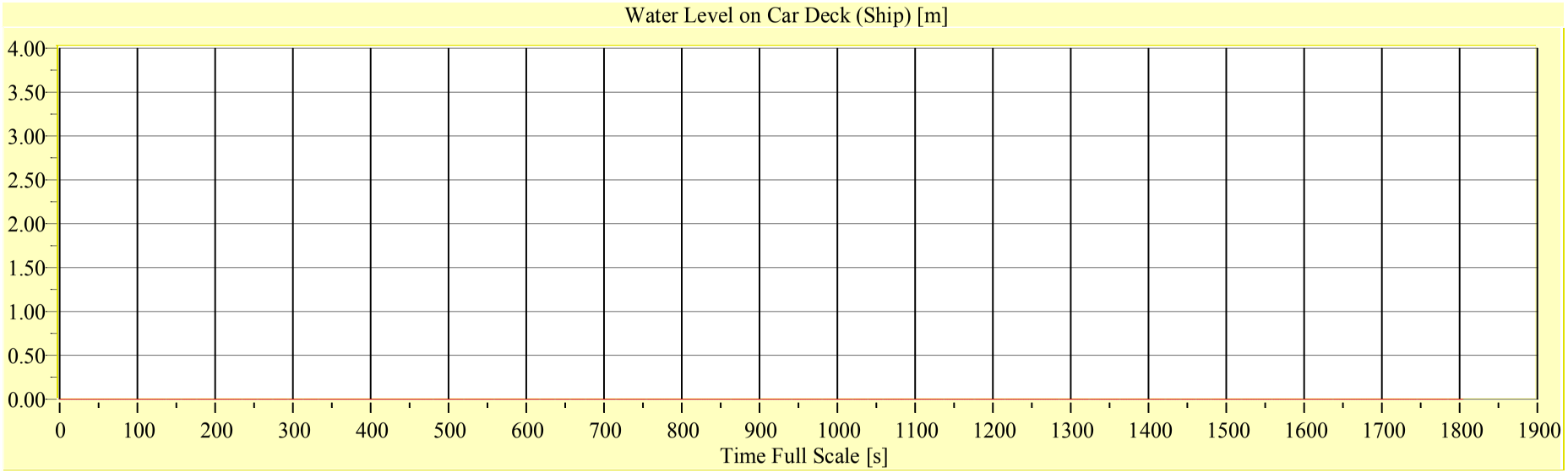



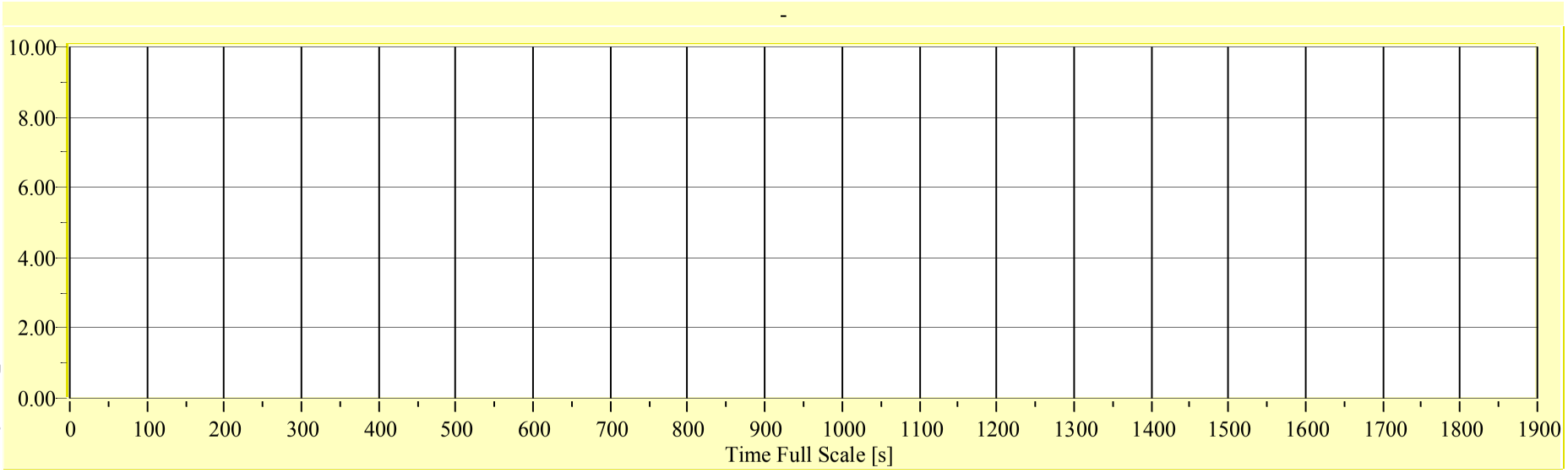



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-04 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



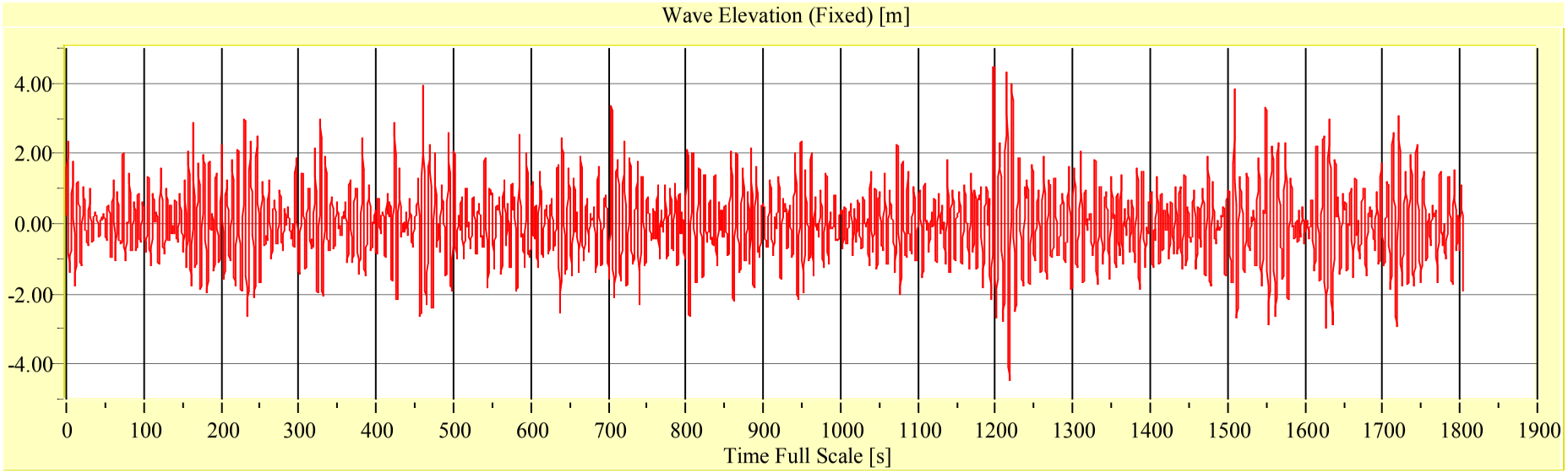



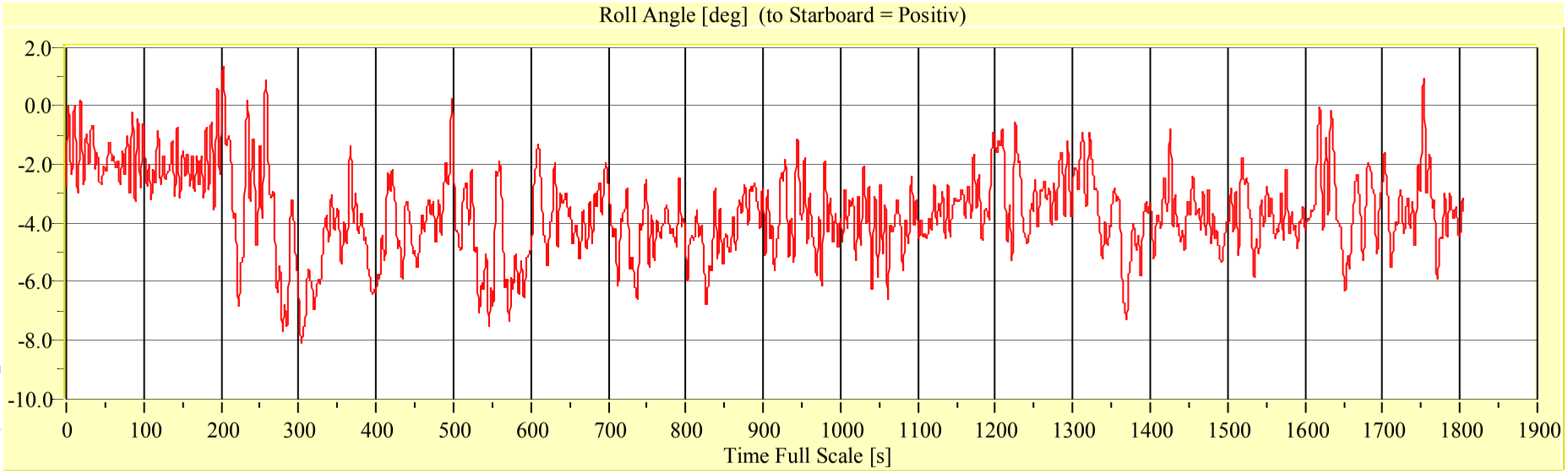



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-05 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



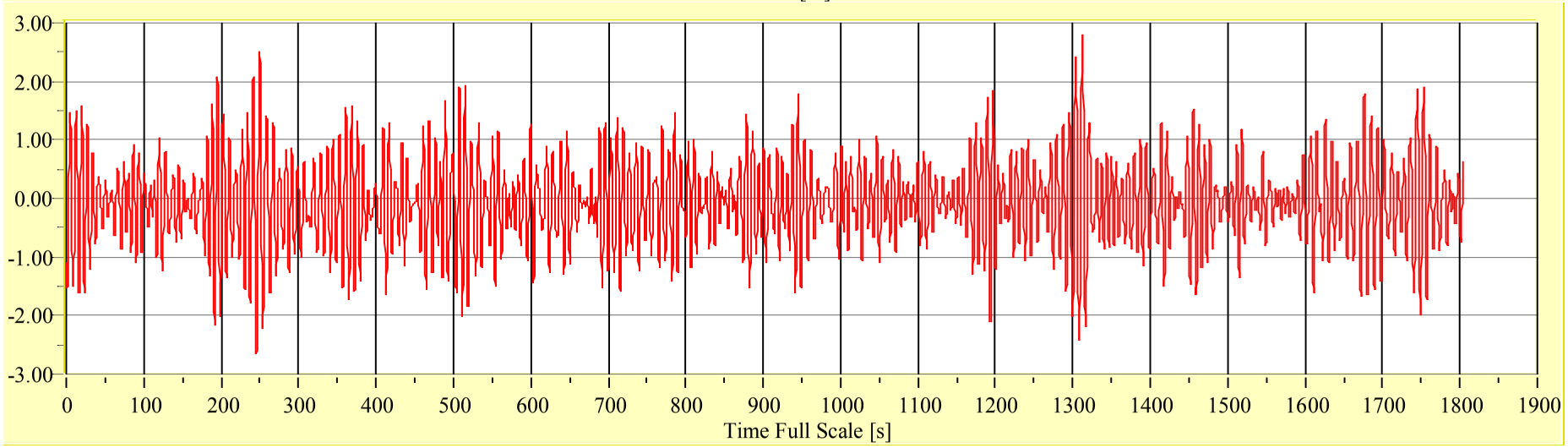



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

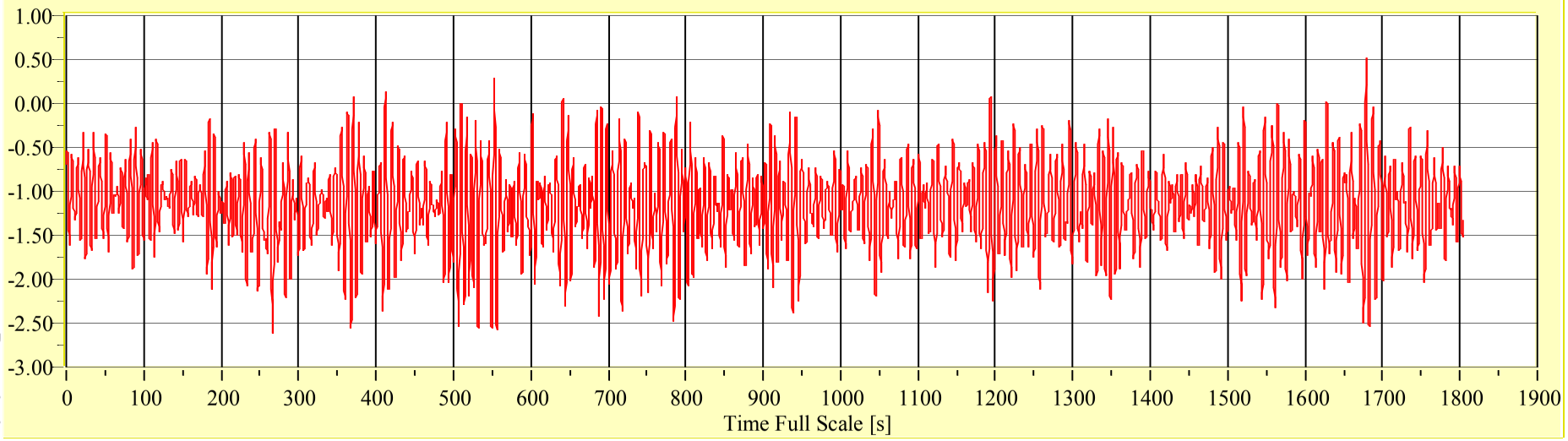
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-05 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Bow Trim = Positiv)

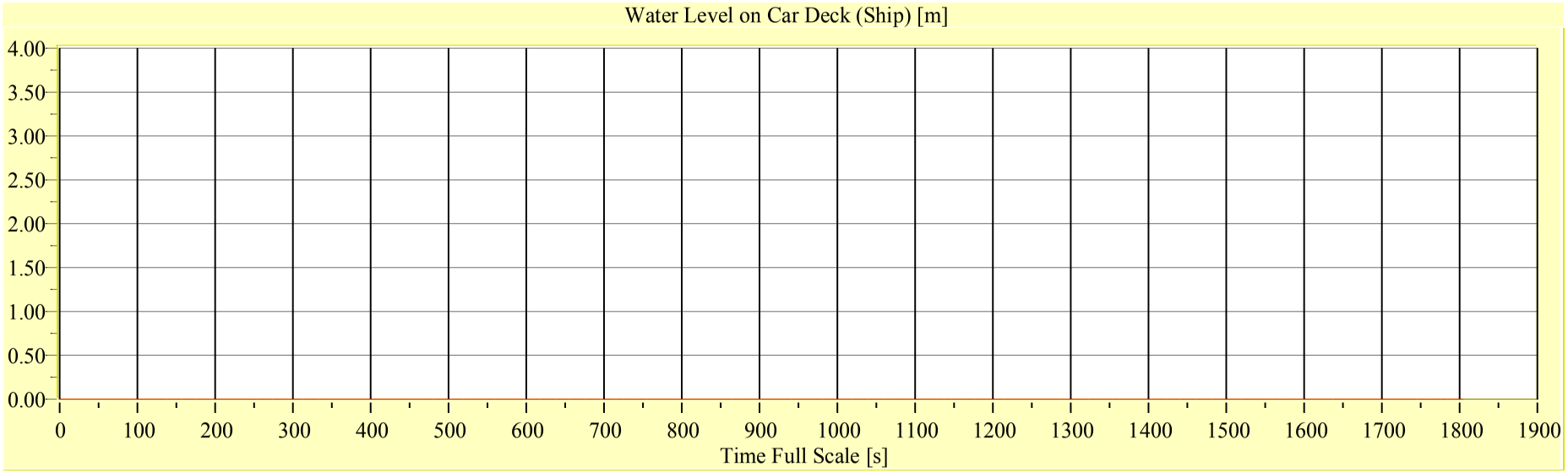


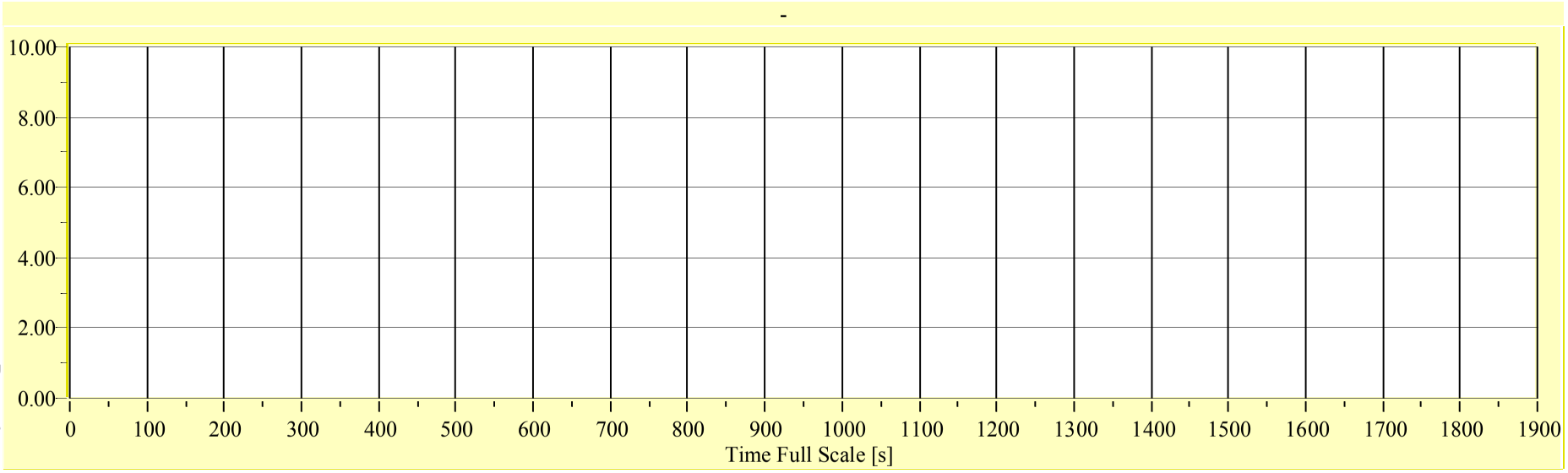



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-05 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



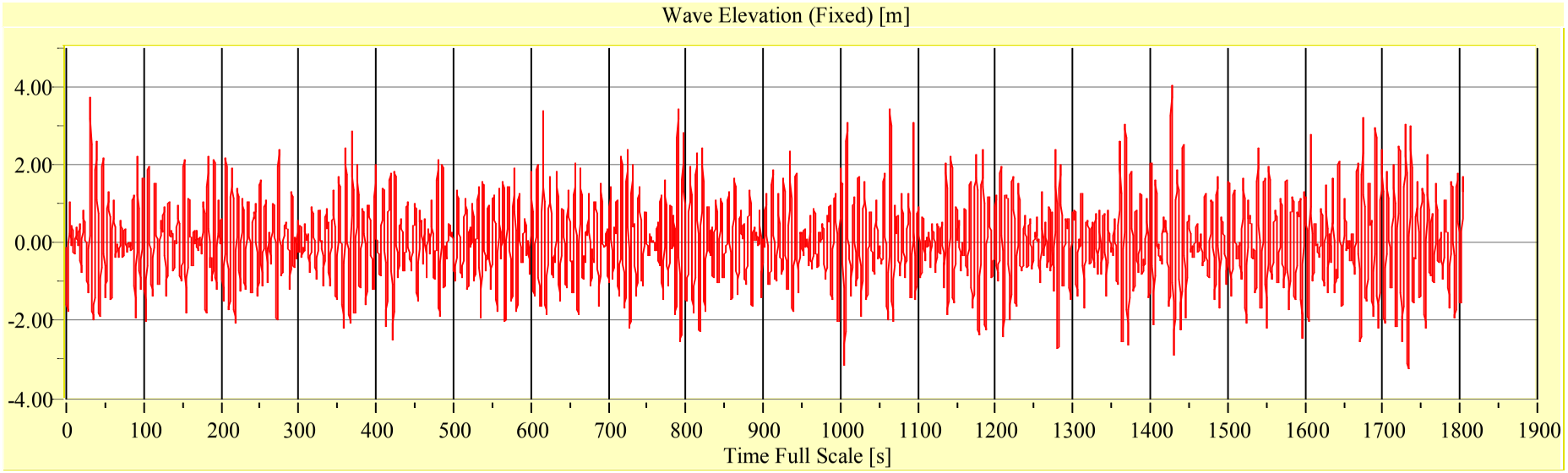



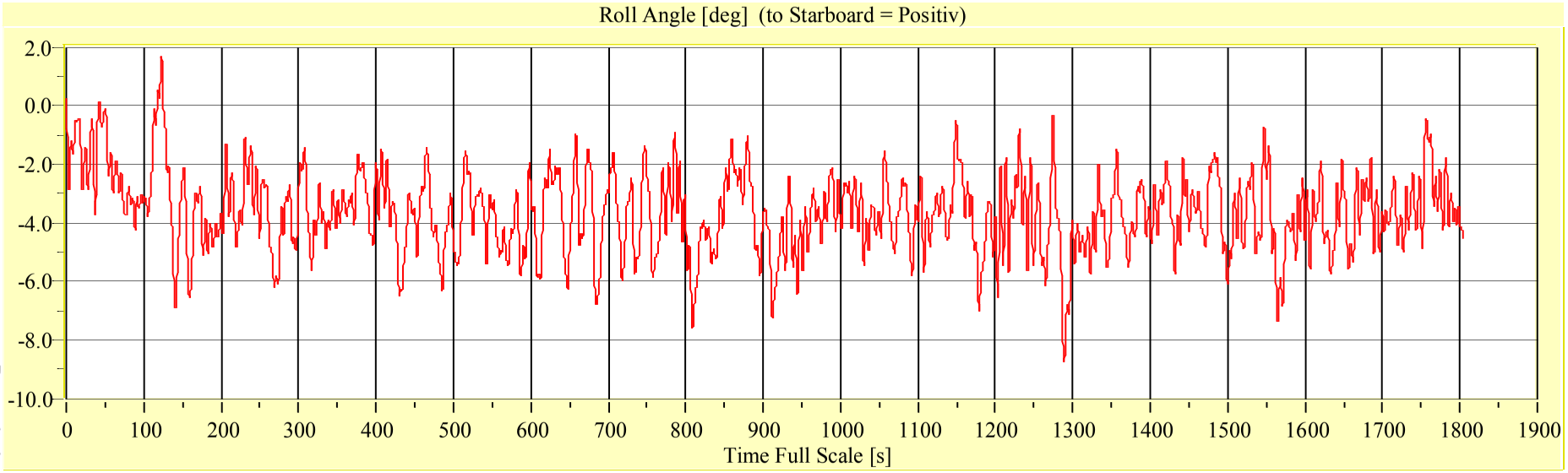



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-06 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



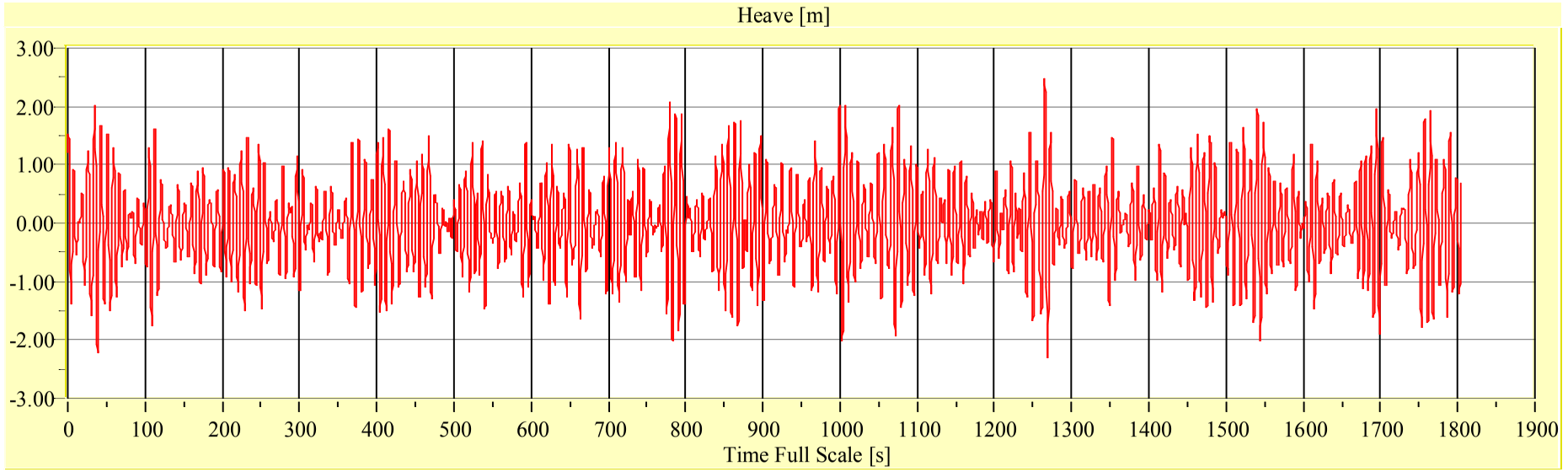



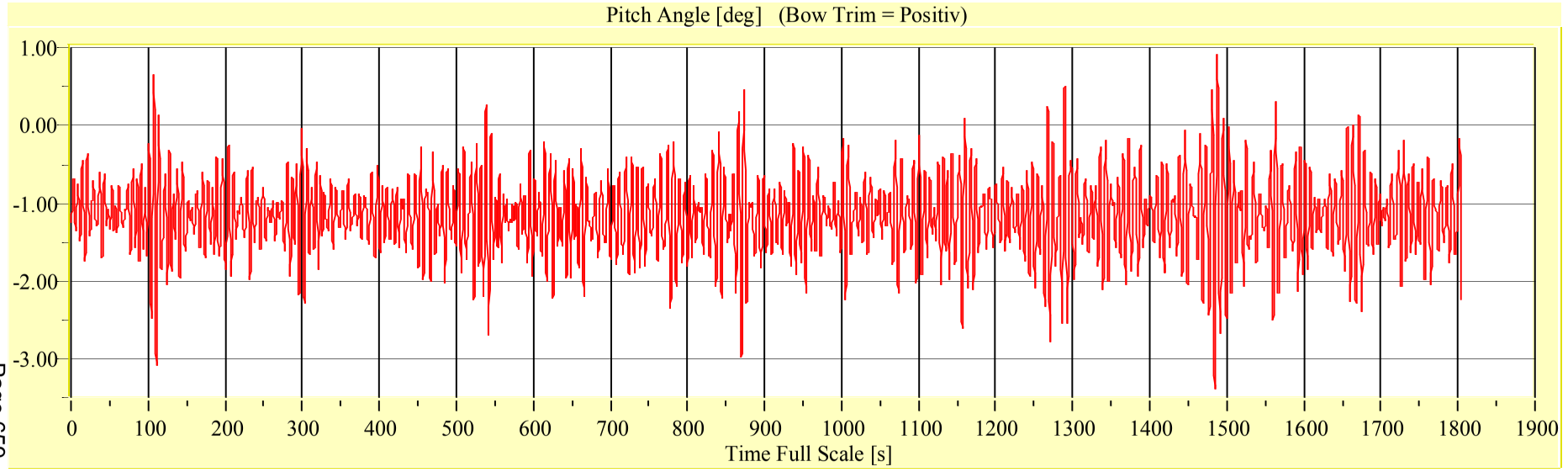



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-06 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



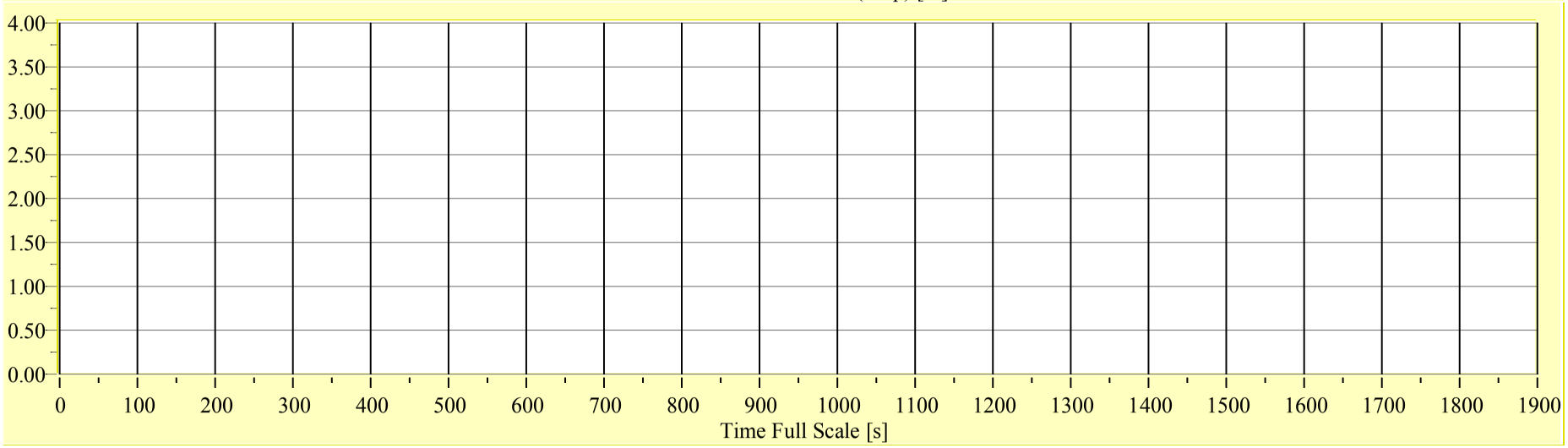



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

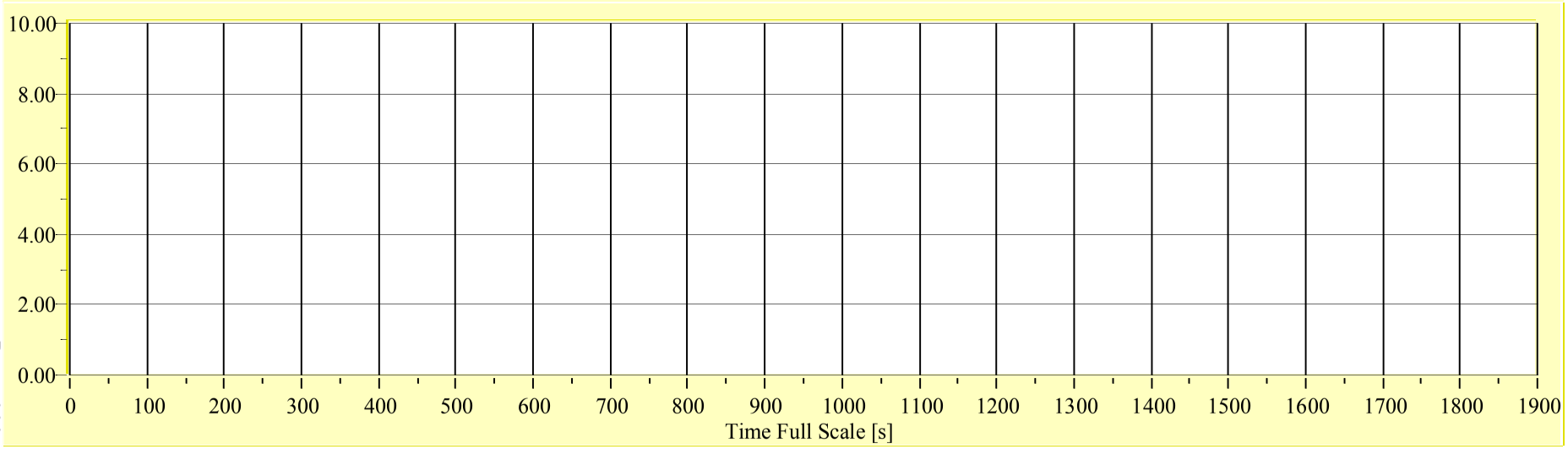
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-06 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Water Level on Car Deck (Ship) [m]




-

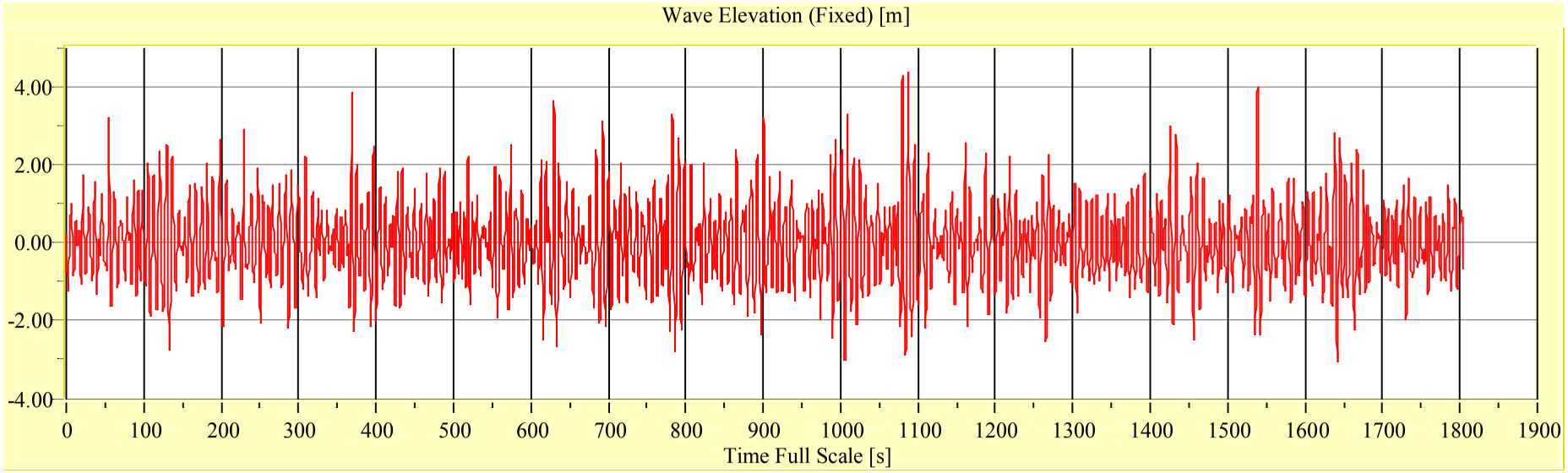


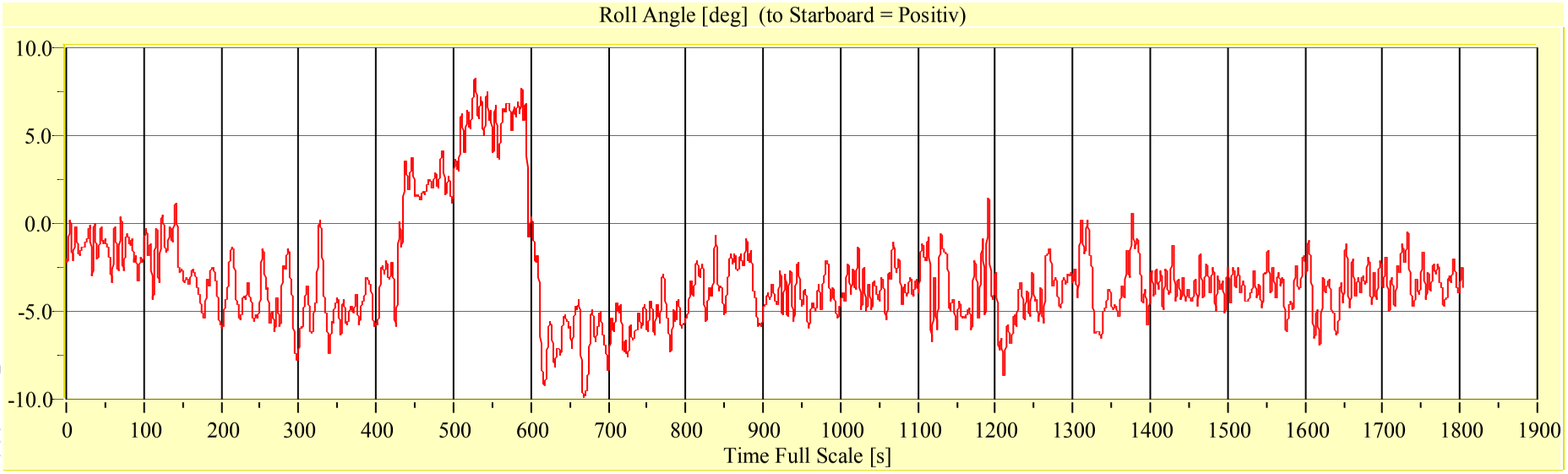



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-07 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



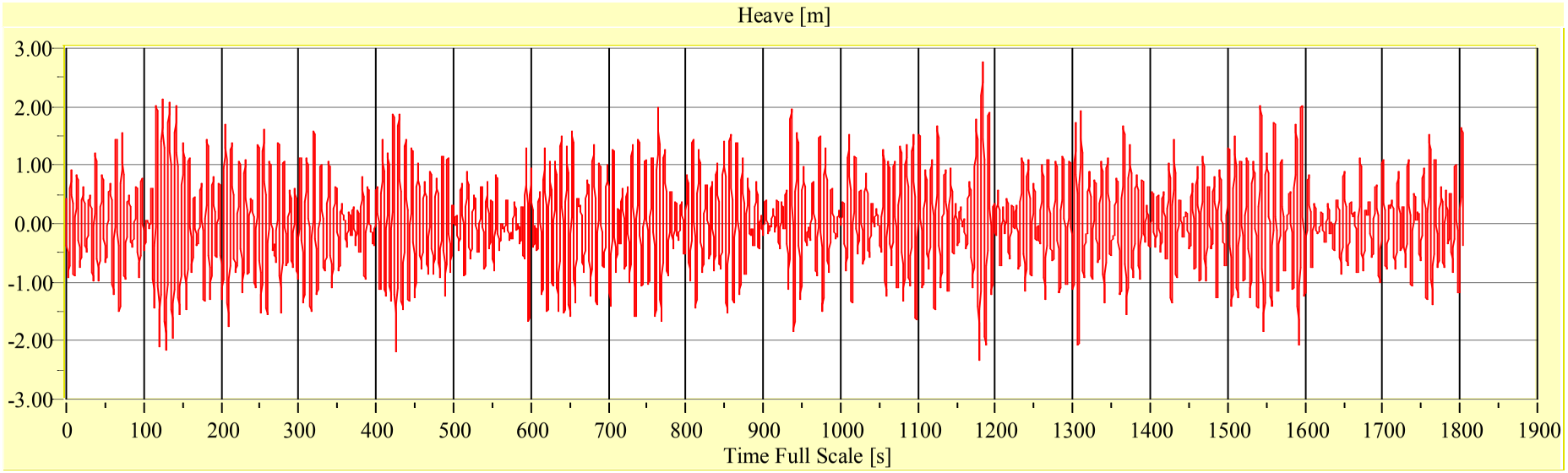



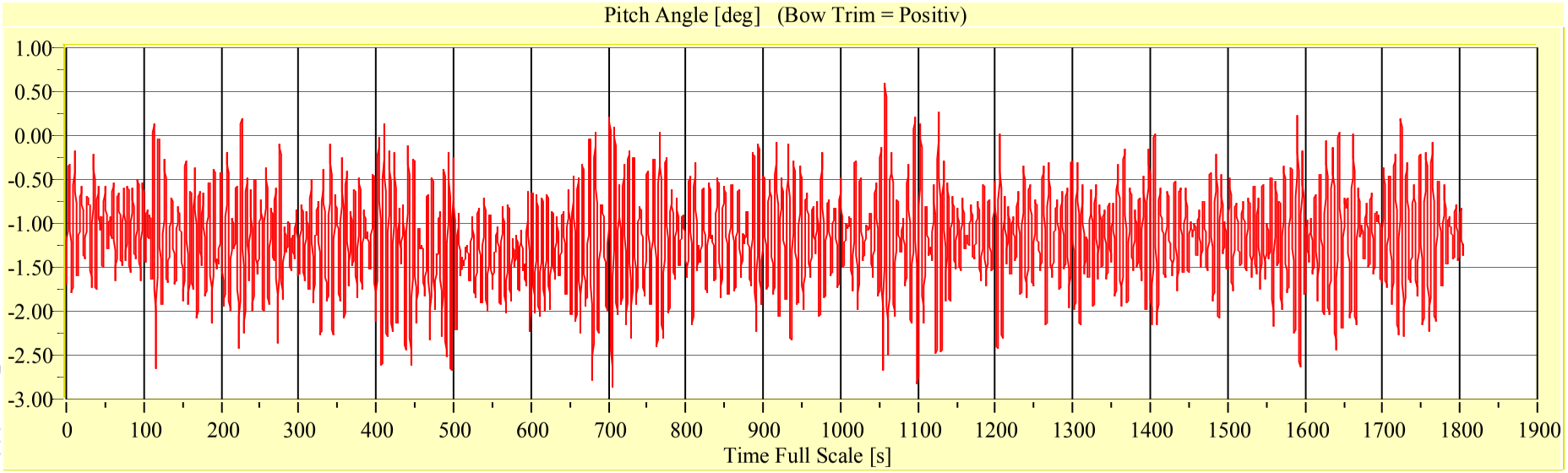



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-07 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



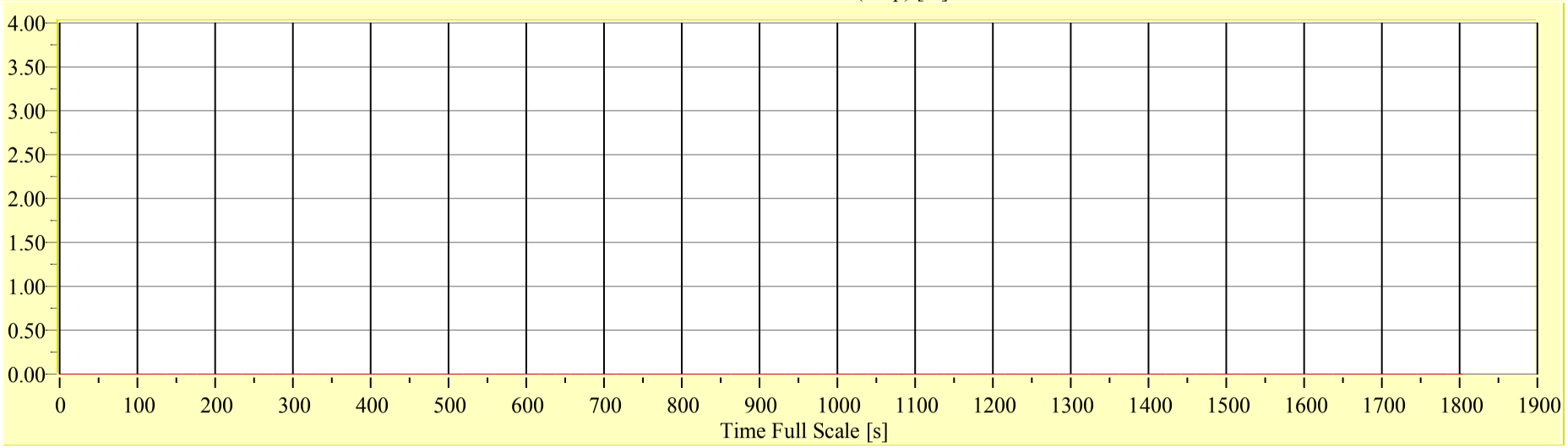



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

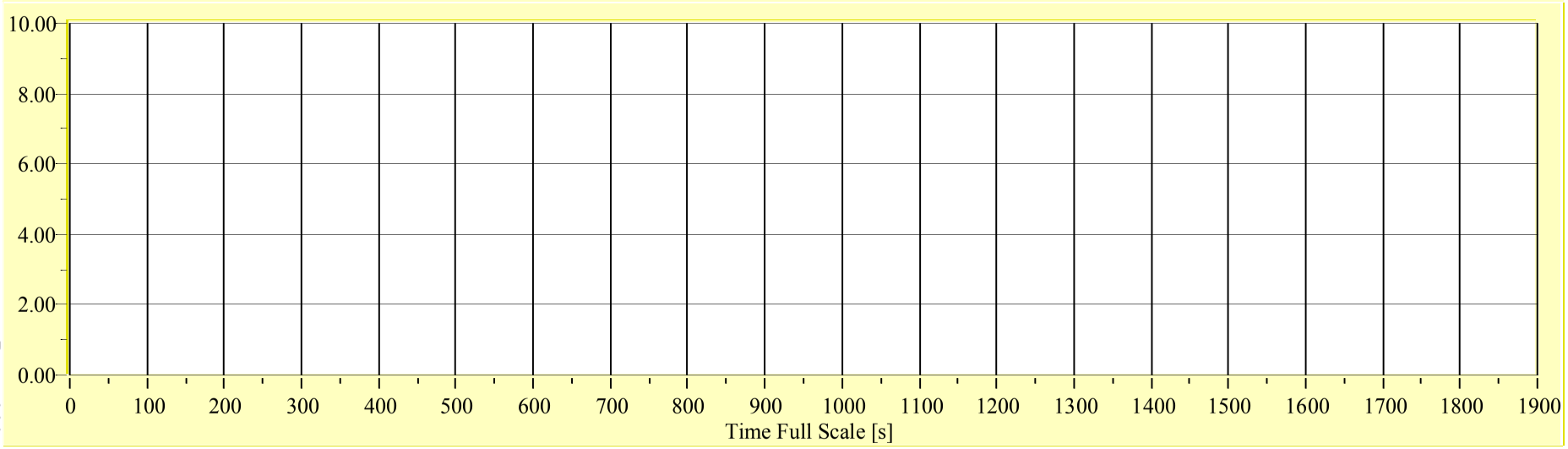
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-07 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Water Level on Car Deck (Ship) [m]




-



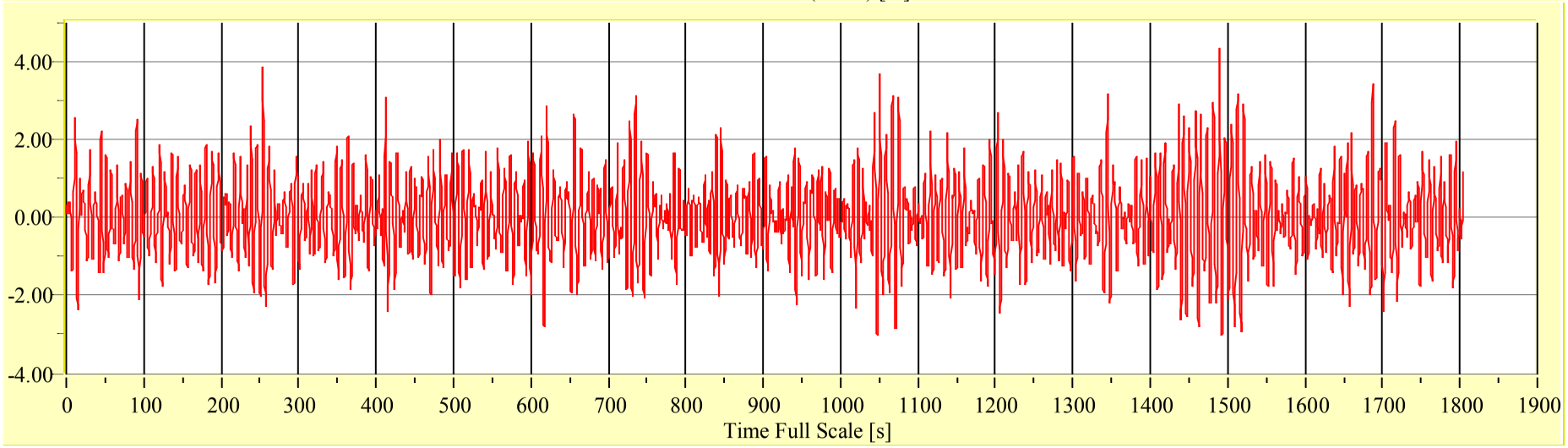



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

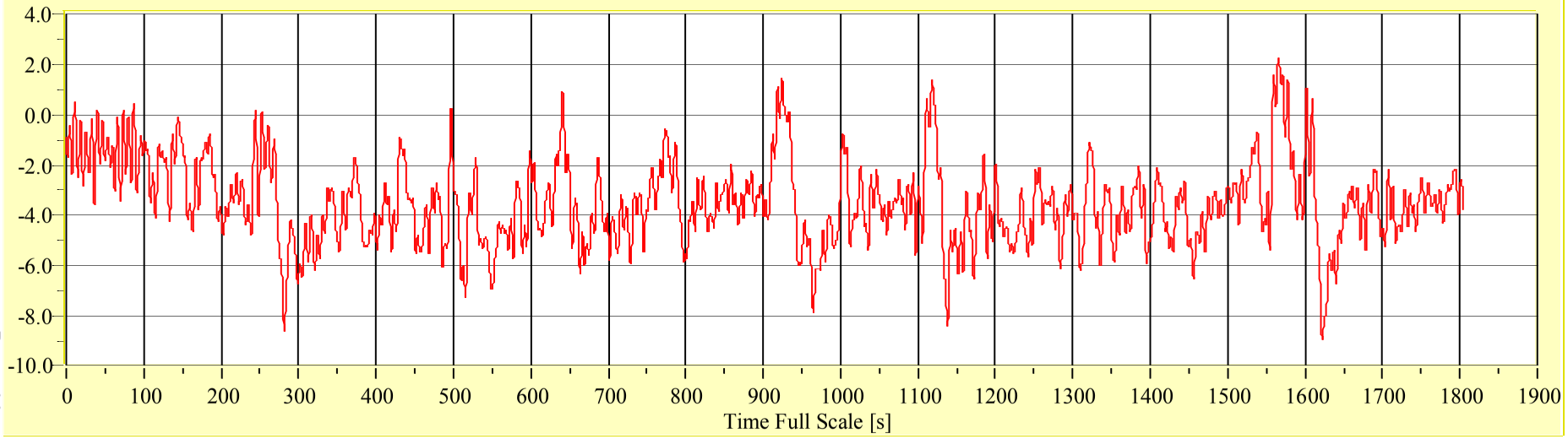
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-08 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to Starboard = Positiv)

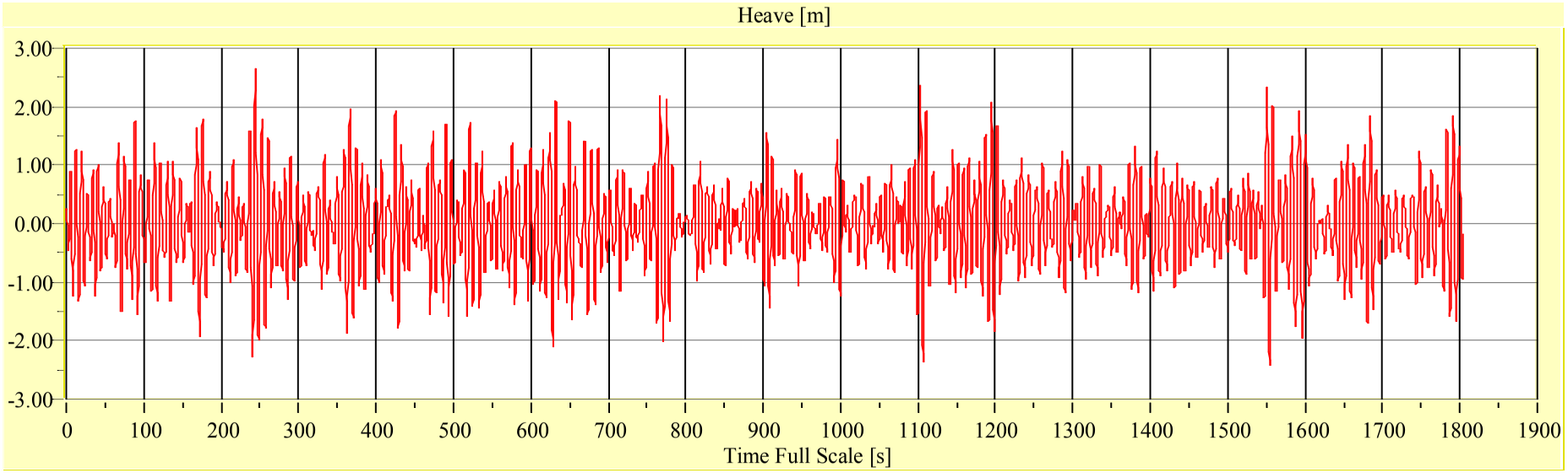


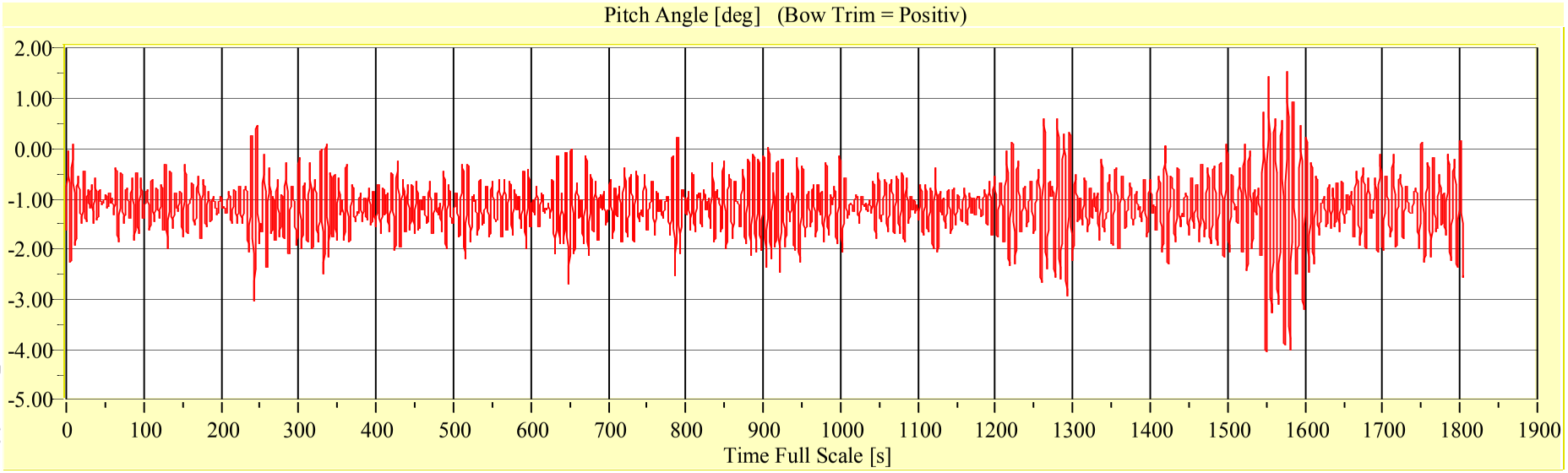



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-08 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



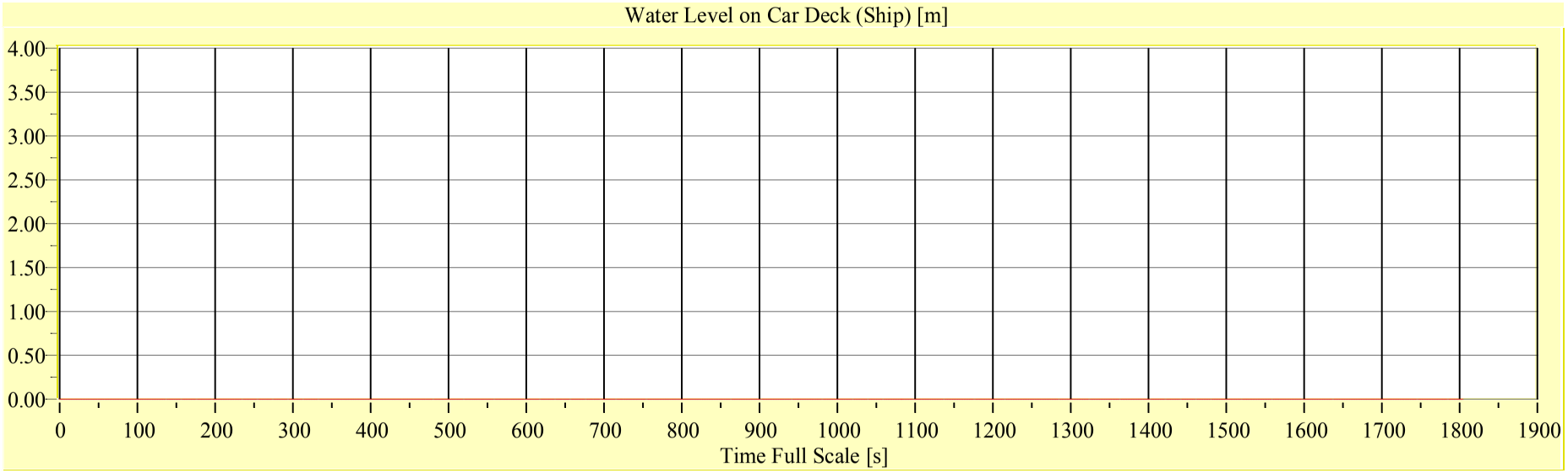



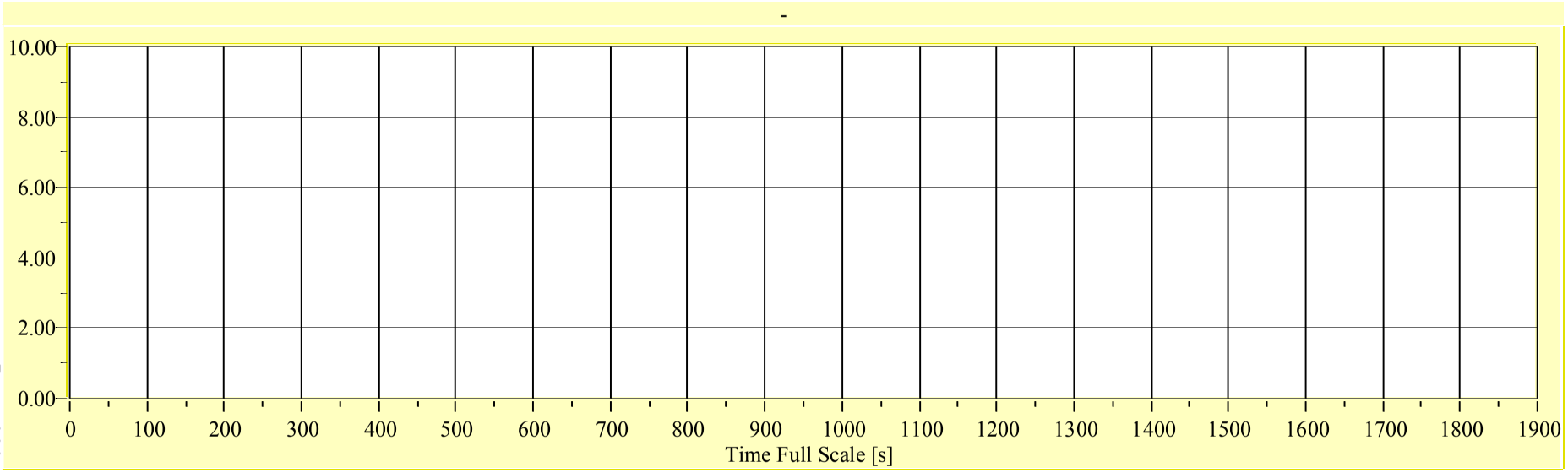



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-08 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



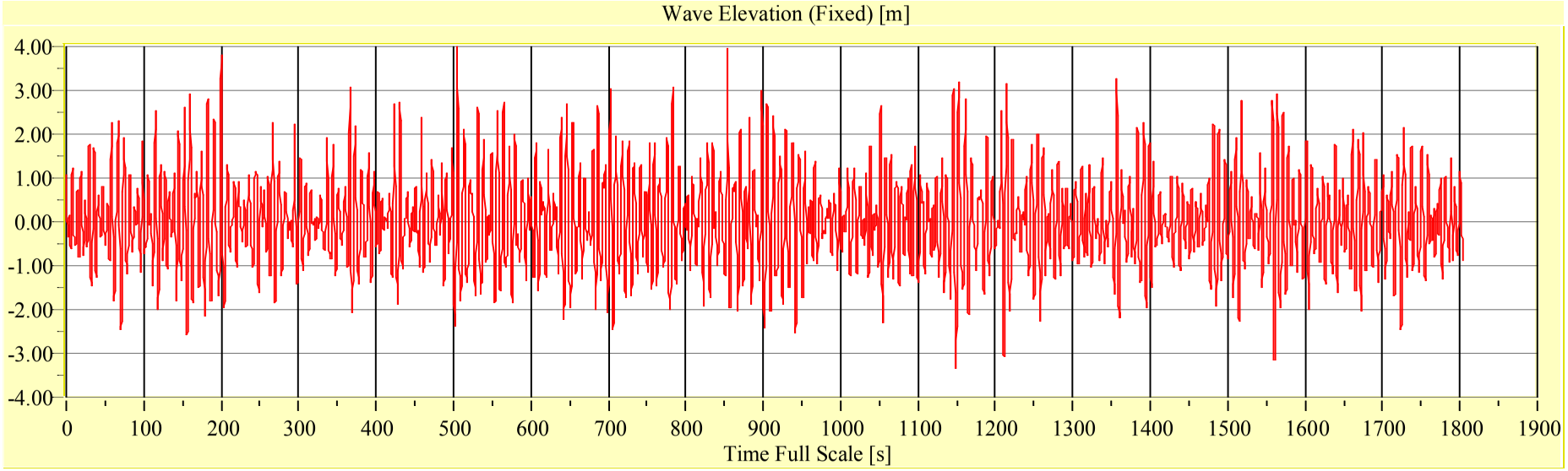



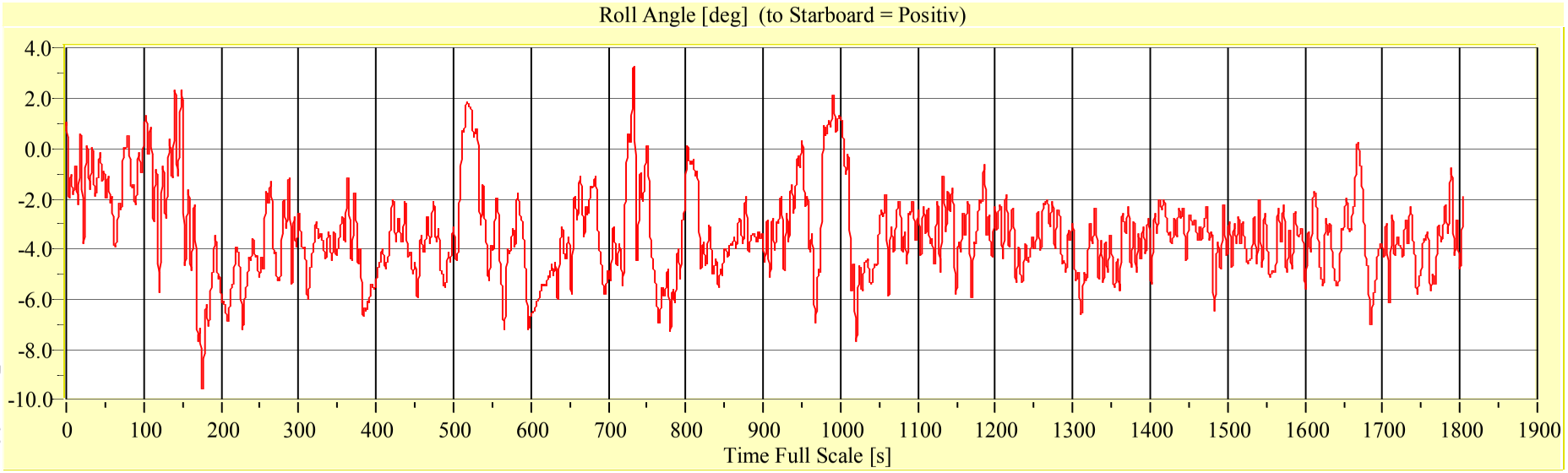



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-09 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



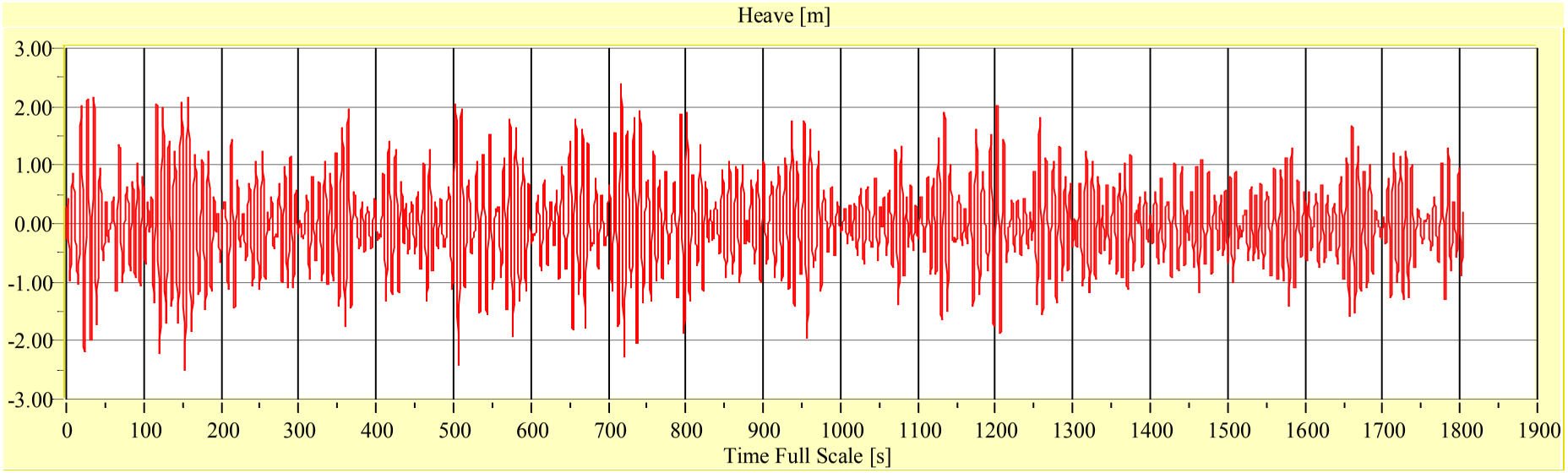



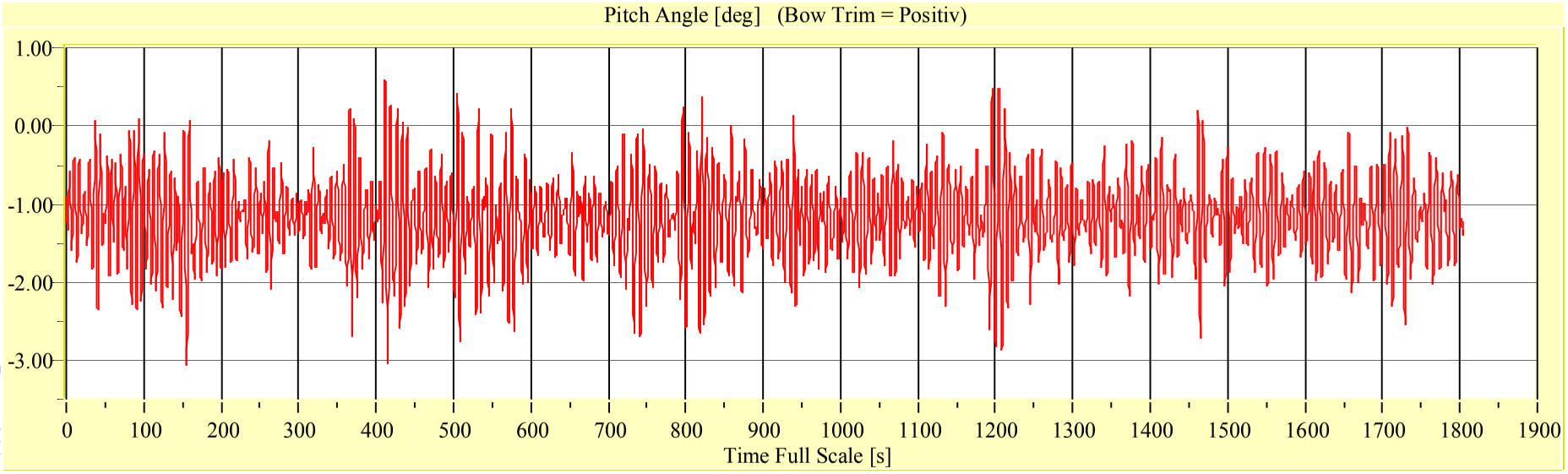



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-09 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



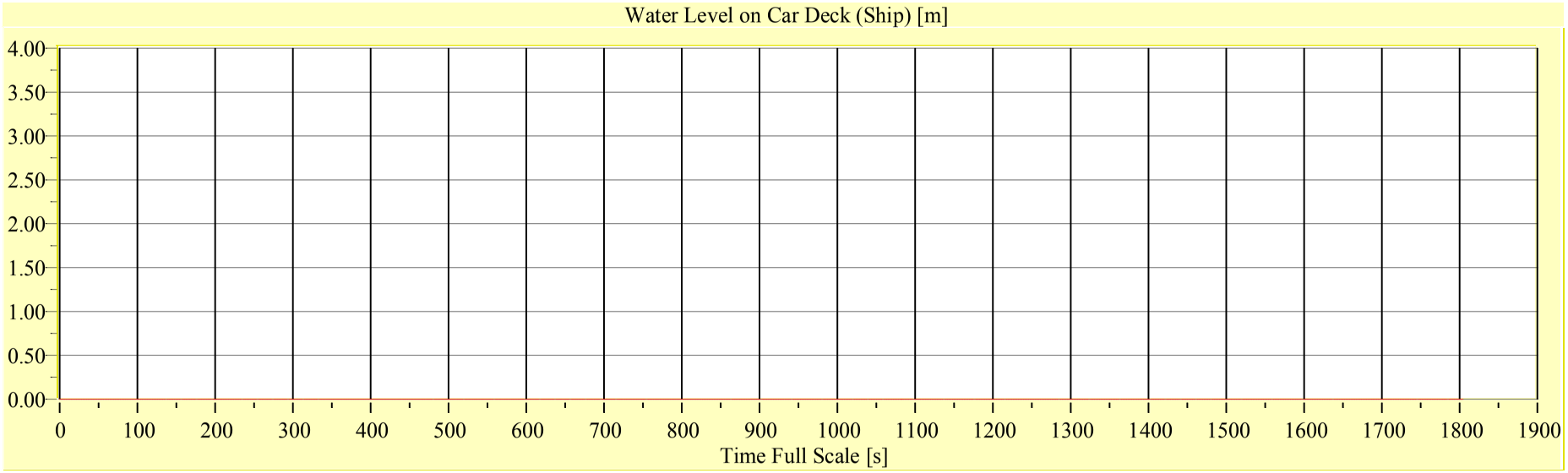



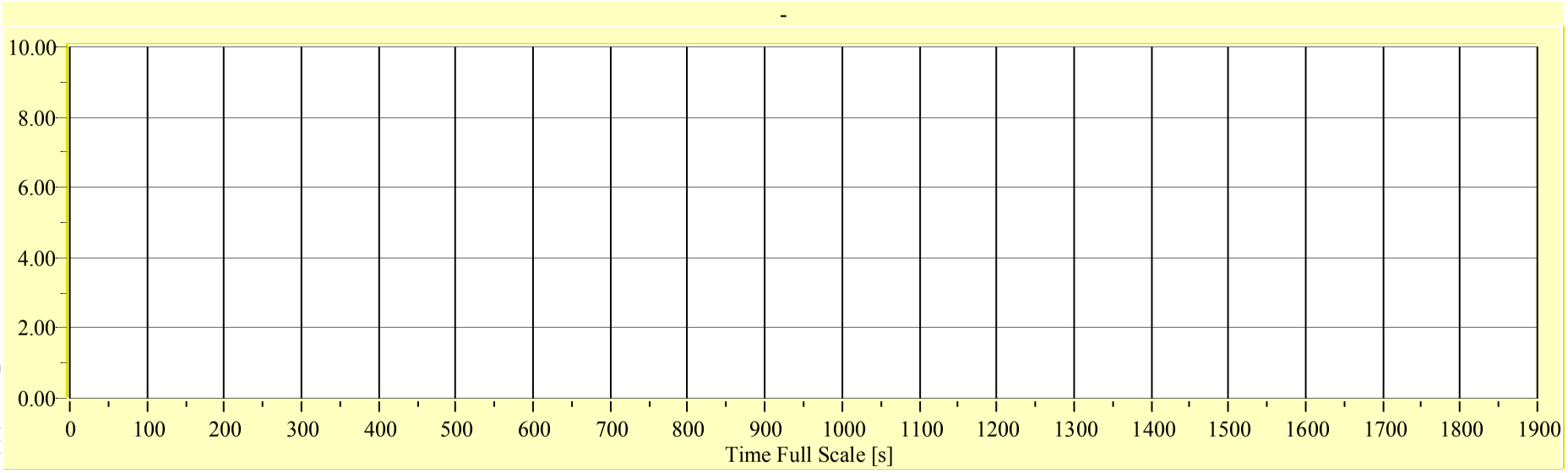



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-09 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



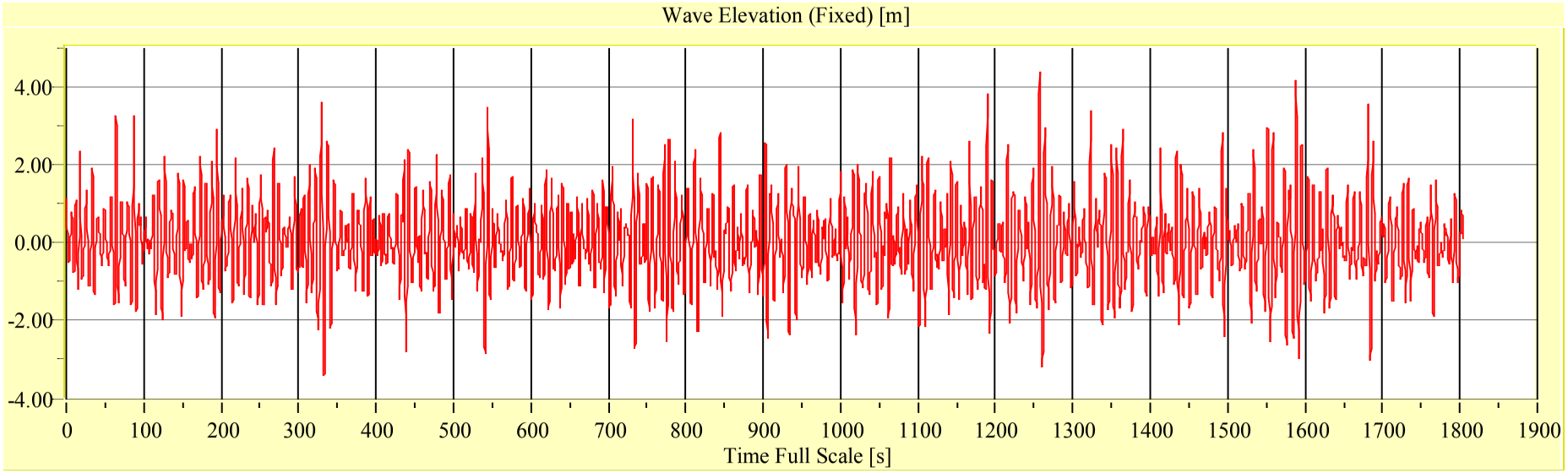



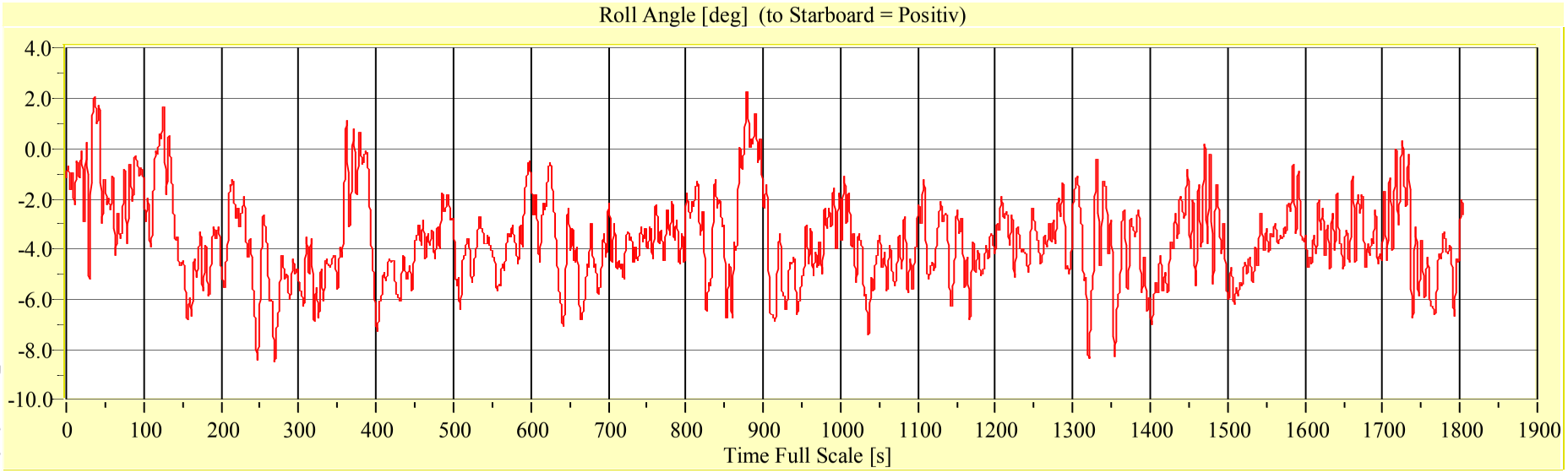



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-10 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



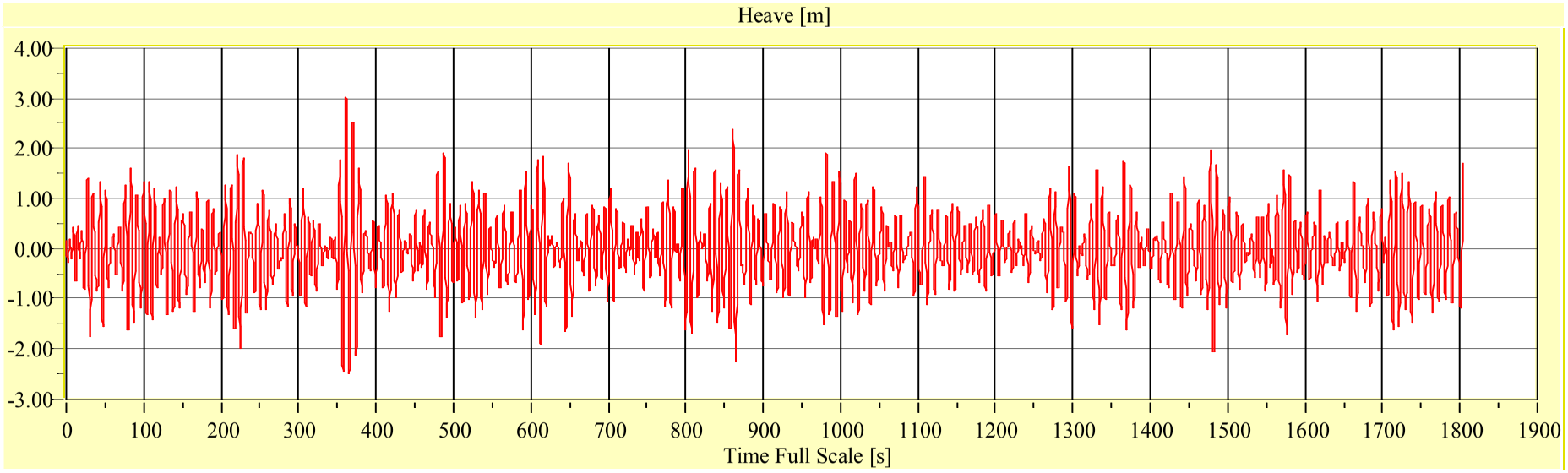



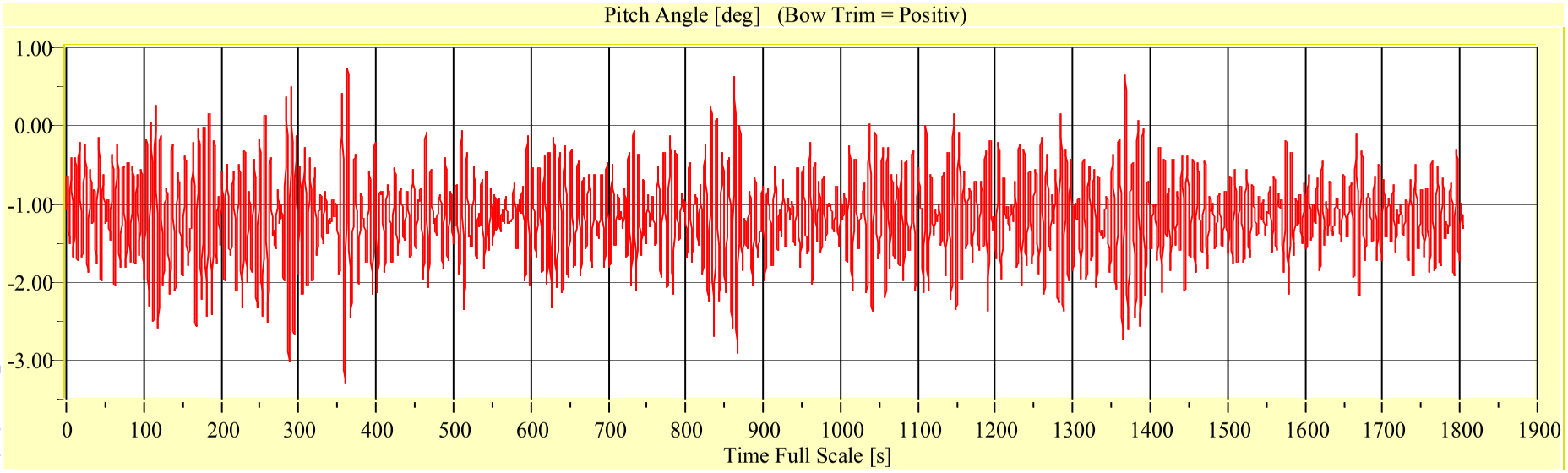



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-10 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|



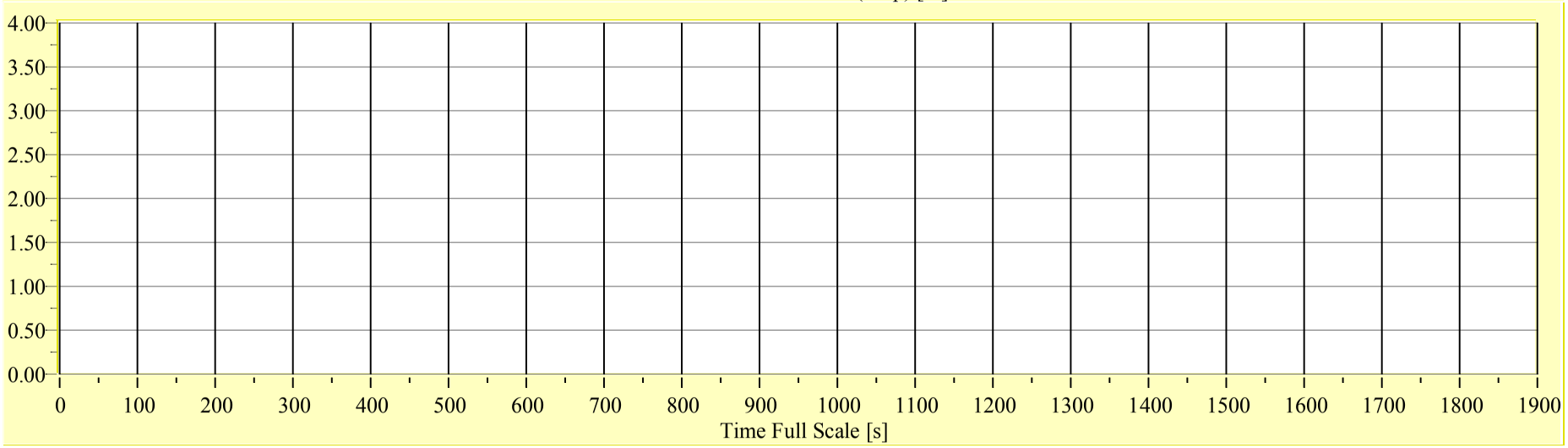



| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

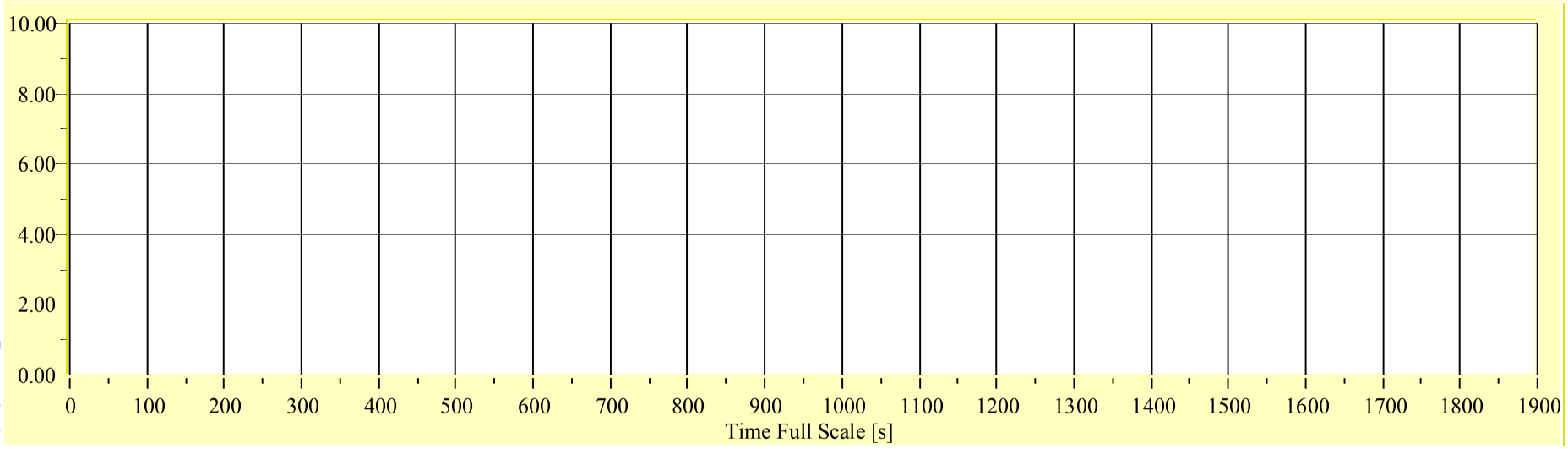
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2446B | Test No. 30000-10 | Target Waves: Hs = 4,00 m Tp = 8,00 s | gamma = 3,3 |
|---|---|---|---|---|

Water Level on Car Deck (Ship) [m]




-






| Date: 11.03.2011 | Project: EMSA 1 | Damage: R7M2_P4-6.1.0-1 |
|---|---|---|

# STOCKHOLM AGREEMENT
# WATER ON DECK MODEL EXPERIMENTS
# FOR PASSENGER/RO-RO VESSEL

# "EMSA 3"

| | | |
|---|---|---|
| Model No. | : | 2458,A |
| Project No. | : | |
| Reference No. | : | |
| Report Date | : | 21/04/2011 |
| Report No. | : | 2458/01 |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DI Dr. Clemens Strasser

| | |
|---|---|
| ***Title:*** | ***Stockholm Agreement Water On Deck Model Experiments for the Passenger/Ro-Ro Vessel "EMSA 3"*** |


## *Summary:*

This report details the model experiments carried out on behalf of "Safety At Sea Ltd." at Vienna Model Basin. The purpose of the model experiments was to investigate the damage survivability of the passenger/Ro-Ro vessel "EMSA 3". The model experiments were performed in accordance with the Model Test Method prescribed in the consolidated edition of EC DIRECTIVE 2003/25/EC which includes the amendments detailed in Directive 2005.12.EC.

The report includes general particulars of the vessel, details of the damage case selection and a description of the experimental procedure. Finally, the results of the experiments are presented.

Measurements were carried out without the model at three different locations within the drift range to ensure the correct wave realisation is used.

The model experiments were carried out in waves characterised by significant wave heights between 2.00 m and 6.00 m. "EMSA 3" survived damage case 1 but did not survive damage case 2.


| | | | |
|---|---|---|---|
| ***Client:*** | *Safety at Sea Ltd.* | ***Report No.:*** | *2458/01* |
| ***Author(s):*** | *Erhard Uhl*<br>_____<br>_____ | ***Checked by:***<br>***Approved by*** | *Clemens Strasser*<br>_____<br>*Clemens Strasser*<br>_____ |


***Keywords:*** **Damage Stability, Model Tests, Survivability, Stockholm Agreement**

# CONTENTS

## GENERAL PARTICULARS

The passenger/Ro-Ro vessel “EMSA 3” is operating in an area, where the significant wave height ($H_S$) is between 2.00 m and 6.00 m. The general particulars of the vessel, both full scale and model scale, are shown in Table 1 (Damage Case 1, R7P15-16.1.0) and Table 1a (Damage Case 2, R7P15-16.2.0-1). The model was constructed in the scale of 1:40.

| Dimension | Full Scale | Model Scale |
|---|---|---|
| $L_{MOD}$ | 193.360 m | 4834.0 mm |
| $L_{BP}$ | 179.100 m | 4477.5 mm |
| B | 30.400 m | 760.0 mm |
| $T_F$ / $T_M$ / $T_Q$/ $T_A$ | 6.700/6.700/6.700/6.700m | 167.5/167.5/167.5/167.5mm |
| D, Depth to Main Deck | 9.50 m | 237.5 mm |
| Displacement in fresh water | 23687.6 tonnes | 370.1 kg |

Table 1: General Particulars of the intact vessel (Damage Case 1, R7P15-16.1.0)

| Dimension | Full Scale | Model Scale |
|---|---|---|
| $L_{MOD}$ | 193.360 m | 4834.0 mm |
| $L_{BP}$ | 179.100 m | 4477.5 mm |
| B | 30.400 m | 760.0 mm |
| $T_F$ / $T_M$ / $T_A$ | 6.700/6.700/6.700/6.700m | 167.5/167.5/167.5/167.5mm |
| D, Depth to Main Deck | 9.50 m | 237.5 mm |
| Displacement in fresh water | 23687.6 tonnes | 370.1 kg |

Table 1a: General Particulars of the intact vessel (Damage Case 2, R7P15-16.2.0-1)

## DAMAGE CASE SELECTION

The damage conditions to be model tested have been selected according to EC DIRECTIVE 2003/25/EC (including amendments) and are defined as follows:

- The worst SOLAS damage is selected from those damages where the centerline of the damage opening lies within the range ± 35% $L_{BP}$ from midships and is taken to be that which gives the least total area under the residual stability curve (Appendix to Annex I Paragraph 3.1).
- If the worst SOLAS damage location is outside the range ±10%$L_{BP}$ from midship, a second MIDSHIP damage condition is to be selected within ±10%$L_{BP}$ range and is taken to be that which gives the least total area under the residual stability curve. (Appendix to Annex I Paragraph 3.1).

**Worst (SOLAS) Damage Case**

The worst SOLAS damage was selected over the trim range of the vessel from 0.00 m stern trim to 0.00 m bow trim. The overall worst damage case and associated initial condition is shown below.

Damage: R7P15-16.1.0
Draught: 6.70 m
Trim: 0.0 m trim by Stern
KG: 15.50 m
GM: 2.30 m

Damage: R7P15-16.1.0
Draught: 6.70 m
Trim: 0.0 m trim by Stern
KG: 15.50 m
GM: 2.03 m

Damage: R7P15-16.2.0-1
Draught: 6.70 m
Trim: 0.0 m trim by Stern
KG: 15.50 m
GM: 2.30 m

The damage opening for both damage cases is centered on frame 130.

## DAMAGE CASE SELECTION

### Model Test Damage Case Hydrostatics

Model test damage case hydrostatics can be found in Appendix A.

It should be noted that these hydrostatics are calculated for the hull without appendages, in line with the hull to be used in the model test, floating in water with a density of 1.025 t/m$^3$. Furthermore, the displacements shown in Appendix C, differ to those shown in Appendix A as they have been calculated with a fluid density of 1.000 t/m$^3$ as is the case during the model experiments.

## CONSTRUCTION OF THE MODEL

The model was constructed by plywood, Plexiglas and foam. The shell of the hull is made of 5 mm which plywood, covered with fiberglass. The skeg was modeled, but other appendages such as rudders, thrusters, fin stabilizers are not modeled.

Transverse watertight bulkheads below the car deck were constructed using plywood covered with fiberglass. The intact tanks below the car deck were constructed using foam. The car deck was constructed using 3 mm clear Plexiglas to aid observation, especially with regards leakage.

Two vertical bars were fixed aft and forward of the model with a horizontal bar attached in between these two. The horizontal bar supports the ballast weights and can be adjusted vertically in order to alter the vertical centre of gravity of the model.

Wooden bars are attached along the top edges of the model, both longitudinally and transversally, in order to improve the stiffness of the model.

Model test information and damage drawings for the model are given in Appendix A and photographs of the model are given in Appendix B.

## LOADING CONDITION AND BALLASTING

Safety At Sea Ltd provided the loading conditions for the damage cases; WORST SOLAS DAMAGES (Damage Case 1 R7P15-6.1.0) and (Damage Case 2 R7P15-16.2.0-1).

Both the full scale and model scale values are summarized in Table 3 and Table 3a along with the values that were measured at the time of the experiments.

| Item | Full Scale | Model Scale | |
|---|---|---|---|
| | | Calculated | Measured |
| Displacement/ Weight | 23687.6 t | 370.1 kg (Fresh water) | 371.0 kg (Fresh water) |
| Draught AP, Port | 6.700 m | 167.5 mm | --- mm |
| Draught AP, Starboard | 6.700 m | 167.5 mm | --- mm |
| Draught 0.25LBP, Port | 6.700 m | 167.5 mm | 167.5 mm |
| Draught 0.25LBP, Starboard | 6.700 m | 167.5 mm | 167.5 mm |
| Draught Amidship, Port | 6.700 m | 167.5 mm | 167.5 mm |
| Draught Amidship, Starboard | 6.700 m | 167.5 mm | 167.5 mm |
| Draught FP | 6.700 m | 167.5 mm | 167.5 mm |
| Trim by Stern | 0.0 m | 0.0 mm | 0.0 mm |

Table 3: Intact Vessel Particulars, worst SOLAS damage R7P15-16.1.0

| Item | Full Scale | Model Scale | |
|---|---|---|---|
| | | Calculated | Measured |
| Displacement/ Weight | 23687.6 t | 370.1 kg (Fresh water) | 371.0 kg (Fresh water) |
| Draught AP, Port | 6.700 m | 167.5 mm | --- mm |
| Draught AP, Starboard | 6.700 m | 167.5 mm | --- mm |
| Draught 0.25LBP, Port | 6.700 m | 167.5 mm | 167.5 mm |
| Draught 0.25LBP, Starboard | 6.700 m | 167.5 mm | 167.5 mm |
| Draught Amidship, Port | 6.700 m | 167.5 mm | 167.5 mm |
| Draught Amidship, Starboard | 6.700 m | 167.5 mm | 167.5 mm |
| Draught FP | 6.700 m | 167.5 mm | 167.5 mm |
| Trim by Bow | 0.0 m | 0.0 mm | 0.0 mm |

Table 3a: Intact Vessel Particulars, SOLAS damage R7P15-16.2.0-1

## INCLINING EXPERIMENT

### PROCEDURE

The inclining test was performed following standard practice. One weight belonging to the ballast weight was transferred to a known distance first to the port side and then to the starboard side, measuring each time the ensuing angle of inclination using an inclinometer. The average inclination was used to find the GM using the following equations:

$$\Phi_{AV} = \frac{\Phi_P + \Phi_{ST}}{2}$$

$$GM = \frac{wd}{\Delta \cdot \tan\left(\Phi_{AV}\right)}$$

$$KG = KM - GM$$

Where:

| | | |
|---|---|---|
| | w | one weight (kg) |
| | d | horizontal distance between weights (m or mm) |
| | $\Phi_{AV}$ | average angle of inclination (deg) |
| | $\Delta$ | model weight (incl. w) |

A test was conducted for each damage case using the intact loading condition as described previously and the results are shown in Table 4, Table 4a and Table 4b.

### WORST SOLAS DAMAGE (DAMAGE CASE 1 R7P15-6.1.0)

| Item | Full Scale | Model Scale (1:40) |
|---|---|---|
| Weight $\Delta$ | 23687.6 tonnes | 370.1 kg |
| $KM_T$ | 17.530 | 438.3 mm |
| d | 8.0 m | 200.0 mm |
| w | 318400 kg | 4.975 kg |
| **Target $GM_T$** | **2.30 m** | **57.5 mm** |
| Measured angle of inclination $\Phi$ | 2.681 deg | 2.681 deg |
| **Measured $GM_T$** | **2.291 m** | **57.275 mm** |

Table 4: Inclining test results for the intact model

| Item | Full Scale | Model Scale (1:40) |
|---|---|---|
| Weight $\Delta$ | 23687.6 tonnes | 370.1 kg |
| $KM_T$ | 17.530 | 438.3 mm |
| d | 8.0 m | 200.0 mm |
| w | 318400 kg | 4.975 kg |
| **Target $GM_T$** | **2.03 m** | **50.75 mm** |
| Measured angle of inclination $\Phi$ | 3.0455 deg | 3.0455 deg |
| **Measured $GM_T$** | **2.0163 m** | **50.407 mm** |

Table 4a: Inclining test results for the intact model

## INCLINING EXPERIMENT

### WORST SOLAS DAMAGE (DAMAGE CASE 2 R7P15-6.2.0-1)

| Item | Full Scale | Model Scale (1:40) |
|---|---|---|
| Weight Δ | 23687.6 tonnes | 370.1 kg |
| $KM_T$ | 17.530 m | 438.3 mm |
| d | 8.0 m | 200.0 mm |
| w | 318400 kg | 4.975 kg |
| **Target $GM_T$** | **2.3 m** | **57.5 mm** |
| Measured angle of inclination Φ | 2.679 deg | 2.679 deg |
| **Measured $GM_T$** | **2.2927 m** | **57.3175 mm** |

Table 4b: Inclining test results for the intact model

## ROLL RADIUS OF GYRATION

According to the Model Test Method, the roll radius of gyration ($K_{XX}$) of the intact model should be in the range **0.35B** to **0.40B**, where B refers to the beam of vessel. It is also important to ensure an accurate modelling of the vessel´s dynamic characteristics so that an essential departure from 0.4B must be avoided. Free rolling tests in air were carried out in order to estimate the natural roll period ($T_n$). The roll radius of gyration can then be determined using the following expression:

$$K_{xx} = \sqrt{\frac{gh}{(2\pi / T_n)^2} - h^2}$$

Where: h = distance between centre of rotation and centre of gravity (m)
$T_n$ = natural roll period in air of model system (sec)

A summary of the intact free rolling tests is given in the tables 5, 5a and 5b, while the time histories of the tests are given in Appendix E, E1 and E2.

**Worst Solas Damage (DAMAGE CASE 1 R7P15-6.1.0)**

| Item | Full Scale | Model Scale (1:40) |
|---|---|---|
| h | 2.00 m | 50 mm |
| Measured natural roll period | 15.8538 sec | 2.5067 sec |
| Roll radius of gyration ($K_{XX}$) | 10.99 m | 274.9 mm |
| B | 30.4 m | 760.0 mm |
| **$K_{XX}$ /B** | **0.3616** | **0.3616** |

Table 5: Free Roll Test in Air

| Item | Full Scale | Model Scale (1:40) |
|---|---|---|
| h | 2.00 m | 50 mm |
| Measured natural roll period | 17.0257 sec | 2.692 sec |
| Roll radius of gyration ($K_{XX}$) | 11.83 m | 295.8 mm |
| B | 30.4 m | 760.0 mm |
| **$K_{XX}$ /B** | **0.3892** | **0.3892** |

Table 5a: Free Roll Test in Air

## ROLL RADIUS OF GYRATION

### Worst Solas Damage (DAMAGE CASE 2 R7P15-6.2.0-1)

| Item | Full Scale | Model Scale (1:40) |
|---|---|---|
| h | 2.00 m | 50 mm |
| Measured natural roll period | 16.0296 sec | 2.5345 sec |
| Roll radius of gyration ($K_{XX}$) | 11.12 m | 278.0 mm |
| B | 30.4 m | 760.0 mm |
| **$K_{XX}$ /B** | **0.3658** | **0.3658** |

Table 5b: Free Roll Test in Air

## PITCH RADIUS OF GYRATION

According to the Model Test Method, the pitch radius of gyration of the model ($K_{YY}$) should be in the range $0.2L_{OA}$ to $0.25L_{OA}$. In order to determine the pitch radius of gyration the model was suspended from the horizontal ballast bar, which is above the vertical centre of gravity (KG). The longitudinal position of the suspension point is located so that an even keel of the model in the air is achieved. The model was pushed down and then let free to pitch around the rotation point. The total time for a certain number of pitching periods is measured and the natural pitch period of the model in the air is determined by taking the average pitching period. The pitch mass moment of inertia is determined by using the following equations:

$$I_{YY} = M_s K_{YY}^2 + M_s h^2$$

$$I_{YY} = \frac{M_s g h T_p^2}{(2\pi)^2}$$

and the pitch radius of gyration is:

$$K_{YY} = \sqrt{\frac{I_{YY}}{M_s} - h^2}$$

Where: h = distance between centre of rotation and centre of gravity (m)
$T_P$ = natural pitch period of model system (sec)
$M_s$ = mass of the model system (kg)
$I_{YY}$ = pitch mass moment of inertia of the model system (kg $m^2$)
$K_{YY}$ = pitch radius of gyration (m)

The results of the test are summarized in Table 6, Table 6a and Table 6b.

| Item | Model Scale | |
|---|---|---|
| $M_s$ | 371.00 | kg |
| h | 315 | mm |
| $T_P$ | 4.3829 | sec |
| $I_{YY}$ | 557.66 | kg $m^2$ |
| LOA | 4834 | mm |
| **$K_{YY}$** | **1184.9** | **mm** |
| **$K_{YY}$/LOA** | **0.2451** | |

Table 6: Pitch radius of gyration, Damage Case 1 R7P15-16.1.0

## PITCH RADIUS OF GYRATION

| Item | Model Scale | |
|---|---|---|
| $M_S$ | 371.00 | kg |
| h | 315 | mm |
| $T_P$ | 4.43 | sec |
| $I_{YY}$ | 570.56 | kg $m^2$ |
| LOA | 4834 | mm |
| **$K_{YY}$** | **1199.4** | **mm** |
| **$K_{YY}$/LOA** | **0.2481** | |

Table 6a: Pitch radius of gyration, Damage Case 1 R7P15-16.1.0

| Item | Model Scale | |
|---|---|---|
| $M_S$ | 371.00 | kg |
| h | 314.5 | mm |
| $T_P$ | 4.41 | sec |
| $I_{YY}$ | 564.04 | kg $m^2$ |
| LOA | 4834 | mm |
| **$K_{YY}$** | **1192.2** | **mm** |
| **$K_{YY}$/LOA** | **0.2466** | |

Table 6b: Pitch radius of gyration, Damage Case 2 R7P15-16.2.0-1

## ENVIROMENTAL CONDITIONS

In accordance with the Model Test Method, an irregular wave environment was modeled using JONSWAP spectra as specified below. Waves are assumed to be coming from beam into the damage opening.

### SHORT WAVES

For short waves the peakness parameter, γ, is 3.3. The peak period is calculated as:

$$T_P = 4\sqrt{H_S}$$

And the zero crossing period is:

$$T_Z = \frac{T_P}{1.285}$$

Where, $T_P$: Peak Period (sec) $H_S$ : Significant wave height (m)
$T_Z$: Zero Crossing Period (sec) γ: Peakness parameter

| Wave | γ | $H_S$ (m) | $T_P$ (sec) | $T_Z$ (sec) |
|---|---|---|---|---|
| Short | 3.3 | 2.00 | 5.6569 | 4.4022 |
| Short | 3.3 | 2.50 | 6.3246 | 4.9218 |
| Short | 3.3 | 3.00 | 6.9282 | 5.3916 |
| Short | 3.3 | 3.25 | 7.2111 | 5.6118 |
| Short | 3.3 | 3.5 | 7.4833 | 5.8236 |
| Short | 3.3 | 3.75 | 7.7460 | 6.0280 |
| Short | 3.3 | 4.00 | 8.0000 | 6.2257 |
| Short | 3.3 | 5.00 | 8.9443 | 6.9605 |
| Short | 3.3 | 6.00 | 9.7980 | 7.6249 |

Table 7 Summary of wave characteristics (JONSWAP)

# EXPERIMENTS

## EXPERIMENTAL SET UP

The test section of the sea-keeping tank is 180 m long, 10.0 m wide and 5.0 m deep with a wave maker at one end and a beach at the other. The wave maker has 2 flaps capable of generating regular and irregular waves using in-house software.

Wave realizations are generated in the presence of authorities and for each record the spectral characteristics are automatically checked to ensure adherence to the pre-specified sea states.

For a representative wave realization, measurements were performed prior to the test at three different locations within the drift range.

The model was free to drift and placed in beam seas (90° heading)with the damage hole facing the oncoming waves, with no mooring system permanently attached to the model. To maintain a beam sea heading of approximately 90° during the model test the following requirements were satisfied:

- Heading control lines, intended for minor adjustment, were located at the centre line of the stem and stern, in a symmetrical fashion and at a level between the position of KG and the damaged waterline
- The carriage speed was equal to the actual drift speed of the model with speed adjustment made when necessary

Ten experiments were carried out. The test period for each experiment was of a duration such that a stationary state was reached, but not less than 30 min in full scale. A different wave realization train was used for each experiment.

Roll and pitch motions are also measured using Qualisys motion capture system to readily provide motion records during the experiments.

## EXPERIMENTAL PROCEDURE

The model is initially positioned 50 m away from the wave maker. When the set-up is ready, random wave realizations are produced in the computer. These wave signals are then sent to the wave maker.

During the experiments, instantaneous measurements of the wave realizations from the fixed wave probe, as well as roll and pitch motions of the model can be observed on the available monitors. All this information was recorded. (See DVD 2458)

The total test time of each test was around 285 seconds, which corresponds to approximately 30.0 minutes in full scale. After the completion of each test the measured wave and roll statistics are examined to ensure compliance with the Model Test Method.

## RESULTS

The worst SOLAS damage is damage case R7P15-16.1.0 in a random wave environment, characterized by a 3.50 m to 6.00 m significant wave height. For the conditions considered "EMSA 3" survived them all. The summary of the results is given in table 7 and table 7a. The wave and roll motion statistics are given in Appendix D and Appendix D1, while the wave and the roll motion time histories are given in Appendix E and Appendix E1.

The SOLAS damage (damage case R7P15-16.2.0-1) was tested in a random wave environment characterized by 2.00 m to 4.00 m significant wave height. For the conditions considered "EMSA 3" did not survive them all. The summary of the results is given in table 7b, 7c, 7d and7e. The wave and the motion statistics are given in Appendix D2, while the wave and the motion time histories are given in Appendix E2.

Damage Case 1 R7P15-16.1.0

| Test No* | Wave No | Wave Height HS (m) | | Result |
|---|---|---|---|---|
| | | Target | Fixed | |
| Worst SOLAS Damage (Damage Case 1 R7P15-16.1.0) Short Waves ($\gamma$ = 3.3) | | | | |
| 29700-01 | 29700-01 | 3.50 | 3.5438 | Survived |
| 29700-02 | 29700-02 | 3.50 | 3.5603 | Survived |
| 29700-03 | 29700-03 | 3.50 | 3.5501 | Survived |
| 29700-04 | 29700-04 | 3.50 | 3.5616 | Survived |
| 29700-05 | 29700-05 | 3.50 | 3.5565 | Survived |
| 29701-01 | 29701-01 | 4.00 | 4.0727 | Survived |
| 29701-02 | 29701-02 | 4.00 | 4.0526 | Survived |
| 29701-03 | 29701-03 | 4.00 | 4.0534 | Survived |
| 29701-04 | 29701-04 | 4.00 | 4.0774 | Survived |
| 29701-05 | 29701-05 | 4.00 | 4.0383 | Survived |
| 29701-06 | 29701-06 | 4.00 | 4.0358 | Survived |
| 29702-01 | 29702-01 | 5.00 | 5.0846 | Survived |
| 29702-02 | 29702-02 | 5.00 | 5.0302 | Survived |
| 29702-03 | 29702-03 | 5.00 | 5.0691 | Survived |
| 29702-04 | 29702-04 | 5.00 | 5.0943 | Survived |
| 29702-05 | 29702-05 | 5.00 | 5.0593 | Survived |
| 29703-01 | 29703-01 | 6.00 | 6.0814 | Survived |
| 29703-02 | 29703-02 | 6.00 | 6.0472 | Survived |
| 29703-03 | 29703-03 | 6.00 | 6.0826 | Survived |
| 29703-04 | 29703-04 | 6.00 | 6.0774 | Survived |
| 29703-05 | 29703-05 | 6.00 | 6.0441 | Survived |

Table 7: Summary of the experimental results
*This number corresponds with the number referenced on the video

## RESULTS

Damage Case 1 R7P15-16.1.0

| Test No* | Wave No | Wave Height HS (m) | | Result |
|---|---|---|---|---|
| | | Target | Fixed | |
| Worst SOLAS Damage (Damage Case 1 R7P15-16.1.0) Short Waves ($\gamma$ = 3.3) | | | | |
| 29705-01 | 29701-01 | 4.00 | 4.0561 | Survived |
| 29705-02 | 29701-02 | 4.00 | 4.0661 | Survived |
| 29705-03 | 29701-03 | 4.00 | 4.0676 | Survived |
| 29705-04 | 29701-04 | 4.00 | 4.0343 | Survived |
| 29705-05 | 29701-05 | 4.00 | 4.0557 | Survived |

Table 7a: Summary of the experimental results
*This number corresponds with the number referenced on the video

Damage Case 2 R7P15-16.2.0-1

| Test No* | Wave No | Wave Height HS (m) | | Result |
|---|---|---|---|---|
| | | Target | Fixed | |
| Worst SOLAS Damage (Damage Case 2 R7P15-16.2.0-1) Short Waves ($\gamma$ = 3.3) | | | | |
| 29708-01 | 29708-01 | 2.00 | 2.0214 | Survived |
| 29708-02 | 29708-02 | 2.00 | 2.0221 | Survived |
| 29708-03 | 29708-03 | 2.00 | 2.0194 | Survived |
| 29708-04 | 29708-04 | 2.00 | 2.0243 | Survived |
| 29708-05 | 29708-05 | 2.00 | 2.0313 | Survived |
| 29708-06 | 29708-06 | 2.00 | 2.0306 | Survived |
| 29708-07 | 29708-07 | 2.00 | 2.0287 | Survived |
| 29708-08 | 29708-08 | 2.00 | 2.0377 | Survived |
| 29708-09 | 29708-09 | 2.00 | 2.0375 | Survived |
| 29708-10 | 29708-10 | 2.00 | 2.0374 | Survived |
| 29709-01 | 29709-01 | 2.50 | 2.5386 | Survived |
| 29709-02 | 29709-02 | 2.50 | 2.5315 | Survived |
| 29709-03 | 29709-03 | 2.50 | 2.5658 | Survived |
| 29709-04 | 29709-04 | 2.50 | 2.5568 | Survived |
| 29709-05 | 29709-05 | 2.50 | 2.5460 | Survived |
| 29710-01 | 29710-01 | 3.00 | 3.0507 | Survived |
| 29710-02 | 29710-02 | 3.00 | 3.0421 | Survived |
| 29710-03 | 29710-03 | 3.00 | 3.0405 | Survived |
| 29710-04 | 29710-04 | 3.00 | 3.0449 | Survived |
| 29710-05 | 29710-05 | 3.00 | 3.0454 | Survived |
| 29710-06 | 29710-06 | 3.00 | 3.0278 | Survived |
| 29710-07 | 29710-07 | 3.00 | 3.0283 | Survived |
| 29710-08 | 29710-08 | 3.00 | 3.0330 | Survived |
| 29710-09 | 29710-09 | 3.00 | 3.0394 | Survived |
| 29710-10 | 29710-10 | 3.00 | 3.0467 | Survived |

Table 7b: Summary of the experimental results
*This number corresponds with the number referenced on the video

## RESULTS

Damage Case 2 R7P15-16.2.0-1

| | | | | |
|---|---|---|---|---|
| 29711-01 | 29700-01 | 3.50 | 3.5606 | Capsized |
| 29711-02 | 29700-02 | 3.50 | 3.5444 | Survived |
| 29711-03 | 29700-03 | 3.50 | 3.5571 | Capsized |
| 29711-04 | 29700-04 | 3.50 | 3.5688 | Capsized |
| 29711-05 | 29700-05 | 3.50 | 3.5562 | Survived |
| 29711-06 | 29700-06 | 3.50 | 3.5562 | Survived |
| 29711-07 | 29700-07 | 3.50 | 3.5469 | Survived |
| 29711-08 | 29700-08 | 3.50 | 3.5505 | Survived |
| 29711-09 | 29700-09 | 3.50 | 3.5541 | Survived |
| 29711-10 | 29700-10 | 3.50 | 3.5563 | Survived |
| 29712-01 | 29701-01 | 4.00 | 4.0510 | Capsized |
| 29712-02 | 29701-02 | 4.00 | 4.0355 | Capsized |
| 29712-03 | 29701-03 | 4.00 | 4.0309 | Capsized |
| 29712-04 | 29701-04 | 4.00 | 4.0278 | Capsized |
| 29712-05 | 29701-05 | 4.00 | 4.0274 | Capsized |
| 29712-06 | 29701-06 | 4.00 | 4.0152 | Capsized |
| 29712-07 | 29701-07 | 4.00 | 4.0172 | Capsized |
| 29712-08 | 29701-08 | 4.00 | 4.0288 | Capsized |
| 29712-09 | 29701-09 | 4.00 | 4.0589 | Capsized |
| 29712-10 | 29701-10 | 4.00 | 4.0277 | Capsized |
| 29713-01 | 29713-01 | 3.25 | 3.2916 | Capsized |
| 29713-02 | 29713-02 | 3.25 | 3.296 | Survived |
| 29713-03 | 29713-03 | 3.25 | 3.3001 | Survived |
| 29713-04 | 29713-04 | 3.25 | 3.3014 | Capsized |
| 29713-05 | 29713-05 | 3.25 | 3.2952 | Survived |
| 29713-06 | 29713-06 | 3.25 | 3.2941 | Survived |
| 29713-07 | 29713-07 | 3.25 | 3.3021 | Survived |
| 29713-08 | 29713-08 | 3.25 | 3.2849 | Survived |
| 29713-09 | 29713-09 | 3.25 | 3.2813 | Capsized |
| 29713-10 | 29713-10 | 3.25 | 3.2920 | Capsized |
| 29714-01 | 29714-01 | 3.75 | 3.7809 | Capsized |
| 29714-02 | 29714-02 | 3.75 | 3.7821 | Capsized |
| 29714-03 | 29714-03 | 3.75 | 3.7952 | Capsized |
| 29714-04 | 29714-04 | 3.75 | 3.7785 | Capsized |
| 29714-05 | 29714-05 | 3.75 | 3.7879 | Capsized |
| 29714-06 | 29714-06 | 3.75 | 3.7922 | Capsized |
| 29714-07 | 29714-07 | 3.75 | 3.7939 | Capsized |
| 29714-08 | 29714-08 | 3.75 | 3.7850 | Capsized |
| 29714-09 | 29714-09 | 3.75 | 3.8042 | Capsized |
| 29714-10 | 29714-10 | 3.75 | 3.7942 | Capsized |

Table 7c: Summary of the experimental results

*This number corresponds with the number referenced on the video

## RESULTS

Damage Case 2 R7P15-16.2.0-1

| | | | | |
|---|---|---|---|---|
| 29715-01 | 29700-01 | 3.50 | 3.5477 | Survived |
| 29715-02 | 29700-02 | 3.50 | 3.5501 | Capsized |
| 29715-03 | 29700-03 | 3.50 | 3.5424 | Survived |
| 29715-04 | 29700-04 | 3.50 | 3.5105 | Survived |
| 29715-05 | 29700-05 | 3.50 | 3.5420 | Capsized |
| 29715-06 | 29700-06 | 3.50 | 3.5403 | Capsized |
| 29715-07 | 29700-07 | 3.50 | 3.5500 | Survived |
| 29715-08 | 29700-08 | 3.50 | 3.5500 | Survived |
| 29715-09 | 29700-09 | 3.50 | 3.5411 | Survived |
| 29715-10 | 29700-10 | 3.50 | 3.5512 | Capsized |
| 29716-01 | 29714-01 | 3.75 | 3.8072 | Survived |
| 29716-02 | 29714-02 | 3.75 | 3.7955 | Capsized |
| 29716-03 | 29714-03 | 3.75 | 3.8132 | Survived |
| 29716-04 | 29714-04 | 3.75 | 3.8076 | Survived |
| 29716-05 | 29714-05 | 3.75 | 3.8193 | Survived |
| 29716-06 | 29714-06 | 3.75 | 3.8190 | Capsized |
| 29716-07 | 29714-07 | 3.75 | 3.7976 | Capsized |
| 29716-08 | 29714-08 | 3.75 | 3.8063 | Capsized |
| 29716-09 | 29714-09 | 3.75 | 3.7892 | Capsized |
| 29716-10 | 29714-10 | 3.75 | 3.7579 | Capsized |
| 29717-01 | 29700-01 | 3.50 | 3.5191 | Capsized |
| 29717-02 | 29700-02 | 3.50 | 3.5324 | Capsized |
| 29717-03 | 29700-03 | 3.50 | 3.5313 | Capsized |
| 29717-04 | 29700-04 | 3.50 | 3.5459 | Survived |
| 29717-05 | 29700-05 | 3.50 | 3.5497 | Capsized |
| 29717-06 | 29700-06 | 3.50 | 3.5467 | Survived |
| 29717-07 | 29700-07 | 3.50 | 3.5485 | Survived |
| 29717-08 | 29700-08 | 3.50 | 3.5416 | Survived |
| 29717-09 | 29700-09 | 3.50 | 3.5490 | Capsized |
| 29717-10 | 29700-10 | 3.50 | 3.5413 | Survived |
| 29718-01 | 29700-01 | 3.50 | 3.5432 | Survived |
| 29718-02 | 29700-02 | 3.50 | 3.5518 | Survived |
| 29718-03 | 29700-03 | 3.50 | 3.5659 | Survived |
| 29718-04 | 29700-04 | 3.50 | 3.5739 | Survived |
| 29718-05 | 29700-05 | 3.50 | 3.5591 | Survived |
| 29718-06 | 29700-06 | 3.50 | 3.5622 | Capsized |
| 29718-07 | 29700-07 | 3.50 | 3.5496 | Survived |
| 29718-08 | 29700-08 | 3.50 | 3.5453 | Capsized |
| 29718-09 | 29700-09 | 3.50 | 3.5828 | Capsized |
| 29718-10 | 29700-10 | 3.50 | 3.5386 | Capsized |

Table 7d: Summary of the experimental results

*This number corresponds with the number referenced on the video

## RESULTS

Damage Case 2 R7P15-16.2.0-1

| | | | | |
|---|---|---|---|---|
| 29719-01 | 29700-01 | 3.50 | 3.5192 | Capsized |
| 29719-02 | 29700-02 | 3.50 | 3.5297 | Capsized |
| 29719-03 | 29700-03 | 3.50 | 3.5325 | Capsized |
| 29719-04 | 29700-04 | 3.50 | 3.5160 | Capsized |
| 29719-05 | 29700-05 | 3.50 | 3.5200 | Capsized |
| 29719-06 | 29700-06 | 3.50 | 3.5244 | Survived |
| 29719-07 | 29700-07 | 3.50 | 3.5362 | Survived |
| 29719-08 | 29700-08 | 3.50 | 3.5388 | Capsized |
| 29719-09 | 29700-09 | 3.50 | 3.5603 | Capsized |
| 29719-10 | 29700-10 | 3.50 | 3.5389 | Survived |
| 29720-01 | 29713-01 | 3.25 | 3.2885 | Survived |
| 29720-02 | 29713-02 | 3.25 | 3.3001 | Capsized |
| 29720-03 | 29713-03 | 3.25 | 3.2898 | Survived |
| 29720-04 | 29713-04 | 3.25 | 3.299 | Survived |
| 29720-05 | 29713-05 | 3.25 | 3.3007 | Survived |
| 29720-06 | 29713-06 | 3.25 | 3.2985 | Survived |
| 29720-07 | 29713-07 | 3.25 | 3.3019 | Survived |
| 29720-08 | 29713-08 | 3.25 | 3.3045 | Survived |
| 29720-09 | 29713-09 | 3.25 | 3.3060 | Survived |
| 29720-10 | 29713-10 | 3.25 | 3.3132 | Survived |
| 29721-01 | 29714-01 | 3.75 | 3.7590 | Capsized |
| 29721-02 | 29714-02 | 3.75 | 3.7653 | Survived |
| 29721-03 | 29714-03 | 3.75 | 3.7448 | Wave too small |
| 29721-04 | 29714-03 | 3.75 | 3.7814 | Capsized |
| 29721-05 | 29714-04 | 3.75 | 3.7793 | Capsized |
| 29721-06 | 29714-05 | 3.75 | 3.7797 | Capsized |
| 29721-07 | 29714-06 | 3.75 | 3.7725 | Capsized |
| 29721-08 | 29714-07 | 3.75 | 3.7754 | Capsized |
| 29721-09 | 29714-08 | 3.75 | 3.7989 | Capsized |
| 29721-10 | 29714-09 | 3.75 | 3.7799 | Capsized |
| 29721-11 | 29714-10 | 3.75 | 3.7894 | Survived |
| 29722-01 | 29700-01 | 3.50 | 3.5385 | Capsized |
| 29722-02 | 29700-02 | 3.50 | 3.5518 | Survived |
| 29722-03 | 29700-03 | 3.50 | 3.5532 | Survived |
| 29722-04 | 29700-04 | 3.50 | 3.5634 | Capsized |
| 29722-05 | 29700-05 | 3.50 | 3.5575 | Capsized |
| 29722-06 | 29700-06 | 3.50 | 3.5458 | Survived |
| 29722-07 | 29700-07 | 3.50 | 3.5593 | Capsized |
| 29722-08 | 29700-08 | 3.50 | 3.5537 | Survived |
| 29722-09 | 29700-09 | 3.50 | 3.5552 | Survived |
| 29722-10 | 29700-10 | 3.50 | 3.5559 | Survived |

Table 7e: Summary of the experimental results
*This number corresponds with the number referenced on the video

## CONCLUSIONS

Model experiments were carried out in a sea state characterised by a significant wave heights of between 2.00 m and 6.00 m to investigate the survivability of the passenger /Ro-Ro vessel. The experiments were conducted according to the Model Test Method specified by IMO. Based on the results of these tests, the following conclusions may be drawn:

- For the worst SOLAS damage (damage case R7P15-16.1.0) the vessel was tested for significant wave heights between 3.50 m and 6.00 m and she survived all the tests.

- For the worst SOLAS damage (damage case R7P15-16.2.0-1) the vessel was tested for significant wave heights between 2.00 m and 4.00 m and she did not survive all the tests.

# APPENDIX A

# DAMAGE INFORMATION & DRAWINGS OF THE MODEL

## Model No. 2458 and 2458A

## Project: “EMSA 3”

## Intact Hydrostatics and Stability Information for Single Damage Case

Damage Case : R7P15-16.1.0
Damage Side : PORT
Initial Condition : DS

| Intact Hydrostatics | | | Intact Stability | | |
|---|---|---|---|---|---|
| Midship Draught | : | 6.700 m | KMT | : | 17.530 m |
| Trim | : | 0.000 m (Between Perps) | | | |
| Trim Angle | : | 0.000 deg | KG | : | 15.230 m |
| Heel Angle | : | 0.000 deg | GM | : | 2.300 m |
| Displacement | : | 24342.9 Tonnes | | | |

Moulded Volume : 23687.6 m3 (Actual Floating Position)
LCB : 85.16 m (From AP - Level Trim Floating Position)

### MAIN CHARACTERISTICS OF THE VESSEL:

| | | |
|---|---|---|
| Length betw. perpendiculars | 179.10 | m |
| Breadth, moulded | 30.40 | m |
| Design draught | 6.60 | m |
| X-coord. of after perpendicular | 0.00 | m |
| X-coord. of reference point | 89.55 | m |
| X-coord. of midship section | 89.55 | m |
| X-coord. of building frame 0 | 0.00 | m |
| Thickness of keelplate | 0.010 | m |
| Mean thickness of shell plating | 0.010 | m |
| Density of water | 1.0250 | ton/m3 |

### Sign Conventions

Trim by Bow : +
Heel to Port : +

Calculations are based on MODELHULL date 2010-05-07 time 10:50

| | | |
|---|---|---|
| Shell thickness used in the calculation | 10.0 | mm |
| X-coord. of aft end of DWL | -0.80 | m |
| X-coord. of fore end of DWL | 185.46 | m |

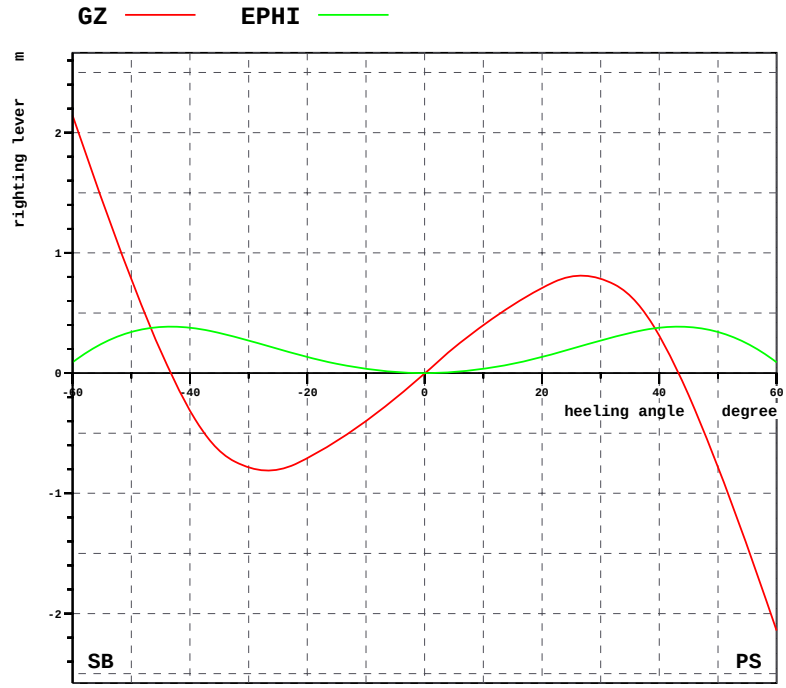
Calc. sections 48

Intact GZ Curve
---

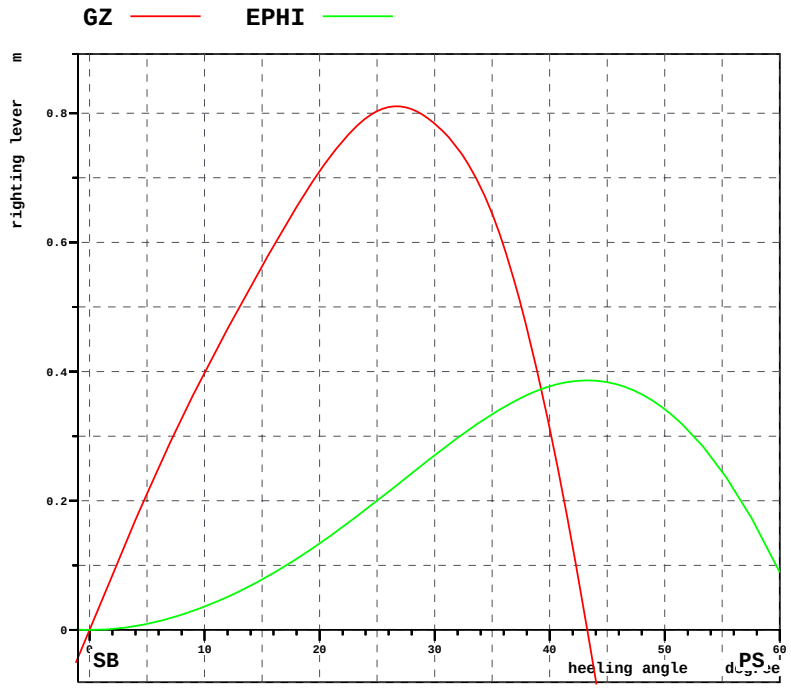
Initial condition : DS, Deepest subd. load line
Damage case : R7P15-16.1.0, Zones Z17-Z18 Port, b1
Stage of damage : INTACT
Phase of stage : EQ

| HEEL degree | GZ m | EPHI rad*m | T m | TR m | OPNAME - | IMRES m | RESMRG m |
|---|---|---|---|---|---|---|---|
| -60.0 | 2.142 | 0.089 | 0.506 | 2.889 | - | - | - |
| -50.0 | 0.782 | 0.342 | 2.048 | 2.344 | - | - | - |
| -45.0 | 0.185 | 0.384 | 2.809 | 2.054 | - | - | - |
| -40.0 | -0.312 | 0.377 | 3.560 | 1.741 | - | - | - |
| -35.0 | -0.644 | 0.334 | 4.296 | 1.419 | - | - | - |
| -30.0 | -0.784 | 0.271 | 4.982 | 1.153 | - | - | - |
| -27.0 | -0.811 | 0.229 | 5.337 | 1.013 | - | - | - |
| -24.0 | -0.792 | 0.187 | 5.642 | 0.875 | - | - | - |
| -21.0 | -0.735 | 0.146 | 5.899 | 0.741 | - | - | - |
| -18.0 | -0.655 | 0.110 | 6.115 | 0.606 | - | - | - |
| -15.0 | -0.563 | 0.078 | 6.294 | 0.475 | - | - | - |
| -12.0 | -0.466 | 0.051 | 6.439 | 0.347 | - | - | - |
| -9.0 | -0.363 | 0.029 | 6.553 | 0.224 | - | - | - |
| -7.0 | -0.290 | 0.018 | 6.610 | 0.149 | - | - | - |
| -5.0 | -0.211 | 0.009 | 6.654 | 0.079 | - | - | - |
| -4.0 | -0.170 | 0.006 | 6.672 | 0.045 | - | - | - |
| -3.0 | -0.128 | 0.003 | 6.685 | 0.017 | - | - | - |
| -2.0 | -0.085 | 0.001 | 6.693 | 0.007 | - | - | - |
| -1.0 | -0.043 | 0.000 | 6.699 | -0.010 | - | - | - |
| 0.0 | 0.000 | 0.000 | 6.700 | 0.000 | - | - | - |
| 1.0 | 0.043 | 0.000 | 6.699 | -0.010 | - | - | - |
| 2.0 | 0.085 | 0.001 | 6.693 | 0.007 | - | - | - |
| 3.0 | 0.128 | 0.003 | 6.685 | 0.017 | - | - | - |
| 4.0 | 0.170 | 0.006 | 6.672 | 0.045 | - | - | - |
| 5.0 | 0.211 | 0.009 | 6.654 | 0.079 | - | - | - |
| 7.0 | 0.290 | 0.018 | 6.610 | 0.149 | - | - | - |
| 9.0 | 0.363 | 0.029 | 6.553 | 0.224 | - | - | - |
| 12.0 | 0.466 | 0.051 | 6.439 | 0.347 | - | - | - |
| 15.0 | 0.563 | 0.078 | 6.294 | 0.475 | - | - | - |
| 18.0 | 0.655 | 0.110 | 6.115 | 0.606 | - | - | - |
| 21.0 | 0.735 | 0.146 | 5.899 | 0.741 | - | - | - |
| 24.0 | 0.792 | 0.187 | 5.642 | 0.875 | - | - | - |
| 27.0 | 0.811 | 0.229 | 5.337 | 1.013 | - | - | - |
| 30.0 | 0.784 | 0.271 | 4.982 | 1.153 | - | - | - |
| 35.0 | 0.644 | 0.334 | 4.296 | 1.419 | - | - | - |
| 40.0 | 0.312 | 0.377 | 3.560 | 1.741 | - | - | - |
| 45.0 | -0.185 | 0.384 | 2.809 | 2.054 | - | - | - |
| 50.0 | -0.782 | 0.342 | 2.048 | 2.344 | - | - | - |
| 60.0 | -2.142 | 0.089 | 0.506 | 2.889 | - | - | - |

Intact GZ Plot (Whole Range)
---




Intact GZ Plot (Heeling To Port)
---



## Damage Hydrostatics and Stability Information for Single Damage Case

Damage Case : R7P15-16.1.0
Damage Side : PORT
Initial Condition : DS
Flooding Stage : *LAST
Phase of Stage : EQ

### Damaged Compartments

| Room | Permeability | Volume | XCG | YCG | ZCG | Moulded Volume |
|---|---|---|---|---|---|---|
| HOLD | 0.90 | 0.0 | - | - | - | 0.0 |
| R100000 | 0.95 | 1212.9 | 98.07 | 0.20 | 2.87 | 1276.7 |
| R100200 | 0.95 | 452.9 | 97.88 | 2.85 | 6.21 | 476.7 |
| R110000 | 0.95 | 680.6 | 110.25 | -0.00 | 2.87 | 716.4 |
| R110200 | 0.95 | 212.7 | 110.02 | 11.87 | 6.68 | 223.9 |

### Floating Position

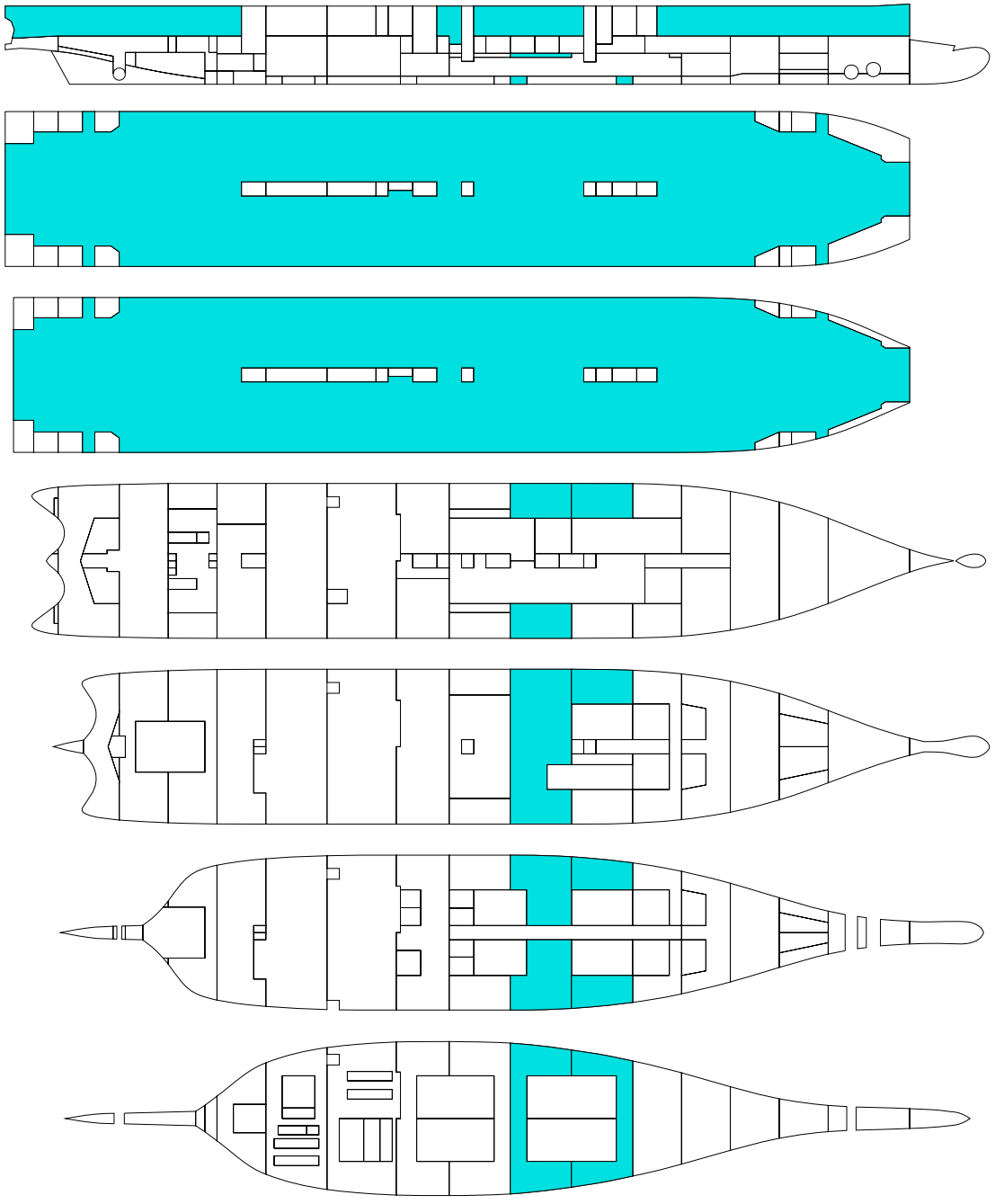
(Draughts given on centreline and perpedicular to waterline)

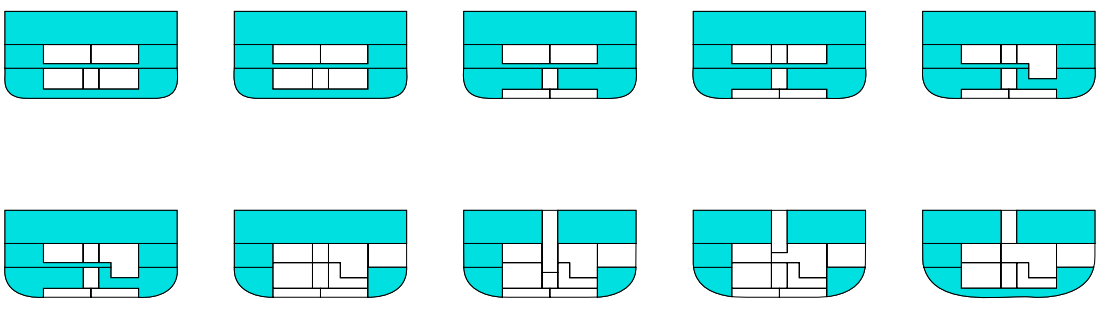
| | | | | |
|---|---|---|---|---|
| Draught Forward | TF | 7.831 m | Heel Angle | 3.052 Deg (To Port) |
| Draught | T | 7.286 m | Trim | 1.090 m |
| Draught Aft | TA | 6.741 m | Trim Angle | 0.349 Deg |

### Damage GZ Particulars

| | |
|---|---|
| Range | 11.820 Deg (Port) |
| GZ Max | 0.165 m |
| Angle at GZ Max | 9.492 Deg (Port) |
| Area Under GZ Curve | 0.021 m.rad |

Damage Case Drawing
---



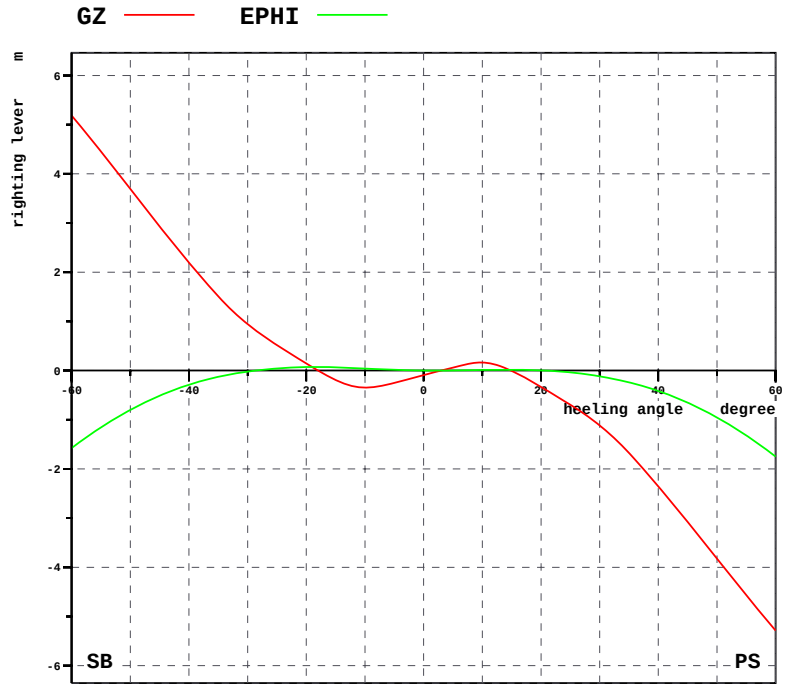


Damaged GZ Curve
---

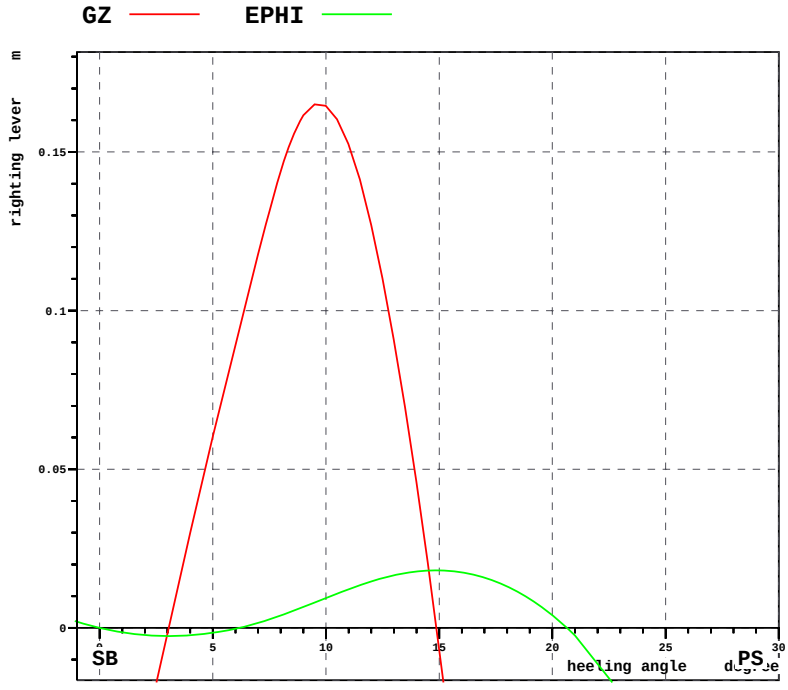
Initial condition : DS, Deepest subd. load line
Damage case : R7P15-16.1.0, Zones Z17-Z18 Port, b1
Stage of damage : 1
Phase of stage : EQ

| HEEL degree | GZ m | EPHI rad*m | T m | TR m | OPNAME - | IMRES m | RESMRG m |
|---|---|---|---|---|---|---|---|
| -60.0 | 5.185 | -1.576 | 4.570 | 1.092 | - | - | - |
| -50.0 | 3.693 | -0.801 | 5.330 | 1.426 | - | - | - |
| -45.0 | 2.935 | -0.512 | 5.646 | 1.592 | - | - | - |
| -40.0 | 2.196 | -0.288 | 5.928 | 1.726 | - | - | - |
| -35.0 | 1.510 | -0.127 | 6.190 | 1.794 | - | - | - |
| -30.0 | 0.943 | -0.021 | 6.439 | 1.715 | - | - | - |
| -27.0 | 0.677 | 0.021 | 6.577 | 1.673 | - | - | - |
| -24.0 | 0.441 | 0.050 | 6.697 | 1.660 | - | - | - |
| -21.0 | 0.212 | 0.067 | 6.791 | 1.617 | - | - | - |
| -18.0 | -0.003 | 0.073 | 6.867 | 1.538 | - | - | - |
| -15.0 | -0.188 | 0.068 | 6.938 | 1.427 | - | - | - |
| -12.0 | -0.319 | 0.054 | 7.012 | 1.295 | - | - | - |
| -9.0 | -0.346 | 0.036 | 7.103 | 1.162 | - | - | - |
| -7.0 | -0.302 | 0.025 | 7.169 | 1.112 | - | - | - |
| -5.0 | -0.248 | 0.015 | 7.223 | 1.069 | - | - | - |
| -4.0 | -0.219 | 0.011 | 7.244 | 1.050 | - | - | - |
| -3.0 | -0.189 | 0.007 | 7.262 | 1.034 | - | - | - |
| -2.0 | -0.158 | 0.004 | 7.275 | 1.034 | - | - | - |
| -1.0 | -0.127 | 0.002 | 7.286 | 1.026 | - | - | - |
| 0.0 | -0.096 | 0.000 | 7.291 | 1.044 | - | - | - |
| 1.0 | -0.064 | -0.001 | 7.294 | 1.045 | - | - | - |
| 2.0 | -0.033 | -0.002 | 7.292 | 1.070 | - | - | - |
| 3.0 | -0.002 | -0.003 | 7.287 | 1.088 | - | - | - |
| 3.1 | -0.000 | -0.003 | 7.286 | 1.090 | - | - | - |
| 4.0 | 0.030 | -0.002 | 7.277 | 1.121 | - | - | - |
| 5.0 | 0.060 | -0.002 | 7.263 | 1.159 | - | - | - |
| 7.0 | 0.118 | 0.002 | 7.225 | 1.237 | - | - | - |
| 9.0 | 0.162 | 0.007 | 7.177 | 1.326 | - | - | - |
| 12.0 | 0.127 | 0.015 | 7.104 | 1.497 | - | - | - |
| 15.0 | -0.007 | 0.018 | 7.040 | 1.646 | - | - | - |
| 18.0 | -0.192 | 0.013 | 6.977 | 1.768 | - | - | - |
| 21.0 | -0.402 | -0.002 | 6.907 | 1.852 | - | - | - |
| 24.0 | -0.624 | -0.029 | 6.819 | 1.895 | - | - | - |
| 27.0 | -0.852 | -0.068 | 6.706 | 1.911 | - | - | - |
| 30.0 | -1.115 | -0.119 | 6.578 | 1.966 | - | - | - |
| 35.0 | -1.676 | -0.240 | 6.347 | 2.060 | - | - | - |
| 40.0 | -2.354 | -0.415 | 6.099 | 2.002 | - | - | - |
| 45.0 | -3.083 | -0.652 | 5.829 | 1.873 | - | - | - |
| 50.0 | -3.829 | -0.954 | 5.524 | 1.719 | - | - | - |
| 60.0 | -5.289 | -1.750 | 4.772 | 1.401 | - | - | - |

Damaged GZ Plot (Whole Range)
---




Damage GZ Plot (Heeling To Port)
---



## Model Test Draught Marks

(Draughts given on centreline and perpedicular to baseline)

Damage Case : R7P15-16.1.0
Damage Side : PORT
Equilibrium Heel Angle: 3.052 Degrees

## Locations of Draught Marks and Breadths at Draught Mark locations

| Draught Mark | X Location | Full Breadth At Mean Damage Draught |
|---|---|---|
| AP | 0.000 m | 28.076 m |
| AFT QUARTER | 44.775 m | 30.400 m |
| MIDSHIP | 89.550 m | 30.400 m |
| FP | 179.100 m | 0.550 m |

## Draughts in Intact, Damage Equilibrium

| Draught Marks at AP | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 7.499 m |
| Mean | 6.700 m | 6.751 m |
| Starboard | 6.700 m | 6.002 m |

| Draught Marks at Aft Quarter | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 7.834 m |
| Mean | 6.700 m | 7.024 m |
| Starboard | 6.700 m | 6.213 m |

| Draught Marks at Midship | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 8.107 m |
| Mean | 6.700 m | 7.297 m |
| Starboard | 6.700 m | 6.486 m |

| Draught Marks at FP | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 7.857 m |
| Mean | 6.700 m | 7.842 m |
| Starboard | 6.700 m | 7.828 m |

Intact Hydrostatics and Stability Information for Single Damage Case
---

Damage Case : R7P15-16.1.0
Damage Side : PORT
Initial Condition : DS-NEW

| Intact Hydrostatics | | | Intact Stability | | |
|---|---|---|---|---|---|
| Midship Draught | : | 6.700 m | KMT | : | 17.530 m |
| Trim | : | 0.000 m (Between Perps) | | | |
| Trim Angle | : | 0.000 deg | KG | : | 15.500 m |
| Heel Angle | : | 0.000 deg | GM | : | 2.030 m |
| Displacement | : | 24342.9 Tonnes | | | |

Moulded Volume : 23687.6 m3 (Actual Floating Position)
LCB : 85.16 m (From AP - Level Trim Floating Position)

MAIN CHARACTERISTICS OF THE VESSEL:
---

| | | |
|---|---|---|
| Length betw. perpendiculars | 179.10 | m |
| Breadth, moulded | 30.40 | m |
| Design draught | 6.60 | m |
| X-coord. of after perpendicular | 0.00 | m |
| X-coord. of reference point | 89.55 | m |
| X-coord. of midship section | 89.55 | m |
| X-coord. of building frame 0 | 0.00 | m |
| Thickness of keelplate | 0.010 | m |
| Mean thickness of shell plating | 0.010 | m |
| Density of water | 1.0250 | ton/m3 |

Sign Conventions
---

Trim by Bow : +
Heel to Port : +

Calculations are based on MODELHULL date 2010-05-07 time 10:50

| | | |
|---|---|---|
| Shell thickness used in the calculation | 10.0 | mm |
| X-coord. of aft end of DWL | -0.80 | m |
| X-coord. of fore end of DWL | 185.46 | m |

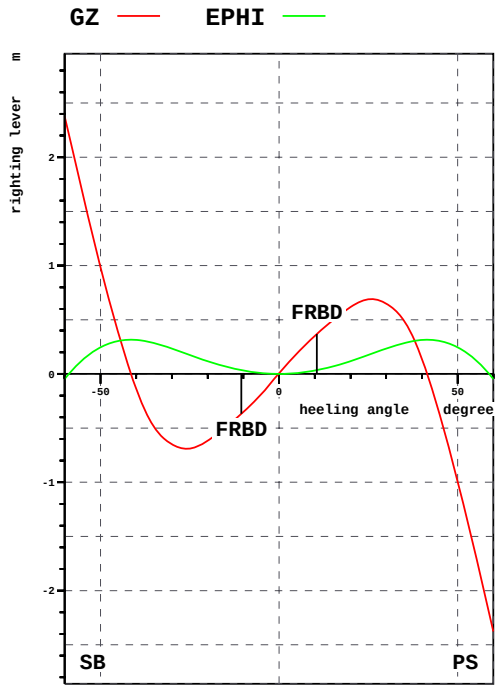
Calc. sections 48

Intact GZ Curve
---

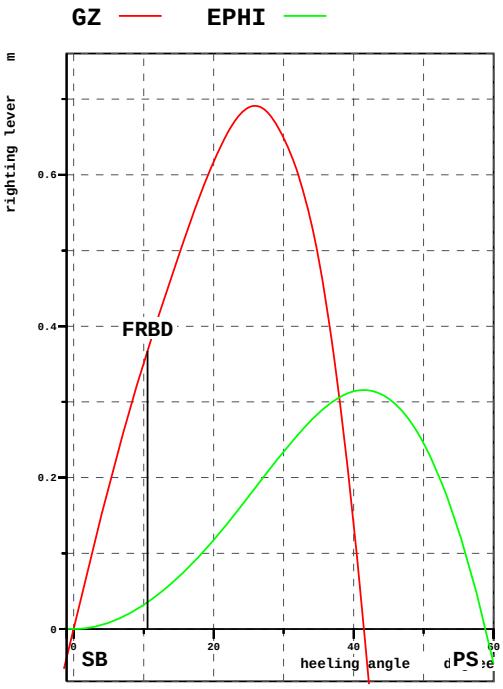
Initial condition : DS-NEW, Deepest subd. load line
Damage case : R7P15-16.1.0, Zones Z17-Z18 Port, b1
Stage of damage : INTACT
Phase of stage : EQ

| HEEL degree | GZ m | EPHI rad*m | T m | TR m | OPNAME - | IMRES m | RESMRG m |
|---|---|---|---|---|---|---|---|
| -60.0 | 2.376 | -0.046 | 0.506 | 2.891 | - | - | -9.51 |
| -50.0 | 0.989 | 0.245 | 2.048 | 2.345 | - | - | -8.06 |
| -45.0 | 0.376 | 0.304 | 2.809 | 2.055 | - | - | -7.26 |
| -40.0 | -0.138 | 0.314 | 3.560 | 1.742 | - | - | -6.40 |
| -35.0 | -0.489 | 0.285 | 4.296 | 1.420 | - | - | -5.52 |
| -30.0 | -0.649 | 0.234 | 4.982 | 1.154 | - | - | -4.59 |
| -27.0 | -0.688 | 0.199 | 5.337 | 1.014 | - | - | -3.98 |
| -24.0 | -0.682 | 0.163 | 5.642 | 0.876 | - | - | -3.32 |
| -21.0 | -0.638 | 0.129 | 5.899 | 0.741 | - | - | -2.63 |
| -18.0 | -0.571 | 0.097 | 6.115 | 0.607 | - | - | -1.90 |
| -15.0 | -0.494 | 0.069 | 6.294 | 0.476 | - | - | -1.15 |
| -12.0 | -0.410 | 0.045 | 6.439 | 0.347 | - | - | -0.38 |
| -9.0 | -0.321 | 0.026 | 6.553 | 0.224 | - | - | 0.41 |
| -7.0 | -0.257 | 0.016 | 6.610 | 0.149 | - | - | 0.94 |
| -5.0 | -0.187 | 0.008 | 6.654 | 0.079 | - | - | 1.47 |
| -4.0 | -0.152 | 0.005 | 6.672 | 0.045 | - | - | 1.74 |
| -3.0 | -0.114 | 0.003 | 6.685 | 0.017 | - | - | 2.00 |
| -2.0 | -0.075 | 0.001 | 6.693 | 0.007 | - | - | 2.27 |
| -1.0 | -0.038 | 0.000 | 6.699 | -0.010 | - | - | 2.53 |
| 0.0 | 0.000 | 0.000 | 6.700 | 0.000 | - | - | 2.80 |
| 1.0 | 0.038 | 0.000 | 6.699 | -0.010 | - | - | 2.53 |
| 2.0 | 0.075 | 0.001 | 6.693 | 0.007 | - | - | 2.27 |
| 3.0 | 0.114 | 0.003 | 6.685 | 0.017 | - | - | 2.00 |
| 4.0 | 0.152 | 0.005 | 6.672 | 0.045 | - | - | 1.74 |
| 5.0 | 0.187 | 0.008 | 6.654 | 0.079 | - | - | 1.47 |
| 7.0 | 0.257 | 0.016 | 6.610 | 0.149 | - | - | 0.94 |
| 9.0 | 0.321 | 0.026 | 6.553 | 0.224 | - | - | 0.41 |
| 12.0 | 0.410 | 0.045 | 6.439 | 0.347 | - | - | -0.38 |
| 15.0 | 0.494 | 0.069 | 6.294 | 0.476 | - | - | -1.15 |
| 18.0 | 0.571 | 0.097 | 6.115 | 0.607 | - | - | -1.90 |
| 21.0 | 0.638 | 0.129 | 5.899 | 0.741 | - | - | -2.63 |
| 24.0 | 0.682 | 0.163 | 5.642 | 0.876 | - | - | -3.32 |
| 27.0 | 0.688 | 0.199 | 5.337 | 1.014 | - | - | -3.98 |
| 30.0 | 0.649 | 0.234 | 4.982 | 1.154 | - | - | -4.59 |
| 35.0 | 0.489 | 0.285 | 4.296 | 1.420 | - | - | -5.52 |
| 40.0 | 0.138 | 0.314 | 3.560 | 1.742 | - | - | -6.40 |
| 45.0 | -0.376 | 0.304 | 2.809 | 2.055 | - | - | -7.26 |
| 50.0 | -0.989 | 0.245 | 2.048 | 2.345 | - | - | -8.06 |
| 60.0 | -2.376 | -0.046 | 0.506 | 2.891 | - | - | -9.51 |

Intact GZ Plot (Whole Range)
---




Intact GZ Plot (Heeling To Port)
---



Damage Hydrostatics and Stability Information for Single Damage Case

Damage Case : R7P15-16.1.0
Damage Side : PORT
Initial Condition : DS-NEW
Flooding Stage : *LAST
Phase of Stage : EQ

Damaged Compartments

| Room | Permeability | Volume | XCG | YCG | ZCG | Moulded Volume |
|---|---|---|---|---|---|---|
| HOLD | 0.90 | 0.0 | - | - | - | 0.0 |
| R100000 | 0.95 | 1212.9 | 98.07 | 0.20 | 2.87 | 1276.7 |
| R100200 | 0.95 | 452.9 | 97.88 | 3.31 | 6.23 | 476.7 |
| R110000 | 0.95 | 680.6 | 110.25 | 0.00 | 2.87 | 716.4 |
| R110200 | 0.95 | 221.3 | 110.02 | 11.88 | 6.74 | 233.0 |

Floating Position

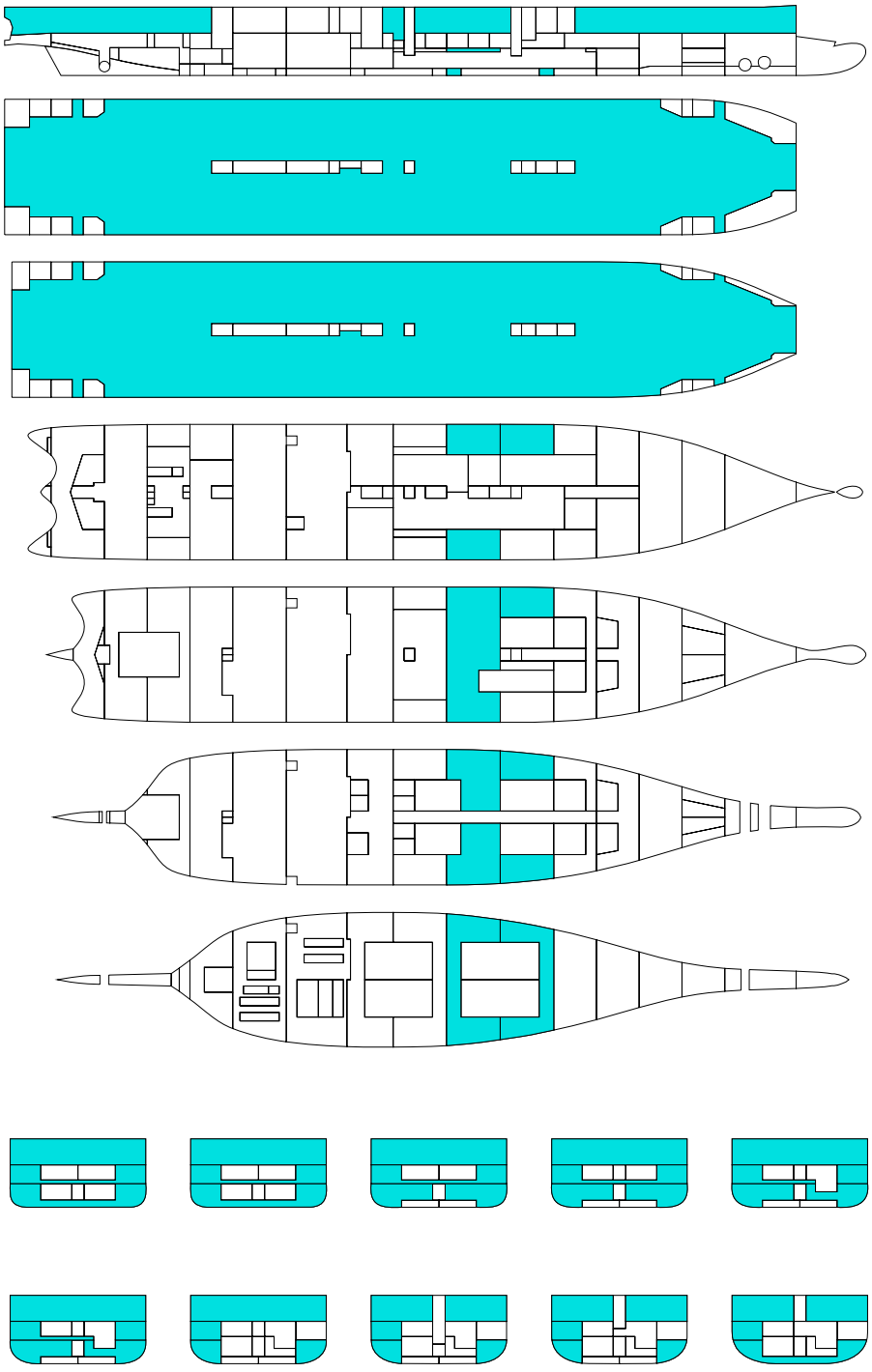
(Draughts given on centreline and perpedicular to waterline)

| | | | | |
|---|---|---|---|---|
| Draught Forward | TF | 7.835 m | Heel Angle | 3.587 Deg (To Port) |
| Draught | T | 7.281 m | Trim | 1.108 m |
| Draught Aft | TA | 6.727 m | Trim Angle | 0.355 Deg |

Damage GZ Particulars

| | |
|---|---|
| Range | 10.025 Deg (Port) |
| GZ Max | 0.120 m |
| Angle at GZ Max | 9.493 Deg (Port) |
| Area Under GZ Curve | 0.013 m.rad |

Damage Case Drawing
---

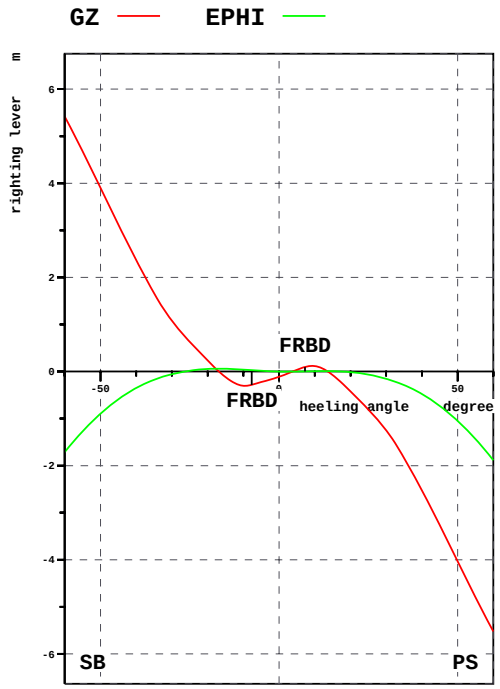


Damaged GZ Curve
---

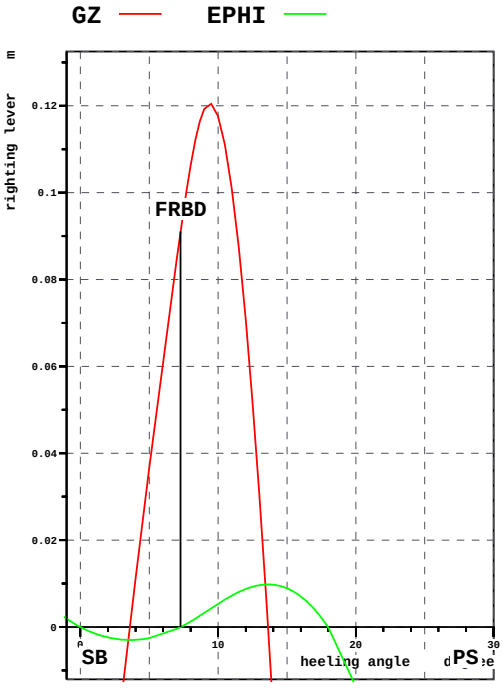
Initial condition : DS-NEW, Deepest subd. load line
Damage case : R7P15-16.1.0, Zones Z17-Z18 Port, b1
Stage of damage : 1
Phase of stage : EQ

| HEEL degree | GZ m | EPHI rad*m | T m | TR m | OPNAME | IMRES m | RESMRG m |
|---|---|---|---|---|---|---|---|
| -60.0 | 5.419 | -1.711 | 4.570 | 1.093 | - | - | -13.20 |
| -50.0 | 3.900 | -0.898 | 5.330 | 1.427 | - | - | -11.15 |
| -45.0 | 3.126 | -0.591 | 5.646 | 1.593 | - | - | -9.99 |
| -40.0 | 2.370 | -0.351 | 5.928 | 1.728 | - | - | -8.77 |
| -35.0 | 1.665 | -0.176 | 6.190 | 1.795 | - | - | -7.49 |
| -30.0 | 1.078 | -0.057 | 6.439 | 1.716 | - | - | -6.16 |
| -27.0 | 0.799 | -0.008 | 6.577 | 1.674 | - | - | -5.36 |
| -24.0 | 0.551 | 0.027 | 6.697 | 1.661 | - | - | -4.54 |
| -21.0 | 0.309 | 0.049 | 6.791 | 1.618 | - | - | -3.71 |
| -18.0 | 0.080 | 0.060 | 6.867 | 1.539 | - | - | -2.85 |
| -15.0 | -0.118 | 0.058 | 6.938 | 1.428 | - | - | -2.00 |
| -12.0 | -0.263 | 0.048 | 7.012 | 1.296 | - | - | -1.16 |
| -9.0 | -0.303 | 0.033 | 7.103 | 1.163 | - | - | -0.35 |
| -7.0 | -0.269 | 0.023 | 7.169 | 1.113 | - | - | 0.16 |
| -5.0 | -0.225 | 0.014 | 7.223 | 1.070 | - | - | 0.67 |
| -4.0 | -0.201 | 0.010 | 7.244 | 1.050 | - | - | 0.92 |
| -3.0 | -0.175 | 0.007 | 7.262 | 1.035 | - | - | 1.17 |
| -2.0 | -0.148 | 0.004 | 7.276 | 1.035 | - | - | 1.42 |
| -1.0 | -0.122 | 0.002 | 7.286 | 1.027 | - | - | 1.64 |
| 0.0 | -0.096 | 0.000 | 7.291 | 1.045 | - | - | 1.74 |
| 1.0 | -0.069 | -0.001 | 7.294 | 1.045 | - | - | 1.63 |
| 2.0 | -0.043 | -0.002 | 7.292 | 1.071 | - | - | 1.39 |
| 3.0 | -0.016 | -0.003 | 7.287 | 1.089 | - | - | 1.14 |
| 3.6 | -0.000 | -0.003 | 7.281 | 1.108 | - | - | 0.98 |
| 4.0 | 0.011 | -0.003 | 7.277 | 1.122 | - | - | 0.87 |
| 5.0 | 0.037 | -0.003 | 7.263 | 1.160 | - | - | 0.60 |
| 7.0 | 0.085 | -0.000 | 7.225 | 1.238 | - | - | 0.07 |
| 9.0 | 0.119 | 0.003 | 7.177 | 1.326 | - | - | -0.46 |
| 12.0 | 0.071 | 0.009 | 7.104 | 1.498 | - | - | -1.30 |
| 15.0 | -0.077 | 0.009 | 7.040 | 1.647 | - | - | -2.15 |
| 18.0 | -0.275 | -0.000 | 6.978 | 1.769 | - | - | -3.02 |
| 21.0 | -0.499 | -0.020 | 6.907 | 1.854 | - | - | -3.88 |
| 24.0 | -0.734 | -0.053 | 6.819 | 1.897 | - | - | -4.72 |
| 27.0 | -0.975 | -0.097 | 6.706 | 1.913 | - | - | -5.54 |
| 30.0 | -1.250 | -0.155 | 6.578 | 1.967 | - | - | -6.36 |
| 35.0 | -1.831 | -0.289 | 6.347 | 2.062 | - | - | -7.71 |
| 40.0 | -2.527 | -0.478 | 6.099 | 2.005 | - | - | -9.00 |
| 45.0 | -3.274 | -0.731 | 5.829 | 1.875 | - | - | -10.24 |
| 50.0 | -4.036 | -1.050 | 5.524 | 1.721 | - | - | -11.41 |
| 60.0 | -5.522 | -1.885 | 4.772 | 1.402 | - | - | -13.46 |

Damaged GZ Plot (Whole Range)
---




Damage GZ Plot (Heeling To Port)
---



Model Test Draught Marks
---
(Draughts given on centreline and perpedicular to baseline)

Damage Case : R7P15-16.1.0
Damage Side : PORT
Equilibrium Heel Angle: 3.587 Degrees

Locations of Draught Marks and Breadths at Draught Mark locations

| Draught Mark | X Location | Full Breadth At Mean Damage Draught |
|---|---|---|
| AP | 0.000 m | 28.025 m |
| AFT QUARTER | 44.775 m | 30.400 m |
| MIDSHIP | 89.550 m | 30.400 m |
| FP | 179.100 m | 0.557 m |

Draughts in Intact, Damage Equilibrium

| Draught Marks at AP | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 7.619 m |
| Mean | 6.700 m | 6.740 m |
| Starboard | 6.700 m | 5.862 m |

| Draught Marks at Aft Quarter | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 7.971 m |
| Mean | 6.700 m | 7.018 m |
| Starboard | 6.700 m | 6.065 m |

| Draught Marks at Midship | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 8.248 m |
| Mean | 6.700 m | 7.296 m |
| Starboard | 6.700 m | 6.343 m |

| Draught Marks at FP | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 7.868 m |
| Mean | 6.700 m | 7.851 m |
| Starboard | 6.700 m | 7.833 m |

Draught Mark Explanation
---
Damage floating position draught marks calculation shown in red
Modlel Draught marks calculation method shown in green

FIGURE 1

FIGURE 2

Intact Hydrostatics and Stability Information for Single Damage Case
---

Damage Case : R7P15-16.2.0-1
Damage Side : PORT
Initial Condition : DS

| Intact Hydrostatics | | | Intact Stability | | |
|---|---|---|---|---|---|
| Midship Draught | : | 6.700 m | KMT | : | 17.530 m |
| Trim | : | 0.000 m (Between Perps) | | | |
| Trim Angle | : | 0.000 deg | KG | : | 15.230 m |
| Heel Angle | : | 0.000 deg | GM | : | 2.300 m |
| Displacement | : | 24342.9 Tonnes | | | |
| Moulded Volume | : | 23687.6 m3 (Actual Floating Position) | | | |
| LCB | : | 85.16 m (From AP - Level Trim Floating Position) | | | |

MAIN CHARACTERISTICS OF THE VESSEL:
---

| | | |
|---|---|---|
| Length betw. perpendiculars | 179.10 | m |
| Breadth, moulded | 30.40 | m |
| Design draught | 6.60 | m |
| X-coord. of after perpendicular | 0.00 | m |
| X-coord. of reference point | 89.55 | m |
| X-coord. of midship section | 89.55 | m |
| X-coord. of building frame 0 | 0.00 | m |
| Thickness of keelplate | 0.010 | m |
| Mean thickness of shell plating | 0.010 | m |
| Density of water | 1.0250 | ton/m3 |

Sign Conventions
---

Trim by Bow : +
Heel to Port : +

Calculations are based on MODELHULL date 2010-05-07 time 11:50

| | | |
|---|---|---|
| Shell thickness used in the calculation | 10.0 | mm |
| X-coord. of aft end of DWL | -0.80 | m |
| X-coord. of fore end of DWL | 185.46 | m |

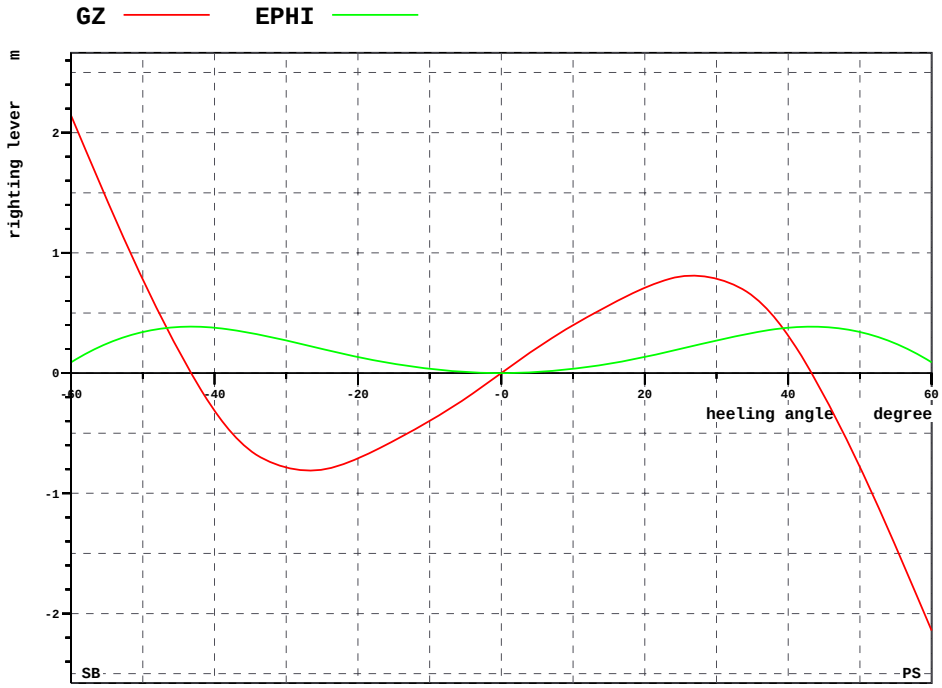
Calc. sections 48

Intact GZ Curve
---

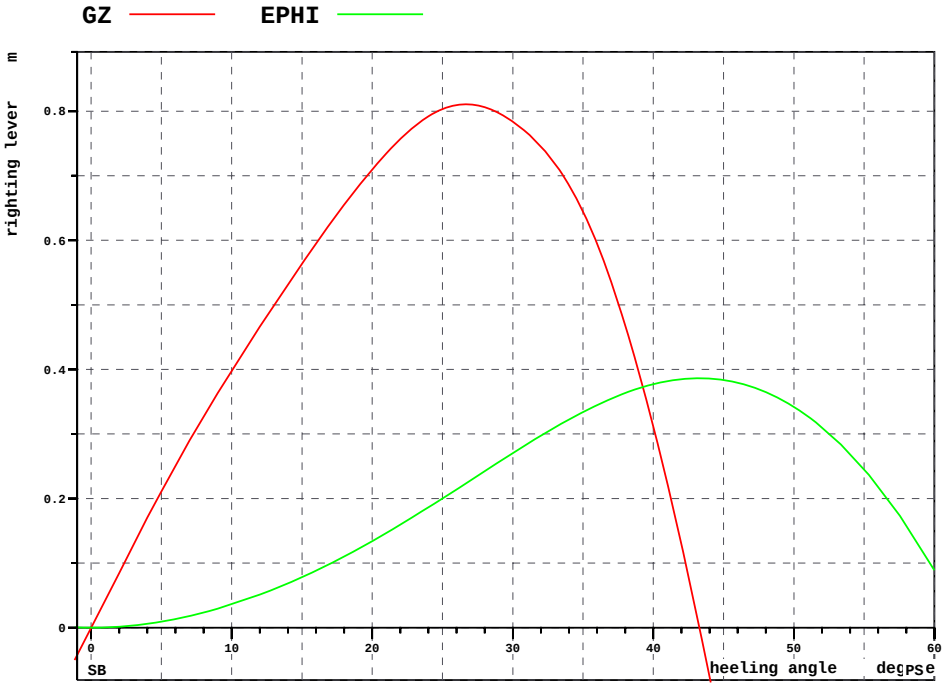
Initial condition : DS, Deepest subd. load line
Damage case : R7P15-16.2.0-1, Zones Z17-Z18 Port, b2, l.ext1
Stage of damage : INTACT
Phase of stage : EQ

| HEEL degree | GZ m | EPHI rad*m | T m | TR m | OPNAME | IMRES m | RESMRG m |
|---|---|---|---|---|---|---|---|
| -60.0 | 2.142 | 0.089 | 0.506 | 2.889 | - | - | - |
| -50.0 | 0.782 | 0.342 | 2.048 | 2.344 | - | - | - |
| -45.0 | 0.185 | 0.384 | 2.809 | 2.054 | - | - | - |
| -40.0 | -0.312 | 0.377 | 3.560 | 1.741 | - | - | - |
| -35.0 | -0.644 | 0.334 | 4.296 | 1.419 | - | - | - |
| -30.0 | -0.784 | 0.271 | 4.982 | 1.153 | - | - | - |
| -27.0 | -0.811 | 0.229 | 5.337 | 1.013 | - | - | - |
| -24.0 | -0.792 | 0.187 | 5.642 | 0.875 | - | - | - |
| -21.0 | -0.735 | 0.146 | 5.899 | 0.741 | - | - | - |
| -18.0 | -0.655 | 0.110 | 6.115 | 0.607 | - | - | - |
| -15.0 | -0.563 | 0.078 | 6.294 | 0.475 | - | - | - |
| -12.0 | -0.466 | 0.051 | 6.439 | 0.347 | - | - | - |
| -9.0 | -0.363 | 0.029 | 6.553 | 0.224 | - | - | - |
| -7.0 | -0.290 | 0.018 | 6.610 | 0.149 | - | - | - |
| -5.0 | -0.211 | 0.009 | 6.654 | 0.079 | - | - | - |
| -4.0 | -0.170 | 0.006 | 6.672 | 0.045 | - | - | - |
| -3.0 | -0.128 | 0.003 | 6.685 | 0.017 | - | - | - |
| -2.0 | -0.085 | 0.001 | 6.693 | 0.007 | - | - | - |
| -1.0 | -0.043 | 0.000 | 6.699 | -0.010 | - | - | - |
| 0.0 | 0.000 | 0.000 | 6.700 | 0.000 | - | - | - |
| 1.0 | 0.043 | 0.000 | 6.699 | -0.010 | - | - | - |
| 2.0 | 0.085 | 0.001 | 6.693 | 0.007 | - | - | - |
| 3.0 | 0.128 | 0.003 | 6.685 | 0.017 | - | - | - |
| 4.0 | 0.170 | 0.006 | 6.672 | 0.045 | - | - | - |
| 5.0 | 0.211 | 0.009 | 6.654 | 0.079 | - | - | - |
| 7.0 | 0.290 | 0.018 | 6.610 | 0.149 | - | - | - |
| 9.0 | 0.363 | 0.029 | 6.553 | 0.224 | - | - | - |
| 12.0 | 0.466 | 0.051 | 6.439 | 0.347 | - | - | - |
| 15.0 | 0.563 | 0.078 | 6.294 | 0.475 | - | - | - |
| 18.0 | 0.655 | 0.110 | 6.115 | 0.607 | - | - | - |
| 21.0 | 0.735 | 0.146 | 5.899 | 0.741 | - | - | - |
| 24.0 | 0.792 | 0.187 | 5.642 | 0.875 | - | - | - |
| 27.0 | 0.811 | 0.229 | 5.337 | 1.013 | - | - | - |
| 30.0 | 0.784 | 0.271 | 4.982 | 1.153 | - | - | - |
| 35.0 | 0.644 | 0.334 | 4.296 | 1.419 | - | - | - |
| 40.0 | 0.312 | 0.377 | 3.560 | 1.741 | - | - | - |
| 45.0 | -0.185 | 0.384 | 2.809 | 2.054 | - | - | - |
| 50.0 | -0.782 | 0.342 | 2.048 | 2.344 | - | - | - |
| 60.0 | -2.142 | 0.089 | 0.506 | 2.889 | - | - | - |

Intact GZ Plot (Whole Range)
---




Intact GZ Plot (Heeling To Port)
---



## Damage Hydrostatics and Stability Information for Single Damage Case

Damage Case : R7P15-16.2.0-1
Damage Side : PORT
Initial Condition : DS
Flooding Stage : *LAST
Phase of Stage : EQ

### Damaged Compartments

| Room | Permeability | Volume | XCG | YCG | ZCG | Moulded Volume |
|---|---|---|---|---|---|---|
| HOLD | 0.90 | 0.0 | - | - | - | 0.0 |
| R090209 | 0.60 | 146.2 | 88.82 | 4.81 | 7.08 | 243.6 |
| R090200A | 0.95 | 668.5 | 102.83 | -4.55 | 6.23 | 703.7 |
| R120202 | 0.60 | 52.8 | 122.03 | -4.76 | 6.98 | 88.1 |
| TUNNEL | 0.95 | 473.7 | 103.83 | -0.00 | 3.59 | 498.6 |
| R100000 | 0.95 | 1212.9 | 98.07 | 0.20 | 2.87 | 1276.7 |
| R100200 | 0.95 | 535.1 | 97.92 | 2.73 | 6.44 | 563.2 |
| R100201 | 0.60 | 63.6 | 100.42 | 5.02 | 7.16 | 106.1 |
| R100202 | 0.60 | 14.4 | 99.21 | 0.02 | 7.00 | 24.1 |
| R100203 | 0.60 | 14.9 | 104.01 | 0.02 | 7.02 | 24.8 |
| R110000 | 0.95 | 680.6 | 110.25 | 0.00 | 2.87 | 716.4 |
| R110200 | 0.95 | 265.7 | 110.03 | 11.86 | 7.02 | 279.7 |
| R110101 | 0.95 | 359.1 | 110.00 | 4.90 | 3.85 | 378.0 |
| R110201 | 0.60 | 205.6 | 114.99 | 5.01 | 7.24 | 342.6 |

### Floating Position

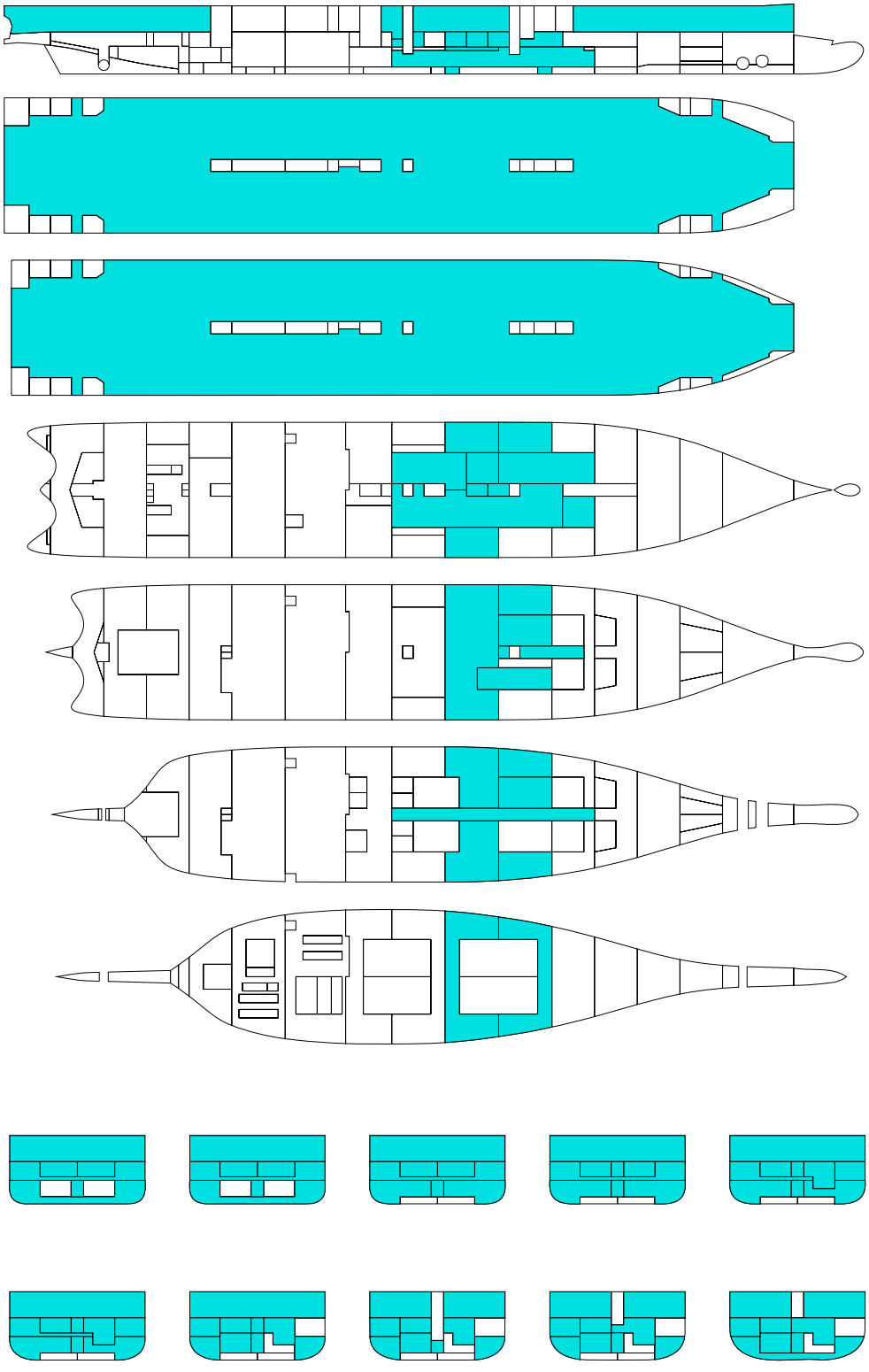
(Draughts given on centreline and perpedicular to waterline)

| | | | | |
|---|---|---|---|---|
| Draught Forward | TF | 8.771 m | Heel Angle | 3.499 Deg (To Port) |
| Draught | T | 7.769 m | Trim | 2.005 m |
| Draught Aft | TA | 6.766 m | Trim Angle | 0.641 Deg |

### Damage GZ Particulars

| | |
|---|---|
| Range | 7.820 Deg (Port) |
| GZ Max | 0.079 m |
| Angle at GZ Max | 7.673 Deg (Port) |
| Area Under GZ Curve | 0.007 m.rad |

Damage Case Drawing
---

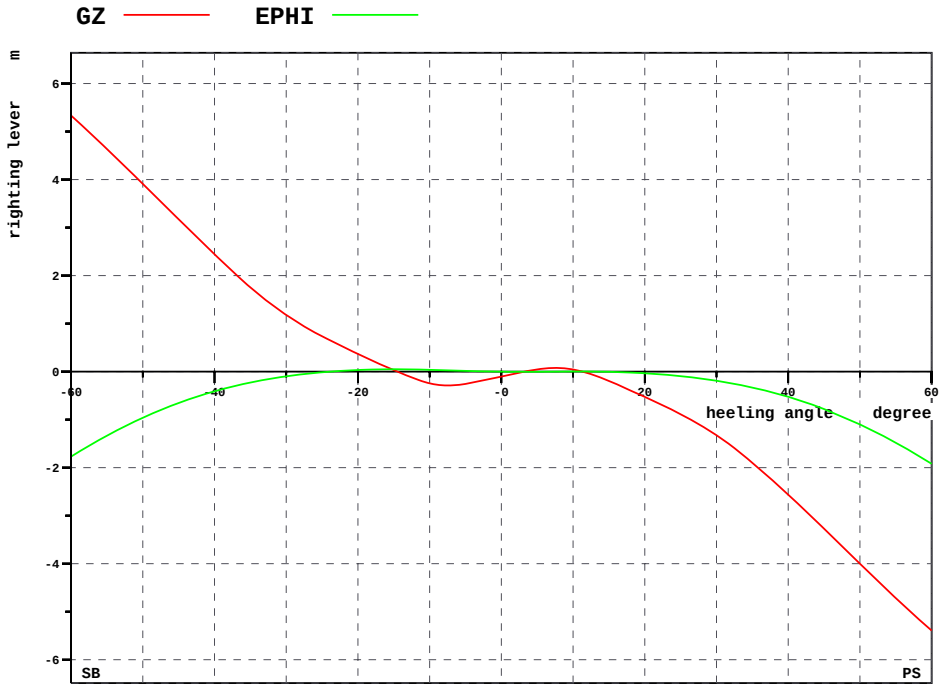


Damaged GZ Curve
---

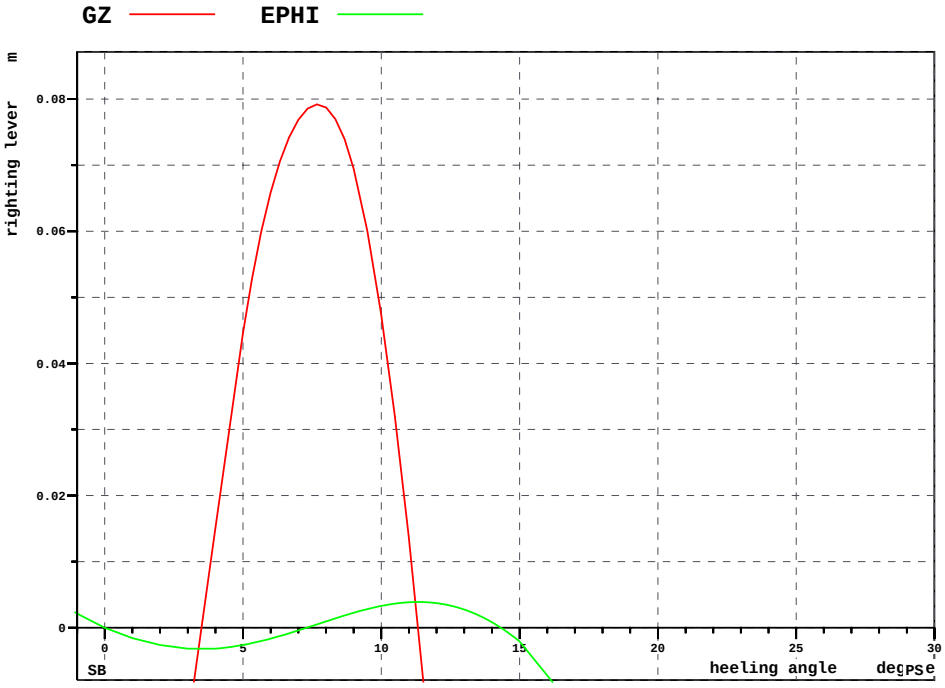
Initial condition : DS, Deepest subd. load line
Damage case : R7P15-16.2.0-1, Zones Z17-Z18 Port, b2, l.ext1
Stage of damage : 1
Phase of stage : EQ

| HEEL degree | GZ m | EPHI rad*m | T m | TR m | OPNAME | IMRES m | RESMRG m |
|---|---|---|---|---|---|---|---|
| -60.0 | 5.333 | -1.771 | 5.689 | 2.428 | - | - | - |
| -50.0 | 3.914 | -0.963 | 6.416 | 2.714 | - | - | - |
| -45.0 | 3.177 | -0.653 | 6.699 | 2.869 | - | - | - |
| -40.0 | 2.444 | -0.408 | 6.933 | 3.013 | - | - | - |
| -35.0 | 1.756 | -0.226 | 7.127 | 3.086 | - | - | - |
| -30.0 | 1.181 | -0.098 | 7.296 | 3.005 | - | - | - |
| -27.0 | 0.901 | -0.044 | 7.386 | 2.906 | - | - | - |
| -24.0 | 0.658 | -0.003 | 7.469 | 2.864 | - | - | - |
| -21.0 | 0.444 | 0.026 | 7.542 | 2.856 | - | - | - |
| -18.0 | 0.233 | 0.043 | 7.591 | 2.794 | - | - | - |
| -15.0 | 0.029 | 0.050 | 7.618 | 2.656 | - | - | - |
| -12.0 | -0.151 | 0.047 | 7.632 | 2.449 | - | - | - |
| -9.0 | -0.271 | 0.035 | 7.651 | 2.200 | - | - | - |
| -7.0 | -0.287 | 0.025 | 7.680 | 2.062 | - | - | - |
| -5.0 | -0.255 | 0.016 | 7.722 | 1.986 | - | - | - |
| -4.0 | -0.226 | 0.012 | 7.743 | 1.970 | - | - | - |
| -3.0 | -0.197 | 0.008 | 7.761 | 1.953 | - | - | - |
| -2.0 | -0.167 | 0.005 | 7.773 | 1.952 | - | - | - |
| -1.0 | -0.137 | 0.002 | 7.782 | 1.943 | - | - | - |
| 0.0 | -0.106 | 0.000 | 7.785 | 1.957 | - | - | - |
| 1.0 | -0.076 | -0.002 | 7.787 | 1.955 | - | - | - |
| 2.0 | -0.045 | -0.003 | 7.782 | 1.977 | - | - | - |
| 3.0 | -0.015 | -0.003 | 7.775 | 1.991 | - | - | - |
| 3.5 | -0.000 | -0.003 | 7.769 | 2.005 | - | - | - |
| 4.0 | 0.015 | -0.003 | 7.762 | 2.019 | - | - | - |
| 5.0 | 0.045 | -0.003 | 7.746 | 2.048 | - | - | - |
| 7.0 | 0.077 | -0.000 | 7.714 | 2.154 | - | - | - |
| 9.0 | 0.069 | 0.002 | 7.692 | 2.314 | - | - | - |
| 12.0 | -0.030 | 0.004 | 7.674 | 2.576 | - | - | - |
| 15.0 | -0.198 | -0.002 | 7.657 | 2.787 | - | - | - |
| 18.0 | -0.394 | -0.018 | 7.625 | 2.921 | - | - | - |
| 21.0 | -0.600 | -0.044 | 7.571 | 2.977 | - | - | - |
| 24.0 | -0.809 | -0.081 | 7.494 | 2.982 | - | - | - |
| 27.0 | -1.050 | -0.129 | 7.410 | 3.028 | - | - | - |
| 30.0 | -1.326 | -0.191 | 7.319 | 3.131 | - | - | - |
| 35.0 | -1.892 | -0.331 | 7.149 | 3.227 | - | - | - |
| 40.0 | -2.568 | -0.525 | 6.960 | 3.174 | - | - | - |
| 45.0 | -3.286 | -0.780 | 6.734 | 3.057 | - | - | - |
| 50.0 | -4.007 | -1.098 | 6.460 | 2.931 | - | - | - |
| 60.0 | -5.393 | -1.920 | 5.750 | 2.701 | - | - | - |

Damaged GZ Plot (Whole Range)
---




Damage GZ Plot (Heeling To Port)
---



## Model Test Draught Marks

(Draughts given on centreline and perpedicular to baseline)

Damage Case : R7P15-16.2.0-1
Damage Side : PORT
Equilibrium Heel Angle: 3.499 Degrees

## Locations of Draught Marks and Breadths at Draught Mark locations

| Draught Mark | X Location | Full Breadth At Mean Damage Draught |
|---|---|---|
| AP | 0.000 m | 28.213 m |
| AFT QUARTER | 44.775 m | 30.400 m |
| MIDSHIP | 89.550 m | 30.400 m |
| FP | 179.100 m | 1.446 m |

## Draughts in Intact, Damage Equilibrium

| Draught Marks at AP | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 7.642 m |
| Mean | 6.700 m | 6.779 m |
| Starboard | 6.700 m | 5.917 m |

| Draught Marks at Aft Quarter | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 8.211 m |
| Mean | 6.700 m | 7.281 m |
| Starboard | 6.700 m | 6.352 m |

| Draught Marks at Midship | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 8.713 m |
| Mean | 6.700 m | 7.783 m |
| Starboard | 6.700 m | 6.854 m |

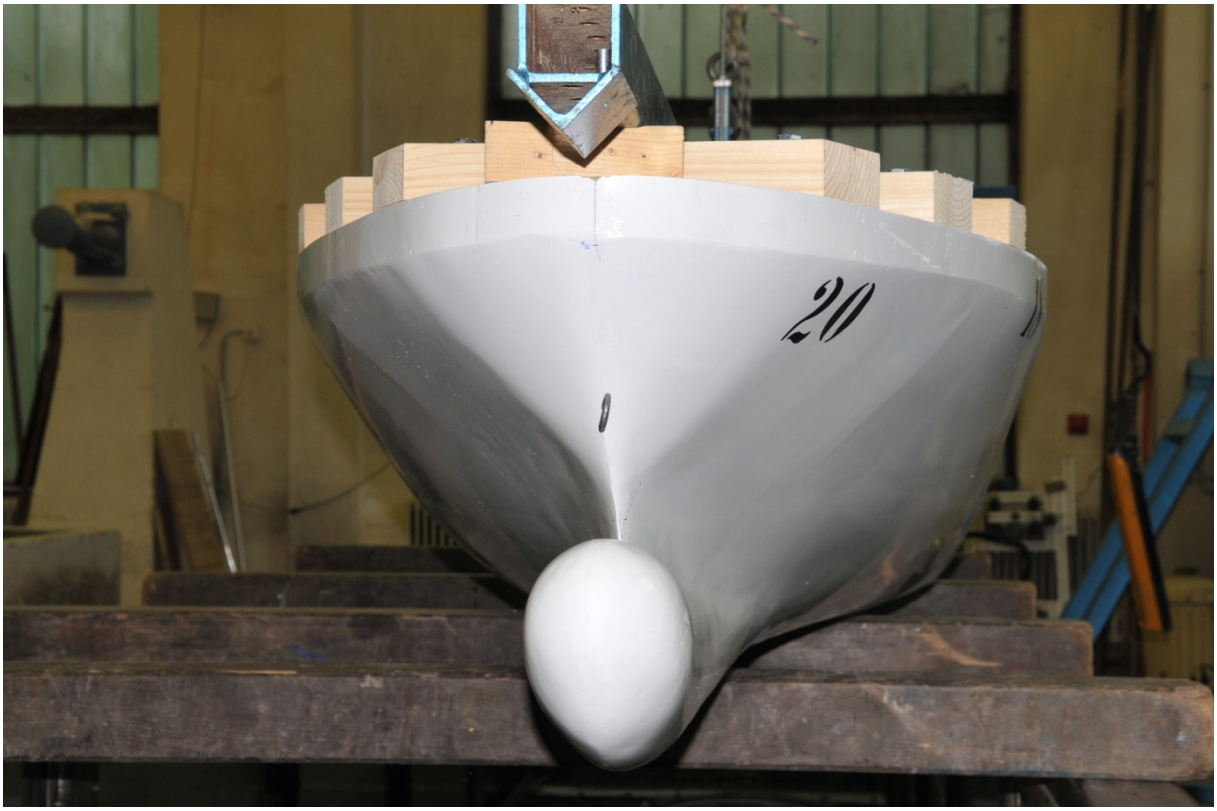
| Draught Marks at FP | Intact | Equilibrium |
|---|---|---|
| Port | 6.700 m | 8.832 m |
| Mean | 6.700 m | 8.788 m |
| Starboard | 6.700 m | 8.743 m |

# APPENDIX B

# PHOTOGRAPHS OF THE MODELS

## Model No. 2458 and 2458A

## Project: “EMSA 3”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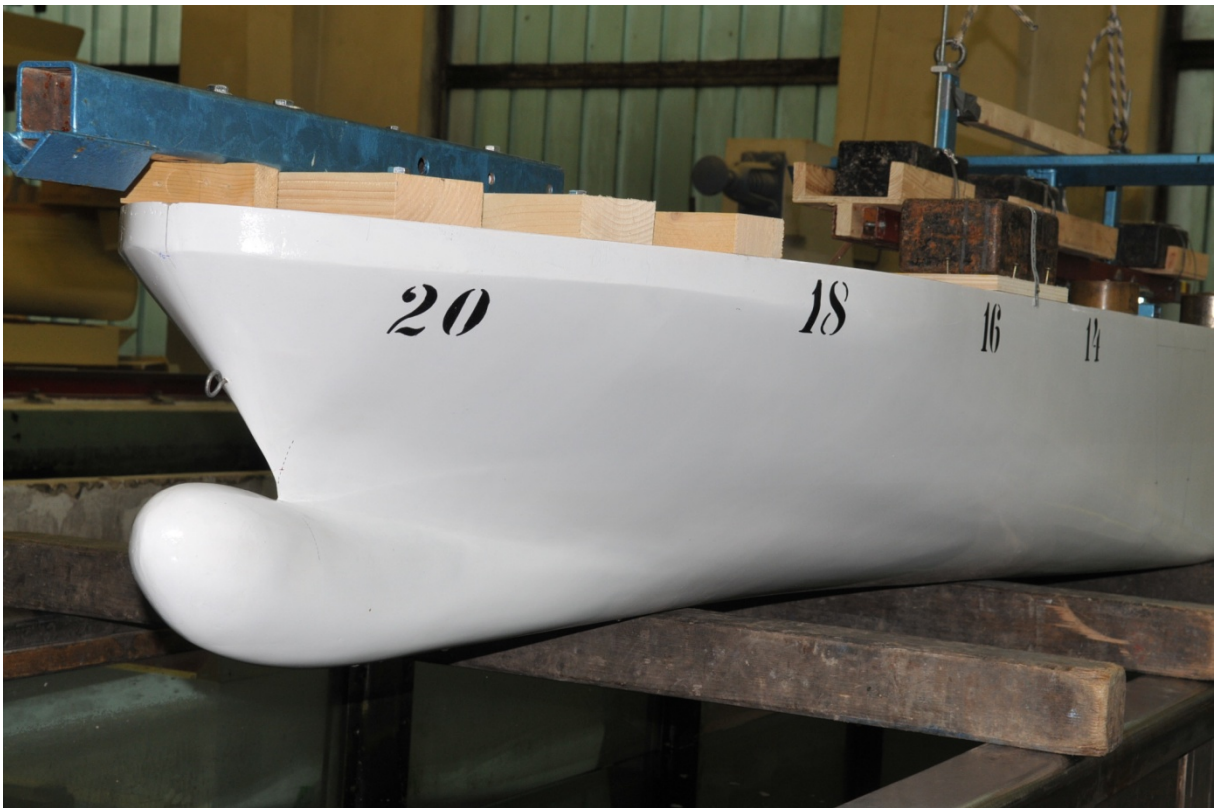
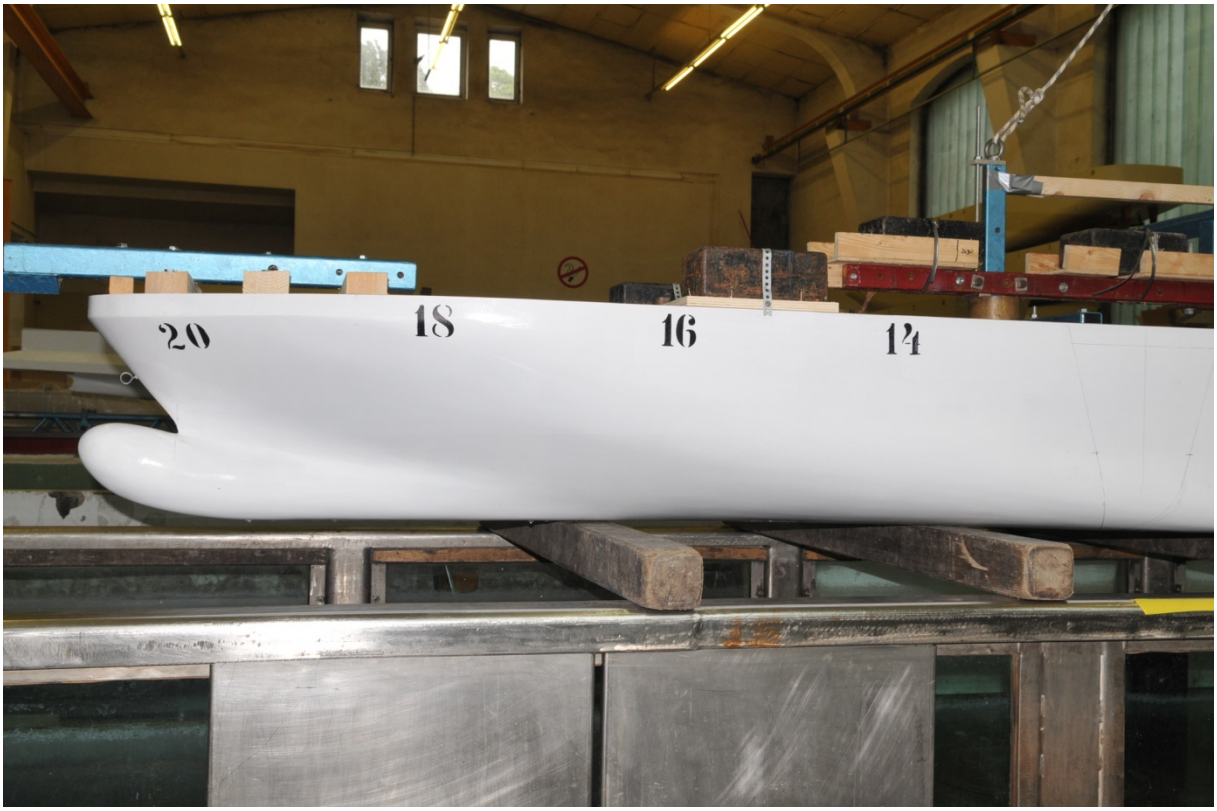
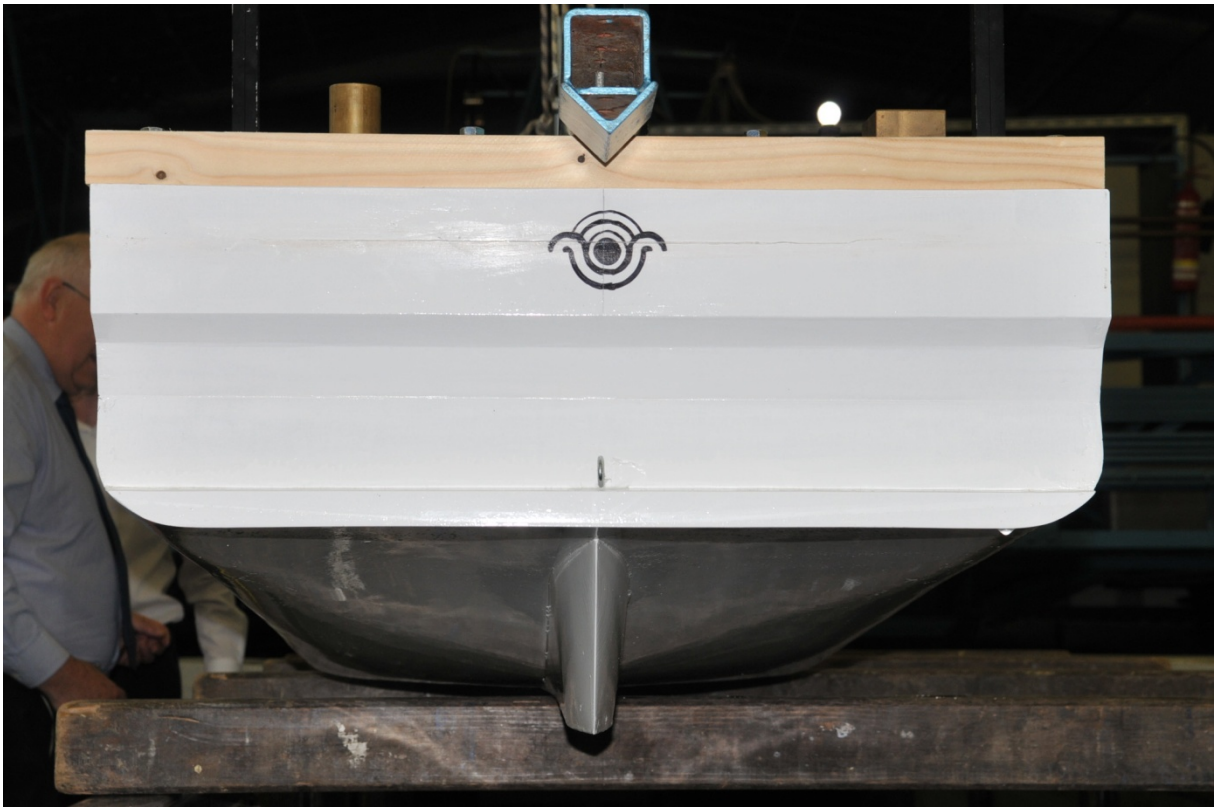

20
18
16
14


20
18
16
14


4
2
0


4
2
0

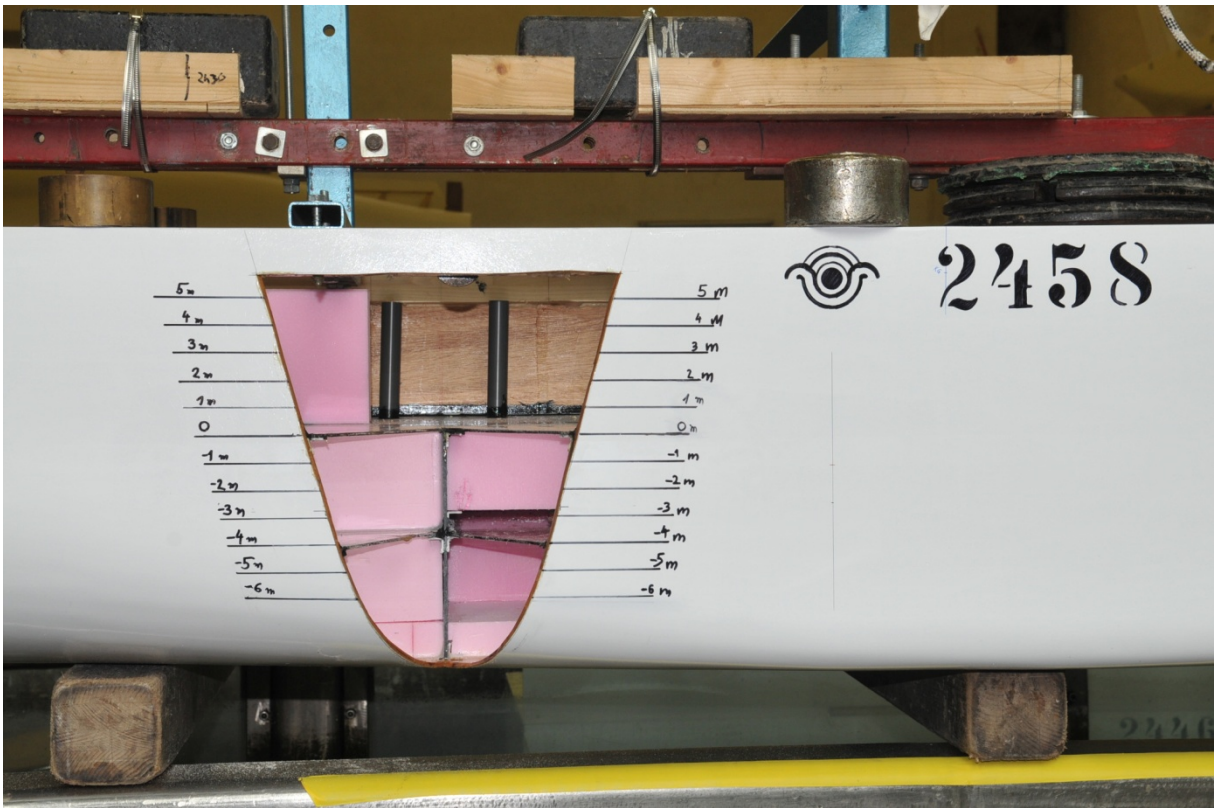


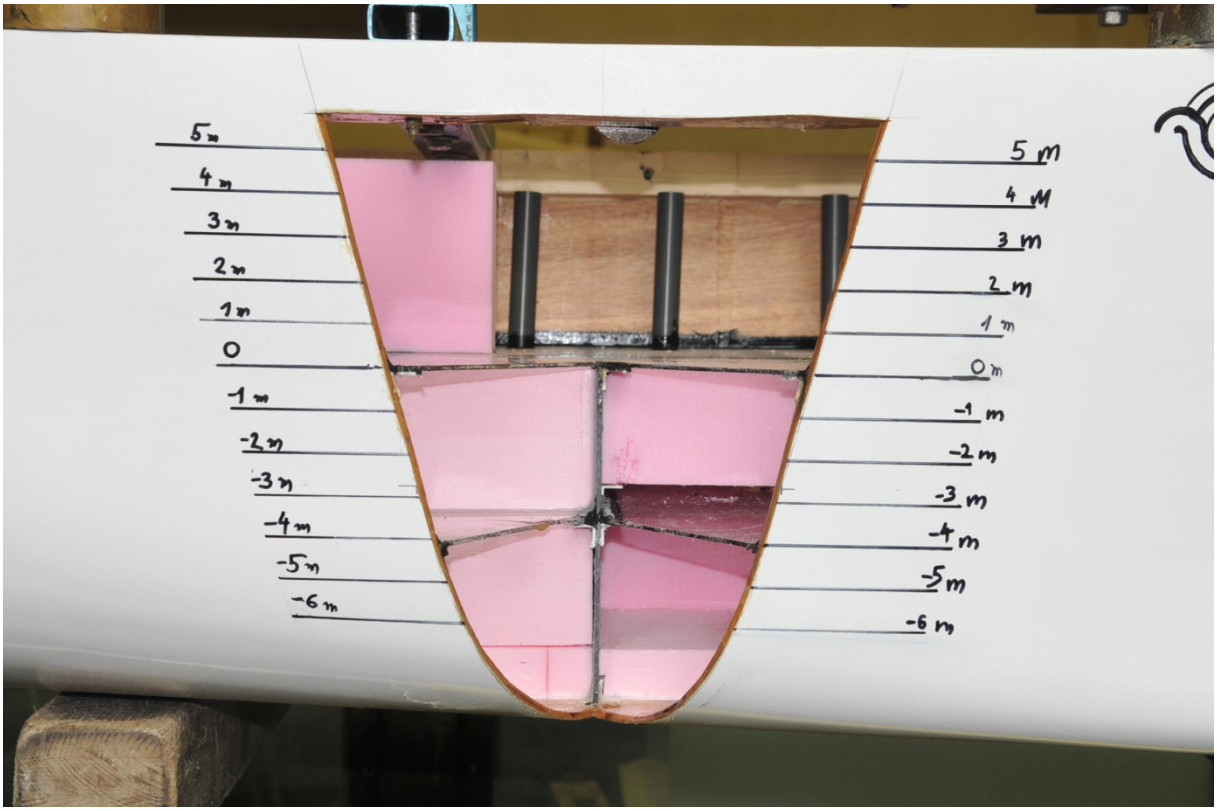
# PHOTOGRAPHS OF THE MODEL

## Model No. 2458

## Project: “EMSA 3”

**Damage Case 1 R7P15-16.1.0**


2458
5 m
4 m
3 m
2 m
1 m
0
-1 m
-2 m
-3 m
-4 m
-5 m
-6 m


5 m
4 m
3 m
2 m
1 m
0
-1 m
-2 m
-3 m
-4 m
-5 m
-6 m

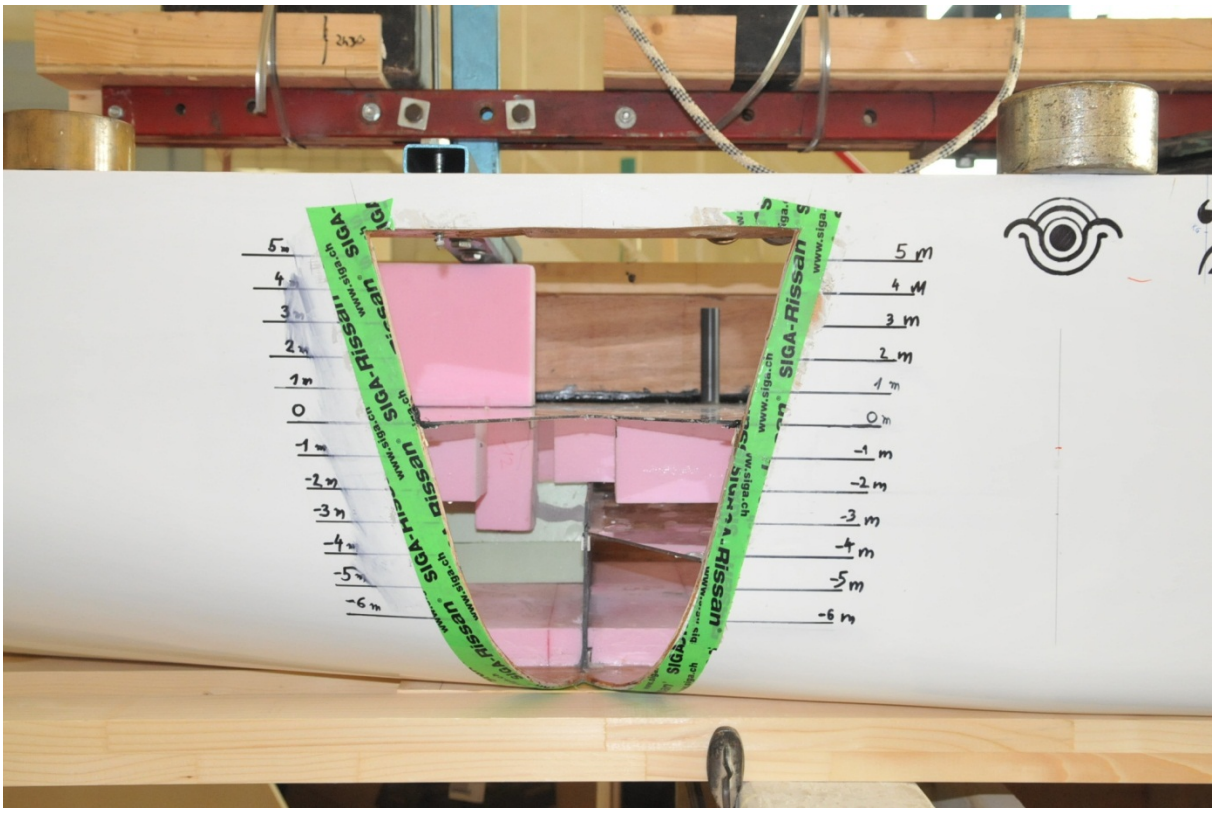
# PHOTOGRAPHS OF THE MODEL

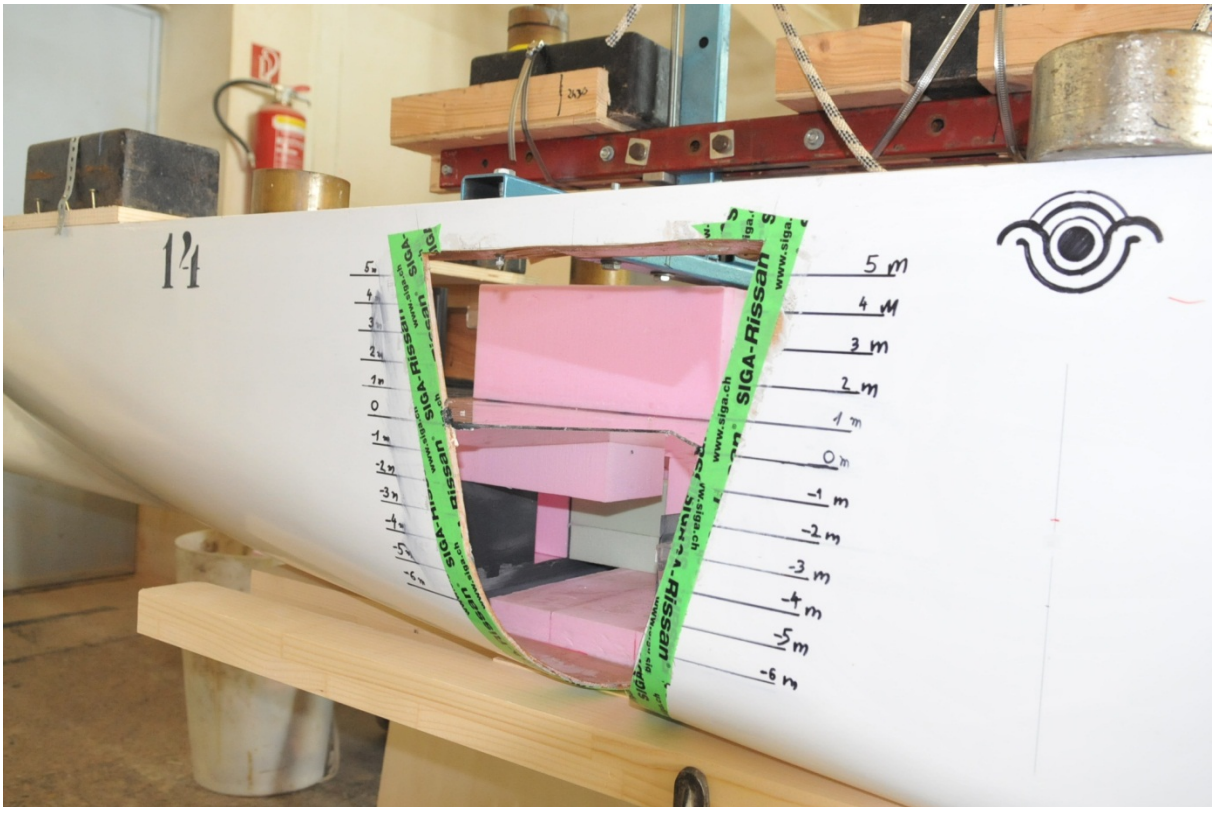
## Model No. 2458A

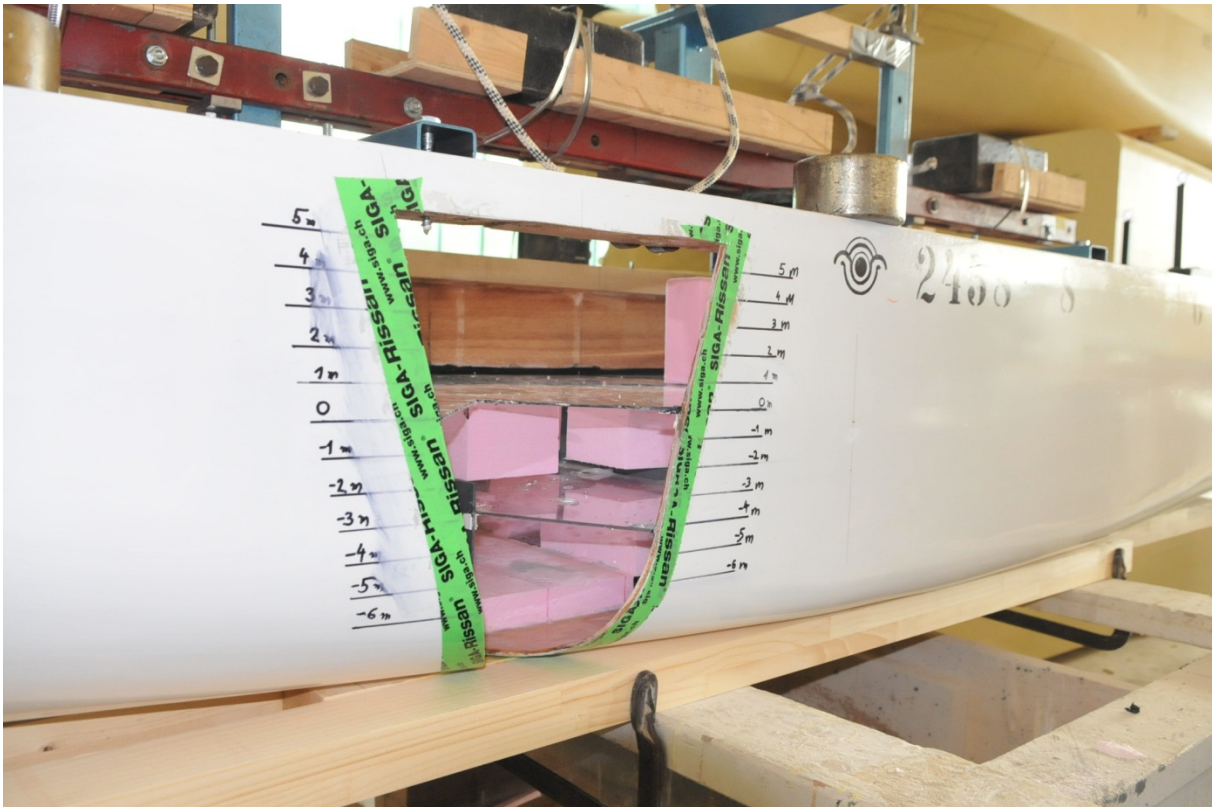
## Project: “EMSA 3”

**Damage Case 2 R7P15-16.2.0-1**


20
18
16
14


SIGA-Rissan
www.siga.ch
5 m
4 m
3 m
2 m
1 m
0
-1 m
-2 m
-3 m
-4 m
-5 m
-6 m


14
SIGA-Rissan
www.siga.ch
5 m
4 m
3 m
2 m
1 m
0
-1 m
-2 m
-3 m
-4 m
-5 m
-6 m


SIGA-Rissan
5 m
4 m
3 m
2 m
1 m
0
-1 m
-2 m
-3 m
-4 m
-5 m
-6 m

# APPENDIX C

# MODEL TEST PROTOCOL

## Model No. 2458

## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

Details of the dimensions and the damage conditions

## GENERAL PARTICULARS

**EUGD01-C1**

Model Scale = 1: 40

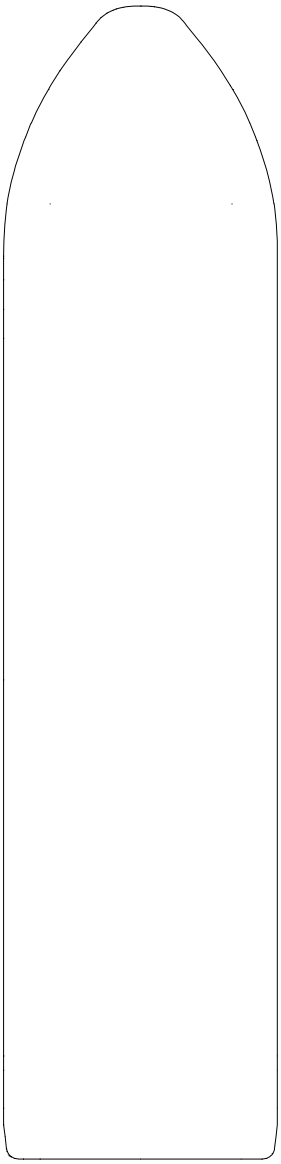
| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **MAIN DIMENSIONS** | | | | |
| LMOD | | | | **4834.0** |
| LBP | 179.100 | 4477.5 | | **4479.0** |
| BMLD | 30.400 | 760.0 | | **763.0** |

| **LONGITUDINAL POSITION OF COLLISION DAMAGE** | | | | |
|---|---|---|---|---|
| Aft Edge | 92.000 | 2300.0 | From AP (#0) | **2301** |
| Mid Bulkhead | 104.000 | 2600.0 | From AP (#0) | **2600** |
| Fwd Edge | 116.000 | 2900.0 | From AP (#0) | **2900** |

# INTACT DRAUGHTS - DAMAGE 1

**Marked in BLACK pen**

| FP | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |



**Port**

**Starboard**

| Midship | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| Midship | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| Quarter | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| Quarter | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| AP | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **-** | mm |

| AP | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **-** | mm |

# DAMAGE DRAUGHTS - DAMAGE 1

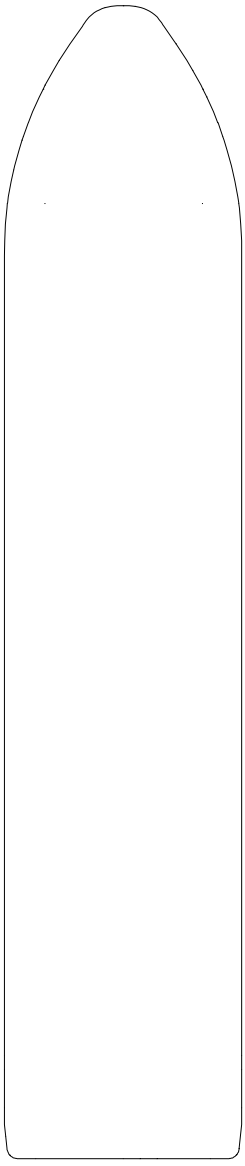
**Marked in RED pen**

| FP | |
|---|---|
| Full Size | 7.842 m |
| Model | 196.1 mm |
| Check | - mm |

| Static Heel | |
|---|---|
| 3.052 | degree(s) |

| FP | |
|---|---|
| Full Size | 7.857 m |
| Model | 196.4 mm |
| Check | **196.5** mm |

**Port**



| FP | |
|---|---|
| Full Size | 7.828 m |
| Model | 195.7 mm |
| Check | **195.5** mm |

**Starboard**

| Midship | |
|---|---|
| Full Size | 8.107 m |
| Model | 202.7 mm |
| Check | **202.5** mm |

| Midship | |
|---|---|
| Full Size | 6.486 m |
| Model | 162.2 mm |
| Check | **162** mm |

| Quarter | |
|---|---|
| Full Size | 7.834 m |
| Model | 195.9 mm |
| Check | **196.0** mm |

| Quarter | |
|---|---|
| Full Size | 6.213 m |
| Model | 155.3 mm |
| Check | **155.5** mm |

| AP | |
|---|---|
| Full Size | 7.499 m |
| Model | 187.5 mm |
| Check | **187.5** mm |

| AP | |
|---|---|
| Full Size | 6.002 m |
| Model | 150.1 mm |
| Check | - mm |

## DAMAGE OPENING - DAMAGE 1

| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **DAMAGE OPENING** | | | | |
| $D_{MLD}$ | 9.50 | 237.5 | Shell Only | **234.0** |
| Length | 8.534 | 213.4 | $3\%L_S$ + 3.0m | **213.5** |
| Dist from AP | 104.00 | 2600.0 | | **as MID BH** |
| B/5 | 9.290 | 232.3 | from CL | **-** |
| | 5.910 | 147.8 | from $B_{EXT}$ | **148.0** |

## INTACT STABILITY CHARACTERISTICS - DAMAGE 1

| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **VESSEL WEIGHT** | | | | |
| Displacement | 23687.60 | 370.1 | | **370 / 371** |
| (fresh water) | tonnes | kg | | |

| **INTACT STABILITY CHARACTERISTICS** | | | | |
|---|---|---|---|---|
| GMT | 2.300 | 57.5 | | **2.29** |
| KG | 15.230 | 380.8 | | **380.5** |
| KM | 17.530 | 438.3 | | - |
| LCB (from AP) | 85.160 | 2129.0 | From AP (#0) Level trim | |

| **RADIUS OF GYRATION CHARACTERISTICS** | | | | |
|---|---|---|---|---|
| Kxx/B (Roll) | **0.3616** | **0.3616** | Allowable 0.35 - 0.40 | |
| | | | | |
| Kyy/LOA (Pitch) | **0.2451** | **0.2451** | Allowable 0.20 - 0.25 | |

| **INCLINE DATA** | | | | |
|---|---|---|---|---|
| Incline Weight | 318400 | 4.975 | kg | |
| Lever | 8.000 | 0.200 | m | |

| **MEASURED ROLL PERIOD** | | | | |
|---|---|---|---|---|
| Intact (in water) | 17.1568 | 2.7127 | sec | |
| Damage (in water) | 19.9856 | 3.1600 | sec | |

## MODEL TEST EXPERIMENTS - DAMAGE 1

| RUN | Hs TARGET | Hs FIX | TIME TO CAPSIZE | COMMENTS |
|---|---|---|---|---|
| 01.06.2010 | | | | |
| 29700-01 | 3.50 | 3.5438 | | survived |
| 02 | 3.50 | 3.5603 | | survived |
| 03 | 3.50 | 3.5501 | | survived |
| 04 | 3.50 | 3.5616 | | survived |
| 05 | 3.50 | 3.5565 | | survived |
| 29701-01 | 4.00 | 4.0727 | | survived |
| 02 | 4.00 | 4.0526 | | survived |
| 03 | 4.00 | 4.0534 | | survived |
| 04 | 4.00 | 4.0774 | | survived |
| 05 | 4.00 | 4.0383 | | survived |
| 06 | 4.00 | 4.0358 | | survived |
| | | | | |
| 02.06.2010 | | | | |
| 29702-01 | 5.00 | 5.0846 | | survived |
| 02 | 5.00 | 5.0302 | | survived |
| 03 | 5.00 | 5.0691 | | survived |
| 04 | 5.00 | 5.0943 | | survived |
| 05 | 5.00 | 5.0593 | | survived |
| 29703-01 | 6.00 | 6.0814 | | survived |
| 02 | 6.00 | 6.0472 | | survived |
| 03 | 6.00 | 6.0826 | | survived |
| 04 | 6.00 | 6.0774 | | survived |
| 05 | 6.00 | 6.0441 | | survived |
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# APPENDIX D

# STATISTICS OF WAVES AND ROLL MOTIONS

## Model No. 2458

## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

**Roll Test in Air Measurements**

**Pitch Test in Air Measurements**

**Roll Test in Water Measurements (Intact Condition)**

**Roll Test in Water Measurements (Damaged Condition)**

**Spectral Characteristics of the Target and Measured Waves**

**Summary of the Measured Wave and Roll Time Realisations**

# Roll in Air Measurements

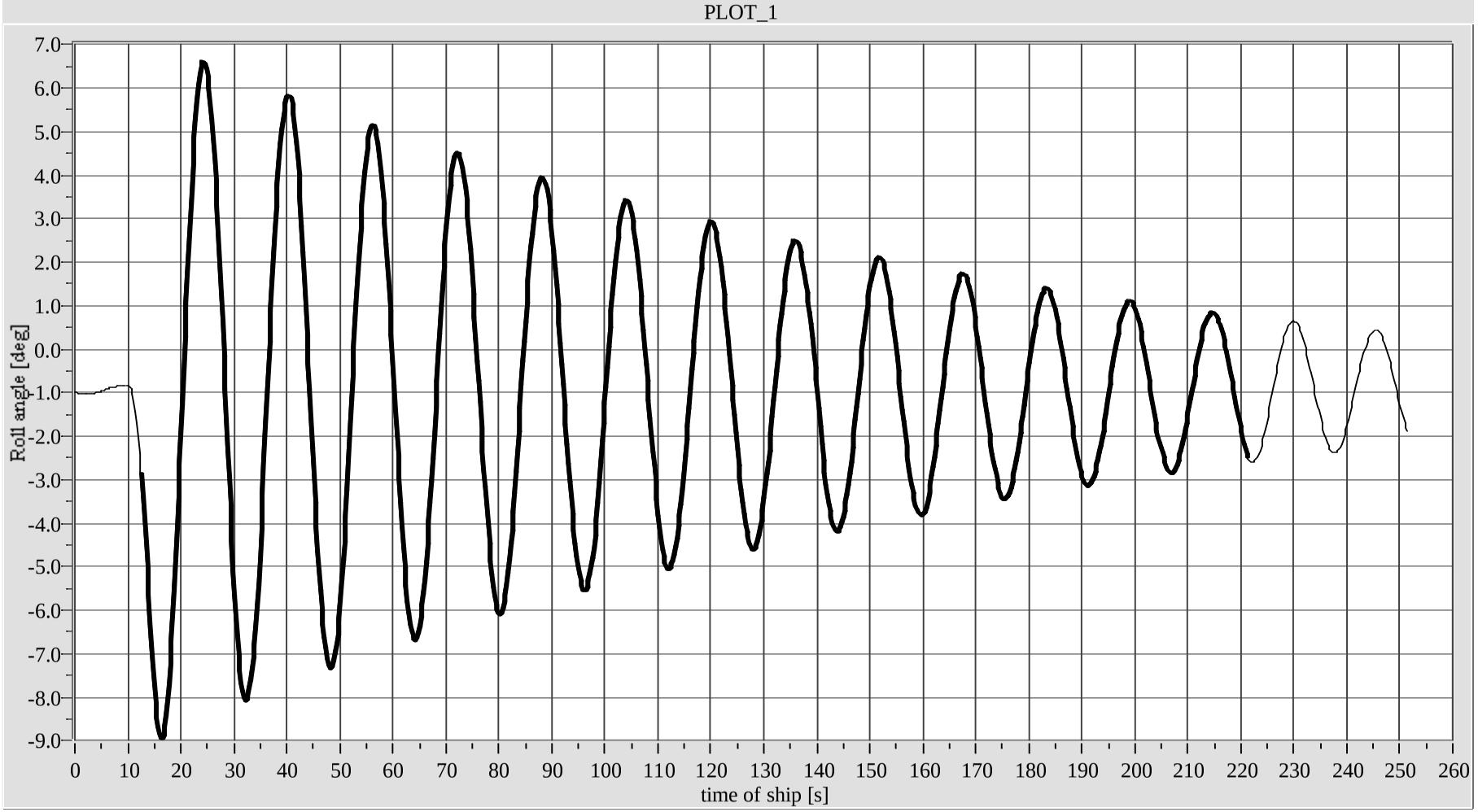
# Model No. 2458

# Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

| Vienna Model Basin Ltd. | Roll Test in Air |
|---|---|

| Model No. 2458 | Test No. 29699-03 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 2.5067 s / 15.8536 s | Project: EMSA 3 | |
|---|---|---|

# Pitch in Air Measurements

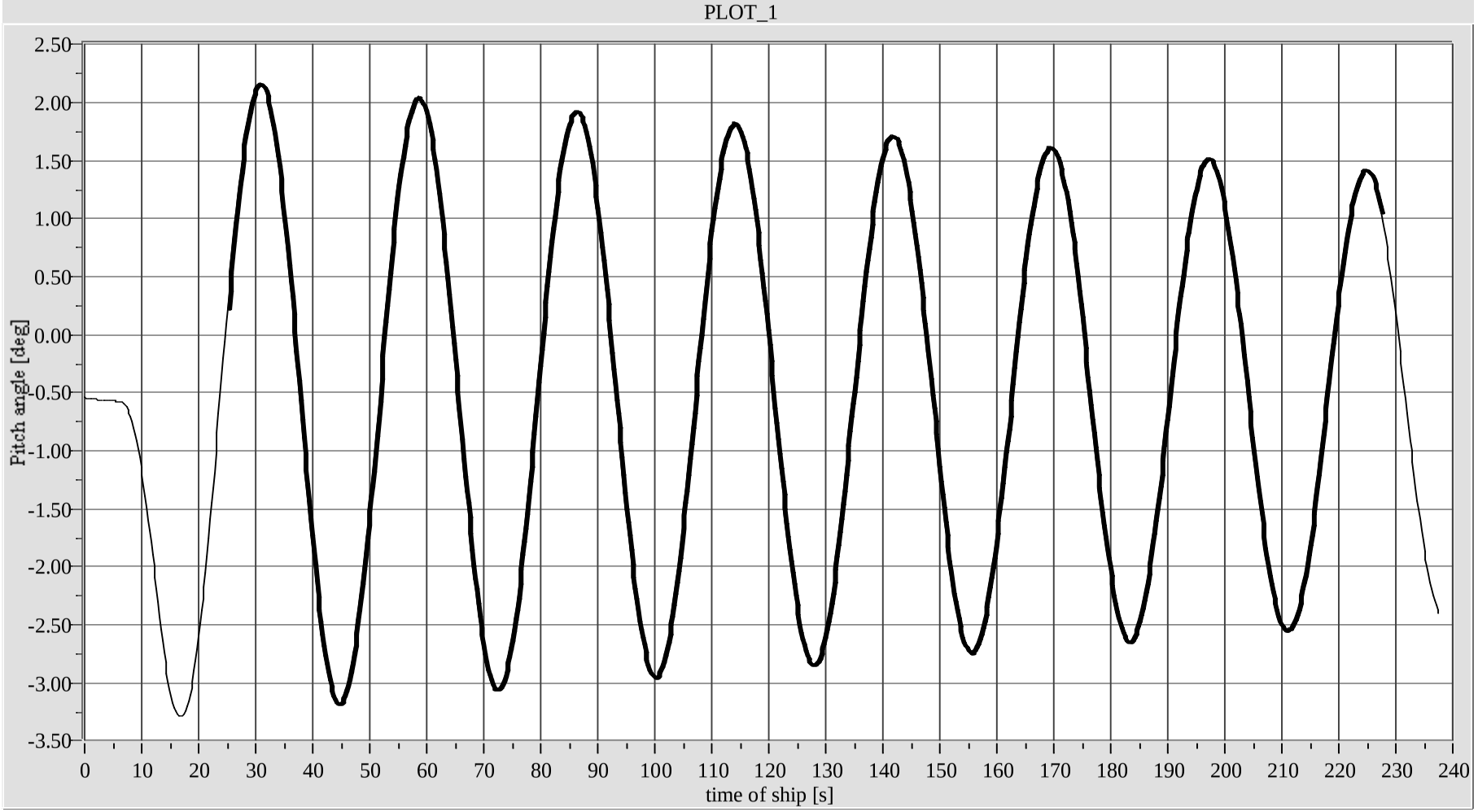
# Model No. 2458

# Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

| Vienna Model Basin Ltd. | Pitch Test in Air |
|---|---|

| Model No. 2458 | Test No. 29699-02 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 4.3829 s / 27.7196 s | Project: EMSA 3 | |
|---|---|---|

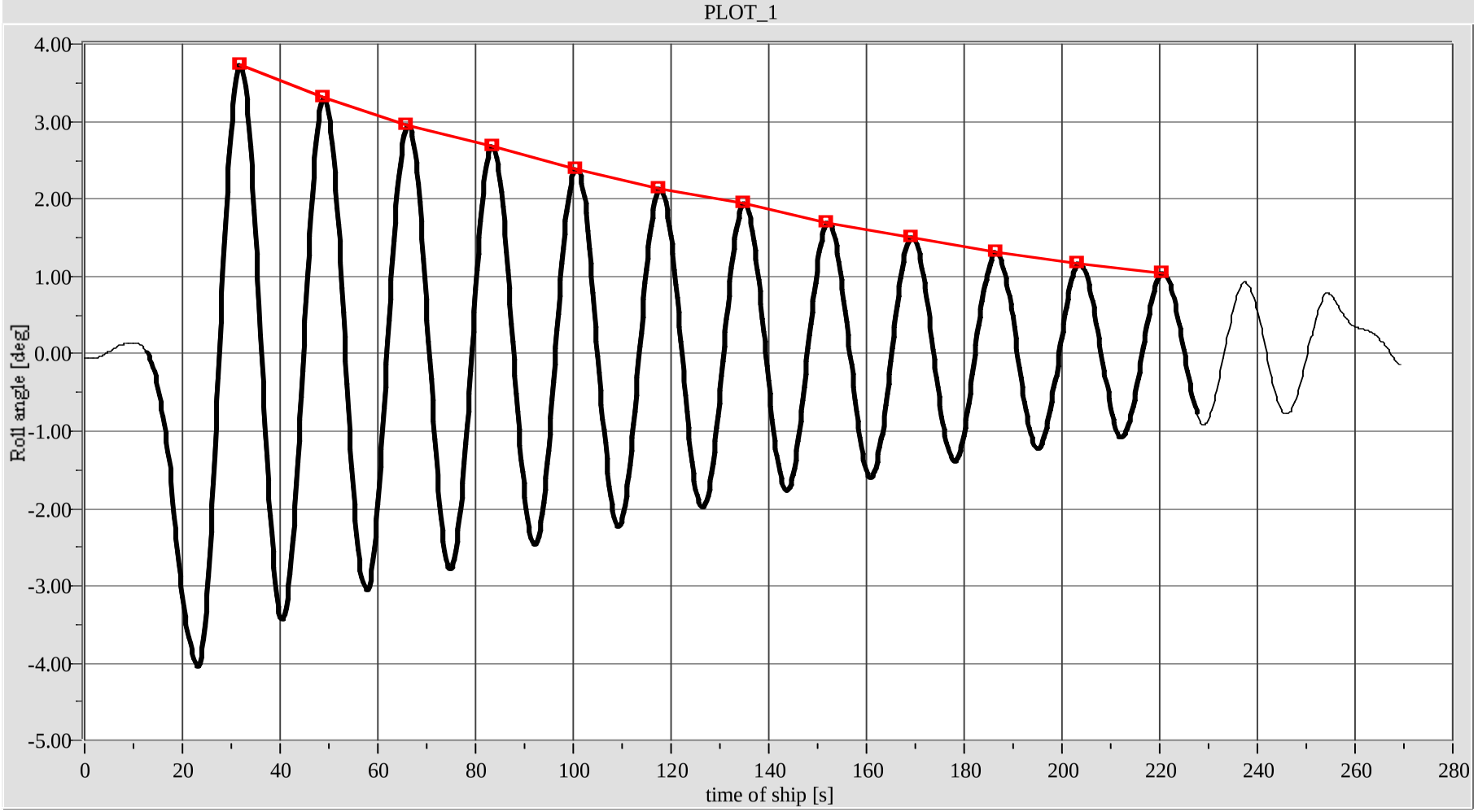
# Roll in Water Measurements (Intact Condition)

# Model No. 2458

# Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

| Vienna Model Basin Ltd. | Roll decay test in water (intact condition) | | | |
|---|---|---|---|---|
| Model No. 2458 | Test No. 29699-04 | GMT = 2,30 m | | without bilge keels |




| Natural Roll Period (Ship) = 17.1568 s | Project: EMSA 3 | Draught = 6,70 |
|---|---|---|

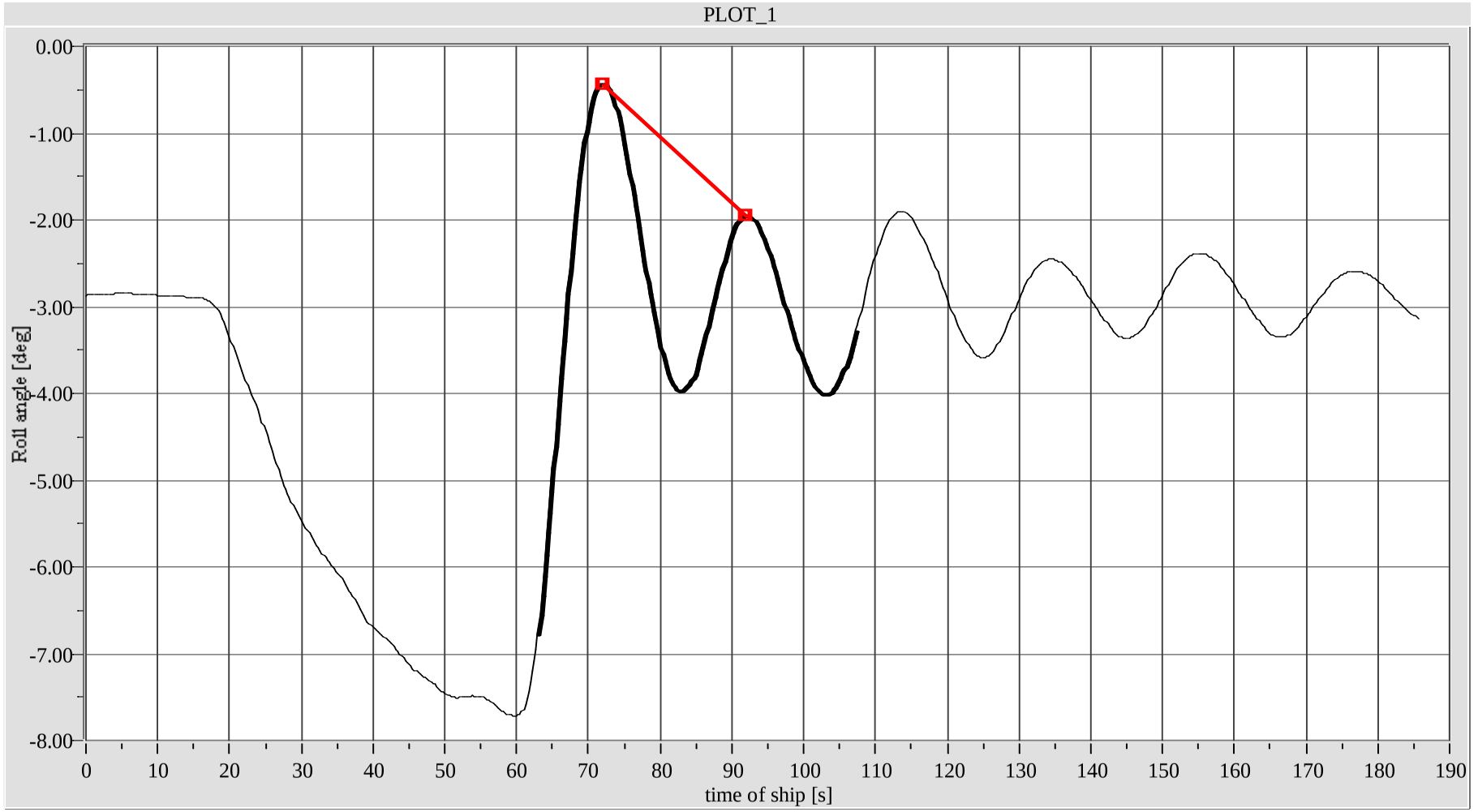
# Roll in Water Measurements (Damaged Condition)

# Model No. 2458

# Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

| Vienna Model Basin Ltd. | Roll decay test in water (damaged condition) | | | |
|---|---|---|---|---|
| Model No. 2458 | Test No. 29699-05 | GMT = 2,30 m | | without bilge keels |




| Natural Roll Period (Ship) = 19.9856 s | Project: EMSA 3 | Draught = 6,70 |
|---|---|---|

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458

## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

**Test No. 29700-01 to 05, Hs = 3.50 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

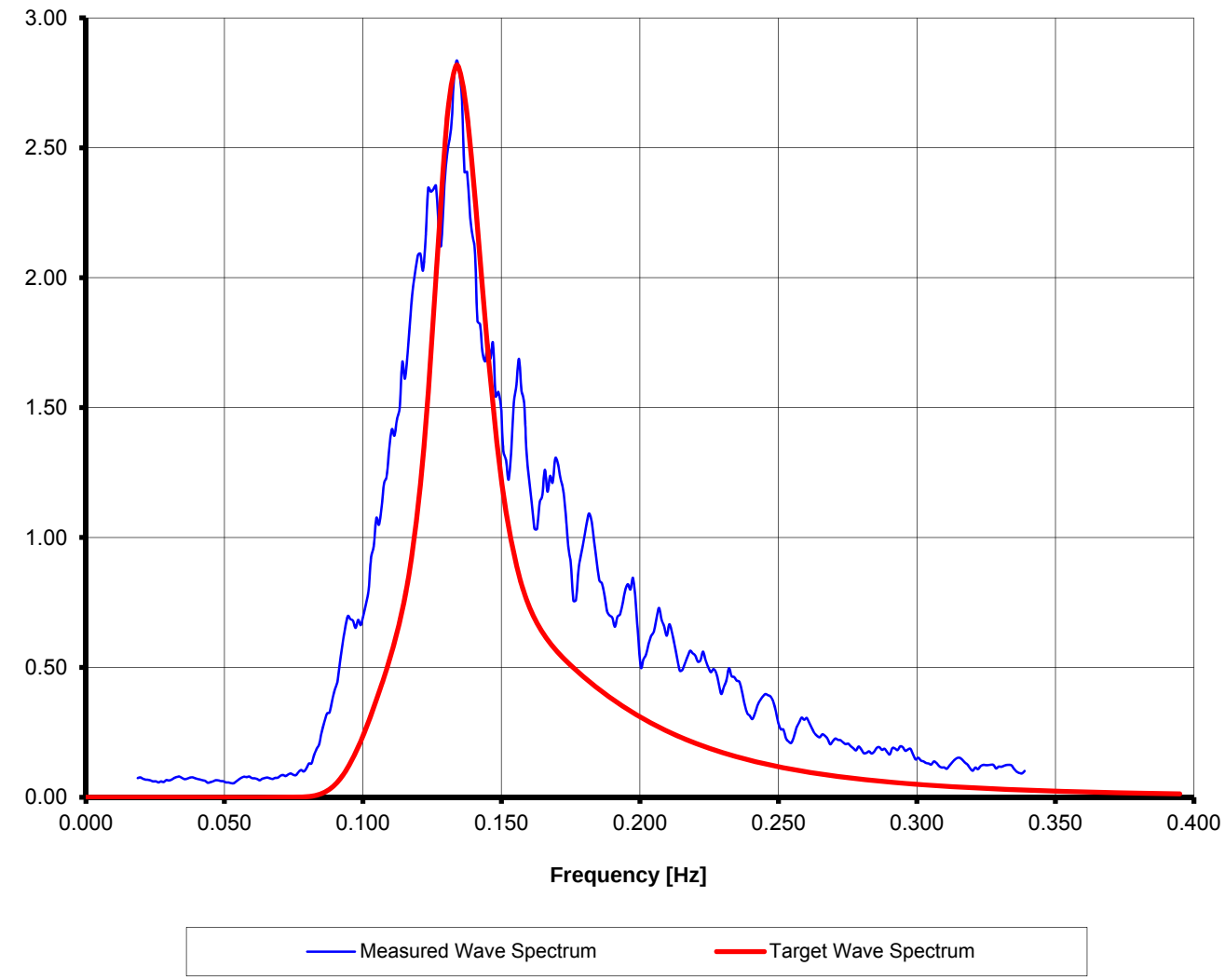
**Model No.: 2458**
**Test No.: 29700-01 to 05**
**Project: EMSA 3**
**Damage 1: R7P15-16.1.0**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.500** | m |
| gamma | 3.300 | |
| $T_P$ | 7.483 | s |
| $T_Z$ | 5.824 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458
**Test No.:** 29700-01 to 05
**Project:** EMSA 3
**Damage 1:** R7P15-16.1.0
**Wave Type:** Jonswap, $\gamma = 3.3$
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.500 | 7.483 | 5.824 | 3.500 - 3.588 | 7.296 - 7.670 | 5.532 - 6.115 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29700-01 | 29700-01 | 3.5438 | 7.555 | 5.619 | | | | | | |
| -02 | -02 | 3.5603 | 7.420 | 5.777 | | | | | | |
| -03 | -03 | 3.5501 | 7.451 | 5.648 | | | | | | |
| -04 | -04 | 3.5616 | 7.469 | 5.759 | | | | | | |
| -05 | -05 | 3.5565 | 7.663 | 5.883 | | | | | | |
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# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458

## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

**Test No. 29701-01 to 06, Hs = 4.00 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

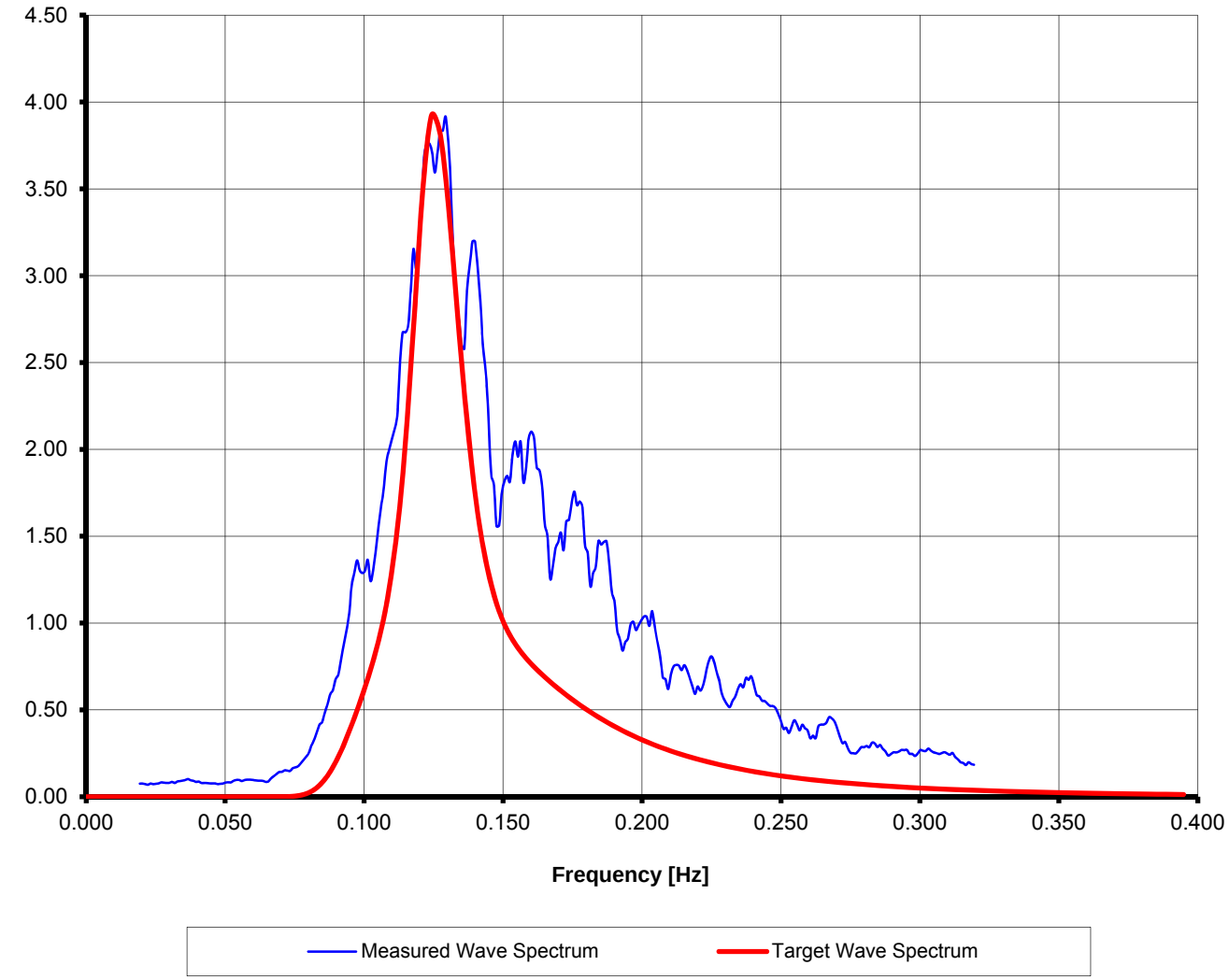
**Model No.: 2458**
**Test No.: 29701-01 to 06**
**Project: EMSA 3**
**Damage 1: R7P15-16.1.0**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **4.000** | m |
| gamma | 3.300 | |
| $T_P$ | 8.000 | s |
| $T_Z$ | 6.226 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458
**Test No.:** 29701-01 to 06
**Project:** EMSA 3
**Damage 1:** R7P15-16.1.0
**Wave Type:** Jonswap, $\gamma = 3.3$
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 4.000 | 8.000 | 6.226 | 4.000 - 4.100 | 7.800 - 8.200 | 5.914 - 6.537 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29701-01 | 29701-01 | 4.0727 | 8.182 | 6.052 | | | | | | |
| -02 | -02 | 4.0526 | 7.914 | 6.024 | | | | | | |
| -03 | -03 | 4.0534 | 7.808 | 5.933 | | | | | | |
| -04 | -04 | 4.0774 | 7.970 | 6.046 | | | | | | |
| -05 | -05 | 4.0383 | 8.137 | 6.050 | | | | | | |
| -06 | -06 | 4.0358 | 8.089 | 5.933 | | | | | | |
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# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458

## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

**Test No. 29702-01 to 05, Hs = 5.00 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

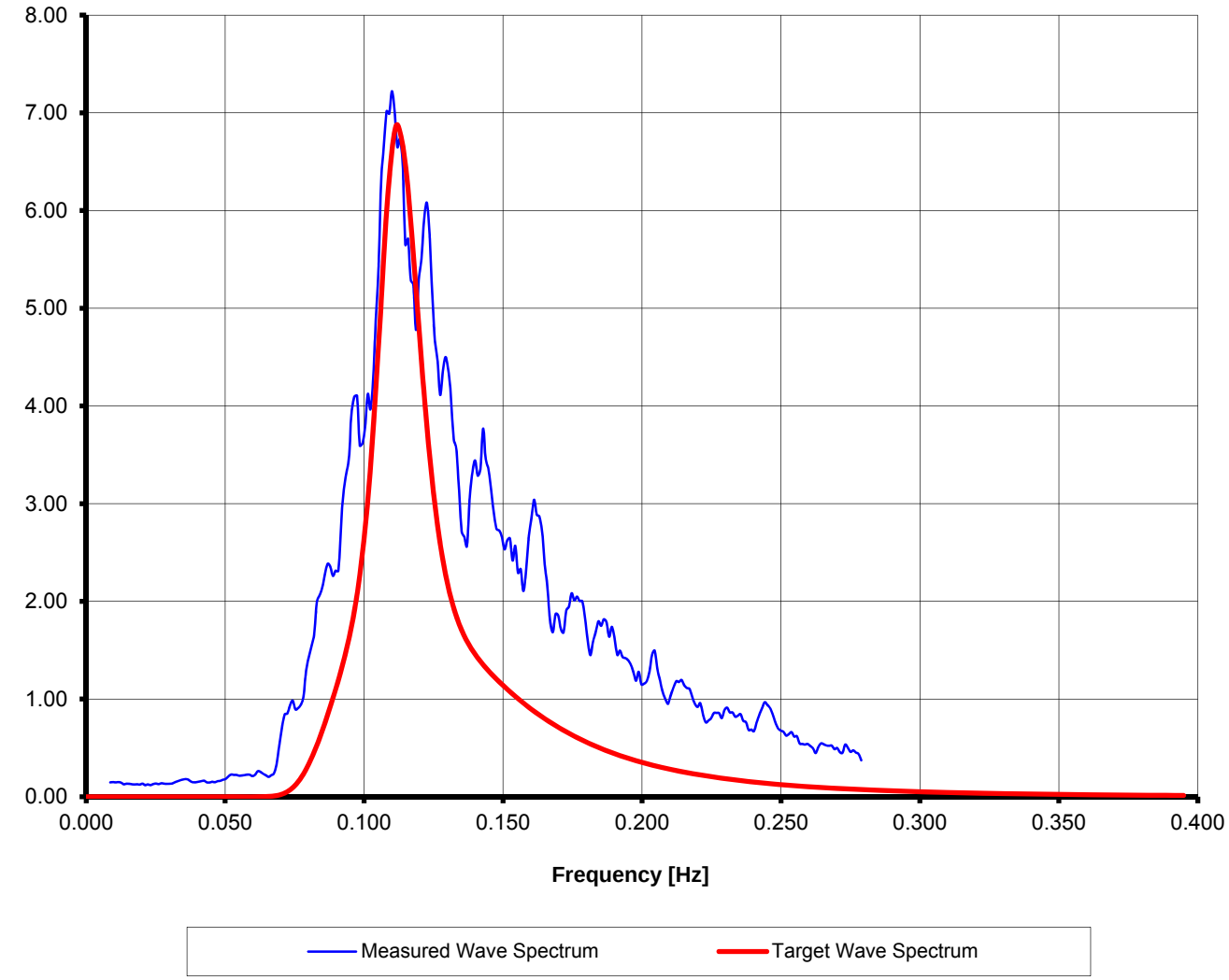
**Model No.: 2458**
**Test No.: 29702-01 to 05**
**Project: EMSA 3**
**Damage 1: R7P15-16.1.0**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **5.000** | m |
| gamma | 3.300 | |
| $T_P$ | 8.944 | s |
| $T_Z$ | 6.961 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458
**Test No.:** 29702-01 to 05
**Project:** EMSA 3
**Damage 1:** R7P15-16.1.0
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 5.000 | 8.944 | 6.961 | 5.000 - 5.125 | 8.721 - 9.168 | 6.612 - 7.309 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29702-01 | 29702-01 | 5.0846 | 8.981 | 6.701 | | | | | | |
| -02 | -02 | 5.0302 | 9.114 | 6.742 | | | | | | |
| -03 | -03 | 5.0691 | 8.935 | 6.687 | | | | | | |
| -04 | -04 | 5.0943 | 8.979 | 6.805 | | | | | | |
| -05 | -05 | 5.0593 | 9.140 | 6.721 | | | | | | |
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# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458

## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

**Test No. 29703-01 to 05, Hs = 6.00 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

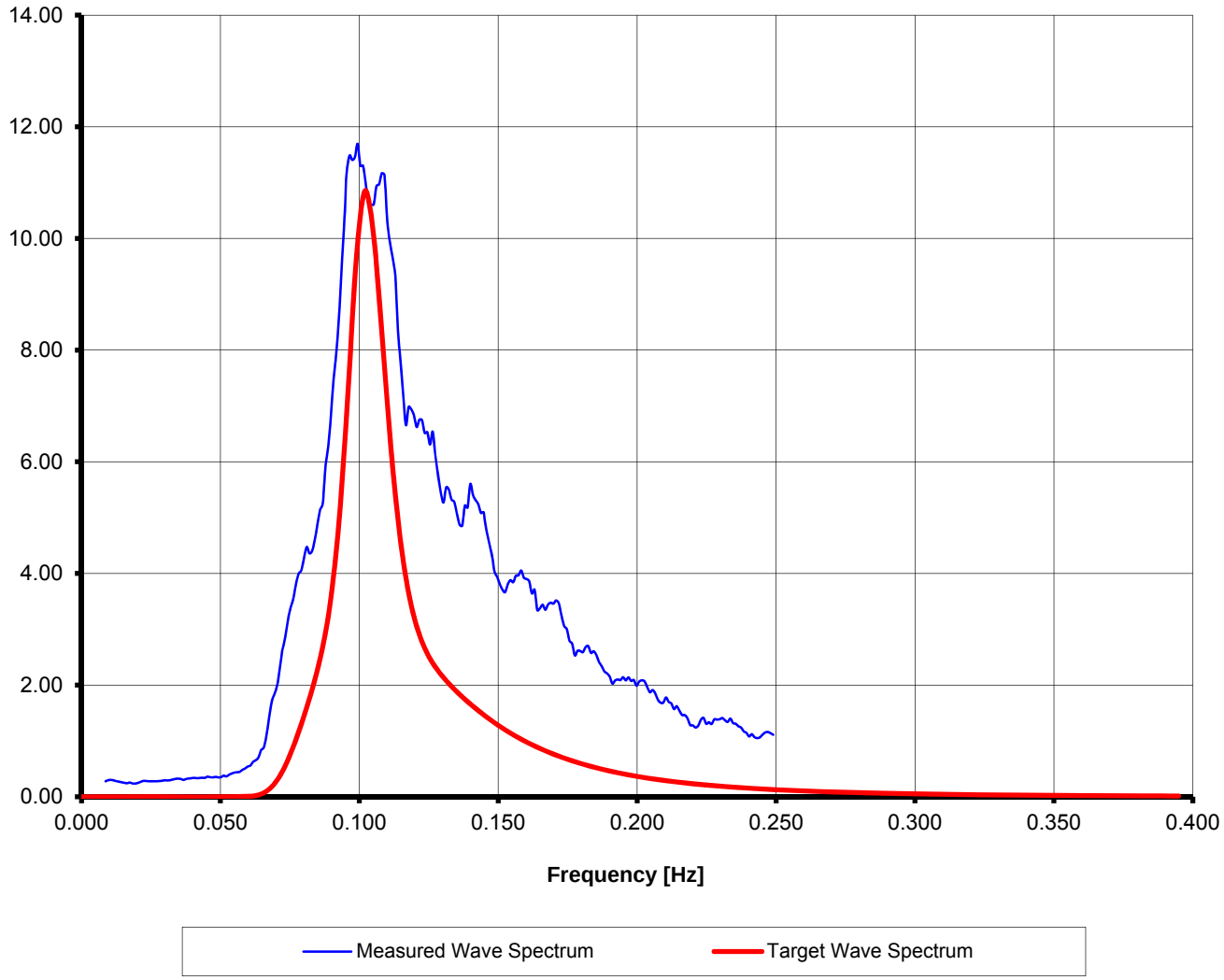
**Model No.: 2458**
**Test No.: 29703-01 to 05**
**Project: EMSA 3**
**Damage 1: R7P15-16.1.0**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **6.000** | m |
| gamma | 3.300 | |
| $T_P$ | 9.798 | s |
| $T_Z$ | 7.625 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458
**Test No.:** 29703-01 to 05
**Project:** EMSA 3
**Damage 1:** R7P15-16.1.0
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 6.000 | 9.798 | 7.625 | 6.000 - 6.150 | 9.553 - ##### | 7.244 - 8.006 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29703-01 | 29703-01 | 6.0814 | 9.839 | 7.326 | | | | | | |
| -02 | -02 | 6.0472 | 9.865 | 7.264 | | | | | | |
| -03 | -03 | 6.0826 | 9.837 | 7.432 | | | | | | |
| -04 | -04 | 6.0774 | 9.862 | 7.351 | | | | | | |
| -05 | -05 | 6.0441 | 9.749 | 7.275 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

# Summary of the Measured Wave and Roll Time Realisations

## Model No. 2458

## Project: “EMSA”

**Damage Case-1 R7P15.16.1.0**

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458** **Hs [m] = 3.50**

**Test No.: 29700-01 to 05** **Damage 1: R7P15-16.1.0**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29700-01 | Roll Angle [deg]* | 0.381 | 1.522 | -1.285 | -4.057 | -2.613 | 1426.9 | 30 |
| | Pitch Angle [deg]** | 0.219 | 0.876 | 0.77 | -1.084 | -0.143 | | |
| | Heave | 0.452 | 1.807 | 1.826 | -1.416 | 0.115 | | |
| | Wave Elevation (fix) [m] | - | - | 4.102 | -2.605 | 0.053 | | |
| -02 | Roll Angle [deg]* | 0.435 | 1.741 | 0.014 | -4.464 | -2.678 | 1328.7 | 30 |
| | Pitch Angle [deg]** | 0.254 | 1.016 | 0.641 | -0.965 | -0.145 | | |
| | Heave | 0.457 | 1.83 | 1.445 | -1.39 | 0.042 | | |
| | Wave Elevation (fix) [m] | - | - | 3.243 | -3.017 | -0.017 | | |
| -03 | Roll Angle [deg]* | 0.397 | 1.588 | -1.102 | -4.115 | -2.58 | 1316.9 | 30 |
| | Pitch Angle [deg]** | 0.268 | 1.071 | 0.997 | -1.181 | -0.142 | | |
| | Heave | 0.411 | 1.643 | 1.795 | -1.539 | 0.077 | | |
| | Wave Elevation (fix) [m] | - | - | 3.694 | -2.475 | 0.098 | | |
| -04 | Roll Angle [deg]* | 0.331 | 1.326 | -1.04 | -3.654 | -2.551 | 1081.4 | 30 |
| | Pitch Angle [deg]** | 0.256 | 1.024 | 0.688 | -1.058 | -0.147 | | |
| | Heave | 0.416 | 1.662 | 1.693 | -1.622 | 0.037 | | |
| | Wave Elevation (fix) [m] | - | - | 3.218 | -2.628 | -0.007 | | |
| -05 | Roll Angle [deg]* | 0.351 | 1.402 | -1.022 | -4.032 | -2.604 | 1109 | 30 |
| | Pitch Angle [deg]** | 0.273 | 1.092 | 0.914 | -1.145 | -0.153 | | |
| | Heave | 0.34 | 1.36 | 1.44 | -1.181 | 0.076 | | |
| | Wave Elevation (fix) [m] | - | - | 3.19 | -3.01 | -0.05 | | |
| -06 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -07 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -08 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -09 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -10 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458** **Hs [m] = 4.00**

**Test No.: 29701-01 to 05** **Damage 1: R7P15-16.1.0**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29701-01 | Roll Angle [deg]* | 0.39 | 1.561 | -0.767 | -3.845 | -2.53 | 1145.6 | 30 |
| | Pitch Angle [deg]** | 0.297 | 1.187 | 1.026 | -1.321 | -0.154 | | |
| | Heave | 0.53 | 2.119 | 1.776 | -1.571 | 0.079 | | |
| | Wave Elevation (fix) [m] | - | - | 4.44 | -2.965 | 0.038 | | |
| -02 | Roll Angle [deg]* | 0.383 | 1.532 | -0.65 | -3.805 | -2.515 | 1260.8 | 30 |
| | Pitch Angle [deg]** | 0.309 | 1.237 | 0.875 | -1.177 | -0.155 | | |
| | Heave | 0.506 | 2.024 | 1.832 | -1.582 | 0.071 | | |
| | Wave Elevation (fix) [m] | - | - | 3.411 | -3.623 | -0.317 | | |
| -03 | Roll Angle [deg]* | 0.478 | 1.911 | -1.062 | -4.338 | -2.67 | 1328.6 | 30 |
| | Pitch Angle [deg]** | 0.287 | 1.147 | 0.691 | -0.986 | -0.144 | | |
| | Heave | 0.521 | 2.083 | 2.378 | -2.531 | -0.012 | | |
| | Wave Elevation (fix) [m] | - | - | 4.469 | -3.23 | -0.201 | | |
| -04 | Roll Angle [deg]* | 0.439 | 1.757 | -0.248 | -4.842 | -2.692 | 1024.8 | 30 |
| | Pitch Angle [deg]** | 0.289 | 1.155 | 1.152 | -1.53 | -0.142 | | |
| | Heave | 0.469 | 1.875 | 1.938 | -1.902 | -0.005 | | |
| | Wave Elevation (fix) [m] | - | - | 3.866 | -3.206 | -0.152 | | |
| -05 | Roll Angle [deg]* | 0.398 | 1.592 | -1.12 | -4.05 | -2.65 | 1135.3 | 30 |
| | Pitch Angle [deg]** | 0.339 | 1.357 | 1.062 | -1.3 | -0.153 | | |
| | Heave | 0.44 | 1.759 | 1.968 | -1.757 | 0.053 | | |
| | Wave Elevation (fix) [m] | - | - | 4.113 | -3.594 | -0.213 | | |
| -06 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -07 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -08 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -09 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -10 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458** **Hs [m] = 5.00**

**Test No.: 29702-01 to 05** **Damage 1: R7P15-16.1.0**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29702-01 | Roll Angle [deg]* | 0.537 | 2.146 | -0.842 | -5.173 | -2.685 | 1373.5 | 30 |
| | Pitch Angle [deg]** | 0.321 | 1.284 | 0.828 | -1.145 | -0.153 | | |
| | Heave | 0.77 | 3.079 | 3.29 | -2.861 | 0.076 | | |
| | Wave Elevation (fix) [m] | - | - | 4.596 | -4.232 | -0.173 | | |
| -02 | Roll Angle [deg]* | 0.609 | 2.436 | -0.508 | -5.71 | -2.857 | 1498.4 | 30 |
| | Pitch Angle [deg]** | 0.297 | 1.186 | 0.77 | -1.112 | -0.139 | | |
| | Heave | 0.76 | 3.04 | 3.341 | -3.21 | -0.086 | | |
| | Wave Elevation (fix) [m] | - | - | 4.445 | -4.432 | -0.104 | | |
| -03 | Roll Angle [deg]* | 0.641 | 2.562 | -0.443 | -5.411 | -2.901 | 1041.9 | 30 |
| | Pitch Angle [deg]** | 0.321 | 1.283 | 1.289 | -1.559 | -0.144 | | |
| | Heave | 0.789 | 3.157 | 3.381 | -2.808 | 0.109 | | |
| | Wave Elevation (fix) [m] | - | - | 5.878 | -3.877 | -0.083 | | |
| -04 | Roll Angle [deg]* | 0.78 | 3.12 | 0.184 | -6.61 | -3.021 | 1021.1 | 30 |
| | Pitch Angle [deg]** | 0.33 | 1.32 | 0.95 | -1.192 | -0.126 | | |
| | Heave | 0.809 | 3.237 | 2.904 | -3.042 | 0.108 | | |
| | Wave Elevation (fix) [m] | - | - | 5.3 | -3.959 | -0.114 | | |
| -05 | Roll Angle [deg]* | 0.614 | 2.458 | -0.227 | -5.252 | -2.824 | 1032.3 | 30 |
| | Pitch Angle [deg]** | 0.307 | 1.228 | 1.055 | -1.584 | -0.135 | | |
| | Heave | 0.759 | 3.038 | 3.064 | -2.696 | 0.145 | | |
| | Wave Elevation (fix) [m] | - | - | 5.186 | -4.681 | -0.229 | | |
| -06 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -07 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -08 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -09 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -10 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458** **Hs [m] = 6.00**

**Test No.: 29703-01 to 05** **Damage 1: R7P15-16.1.0**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29703-01 | Roll Angle [deg]* | 0.748 | 2.992 | 0.691 | -6.775 | -2.747 | 855.7 | 30 |
| | Pitch Angle [deg]** | 0.359 | 1.436 | 2.088 | -2.102 | -0.142 | | |
| | Heave | 0.963 | 3.852 | 3.742 | -3.41 | 0.043 | | |
| | Wave Elevation (fix) [m] | - | - | 5.604 | -4.852 | -0.155 | | |
| -02 | Roll Angle [deg]* | 0.68 | 2.719 | -0.67 | -5.188 | -2.946 | 1025 | 30 |
| | Pitch Angle [deg]** | 0.347 | 1.39 | 1.127 | -1.192 | -0.14 | | |
| | Heave | 0.95 | 3.799 | 3.469 | -3.334 | -0.039 | | |
| | Wave Elevation (fix) [m] | - | - | 5.3 | -4.675 | -0.224 | | |
| -03 | Roll Angle [deg]* | 0.787 | 3.147 | 0.709 | -6.253 | -2.952 | 993 | 30 |
| | Pitch Angle [deg]** | 0.431 | 1.722 | 1.541 | -1.822 | -0.142 | | |
| | Heave | 1 | 4 | 3.526 | -3.488 | -0.078 | | |
| | Wave Elevation (fix) [m] | - | - | 4.612 | -5.173 | -0.262 | | |
| -04 | Roll Angle [deg]* | 1.073 | 4.292 | 0.108 | -8.215 | -3.529 | 1081.8 | 30 |
| | Pitch Angle [deg]** | 0.34 | 1.359 | 1.328 | -1.48 | -0.127 | | |
| | Heave | 0.975 | 3.901 | 3.706 | -3.312 | 0.088 | | |
| | Wave Elevation (fix) [m] | - | - | 5.82 | -5.036 | -0.225 | | |
| -05 | Roll Angle [deg]* | 0.677 | 2.707 | -0.058 | -5.465 | -2.966 | 1070.2 | 30 |
| | Pitch Angle [deg]** | 0.368 | 1.472 | 1.058 | -1.339 | -0.146 | | |
| | Heave | 0.972 | 3.887 | 2.974 | -3.63 | -0.109 | | |
| | Wave Elevation (fix) [m] | - | - | 5.842 | -4.544 | -0.131 | | |
| -06 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -07 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -08 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -09 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -10 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |

* to Port Side = positiv ** Stern Trim = positiv

# APPENDIX E

# TIME HISTORIES OF THE EXPERIMENTS

# WAVE AND ROLL TIME HISTORIES

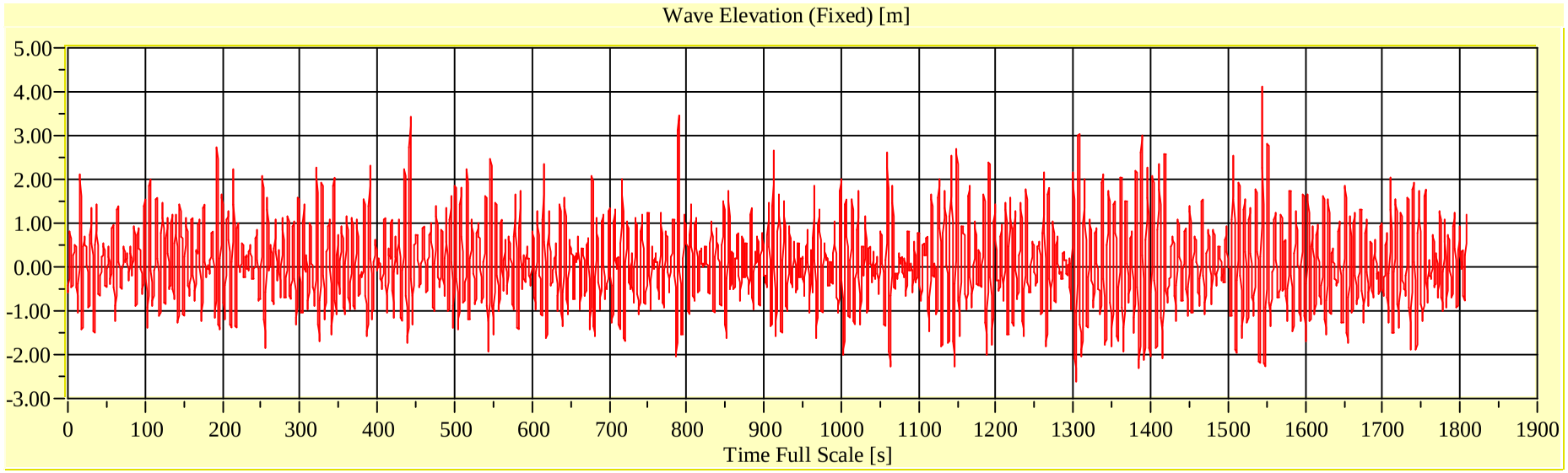
## Model No. 2458

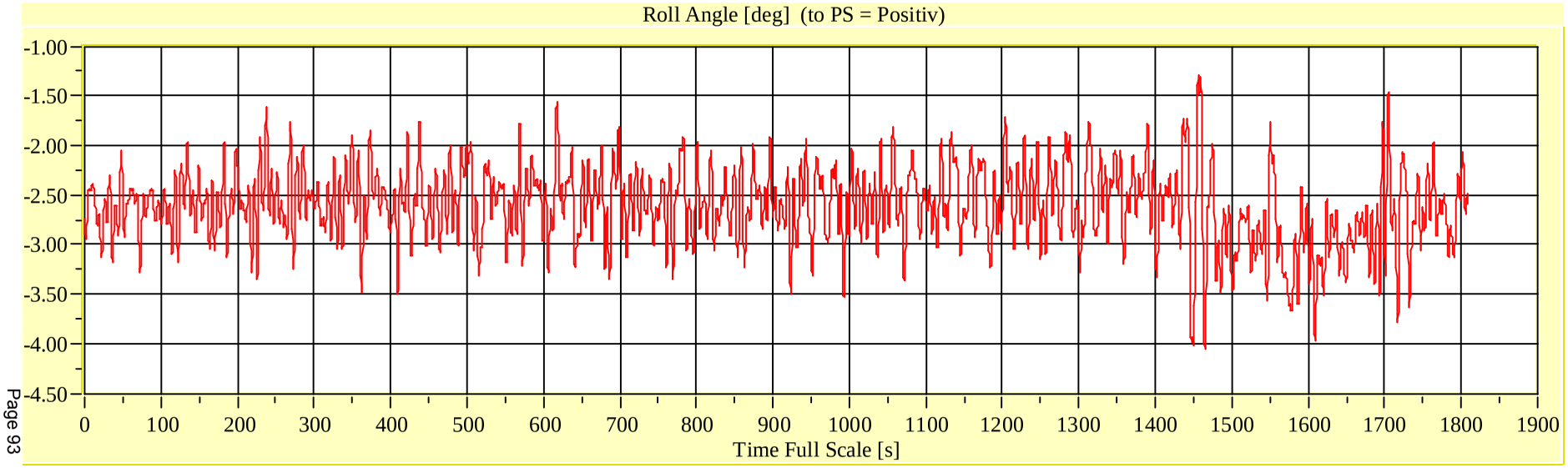
## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-01 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



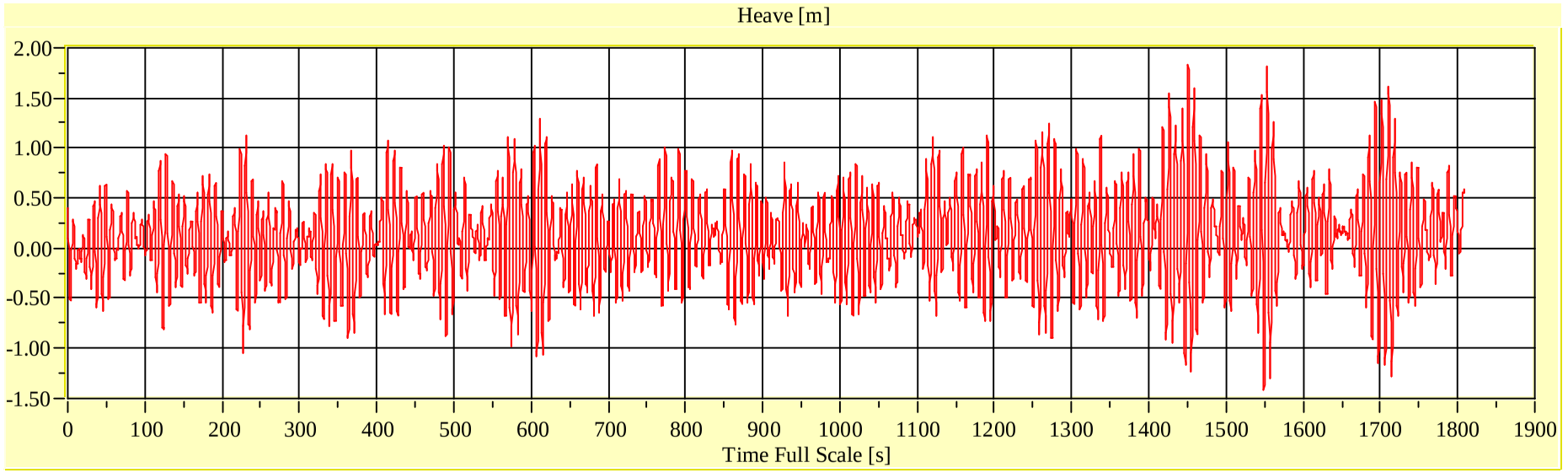



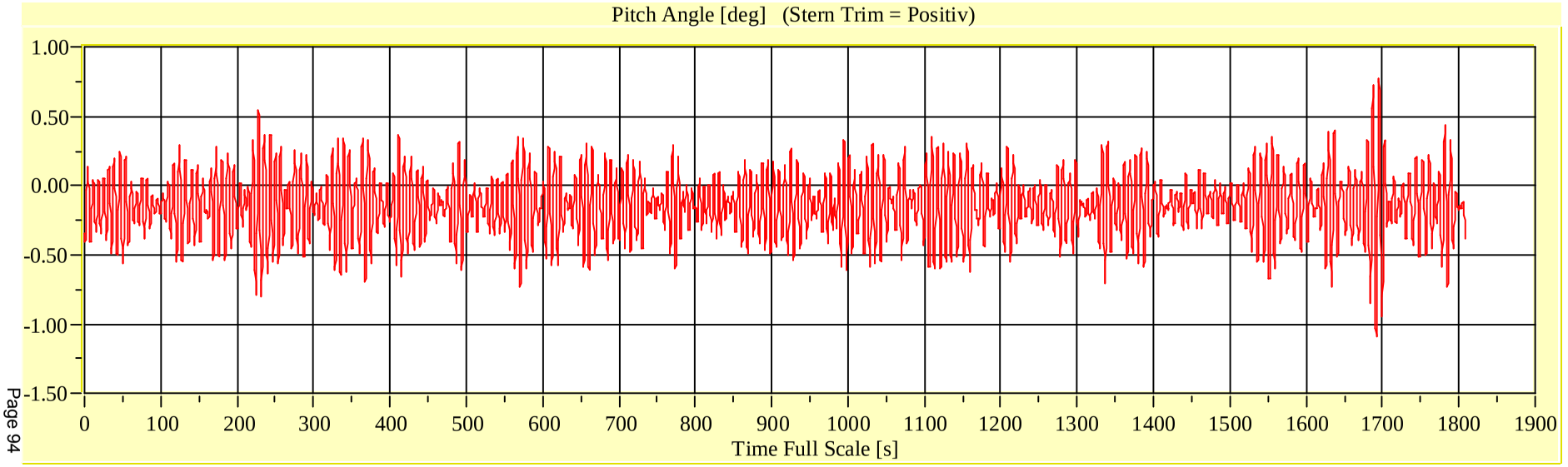



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-01 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



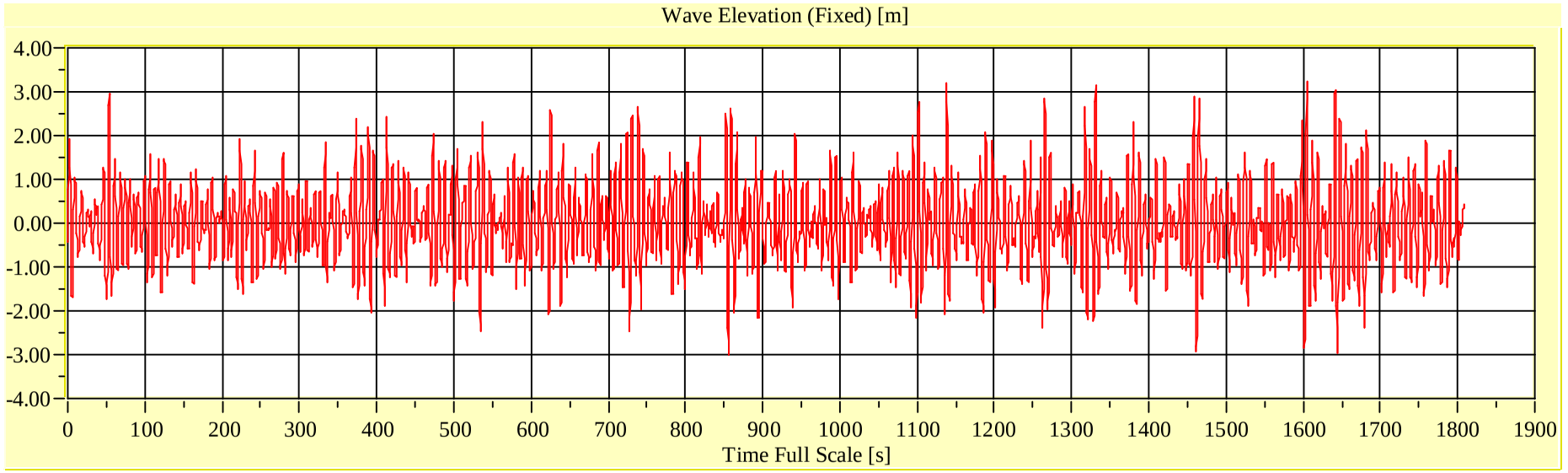



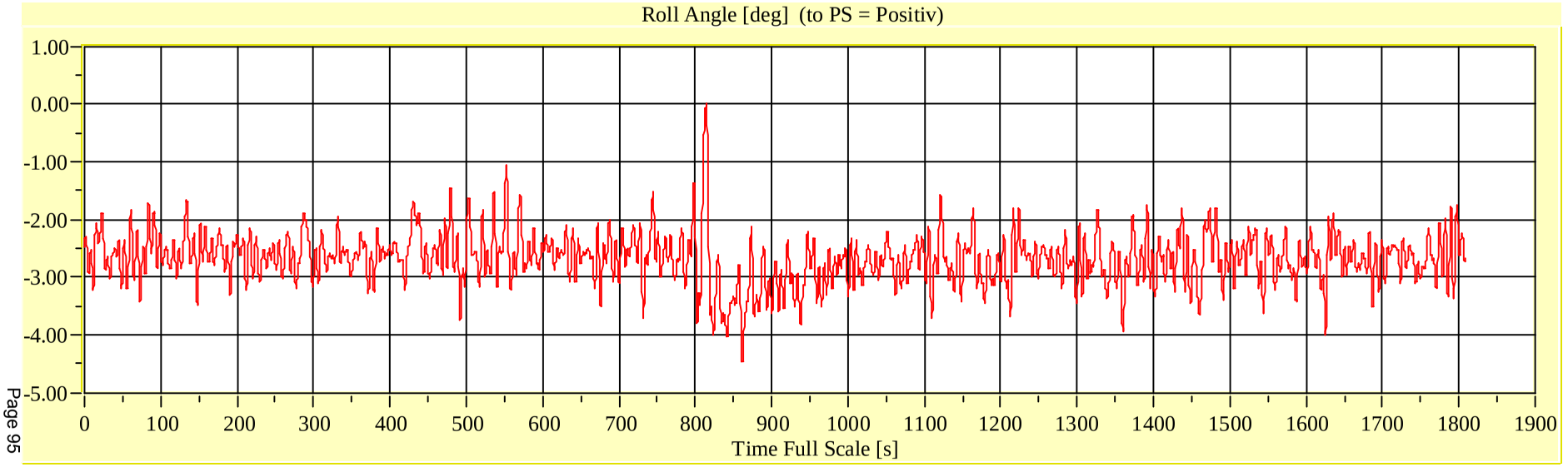



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-02 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



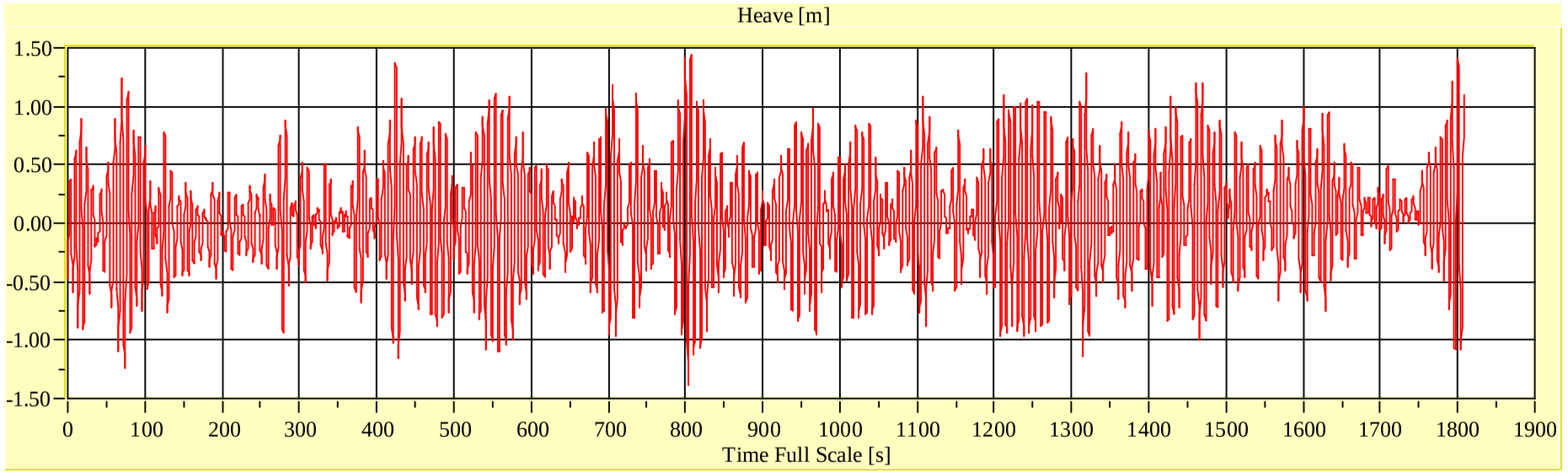



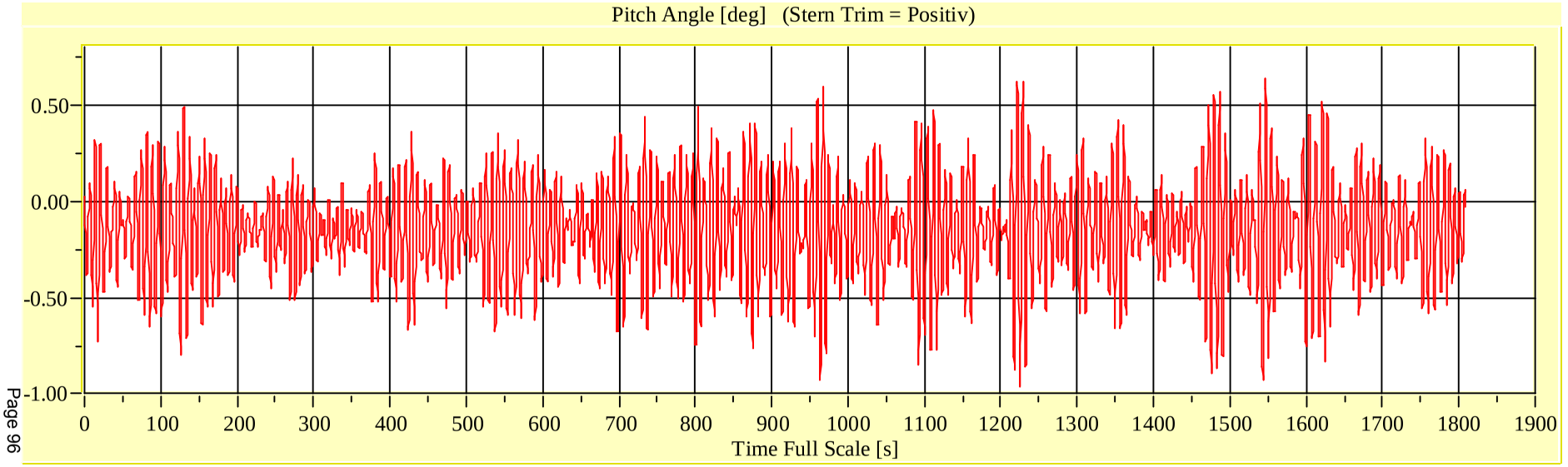



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-02 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



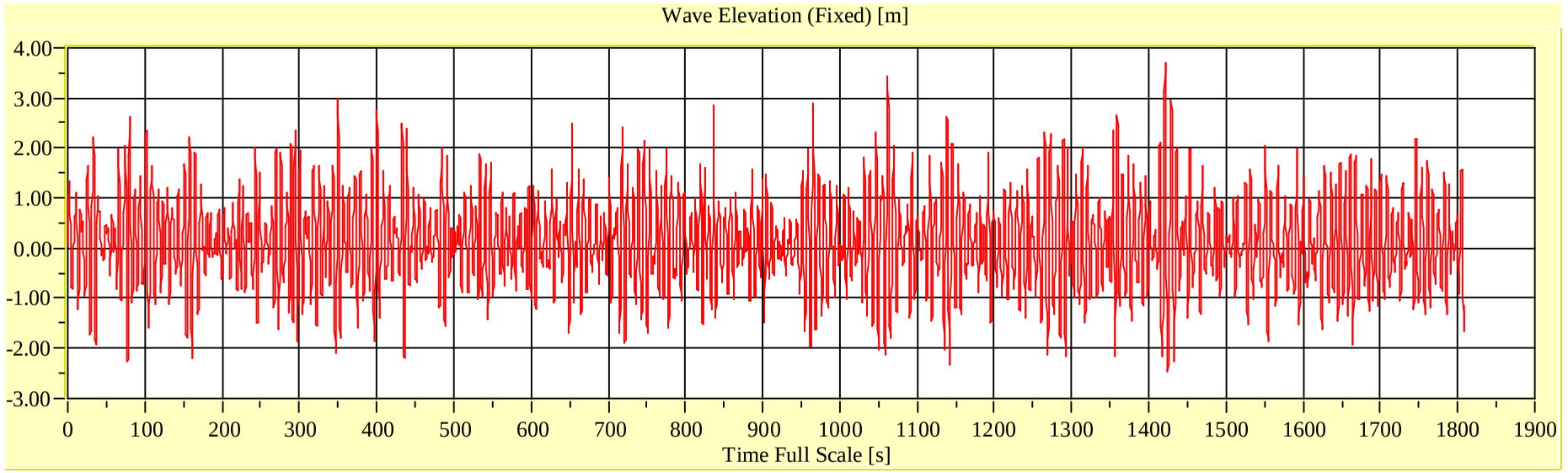



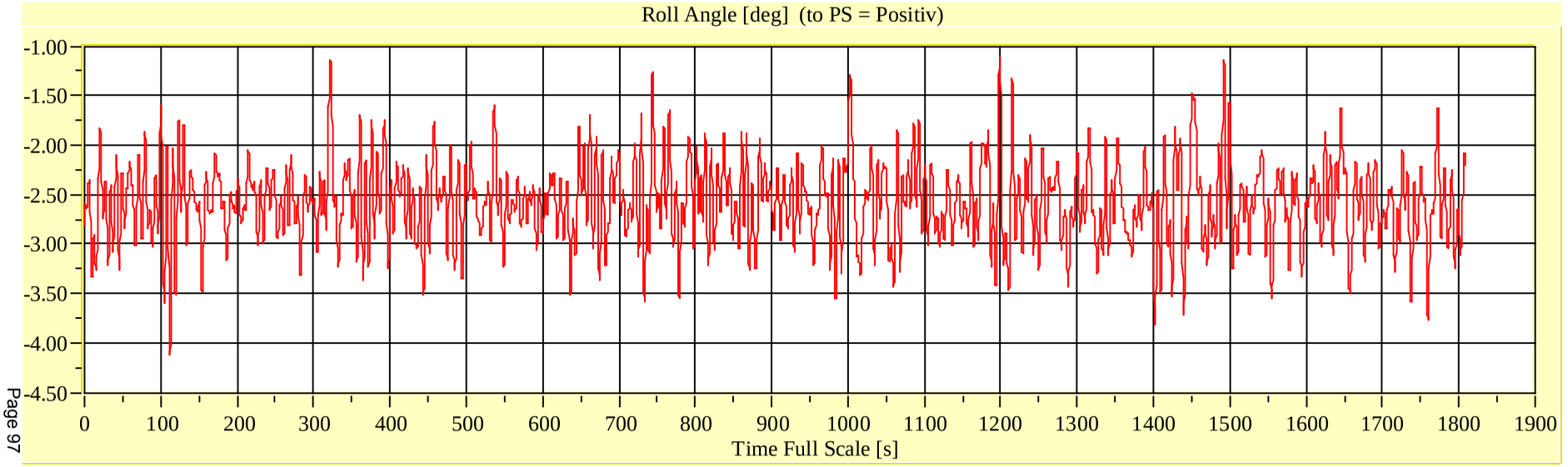



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-03 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



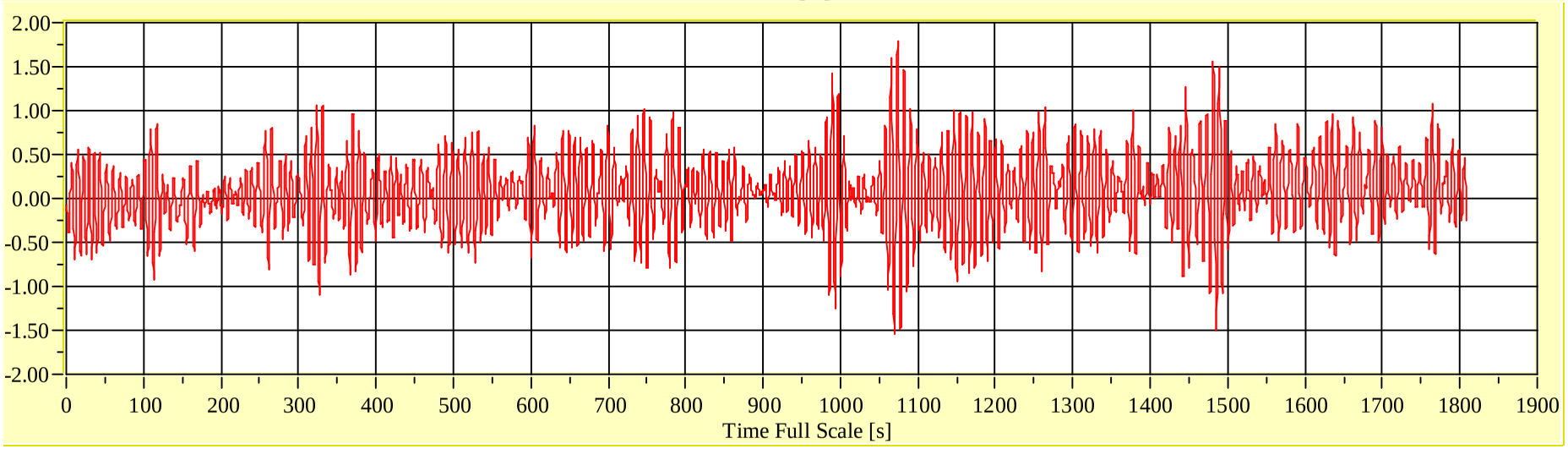



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

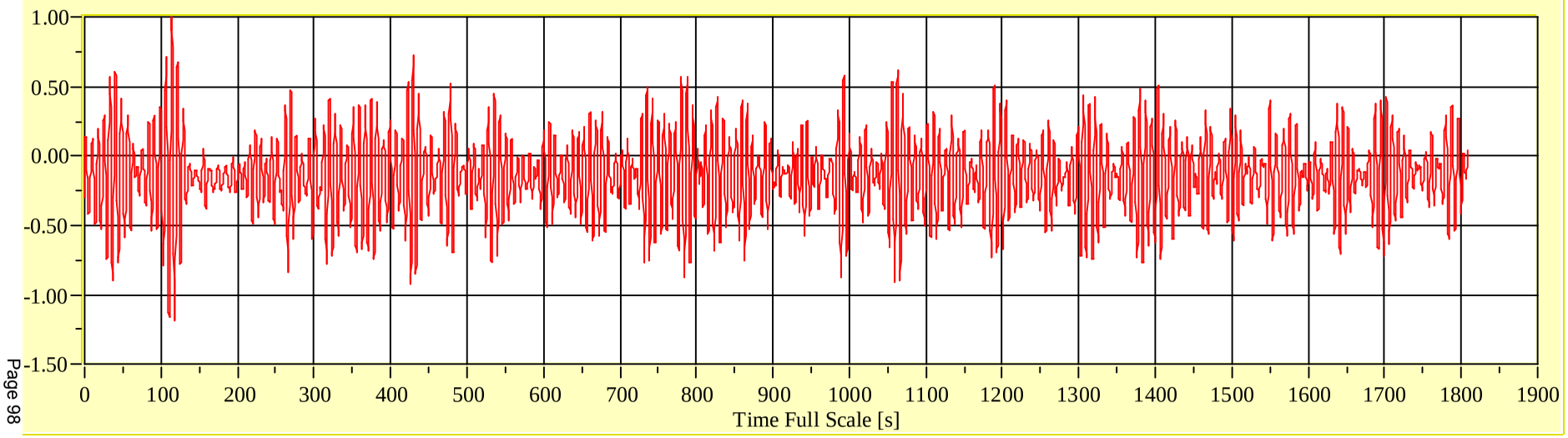
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-03 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Stern Trim = Positiv)

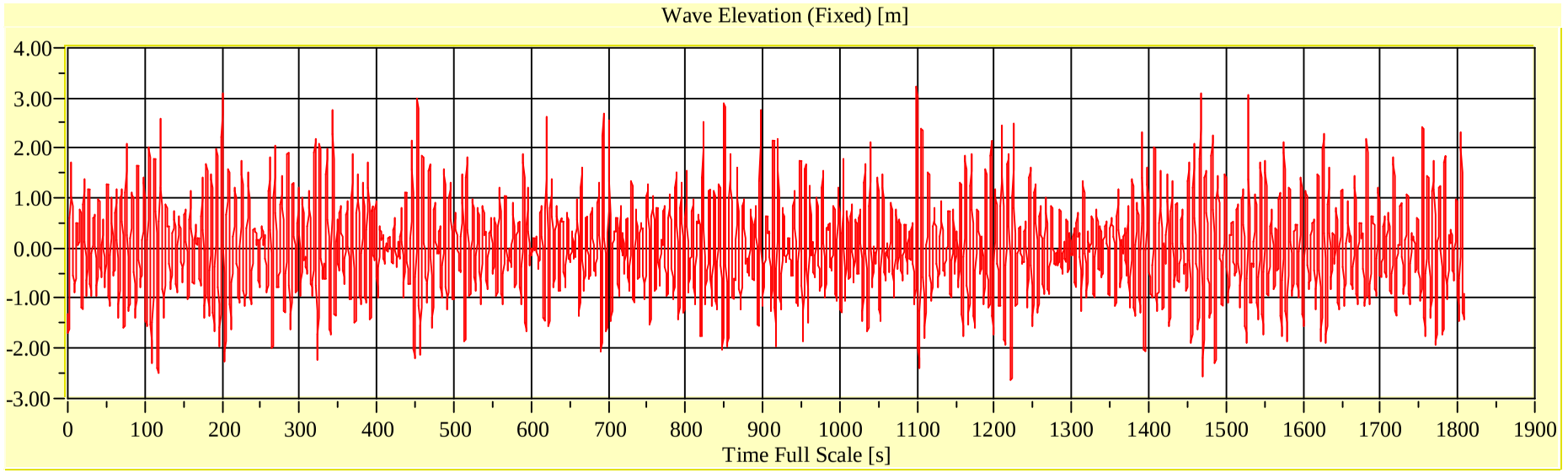


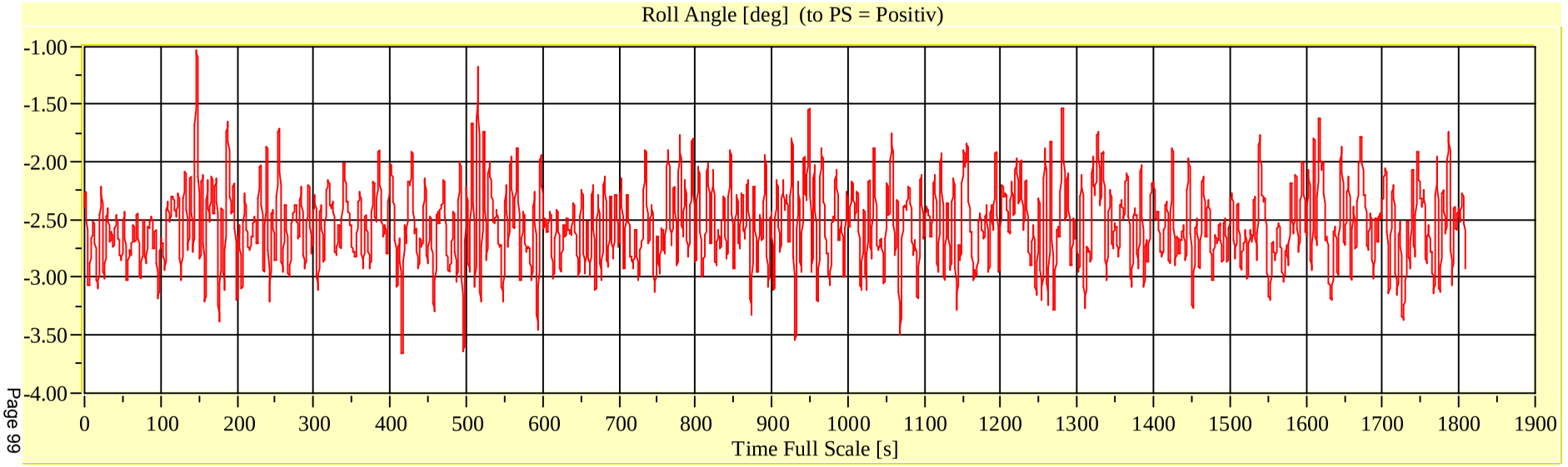



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-04 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



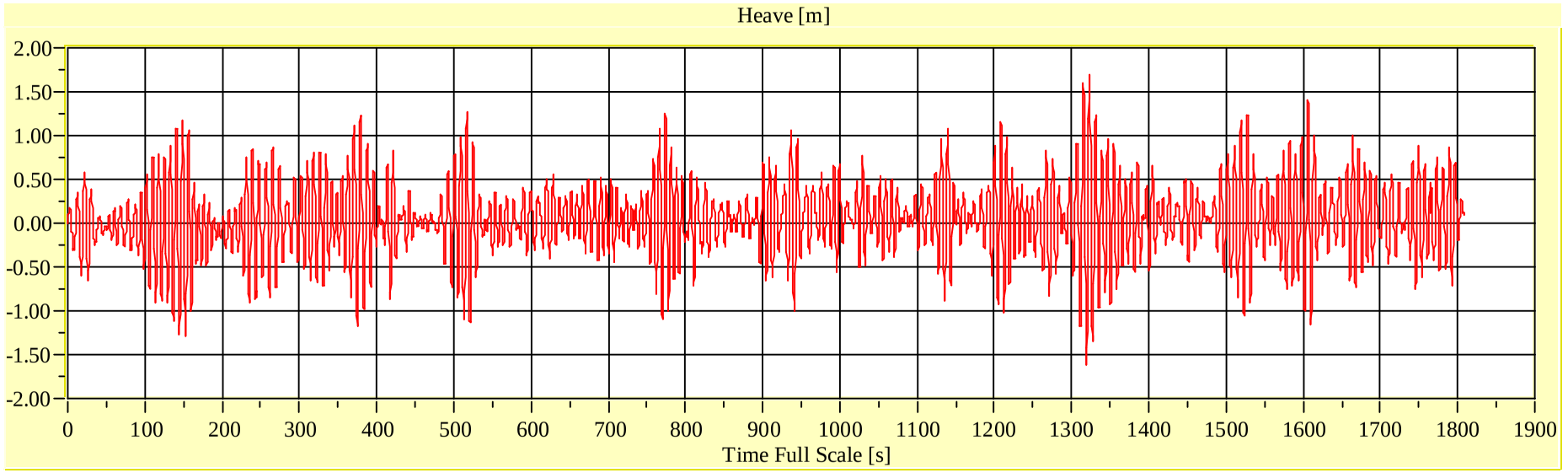



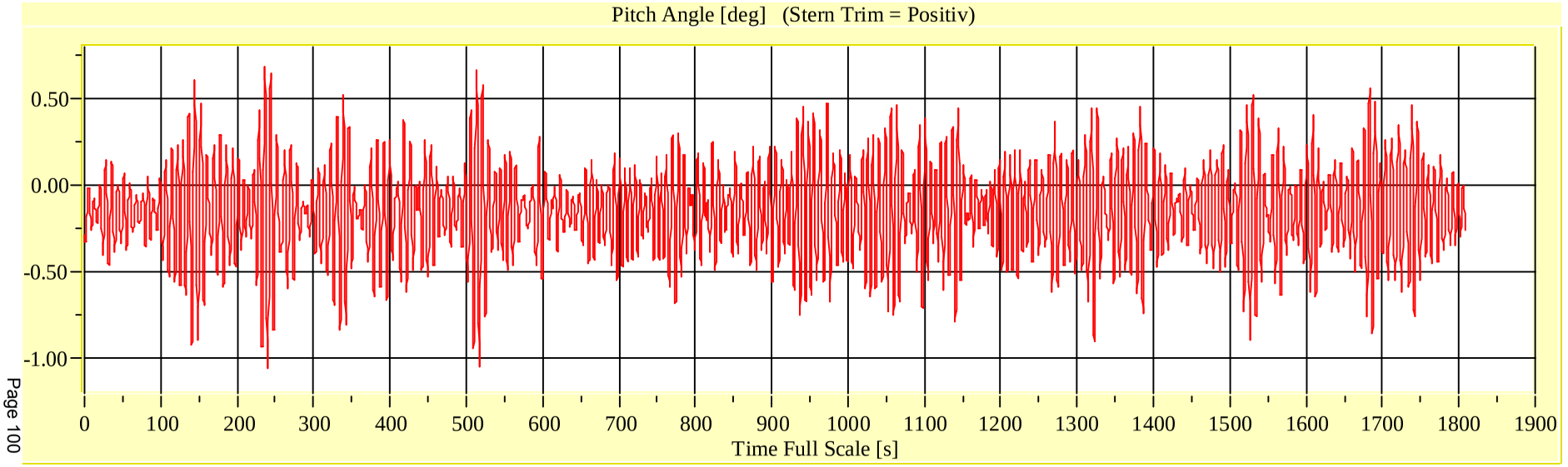



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-04 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



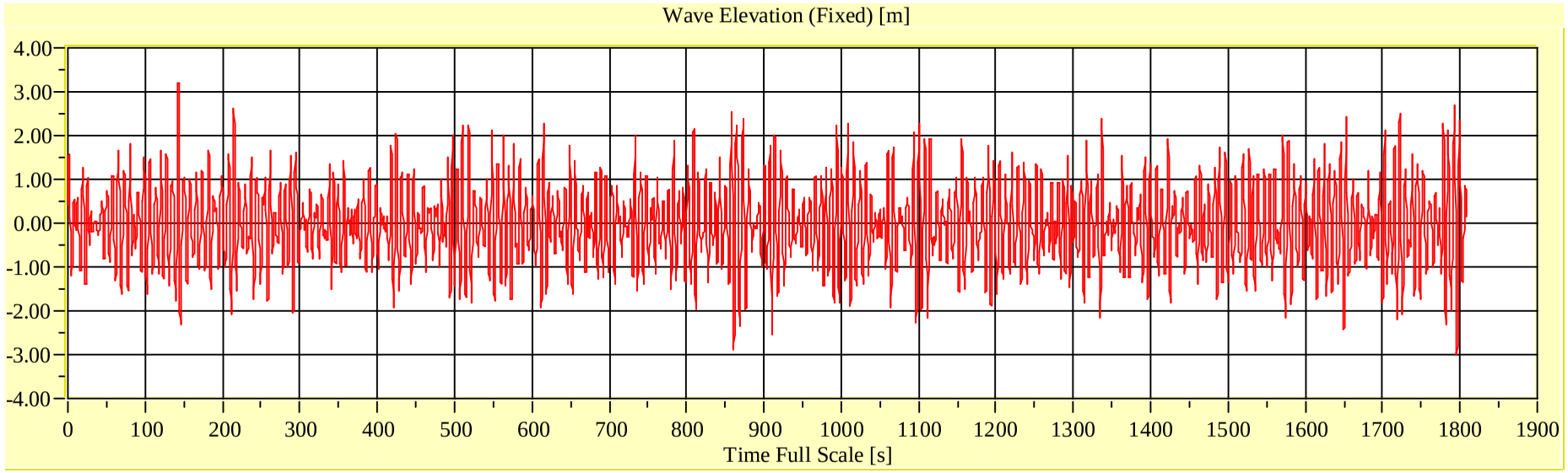



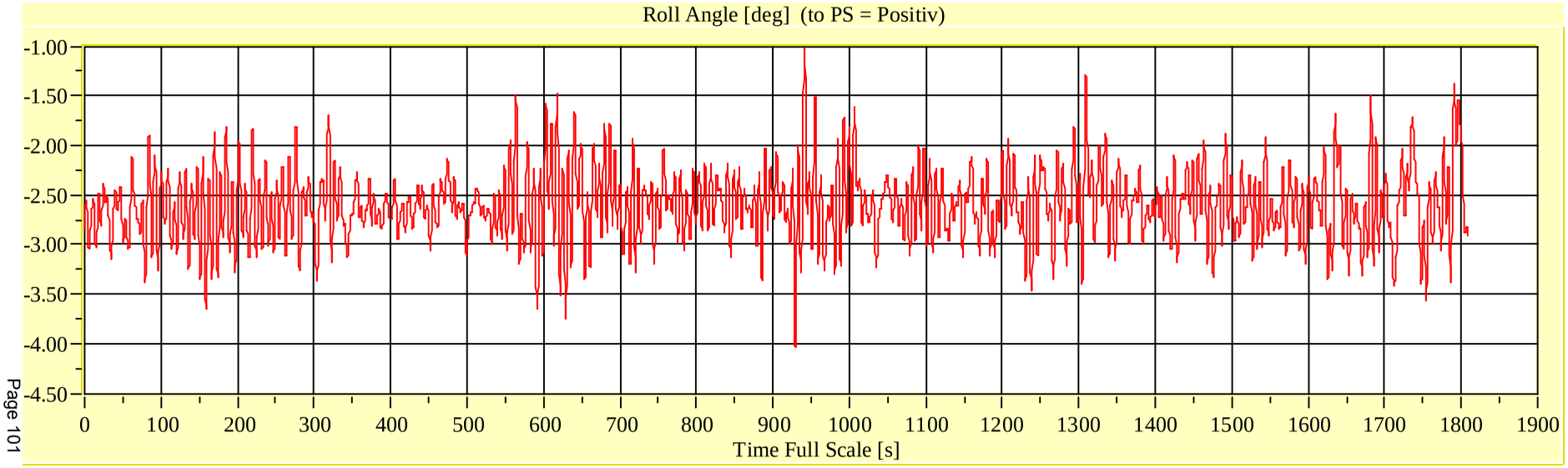



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-05 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



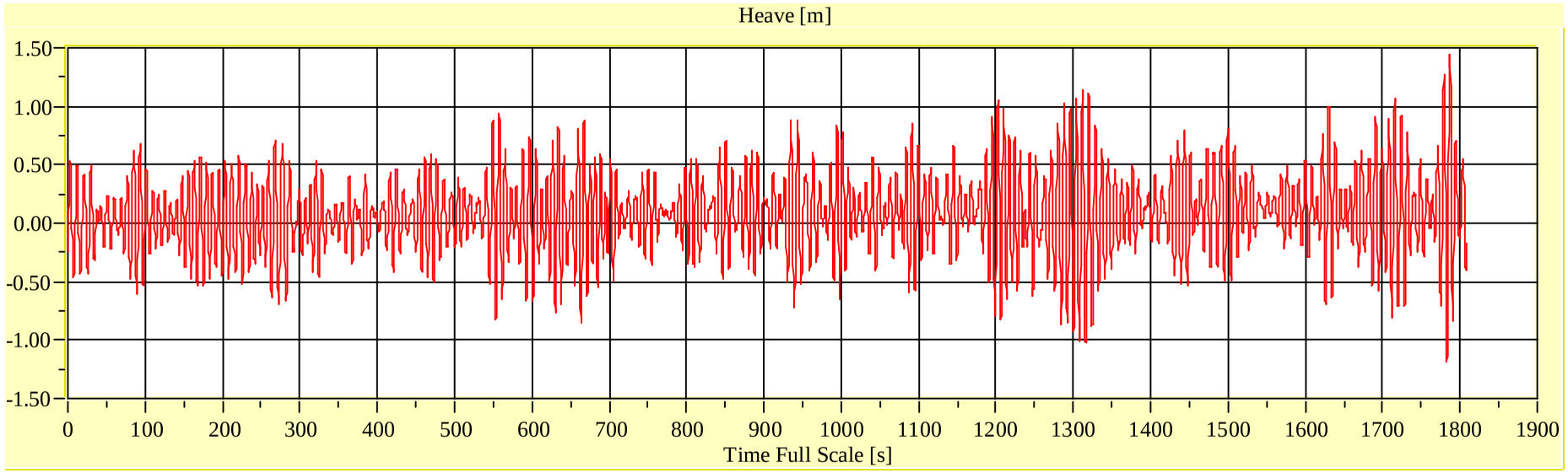



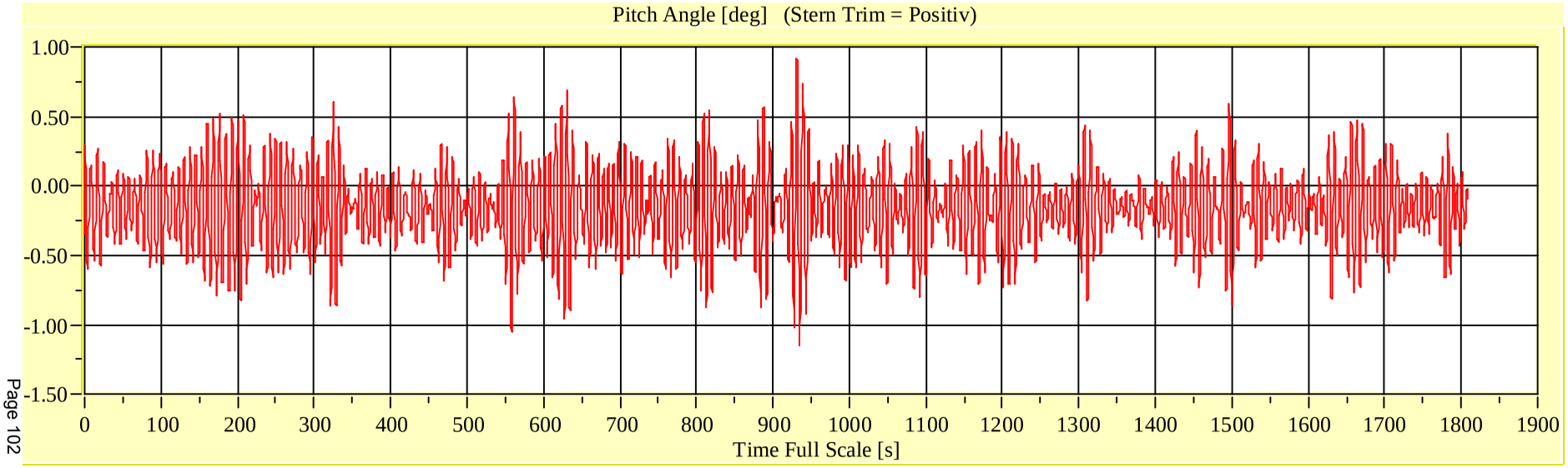



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29700-05 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



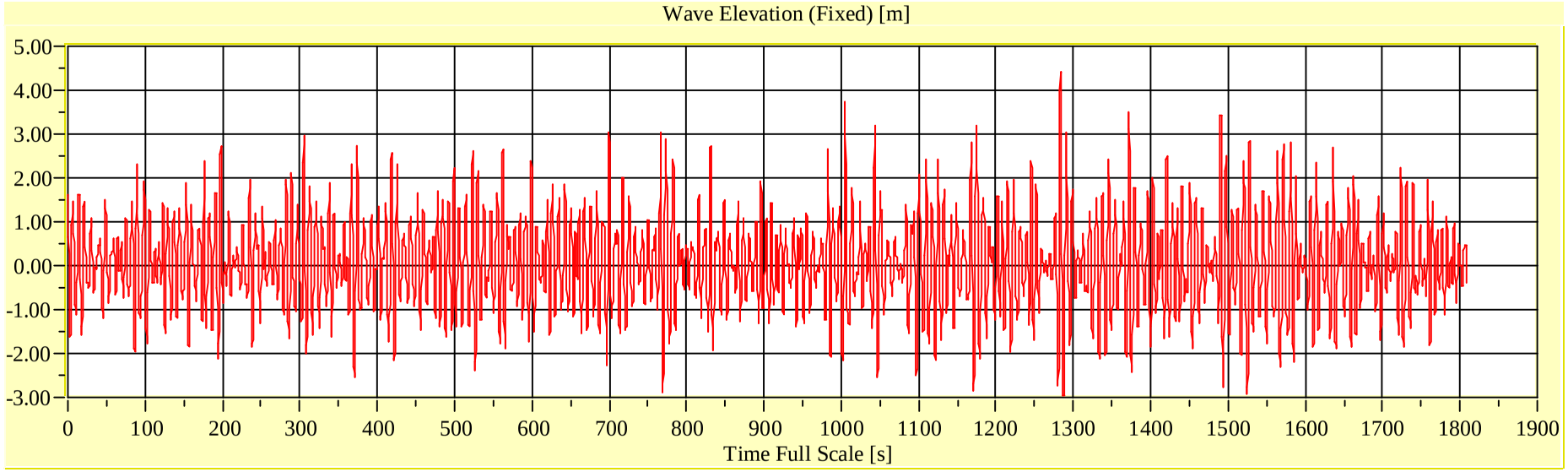



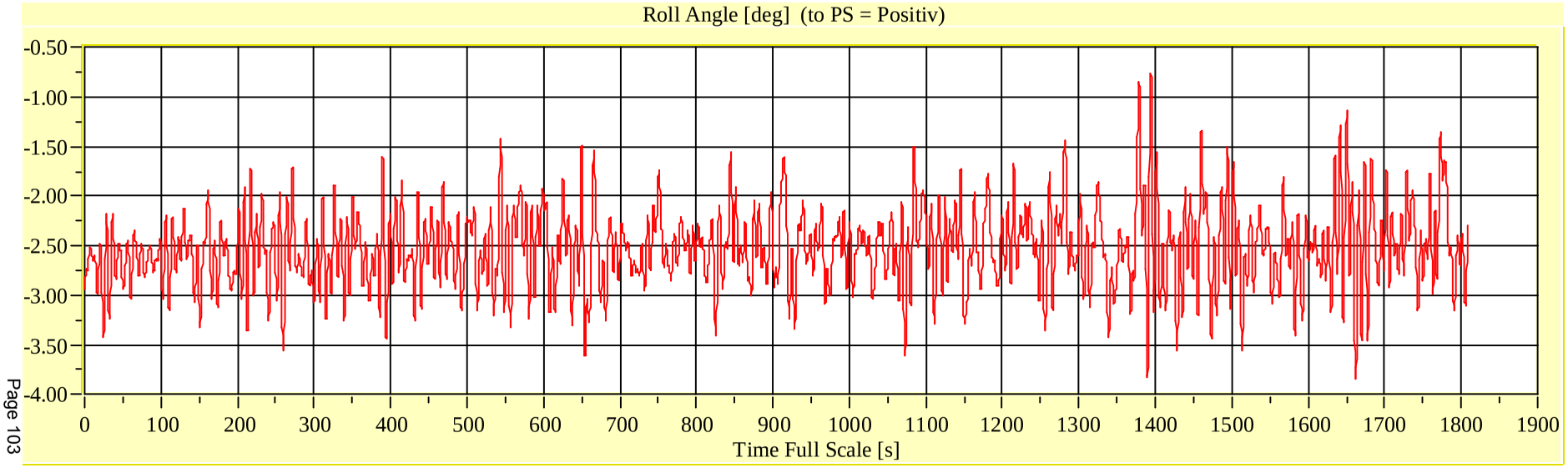



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-01 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



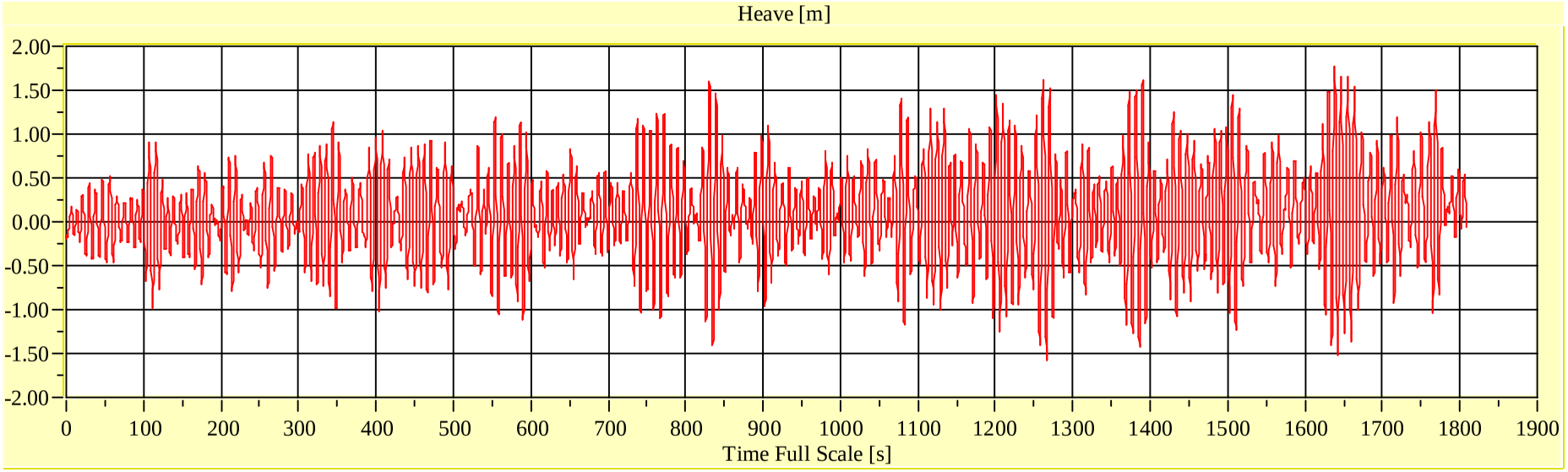



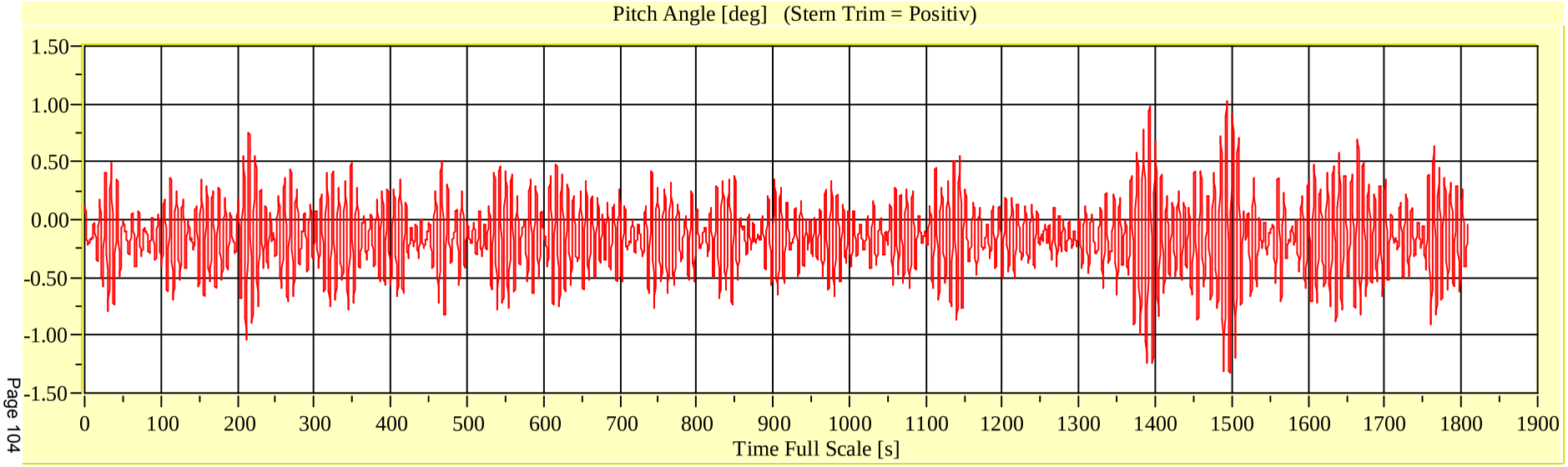



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-01 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



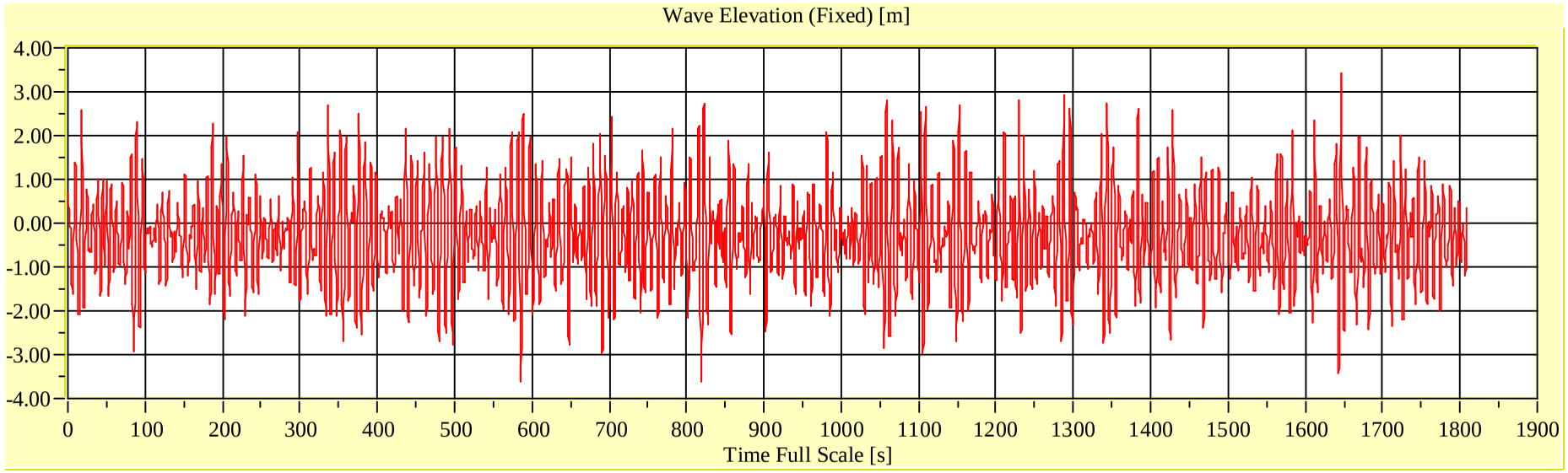



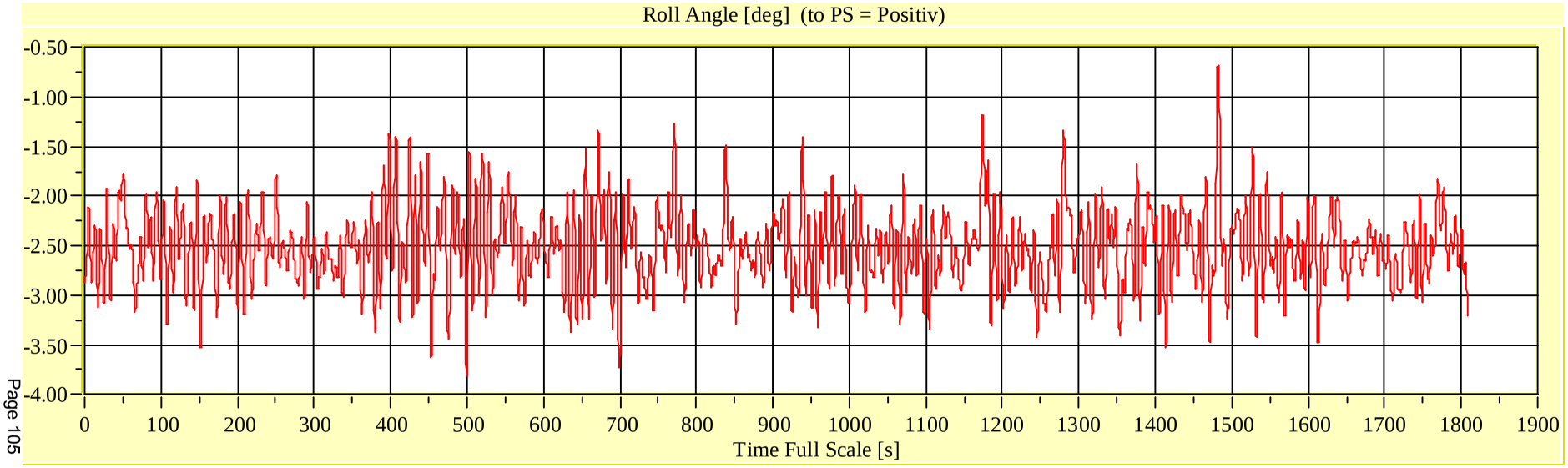



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-02 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



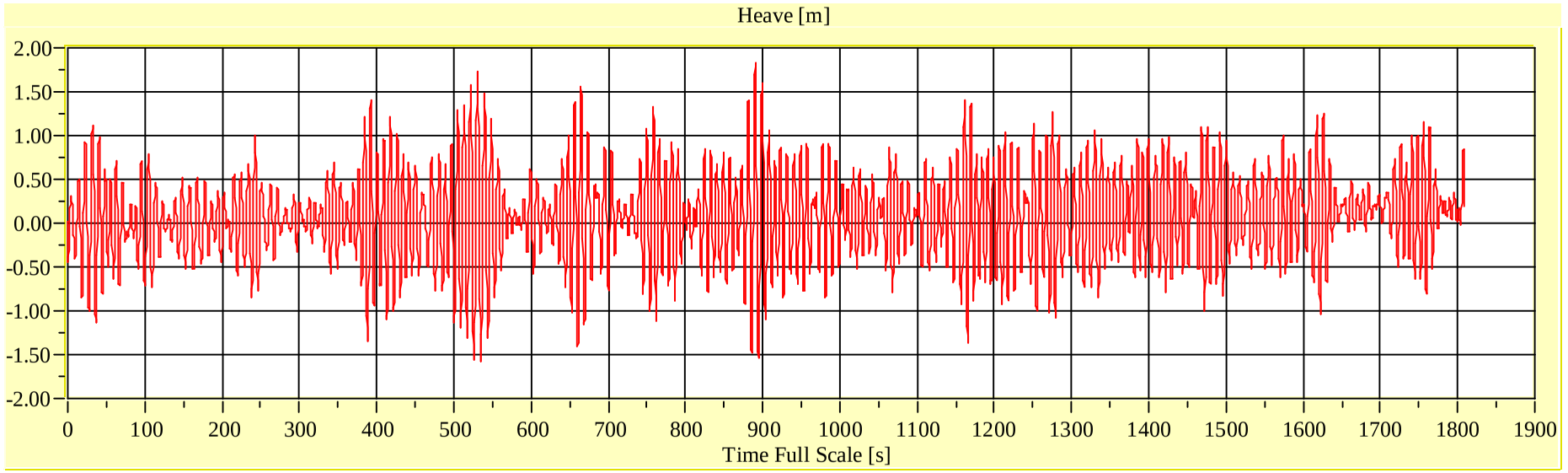



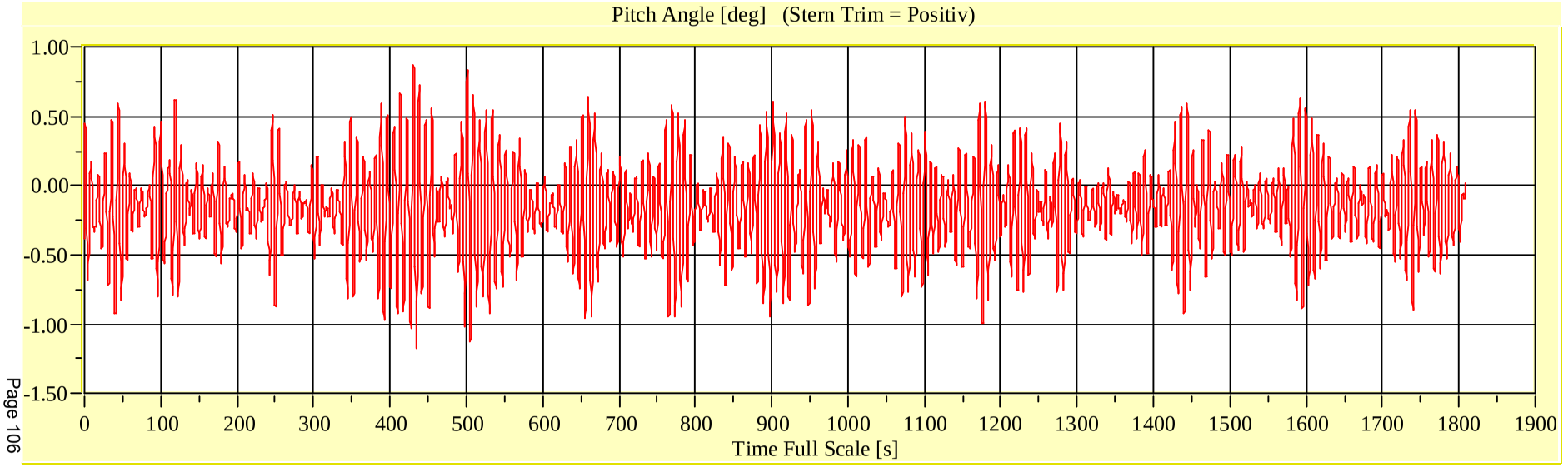



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-02 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



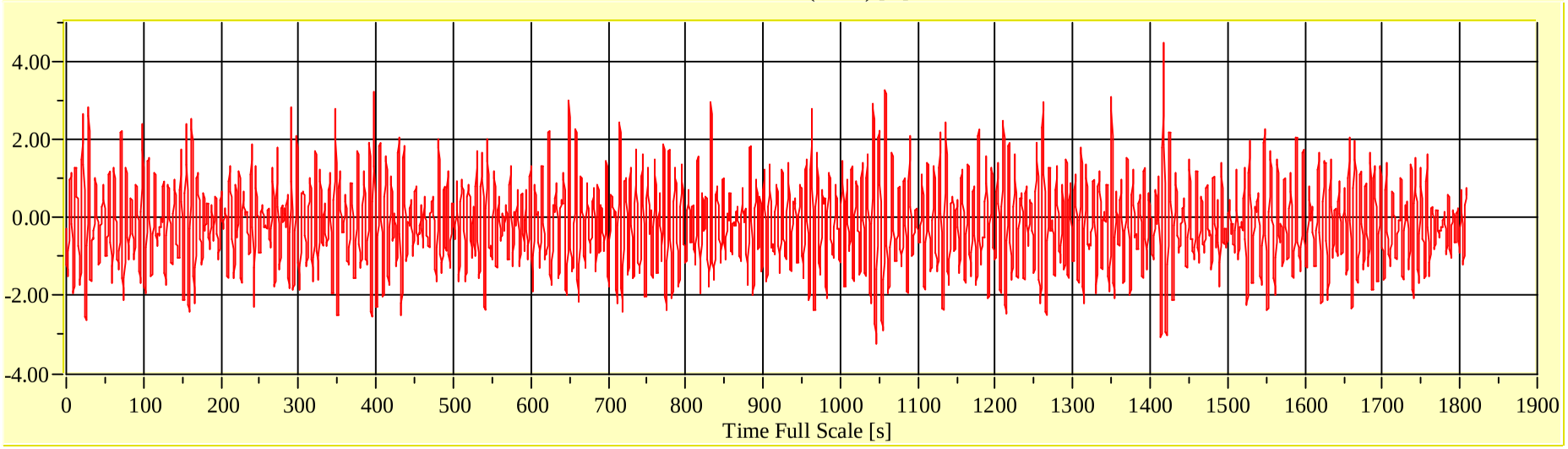



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

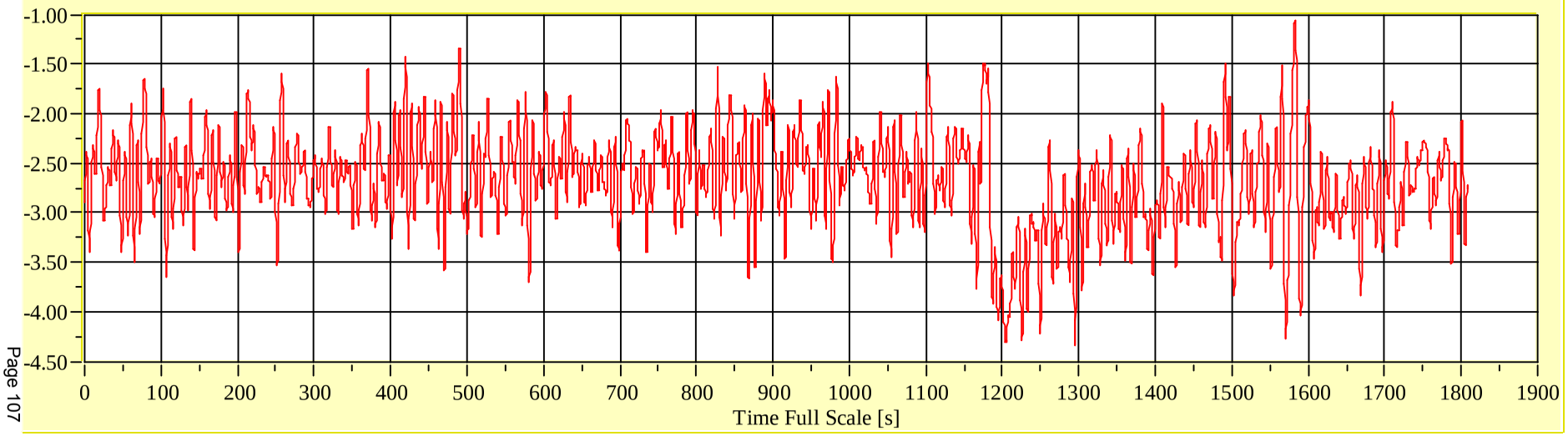
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-03 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to PS = Positiv)

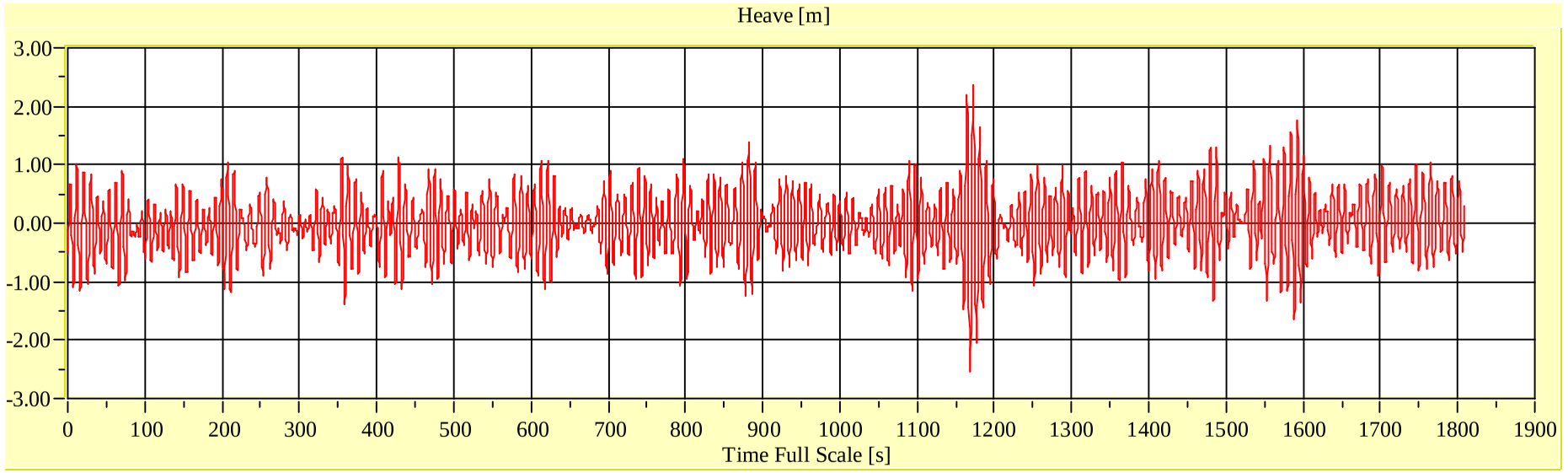


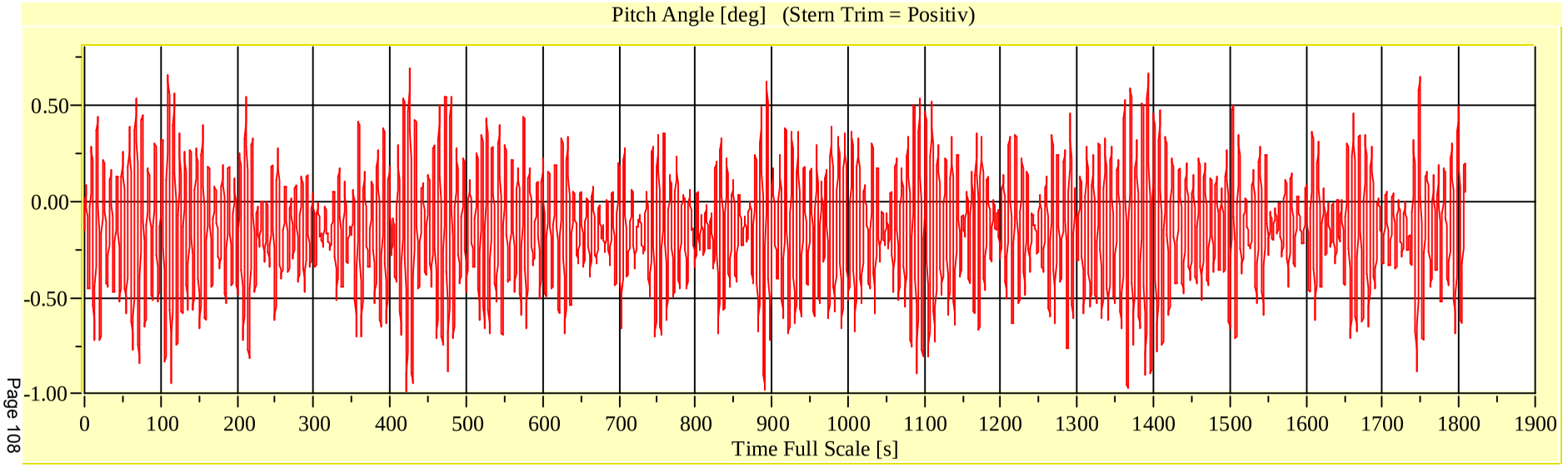



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-03 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



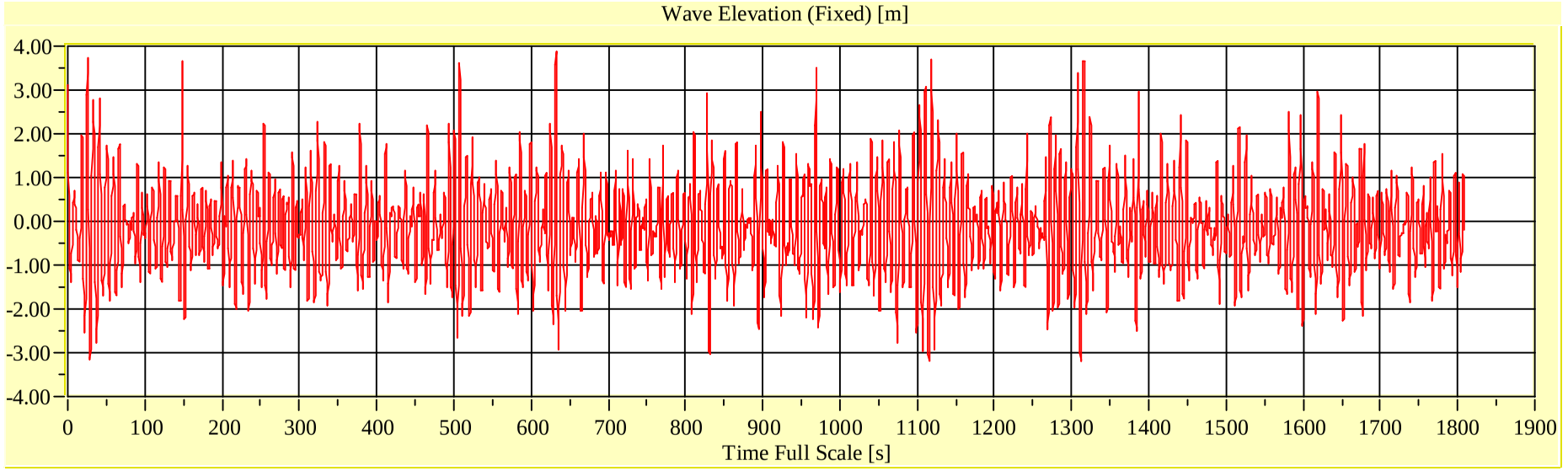



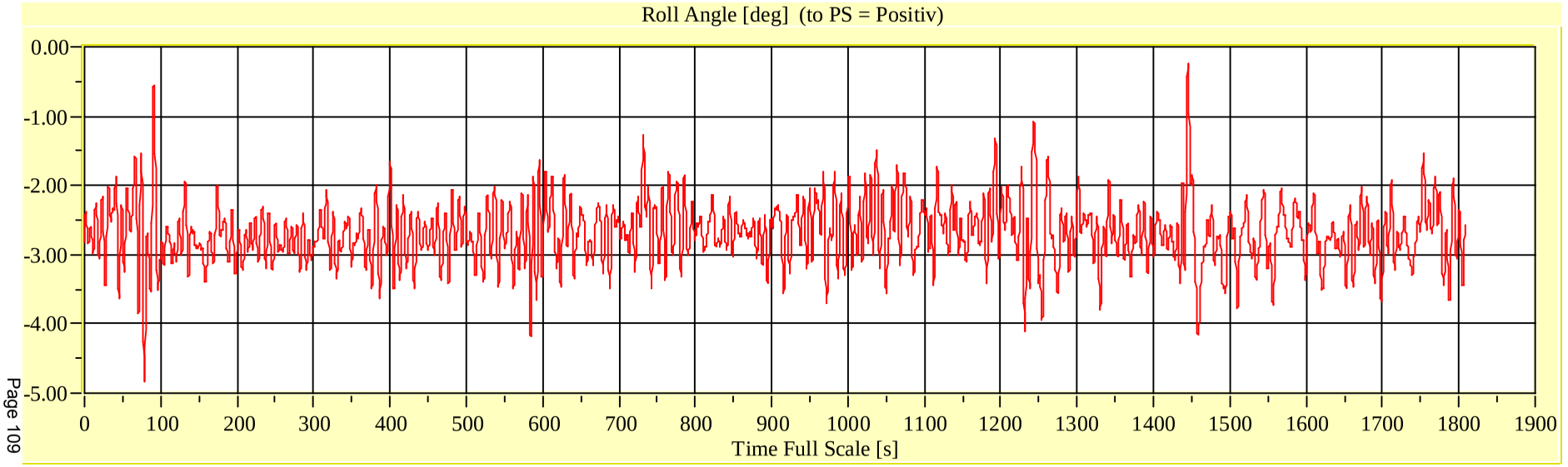



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-04 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



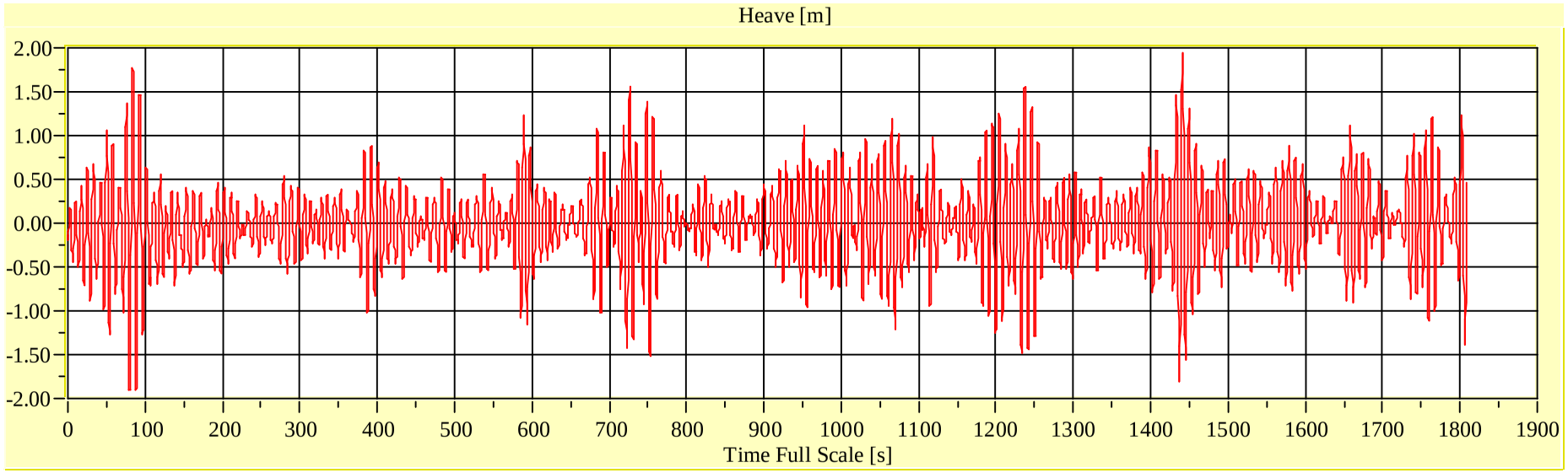



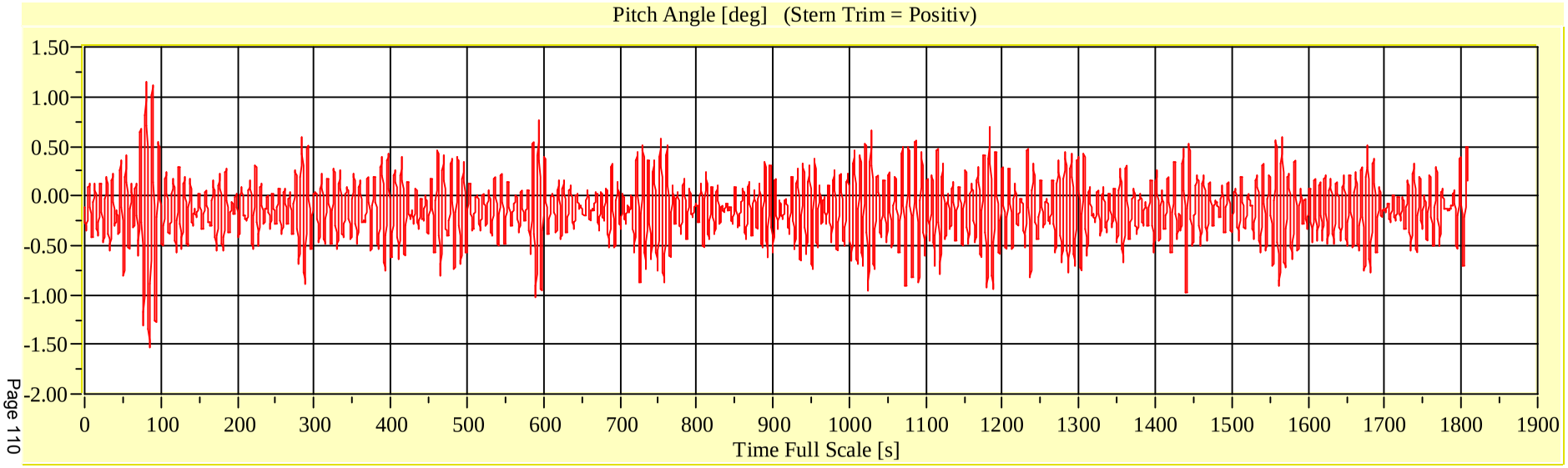



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-04 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



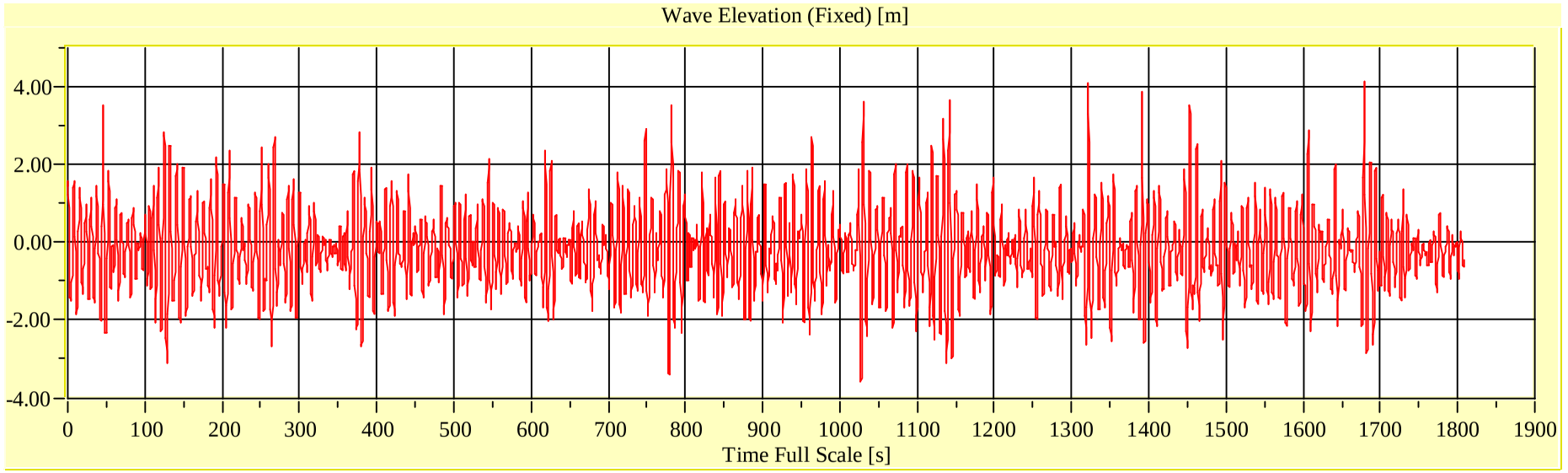



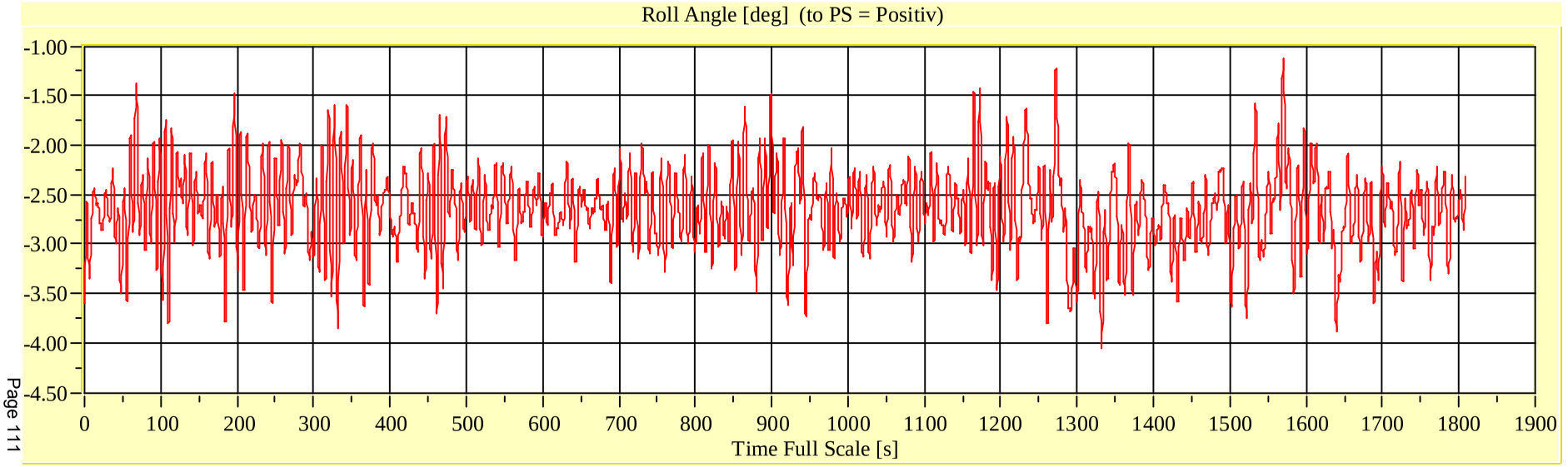



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-05 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



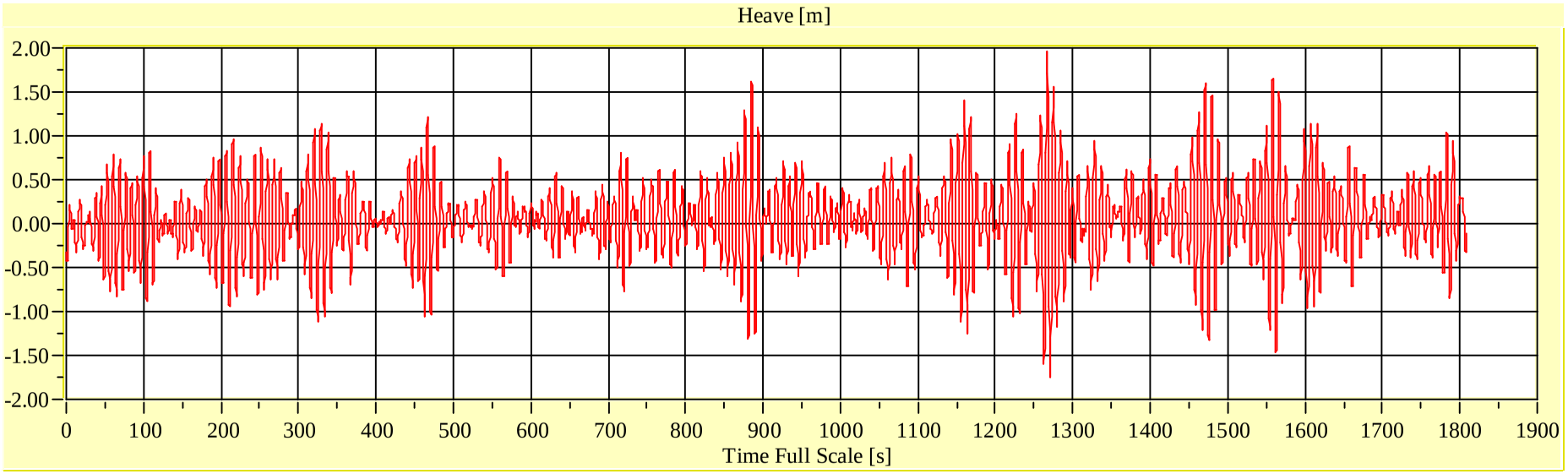



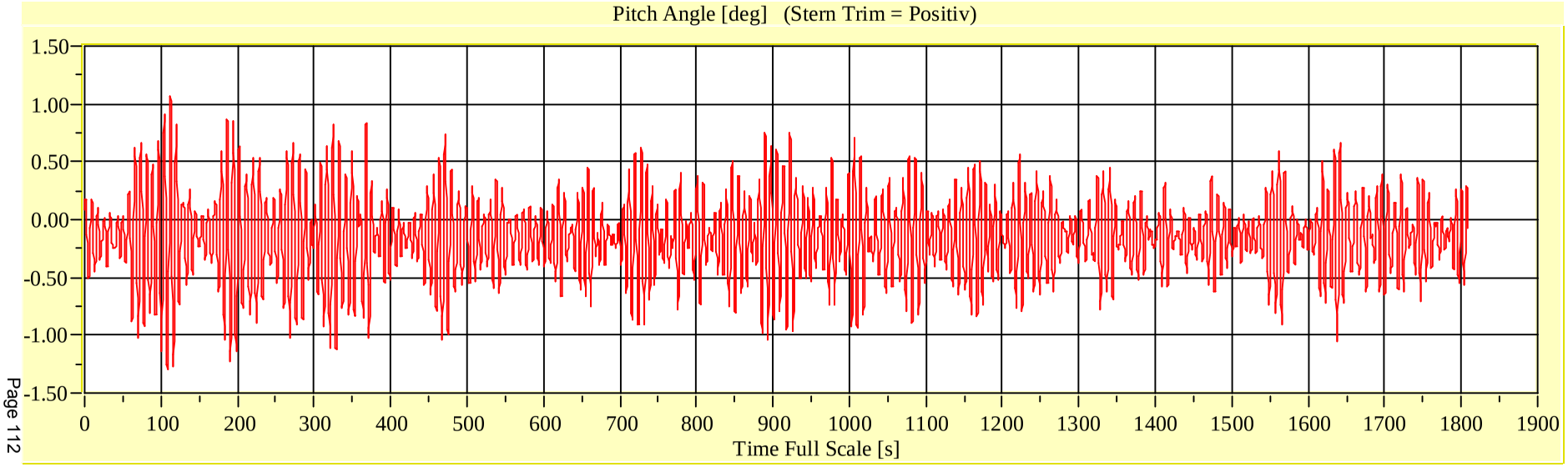



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29701-05 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



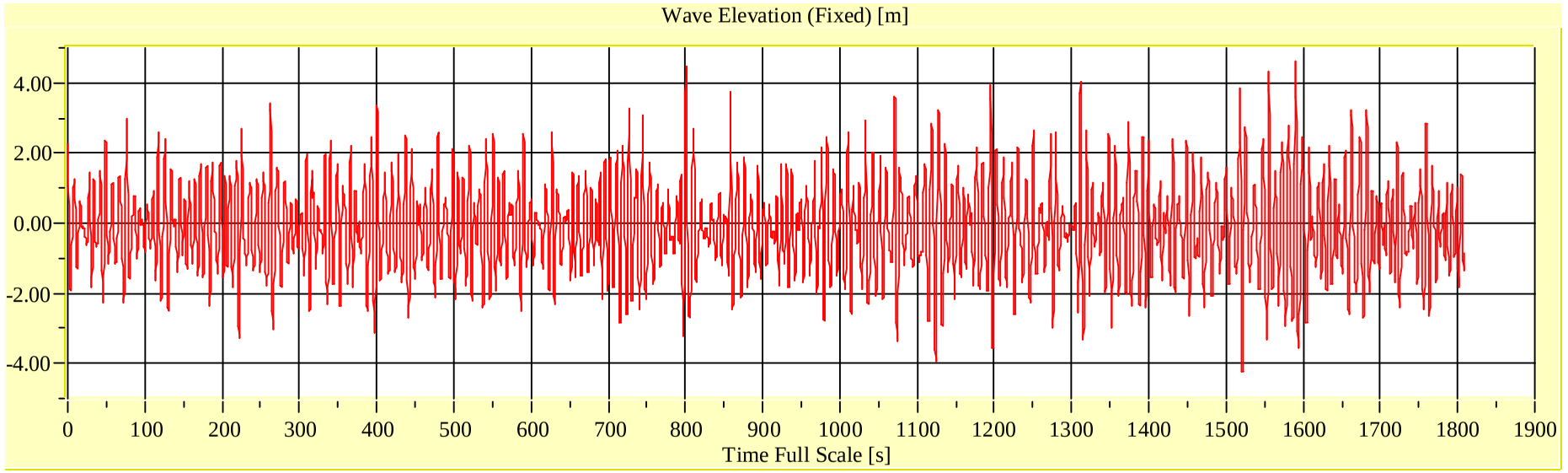



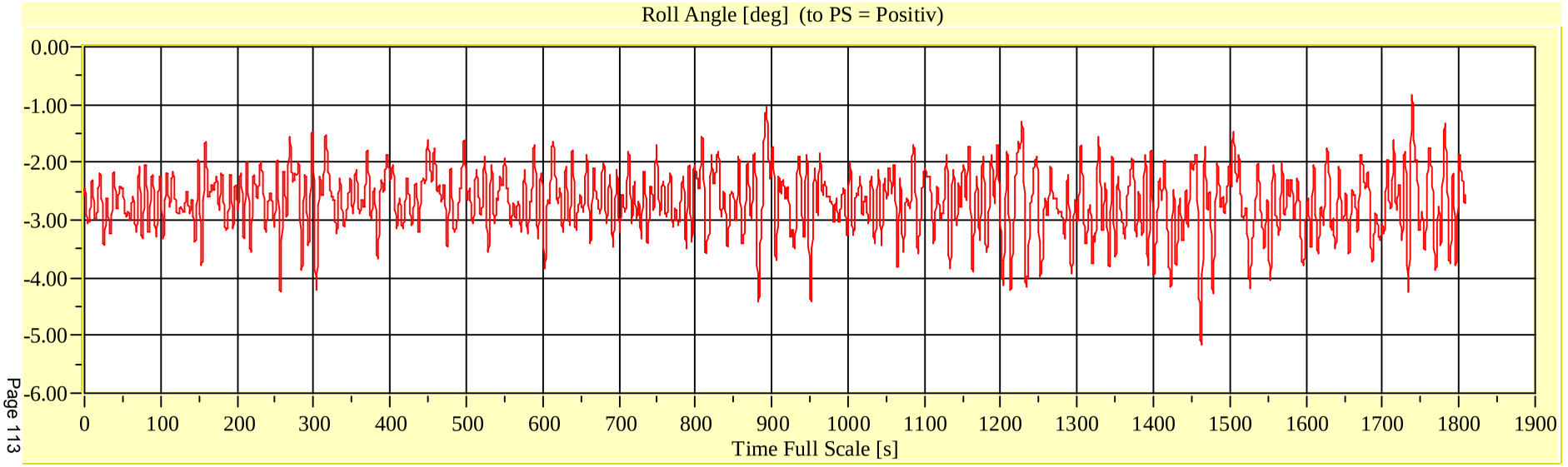



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-01 | Target Waves: Hs = 5.0 m Tp = 8,9443 ss | gamma = 3,3 |
|---|---|---|---|---|



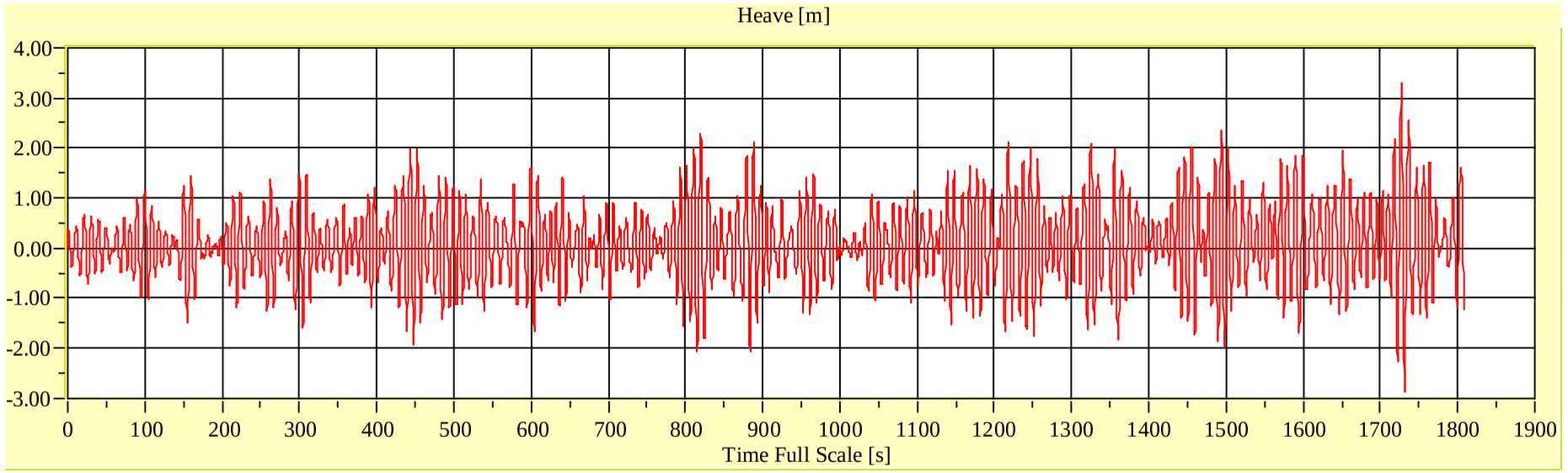



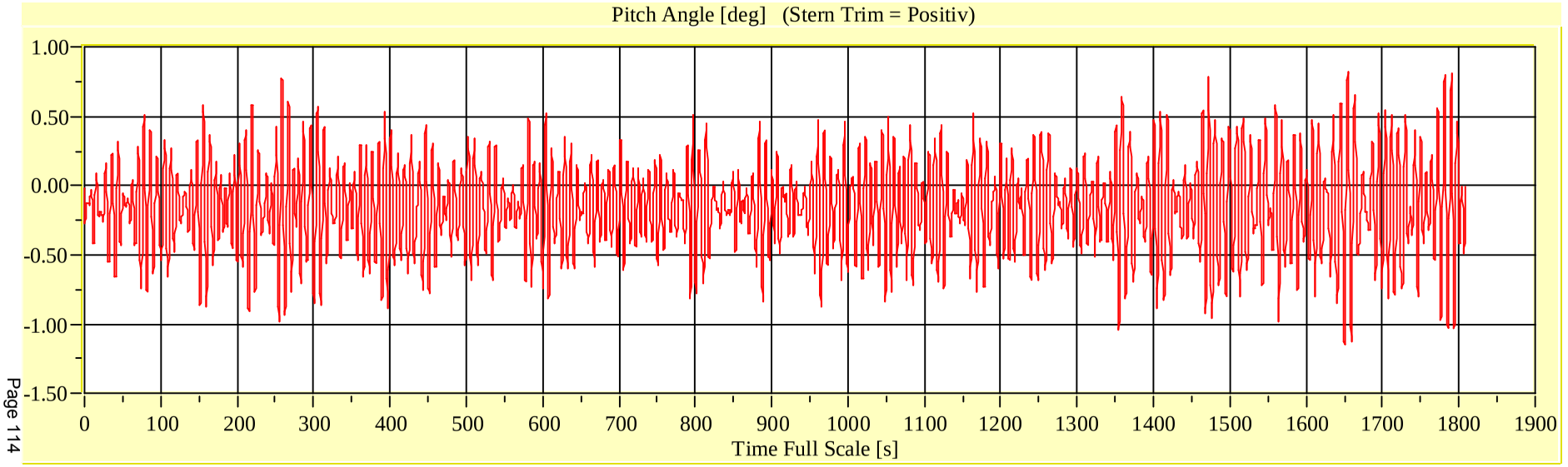



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-01 | Target Waves: Hs = 5,0 m Tp = 8,9443 s | gamma = 3,3 |
|---|---|---|---|---|



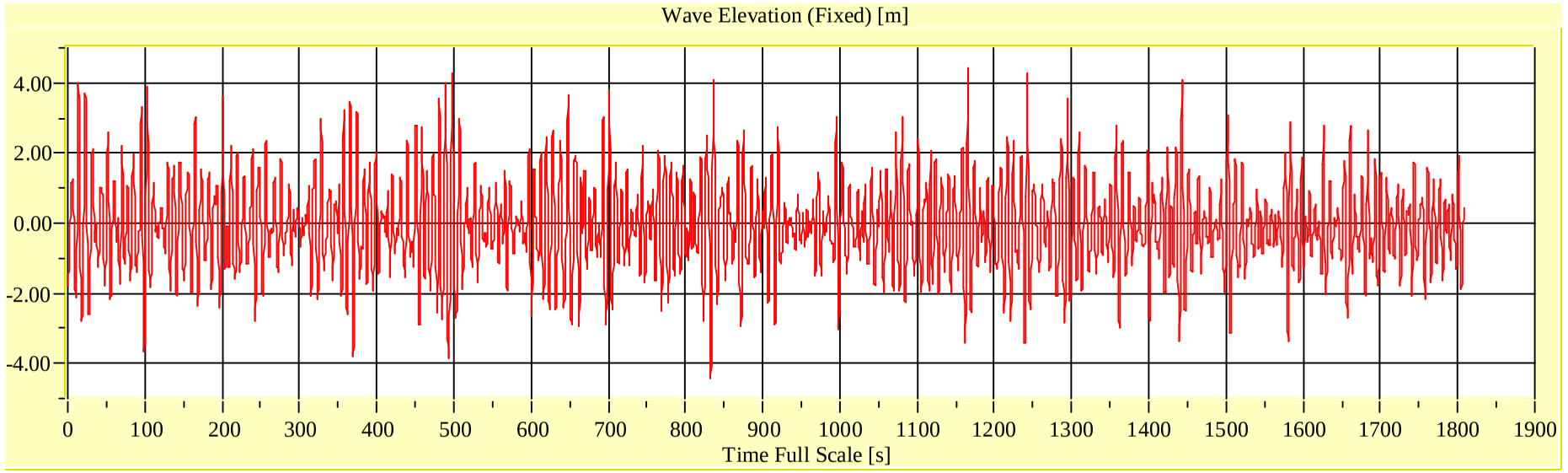



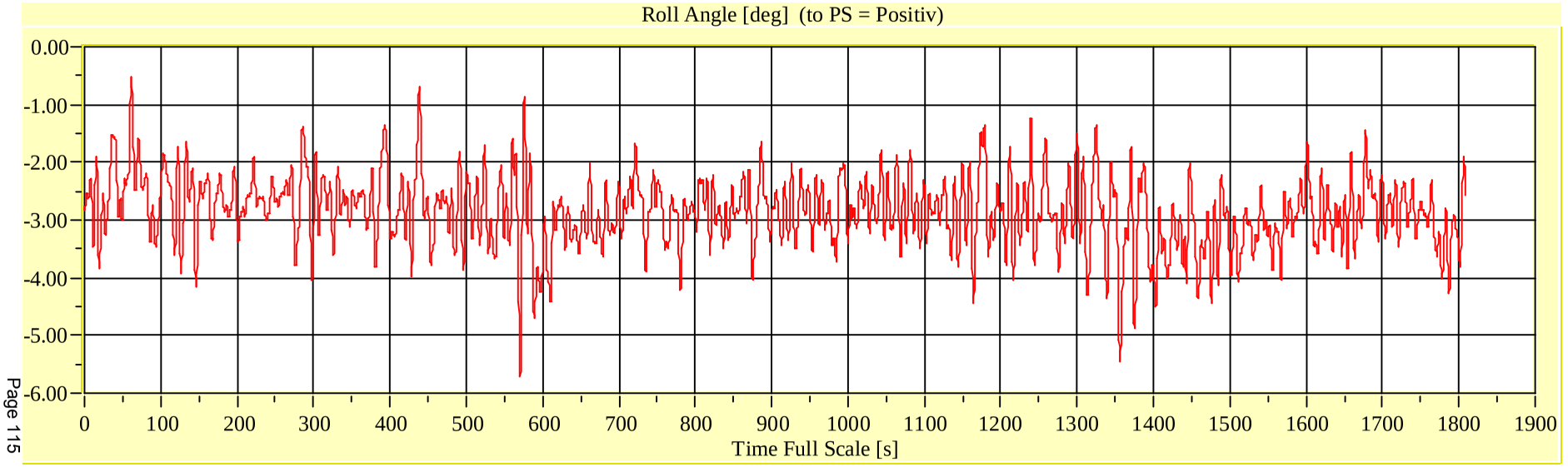



| Date: 01.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-02 | Target Waves: Hs = 5,0 m Tp = 8,9443 s | gamma = 3,3 |
|---|---|---|---|---|



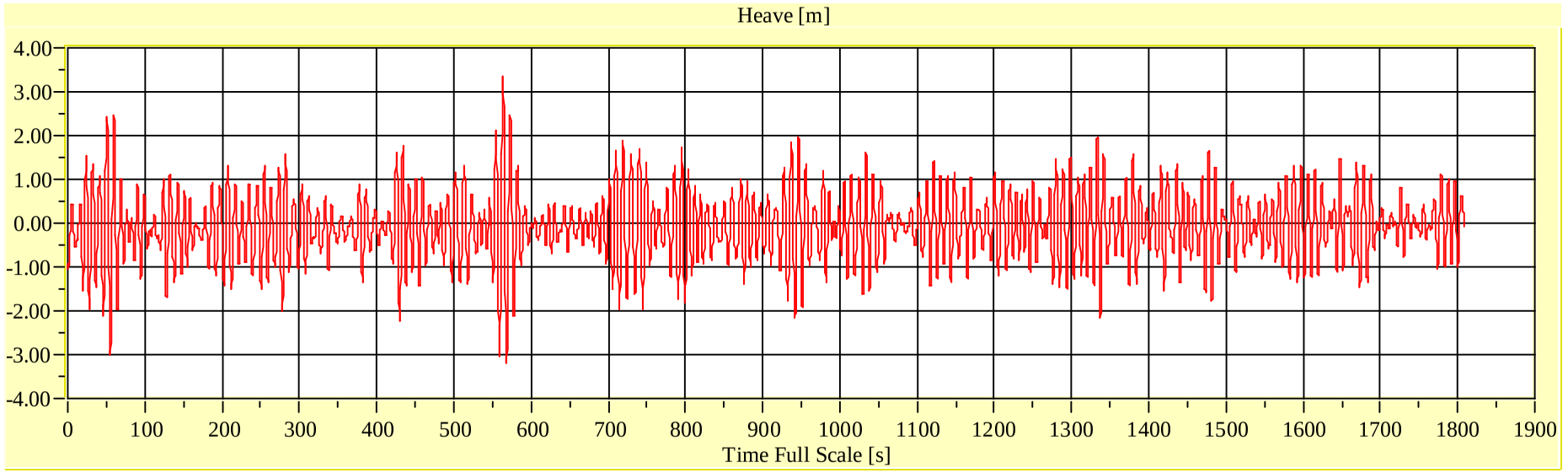



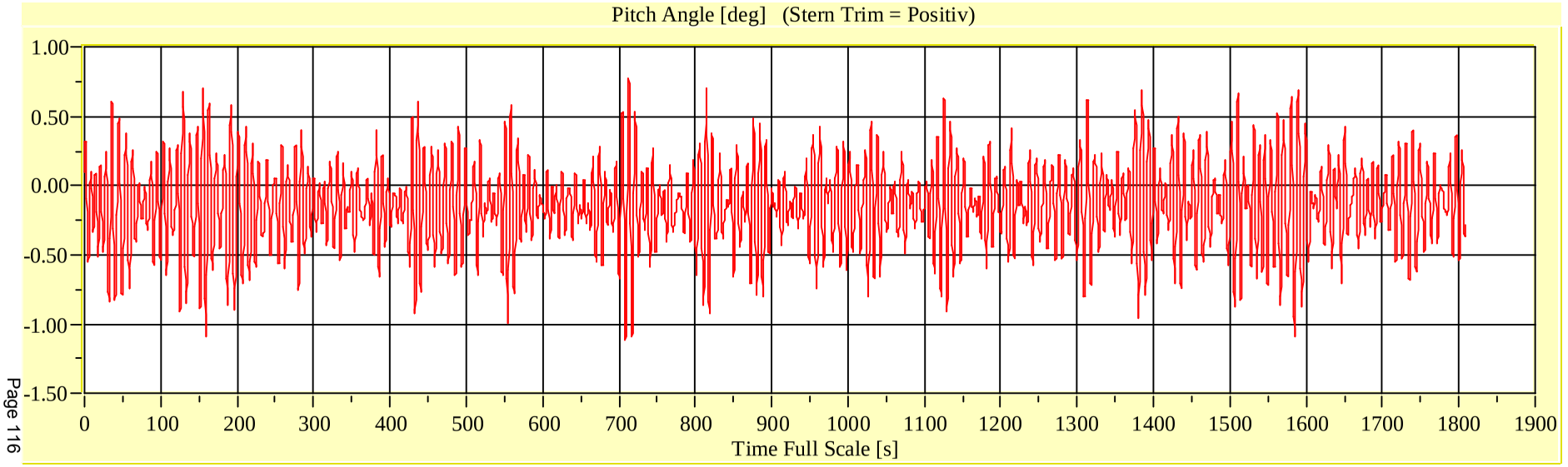



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-02 | Target Waves: Hs = 5,0 m Tp = 8,9443 s | gamma = 3,3 |
|---|---|---|---|---|



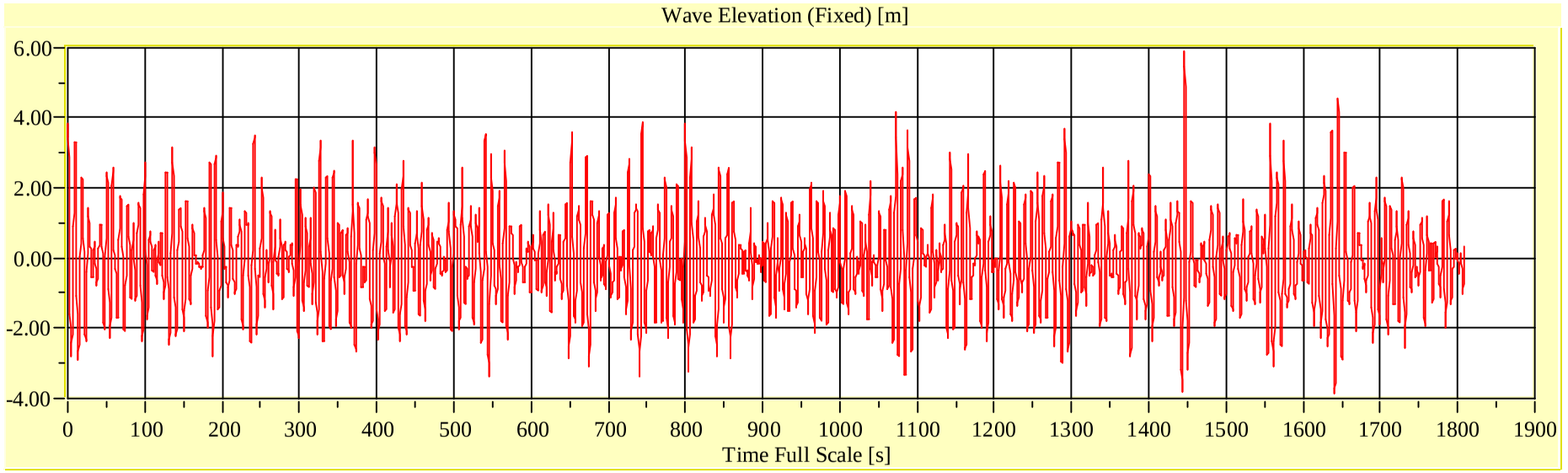



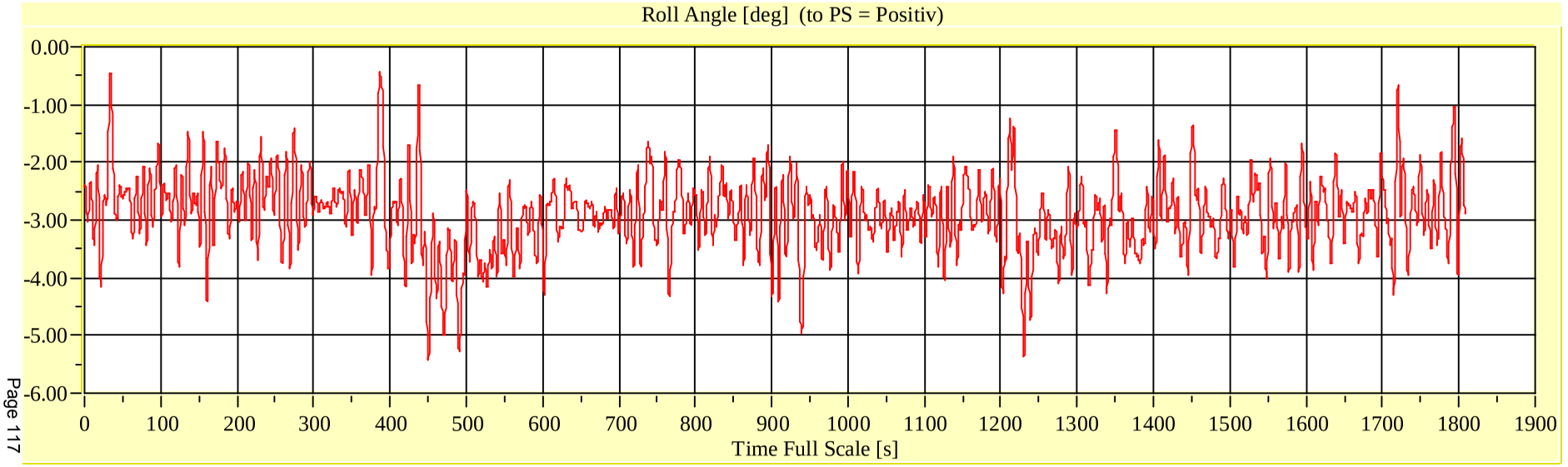



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-03 | Target Waves: Hs = 5,0 m Tp = 8,9443 s | gamma = 3,3 |
|---|---|---|---|---|



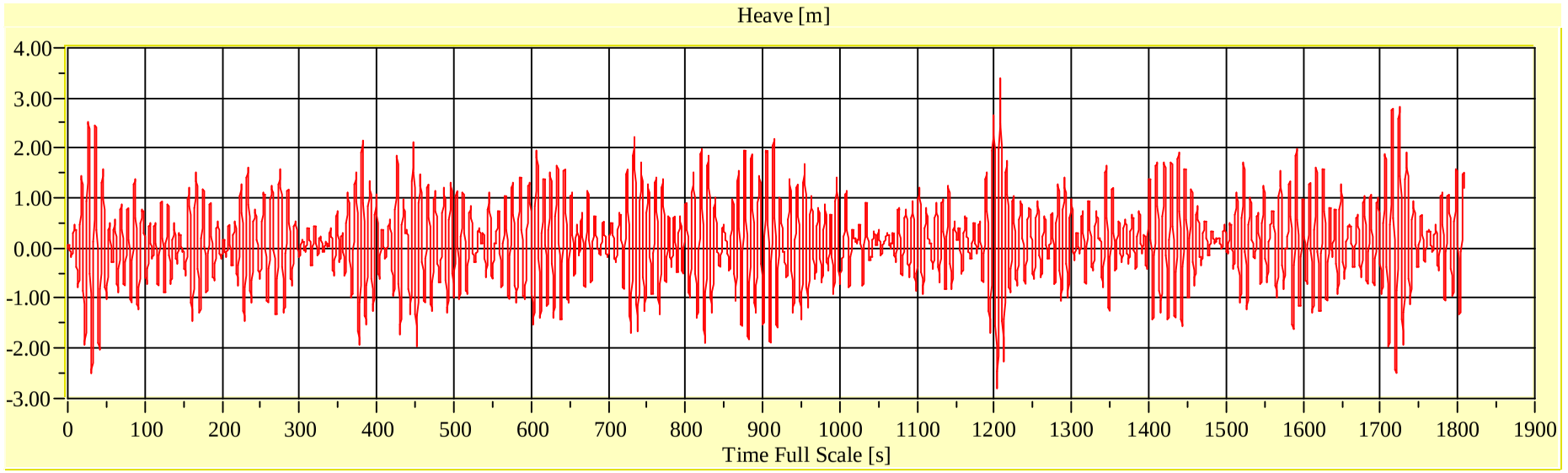



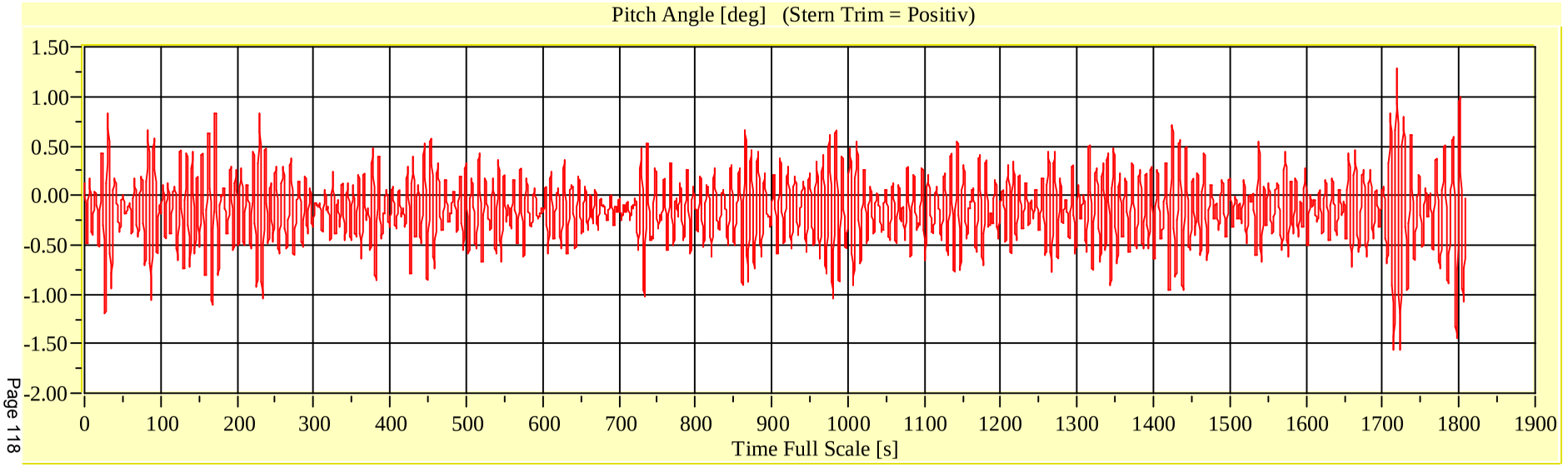



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-03 | Target Waves: Hs = 5,0 m Tp = 8,9443 s | gamma = 3,3 |
|---|---|---|---|---|



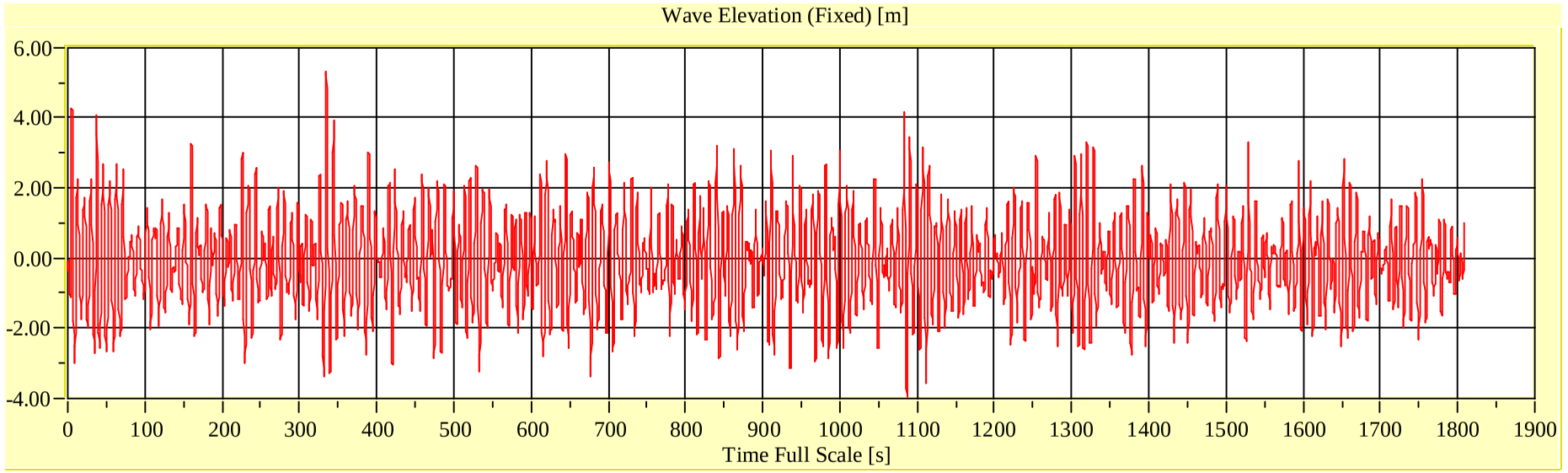



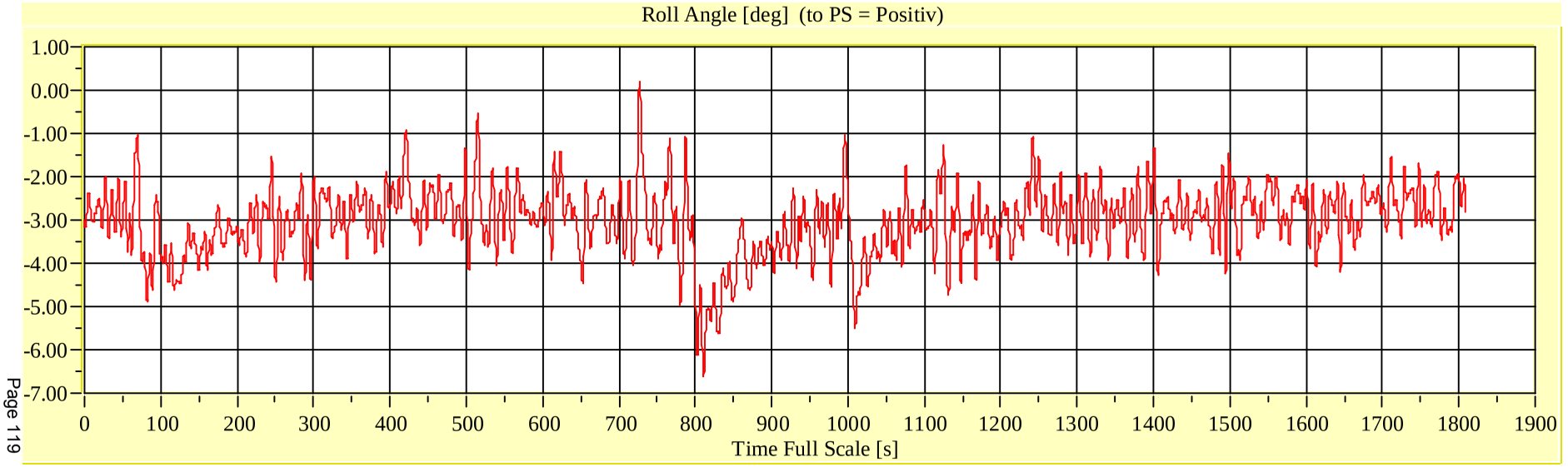



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-04 | Target Waves: Hs = 5,0 m Tp = 8,9443 s | gamma = 3,3 |
|---|---|---|---|---|



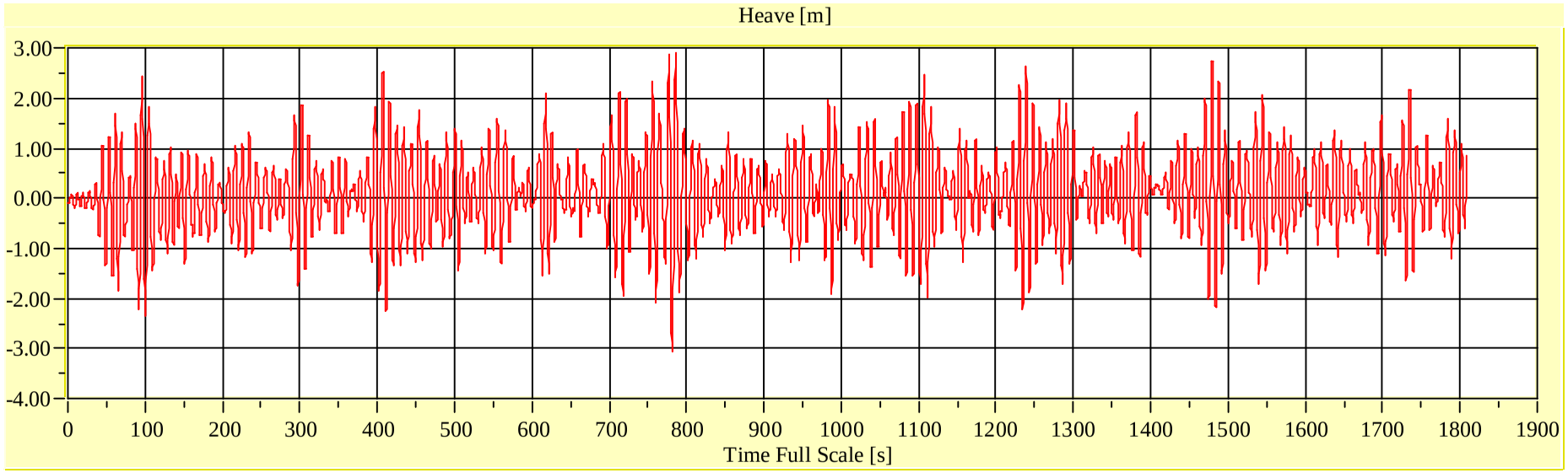



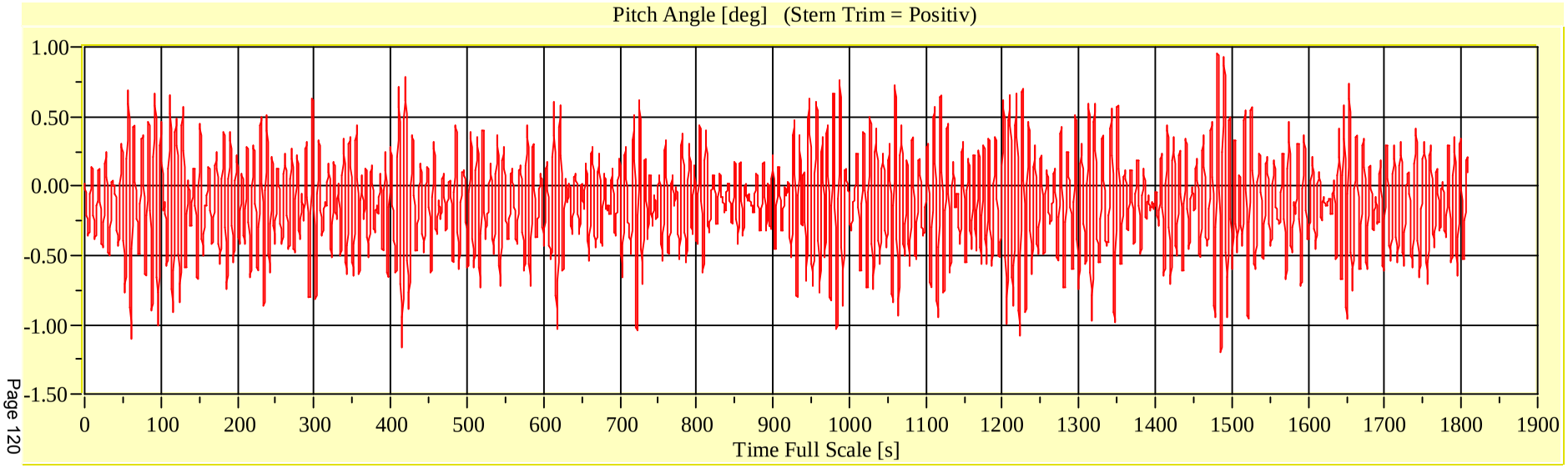



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-04 | Target Waves: Hs = 5,0 m Tp = 8,9443 s | gamma = 3,3 |
|---|---|---|---|---|



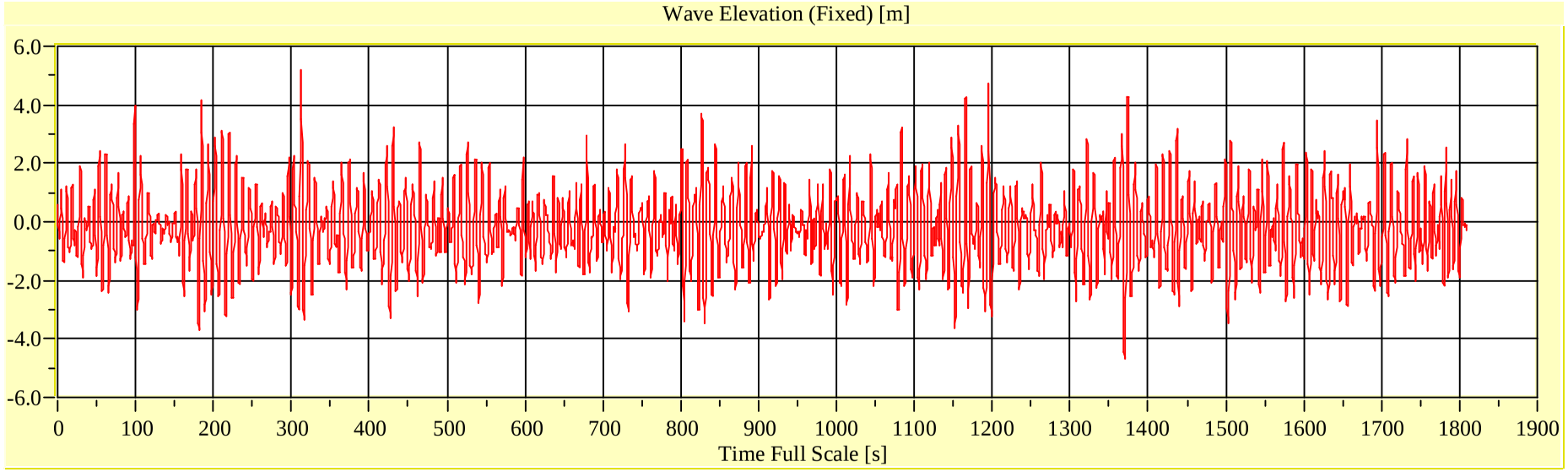



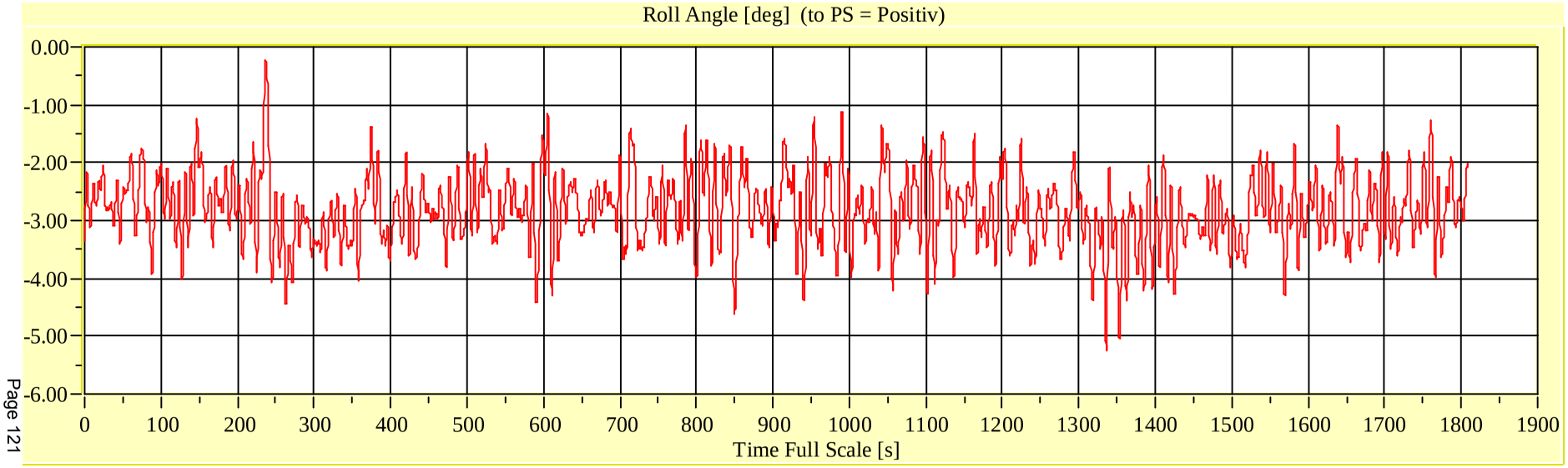



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-05 | Target Waves: Hs = 5,0 m Tp = 8,9443 s | gamma = 3,3 |
|---|---|---|---|---|



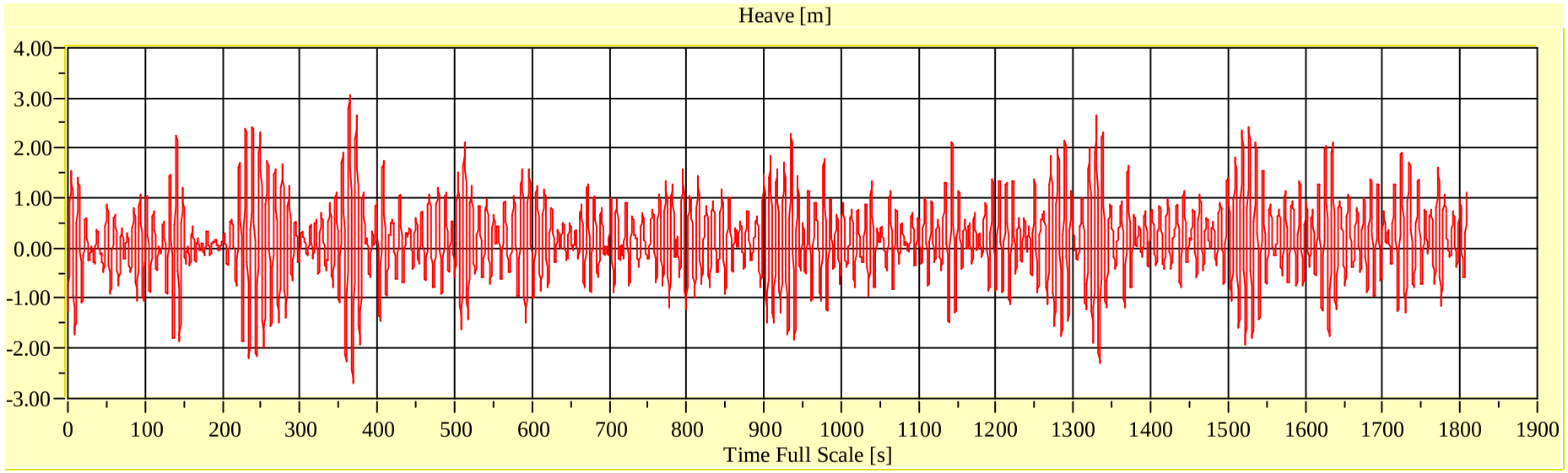



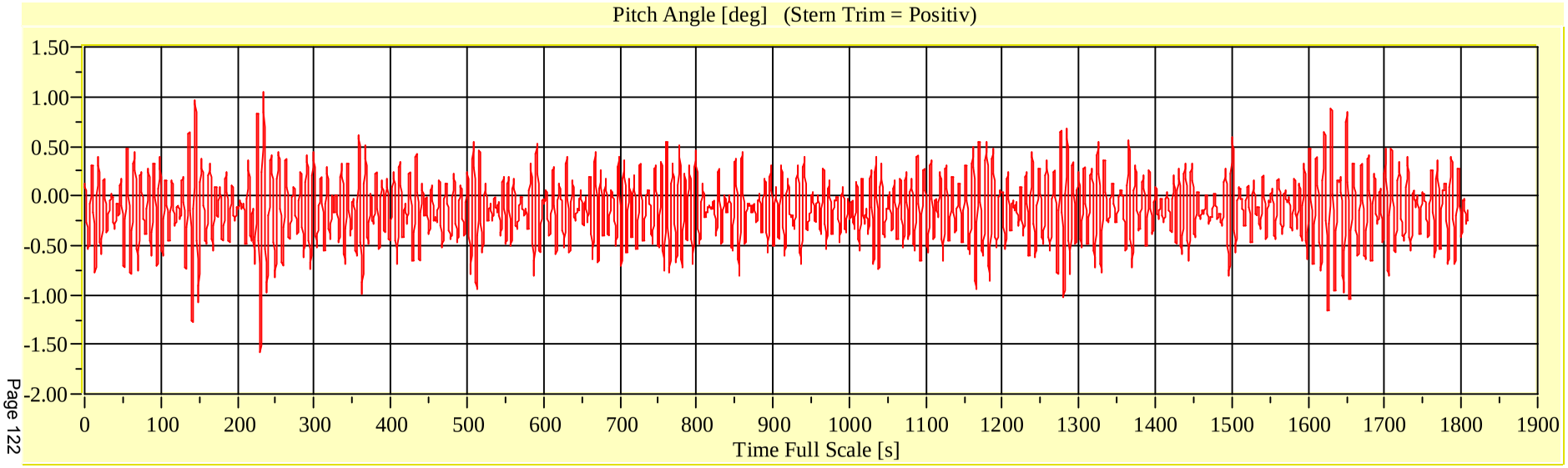



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29702-05 | Target Waves: Hs = 5,0 m Tp = 8,9443 s | gamma = 3,3 |
|---|---|---|---|---|



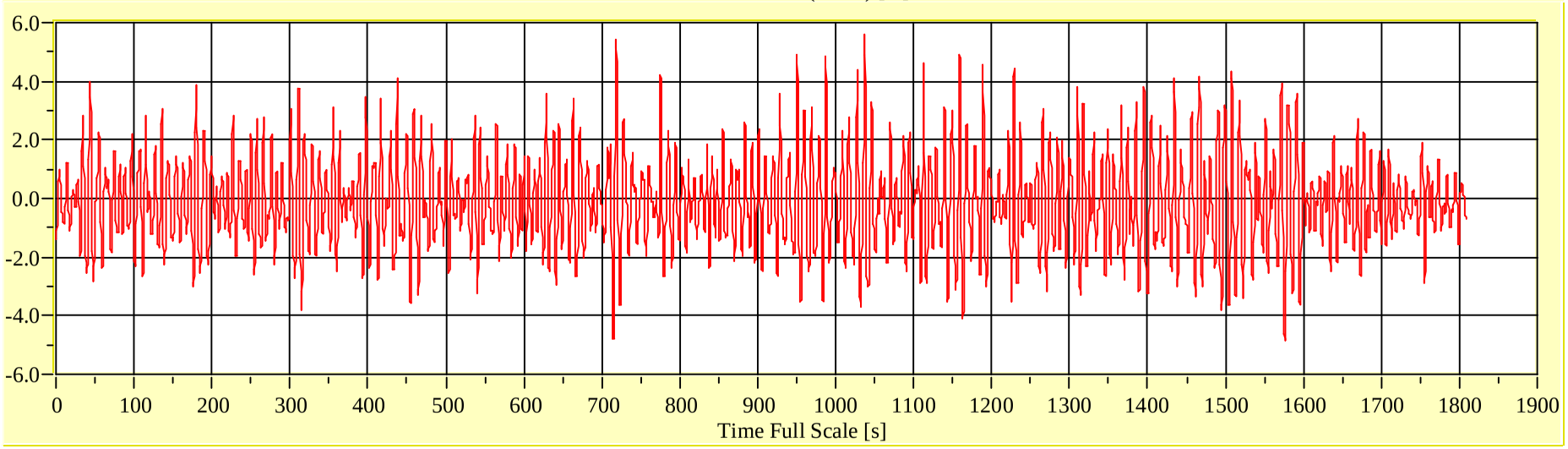



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

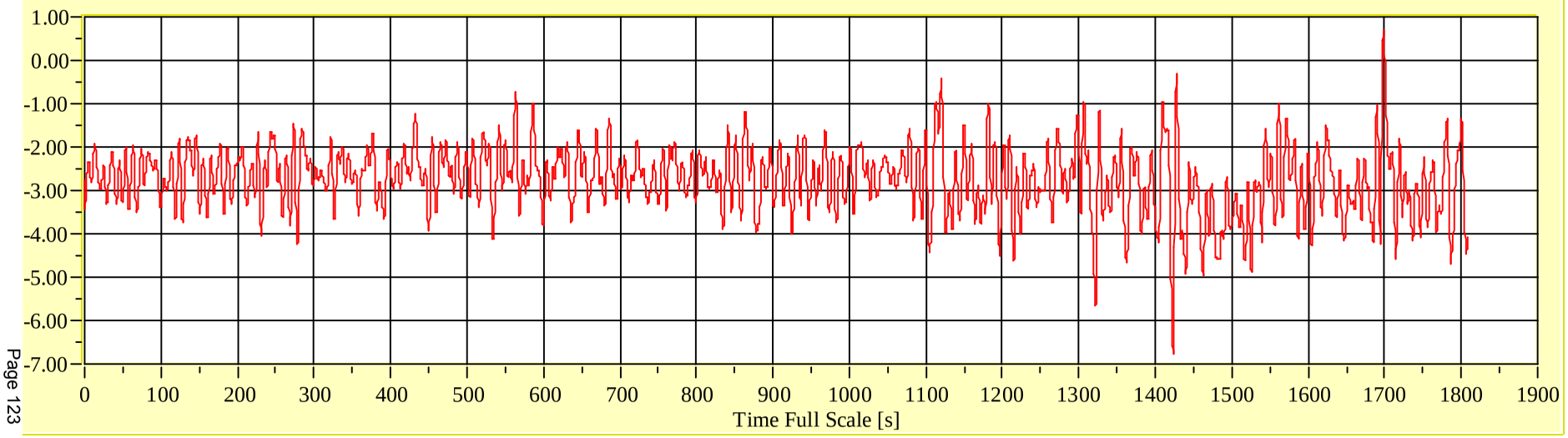
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-01 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to PS = Positiv)

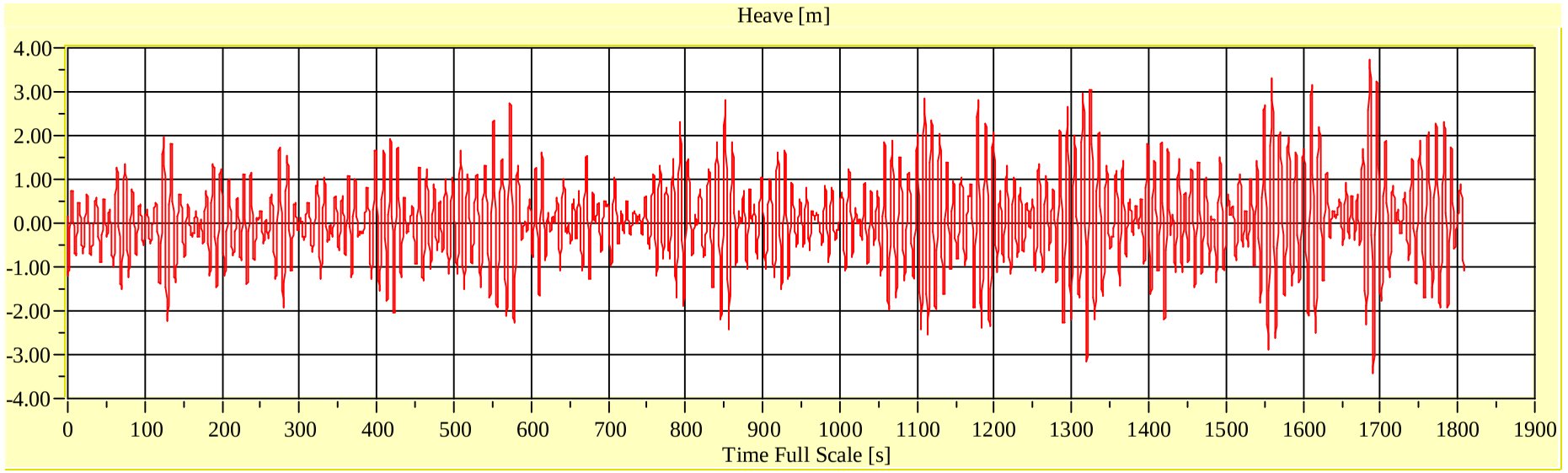


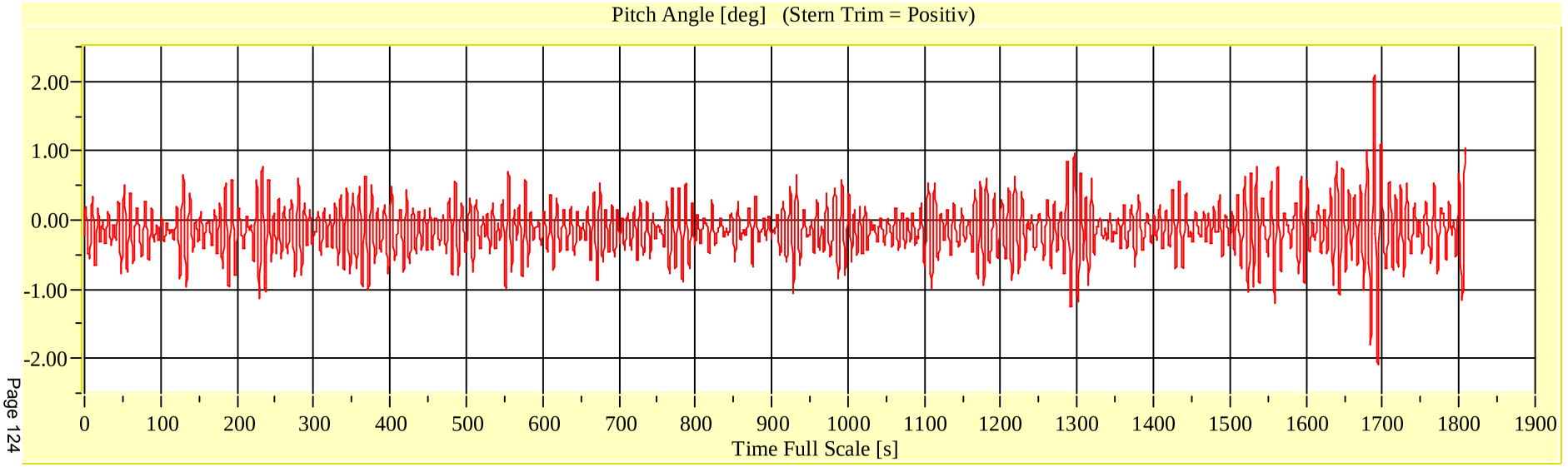



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-01 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|



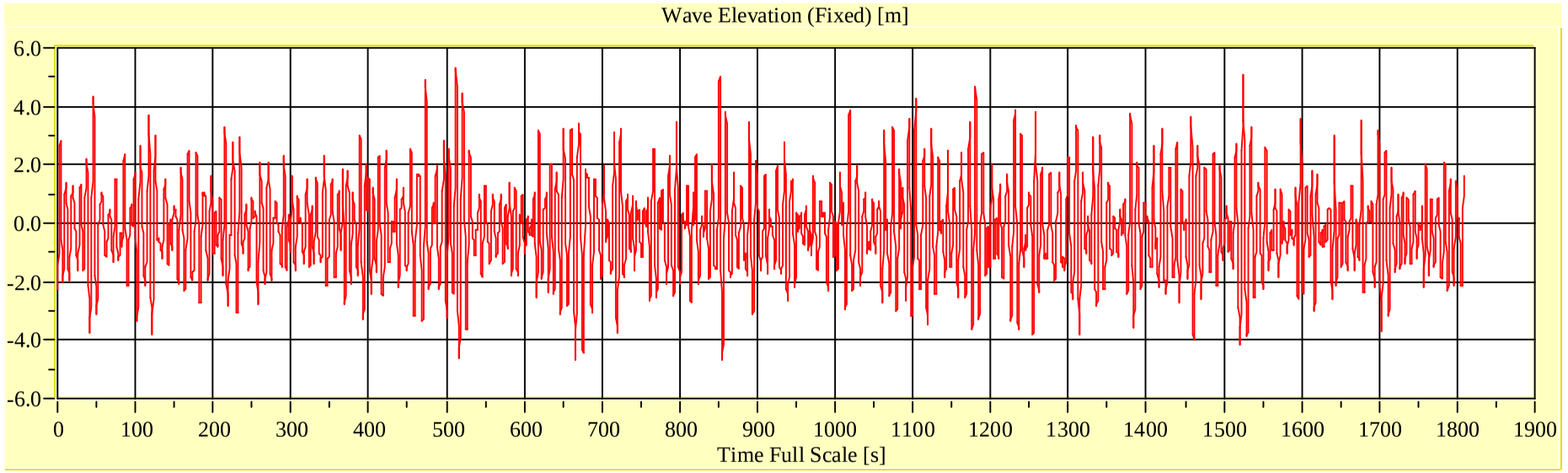



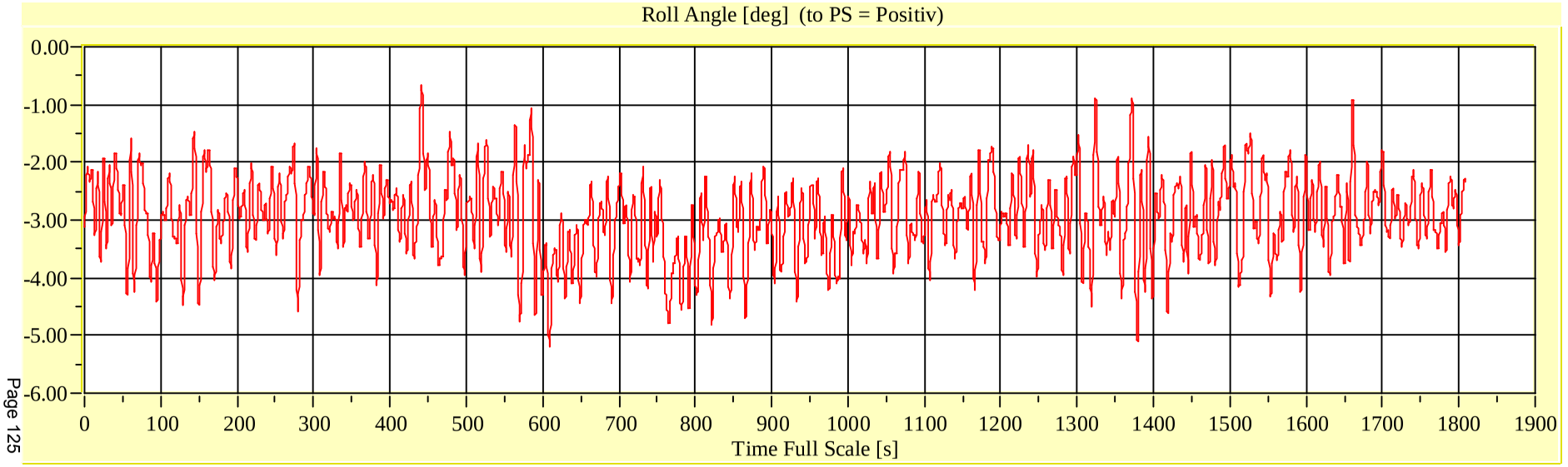



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-02 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|



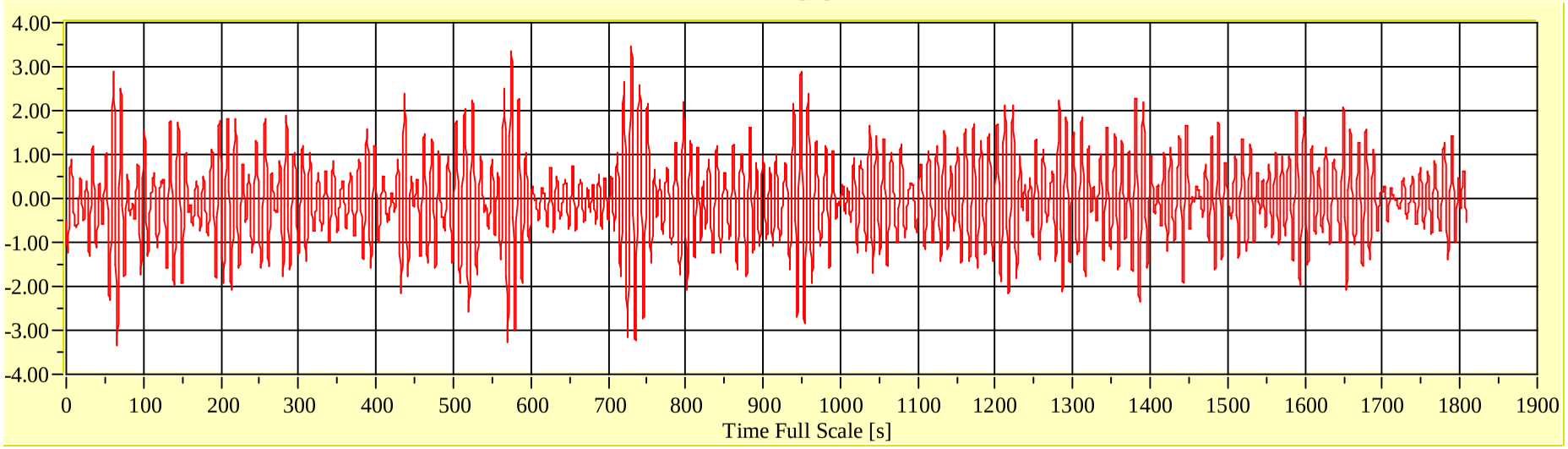



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

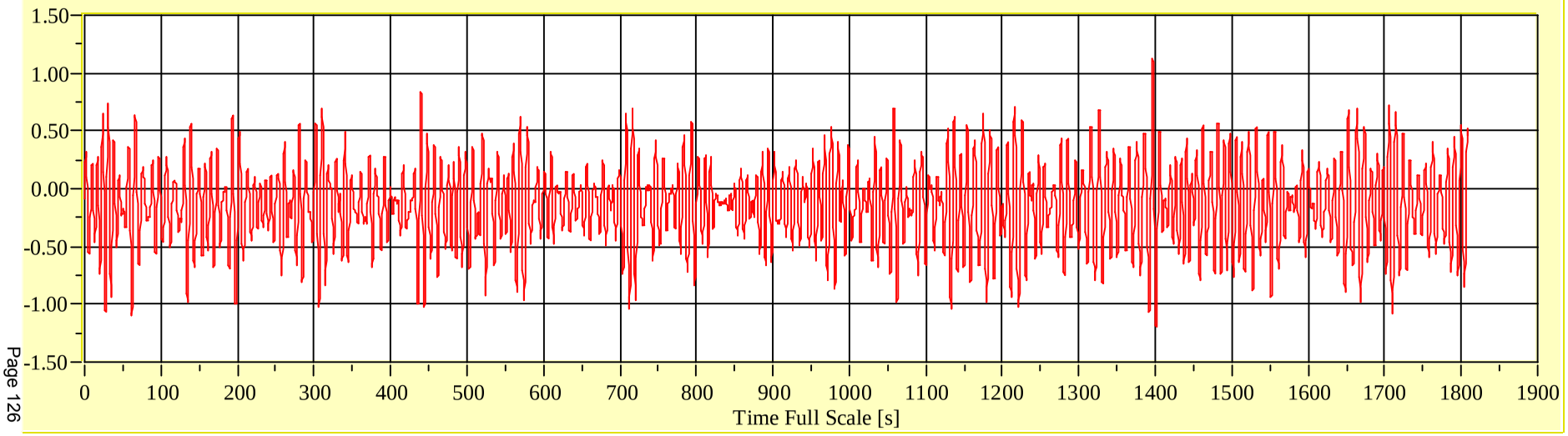
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-02 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Stern Trim = Positiv)



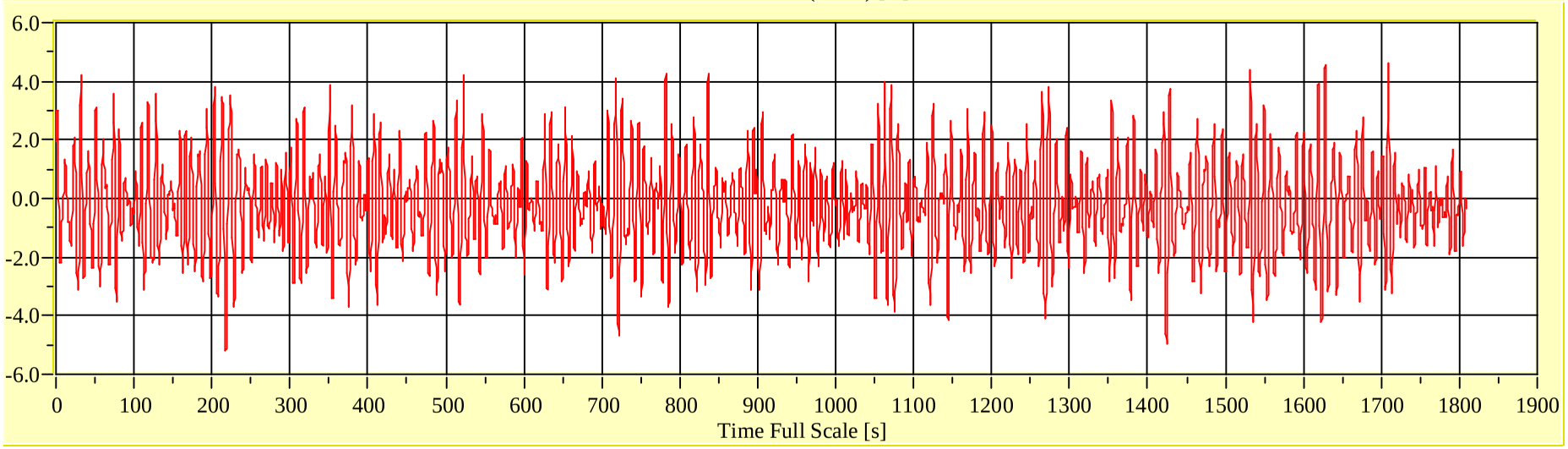



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

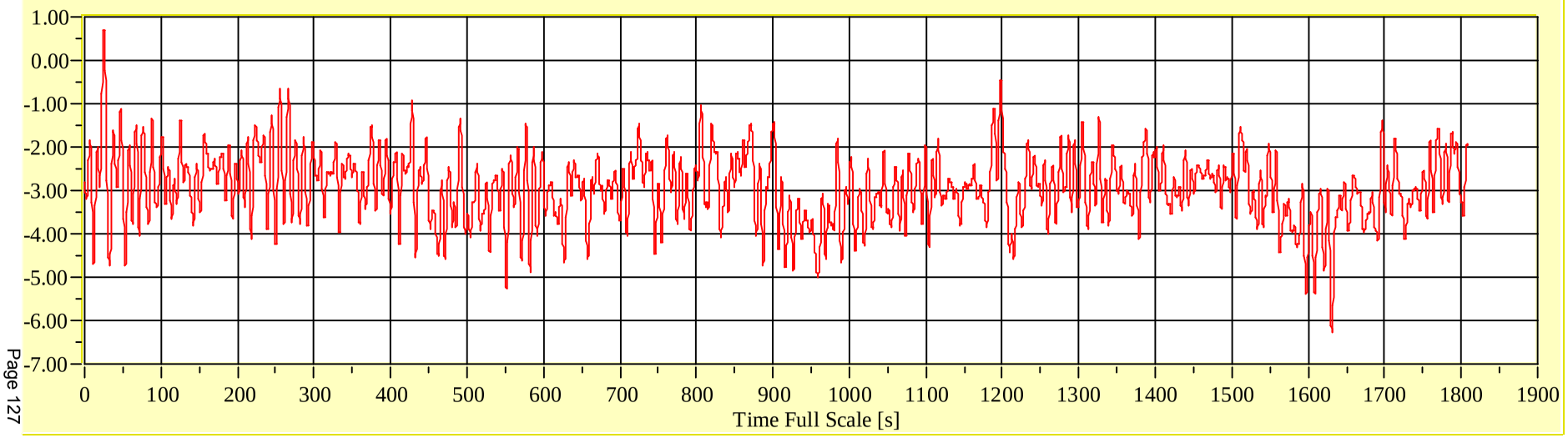
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-03 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|

Wave Elevation (Fixed) [m]




Roll Angle [deg] (to PS = Positiv)

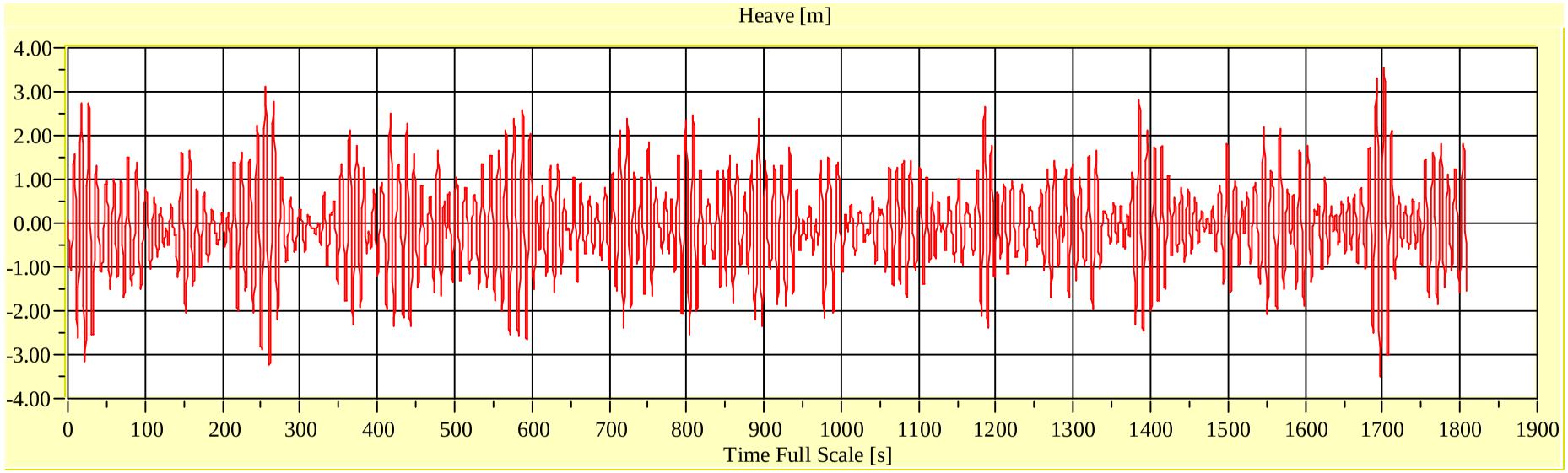


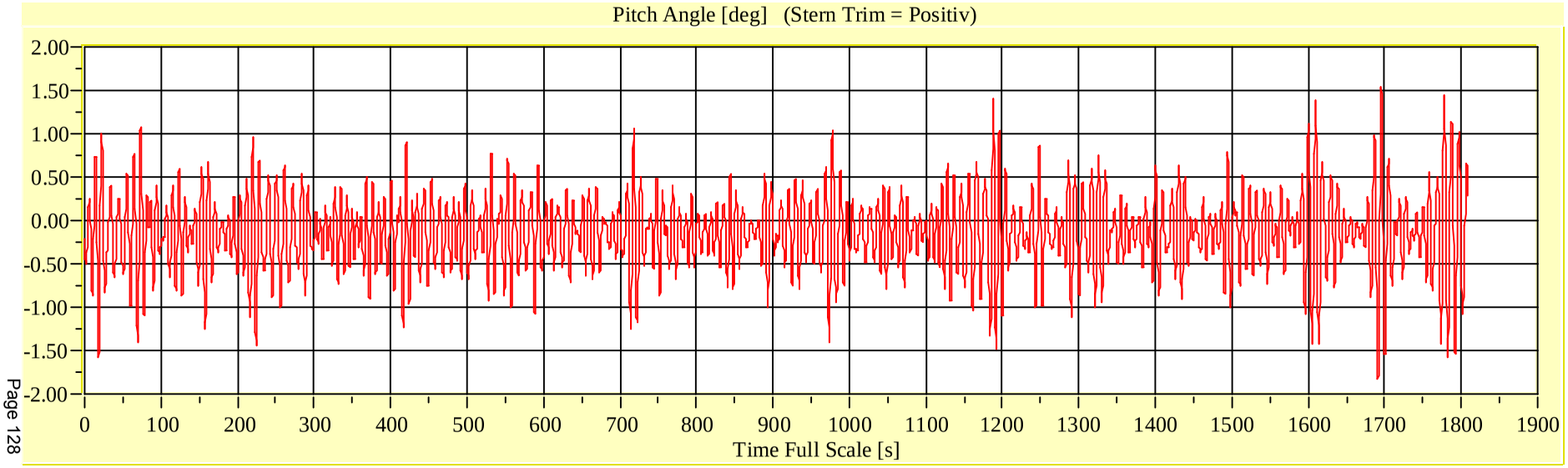



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-03 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|



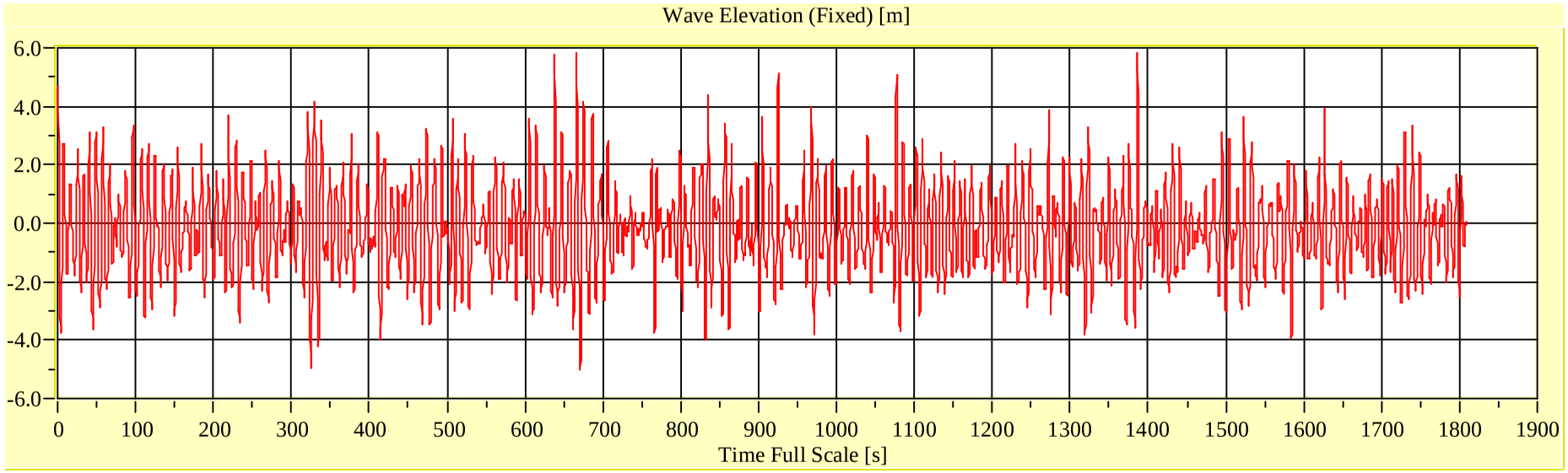



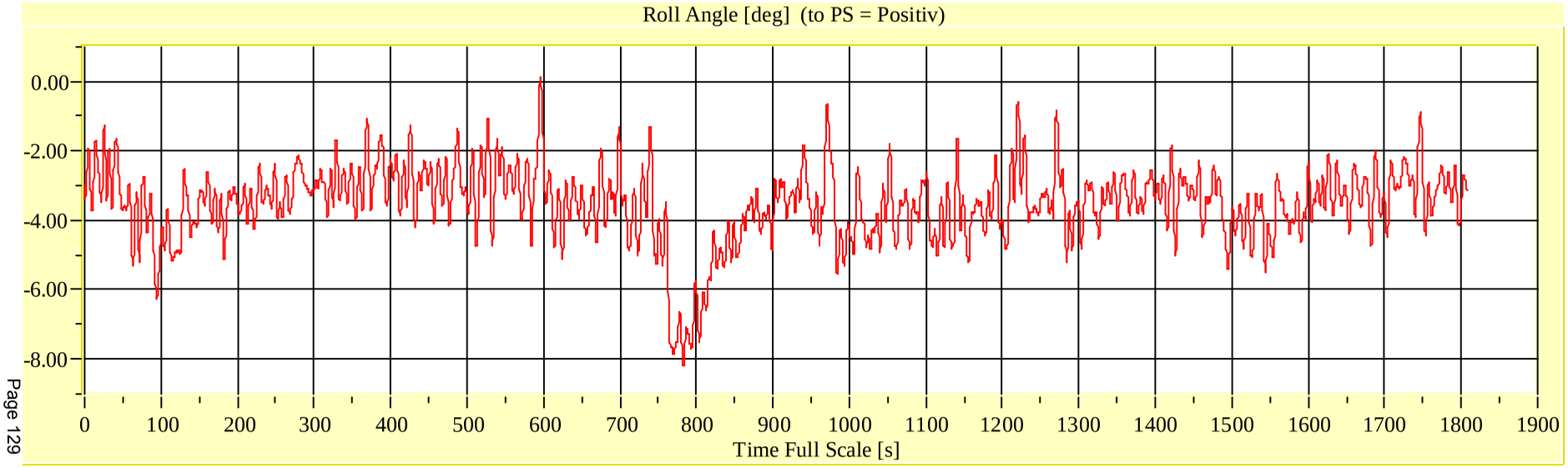



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-04 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|



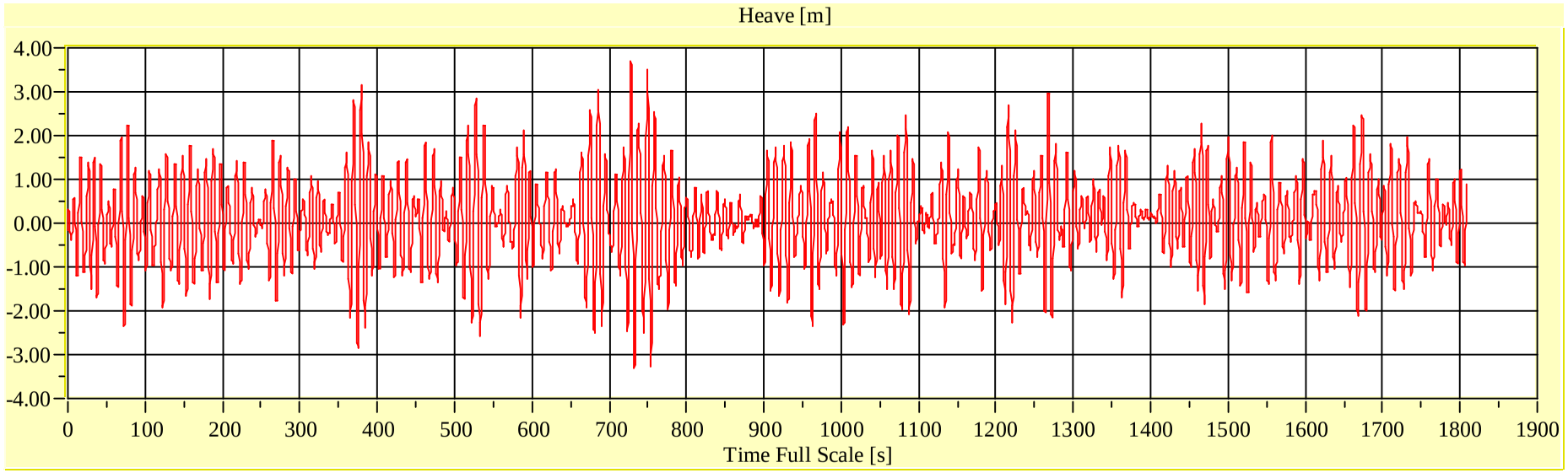



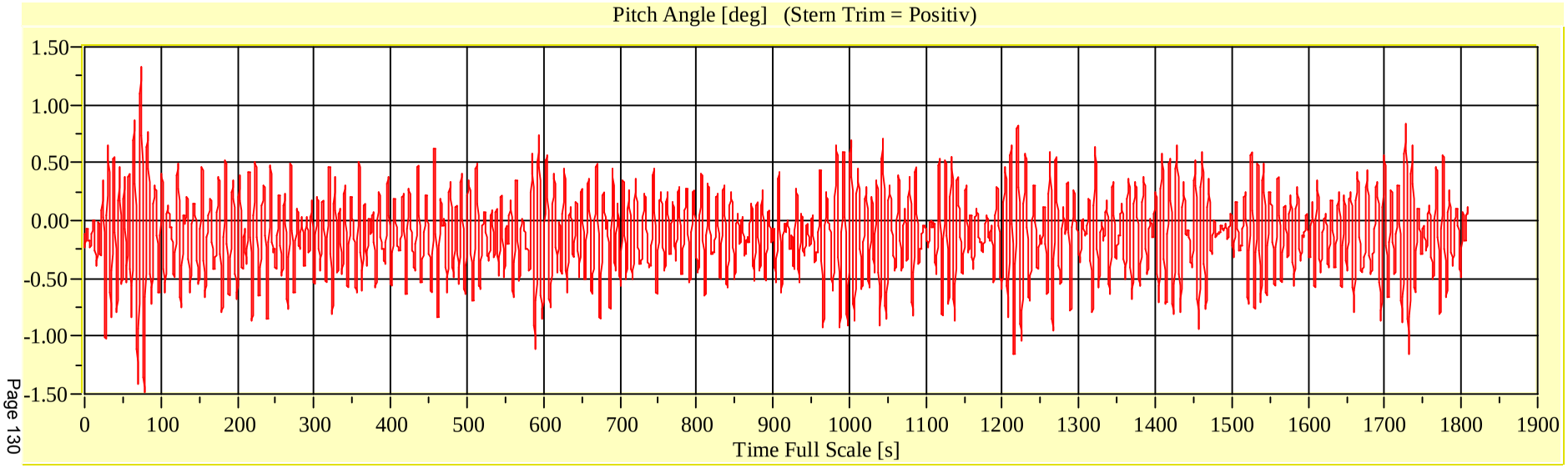



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-04 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|



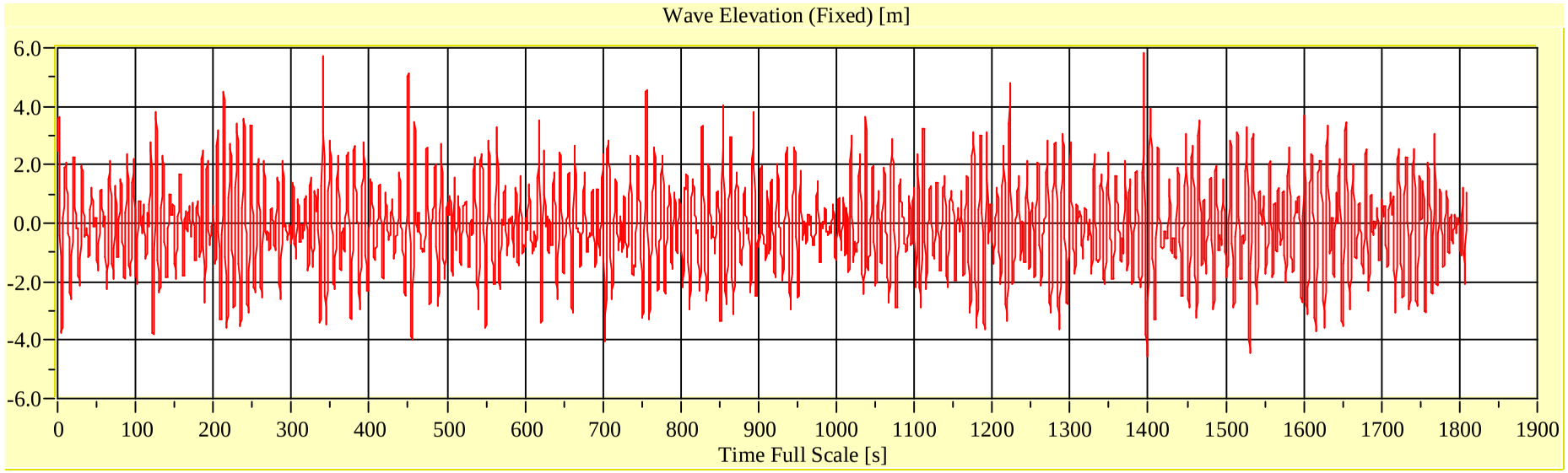



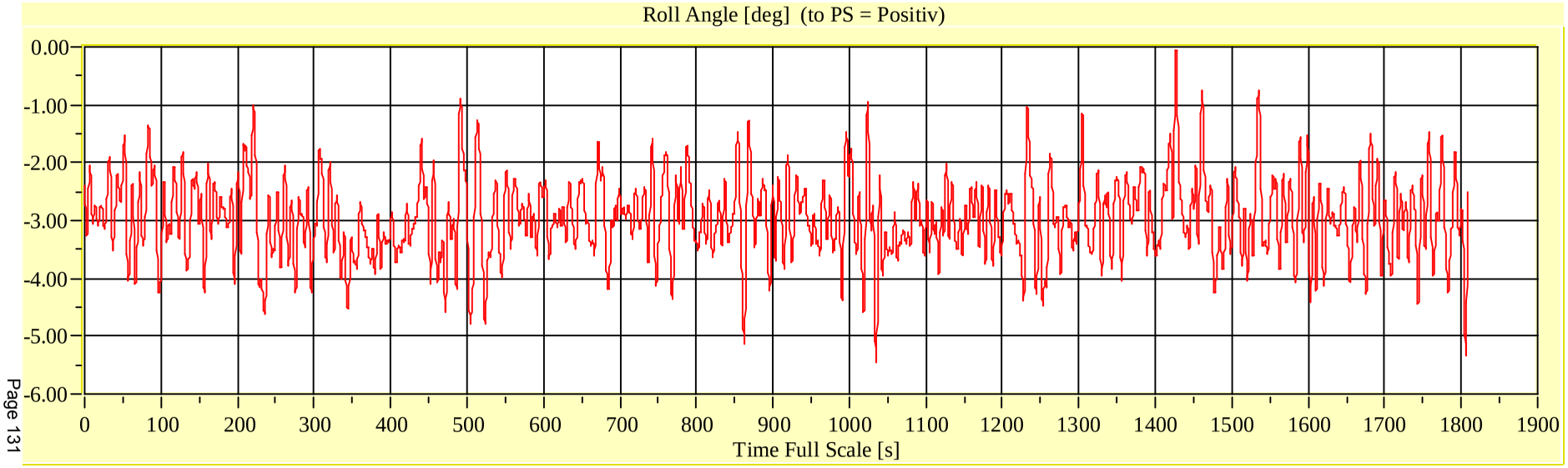



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-05 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|



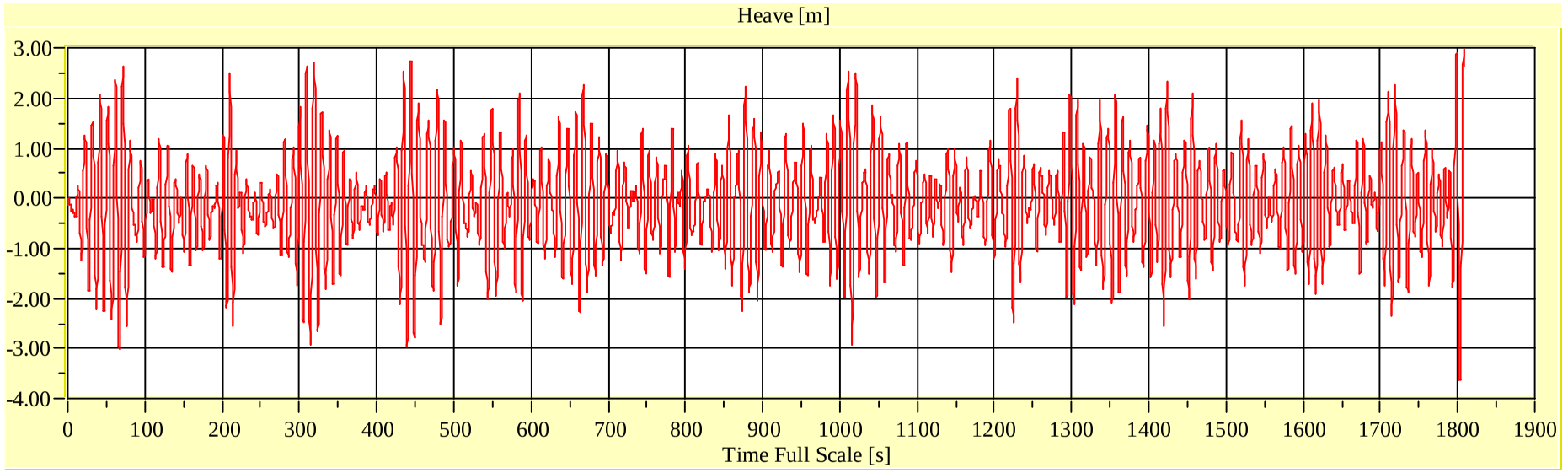



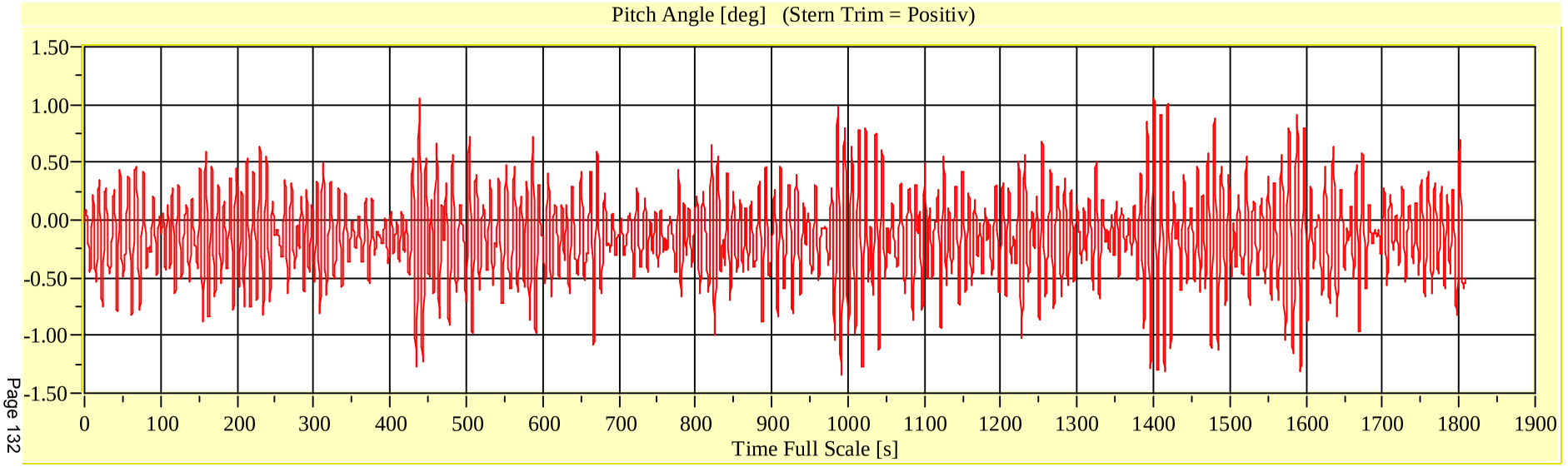



| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29703-05 | Target Waves: Hs = 6,0 m Tp = 9,798 s | gamma = 3,3 |
|---|---|---|---|---|






| Date: 02.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

# APPENDIX C1

# MODEL TEST PROTOCOL

## Model No. 2458

## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

Details of the dimensions and the damage conditions

# GENERAL PARTICULARS

**EUGD01-C1**

Model Scale = 1: 40

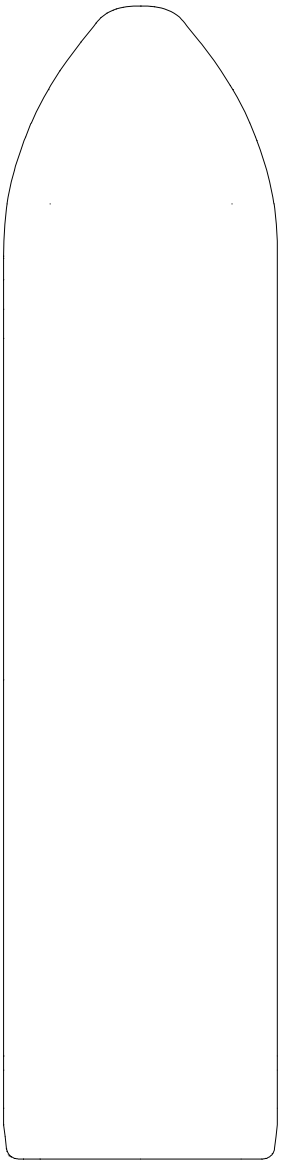
| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **MAIN DIMENSIONS** | | | | |
| LMOD | | | | **4834.0** |
| LBP | 179.100 | 4477.5 | | **4479.0** |
| BMLD | 30.400 | 760.0 | | **763.0** |

| **LONGITUDINAL POSITION OF COLLISION DAMAGE** | | | | |
|---|---|---|---|---|
| Aft Edge | 92.000 | 2300.0 | From AP (#0) | **2301** |
| Mid Bulkhead | 104.000 | 2600.0 | From AP (#0) | **2600** |
| Fwd Edge | 116.000 | 2900.0 | From AP (#0) | **2900** |

# INTACT DRAUGHTS - DAMAGE 1

**Marked in BLACK pen**

| FP | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |



**Port**

**Starboard**

| Midship | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| Midship | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| Quarter | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| Quarter | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| AP | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **-** | mm |

| AP | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **-** | mm |

# DAMAGE DRAUGHTS - DAMAGE 1

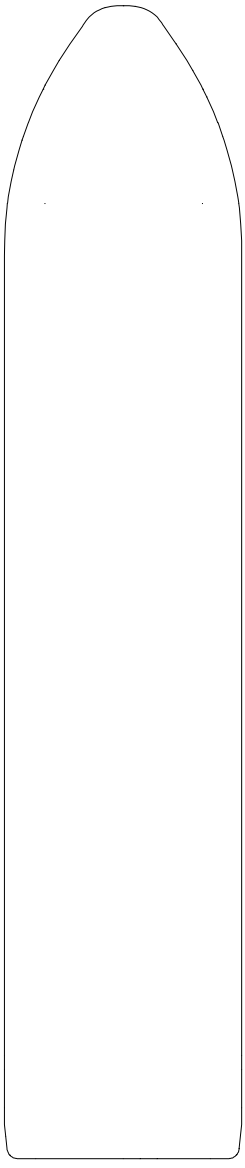
**Marked in BLUE pen**

| FP | |
|---|---|
| Full Size | 7.851 m |
| Model | 196.3 mm |
| Check | - mm |

| Static Heel | |
|---|---|
| 3.586 | degree(s) |

| FP | |
|---|---|
| Full Size | 7.868 m |
| Model | 196.7 mm |
| Check | **196.5** mm |

**Port**



| FP | |
|---|---|
| Full Size | 7.833 m |
| Model | 195.8 mm |
| Check | **195.5** mm |

**Starboard**

| Midship | |
|---|---|
| Full Size | 8.248 m |
| Model | 206.2 mm |
| Check | **206.0** mm |

| Midship | |
|---|---|
| Full Size | 6.343 m |
| Model | 158.6 mm |
| Check | **158.5** mm |

| Quarter | |
|---|---|
| Full Size | 7.971 m |
| Model | 199.3 mm |
| Check | **199.5** mm |

| Quarter | |
|---|---|
| Full Size | 6.075 m |
| Model | 151.9 mm |
| Check | **151.5** mm |

| AP | |
|---|---|
| Full Size | 7.619 m |
| Model | 190.5 mm |
| Check | **190.5** mm |

| AP | |
|---|---|
| Full Size | 5.862 m |
| Model | 146.6 mm |
| Check | - mm |

## DAMAGE OPENING - DAMAGE 1

| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **DAMAGE OPENING** | | | | |
| DMLD | 9.50 | 237.5 | Shell Only | **234.0** |
| Length | 8.534 | 213.4 | 3%$L_S$ + 3.0m | **213.5** |
| Dist from AP | 104.00 | 2600.0 | | **as MID BH** |
| B/5 | 9.290 | 232.3 | from CL | **-** |
| | 5.910 | 147.8 | from BEXT | **148.0** |

# INTACT STABILITY CHARACTERISTICS - DAMAGE 1

| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **VESSEL WEIGHT** | | | | |
| Displacement | 23687.60 | 370.1 | | **370 / 371** |
| (fresh water) | tonnes | kg | | |

| **INTACT STABILITY CHARACTERISTICS** | | | | |
|---|---|---|---|---|
| GMT | 2.300 | 57.5 | | **2.0163** |
| KG | 15.230 | 380.8 | | **-** |
| KM | 17.530 | 438.3 | | - |
| LCB (from AP) | 85.160 | 2129.0 | From AP (#0) Level trim | |

| **RADIUS OF GYRATION CHARACTERISTICS** | | | | |
|---|---|---|---|---|
| Kxx/B (Roll) | **0.3892** | **0.3892** | Allowable 0.35 - 0.40 | |
| | | | | |
| Kyy/LOA (Pitch) | **0.2481** | **0.2481** | Allowable 0.20 - 0.25 | |

| **INCLINE DATA** | | | | |
|---|---|---|---|---|
| Incline Weight | 318400 | 4.975 | kg | |
| Lever | 8.000 | 0.200 | m | |

| **MEASURED ROLL PERIOD** | | | | |
|---|---|---|---|---|
| Intact (in water) | 18.2147 | 2.8800 | sec | |
| Damage (in water) | 20.9975 | 3.3200 | sec | |

| **DAMAGE GZ CHECK** | | | | |
|---|---|---|---|---|
| Weight | **4.975 kg** | | | |
| **LEVER (cm)** | **Heel (Check1)** | **Heel (Check2)** | **Heel (Check3)** | **Heel (Check4)** |
| **0** | **3.52** | ***3.52*** | | |
| **5** | **4.80** | ***4.82*** | | |
| **10** | **6.22** | **6.18** | | |
| **15** | **7.72** | ***7.60*** | | |
| **20** | **8.99** | **8.85** | | |
| | **before test** | **after test** | | |

## MODEL TEST EXPERIMENTS - DAMAGE 1

| RUN | Hs TARGET | Hs FIX | TIME TO CAPSIZE | COMMENTS |
|---|---|---|---|---|
| **04.06.2010** | | | | |
| **29705-01** | **4.00** | **4.0561** | | **survived, no water accumulation** |
| **02** | **4.00** | **4.0661** | | **survived** |
| **03** | **4.00** | **4.0676** | | **survived, maximum roll 6°** |
| **04** | **4.00** | **4.0343** | | **survived, water on deck but drained fast** |
| **05** | **4.00** | **4.0557** | | **survived** |

# APPENDIX D1

# STATISTICS OF WAVES AND ROLL MOTIONS

## Model No. 2458

## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

**Roll Test in Air Measurements**

**Pitch Test in Air Measurements**

**Roll Test in Water Measurements (Intact Condition)**

**Roll Test in Water Measurements (Damaged Condition)**

**Spectral Characteristics of the Target and Measured Waves**

**Summary of the Measured Wave and Roll Time Realisations**

# Roll in Air Measurements

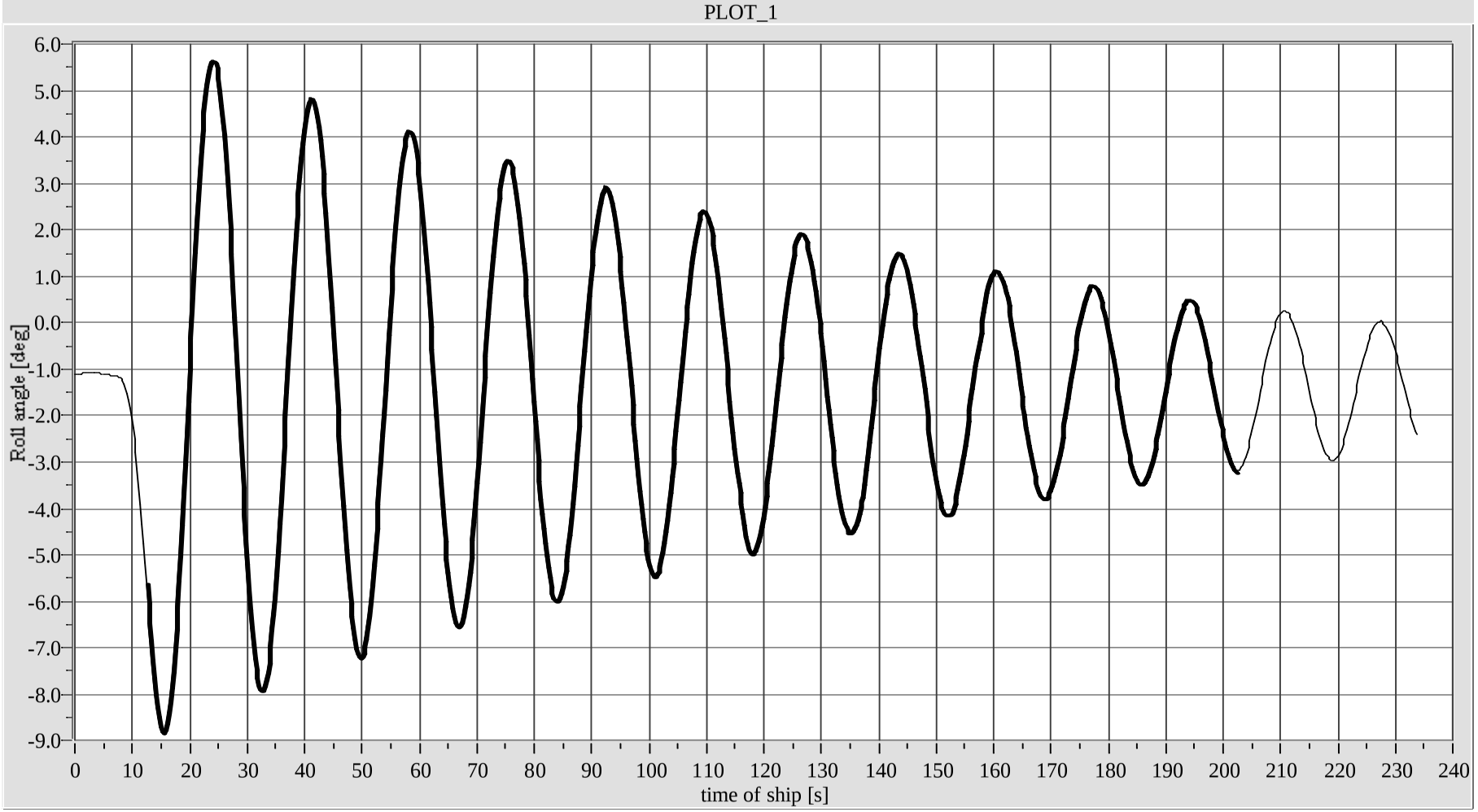
# Model No. 2458

# Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

| Vienna Model Basin Ltd. | Roll Test in Air |
|---|---|

| Model No. 2458 | Test No. 29704-02 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 2.6920 s / 17.0257 s | Project: EMSA 3 | |
|---|---|---|

# Pitch in Air Measurements

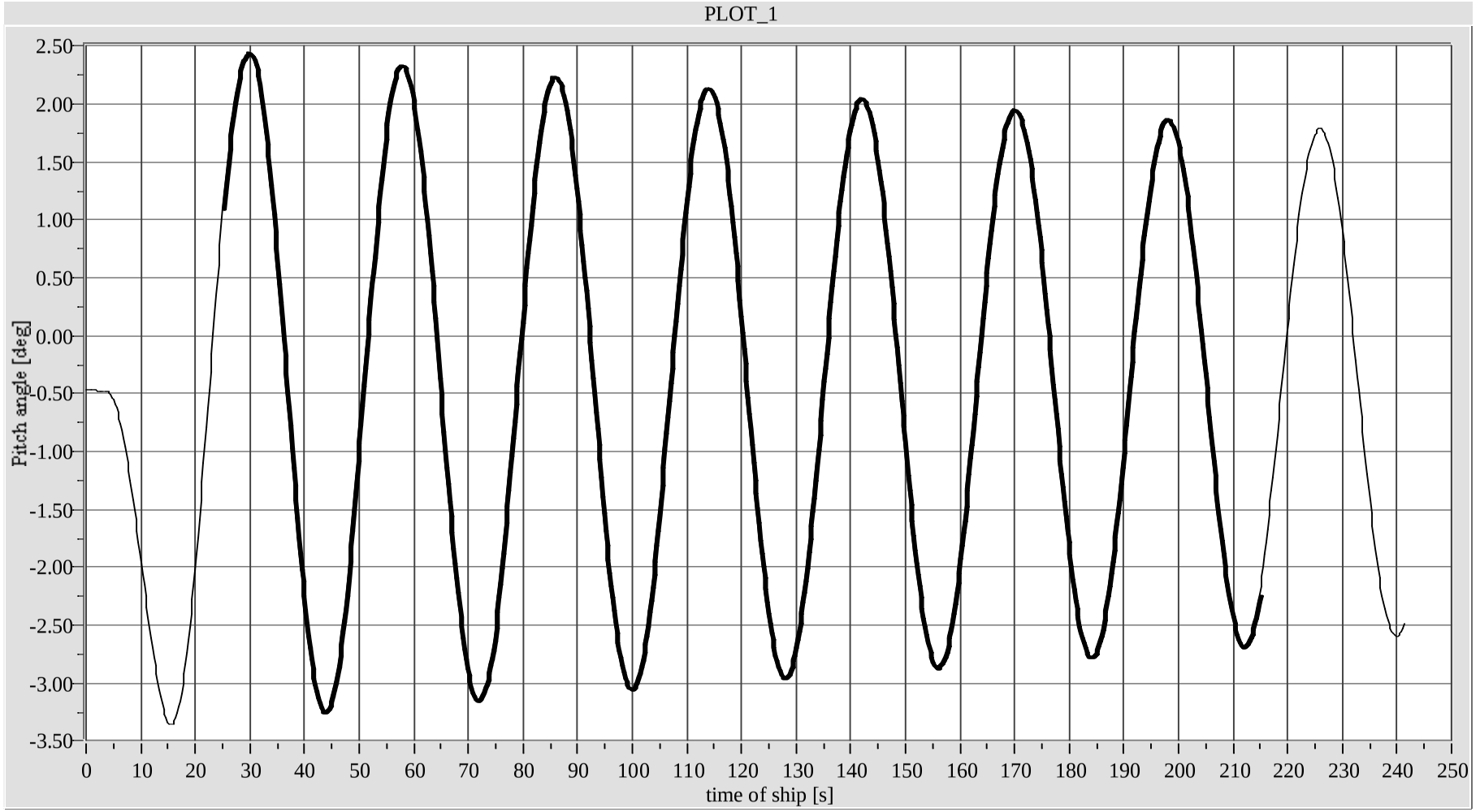
# Model No. 2458

# Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

| Vienna Model Basin Ltd. | Pitch Test in Air |
|---|---|

| Model No. 2458 | Test No. 29704-03 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 4.4333 s / 28.0389 s | Project: EMSA 3 | |
|---|---|---|

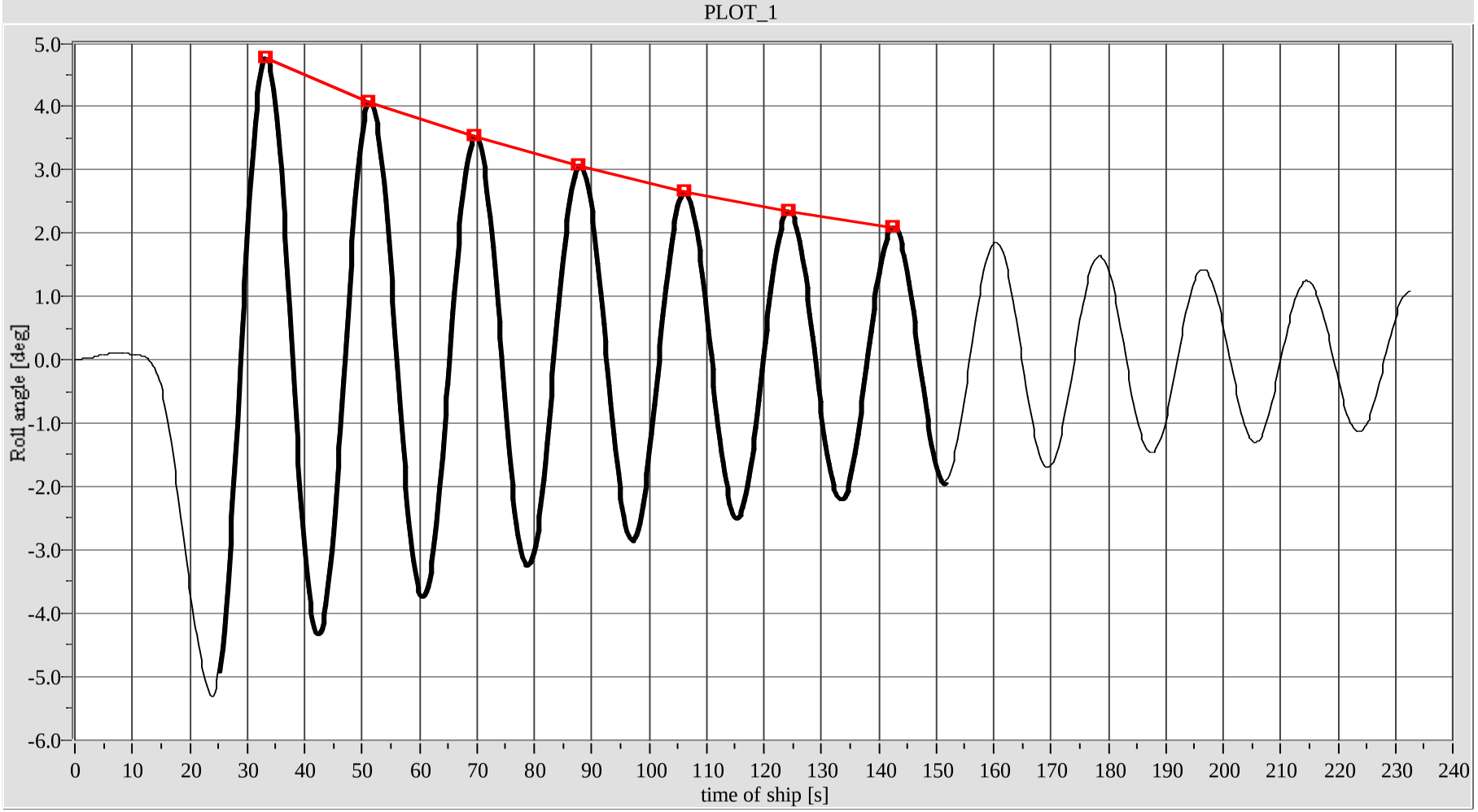
# Roll in Water Measurements (Intact Condition)

# Model No. 2458

# Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

| Vienna Model Basin Ltd. | Roll decay test in water (intact condition) | | | |
|---|---|---|---|---|
| Model No. 2458 | Test No. 29704-04 | GMT = 2,03 m | | without bilge keels |




| Natural Roll Period (Ship) = 18.2147 s | Project: EMSA 3 | Draught = 6,70 |
|---|---|---|

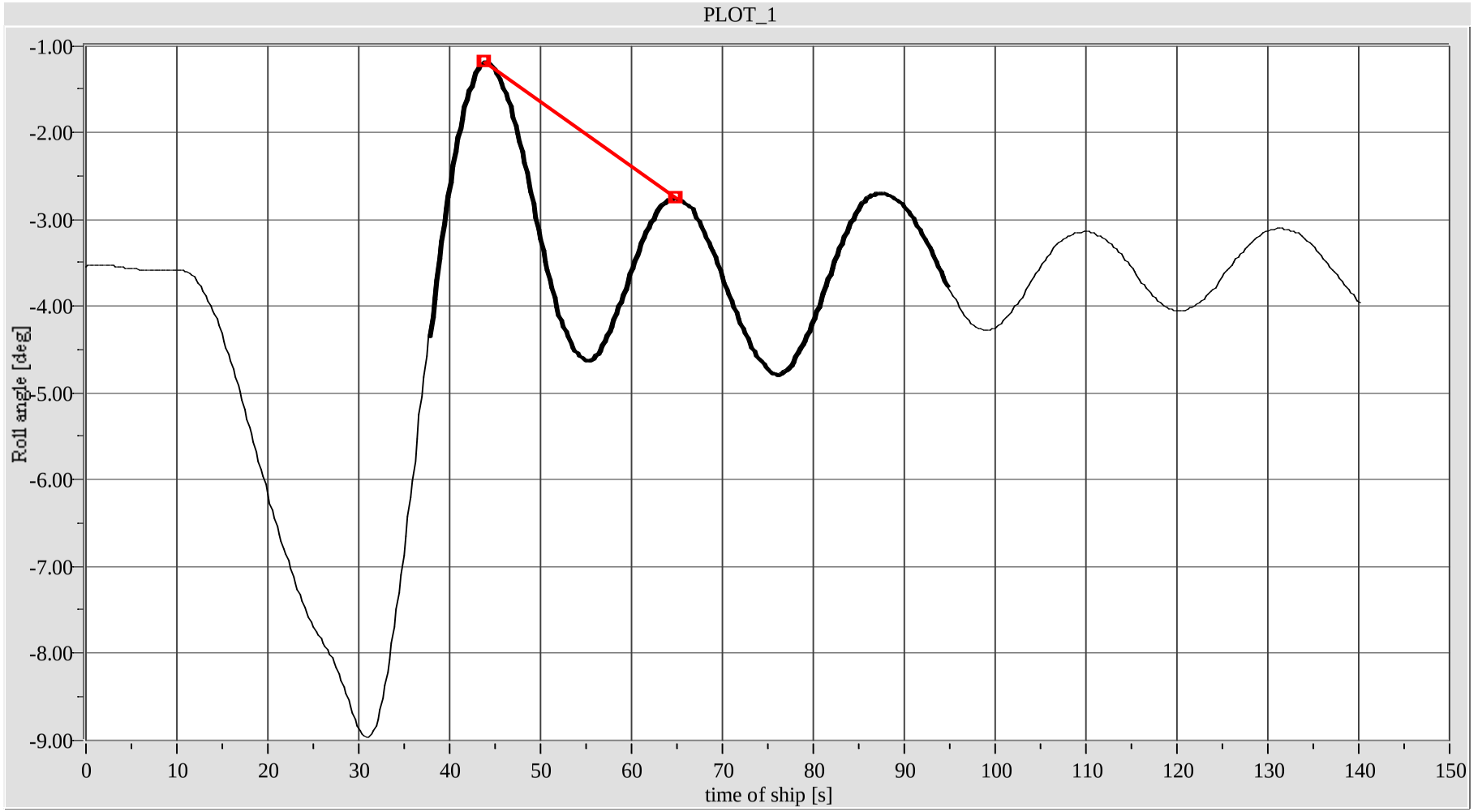
# Roll in Water Measurements (Damaged Condition)

# Model No. 2458

# Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

| Vienna Model Basin Ltd. | Roll decay test in water (damaged condition) | | | |
|---|---|---|---|---|
| Model No. 2458 | Test No. 29704-05 | GMT = 2,03 m | | without bilge keels |




| Natural Roll Period (Ship) = 20.9975 s | Project: EMSA 3 | Draught = 6,70 |
|---|---|---|

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458

## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

**Test No. 29705-01 to 05, Hs = 4.00 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

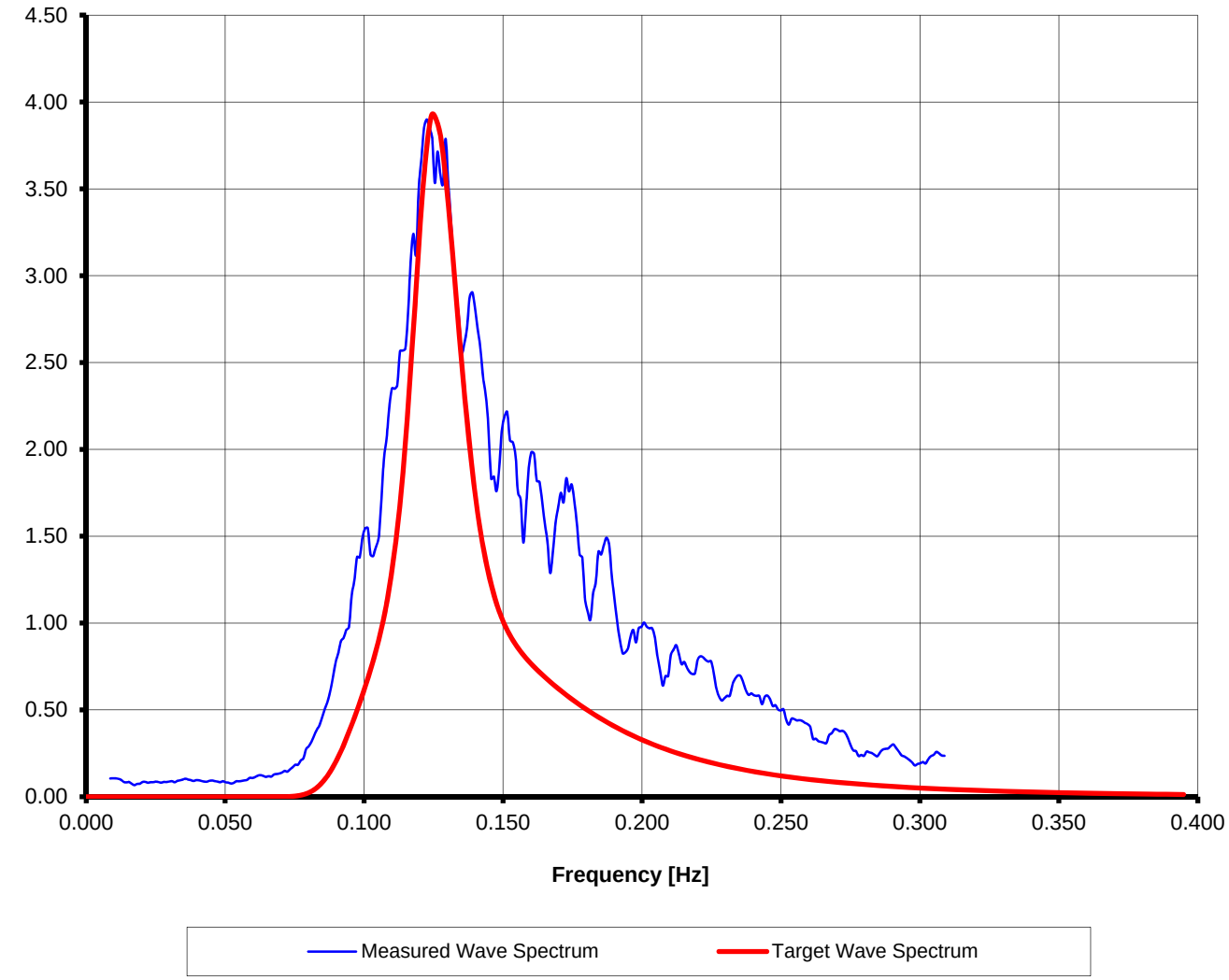
**Model No.: 2458**
**Test No.: 29705-01 to 05**
**Project: EMSA 3**
**Damage 1: R7P15-16.1.0**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **4.000** | m |
| gamma | 3.300 | |
| $T_P$ | 8.000 | s |
| $T_Z$ | 6.226 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458
**Test No.:** 29705-01 to 05
**Project:** EMSA 3
**Damage 1:** R7P15-16.1.0
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 4.000 | 8.000 | 6.226 | 4.000 - 4.100 | 7.800 - 8.200 | 5.914 - 6.537 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29705-01 | 29701-01 | 4.0561 | 8.079 | 5.999 | | | | | | |
| -02 | -02 | 4.0664 | 8.131 | 6.145 | | | | | | |
| -03 | -03 | 4.0676 | 8.153 | 6.122 | | | | | | |
| -04 | -04 | 4.0343 | 7.922 | 6.028 | | | | | | |
| -05 | -05 | 4.0557 | 7.997 | 5.998 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

# Summary of the Measured Wave and Roll Time Realisations

## Model No. 2458

## Project: “EMSA”

**Damage Case-1 R7P15.16.1.0**

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458** **Hs [m] = 4.00**

**Test No.: 29705-01 to 05** **Damage 1: R7P15-16.1.0**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29705-01 | Roll Angle [deg]* | 0.677 | 2.707 | -0.058 | -5.465 | -2.966 | 1070.2 | 30 |
| | Pitch Angle [deg]** | 0.368 | 1.472 | 1.058 | -1.339 | -0.146 | | |
| | Heave | 0.972 | 3.887 | 2.934 | -3.67 | -0.149 | | |
| | Wave Elevation (fix) [m] | - | - | 4.124 | -2.783 | 0.06 | | |
| -02 | Roll Angle [deg]* | 0.383 | 1.532 | -1.415 | -4.493 | -3.171 | 796.2 | 30 |
| | Pitch Angle [deg]** | 0.248 | 0.993 | 0.994 | -1.213 | -0.052 | | |
| | Heave | 0.505 | 2.018 | 1.789 | -1.376 | 0.051 | | |
| | Wave Elevation (fix) [m] | - | - | 3.622 | -3.617 | -0.095 | | |
| -03 | Roll Angle [deg]* | 0.565 | 2.26 | -1.177 | -5.897 | -3.291 | 918.9 | 30 |
| | Pitch Angle [deg]** | 0.348 | 1.39 | 1.08 | -1.184 | -0.039 | | |
| | Heave | 0.524 | 2.095 | 2.773 | -2.722 | 0.001 | | |
| | Wave Elevation (fix) [m] | - | - | 4.018 | -3.526 | -0.158 | | |
| -04 | Roll Angle [deg]* | 0.647 | 2.59 | -0.486 | -6.732 | -3.544 | 913.9 | 30 |
| | Pitch Angle [deg]** | 0.29 | 1.158 | 1.307 | -1.321 | -0.027 | | |
| | Heave | 0.537 | 2.147 | 2.141 | -1.974 | 0.044 | | |
| | Wave Elevation (fix) [m] | - | - | 4.982 | -3.506 | -0.105 | | |
| -05 | Roll Angle [deg]* | 0.458 | 1.833 | -1.444 | -4.817 | -3.263 | 917.2 | 30 |
| | Pitch Angle [deg]** | 0.303 | 1.212 | 1.076 | -1.094 | -0.031 | | |
| | Heave | 0.545 | 2.178 | 2.202 | -1.846 | 0.148 | | |
| | Wave Elevation (fix) [m] | - | - | 4..083 | -3.333 | -0.166 | | |
| -06 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -07 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -08 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -09 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -10 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |

* to Port Side = positiv ** Stern Trim = positiv

# APPENDIX E1

# TIME HISTORIES OF THE EXPERIMENTS

# WAVE AND ROLL TIME HISTORIES

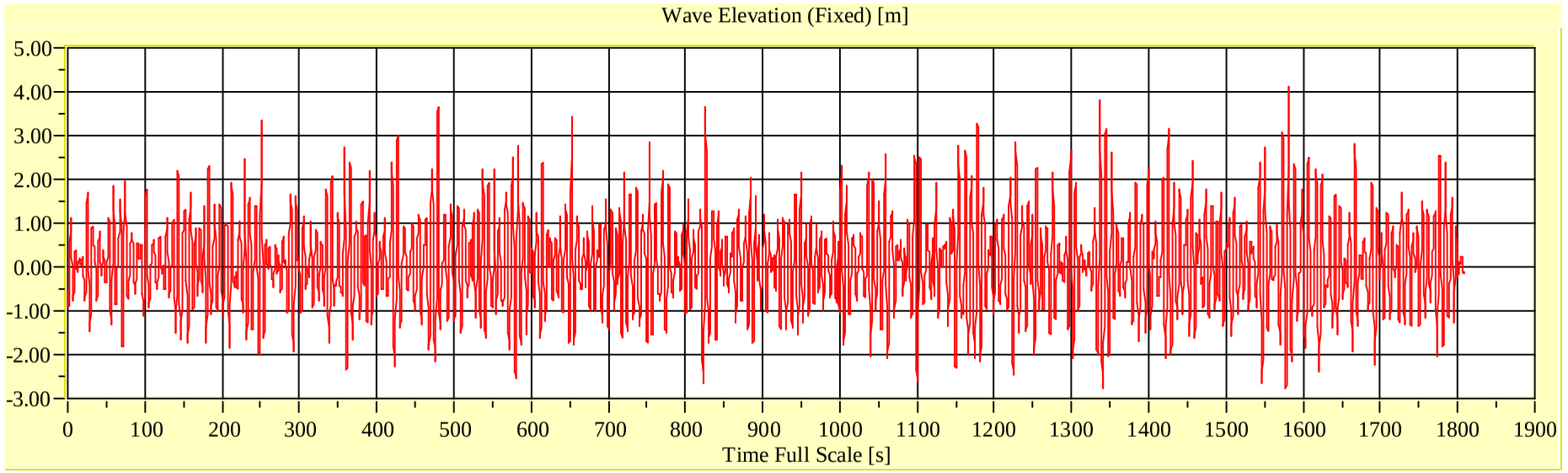
## Model No. 2458

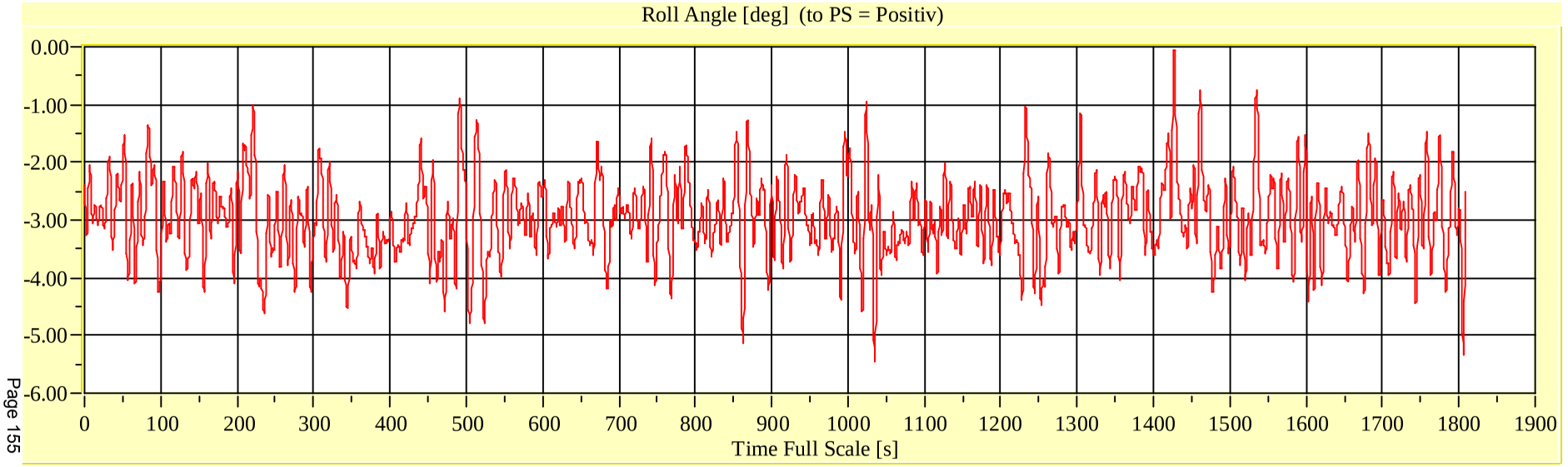
## Project: “EMSA 3”

**Damage Case-1 R7P15-16.1.0**

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-01 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



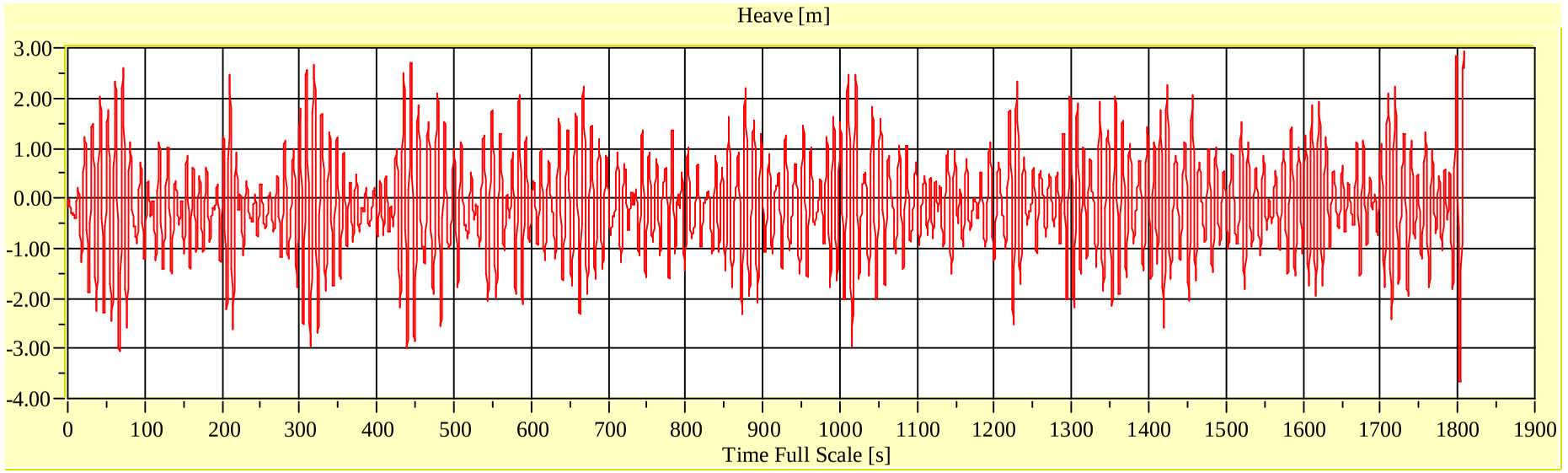



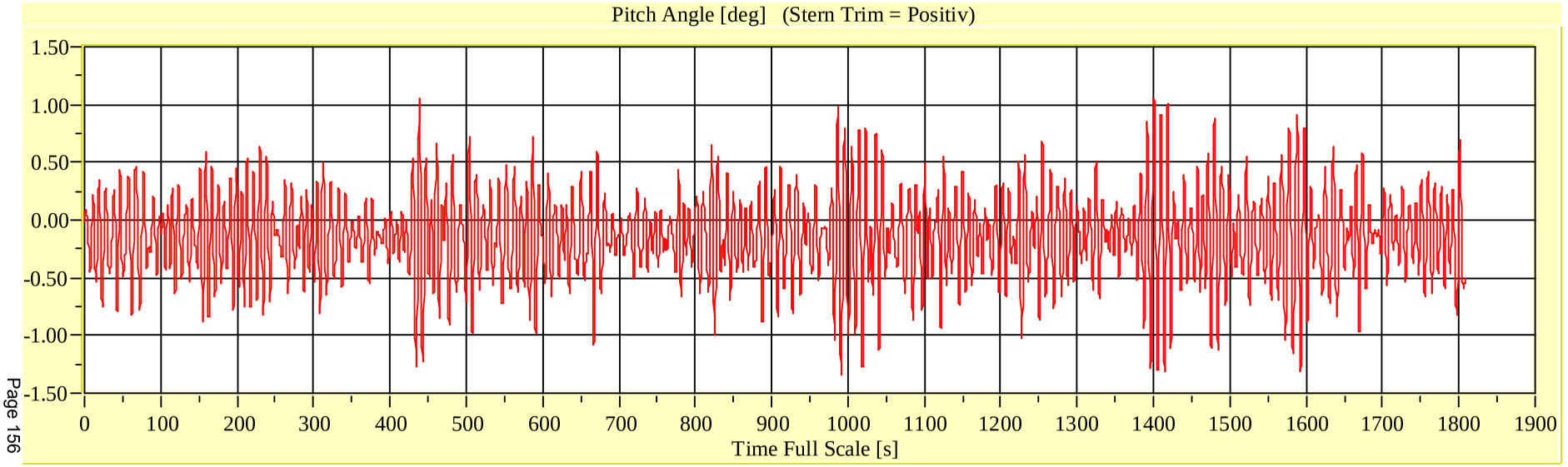



| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-01 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



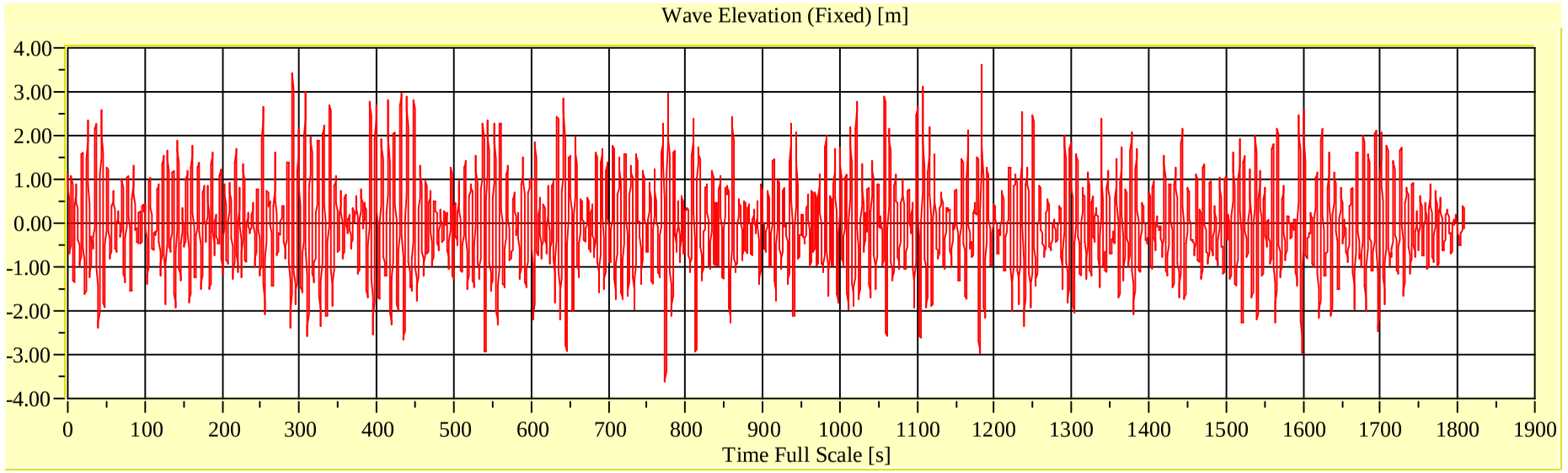



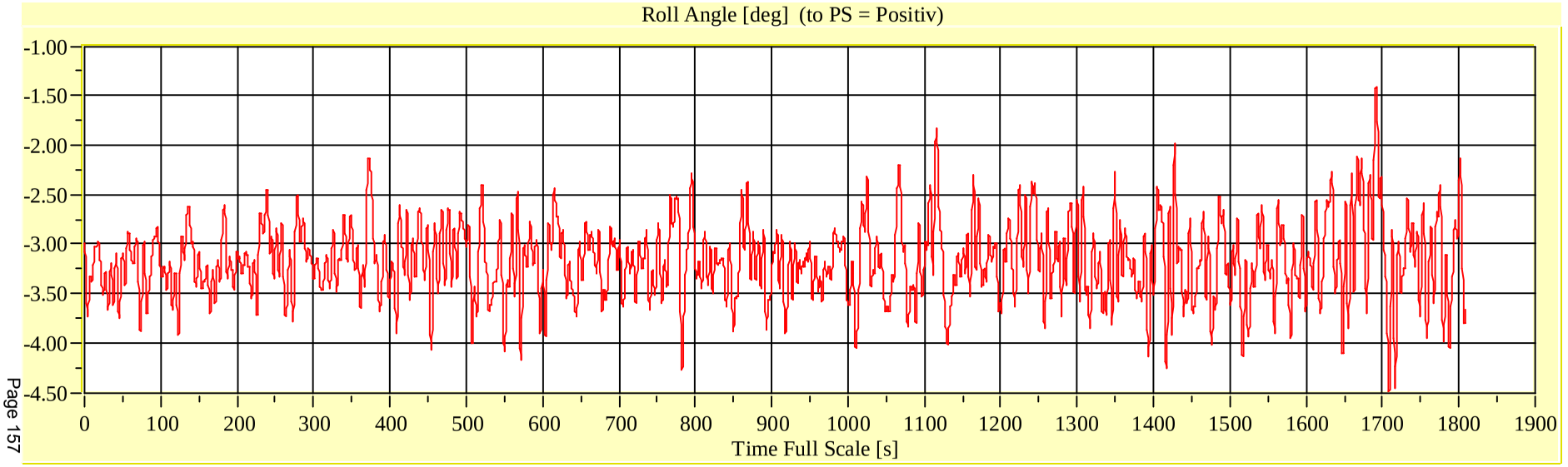



| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-02 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



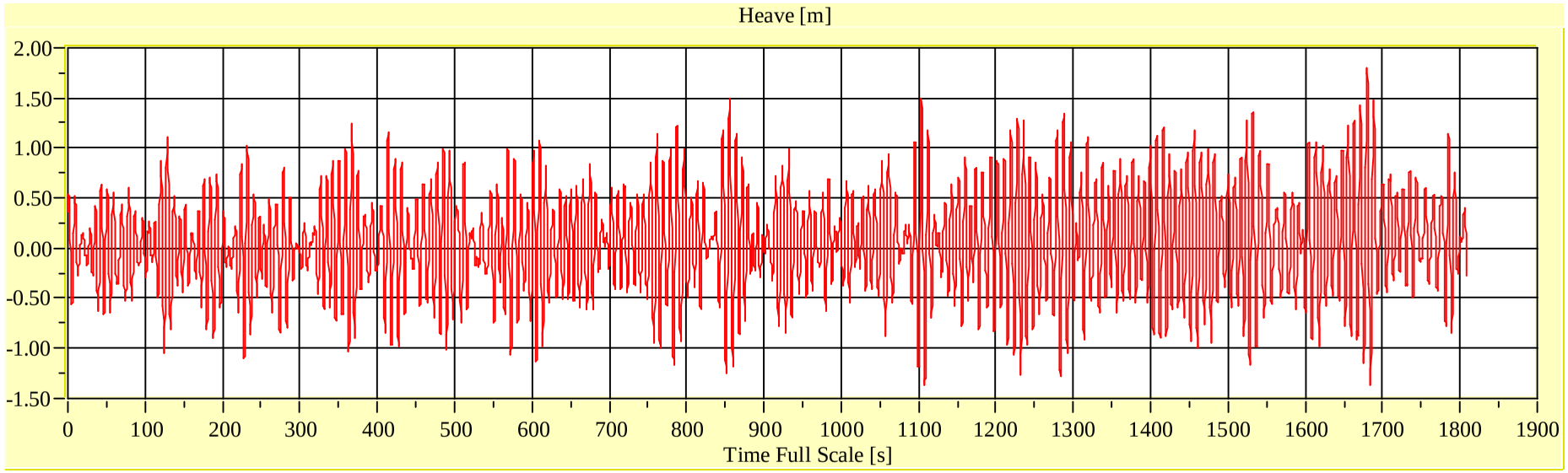



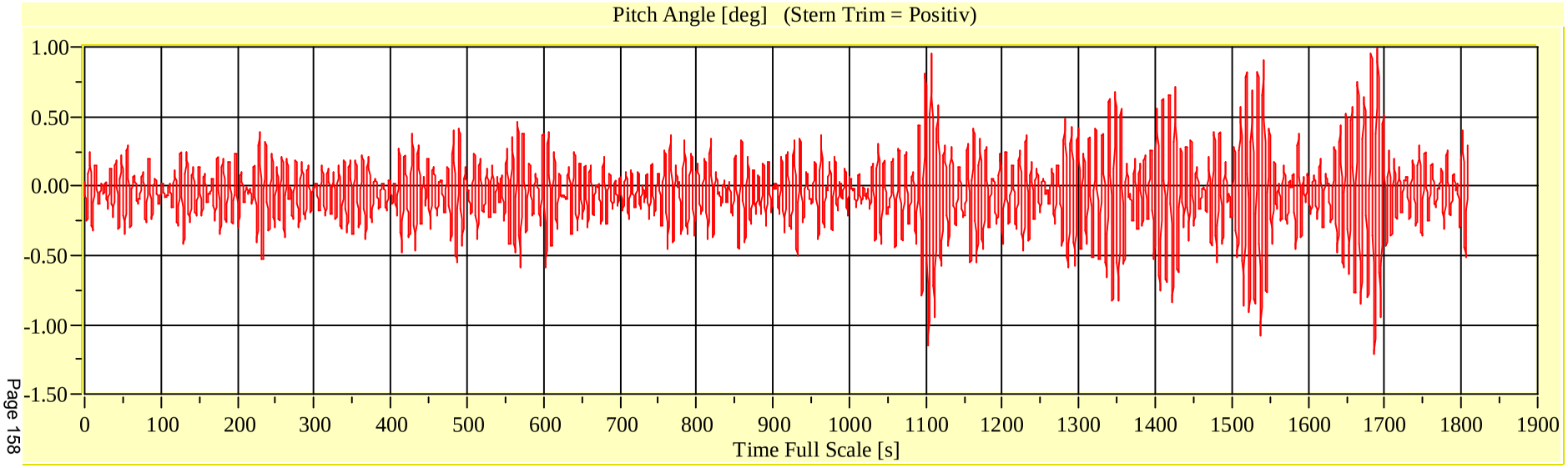



| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-02 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



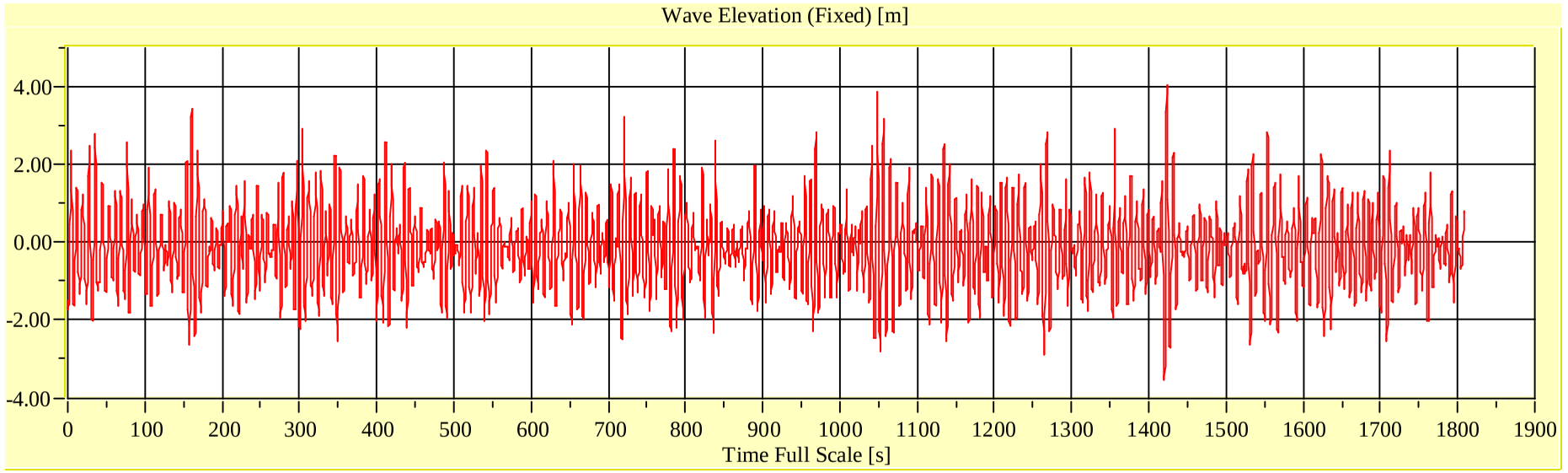



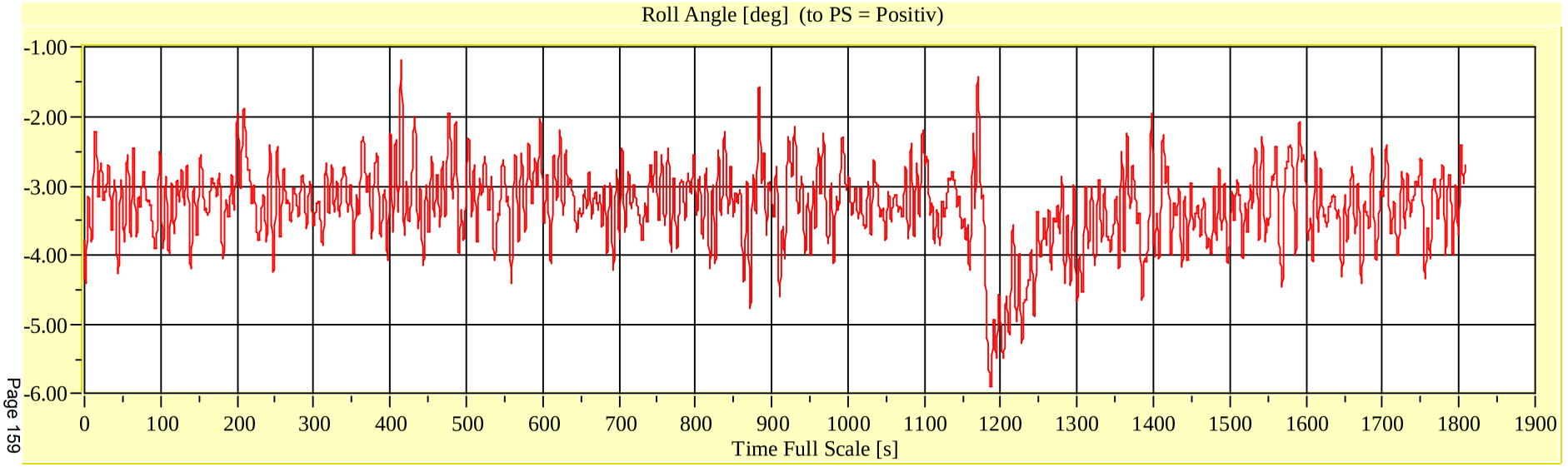



| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-03 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



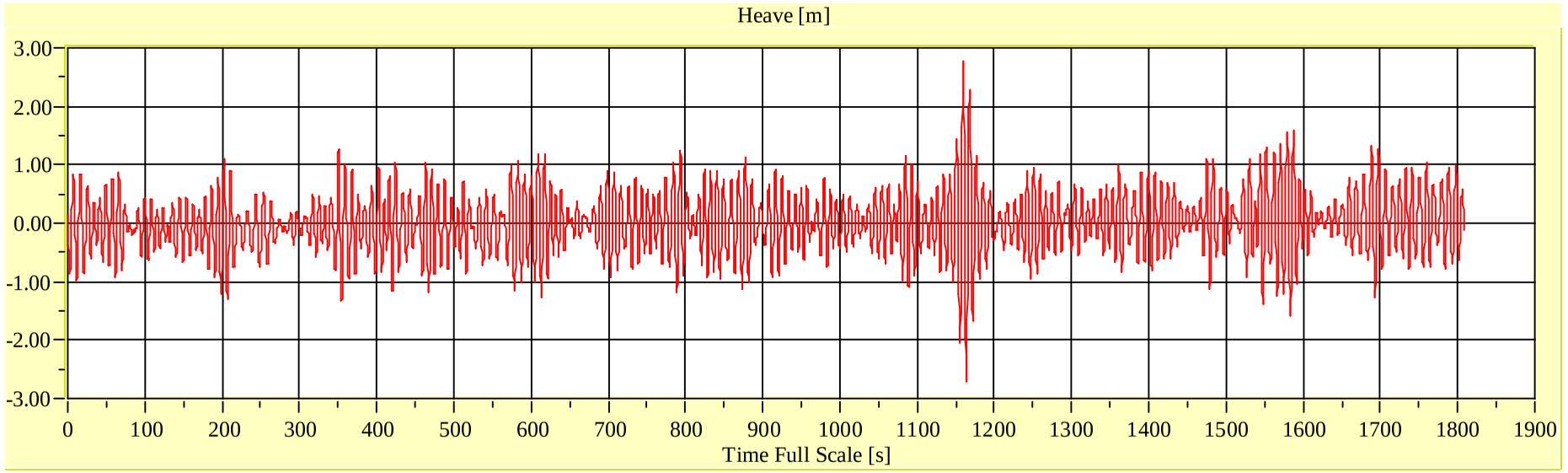



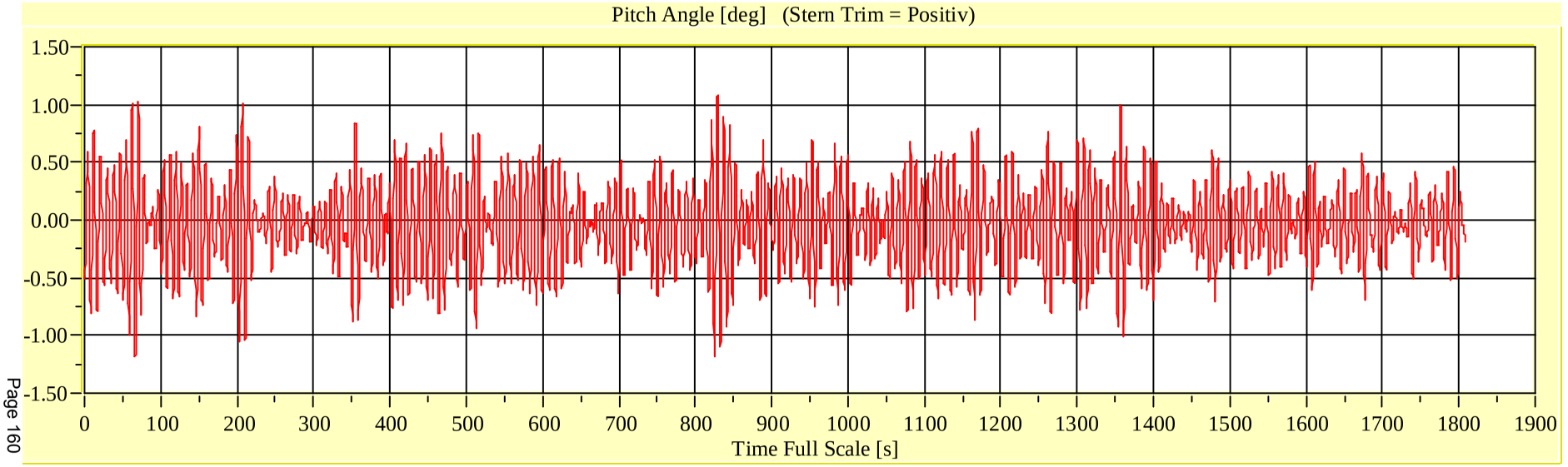



| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-03 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



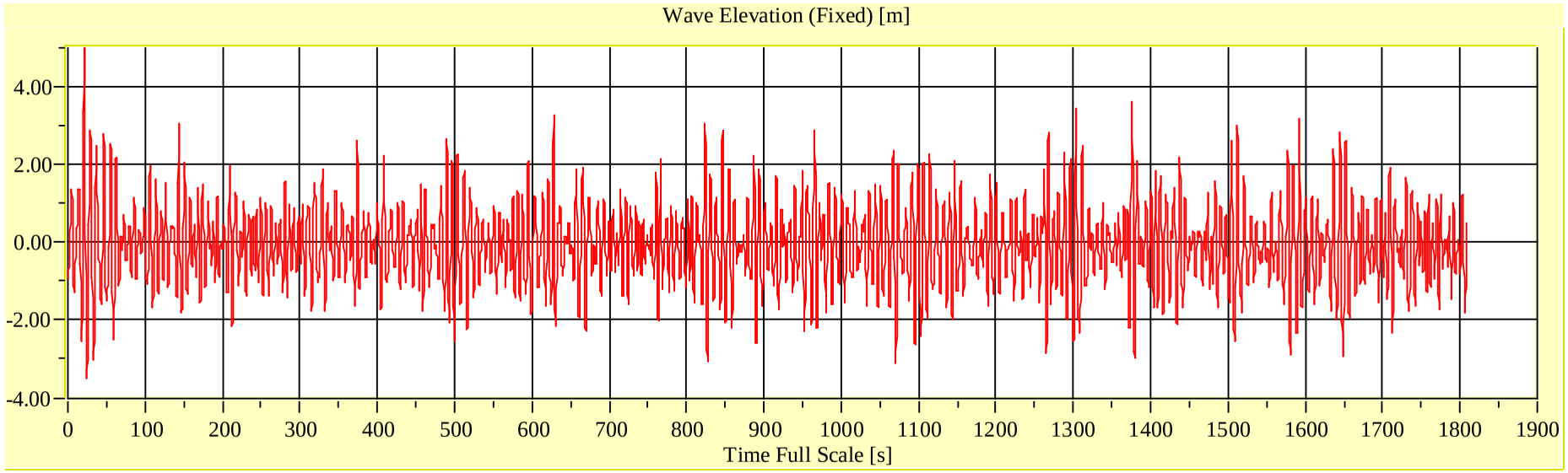



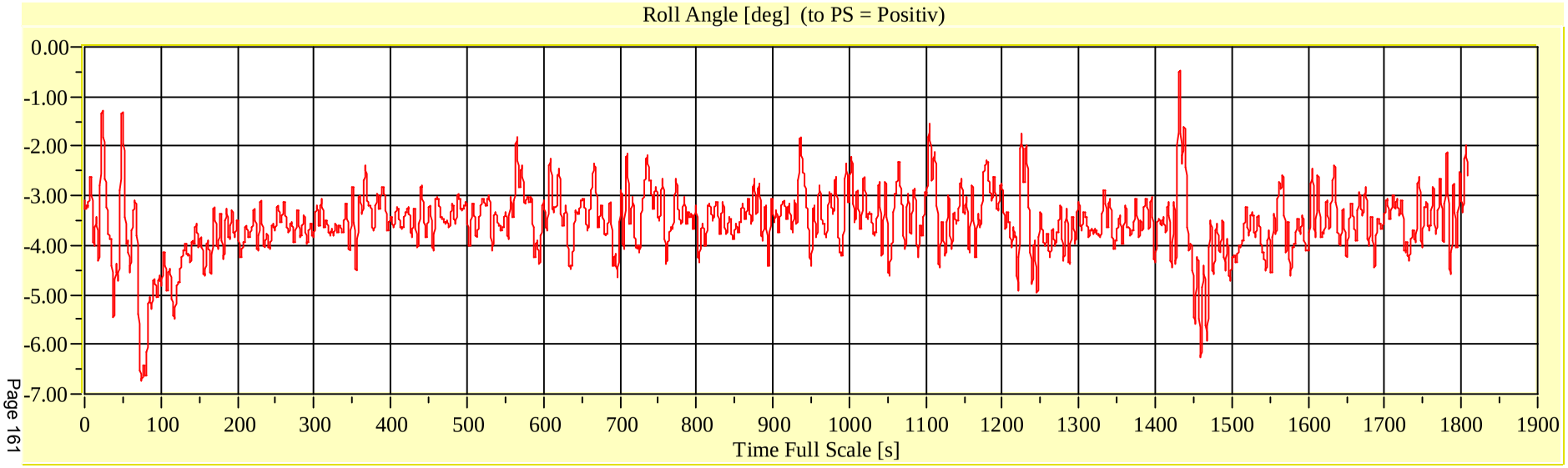



| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-04 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



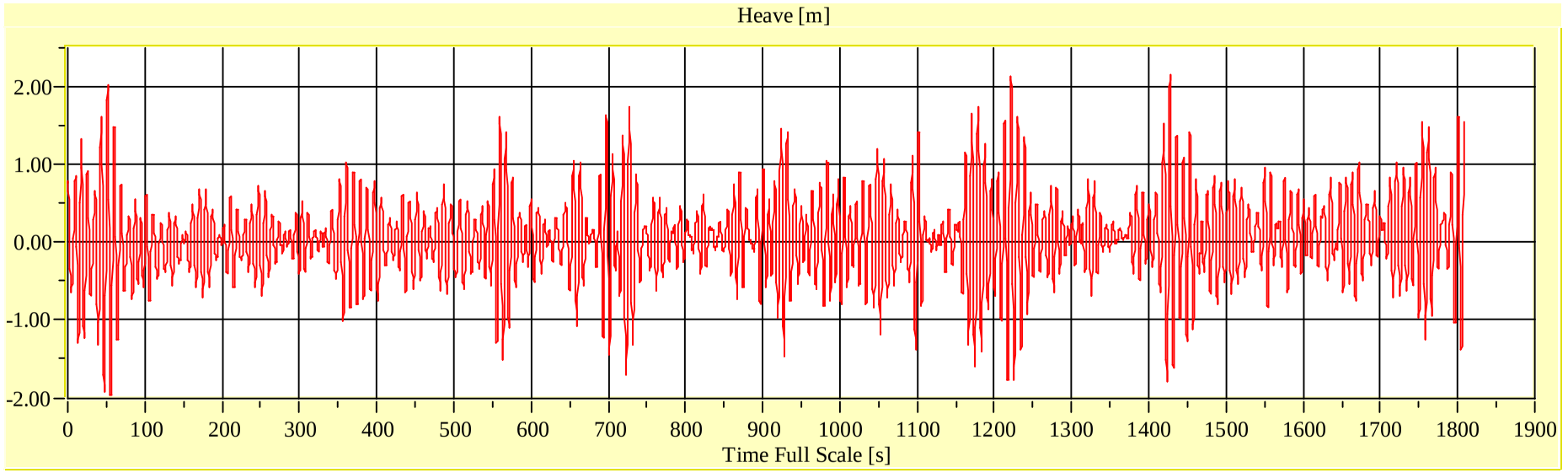



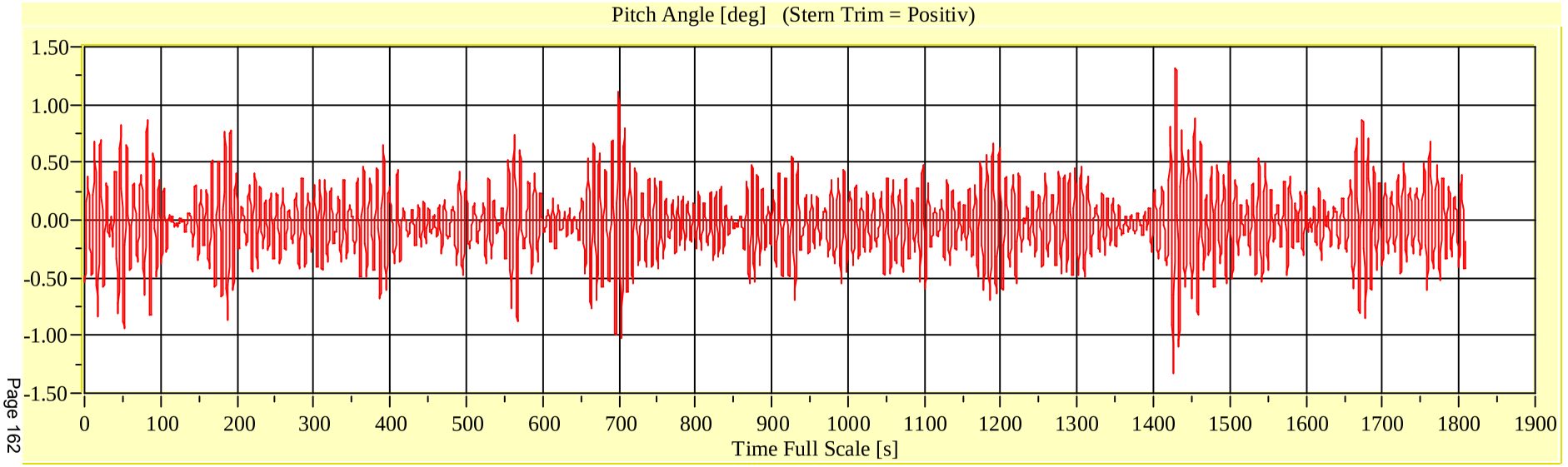



| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-04 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



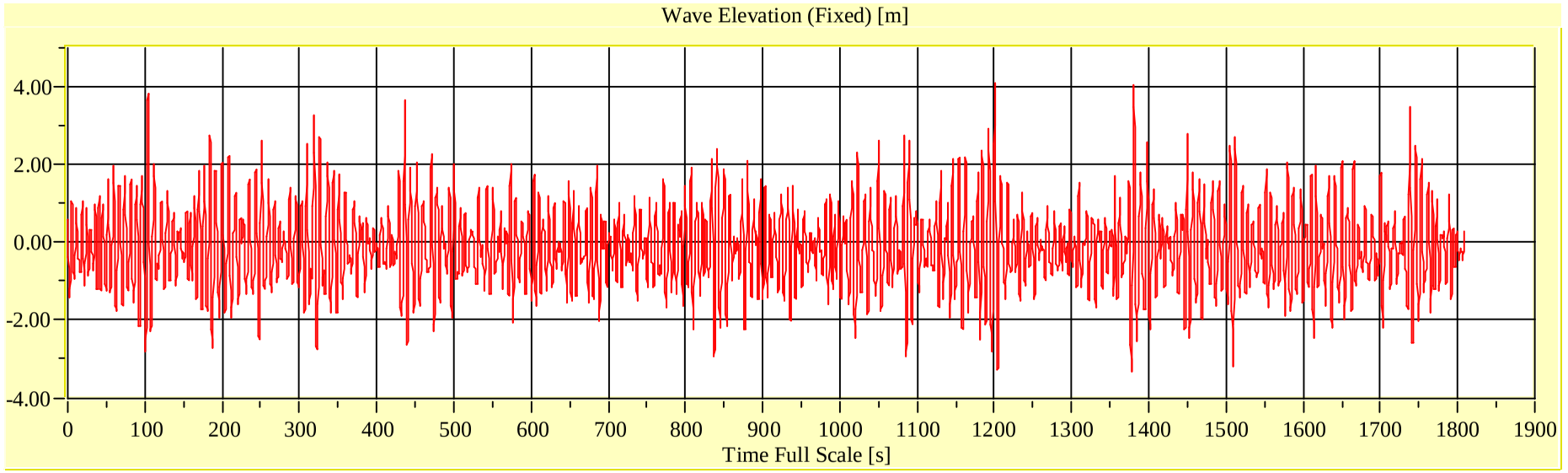



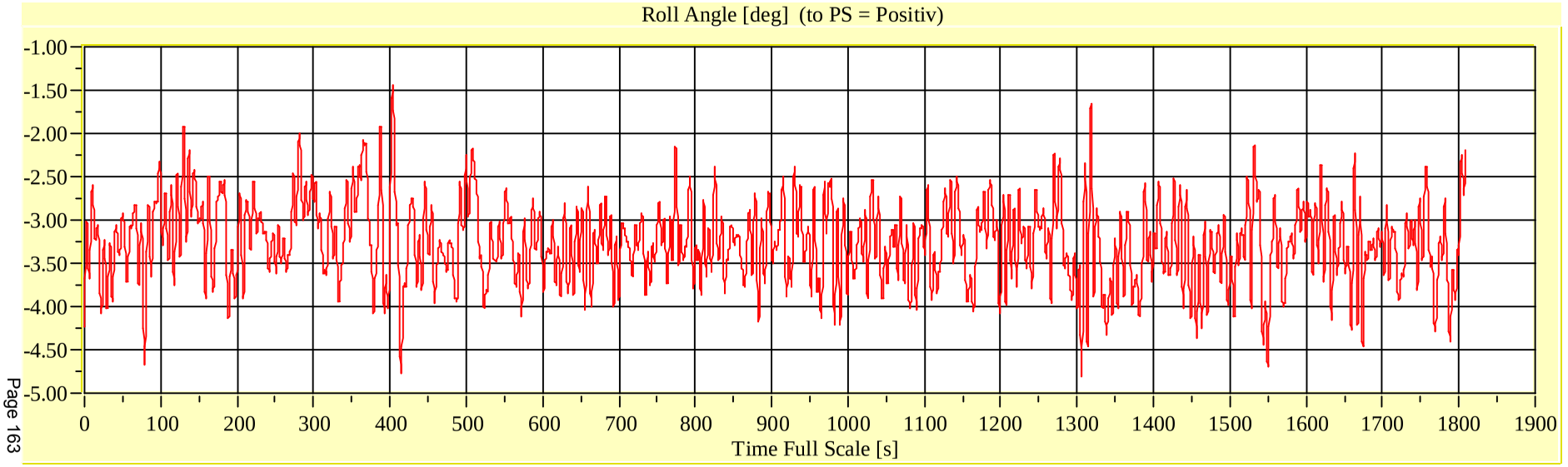



| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-05 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



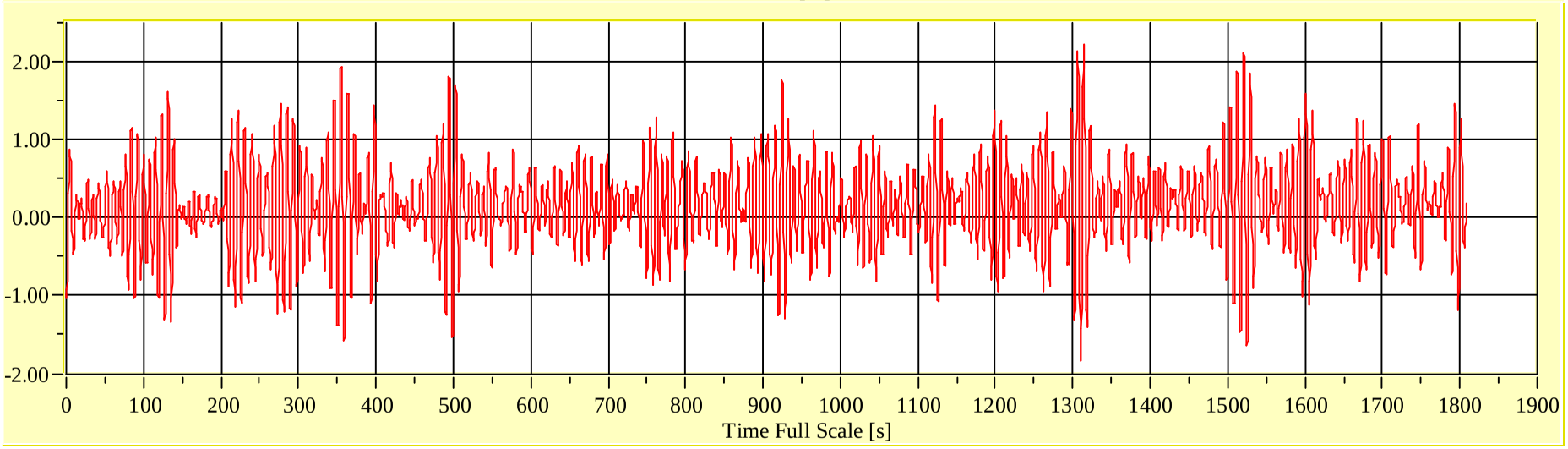



| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

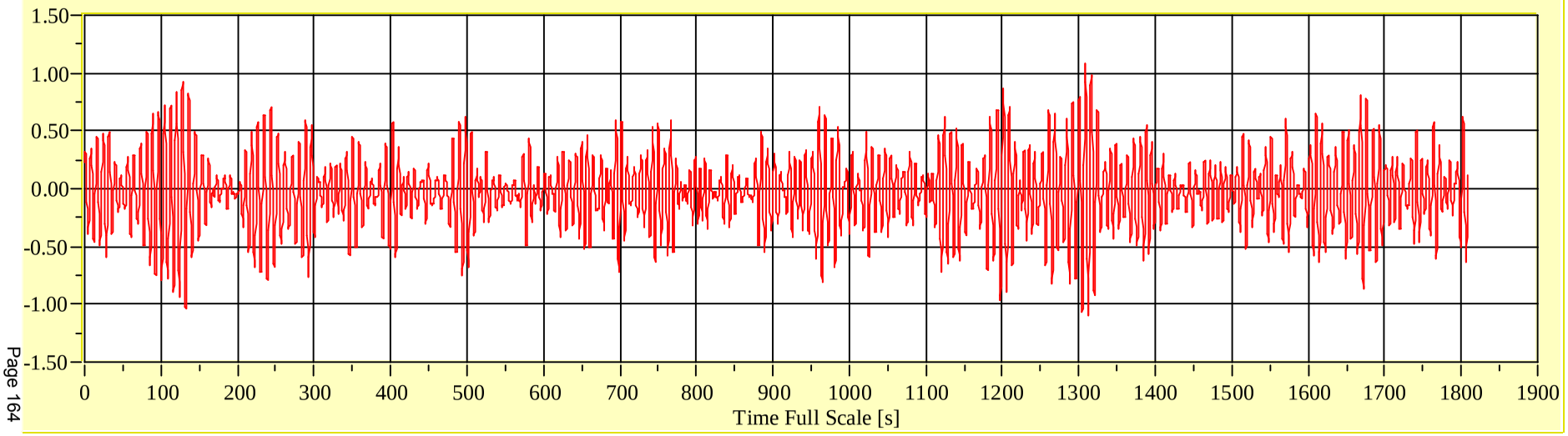
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29705-05 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Stern Trim = Positiv)






| Date: 04.06.2010 | Project: EMSA 2 | Damage 1: R7P15-16.1.0 |
|---|---|---|

# APPENDIX C2

# MODEL TEST PROTOCOL

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

Details of the dimensions and the damage conditions

# GENERAL PARTICULARS

**EUGD01-C1**

Model Scale = 1: 40

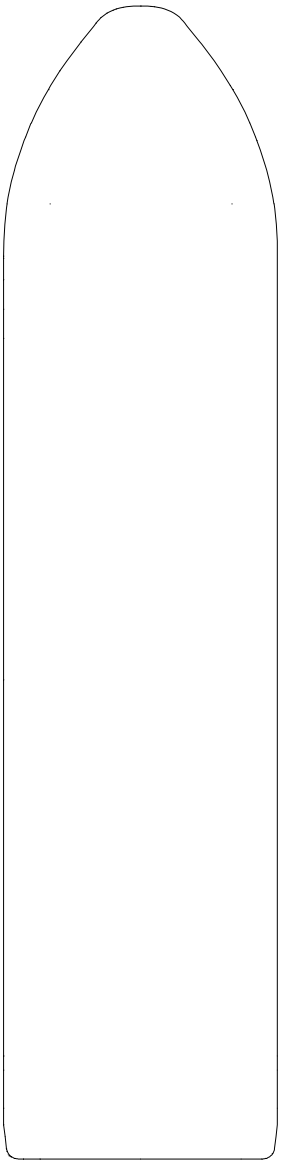
| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **MAIN DIMENSIONS** | | | | |
| LMOD | | | | **4834.0** |
| LBP | 179.100 | 4477.5 | | **4479.0** |
| BMLD | 30.400 | 760.0 | | **763.0** |

| **LONGITUDINAL POSITION OF COLLISION DAMAGE** | | | | |
|---|---|---|---|---|
| Aft Edge | 92.000 | 2300.0 | From AP (#0) | **2301** |
| Mid Bulkhead | 104.000 | 2600.0 | From AP (#0) | **2600** |
| Fwd Edge | 116.000 | 2900.0 | From AP (#0) | **2900** |

# INTACT DRAUGHTS - DAMAGE 2

**Marked in BLACK pen**

| FP | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |



**Port**

**Starboard**

| Midship | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| Midship | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| Quarter | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| Quarter | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **167.5** | mm |

| AP | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **-** | mm |

| AP | | |
|---|---|---|
| Full Size | 6.700 | m |
| Model | 167.5 | mm |
| Check | **-** | mm |

# DAMAGE DRAUGHTS - DAMAGE 2

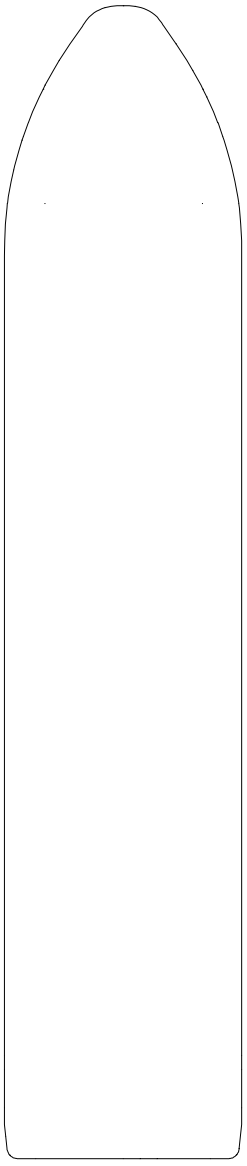
**Marked in RED pen**

| FP | |
|---|---|
| Full Size | 8.788 m |
| Model | 219.7 mm |
| Check | - mm |

| Static Heel | |
|---|---|
| 3.499 | degree(s) |

| FP | |
|---|---|
| Full Size | 8.832 m |
| Model | 220.8 mm |
| Check | OK mm |

**Port**



| FP | |
|---|---|
| Full Size | 8.743 m |
| Model | 218.6 mm |
| Check | OK mm |

**Starboard**

| Midship | |
|---|---|
| Full Size | 8.713 m |
| Model | 217.8 mm |
| Check | OK mm |

| Midship | |
|---|---|
| Full Size | 6.854 m |
| Model | 171.4 mm |
| Check | OK mm |

| Quarter | |
|---|---|
| Full Size | 8.211 m |
| Model | 205.3 mm |
| Check | OK mm |

| Quarter | |
|---|---|
| Full Size | 6.352 m |
| Model | 158.8 mm |
| Check | OK mm |

| AP | |
|---|---|
| Full Size | 7.642 m |
| Model | 191.1 mm |
| Check | OK mm |

| AP | |
|---|---|
| Full Size | 5.917 m |
| Model | 147.9 mm |
| Check | - mm |

## DAMAGE OPENING - DAMAGE 2

| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **DAMAGE OPENING** | | | | |
| DMLD | 9.50 | 237.5 | Shell Only | **OK** |
| Length | 8.534 | 213.4 | $3\%L_S$ + 3.0m | **210.0** |
| Dist from AP | 104.00 | 2600.0 | | **OK** |
| B/5 | 9.290 | 232.3 | from CL | **-** |
| | 5.910 | 147.8 | from $B_{EXT}$ | **-** |

# INTACT STABILITY CHARACTERISTICS - DAMAGE 2

| | SHIP (m) | MODEL (mm) | NOTES | CHECKED |
|---|---|---|---|---|
| **VESSEL WEIGHT** | | | | |
| Displacement | 23687.60 | 370.1 | | **370 / 371** |
| (fresh water) | tonnes | kg | | |

| **INTACT STABILITY CHARACTERISTICS** | | | | |
|---|---|---|---|---|
| GMT | 2.300 | 57.5 | | **2.2927** |
| KG | 15.230 | 380.8 | | **-** |
| KM | 17.530 | 438.3 | | - |
| LCB (from AP) | 85.160 | 2129.0 | From AP (#0) Level trim | |

| **RADIUS OF GYRATION CHARACTERISTICS** | | | | |
|---|---|---|---|---|
| Kxx/B (Roll) | **0.3658** | **0.3658** | Allowable 0.35 - 0.40 | |
| | | | | |
| Kyy/LOA (Pitch) | **0.2466** | **0.2466** | Allowable 0.20 - 0.25 | |

| **INCLINE DATA** | | | | |
|---|---|---|---|---|
| Incline Weight | 318400 | 4.975 | kg | |
| Lever | 8.000 | 0.200 | m | |
| Incline Heel | **2.679** | **2.679** | deg | |

| **MEASURED ROLL PERIOD** | | | | |
|---|---|---|---|---|
| Intact (in water) | 17.4052 | 2.7520 | sec | |
| Damage (in water) | 24.1598 | 3.8200 | sec | |

## MODEL TEST EXPERIMENTS - DAMAGE 2

| RUN | Hs TARGET | Hs FIX | TIME TO CAPSIZE | COMMENTS |
|---|---|---|---|---|
| 10.06.2010 | | | | |
| 29708-01 | 2.00 | 2.0214 | | survived |
| 02 | 2.00 | 2.0221 | | survived |
| 03 | 2.00 | 2.0194 | | survived |
| 04 | 2.00 | 2.0243 | | survived |
| 05 | 2.00 | 2.0313 | | survived |
| 06 | 2.00 | 2.0306 | | survived |
| 07 | 2.00 | 2.0287 | | survived |
| 08 | 2.00 | 2.0377 | | survived |
| 09 | 2.00 | 2.0375 | | survived |
| 10 | 2.00 | 2.0374 | | survived |
| 29709-01 | 2.50 | 2.5386 | | survived |
| 02 | 2.50 | 2.5315 | | survived |
| 03 | 2.50 | 2.5658 | | survived |
| 04 | 2.50 | 2.5568 | | survived |
| 05 | 2.50 | 2.5460 | | survived |
| 29710-01 | 3.00 | 3.0507 | | survived |
| 02 | 3.00 | 3.0421 | | survived |
| 03 | 3.00 | 3.0450 | | survived |
| 04 | 3.00 | 3.0449 | | survived |
| 05 | 3.00 | 3.0454 | | survived |
| 29711-01 | 3.50 | 3.5606 | 270 | capsized |
| 02 | 3.50 | 3.5444 | | survived |
| 03 | 3.50 | 3.5571 | 220 | capsized |
| 11.06.2010 | | | | |
| 29712-01 | 4.00 | 4.0510 | 200 | capsized |
| 02 | 4.00 | 4.0355 | 80 | capsized |
| 03 | 4.00 | 4.0309 | 15 | capsized |
| 04 | 4.00 | 4.0278 | 90 | capsized |
| 05 | 4.00 | 4.0274 | 85 | capsized |
| 06 | 4.00 | 1.0152 | 120 | capsized |
| 07 | 4.00 | 4.0172 | 120 | capsized |
| 08 | 4.00 | 4.0288 | 95 | capsized |
| 09 | 4.00 | 4.0589 | 25 | capsized |
| 10 | 4.00 | 4.0277 | 85 | capsized |
| 29710-06 | 3.00 | 3.0278 | | survived |
| 07 | 3.00 | 3.0283 | | survived |
| 08 | 3.00 | 3.0330 | | survived |
| 09 | 3.00 | 3.0394 | | survived |
| 10 | 3.00 | 3.0467 | | survived |
| | | | | |

## MODEL TEST EXPERIMENTS - DAMAGE 2

| RUN | Hs TARGET | Hs FIX | TIME TO CAPSIZE | COMMENTS |
|---|---|---|---|---|
| 11.06.2010 | | | | |
| 29713-01 | 3.25 | 3.2916 | 230 | capsized |
| 02 | 3.25 | 3.2960 | | survived |
| 03 | 3.25 | 3.3001 | | survived |
| 04 | 3.25 | 3.3014 | 250 | capsized |
| 05 | 3.25 | 3.2952 | | survived |
| 06 | 3.25 | 3.2941 | | survived |
| 07 | 3.25 | 3.3021 | | survived |
| 14.06.2010 | | | | |
| 29713-08 | 3.25 | 3.2849 | | survived |
| 09 | 3.25 | 3.2813 | 220 | capsized |
| 10 | 3.25 | 3.2920 | 155 | capsized |
| 29714-01 | 3.75 | 3.7809 | 80 | capsized |
| 02 | 3.75 | 3.7821 | 125 | capsized |
| 03 | 3.75 | 3.7952 | 110 | capsized |
| 04 | 3.75 | 3.7785 | 150 | capsized |
| 05 | 3.75 | 3.7879 | 125 | capsized |
| 06 | 3.75 | 3.7922 | 220 | capsized |
| 07 | 3.75 | 3.7939 | 225 | capsized |
| 08 | 3.75 | 3.7850 | 160 | capsized |
| 09 | 3.75 | 3.8042 | 180 | capsized |
| 10 | 3.75 | 3.7942 | 95 | capsized |
| 29711-04 | 3.50 | 3.5688 | 230 | capsized |
| 05 | 3.50 | 3.5562 | | survived |
| 06 | 3.50 | 0.3556 | | survived |
| 07 | 3.50 | 3.5469 | | survived |
| 08 | 3.50 | 3.5505 | | survived |
| 09 | 3.50 | 3.5541 | | survived |
| 10 | 3.50 | 3.5563 | | survived |
| 29715-01 | 3.50 | 3.5477 | | survived |
| 02 | 3.50 | 3.5501 | 250 | capsized |
| 03 | 3.50 | 3.5424 | | survived |
| 15.06.2010 | | | | |
| 29715-04 | 3.50 | 3.5105 | | survived |
| 05 | 3.50 | 3.5420 | 165 | capsized |
| 06 | 3.50 | 3.5403 | 130 | capsized |
| 07 | 3.50 | 3.5500 | | survived |
| 08 | 3.50 | 3.5500 | | survived |
| 09 | 3.50 | 3.5411 | | survived |
| 10 | 3.50 | 3.5512 | 280 | capsized |
| | | | | |

## MODEL TEST EXPERIMENTS - DAMAGE 2

| RUN | Hs TARGET | Hs FIX | TIME TO CAPSIZE | COMMENTS |
|---|---|---|---|---|
| 29716-01 | 3.75 | 3.8072 | | survived |
| 02 | 3.75 | 3.7955 | 210 | capsized |
| 03 | 3.75 | 3.8132 | | survived |
| 04 | 3.75 | 3.8076 | | survived |
| 05 | 3.75 | 3.8193 | | survived |
| 16.06.2010 | | | | |
| 29717-01 | 3.50 | 3.5191 | 240 | capsized |
| 02 | 3.50 | 3.5324 | 245 | capsized |
| 03 | 3.50 | 3.5313 | 250 | capsized |
| 04 | 3.50 | 3.5459 | | survived |
| 05 | 3.50 | 3.5497 | 270 | capsized |
| 06 | 3.50 | 3.5467 | | survived |
| 07 | 3.50 | 3.5485 | | survived |
| 08 | 3.50 | 3.5416 | | survived |
| 09 | 3.50 | 3.5490 | 90 | capsized |
| 10 | 3.50 | 3.5413 | | survived |
| 29718-01 | 3.50 | 3.5432 | | survived |
| 02 | 3.50 | 3.5518 | | survived |
| 03 | 3.50 | 3.5659 | | survived |
| 04 | 3.50 | 3.5739 | | survived |
| 05 | 3.50 | 3.5591 | | survived |
| 06 | 3.50 | 3.5622 | 270 | capsized |
| 07 | 3.50 | 3.5496 | | survived |
| 08 | 3.50 | 3.5453 | 150 | capsized |
| 09 | 3.50 | 3.5828 | 80 | capsized |
| 10 | 3.50 | 3.5386 | 120 | capsized |
| 29716-06 | 3.75 | 3.8190 | 205 | capsized |
| 07 | 3.75 | 3.7976 | 230 | capsized |
| 08 | 3.75 | 3.8063 | 165 | capsized |
| 09 | 3.75 | 3.7892 | 220 | capsized |
| 17.06.2010 | | | | |
| 29716-10 | 3.75 | 3.7579 | 205 | capsized |
| 29720-01 | 3.25 | 3.5192 | 110 | capsized |
| 02 | 3.25 | 3.5297 | 155 | capsized |
| 03 | 3.25 | 3.5325 | 160 | capsized |
| 04 | 3.25 | 3.5160 | 130 | capsized |
| 05 | 3.25 | 3.5200 | 240 | capsized |
| 06 | 3.25 | 3.5244 | | survived |
| 07 | 3.25 | 3.5362 | | survived |
| 08 | 3.25 | 3.5388 | 170 | capsized |
| 09 | 3.25 | 3.5603 | 130 | capsized |

## MODEL TEST EXPERIMENTS - DAMAGE 2

| RUN | Hs TARGET | Hs FIX | TIME TO CAPSIZE | COMMENTS |
|---|---|---|---|---|
| 29720-10 | 3.25 | 3.313 | | survived |
| 18.06.2010 | | | | |
| 29721-01 | 3.75 | 3.7590 | 135 | capsized |
| 02 | 3.75 | 3.7653 | | survived |
| 03 | 3.75 | 3.7448 | | wave too small |
| 04 | 3.75 | 3.7814 | 30 | capsized |
| 05 | 3.75 | 3.7793 | 70 | capsized |
| 06 | 3.75 | 0.3780 | 130 | capsized |
| 07 | 3.75 | 3.7725 | 155 | capsized |
| 08 | 3.75 | 3.7754 | 165 | capsized |
| 09 | 3.75 | 3.7989 | 120 | capsized |
| 10 | 3.75 | 3.7799 | 175 | capsized |
| 11 | 3.75 | 3.7894 | | survived |
| 29722-01 | 3.50 | 3.5385 | 280 | capsized |
| 02 | 3.50 | 3.5518 | | survived |
| 03 | 3.50 | 3.5532 | | survived |
| 04 | 3.50 | 3.5634 | 240 | capsized |
| 05 | 3.50 | 3.5575 | 205 | capsized |
| 06 | 3.50 | 3.5458 | | survived |
| 07 | 3.50 | 3.5593 | 230 | capsized |
| 08 | 3.50 | 3.5537 | | survived |
| 09 | 3.50 | 3.5552 | | survived |
| 10 | 3.50 | 3.5559 | | survived |
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# APPENDIX D2

# STATISTICS OF WAVES AND ROLL MOTIONS

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Roll Test in Air Measurements**

**Pitch Test in Air Measurements**

**Roll Test in Water Measurements (Intact Condition)**

**Spectral Characteristics of the Target and Measured Waves**

**Summary of the Measured Wave and Roll Time Realisations**

# Roll in Air Measurements

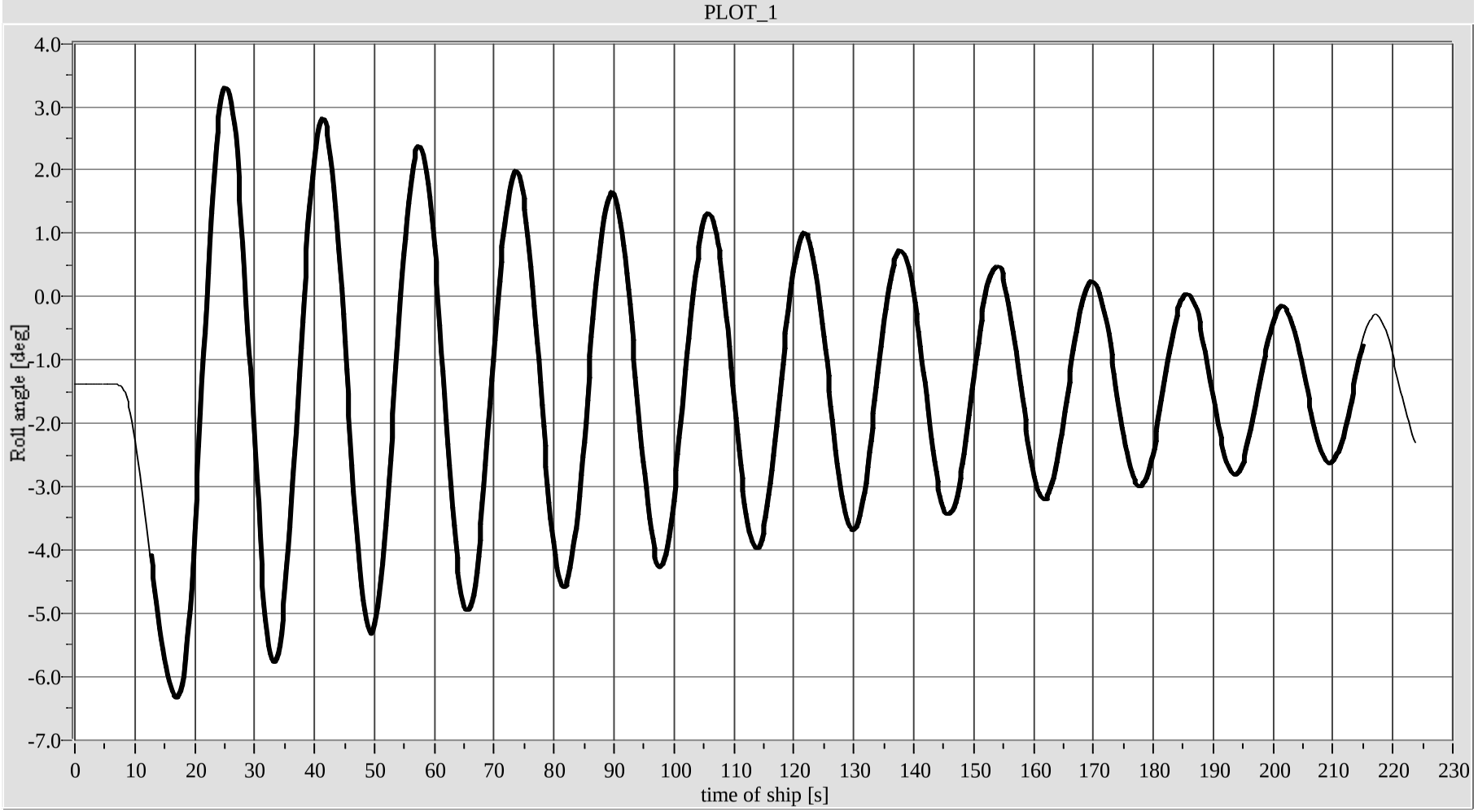
# Model No. 2458A

# Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

| Vienna Model Basin Ltd. | Roll Test in Air |
|---|---|

| Model No. 2458A | Test No. 29707-02 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 2.5345 s / 16.0299 s | Project: EMSA 3 | |
|---|---|---|

# Pitch in Air Measurements

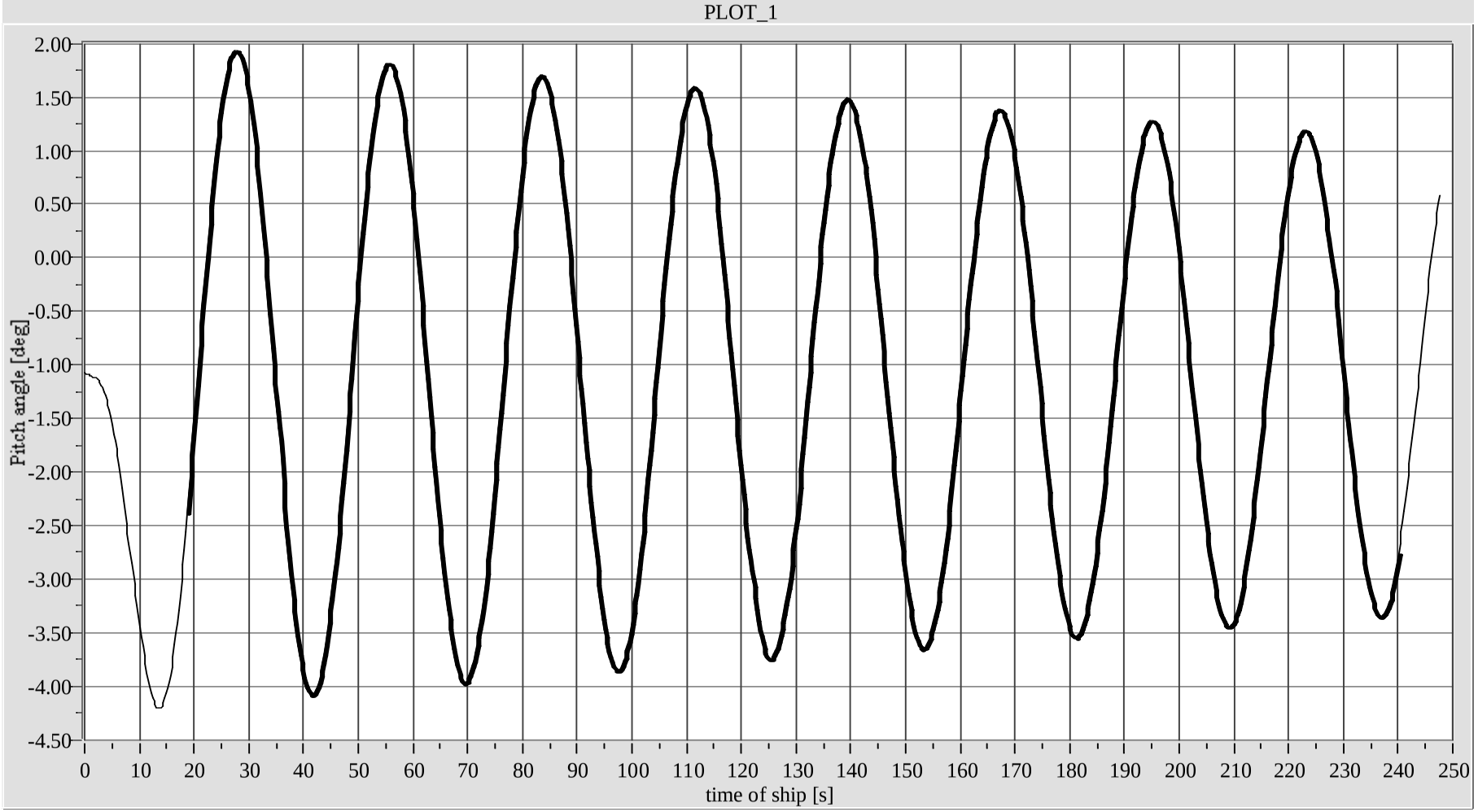
# Model No. 2458A

# Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

| Vienna Model Basin Ltd. | Pitch Test in Air |
|---|---|

| Model No. 2458A | Test No. 29707-03 | No bilge keels |
|---|---|---|




| Period (Model / Ship) = 4.4114 s / 27.9003 s | Project: EMSA 3 | |
|---|---|---|

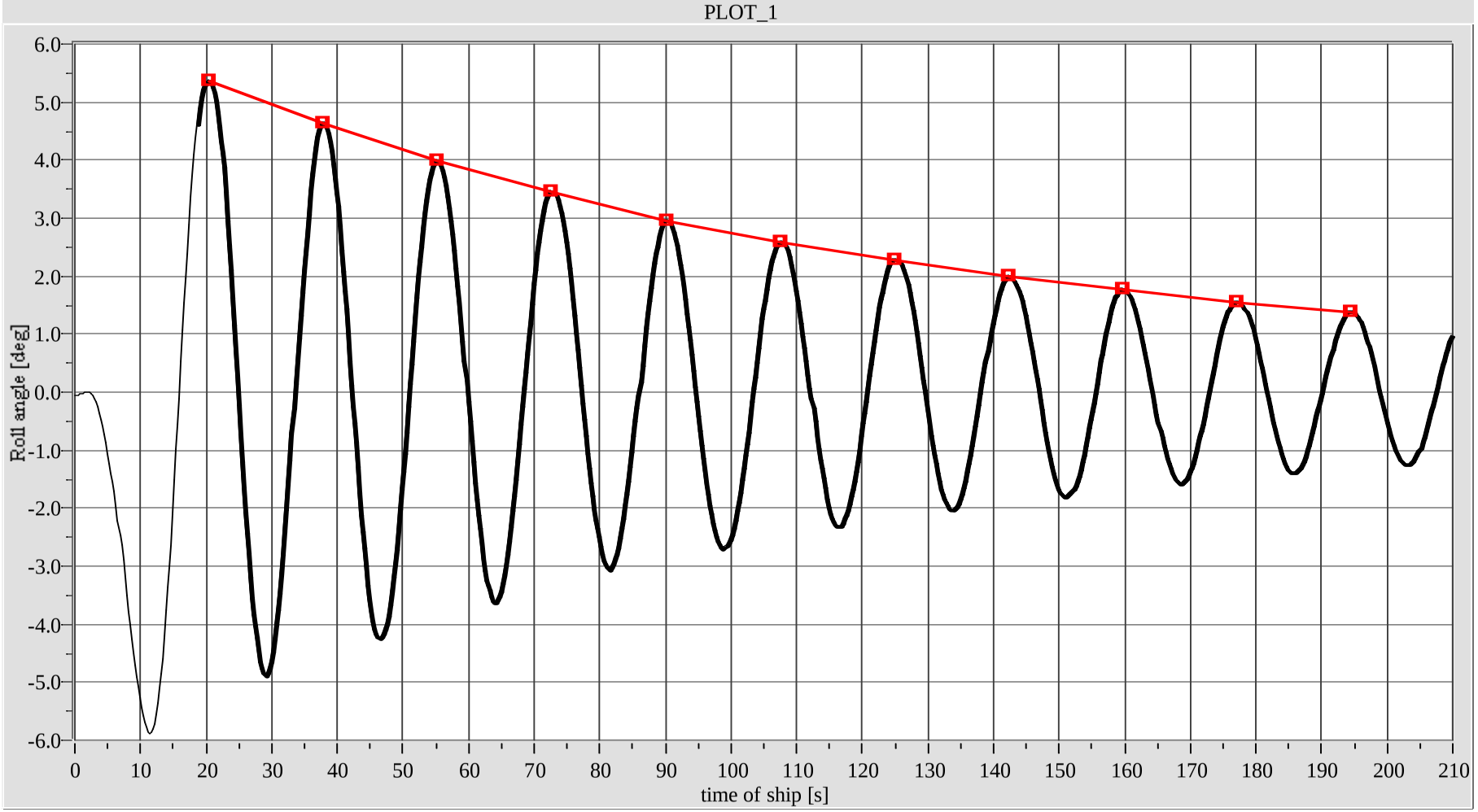
# Roll in Water Measurements (Intact Condition)

# Model No. 2458A

# Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

| Vienna Model Basin Ltd. | Roll decay test in water (intact condition) | | | |
|---|---|---|---|---|
| Model No. 2458A | Test No. 29707-04 | GMT = 2,30 m | | without bilge keels |




| Natural Roll Period (Ship) = 17.4052 s | Project: EMSA 3 | Draught = 6,70 |
|---|---|---|

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29708-01 to 10, Hs = 2.00 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

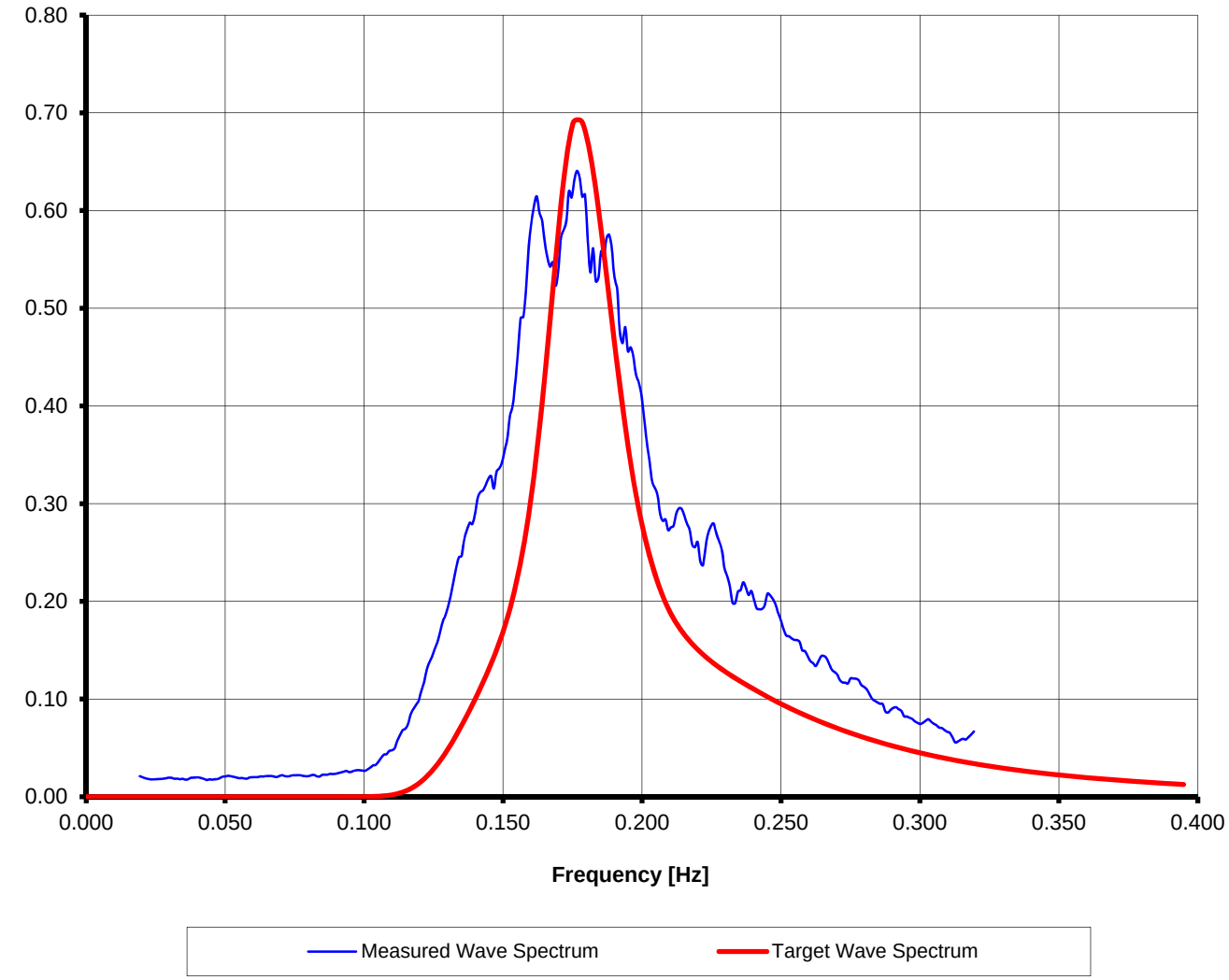
**Model No.: 2458A**
**Test No.: 29708-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **2.000** | m |
| gamma | 3.300 | |
| $T_P$ | 5.657 | s |
| $T_Z$ | 4.402 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29708-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 2.000 | 5.657 | 4.402 | 2.000 - 2.050 | 5.515 - 5.798 | 4.182 - 4.622 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29708-01 | 29708-01 | 2.0214 | 5.654 | 4.522 | | | | | | |
| -02 | -02 | 2.0221 | 5.692 | 4.554 | | | | | | |
| -03 | -03 | 2.0194 | 5.577 | 4.579 | | | | | | |
| -04 | -04 | 2.0243 | 5.636 | 4.617 | | | | | | |
| -05 | -05 | 2.0313 | 5.733 | 4.611 | | | | | | |
| -06 | -06 | 2.0306 | 5.574 | 4.614 | | | | | | |
| -07 | -07 | 2.0287 | 5.625 | 4.618 | | | | | | |
| -08 | -08 | 2.0377 | 5.577 | 4.595 | | | | | | |
| -09 | -09 | 2.0375 | 5.626 | 4.613 | | | | | | |
| -10 | -10 | 2.0374 | 5.686 | 4.616 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29709-01 to 05, Hs = 2.50 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

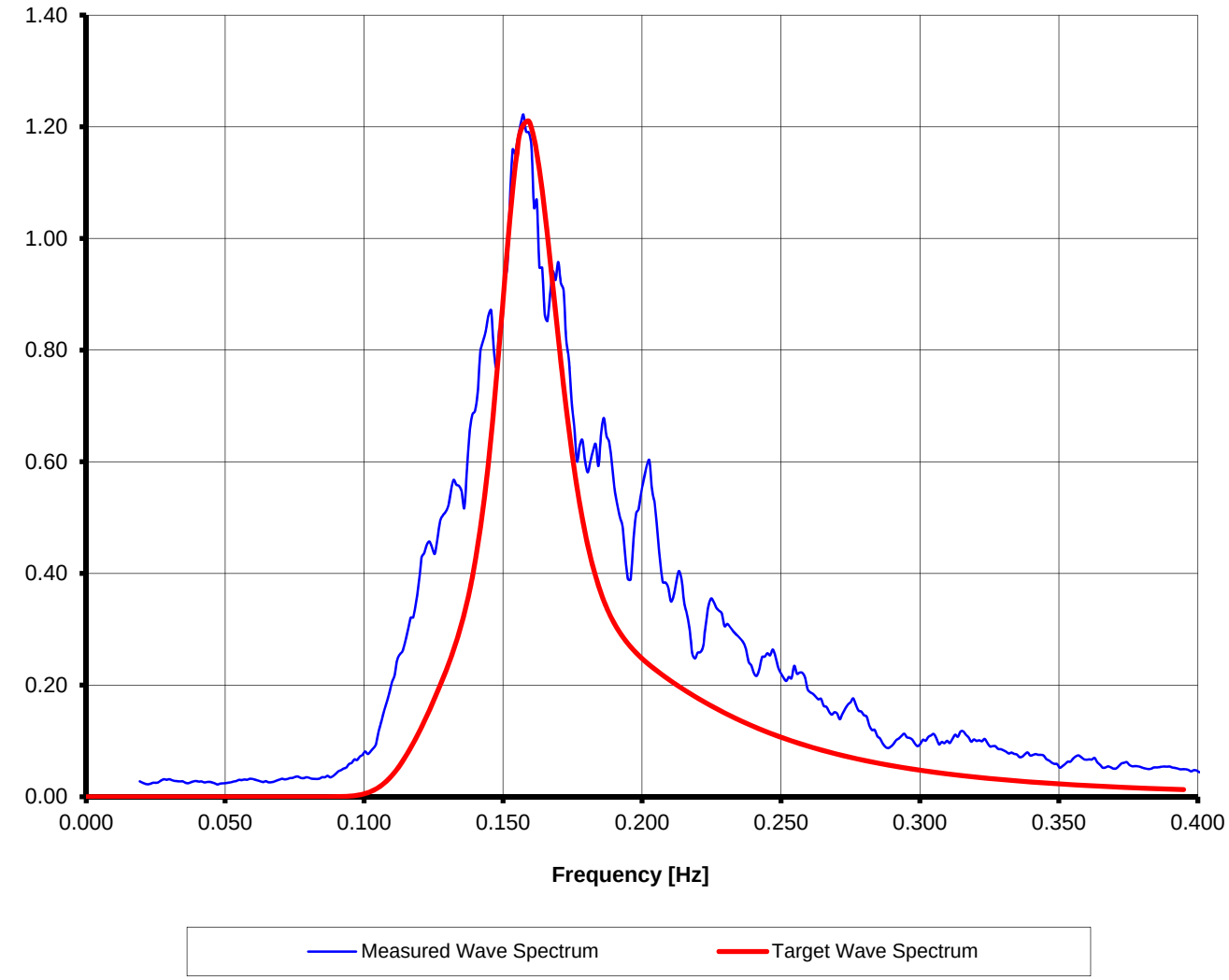
**Model No.: 2458A**
**Test No.: 29709-01 to 05**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **2.500** | m |
| gamma | 3.300 | |
| $T_P$ | 6.325 | s |
| $T_Z$ | 4.922 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29709-01 to 05
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 2.500 | 6.325 | 4.922 | 2.500 - 2.563 | 6.166 - 6.483 | 4.676 - 5.168 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29709-01 | 29709-01 | 2.5386 | 6.343 | 4.904 | | | | | | |
| -02 | -02 | 2.5315 | 6.293 | 4.816 | | | | | | |
| -03 | -03 | 2.5658 | 6.364 | 4.843 | | | | | | |
| -04 | -04 | 2.5568 | 6.422 | 4.916 | | | | | | |
| -05 | -05 | 2.5460 | 6.351 | 4.855 | | | | | | |
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# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29710-01 to 10, Hs = 3.00 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

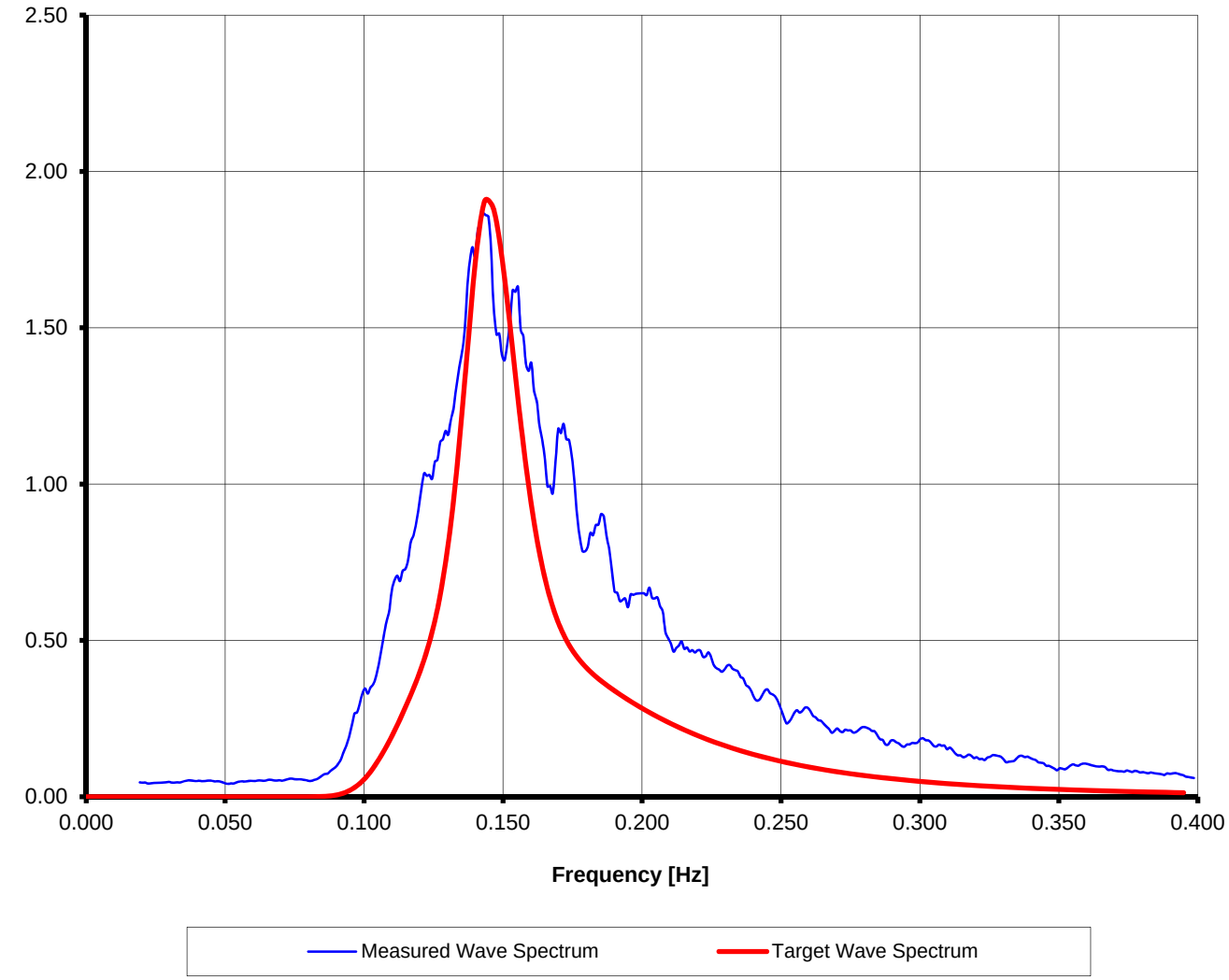
**Model No.: 2458A**
**Test No.: 29710-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.000** | m |
| gamma | 3.300 | |
| $T_P$ | 6.928 | s |
| $T_Z$ | 5.392 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29710-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.000 | 6.928 | 5.392 | 3.000 - 3.075 | 6.755 - 7.101 | 5.122 - 5.661 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29710-01 | 29710-01 | 3.0507 | 6.805 | 5.333 | | | | | | |
| -02 | -02 | 3.0421 | 6.797 | 5.389 | | | | | | |
| -03 | -03 | 3.0405 | 6.892 | 5.240 | | | | | | |
| -04 | -04 | 3.0449 | 6.756 | 5.220 | | | | | | |
| -05 | -05 | 3.0454 | 6.852 | 5.216 | | | | | | |
| -06 | -06 | 3.0278 | 6.991 | 5.206 | | | | | | |
| -07 | -07 | 3.0283 | 7.100 | 5.252 | | | | | | |
| -08 | -08 | 3.0330 | 7.097 | 5.246 | | | | | | |
| -09 | -09 | 3.0394 | 7.022 | 5.197 | | | | | | |
| -10 | -10 | 3.0467 | 7.017 | 5.138 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29711-01 to 10, Hs = 3.50 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

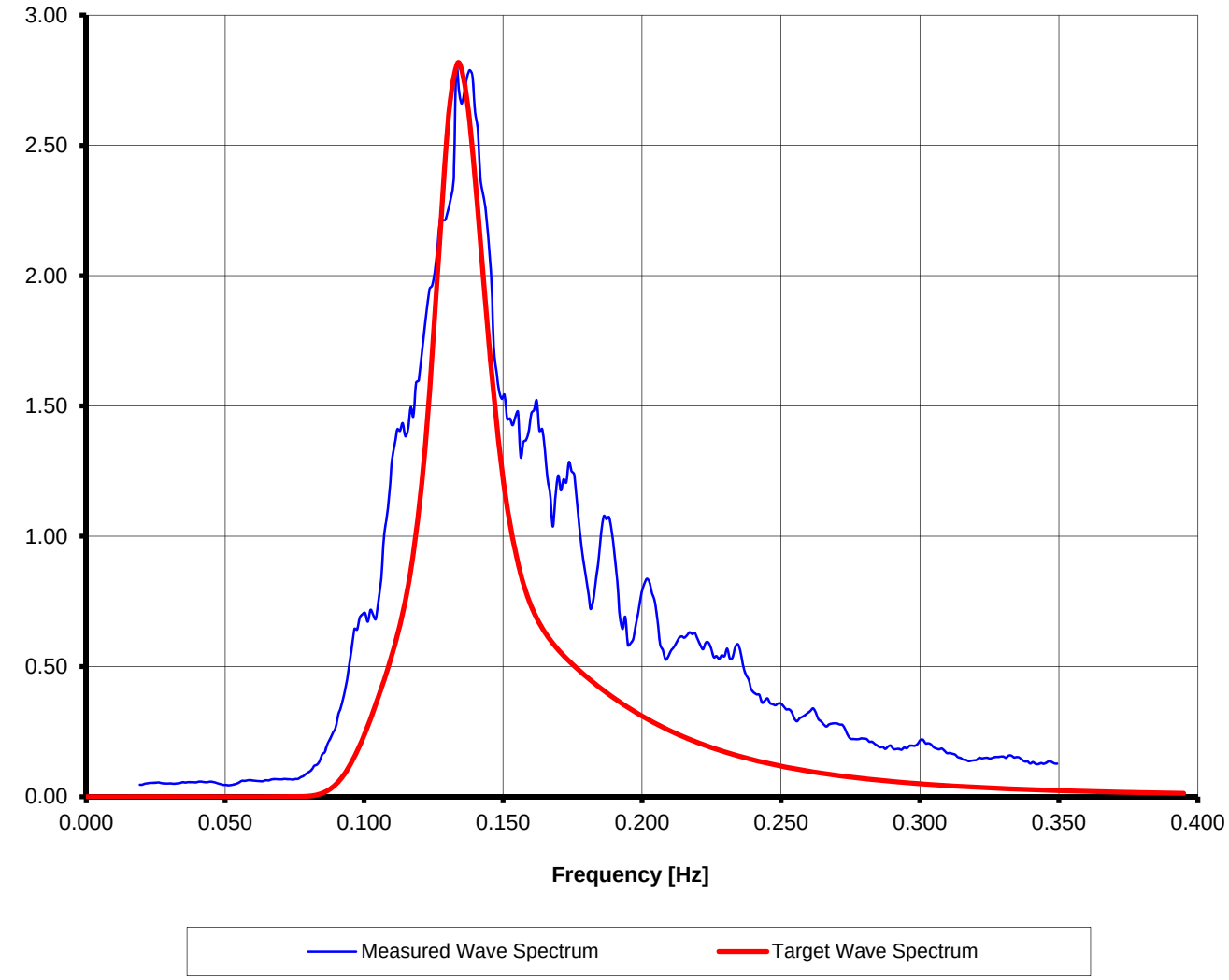
**Model No.: 2458A**
**Test No.: 29711-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.500** | m |
| gamma | 3.300 | |
| $T_P$ | 7.483 | s |
| $T_Z$ | 5.824 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29711-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma = 3.3$
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.500 | 7.483 | 5.824 | 3.500 - 3.588 | 7.296 - 7.670 | 5.532 - 6.115 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29711-01 | 29700-01 | 3.5605 | 7.541 | 5.654 | | | | | | |
| -02 | -02 | 3.5444 | 7.596 | 5.781 | | | | | | |
| -03 | -03 | 3.5571 | 7.414 | 5.702 | | | | | | |
| -04 | -04 | 3.5688 | 7.444 | 5.553 | | | | | | |
| -05 | -05 | 3.5562 | 7.652 | 5.554 | | | | | | |
| -06 | -06 | 3.5562 | 7.481 | 5.690 | | | | | | |
| -07 | -07 | 3.5469 | 7.499 | 5.627 | | | | | | |
| -08 | -08 | 3.5505 | 7.505 | 5.648 | | | | | | |
| -09 | -09 | 3.5541 | 7.352 | 5.745 | | | | | | |
| -10 | -10 | 3.5563 | 7.497 | 5.809 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29712-01 to 10, Hs = 4.00 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

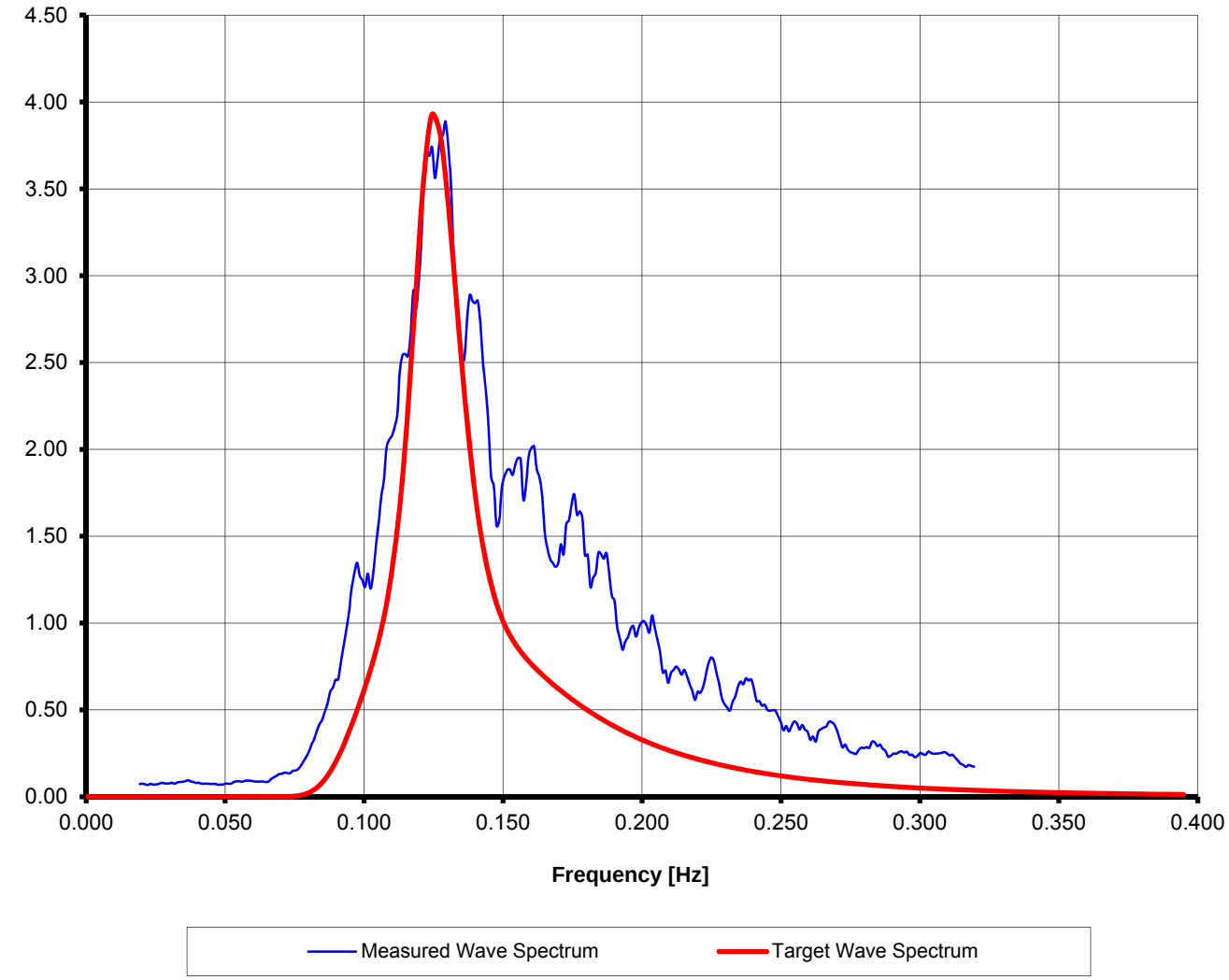
**Model No.: 2458A**
**Test No.: 29712-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **4.000** | m |
| gamma | 3.300 | |
| $T_P$ | 8.000 | s |
| $T_Z$ | 6.226 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29712-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 4.000 | 8.000 | 6.226 | 4.000 - 4.100 | 7.800 - 8.200 | 5.914 - 6.537 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29712-01 | 29701-01 | 4.0510 | 8.164 | 6.067 | | | | | | |
| -02 | -02 | 4.0355 | 7.908 | 6.148 | | | | | | |
| -03 | -03 | 4.0309 | 8.012 | 6.226 | | | | | | |
| -04 | -04 | 4.0278 | 7.981 | 5.923 | | | | | | |
| -05 | -05 | 4.0274 | 7.898 | 6.060 | | | | | | |
| -06 | -06 | 4.0152 | 7.905 | 5.954 | | | | | | |
| -07 | -07 | 4.0172 | 8.112 | 5.919 | | | | | | |
| -08 | -08 | 4.0288 | 8.085 | 6.037 | | | | | | |
| -09 | -09 | 4.0589 | 8.023 | 5.942 | | | | | | |
| -10 | -10 | 4.0277 | 8.044 | 5.922 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29713-01 to 10, Hs = 3.25 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

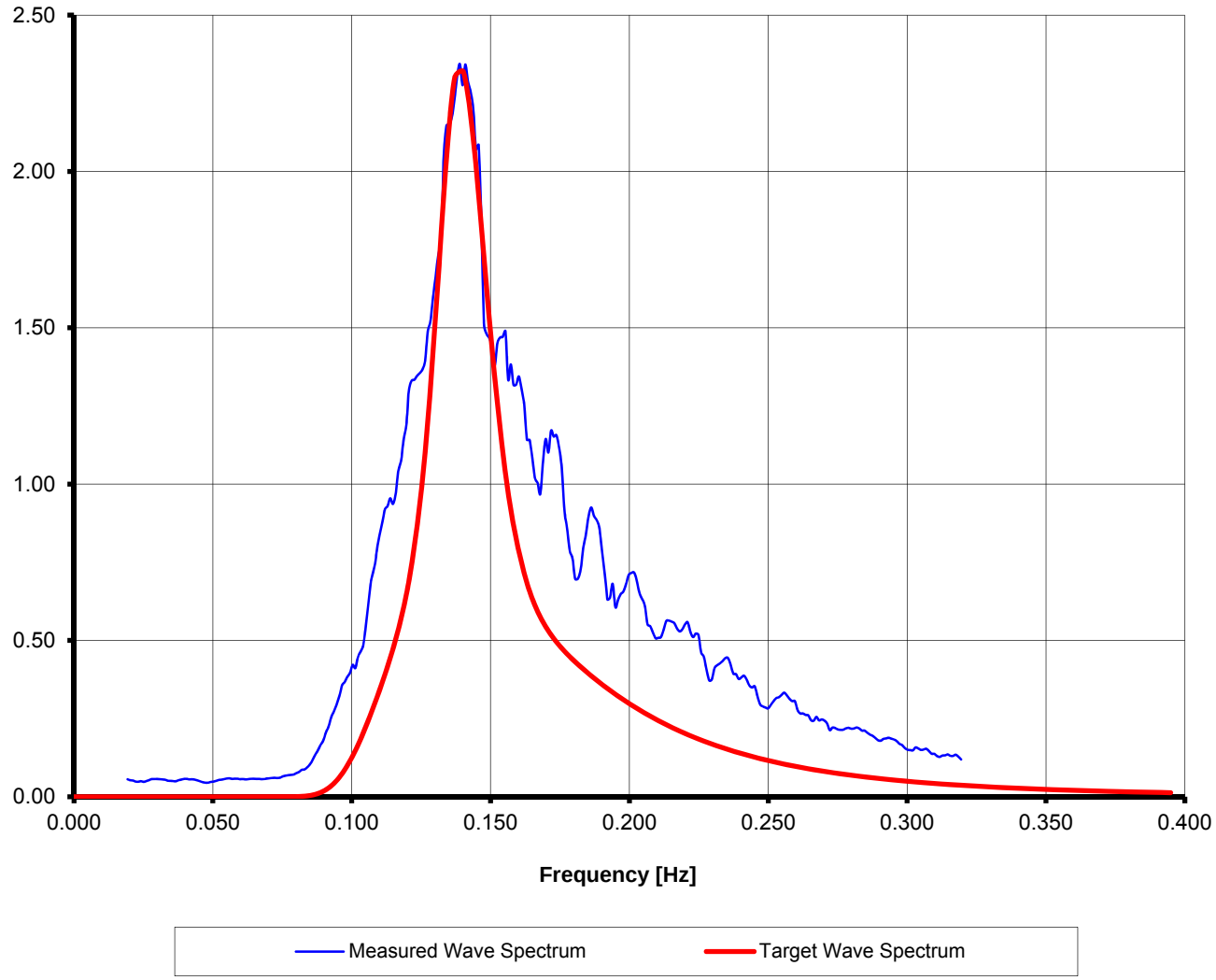
**Model No.: 2458A**
**Test No.: 29713-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.250** | m |
| gamma | 3.300 | |
| $T_P$ | 7.211 | s |
| $T_Z$ | 5.612 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29713-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma = 3.3$
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.250 | 7.211 | 5.612 | 3.250 - 3.331 | 7.031 - 7.391 | 5.331 - 5.892 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29713-01 | 29713-01 | 3.2916 | 7.207 | 5.579 | | | | | | |
| -02 | -02 | 3.2960 | 7.056 | 5.698 | | | | | | |
| -03 | -03 | 3.3001 | 7.240 | 5.663 | | | | | | |
| -04 | -04 | 3.3014 | 7.121 | 5.701 | | | | | | |
| -05 | -05 | 3.2952 | 7.369 | 5.639 | | | | | | |
| -06 | -06 | 3.2941 | 7.185 | 5.823 | | | | | | |
| -07 | -07 | 3.3021 | 7.108 | 5.851 | | | | | | |
| -08 | -08 | 3.2849 | 7.084 | 5.633 | | | | | | |
| -09 | -09 | 3.2813 | 7.334 | 5.843 | | | | | | |
| -10 | -10 | 3.2920 | 7.184 | 5.731 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29714-01 to 10, Hs = 3.75 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

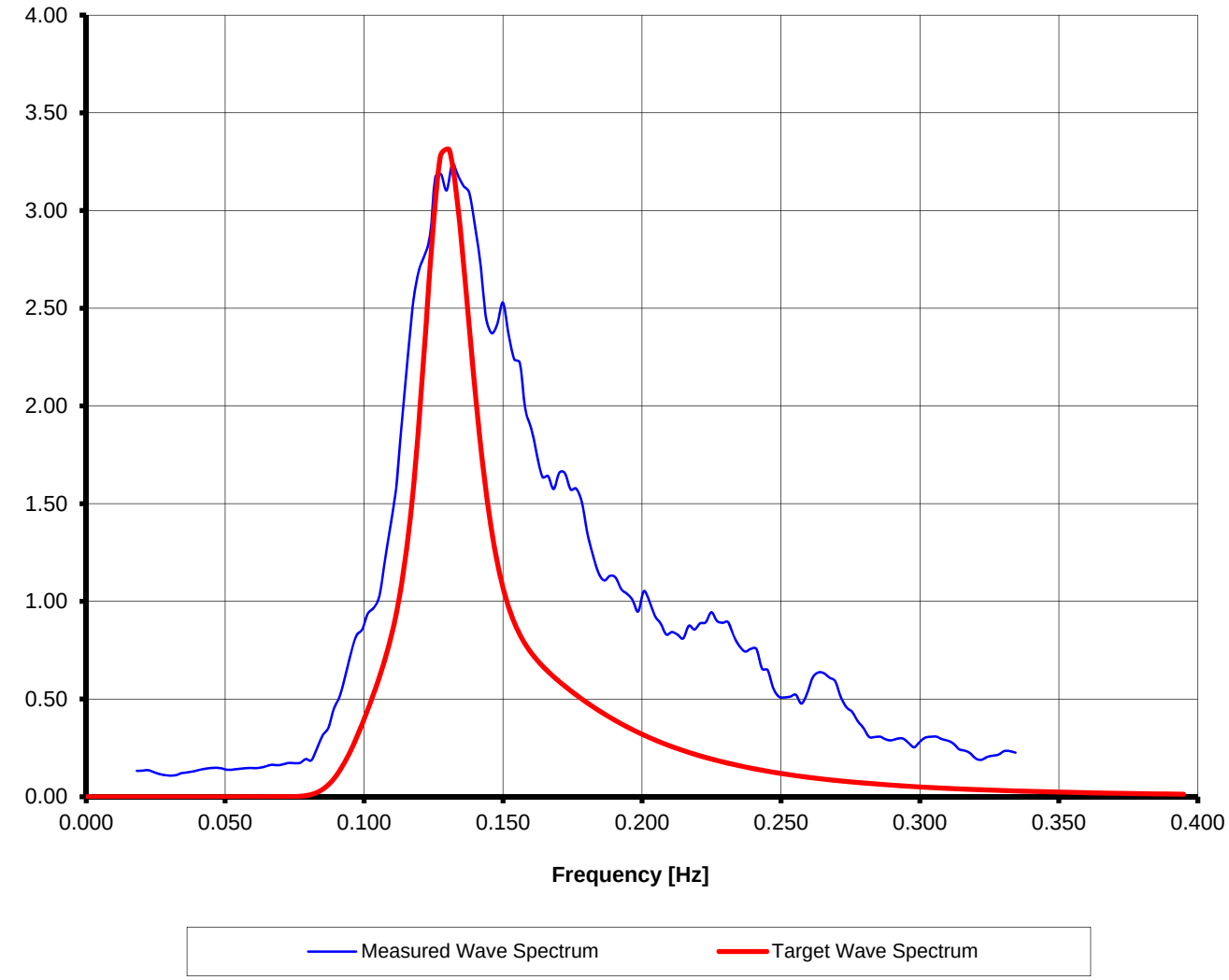
**Model No.: 2458A**
**Test No.: 29714-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.750** | m |
| gamma | 3.300 | |
| $T_P$ | 7.746 | s |
| $T_Z$ | 6.028 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29714-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.750 | 7.746 | 6.028 | 3.750 - 3.844 | 7.552 - 7.940 | 5.727 - 6.329 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29714-01 | 29714-01 | 3.7809 | 7.765 | 5.962 | | | | | | |
| -02 | -02 | 3.7821 | 7.909 | 5.991 | | | | | | |
| -03 | -03 | 3.7952 | 7.893 | 5.955 | | | | | | |
| -04 | -04 | 3.7785 | 7.699 | 5.938 | | | | | | |
| -05 | -05 | 3.7879 | 7.786 | 5.925 | | | | | | |
| -06 | -06 | 3.7922 | 7.596 | 6.028 | | | | | | |
| -07 | -07 | 3.7939 | 7.697 | 5.986 | | | | | | |
| -08 | -08 | 3.7850 | 7.834 | 5.893 | | | | | | |
| -09 | -09 | 3.8042 | 7.621 | 5.911 | | | | | | |
| -10 | -10 | 3.7942 | 7.685 | 6.028 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29715-01 to 10, Hs = 3.50 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

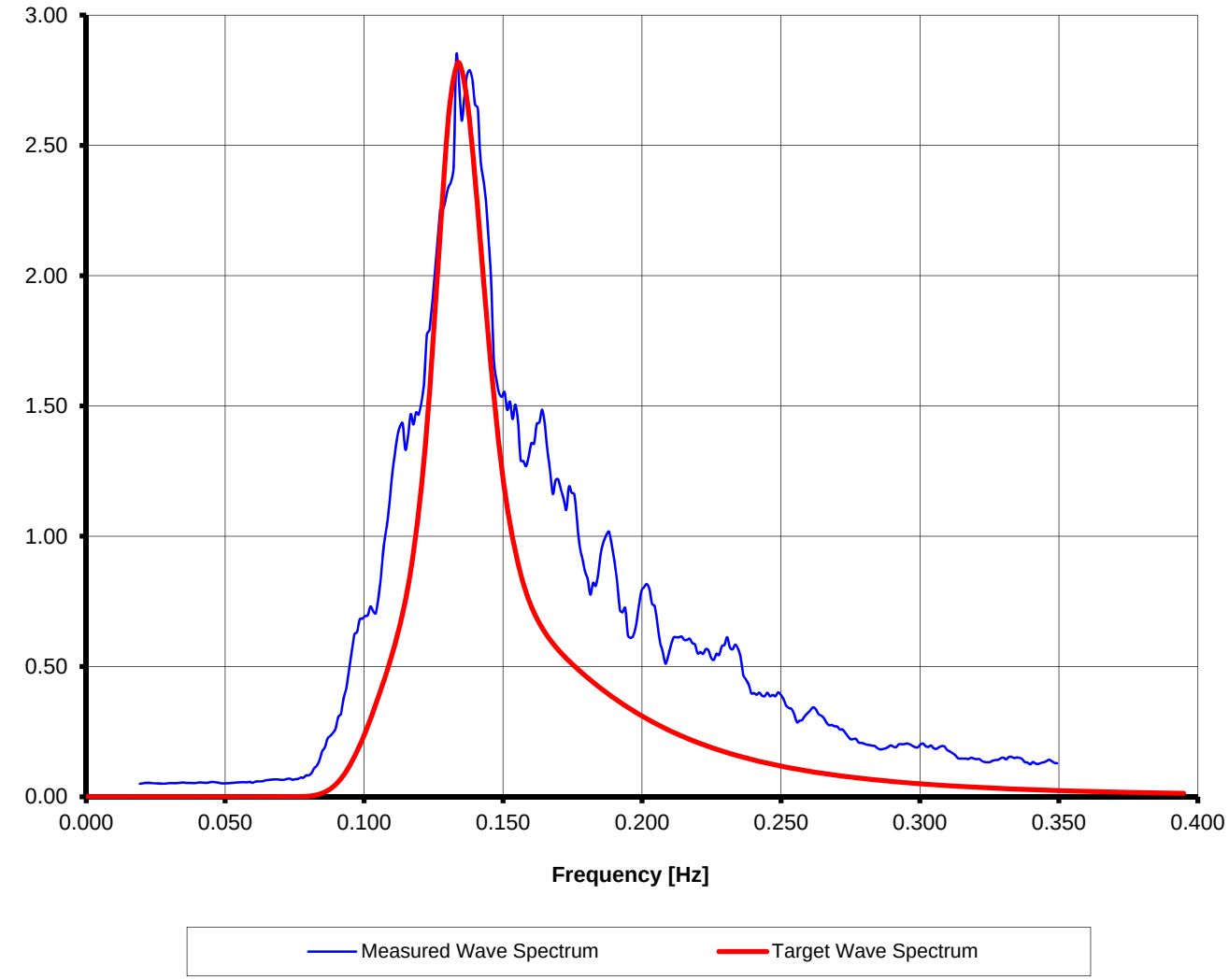
**Model No.: 2458A**
**Test No.: 29715-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.500** | m |
| gamma | 3.300 | |
| $T_P$ | 7.483 | s |
| $T_Z$ | 5.824 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29715-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.500 | 7.483 | 5.824 | 3.500 - 3.588 | 7.296 - 7.670 | 5.532 - 6.115 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29715-01 | 29700-01 | 3.5477 | 7.446 | 5.789 | | | | | | |
| -02 | -02 | 3.5501 | 7.395 | 5.681 | | | | | | |
| -03 | -03 | 3.5424 | 7.496 | 5.669 | | | | | | |
| -04 | -04 | 3.5105 | 7.485 | 5.572 | | | | | | |
| -05 | -05 | 3.5420 | 7.519 | 5.653 | | | | | | |
| -06 | -06 | 3.5403 | 7.371 | 5.823 | | | | | | |
| -07 | -07 | 3.5500 | 7.601 | 5.702 | | | | | | |
| -08 | -08 | 3.5500 | 7.665 | 5.645 | | | | | | |
| -09 | -09 | 3.5411 | 7.554 | 5.617 | | | | | | |
| -10 | -10 | 3.5512 | 7.520 | 5.637 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29716-01 to 10, Hs = 3.75 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

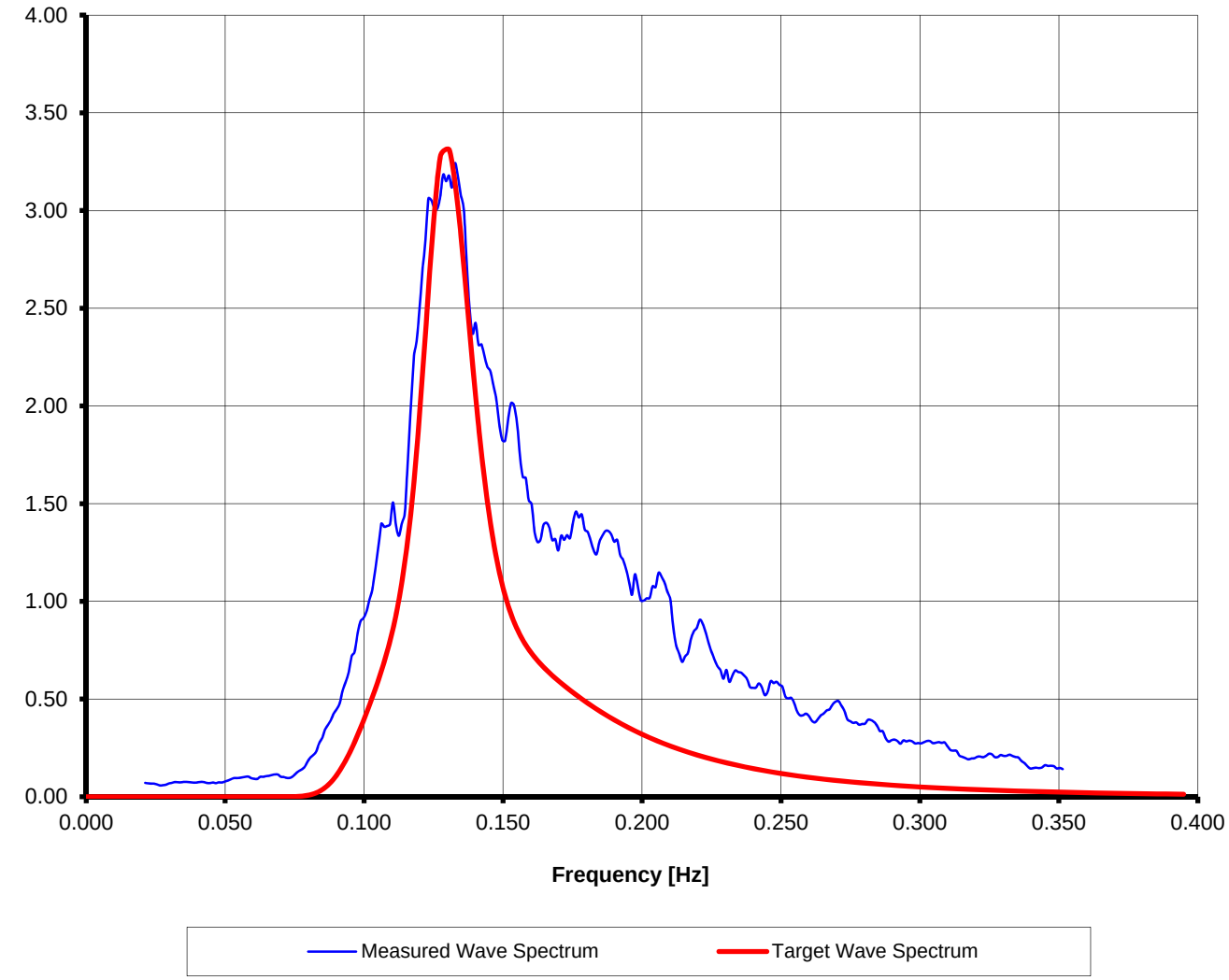
**Model No.: 2458A**
**Test No.: 29716-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.750** | m |
| gamma | 3.300 | |
| $T_P$ | 7.746 | s |
| $T_Z$ | 6.028 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29716-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.750 | 7.746 | 6.028 | 3.750 - 3.844 | 7.552 - 7.940 | 5.727 - 6.329 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29716-01 | 29714-01 | 3.8072 | 7.561 | 6.151 | | | | | | |
| -02 | -02 | 3.7955 | 7.782 | 6.172 | | | | | | |
| -03 | -03 | 3.8132 | 7.693 | 6.033 | | | | | | |
| -04 | -04 | 3.8076 | 7.734 | 6.166 | | | | | | |
| -05 | -05 | 3.8193 | 7.872 | 6.189 | | | | | | |
| -06 | -06 | 3.8190 | 7.624 | 6.125 | | | | | | |
| -07 | -07 | 3.7976 | 7.765 | 5.909 | | | | | | |
| -08 | -08 | 3.8063 | 7.726 | 6.005 | | | | | | |
| -09 | -09 | 3.7892 | 7.933 | 5.937 | | | | | | |
| -10 | -10 | 3.7579 | 7.732 | 6.149 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29717-01 to 10, Hs = 3.50 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

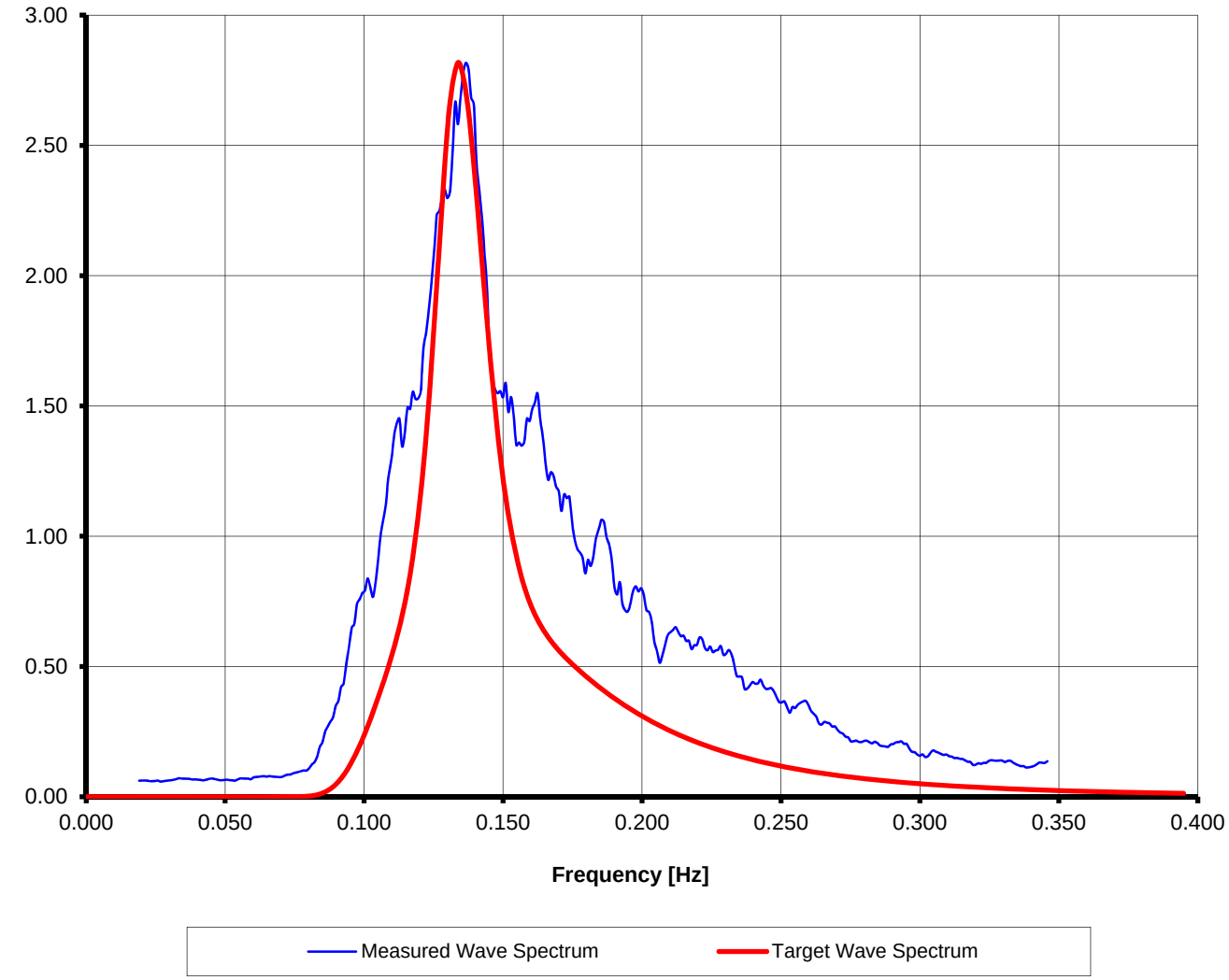
**Model No.: 2458A**
**Test No.: 29717-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.500** | m |
| gamma | 3.300 | |
| $T_P$ | 7.483 | s |
| $T_Z$ | 5.824 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29717-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.500 | 7.483 | 5.824 | 3.500 - 3.588 | 7.296 - 7.670 | 5.532 - 6.115 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29717-01 | 29700-01 | 3.5191 | 7.602 | 5.760 | | | | | | |
| -02 | -02 | 3.5324 | 7.489 | 5.798 | | | | | | |
| -03 | -03 | 3.5313 | 7.603 | 5.727 | | | | | | |
| -04 | -04 | 3.5459 | 7.432 | 5.735 | | | | | | |
| -05 | -05 | 3.5497 | 7.434 | 5.669 | | | | | | |
| -06 | -06 | 3.5467 | 7.545 | 5.695 | | | | | | |
| -07 | -07 | 3.5485 | 7.654 | 5.704 | | | | | | |
| -08 | -08 | 3.5416 | 7.450 | 5.682 | | | | | | |
| -09 | -09 | 3.5490 | 7.666 | 5.824 | | | | | | |
| -10 | -10 | 3.5413 | 7.297 | 5.639 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29718-01 to 10, Hs = 3.50 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

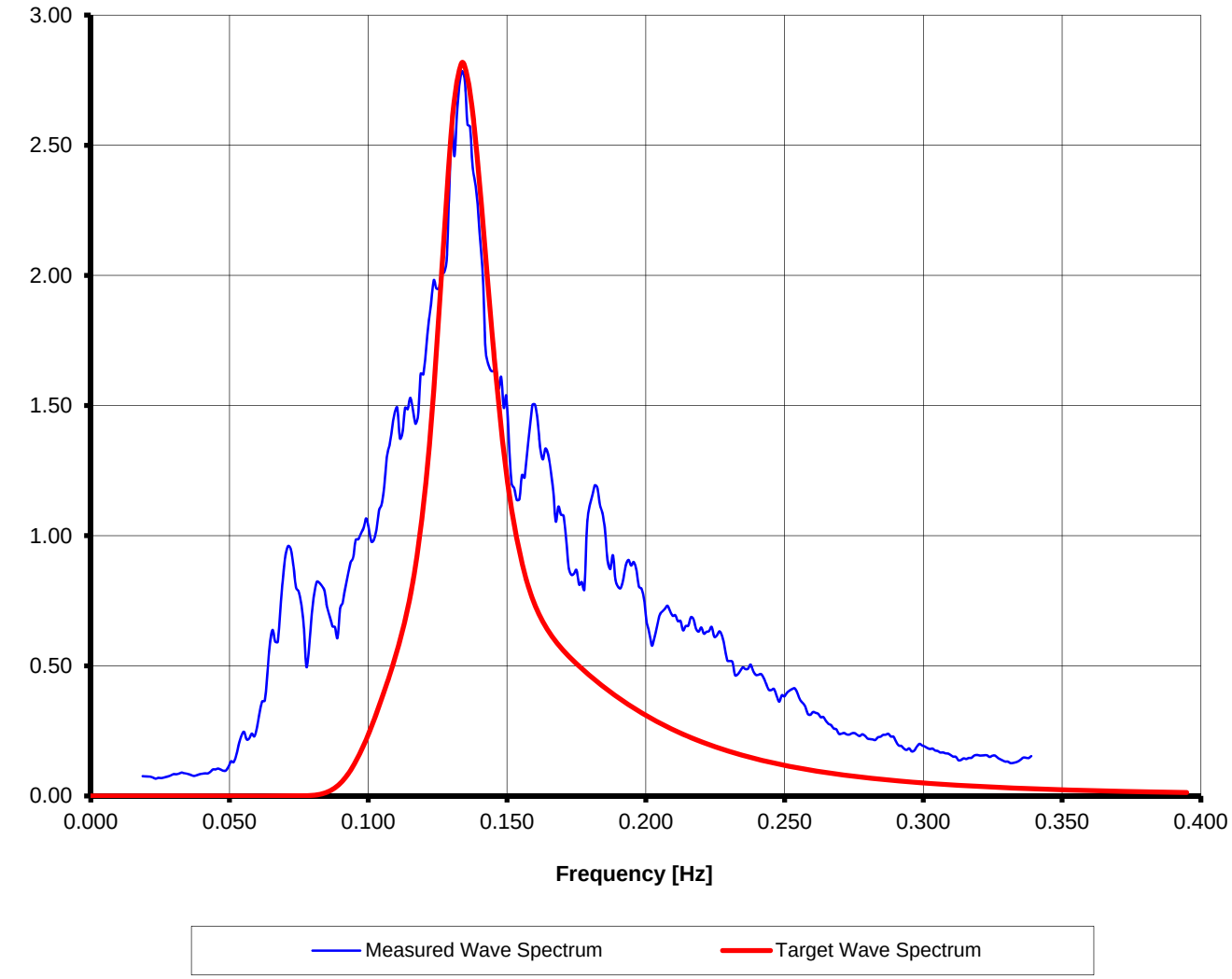
**Model No.: 2458A**
**Test No.: 29718-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.500** | m |
| gamma | 3.300 | |
| $T_P$ | 7.483 | s |
| $T_Z$ | 5.824 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29718-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.500 | 7.483 | 5.824 | 3.500 - 3.588 | 7.296 - 7.670 | 5.532 - 6.115 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29718-01 | 29700-01 | 3.5432 | 7.663 | 5.741 | | | | | | |
| -02 | -02 | 3.5518 | 7.508 | 5.724 | | | | | | |
| -03 | -03 | 3.5659 | 7.437 | 5.789 | | | | | | |
| -04 | -04 | 3.5739 | 7.482 | 5.691 | | | | | | |
| -05 | -05 | 3.5591 | 7.605 | 5.780 | | | | | | |
| -06 | -06 | 3.5622 | 7.463 | 5.662 | | | | | | |
| -07 | -07 | 3.5496 | 7.478 | 5.662 | | | | | | |
| -08 | -08 | 3.5453 | 7.316 | 5.872 | | | | | | |
| -09 | -09 | 3.5828 | 7.393 | 5.805 | | | | | | |
| -10 | -10 | 3.5386 | 7.464 | 5.679 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29719-01 to 10, Hs = 3.50 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

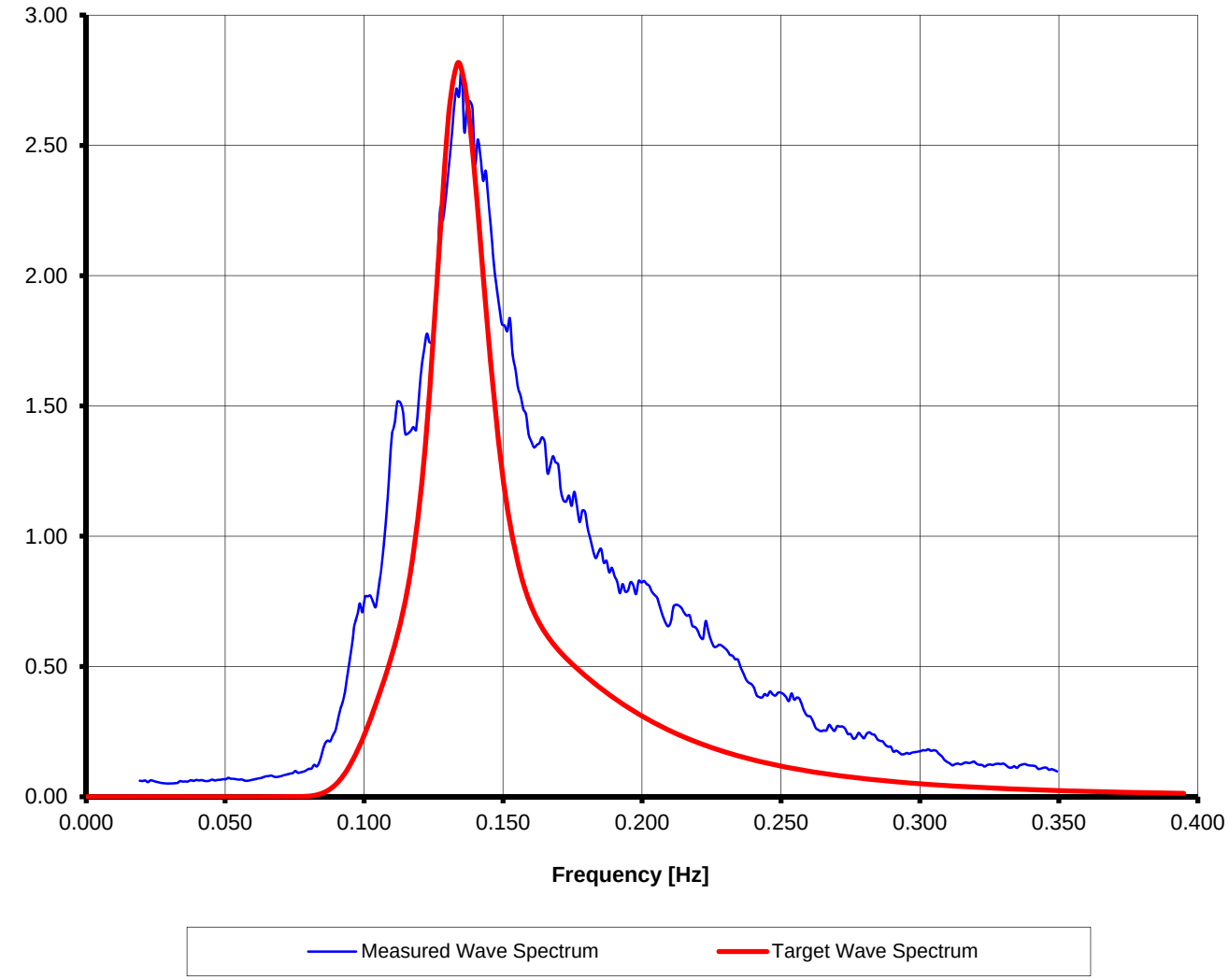
**Model No.: 2458A**
**Test No.: 29719-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.500** | m |
| gamma | 3.300 | |
| $T_P$ | 7.483 | s |
| $T_Z$ | 5.824 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29719-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.500 | 7.483 | 5.824 | 3.500 - 3.588 | 7.296 - 7.670 | 5.532 - 6.115 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29719-01 | 29700-01 | 3.5192 | 7.364 | 5.839 | | | | | | |
| -02 | -02 | 3.5297 | 7.333 | 5.820 | | | | | | |
| -03 | -03 | 3.5325 | 7.487 | 5.824 | | | | | | |
| -04 | -04 | 3.5160 | 7.426 | 5.866 | | | | | | |
| -05 | -05 | 3.5200 | 7.443 | 5.736 | | | | | | |
| -06 | -06 | 3.5244 | 7.510 | 5.826 | | | | | | |
| -07 | -07 | 3.5362 | 7.636 | 5.733 | | | | | | |
| -08 | -08 | 3.5388 | 7.631 | 5.734 | | | | | | |
| -09 | -09 | 3.5603 | 7.385 | 5.824 | | | | | | |
| -10 | -10 | 3.5389 | 7.653 | 5.662 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29720-01 to 10, Hs = 3.25 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

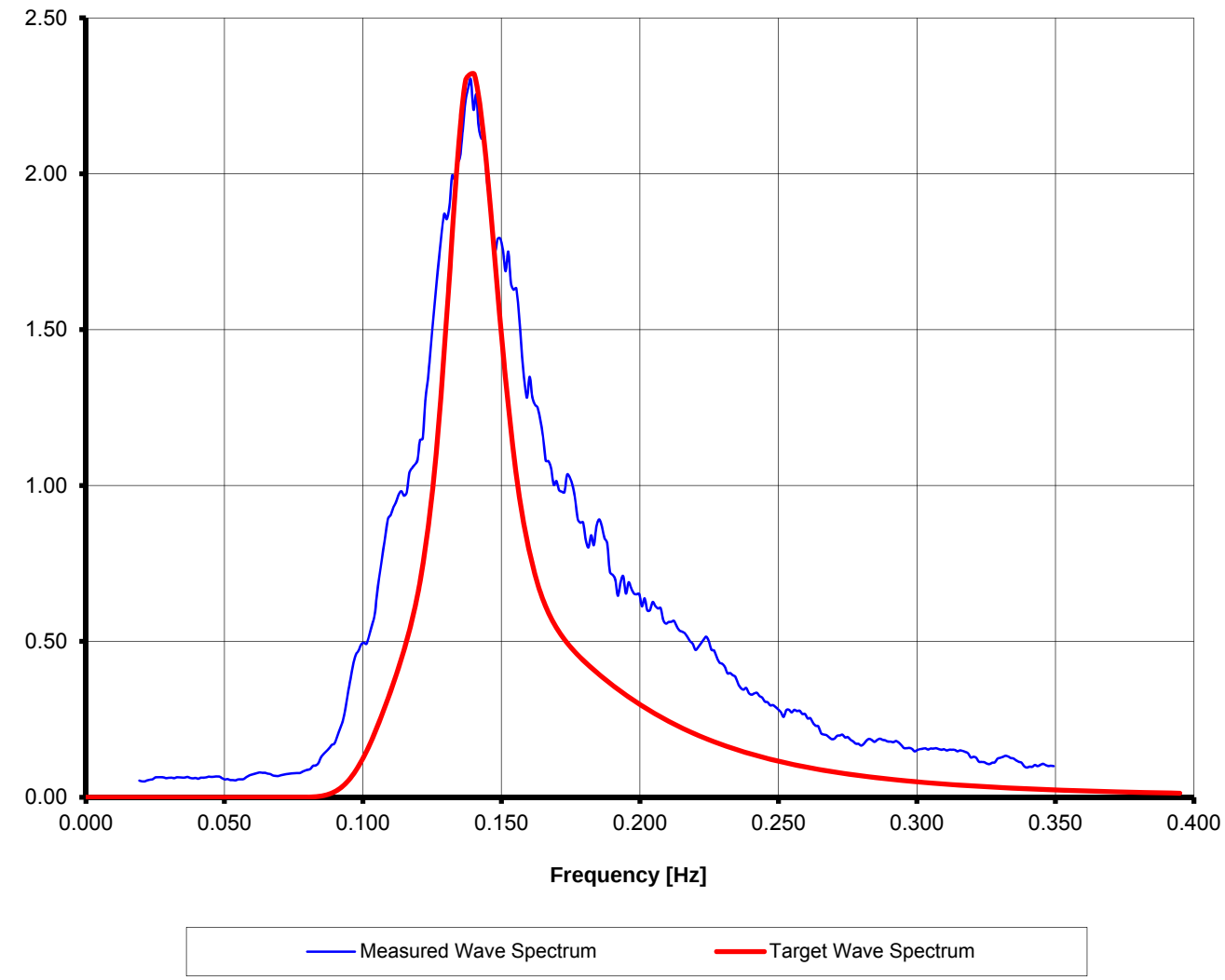
**Model No.: 2458A**
**Test No.: 29720-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.250** | m |
| gamma | 3.300 | |
| $T_P$ | 7.211 | s |
| $T_Z$ | 5.612 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29720-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma = 3.3$
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.250 | 7.211 | 5.612 | 3.250 - 3.331 | 7.031 - 7.391 | 5.331 - 5.892 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29720-01 | 29713-01 | 3.2885 | 7.212 | 5.756 | | | | | | |
| -02 | -02 | 3.3001 | 7.137 | 5.735 | | | | | | |
| -03 | -03 | 3.2898 | 7.043 | 5.872 | | | | | | |
| -04 | -04 | 3.2990 | 7.291 | 5.594 | | | | | | |
| -05 | -05 | 3.3007 | 7.344 | 5.676 | | | | | | |
| -06 | -06 | 3.2985 | 7.150 | 5.606 | | | | | | |
| -07 | -07 | 3.3019 | 7.222 | 5.642 | | | | | | |
| -08 | -08 | 3.3045 | 7.103 | 5.666 | | | | | | |
| -09 | -09 | 3.3060 | 7.110 | 5.822 | | | | | | |
| -10 | -10 | 3.3132 | 7.327 | 5.689 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29721-01 to 10, Hs = 3.75 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

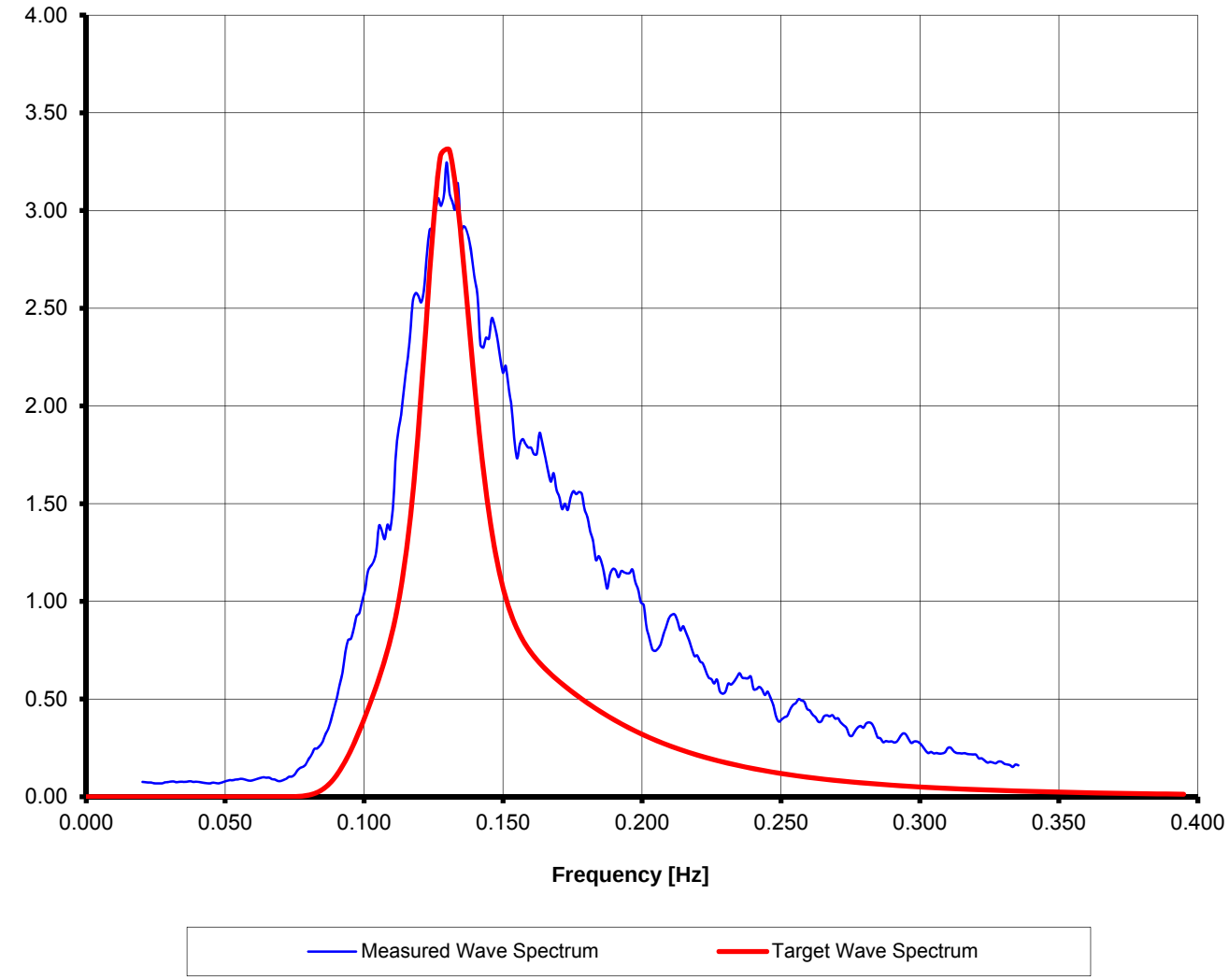
**Model No.: 2458A**
**Test No.: 29721-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.750** | m |
| gamma | 3.300 | |
| $T_P$ | 7.746 | s |
| $T_Z$ | 6.028 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29721-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma = 3.3$
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.750 | 7.746 | 6.028 | 3.750 - 3.844 | 7.552 - 7.940 | 5.727 - 6.329 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29721-01 | 29714-01 | 3.7590 | 7.589 | 6.171 | | | | | | |
| -02 | -02 | 3.7653 | 7.628 | 6.003 | | | | | | |
| -03 | -03 | 3.7448 | 7.852 | 5.949 | | | | | | |
| -04 | -04 | 3.7814 | 7.852 | 6.028 | | | | | | |
| -05 | -05 | 3.7793 | 7.739 | 5.891 | | | | | | |
| -06 | -06 | 3.7797 | 7.663 | 6.028 | | | | | | |
| -07 | -07 | 3.7725 | 7.794 | 5.926 | | | | | | |
| -08 | -08 | 3.7754 | 7.825 | 5.917 | | | | | | |
| -09 | -09 | 3.7989 | 7.769 | 6.028 | | | | | | |
| -10 | -10 | 3.7799 | 7.855 | 5.837 | | | | | | |
| -11 | -11 | 3.7894 | 7.874 | 5.902 | | | | | | |

# Spectral Characteristics of the Target and Measured Waves

## Model No. 2458A

## Project: “EMSA 3”

**Damage Case-2 R7P15-16.2.0-1**

**Test No. 29722-01 to 10, Hs = 3.50 m**

# WAVE MEASUREMENT DURING THE TESTS
## Location 1 (Arc 29) Wave Probe-1 DHI-834

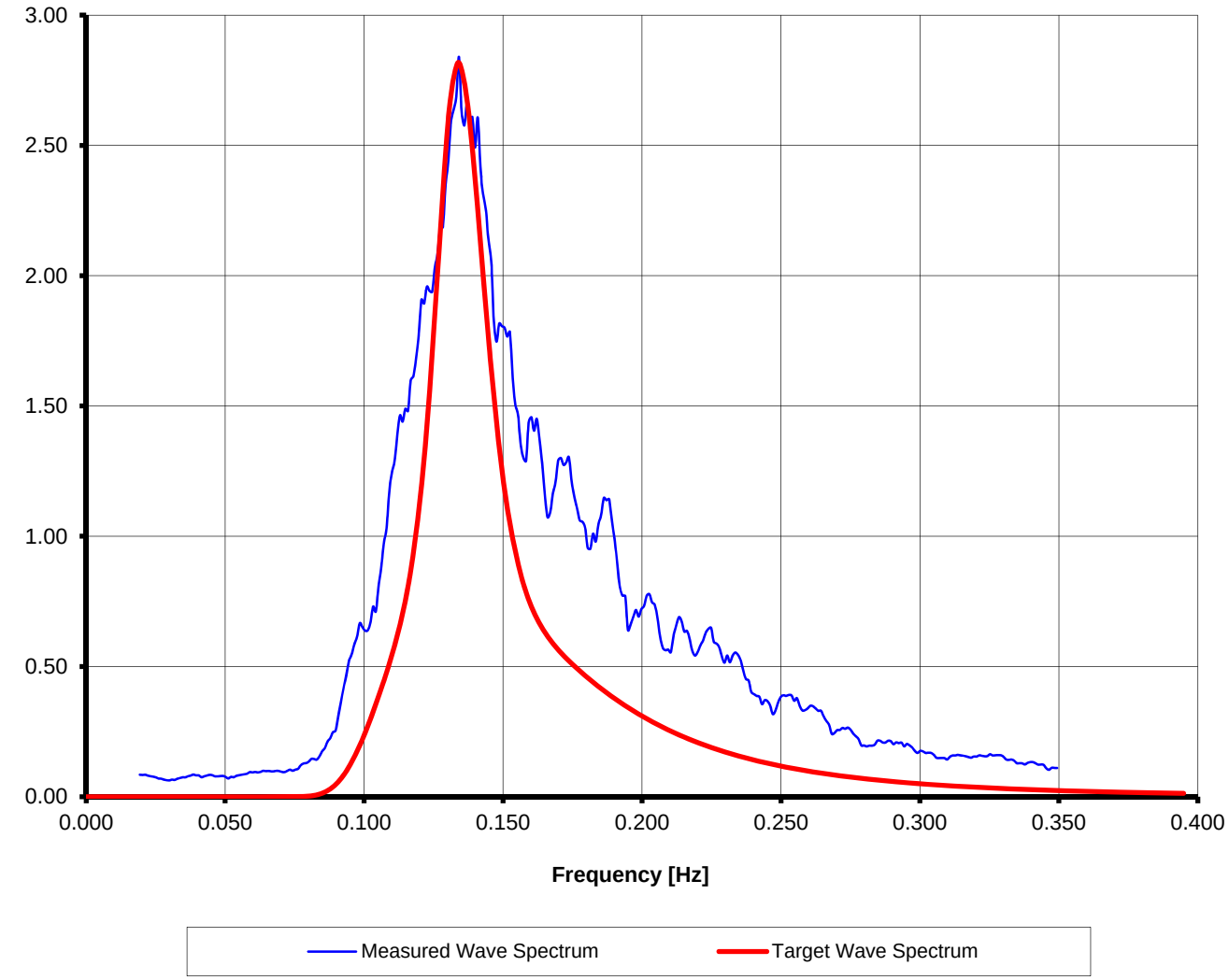
**Model No.: 2458A**
**Test No.: 29722-01 to 10**
**Project: EMSA 3**
**Damage 2: R7P15-16.2.0-1**
**Wave Type: Jonswap**
**Scale: 40.00**

**Short Waves**

| Parameter | Value | Units |
|---|---|---|
| $H_S$ | **3.500** | m |
| gamma | 3.300 | |
| $T_P$ | 7.483 | s |
| $T_Z$ | 5.824 | s |

## Spectral Characteristics

**Spectral Density S(ω) [m².s]**



# WAVE MEASUREMENT DURING THE TESTS (FIXED WAVE PROPE)

**Model No.:** 2458A
**Test No.:** 29722-01 to 10
**Project:** EMSA 3
**Damage 2:** R7P15-16.2.0-1
**Wave Type:** Jonswap, $\gamma$ = 3.3
**Scale:** 40.00

| Target of the Waves | | | Variation of the Waves | | |
|---|---|---|---|---|---|
| $H_S$ | $T_P$ | $T_Z$ | $H_S$ | $T_P$ | $T_Z$ |
| [m] | [s] | [s] | [m] | [s] | [s] |
| 3.500 | 7.483 | 5.824 | 3.500 - 3.588 | 7.296 - 7.670 | 5.532 - 6.115 |

| | | Location 1 (Wave Probe-1 DHI-834) | | | Location 2 (Wave Probe-2 DHI-835) | | | Location 3 (Wave Probe-3 DHI-836) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of the Test | Wave No. | Hs | Tp | Tz | Hs | Tp | Tz | Hs | Tp | Tz |
| [ ] | | [m] | [s] | [s] | [m] | [s] | [s] | [m] | [s] | [s] |
| 29722-01 | 29700-01 | 3.5385 | 7.309 | 5.594 | | | | | | |
| -02 | -02 | 3.5518 | 7.653 | 5.727 | | | | | | |
| -03 | -03 | 3.5532 | 7.421 | 5.713 | | | | | | |
| -04 | -04 | 3.5634 | 7.544 | 5.689 | | | | | | |
| -05 | -05 | 3.5575 | 7.651 | 5.695 | | | | | | |
| -06 | -06 | 3.5458 | 7.509 | 5.777 | | | | | | |
| -07 | -07 | 3.5593 | 7.422 | 5.655 | | | | | | |
| -08 | -08 | 3.5537 | 7.525 | 5.799 | | | | | | |
| -09 | -09 | 3.5552 | 7.385 | 5.775 | | | | | | |
| -10 | -10 | 3.5559 | 7.557 | 5.724 | | | | | | |

# Summary of the Measured Wave and Roll Time Realisations

## Model No. 2458A

## Project: “EMSA”

**Damage Case-2 R7P15.16.2.0-1**

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 2.00**

**Test No.: 29708-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29708-01 | Roll Angle [deg]* | 0.112 | 0.447 | -3.054 | -3.866 | -3.529 | 658 | 30 |
| | Pitch Angle [deg]** | 0.079 | 0.317 | 0.875 | 0.266 | 0.59 | | |
| | Heave | 0.119 | 0.477 | 0.459 | -0.424 | 0.048 | | |
| | Wave Elevation (fix) [m] | - | - | 2.044 | -1.862 | -0.031 | | |
| -02 | Roll Angle [deg]* | 0.161 | 0.644 | -3.28 | -4.255 | -3.628 | 649 | 30 |
| | Pitch Angle [deg]** | 0.054 | 0.217 | 0.807 | 0.407 | 0.605 | | |
| | Heave | 0.12 | 0.481 | 0.499 | -0.384 | 0.043 | | |
| | Wave Elevation (fix) [m] | - | - | 2.287 | -1.74 | -0.168 | | |
| -03 | Roll Angle [deg]* | 0.173 | 0.693 | -2.74 | -4.601 | -3.585 | 759.7 | 30 |
| | Pitch Angle [deg]** | 0.067 | 0.269 | 0.904 | 0.31 | 0.611 | | |
| | Heave | 0.139 | 0.558 | 0.538 | -0.384 | 0.083 | | |
| | Wave Elevation (fix) [m] | - | - | 2.267 | -2.063 | -0.101 | | |
| -04 | Roll Angle [deg]* | 0.155 | 0.618 | -2.974 | -4.28 | -3.592 | 560 | 30 |
| | Pitch Angle [deg]** | 0.083 | 0.33 | 0.947 | 0.324 | 0.621 | | |
| | Heave | 0.124 | 0.498 | 0.507 | -0.501 | 0.085 | | |
| | Wave Elevation (fix) [m] | - | - | 2.398 | -1.77 | 0.012 | | |
| -05 | Roll Angle [deg]* | 0.152 | 0.607 | -2.945 | -4.01 | -3.495 | 516 | 30 |
| | Pitch Angle [deg]** | 0.087 | 0.35 | 0.911 | 0.324 | 0.622 | | |
| | Heave | 0.115 | 0.459 | 0.59 | -0.347 | 0.092 | | |
| | Wave Elevation (fix) [m] | - | - | 2.012 | -1.626 | 0.051 | | |
| -06 | Roll Angle [deg]* | 0.177 | 0.707 | -2.819 | -4.28 | -3.516 | 600.4 | 30 |
| | Pitch Angle [deg]** | 0.099 | 0.397 | 0.94 | 0.324 | 0.626 | | |
| | Heave | 0.113 | 0.452 | 0.482 | -0.306 | 0.114 | | |
| | Wave Elevation (fix) [m] | - | - | 1.813 | -1.877 | -0.082 | | |
| -07 | Roll Angle [deg]* | 0.205 | 0.821 | -3.02 | -4.266 | -3.646 | 740.3 | 30 |
| | Pitch Angle [deg]** | 0.093 | 0.372 | 1.051 | 0.23 | 0.628 | | |
| | Heave | 0.131 | 0.525 | 0.541 | -0.314 | 0.09 | | |
| | Wave Elevation (fix) [m] | - | - | 2.297 | -1.88 | -0.075 | | |
| -08 | Roll Angle [deg]* | 0.219 | 0.874 | -3.179 | -4.504 | -3.683 | 651.7 | 30 |
| | Pitch Angle [deg]** | 0.096 | 0.385 | 1.012 | 0.288 | 0.637 | | |
| | Heave | 0.131 | 0.524 | 0.584 | -0.235 | 0.14 | | |
| | Wave Elevation (fix) [m] | - | - | 2.648 | -1.877 | -0.052 | | |
| -09 | Roll Angle [deg]* | 0.154 | 0.617 | -3.024 | -4.118 | -3.542 | 615.7 | 30 |
| | Pitch Angle [deg]** | 0.096 | 0.383 | 0.976 | 0.317 | 0.644 | | |
| | Heave | 0.1 | 0.399 | 0.958 | 0.034 | 0.501 | | |
| | Wave Elevation (fix) [m] | - | - | 2.179 | -1.946 | -0.058 | | |
| -10 | Roll Angle [deg]* | 0.167 | 0.67 | -2.801 | -4.082 | -3.538 | 617.2 | 30 |
| | Pitch Angle [deg]** | 0.092 | 0.368 | 0.997 | 0.288 | 0.642 | | |
| | Heave | 0.098 | 0.391 | 0.445 | -0.342 | 0.002 | | |
| | Wave Elevation (fix) [m] | - | - | 1.944 | -1.859 | -0.14 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 2.50**

**Test No.: 29709-01 to 05** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29709-01 | Roll Angle [deg]* | 0.237 | 0.949 | -2.765 | -4.702 | -3.582 | 766.2 | 30 |
| | Pitch Angle [deg]** | 0.124 | 0.495 | 1.13 | 0.212 | 0.664 | | |
| | Heave | 0.203 | 0.811 | 0.968 | -0.622 | 0.13 | | |
| | Wave Elevation (fix) [m] | - | - | 2.562 | -1.982 | 0.02 | | |
| -02 | Roll Angle [deg]* | 0.315 | 1.26 | -2.786 | -4.824 | -3.732 | 810.1 | 30 |
| | Pitch Angle [deg]** | 0.139 | 0.554 | 1.109 | 0.223 | 0.657 | | |
| | Heave | 0.199 | 0.796 | 0.758 | -0.474 | 0.088 | | |
| | Wave Elevation (fix) [m] | - | - | 2.571 | -1.976 | 0.017 | | |
| -03 | Roll Angle [deg]* | 0.35 | 1.402 | -2.657 | -5.353 | -3.759 | 730.1 | 30 |
| | Pitch Angle [deg]** | 0.155 | 0.621 | 1.318 | -0.007 | 0.665 | | |
| | Heave | 0.193 | 0.773 | 1.062 | -0.563 | 0.141 | | |
| | Wave Elevation (fix) [m] | - | - | 2.816 | -2.463 | -0.094 | | |
| -04 | Roll Angle [deg]* | 0.206 | 0.824 | -2.722 | -4.19 | -3.542 | 769.7 | 30 |
| | Pitch Angle [deg]** | 0.18 | 0.719 | 1.404 | -0.094 | 0.664 | | |
| | Heave | 0.133 | 0.532 | 0.787 | -0.47 | 0.121 | | |
| | Wave Elevation (fix) [m] | - | - | 2.82 | -1.949 | -0.023 | | |
| -05 | Roll Angle [deg]* | 0.262 | 1.049 | -3.074 | -5.458 | -3.989 | 737 | 30 |
| | Pitch Angle [deg]** | 0.152 | 0.608 | 1.303 | -0.011 | 0.672 | | |
| | Heave | 0.157 | 0.629 | 0.821 | -0.779 | -0.023 | | |
| | Wave Elevation (fix) [m] | - | - | 2.518 | -2.283 | -0.154 | | |
| -06 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -07 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -08 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -09 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -10 | Roll Angle [deg]* | | | | | | | |
| | Pitch Angle [deg]** | | | | | | | |
| | Heave | | | | | | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.00**

**Test No.: 29710-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29710-01 | Roll Angle [deg]* | 1.036 | 4.143 | -2.653 | -7.391 | -4.057 | 689.6 | 30 |
| | Pitch Angle [deg]** | 0.243 | 0.97 | 1.44 | -0.126 | 0.651 | | |
| | Heave | 0.261 | 1.043 | 1.384 | -1.448 | -0.023 | | |
| | Wave Elevation (fix) [m] | - | - | 2.835 | -2.474 | -0.176 | | |
| -02 | Roll Angle [deg]* | 0.409 | 1.632 | -2.747 | -5.468 | -3.917 | 797.2 | 30 |
| | Pitch Angle [deg]** | 0.262 | 1.048 | 1.532 | -0.18 | 0.661 | | |
| | Heave | 0.24 | 0.962 | 0.875 | -0.843 | -0.024 | | |
| | Wave Elevation (fix) [m] | - | - | 2.696 | -2.74 | -0.171 | | |
| -03 | Roll Angle [deg]* | 0.308 | 1.233 | -2.761 | -4.856 | -3.716 | 774.5 | 30 |
| | Pitch Angle [deg]** | 0.227 | 0.908 | 1.336 | -0.058 | 0.66 | | |
| | Heave | 0.212 | 0.848 | 0.963 | -0.758 | 0.088 | | |
| | Wave Elevation (fix) [m] | - | - | 2.902 | -2.631 | -0.083 | | |
| -04 | Roll Angle [deg]* | 0.682 | 2.727 | -2.243 | -7.276 | -4.476 | 656.6 | 30 |
| | Pitch Angle [deg]** | 0.229 | 0.918 | 1.494 | -0.061 | 0.693 | | |
| | Heave | 0.264 | 1.057 | 1.458 | -0.92 | 0.203 | | |
| | Wave Elevation (fix) [m] | - | - | 3.652 | -2.487 | 0.007 | | |
| -05 | Roll Angle [deg]* | 0.543 | 2.171 | -2.606 | -5.803 | -4.061 | 743.1 | 30 |
| | Pitch Angle [deg]** | 0.22 | 0.879 | 1.512 | -0.191 | 0.677 | | |
| | Heave | 0.262 | 1.048 | 1 | -0.984 | 0 | | |
| | Wave Elevation (fix) [m] | - | - | 3.255 | -2.728 | -0.029 | | |
| -06 | Roll Angle [deg]* | 0.56 | 2.242 | -3.125 | -6.116 | -4.226 | 808.5 | 30 |
| | Pitch Angle [deg]** | 0.153 | 0.614 | 1.386 | 0.058 | 0.675 | | |
| | Heave | 0.273 | 1.093 | 1.162 | -1.088 | 0.041 | | |
| | Wave Elevation (fix) [m] | - | - | 3.402 | -2.549 | 0.049 | | |
| -07 | Roll Angle [deg]* | 0.585 | 2.339 | -2.75 | -6.311 | -4.468 | 783.7 | 30 |
| | Pitch Angle [deg]** | 0.169 | 0.675 | 1.339 | 0.043 | 0.702 | | |
| | Heave | 0.284 | 1.137 | 1.053 | -0.88 | 0.074 | | |
| | Wave Elevation (fix) [m] | - | - | 3.142 | -2.469 | -0.122 | | |
| -08 | Roll Angle [deg]* | 0.219 | 0.874 | -3.179 | -4.504 | -3.683 | 651.7 | 30 |
| | Pitch Angle [deg]** | 0.096 | 0.385 | 1.012 | 0.288 | 0.637 | | |
| | Heave | 0.131 | 0.524 | 0.584 | -0.235 | 0.14 | | |
| | Wave Elevation (fix) [m] | - | - | 2.642 | -2.455 | -0.061 | | |
| -09 | Roll Angle [deg]* | 0.943 | 3.774 | -2.74 | -8.154 | -4.938 | 873.5 | 30 |
| | Pitch Angle [deg]** | 0.199 | 0.795 | 1.465 | -0.122 | 0.721 | | |
| | Heave | 0.283 | 1.133 | 1.325 | -1.222 | 0.023 | | |
| | Wave Elevation (fix) [m] | - | - | 3.853 | -2.302 | 0.039 | | |
| -10 | Roll Angle [deg]* | 0.682 | 2.729 | -2.668 | -6.642 | -4.449 | 763 | 30 |
| | Pitch Angle [deg]** | 0.207 | 0.828 | 1.703 | -0.241 | 0.7 | | |
| | Heave | 0.288 | 1.153 | 0.987 | -1.08 | -0.062 | | |
| | Wave Elevation (fix) [m] | - | - | 3.002 | -2.582 | -0.035 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.50**

**Test No.: 29711-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29711-01 | Roll Angle [deg]* | 3.567 | 14.268 | -2.534 | -27.24 | -4.93 | 693.9 | 30 |
| | Pitch Angle [deg]** | 0.263 | 1.053 | 1.75 | -0.439 | 0.699 | | |
| | Heave | 0.369 | 1.478 | 1.89 | -1.774 | 0.035 | | |
| | Wave Elevation (fix) [m] | - | - | 3.719 | -2.676 | 0.024 | | |
| -02 | Roll Angle [deg]* | 0.545 | 2.182 | -2.444 | -5.933 | -4.198 | 680.7 | 30 |
| | Pitch Angle [deg]** | 0.235 | 0.941 | 1.48 | -0.277 | 0.683 | | |
| | Heave | 0.331 | 1.323 | 1.141 | -1.019 | 0.022 | | |
| | Wave Elevation (fix) [m] | - | - | 3.106 | -3.088 | -0.09 | | |
| -03 | Roll Angle [deg]* | 1.287 | 5.146 | -0.371 | -13.975 | -4.725 | 810.2 | 28 |
| | Pitch Angle [deg]** | 0.281 | 1.125 | 1.706 | -0.385 | 0.7 | | |
| | Heave | 0.333 | 1.333 | 1.512 | -1.266 | 0.105 | | |
| | Wave Elevation (fix) [m] | - | - | 4.162 | -2.923 | -0.136 | | |
| -04 | Roll Angle [deg]* | 2.704 | 10.817 | -2.164 | -22.367 | -5.027 | 773.8 | 25 |
| | Pitch Angle [deg]** | 0.242 | 0.966 | 1.541 | -0.191 | 0.725 | | |
| | Heave | 0.349 | 1.388 | 1.808 | -1.712 | -0.047 | | |
| | Wave Elevation (fix) [m] | - | - | 4.008 | -2.943 | 0.027 | | |
| -05 | Roll Angle [deg]* | 0.419 | 1.677 | -2.646 | -5.368 | -3.984 | 645.6 | 30 |
| | Pitch Angle [deg]** | 0.278 | 1.114 | 1.742 | -0.389 | 0.711 | | |
| | Heave | 0.255 | 1.019 | 1.109 | -0.866 | 0.119 | | |
| | Wave Elevation (fix) [m] | - | - | 3.51 | -2.533 | 0.095 | | |
| -06 | Roll Angle [deg]* | 0.786 | 3.142 | -2.452 | -7.326 | -4.143 | 675.6 | 28 |
| | Pitch Angle [deg]** | 0.262 | 1.048 | 1.609 | -0.0216 | 0.715 | | |
| | Heave | 0.296 | 1.183 | 1.694 | -1.224 | 0.109 | | |
| | Wave Elevation (fix) [m] | - | - | 3.91 | -3.303 | 0 | | |
| -07 | Roll Angle [deg]* | 0.398 | 1.592 | -2.866 | -5.756 | -4.011 | 708.5 | 30 |
| | Pitch Angle [deg]** | 0.29 | 1.16 | 1.638 | -0.23 | 0.712 | | |
| | Heave | 0.303 | 1.211 | 1.086 | -0.955 | 0.039 | | |
| | Wave Elevation (fix) [m] | - | - | 3.457 | -2.684 | -0.099 | | |
| -08 | Roll Angle [deg]* | 0.82 | 3.279 | -2.002 | -7.096 | -4.264 | 784.8 | 30 |
| | Pitch Angle [deg]** | 0.302 | 1.21 | 1.627 | -0.227 | 0.719 | | |
| | Heave | 0.302 | 1.209 | 1.266 | -1.333 | -0.03 | | |
| | Wave Elevation (fix) [m] | - | - | 3.295 | -2.92 | -0.006 | | |
| -09 | Roll Angle [deg]* | 0.47 | 1.881 | -2.776 | -6.818 | -4.239 | 680.7 | 28 |
| | Pitch Angle [deg]** | 0.307 | 1.227 | 1.854 | -0.371 | 0.716 | | |
| | Heave | 0.273 | 1.093 | 1.16 | -0.917 | 0.052 | | |
| | Wave Elevation (fix) [m] | - | - | 3.366 | -2.561 | -0.044 | | |
| -10 | Roll Angle [deg]* | 0.631 | 2.526 | -2.336 | -6.908 | -4.21 | 765.5 | 30 |
| | Pitch Angle [deg]** | 0.307 | 1.227 | 1.692 | -0.324 | 0.711 | | |
| | Heave | 0.285 | 1.139 | 1.253 | -0.955 | 0.097 | | |
| | Wave Elevation (fix) [m] | - | - | 3.793 | -2.73 | -0.019 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 4.00**

**Test No.: 29712-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29712-01 | Roll Angle [deg]* | 2.07 | 8.279 | 4.381 | -16.47 | -4.289 | 774.9 | 30 |
| | Pitch Angle [deg]** | 0.219 | 0.877 | 1.57 | -0.112 | 0.707 | | |
| | Heave | 0.453 | 1.812 | 1.584 | -1.232 | 0.134 | | |
| | Wave Elevation (fix) [m] | - | - | 3.633 | -3.117 | -0.128 | | |
| -02 | Roll Angle [deg]* | 2.329 | 9.316 | 1.015 | -16.24 | -4.968 | 400.5 | 9 |
| | Pitch Angle [deg]** | 0.229 | 0.917 | 1.49 | -0.047 | 0.701 | | |
| | Heave | 0.495 | 1.979 | 1.694 | -1.547 | 0.101 | | |
| | Wave Elevation (fix) [m] | - | - | 3.39 | -2.7 | -0.145 | | |
| -03 | Roll Angle [deg]* | 3.025 | 12.101 | -0.522 | -14.68 | -5.797 | 149.8 | 3.5 |
| | Pitch Angle [deg]** | 0.22 | 0.878 | 1.361 | 0.108 | 0.713 | | |
| | Heave | 0.649 | 2.598 | 1.957 | -2.222 | -0.067 | | |
| | Wave Elevation (fix) [m] | - | - | 3.545 | -2.704 | 0.081 | | |
| -04 | Roll Angle [deg]* | 3.366 | 13.465 | -1.98 | -23 | -6.293 | 424.8 | 10 |
| | Pitch Angle [deg]** | 0.199 | 0.797 | 1.303 | -0.108 | 0.664 | | |
| | Heave | 0.464 | 1.855 | 1.496 | -1.39 | 0.024 | | |
| | Wave Elevation (fix) [m] | - | - | 3.025 | -2.828 | 0.014 | | |
| -05 | Roll Angle [deg]* | 2.634 | 10.536 | 1.217 | -16.553 | -5.427 | 312.7 | 11 |
| | Pitch Angle [deg]** | 0.204 | 0.817 | 1.4 | 0.014 | 0.681 | | |
| | Heave | 0.523 | 2.093 | 1.589 | -1.643 | -0.001 | | |
| | Wave Elevation (fix) [m] | - | - | 3.772 | -2.884 | -0.068 | | |
| -06 | Roll Angle [deg]* | 2.284 | 9.136 | -0.011 | -15.847 | -5.181 | 434.4 | 13.5 |
| | Pitch Angle [deg]** | 0.176 | 0.702 | 1.231 | 0.184 | 0.675 | | |
| | Heave | 0.467 | 1.868 | 1.31 | -1.282 | 0.005 | | |
| | Wave Elevation (fix) [m] | - | - | 3.992 | -3.004 | -0.007 | | |
| -07 | Roll Angle [deg]* | 2.433 | 9.732 | -2.93 | -17.474 | -5.161 | 380.5 | 12.5 |
| | Pitch Angle [deg]** | 0.168 | 0.672 | 1.202 | 0.101 | 0.711 | | |
| | Heave | 0.464 | 1.856 | 1.41 | -1.17 | 0.057 | | |
| | Wave Elevation (fix) [m] | - | - | 3.785 | -2.802 | 0.024 | | |
| -08 | Roll Angle [deg]* | 2.546 | 10.184 | -3.19 | -17.87 | -6.143 | 358.7 | 11 |
| | Pitch Angle [deg]** | 0.2 | 0.8 | 1.393 | 0.148 | 0.741 | | |
| | Heave | 0.496 | 1.986 | 1.627 | -1.8 | -0.013 | | |
| | Wave Elevation (fix) [m] | - | - | 3.397 | -2.756 | -0.022 | | |
| -09 | Roll Angle [deg]* | 4.95 | 19.8 | 6.57 | -20.668 | -7.243 | 266.5 | 5 |
| | Pitch Angle [deg]** | 0.228 | 0.912 | 1.357 | 0.061 | 0.741 | | |
| | Heave | 0.496 | 1.985 | 2.187 | -2.066 | -0.058 | | |
| | Wave Elevation (fix) [m] | - | - | 3.603 | -3.089 | -0.072 | | |
| -10 | Roll Angle [deg]* | 2.168 | 8.672 | -2.128 | -15.707 | -5.513 | 330.5 | 11 |
| | Pitch Angle [deg]** | 0.152 | 0.608 | 1.238 | 0.209 | 0.724 | | |
| | Heave | 0.49 | 1.96 | 1.573 | -1.48 | 0.059 | | |
| | Wave Elevation (fix) [m] | - | - | 3.101 | -2.72 | 0.029 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.25**

**Test No.: 29713-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29713-01 | Roll Angle [deg]* | 2.289 | 9.155 | 0.536 | -22.111 | -4.729 | 753.8 | 29 |
| | Pitch Angle [deg]** | 0.205 | 0.82 | 1.426 | -0.022 | 0.713 | | |
| | Heave | 0.31 | 1.241 | 1.426 | -1.253 | 0.04 | | |
| | Wave Elevation (fix) [m] | - | - | 3.586 | -2.694 | 0.007 | | |
| -02 | Roll Angle [deg]* | 0.501 | 2.003 | -2.675 | -5.465 | -3.747 | 615.1 | 30 |
| | Pitch Angle [deg]** | 0.234 | 0.935 | 1.368 | -0.173 | 0.691 | | |
| | Heave | 0.255 | 1.018 | 0.982 | -0.819 | 0.037 | | |
| | Wave Elevation (fix) [m] | - | - | 3.503 | -2.403 | 0.016 | | |
| -03 | Roll Angle [deg]* | 0.883 | 3.533 | -2.592 | -7.495 | -4.415 | 741.1 | 30 |
| | Pitch Angle [deg]** | 0.249 | 0.997 | 1.537 | -0.22 | 0.706 | | |
| | Heave | 0.267 | 1.067 | 1.013 | -0.971 | -0.016 | | |
| | Wave Elevation (fix) [m] | - | - | 3.242 | -2.234 | -0.028 | | |
| -04 | Roll Angle [deg]* | 3.256 | 13.023 | 6.577 | -21.942 | -4.776 | 639 | 30 |
| | Pitch Angle [deg]** | 0.256 | 1.023 | 1.526 | -0.22 | 0.732 | | |
| | Heave | 0.304 | 1.215 | 1.595 | -1.23 | 0.143 | | |
| | Wave Elevation (fix) [m] | - | - | 3.474 | -2.921 | -0.172 | | |
| -05 | Roll Angle [deg]* | 0.586 | 2.346 | -2.675 | -6.516 | -4.188 | 677 | 30 |
| | Pitch Angle [deg]** | 0.255 | 1.018 | 1.753 | -0.353 | 0.704 | | |
| | Heave | 0.257 | 1.027 | 0.893 | -0.97 | -0.049 | | |
| | Wave Elevation (fix) [m] | - | - | 3.621 | -2.655 | 0.02 | | |
| -06 | Roll Angle [deg]* | 0.375 | 1.499 | -2.934 | -5.278 | -3.825 | 664.3 | 30 |
| | Pitch Angle [deg]** | 0.217 | 0.869 | 1.595 | -0.187 | 0.683 | | |
| | Heave | 0.231 | 0.922 | 1.126 | -1.152 | -0.036 | | |
| | Wave Elevation (fix) [m] | - | - | 3.877 | -2.788 | -0.058 | | |
| -07 | Roll Angle [deg]* | 0.311 | 1.244 | -2.47 | -4.712 | -3.615 | 607.3 | 30 |
| | Pitch Angle [deg]** | 0.271 | 1.085 | 1.562 | -0.158 | 0.685 | | |
| | Heave | 0.204 | 0.817 | 0.81 | -0.701 | 0.028 | | |
| | Wave Elevation (fix) [m] | - | - | 3.162 | -2.647 | -0.058 | | |
| -08 | Roll Angle [deg]* | 0.79 | 3.161 | -2.804 | -7.758 | -4.696 | 868.1 | 30 |
| | Pitch Angle [deg]** | 0.195 | 0.781 | 1.429 | -0.007 | 0.724 | | |
| | Heave | 0.33 | 1.322 | 1.214 | -1.048 | 0.002 | | |
| | Wave Elevation (fix) [m] | - | - | 2.79 | -2.48 | -0.215 | | |
| -09 | Roll Angle [deg]* | 2.415 | 9.66 | -2.574 | -21.456 | -6.15 | 799.1 | 25.5 |
| | Pitch Angle [deg]** | 0.234 | 0.935 | 1.66 | -0.205 | 0.765 | | |
| | Heave | 0.345 | 1.378 | 1.472 | -1.549 | -0.06 | | |
| | Wave Elevation (fix) [m] | - | - | 3.242 | -2.625 | -0.246 | | |
| -10 | Roll Angle [deg]* | 2.71 | 10.841 | -2.56 | -21.038 | -5.931 | 588.6 | 19 |
| | Pitch Angle [deg]** | 0.234 | 0.936 | 1.616 | -0.191 | 0.758 | | |
| | Heave | 0.365 | 1.459 | 1.347 | -1.014 | 0.165 | | |
| | Wave Elevation (fix) [m] | - | - | 3.2 | -3.173 | -0.14 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.75**

**Test No.: 29714-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29714-01 | Roll Angle [deg]* | 3.718 | 14.87 | -2.286 | -24.901 | -6.648 | 373.8 | 11 |
| | Pitch Angle [deg]** | 0.248 | 0.992 | 1.573 | -0.122 | 0.738 | | |
| | Heave | 0.459 | 1.838 | 1.467 | -1.464 | -0.061 | | |
| | Wave Elevation (fix) [m] | - | - | 2.866 | -3.098 | -0.132 | | |
| -02 | Roll Angle [deg]* | 2.28 | 9.118 | -2.059 | -18.446 | -5.171 | 481.8 | 16 |
| | Pitch Angle [deg]** | 0.232 | 0.928 | 1.39 | 0 | 0.685 | | |
| | Heave | 0.38 | 1.519 | 1.176 | -1.208 | -0.024 | | |
| | Wave Elevation (fix) [m] | - | - | 2.99 | -2.658 | -0.161 | | |
| -03 | Roll Angle [deg]* | 2.317 | 9.268 | -3.035 | -20.002 | -5.815 | 416.3 | 13.5 |
| | Pitch Angle [deg]** | 0.249 | 0.994 | 1.627 | -0.122 | 0.756 | | |
| | Heave | 0.431 | 1.726 | 2.205 | -1.798 | 0.108 | | |
| | Wave Elevation (fix) [m] | - | - | 3.73 | -2.776 | -0.008 | | |
| -04 | Roll Angle [deg]* | 2.553 | 10.212 | -2.786 | -21.582 | -5.501 | 541.9 | 16 |
| | Pitch Angle [deg]** | 0.217 | 0.869 | 1.512 | -0.058 | 0.742 | | |
| | Heave | 0.425 | 1.699 | 2.437 | -2.197 | 0.023 | | |
| | Wave Elevation (fix) [m] | - | - | 2.986 | -2.487 | -0.039 | | |
| -05 | Roll Angle [deg]* | 2.751 | 11.003 | -2.912 | -20.894 | -5.635 | 486.2 | 11 |
| | Pitch Angle [deg]** | 0.237 | 0.948 | 1.627 | 0.05 | 0.705 | | |
| | Heave | 0.471 | 1.885 | 1.68 | -1.826 | -0.02 | | |
| | Wave Elevation (fix) [m] | - | - | 3.786 | -3.174 | 0.01 | | |
| -06 | Roll Angle [deg]* | 2.309 | 9.236 | 0.335 | -21.25 | -6.091 | 801 | 25.5 |
| | Pitch Angle [deg]** | 0.237 | 0.947 | 1.609 | -0.216 | 0.769 | | |
| | Heave | 0.422 | 1.687 | 1.558 | -1.667 | 0.098 | | |
| | Wave Elevation (fix) [m] | - | - | 3.88 | -3.892 | -0.044 | | |
| -07 | Roll Angle [deg]* | 1.847 | 7.388 | -2.232 | -16.574 | -5.233 | 759.5 | 25.5 |
| | Pitch Angle [deg]** | 0.259 | 1.037 | 1.609 | -0.14 | 0.716 | | |
| | Heave | 0.412 | 1.649 | 1.354 | -1.434 | 0.013 | | |
| | Wave Elevation (fix) [m] | - | - | 4.044 | -2.558 | 0.073 | | |
| -08 | Roll Angle [deg]* | 2.326 | 9.303 | -1.458 | -17.737 | -5.609 | 533.1 | 20 |
| | Pitch Angle [deg]** | 0.262 | 1.049 | 1.976 | -0.475 | 0.758 | | |
| | Heave | 0.395 | 1.582 | 2.003 | -1.683 | 0.129 | | |
| | Wave Elevation (fix) [m] | - | - | 3.56 | -2.82 | -0.023 | | |
| -09 | Roll Angle [deg]* | 2.699 | 10.796 | 2.408 | -20.675 | -6.151 | 702.3 | 22.5 |
| | Pitch Angle [deg]** | 0.293 | 1.173 | 1.584 | -0.155 | 0.761 | | |
| | Heave | 0.431 | 1.723 | 2.374 | -2.029 | 0.075 | | |
| | Wave Elevation (fix) [m] | - | - | 3.716 | -2.982 | -0.063 | | |
| -10 | Roll Angle [deg]* | 2.71 | 10.839 | -2.772 | -19.796 | -5.406 | 355.6 | 12.5 |
| | Pitch Angle [deg]** | 0.293 | 1.171 | 1.516 | -0.154 | 0.748 | | |
| | Heave | 0.437 | 1.748 | 1.934 | -1.458 | 0.031 | | |
| | Wave Elevation (fix) [m] | - | - | 4.161 | -3.069 | 0.036 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.50**

**Test No.: 29715-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29715-01 | Roll Angle [deg]* | 0.842 | 3.367 | -2.606 | -7.657 | -4.183 | 736.2 | 30 |
| | Pitch Angle [deg]** | 0.28 | 1.121 | 1.562 | -0.101 | 0.714 | | |
| | Heave | 0.315 | 1.26 | 1.48 | -1.435 | -0.007 | | |
| | Wave Elevation (fix) [m] | - | - | 3.617 | -3.511 | 0.02 | | |
| -02 | Roll Angle [deg]* | 2.123 | 8.492 | -2.11 | -19.256 | -5.471 | 723.4 | 27.5 |
| | Pitch Angle [deg]** | 0.278 | 1.11 | 1.706 | -0.122 | 0.747 | | |
| | Heave | 0.338 | 1.35 | 1.16 | -1.077 | 0.045 | | |
| | Wave Elevation (fix) [m] | - | - | 3.6 | -2.657 | -0.076 | | |
| -03 | Roll Angle [deg]* | 1.241 | 4.965 | -2.855 | -9.068 | -4.791 | 815.4 | 30 |
| | Pitch Angle [deg]** | 0.289 | 1.155 | 1.739 | -0.317 | 0.73 | | |
| | Heave | 0.333 | 1.331 | 1.264 | -1.2 | 0.009 | | |
| | Wave Elevation (fix) [m] | - | - | 4.088 | -2.593 | -0.015 | | |
| -04 | Roll Angle [deg]* | 0.421 | 1.683 | -3.143 | -5.789 | -4.169 | 478.6 | 30 |
| | Pitch Angle [deg]** | 0.165 | 0.659 | 1.217 | 0.018 | 0.613 | | |
| | Heave | 0.323 | 1.293 | 1.502 | -1.054 | 0.19 | | |
| | Wave Elevation (fix) [m] | - | - | 3.501 | -2.91 | 0.136 | | |
| -05 | Roll Angle [deg]* | 2.358 | 9.432 | 0.702 | -19.044 | -5.861 | 514.3 | 22 |
| | Pitch Angle [deg]** | 0.238 | 0.953 | 1.408 | -0.126 | 0.651 | | |
| | Heave | 0.405 | 1.618 | 2.309 | -0.36 | 0.864 | | |
| | Wave Elevation (fix) [m] | - | - | 3.251 | -2.528 | -0.011 | | |
| -06 | Roll Angle [deg]* | 2.899 | 11.598 | -0.313 | -21.956 | -5.707 | 522.6 | 17 |
| | Pitch Angle [deg]** | 0.235 | 0.939 | 1.4 | -0.158 | 0.66 | | |
| | Heave | 0.405 | 1.62 | 1.501 | -1.2 | 0.095 | | |
| | Wave Elevation (fix) [m] | - | - | 2.82 | -2.556 | -0.043 | | |
| -07 | Roll Angle [deg]* | 0.61 | 2.441 | -2.527 | -6.156 | -4.208 | 632.4 | 30 |
| | Pitch Angle [deg]** | 0.242 | 0.967 | 1.537 | -0.378 | 0.637 | | |
| | Heave | 0.31 | 1.239 | 1.579 | -1.342 | 0.1 | | |
| | Wave Elevation (fix) [m] | - | - | 3.643 | -2.85 | 0.091 | | |
| -08 | Roll Angle [deg]* | 0.864 | 3.457 | -2.851 | -7.52 | -4.455 | 638.3 | 22 |
| | Pitch Angle [deg]** | 0.255 | 1.019 | 1.541 | -0.202 | 0.646 | | |
| | Heave | 0.333 | 1.333 | 1.739 | -1.336 | 0.096 | | |
| | Wave Elevation (fix) [m] | - | - | 3.192 | -3.09 | 0.027 | | |
| -09 | Roll Angle [deg]* | 0.71 | 2.84 | -2.887 | -7.027 | -4.525 | 550.6 | 30 |
| | Pitch Angle [deg]** | 0.26 | 1.04 | 1.462 | -0.184 | 0.64 | | |
| | Heave | 0.348 | 1.391 | 1.555 | -1.053 | 0.212 | | |
| | Wave Elevation (fix) [m] | - | - | 3.664 | -3.166 | -0.032 | | |
| -10 | Roll Angle [deg]* | 2.153 | 8.613 | -2.578 | -19.451 | -5.293 | 672.6 | 30 |
| | Pitch Angle [deg]** | 0.255 | 1.021 | 1.53 | -0.41 | 0.649 | | |
| | Heave | 0.369 | 1.474 | 1.454 | -1.294 | 0.042 | | |
| | Wave Elevation (fix) [m] | - | - | 3.61 | -2.749 | 0.068 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.75**

**Test No.: 29716-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29716-01 | Roll Angle [deg]* | 0.891 | 3.563 | -2.408 | -7.877 | -4.09 | 566.7 | 30 |
| | Pitch Angle [deg]** | 0.273 | 1.09 | 1.354 | -0.097 | 0.637 | | |
| | Heave | 0.453 | 1.812 | 1.811 | -1.677 | 0.023 | | |
| | Wave Elevation (fix) [m] | - | - | 3.62 | -2.865 | 0.004 | | |
| -02 | Roll Angle [deg]* | 2.787 | 11.147 | -1.75 | -21.55 | -5.883 | 602.5 | 27 |
| | Pitch Angle [deg]** | 0.295 | 1.179 | 1.804 | -0.342 | 0.662 | | |
| | Heave | 0.456 | 1.825 | 1.798 | -1.533 | 0.062 | | |
| | Wave Elevation (fix) [m] | - | - | 3.876 | -2.792 | -0.095 | | |
| -03 | Roll Angle [deg]* | 0.839 | 3.357 | -2.228 | -8.082 | -4.374 | 528.1 | 30 |
| | Pitch Angle [deg]** | 0.327 | 1.308 | 1.984 | -0.824 | 0.636 | | |
| | Heave | 0.433 | 1.732 | 1.792 | -1.574 | 0.048 | | |
| | Wave Elevation (fix) [m] | - | - | 3.84 | -3.219 | 0.026 | | |
| -04 | Roll Angle [deg]* | 0.604 | 2.418 | -2.542 | -6.862 | -4.581 | 518.6 | 30 |
| | Pitch Angle [deg]** | 0.287 | 1.147 | 1.814 | -0.518 | 0.655 | | |
| | Heave | 0.424 | 1.694 | 1.533 | -1.546 | 0.009 | | |
| | Wave Elevation (fix) [m] | - | - | 3.719 | -2.684 | 0.042 | | |
| -05 | Roll Angle [deg]* | 0.892 | 3.567 | -1.228 | -7.495 | -4.134 | 483.7 | 30 |
| | Pitch Angle [deg]** | 0.321 | 1.283 | 1.66 | -0.457 | 0.62 | | |
| | Heave | 0.395 | 1.58 | 1.73 | -1.362 | 0.101 | | |
| | Wave Elevation (fix) [m] | - | - | 4.774 | -2.976 | 0.032 | | |
| -06 | Roll Angle [deg]* | 2.392 | 9.569 | -2.884 | -21.424 | -5.244 | 561.7 | 23 |
| | Pitch Angle [deg]** | 0.309 | 1.237 | 1.49 | -0.173 | 0.689 | | |
| | Heave | 0.419 | 1.676 | 1.41 | -1.218 | 0.027 | | |
| | Wave Elevation (fix) [m] | - | - | 3.305 | -2.706 | 0.037 | | |
| -07 | Roll Angle [deg]* | 3.405 | 13.622 | -0.403 | -25.006 | -6.535 | 850.2 | 27.5 |
| | Pitch Angle [deg]** | 0.315 | 1.261 | 1.789 | -0.22 | 0.718 | | |
| | Heave | 0.413 | 1.652 | 1.434 | -1.424 | 0.022 | | |
| | Wave Elevation (fix) [m] | - | - | 3.819 | -3.791 | 0.014 | | |
| -08 | Roll Angle [deg]* | 2.863 | 11.453 | -1.156 | -21.276 | -6.264 | 547.5 | 19.5 |
| | Pitch Angle [deg]** | 0.297 | 1.188 | 1.602 | -0.31 | 0.709 | | |
| | Heave | 0.383 | 1.533 | 1.478 | -1.261 | 0.033 | | |
| | Wave Elevation (fix) [m] | - | - | 3.324 | -3.128 | -0.134 | | |
| -09 | Roll Angle [deg]* | 2.395 | 9.581 | -0.414 | -20.02 | 5.559 | 704.9 | 25 |
| | Pitch Angle [deg]** | 0.343 | 1.372 | 1.71 | -0.407 | 0.694 | | |
| | Heave | 0.363 | 1.452 | 1.778 | -1.643 | 0.013 | | |
| | Wave Elevation (fix) [m] | - | - | 3.307 | -2.97 | 0.056 | | |
| -10 | Roll Angle [deg]* | 1.793 | 7.174 | -2.956 | -19.13 | -6.022 | 814.5 | 23 |
| | Pitch Angle [deg]** | 0.162 | 0.648 | 1.483 | -0.043 | 0.687 | | |
| | Heave | 0.464 | 1.856 | 1.797 | -1.64 | 0.074 | | |
| | Wave Elevation (fix) [m] | - | - | 3.959 | -3.21 | -0.084 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.50**

**Test No.: 29717-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29717-01 | Roll Angle [deg]* | 2.264 | 9.058 | -2.959 | -20.17 | -5.082 | 840.9 | 27.5 |
| | Pitch Angle [deg]** | 0.13 | 0.521 | 1.21 | 0.248 | 0.657 | | |
| | Heave | 0.409 | 1.637 | 1.349 | -1.301 | 0.024 | | |
| | Wave Elevation (fix) [m] | - | - | 3.38 | -3.208 | 0 | | |
| -02 | Roll Angle [deg]* | 2.487 | 9.947 | -2.488 | -19.091 | -6.338 | 779.4 | 27.5 |
| | Pitch Angle [deg]** | 0.2 | 0.799 | 1.292 | 0.004 | 0.695 | | |
| | Heave | 0.414 | 1.655 | 1.262 | -1.182 | 0.01 | | |
| | Wave Elevation (fix) [m] | - | - | 3.278 | -2.921 | -0.027 | | |
| -03 | Roll Angle [deg]* | 1.725 | 6.889 | -3.121 | -14.81 | -5.716 | 727.2 | 27.5 |
| | Pitch Angle [deg]** | 0.201 | 0.805 | 1.393 | -0.014 | 0.687 | | |
| | Heave | 0.379 | 1.517 | 1.419 | -1.243 | 0.062 | | |
| | Wave Elevation (fix) [m] | - | - | 2.827 | -2.781 | -0.116 | | |
| -04 | Roll Angle [deg]* | 1.17 | 4.681 | -3.024 | -8.701 | -5.38 | 723 | 30 |
| | Pitch Angle [deg]** | 0.252 | 1.007 | 1.57 | -0.238 | 0.681 | | |
| | Heave | 0.376 | 1.502 | 1.61 | -1.695 | 0.025 | | |
| | Wave Elevation (fix) [m] | - | - | 3.426 | -2.862 | -0.021 | | |
| -05 | Roll Angle [deg]* | 2.064 | 8.256 | -0.097 | -18.619 | -5.525 | 722.1 | 30 |
| | Pitch Angle [deg]** | 0.23 | 0.919 | 1.562 | -0.27 | 0.691 | | |
| | Heave | 0.391 | 1.564 | 1.742 | -1.618 | 0.028 | | |
| | Wave Elevation (fix) [m] | - | - | 3.329 | -3.075 | -0.054 | | |
| -06 | Roll Angle [deg]* | 0.747 | 2.987 | -2.696 | -6.962 | -4.35 | 575 | 30 |
| | Pitch Angle [deg]** | 0.267 | 1.066 | 1.523 | -0.176 | 0.666 | | |
| | Heave | 0.304 | 1.218 | 1.062 | -1.008 | 0.008 | | |
| | Wave Elevation (fix) [m] | - | - | 2.75 | -2.469 | -0.117 | | |
| -07 | Roll Angle [deg]* | 0.887 | 3.55 | -2.632 | -7.693 | -4.479 | 455.5 | 30 |
| | Pitch Angle [deg]** | 0.297 | 1.187 | 1.825 | -0.522 | 0.671 | | |
| | Heave | 0.316 | 1.262 | 1.526 | -1.123 | 0.138 | | |
| | Wave Elevation (fix) [m] | - | - | 3.363 | -2.938 | -0.116 | | |
| -08 | Roll Angle [deg]* | 0.894 | 3.576 | -2.426 | -7.967 | -4.405 | 537.8 | 30 |
| | Pitch Angle [deg]** | 0.266 | 1.062 | 1.501 | -0.184 | 0.664 | | |
| | Heave | 0.316 | 1.265 | 1.587 | -1.315 | 0.072 | | |
| | Wave Elevation (fix) [m] | - | - | 3.388 | -2.959 | -0.02 | | |
| -09 | Roll Angle [deg]* | 3.791 | 15.163 | -2.732 | -21.128 | -5.885 | 296.3 | 11 |
| | Pitch Angle [deg]** | 0.35 | 1.401 | 1.696 | -0.274 | 0.691 | | |
| | Heave | 0.379 | 1.514 | 1.475 | -1.059 | 0.104 | | |
| | Wave Elevation (fix) [m] | - | - | 3.09 | -2.89 | -0.049 | | |
| -10 | Roll Angle [deg]* | 638 | 2.552 | -2.822 | -6.692 | -4.566 | 592.9 | 30 |
| | Pitch Angle [deg]** | 0.235 | 0.94 | 1.566 | -0.306 | 0.668 | | |
| | Heave | 0.301 | 1.203 | 1.229 | -1.126 | 0.031 | | |
| | Wave Elevation (fix) [m] | - | - | 3.272 | -2.797 | -0.039 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.50**

**Test No.: 29718-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29718-01 | Roll Angle [deg]* | 1.355 | 5.421 | -2.606 | -8.964 | -4.327 | 496.5 | 30 |
| | Pitch Angle [deg]** | 0.262 | 1.049 | 1.584 | -0.223 | 0.664 | | |
| | Heave | 0.307 | 1.227 | 1.448 | -1.218 | 0.033 | | |
| | Wave Elevation (fix) [m] | - | - | 3.123 | -3.006 | 0.013 | | |
| -02 | Roll Angle [deg]* | 0.643 | 2.572 | -2.92 | -6.962 | -4.438 | 542.9 | 30 |
| | Pitch Angle [deg]** | 0.3 | 1.201 | 1.717 | -0.331 | 0.664 | | |
| | Heave | 0.291 | 1.164 | 0.922 | -0.851 | 0.053 | | |
| | Wave Elevation (fix) [m] | - | - | 3.708 | -2.654 | 0.029 | | |
| -03 | Roll Angle [deg]* | 0.872 | 3.489 | -2.57 | -8.208 | -4.333 | 764.4 | 30 |
| | Pitch Angle [deg]** | 0.31 | 1.24 | 1.674 | -0.299 | 0.66 | | |
| | Heave | 0.319 | 1.274 | 1.419 | -1.208 | 0.075 | | |
| | Wave Elevation (fix) [m] | - | - | 4.26 | -3.272 | 0.078 | | |
| -04 | Roll Angle [deg]* | 0.835 | 3.339 | -2.311 | -7.718 | -4.892 | 766.4 | 30 |
| | Pitch Angle [deg]** | 0.292 | 1.169 | 1.667 | -0.468 | 0.679 | | |
| | Heave | 0.365 | 1.459 | 1.808 | -1.549 | 0.022 | | |
| | Wave Elevation (fix) [m] | - | - | 3.712 | -2.851 | -0.164 | | |
| -05 | Roll Angle [deg]* | 0.855 | 3.42 | -2.293 | -7.92 | -4.39 | 736.8 | 30 |
| | Pitch Angle [deg]** | 0.241 | 0.965 | 1.523 | -0.223 | 0.664 | | |
| | Heave | 0.34 | 1.361 | 1.411 | -1.261 | 0.027 | | |
| | Wave Elevation (fix) [m] | - | - | 3.739 | -2.97 | 0.147 | | |
| -06 | Roll Angle [deg]* | 1.249 | 4.996 | -2.552 | -11.574 | -4.728 | 690.2 | 30 |
| | Pitch Angle [deg]** | 0.298 | 1.192 | 1.602 | -0.346 | 0.674 | | |
| | Heave | 0.354 | 1.414 | 1.654 | -1.242 | 0.069 | | |
| | Wave Elevation (fix) [m] | - | - | 2.95 | -2.652 | -0.039 | | |
| -07 | Roll Angle [deg]* | 0.69 | 2.76 | -2.527 | -6.498 | -4.125 | 661.2 | 30 |
| | Pitch Angle [deg]** | 0.262 | 1.049 | 1.49 | -0.248 | 0.655 | | |
| | Heave | 0.335 | 1.338 | 1.614 | -1.333 | 0.044 | | |
| | Wave Elevation (fix) [m] | - | - | 3.333 | -2.955 | -0.002 | | |
| -08 | Roll Angle [deg]* | 2.598 | 10.392 | -2.441 | -21.089 | -4.947 | 433.2 | 17.5 |
| | Pitch Angle [deg]** | 0.284 | 1.137 | 1.501 | -0.097 | 0.674 | | |
| | Heave | 0.353 | 1.412 | 1.805 | -1.706 | 0.052 | | |
| | Wave Elevation (fix) [m] | - | - | 4.41 | -2.521 | 0.083 | | |
| -09 | Roll Angle [deg]* | 4.623 | 18.493 | -3.024 | -22.867 | -7.021 | 323.8 | 10 |
| | Pitch Angle [deg]** | 0.388 | 1.554 | 1.976 | -0.482 | 0.717 | | |
| | Heave | 0.349 | 1.396 | 1.342 | -1.16 | 0.024 | | |
| | Wave Elevation (fix) [m] | - | - | 4.35 | 2.262 | 0.16 | | |
| -10 | Roll Angle [deg]* | 3.042 | 12.168 | -3.06 | -20.149 | -5.883 | 329.4 | 15.5 |
| | Pitch Angle [deg]** | 0.297 | 1.186 | 1.696 | -0.356 | 0.698 | | |
| | Heave | 0.316 | 1.262 | 1.414 | -1.229 | 0.049 | | |
| | Wave Elevation (fix) [m] | - | - | 3.285 | -2.971 | -0.04 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.50**

**Test No.: 29719-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29719-01 | Roll Angle [deg]* | 2.625 | 10.498 | 0.691 | -19.163 | -5.817 | 406.6 | 13 |
| | Pitch Angle [deg]** | 0.176 | 0.706 | 1.26 | 0.112 | 0.676 | | |
| | Heave | 0.4 | 1.598 | 1.197 | -1.098 | 0.058 | | |
| | Wave Elevation (fix) [m] | - | - | 2.706 | -2.6 | -0.143 | | |
| -02 | Roll Angle [deg]* | 2.302 | 9.206 | -3.312 | -17.413 | -6.14 | 514.9 | 18 |
| | Pitch Angle [deg]** | 0.199 | 0.795 | 1.382 | 0.072 | 0.694 | | |
| | Heave | 0.407 | 1.628 | 1.358 | -1.122 | 0.019 | | |
| | Wave Elevation (fix) [m] | - | - | 3.192 | -2.493 | -0.173 | | |
| -03 | Roll Angle [deg]* | 2.37 | 9.481 | -2.999 | -20.12 | -6.383 | 523 | 17.5 |
| | Pitch Angle [deg]** | 0.191 | 0.763 | 1.332 | 0.173 | 0.705 | | |
| | Heave | 0.384 | 1.534 | 1.202 | -1.106 | 0.026 | | |
| | Wave Elevation (fix) [m] | - | - | 3.045 | -2.301 | 0.063 | | |
| -04 | Roll Angle [deg]* | 1.734 | 6.934 | -3.179 | -14.558 | -5.554 | 463 | 14 |
| | Pitch Angle [deg]** | 0.158 | 0.632 | 1.249 | 0.054 | 0.681 | | |
| | Heave | 0.411 | 1.644 | 1.643 | -1.397 | 0.1 | | |
| | Wave Elevation (fix) [m] | - | - | 3.438 | -2.649 | 0.058 | | |
| -05 | Roll Angle [deg]* | 2.59 | 10.361 | -1.58 | -19.958 | -6.145 | 659.4 | 30 |
| | Pitch Angle [deg]** | 0.198 | 0.793 | 1.3 | -0.032 | 0.696 | | |
| | Heave | 0.401 | 1.603 | 1.605 | -1.163 | 0.161 | | |
| | Wave Elevation (fix) [m] | - | - | 3.402 | -2.815 | 0.18 | | |
| -06 | Roll Angle [deg]* | 0.998 | 3.992 | -2.945 | -7.895 | -5.068 | 693 | 30 |
| | Pitch Angle [deg]** | 0.196 | 0.786 | 1.375 | -0.104 | 0.674 | | |
| | Heave | 0.393 | 1.57 | 1.41 | -1.23 | 0.05 | | |
| | Wave Elevation (fix) [m] | - | - | 3.531 | -2.74 | -0.049 | | |
| -07 | Roll Angle [deg]* | 1.09 | 4.358 | -2.938 | -8.543 | -4.916 | 818.8 | 30 |
| | Pitch Angle [deg]** | 0.2 | 0.801 | 1.307 | -0.104 | 0.669 | | |
| | Heave | 0.395 | 1.578 | 1.44 | -1.322 | -0.007 | | |
| | Wave Elevation (fix) [m] | - | - | 3.571 | -2.827 | -0.039 | | |
| -08 | Roll Angle [deg]* | 2.499 | 9.996 | -2.92 | -21.071 | -4.968 | 562 | 20.5 |
| | Pitch Angle [deg]** | 0.204 | 0.816 | 1.199 | 0.014 | 0.669 | | |
| | Heave | 0.375 | 1.499 | 1.867 | -1.659 | 0.084 | | |
| | Wave Elevation (fix) [m] | - | - | 3.421 | -2.588 | 0.156 | | |
| -09 | Roll Angle [deg]* | 2.821 | 11.284 | -2.851 | -20.326 | -5.964 | 426.4 | 16 |
| | Pitch Angle [deg]** | 0.218 | 0.873 | 1.544 | -0.097 | 0.692 | | |
| | Heave | 0.387 | 1.547 | 1.541 | -1.355 | 0.075 | | |
| | Wave Elevation (fix) [m] | - | - | 4.18 | -2.778 | 0.067 | | |
| -10 | Roll Angle [deg]* | 0.682 | 2.726 | -2.462 | -8.086 | -4.29 | 711.1 | 30 |
| | Pitch Angle [deg]** | 0.242 | 0.969 | 1.483 | -0.245 | 0.665 | | |
| | Heave | 0.3 | 1.199 | 1.493 | -1.15 | 0.046 | | |
| | Wave Elevation (fix) [m] | - | - | 3.236 | -2.826 | 0.095 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.25**

**Test No.: 29720-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29720-01 | Roll Angle [deg]* | 0.765 | 3.059 | -2.885 | -6.242 | -4.446 | 268.1 | 10 |
| | Pitch Angle [deg]** | 0.181 | 0.723 | 1.163 | 0.166 | 0.654 | | |
| | Heave | 0.348 | 1.394 | 1.2 | -1.245 | -0.032 | | |
| | Wave Elevation (fix) [m] | - | - | 3.509 | -2.644 | -0.012 | | |
| -02 | Roll Angle [deg]* | 3.318 | 13.273 | -2.927 | -24.221 | -5.407 | 782 | 28 |
| | Pitch Angle [deg]** | 0.282 | 1.128 | 1.501 | -0.194 | 0.682 | | |
| | Heave | 0.309 | 1.235 | 0.979 | -1.008 | 0.033 | | |
| | Wave Elevation (fix) [m] | - | - | 3.434 | -2.629 | 0.006 | | |
| -03 | Roll Angle [deg]* | 0.328 | 1.314 | -2.318 | -4.792 | -3.635 | 674.6 | 30 |
| | Pitch Angle [deg]** | 0.216 | 0.865 | 1.346 | -0.079 | 0.639 | | |
| | Heave | 0.267 | 1.069 | 1.17 | -1.173 | 0.043 | | |
| | Wave Elevation (fix) [m] | - | - | 3.484 | -2.655 | -0.035 | | |
| -04 | Roll Angle [deg]* | 0.937 | 3.75 | -2.603 | -8.374 | -4.353 | 786.2 | 30 |
| | Pitch Angle [deg]** | 0.216 | 0.864 | 1.39 | -0.119 | 0.655 | | |
| | Heave | 0.333 | 1.331 | 1.366 | -1.104 | 0.092 | | |
| | Wave Elevation (fix) [m] | - | - | 3.97 | -2.639 | 0.111 | | |
| -05 | Roll Angle [deg]* | 0.49 | 1.961 | -2.812 | -5.389 | -4.068 | 761.8 | 30 |
| | Pitch Angle [deg]** | 0.254 | 1.017 | 1.519 | -0.313 | 0.649 | | |
| | Heave | 0.308 | 1.234 | 1.52 | -1.123 | 0.096 | | |
| | Wave Elevation (fix) [m] | - | - | 3.131 | -2.526 | -0.098 | | |
| -06 | Roll Angle [deg]* | 0.552 | 2.208 | -2.48 | -6.005 | -4.078 | 616.1 | 30 |
| | Pitch Angle [deg]** | 0.257 | 1.027 | 1.602 | -0.382 | 0.646 | | |
| | Heave | 0.28 | 1.118 | 1.202 | -1.003 | 0.095 | | |
| | Wave Elevation (fix) [m] | - | - | 3.895 | -2.41 | 0 | | |
| -07 | Roll Angle [deg]* | 0.989 | 3.957 | -2.387 | -8.507 | -4.204 | 694.7 | 30 |
| | Pitch Angle [deg]** | 0.281 | 1.122 | 1.62 | -0.241 | 0.648 | | |
| | Heave | 0.279 | 1.114 | 1.518 | -1.333 | 0.064 | | |
| | Wave Elevation (fix) [m] | - | - | 3.636 | -2.575 | -0.061 | | |
| -08 | Roll Angle [deg]* | 0.599 | 2.398 | -2.473 | -6.746 | -4.305 | 614.6 | 30 |
| | Pitch Angle [deg]** | 0.321 | 1.284 | 1.609 | -0.302 | 0.657 | | |
| | Heave | 0.253 | 1.013 | 1.229 | -1.069 | 0.042 | | |
| | Wave Elevation (fix) [m] | - | - | 4.826 | -2.54 | 0.116 | | |
| -09 | Roll Angle [deg]* | 0.548 | 2.191 | -2.484 | -6.343 | -4.011 | 685.9 | 30 |
| | Pitch Angle [deg]** | 0.277 | 1.108 | 1.735 | -0.583 | 0.643 | | |
| | Heave | 0.275 | 1.099 | 1.24 | -1.051 | 0.043 | | |
| | Wave Elevation (fix) [m] | - | - | 3.757 | -2.666 | 0.046 | | |
| -10 | Roll Angle [deg]* | 0.656 | 2.623 | -2.272 | -6.34 | -4.149 | 689.1 | 30 |
| | Pitch Angle [deg]** | 0.265 | 1.058 | 1.58 | -0.313 | 0.652 | | |
| | Heave | 0.303 | 1.211 | 1.323 | -1.237 | 0.017 | | |
| | Wave Elevation (fix) [m] | - | - | 3.185 | -2.744 | 0 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.75**

**Test No.: 29721-01 to 11** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29721-01 | Roll Angle [deg]* | 2.228 | 8.91 | -2.43 | -17.284 | -5.977 | 491.2 | 16 |
| | Pitch Angle [deg]** | 0.136 | 0.544 | 1.202 | 0.162 | 0.711 | | |
| | Heave | 0.474 | 1.896 | 1.397 | -1.493 | -0.056 | | |
| | Wave Elevation (fix) [m] | - | - | 3.899 | -2.666 | -0.023 | | |
| -02 | Roll Angle [deg]* | 1.073 | 4.293 | -3.064 | -8.158 | -5.028 | 747.9 | 30 |
| | Pitch Angle [deg]** | 0.238 | 0.954 | 1.397 | -0.072 | 0.688 | | |
| | Heave | 0.413 | 1.65 | 1.739 | -1.534 | 0.044 | | |
| | Wave Elevation (fix) [m] | - | - | 4.528 | -3.008 | -0.013 | | |
| -03 | Roll Angle [deg]* | 0.704 | 2.817 | -2.632 | -6.847 | -4.526 | 496.3 | 30 |
| | Pitch Angle [deg]** | 0.197 | 0.787 | 1.332 | -0.061 | 0.676 | | |
| | Heave | 0.317 | 1.268 | 1.259 | -1.166 | 0.05 | | |
| | Wave Elevation (fix) [m] | - | - | 5.101 | -3.83 | -0.061 | | |
| -05 | Roll Angle [deg]* | 3.221 | 12.883 | -2.682 | -20.25 | -6.961 | 228 | 8.5 |
| | Pitch Angle [deg]** | 0.219 | 0.877 | 1.354 | -0.022 | 0.729 | | |
| | Heave | 0.5 | 2.002 | 1.531 | -1.515 | -0.002 | | |
| | Wave Elevation (fix) [m] | - | - | 3.245 | -2.835 | -0.161 | | |
| -06 | Roll Angle [deg]* | 2.594 | 10.375 | -2.599 | -19.253 | -5.468 | 407.7 | 15 |
| | Pitch Angle [deg]** | 0.247 | 0.987 | 1.379 | -0.058 | 0.702 | | |
| | Heave | 0.439 | 1.756 | 1.418 | -1.245 | 0.067 | | |
| | Wave Elevation (fix) [m] | - | - | 3.69 | -2.858 | 0.003 | | |
| -07 | Roll Angle [deg]* | 4.147 | 16.587 | 0.655 | -27.396 | -6.846 | 712 | 20 |
| | Pitch Angle [deg]** | 0.23 | 0.922 | 1.562 | 0.083 | 0.729 | | |
| | Heave | 0.472 | 1.886 | 1.933 | -1.872 | -0.056 | | |
| | Wave Elevation (fix) [m] | - | - | 3.559 | -2.876 | -0.079 | | |
| -08 | Roll Angle [deg]* | 2.086 | 8.343 | -2.815 | -17.644 | -5.254 | 485 | 19 |
| | Pitch Angle [deg]** | 0.224 | 0.895 | 1.386 | -0.011 | 0.705 | | |
| | Heave | 0.436 | 1.745 | 2.069 | -1.832 | 0.026 | | |
| | Wave Elevation (fix) [m] | - | - | 3.36 | -2.768 | -0.057 | | |
| -09 | Roll Angle [deg]* | 2.675 | 10.699 | -2.675 | -16.898 | -5.493 | 371.2 | 15 |
| | Pitch Angle [deg]** | 0.222 | 0.887 | 1.364 | 0.133 | 0.711 | | |
| | Heave | 0.454 | 1.816 | 1.643 | -1.755 | 0.011 | | |
| | Wave Elevation (fix) [m] | - | - | 3.195 | -3.14 | -0.045 | | |
| -10 | Roll Angle [deg]* | 2.329 | 9.317 | -1.109 | -18.346 | -5.898 | 441 | 19 |
| | Pitch Angle [deg]** | 0.221 | 0.885 | 1.508 | -0.011 | 0.723 | | |
| | Heave | 0.407 | 1.627 | 1.819 | -1.416 | 0.173 | | |
| | Wave Elevation (fix) [m] | - | - | 3.761 | -3.126 | 0.041 | | |
| -11 | Roll Angle [deg]* | 0.765 | 3.06 | -2.581 | -4.189 | -4.284 | 657.7 | 30 |
| | Pitch Angle [deg]** | 0.235 | 0.941 | 1.441 | -0.151 | 0.687 | | |
| | Heave | 0.404 | 1.616 | 1.682 | -1.461 | 0.052 | | |
| | Wave Elevation (fix) [m] | - | - | 3.278 | -2.956 | -0.029 | | |

* to Port Side = positiv ** Stern Trim = positiv

# Sea Keeping Test in Irregular Seas (Statistics)

## Evaluation of Worst Solas Damage (Ship Values)

**Model No.: 2458A** **Hs [m] = 3.50**

**Test No.: 29722-01 to 10** **Damage 2: R7P15-16.2.0-1**

**Project: EMSA 3** **Scale = 40.00**

| Test No. | Description | RMS (SD) Value | Significant Value | max | min | mean | Drift [m] | Duration of the Tests [min] |
|---|---|---|---|---|---|---|---|---|
| 29722-01 | Roll Angle [deg]* | 2.515 | 10.06 | -2.426 | -20.074 | -4.618 | 752.5 | 30 |
| | Pitch Angle [deg]** | 0.244 | 0.975 | 1.483 | -0.083 | 0.687 | | |
| | Heave | 0.352 | 1.41 | 1.426 | -1.342 | 0.069 | | |
| | Wave Elevation (fix) [m] | - | - | 2.993 | -2.817 | -0.048 | | |
| -02 | Roll Angle [deg]* | 0.494 | 1.974 | -2.524 | -5.62 | -3.995 | 704.1 | 30 |
| | Pitch Angle [deg]** | 0.271 | 1.086 | 1.609 | -0.234 | 0.678 | | |
| | Heave | 0.3 | 1.2 | 1.149 | -0.922 | 0.059 | | |
| | Wave Elevation (fix) [m] | - | - | 3.656 | -3.107 | -0.172 | | |
| -03 | Roll Angle [deg]* | 0.7 | 2.801 | -2.876 | -7.679 | -3.823 | 677 | 30 |
| | Pitch Angle [deg]** | 0.187 | 0.747 | 1.501 | -0.176 | 0.675 | | |
| | Heave | 0.34 | 1.36 | 1.778 | -1.55 | 0.057 | | |
| | Wave Elevation (fix) [m] | - | - | 3.831 | -3.111 | -0.045 | | |
| -04 | Roll Angle [deg]* | 2.391 | 9.564 | -3.056 | -19.271 | -5.339 | 755.8 | 26.5 |
| | Pitch Angle [deg]** | 0.248 | 0.993 | 1.451 | -0.112 | 0.699 | | |
| | Heave | 0.392 | 1.569 | 1.341 | -1.216 | 0.009 | | |
| | Wave Elevation (fix) [m] | - | - | 3.603 | -2.538 | 0.002 | | |
| -05 | Roll Angle [deg]* | 2.455 | 9.818 | -3.168 | -21.316 | -5.279 | 602.1 | 23 |
| | Pitch Angle [deg]** | 0.287 | 1.149 | 1.62 | -0.209 | 0.694 | | |
| | Heave | 0.358 | 1.432 | 1.402 | -1.187 | 0.095 | | |
| | Wave Elevation (fix) [m] | - | - | | | | | |
| -06 | Roll Angle [deg]* | 0.692 | 2.768 | -2.588 | -7.384 | -4.734 | 675.3 | 30 |
| | Pitch Angle [deg]** | 0.311 | 1.244 | 1.652 | -0.292 | 0.691 | | |
| | Heave | 0.359 | 1.438 | 1.558 | -1.402 | 0.03 | | |
| | Wave Elevation (fix) [m] | - | - | 3.609 | -2.769 | 0.015 | | |
| -07 | Roll Angle [deg]* | 2.359 | 9.438 | -1.804 | -19.544 | -4.909 | 709.9 | 25.5 |
| | Pitch Angle [deg]** | 0.287 | 1.148 | 1.811 | -0.504 | 0.69 | | |
| | Heave | 0.32 | 1.281 | 1.334 | -1.261 | 0.03 | | |
| | Wave Elevation (fix) [m] | - | - | 3.922 | -3.1 | -0.129 | | |
| -08 | Roll Angle [deg]* | 0.573 | 2.294 | -2.387 | -6.214 | -4.007 | 688.7 | 30 |
| | Pitch Angle [deg]** | 0.3 | 1.199 | 1.714 | -0.259 | 0.678 | | |
| | Heave | 0.296 | 1.185 | 1.322 | -0.982 | 0.09 | | |
| | Wave Elevation (fix) [m] | - | - | 3.814 | -2.491 | -0.045 | | |
| -09 | Roll Angle [deg]* | 0.408 | 1.633 | -2.257 | -5.281 | -3.774 | 526.2 | 30 |
| | Pitch Angle [deg]** | 0.271 | 1.083 | 1.663 | -0.317 | 0.67 | | |
| | Heave | 0.259 | 1.034 | 1.197 | -0.893 | 0.081 | | |
| | Wave Elevation (fix) [m] | - | - | 3.613 | -2.685 | -0.126 | | |
| -10 | Roll Angle [deg]* | 0.487 | 1.948 | -2.851 | -5.76 | -4.004 | 664.5 | 30 |
| | Pitch Angle [deg]** | 0.297 | 1.187 | 1.512 | -0.227 | 0.675 | | |
| | Heave | 0.273 | 1.091 | 1.579 | -1.342 | 0.037 | | |
| | Wave Elevation (fix) [m] | - | - | 3.155 | -3.061 | -0.101 | | |

* to Port Side = positiv ** Stern Trim = positiv

# APPENDIX E2

# TIME HISTORIES OF THE EXPERIMENTS

# WAVE AND ROLL TIME HISTORIES

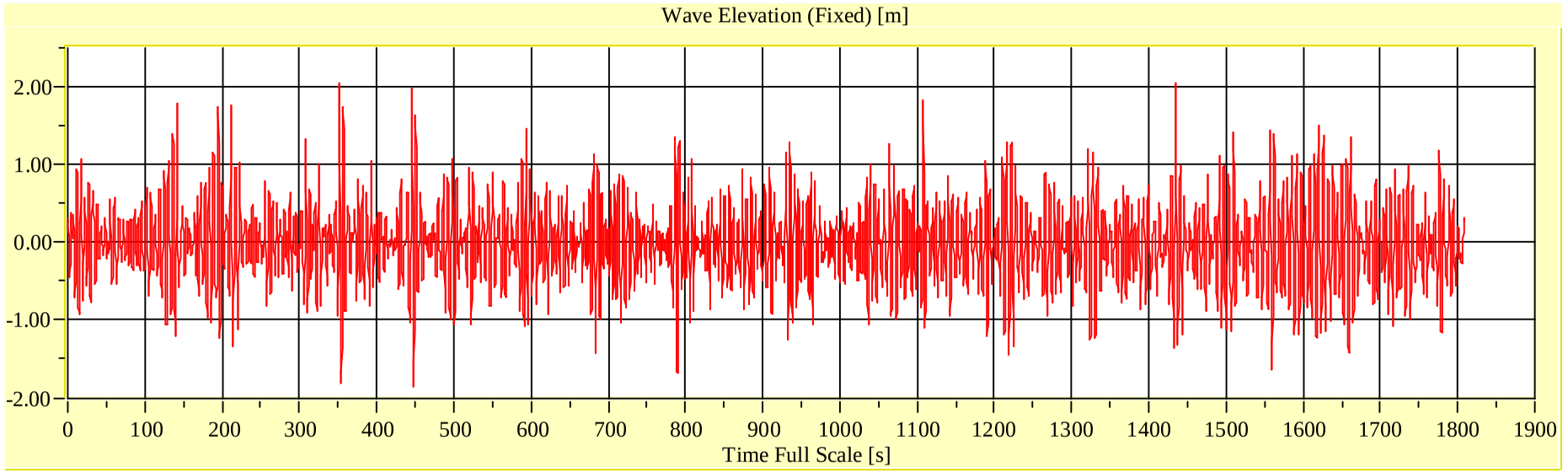
## Model No. 2458A

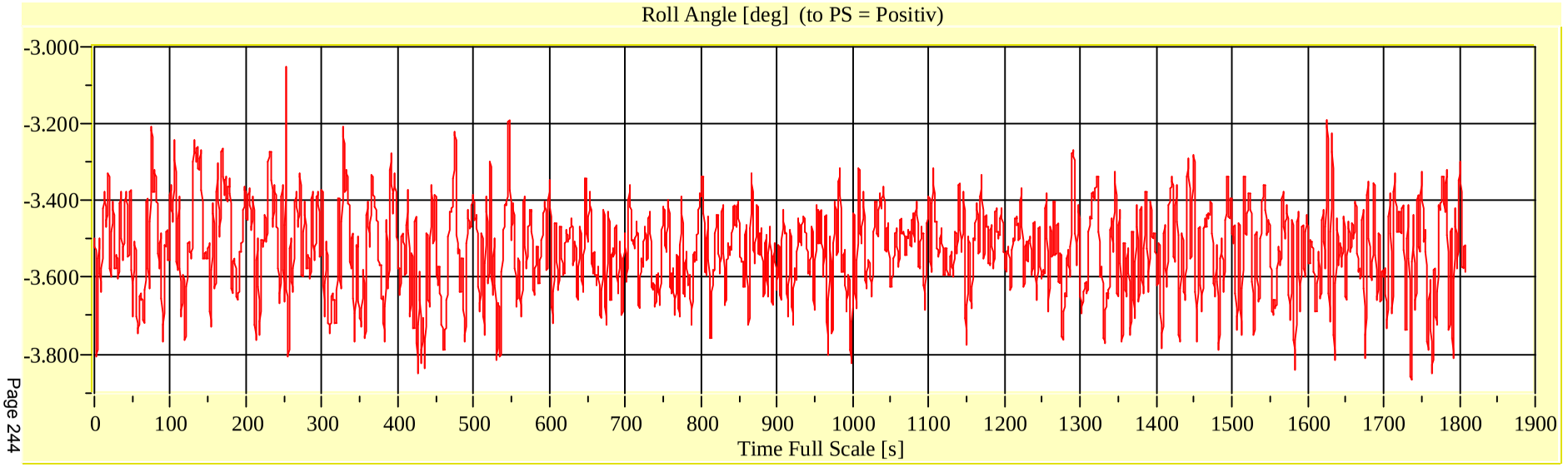
## Project: “EMSA 3”

**Damage Case-1 R7P15-16.2.0-1**

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-01 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



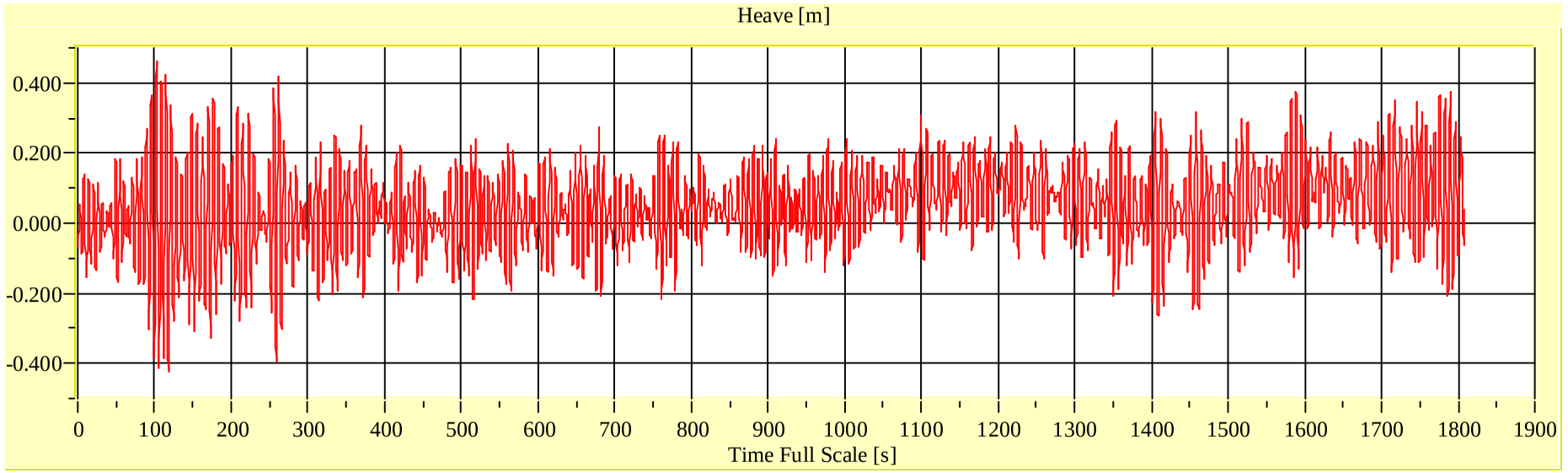



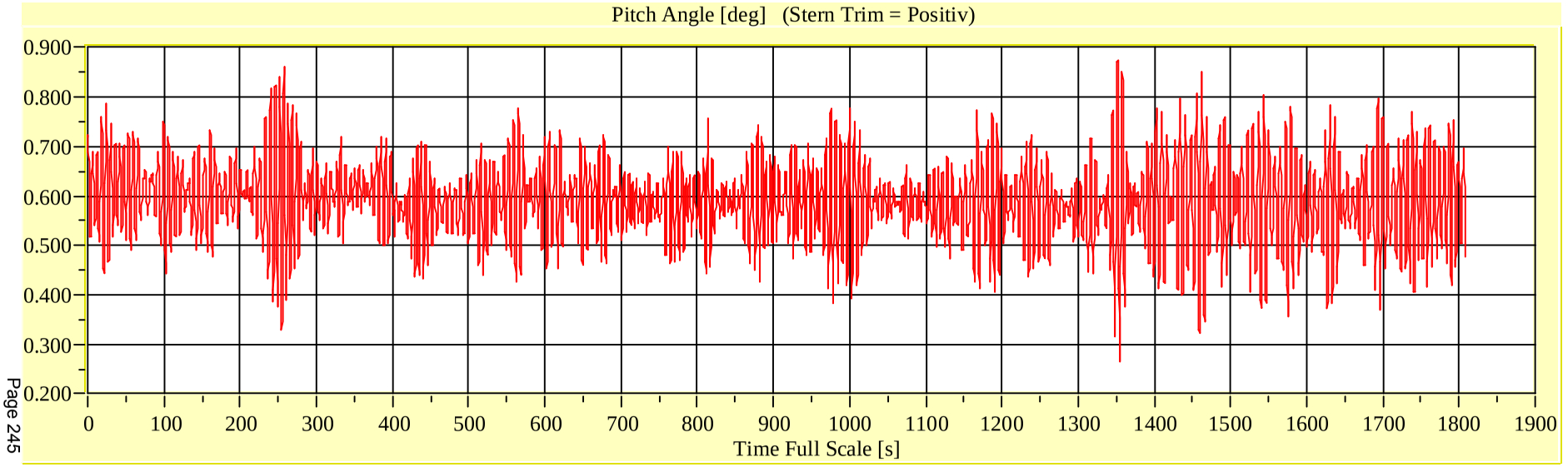



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-01 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



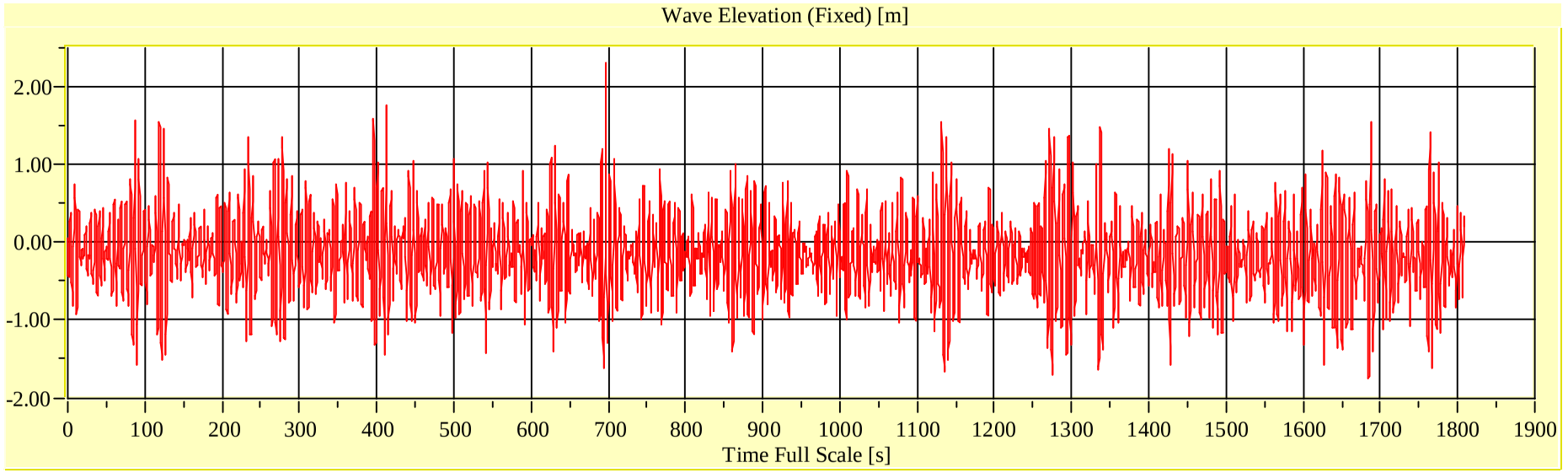



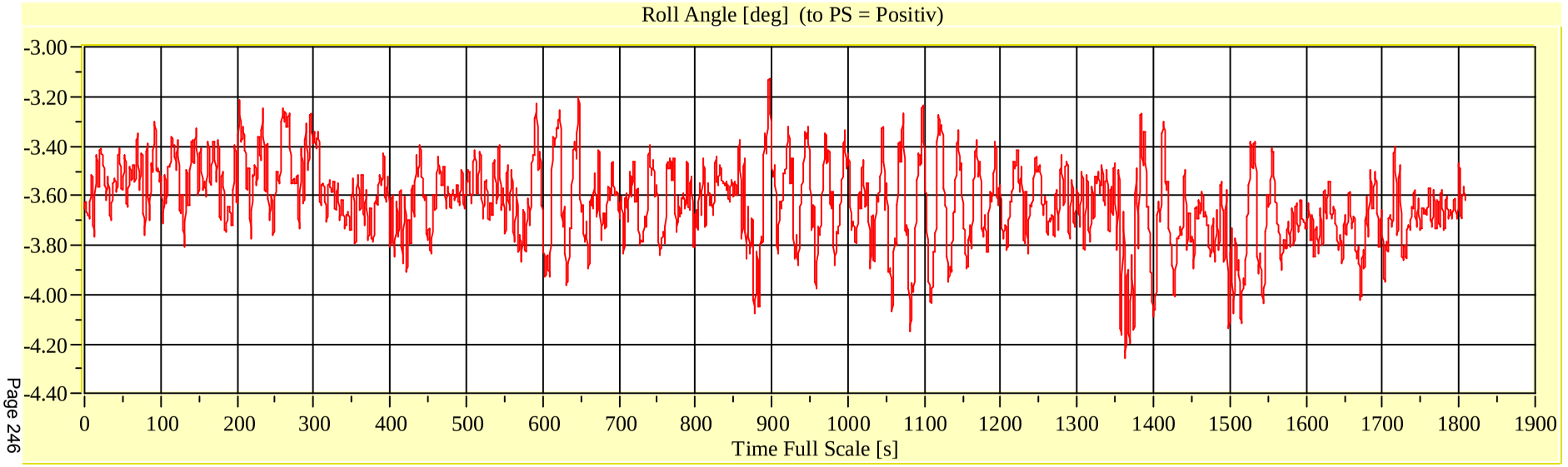



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-02 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



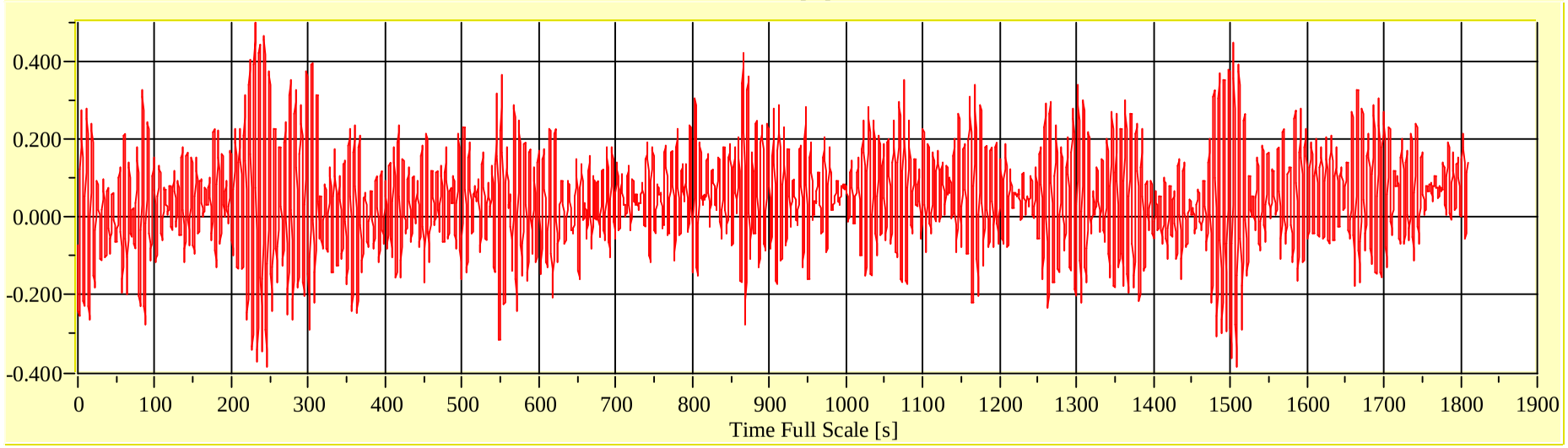



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

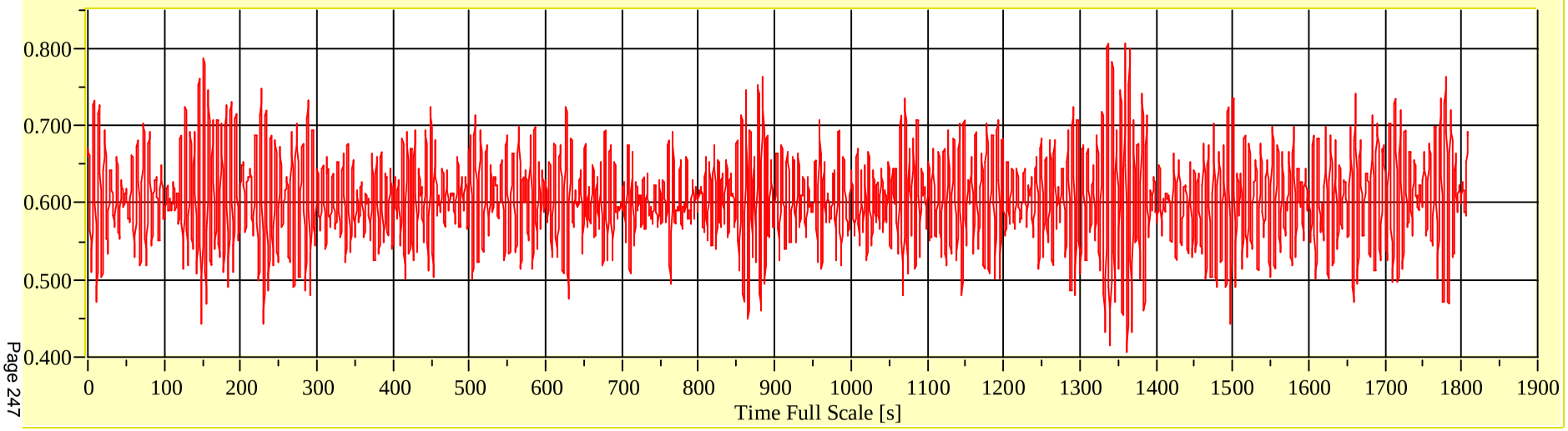
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-02 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Stern Trim = Positiv)

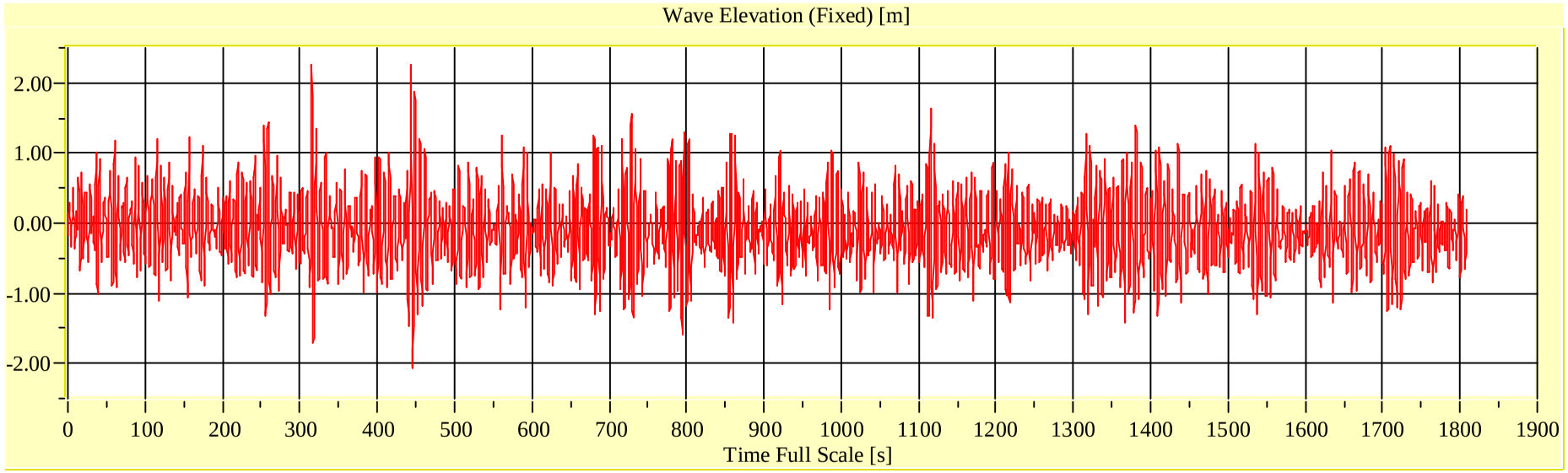


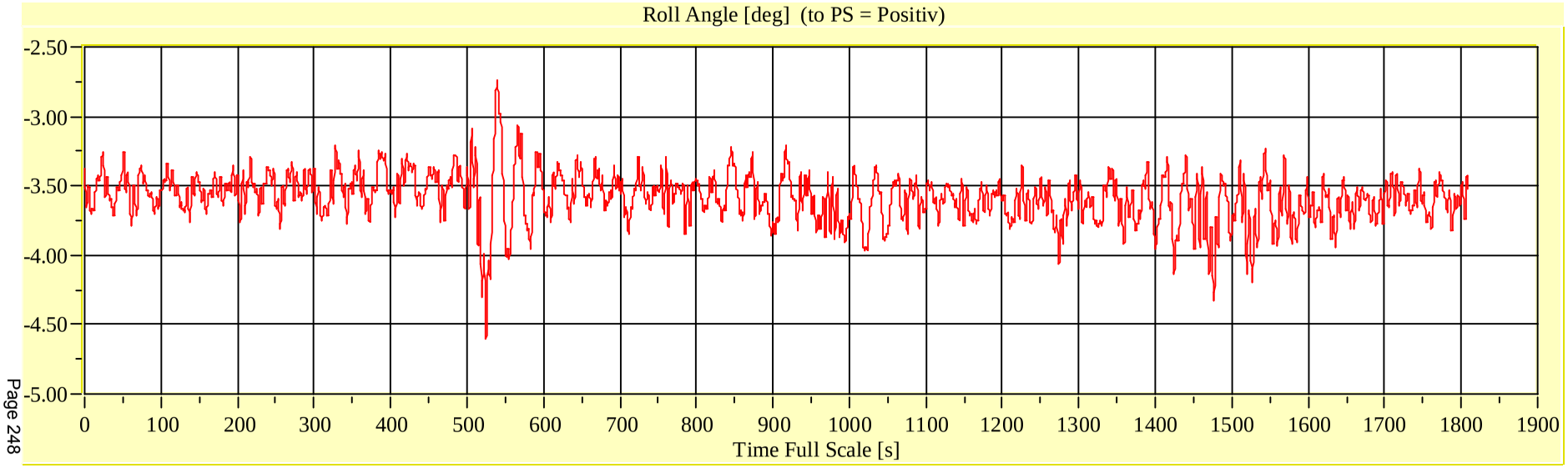



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-03 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



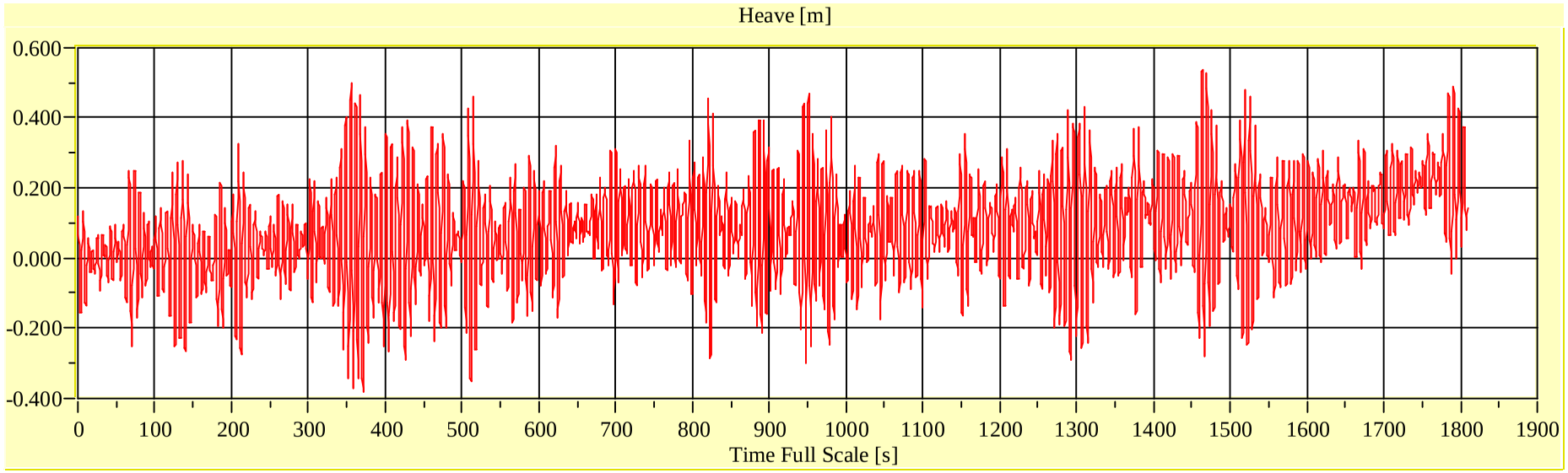



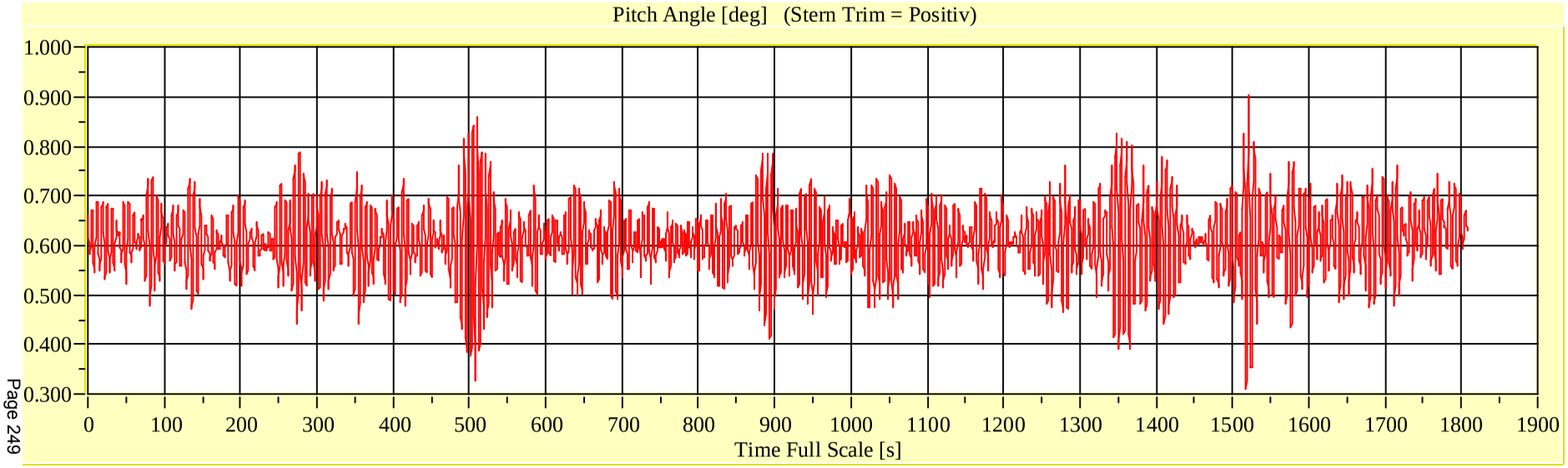



| Date: 17.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-03 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



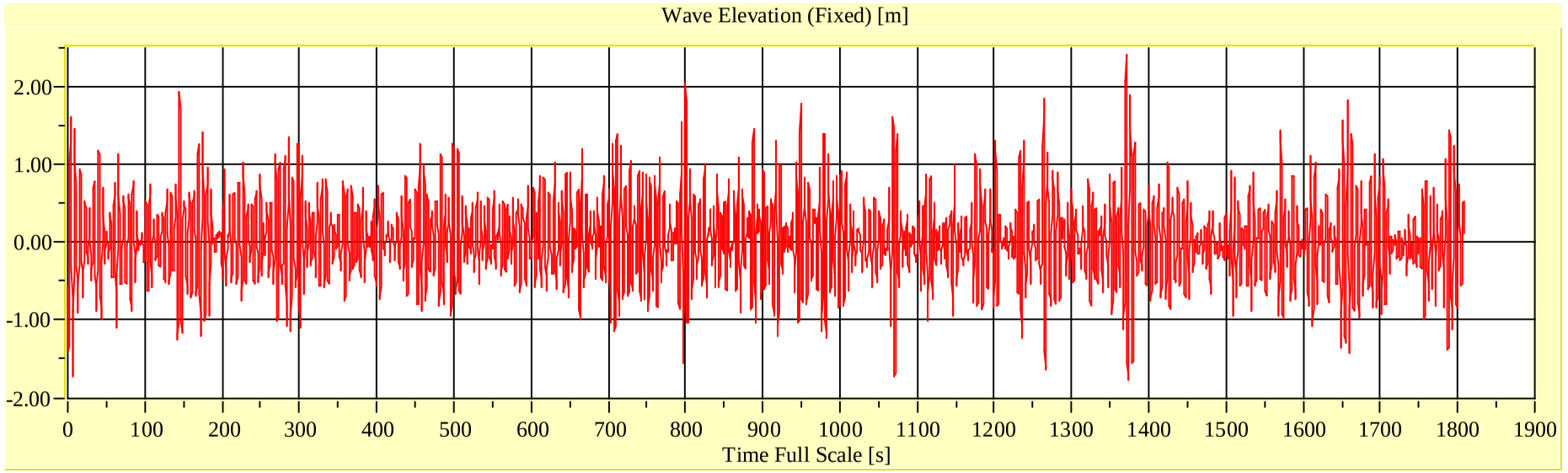



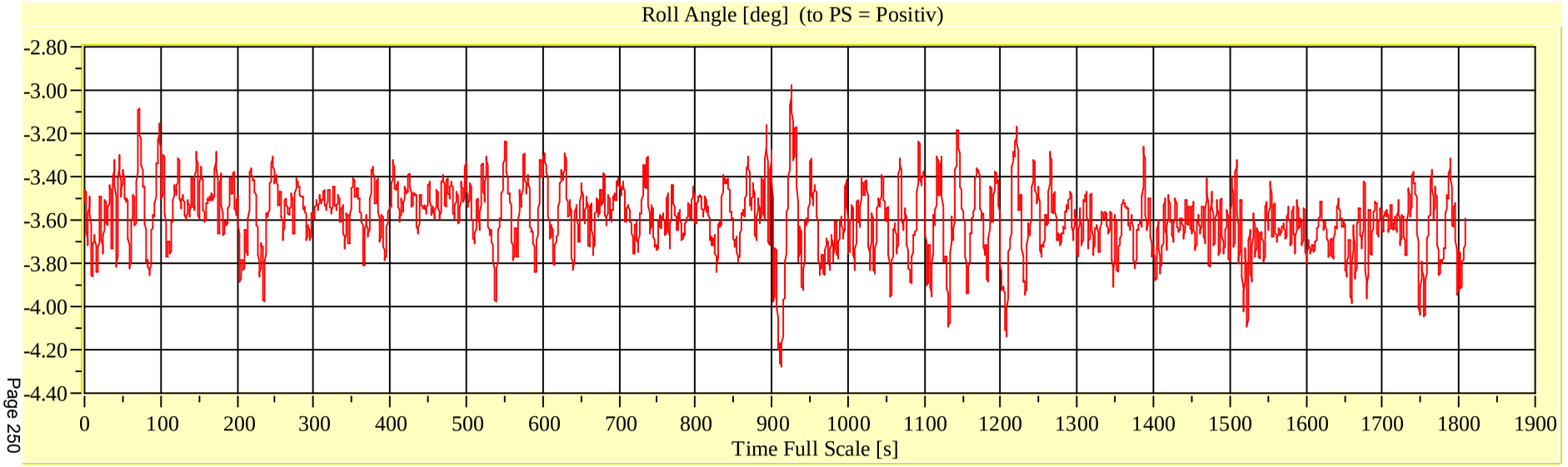



| Date: 17.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-04 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



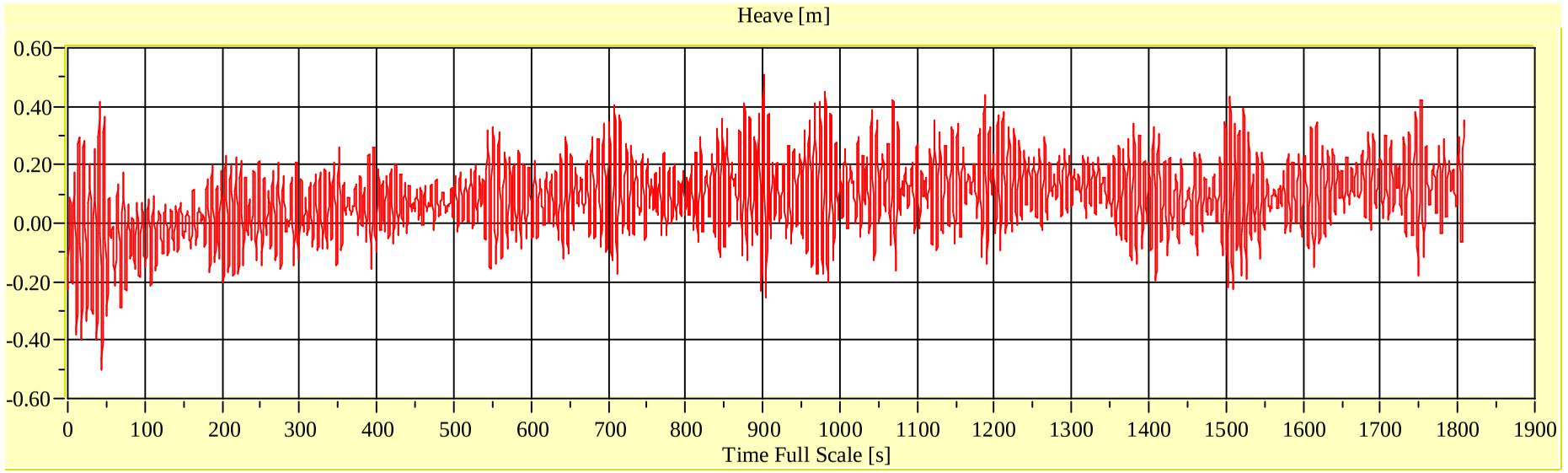



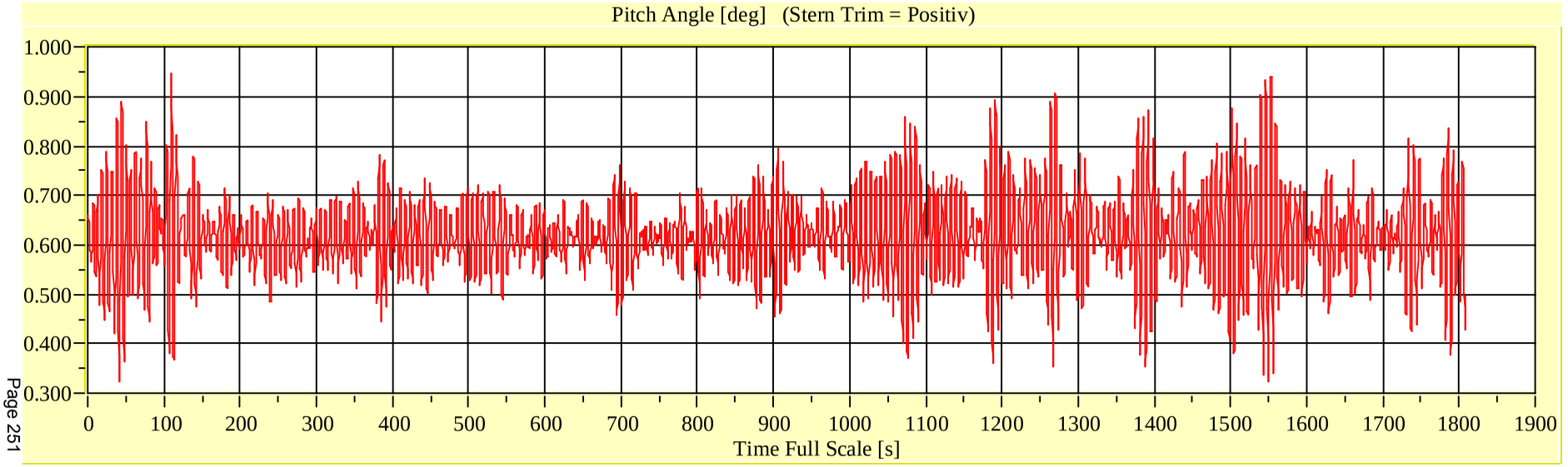



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-04 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



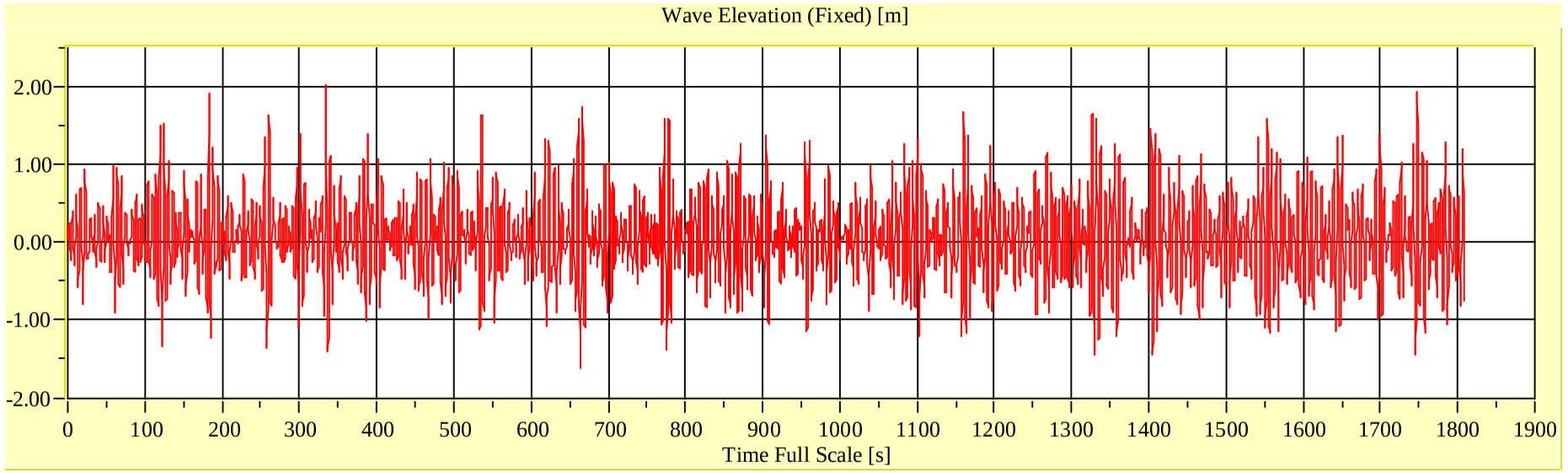



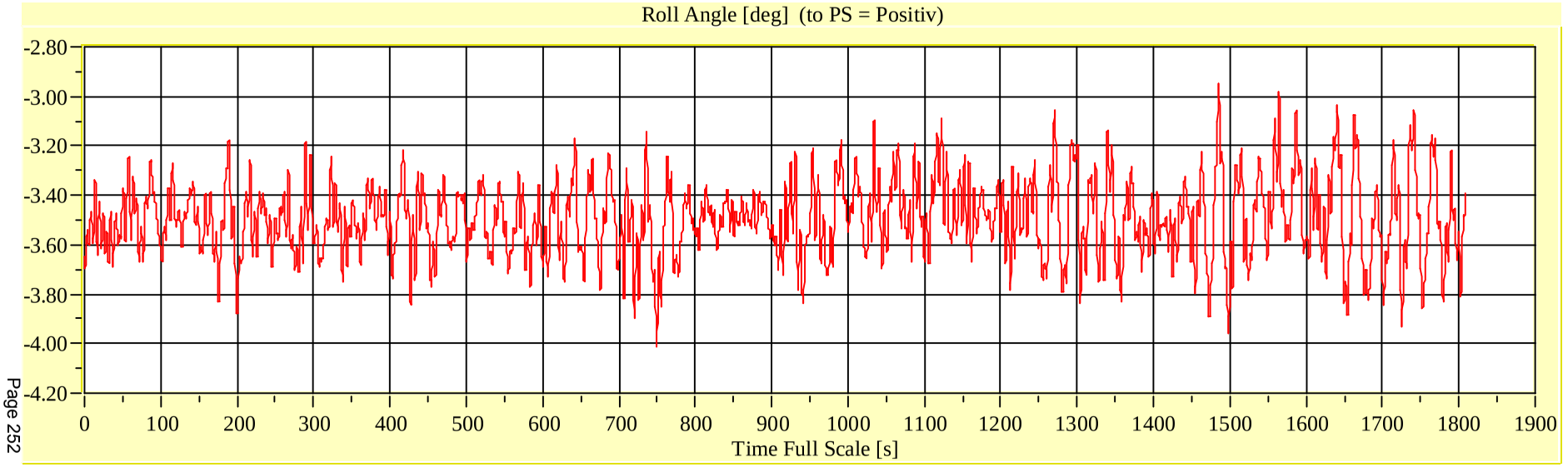



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-05 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



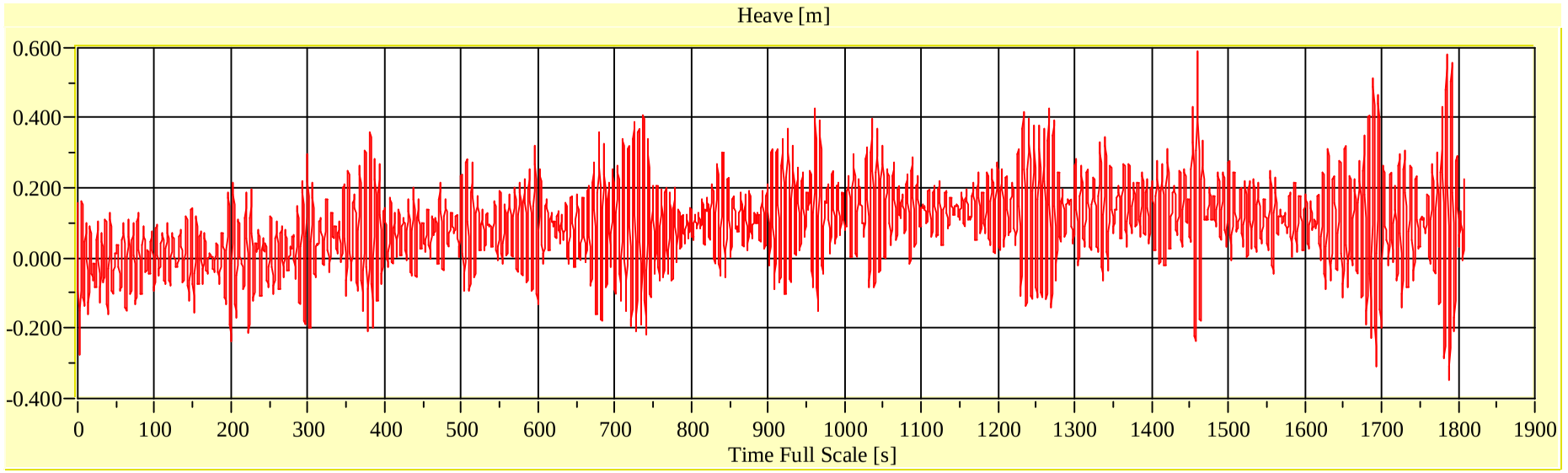



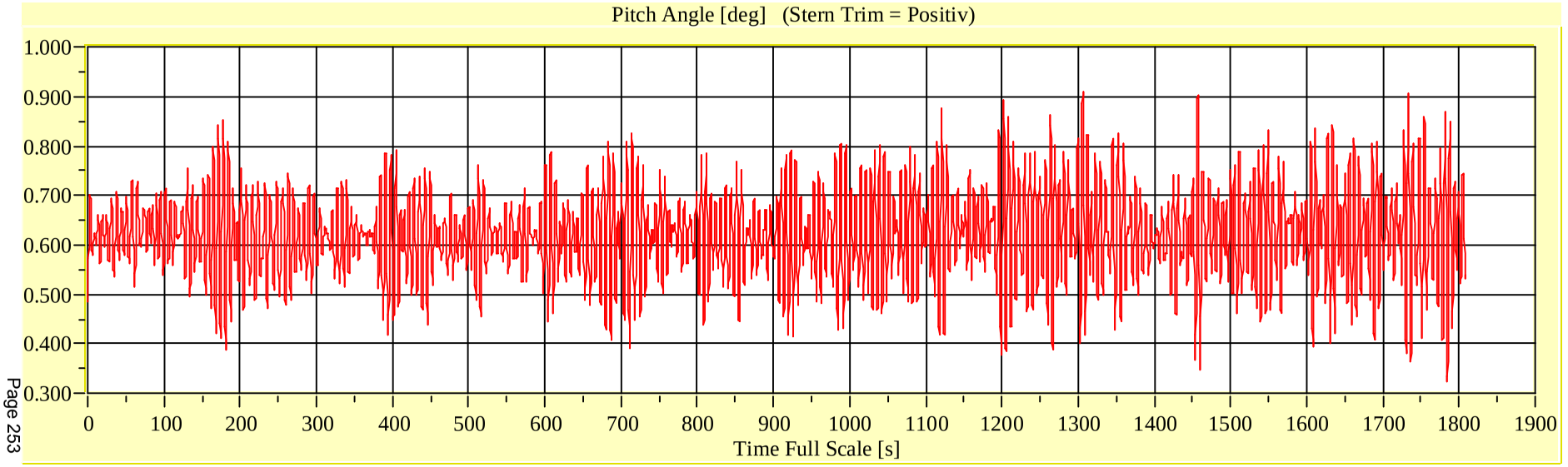



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-05 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



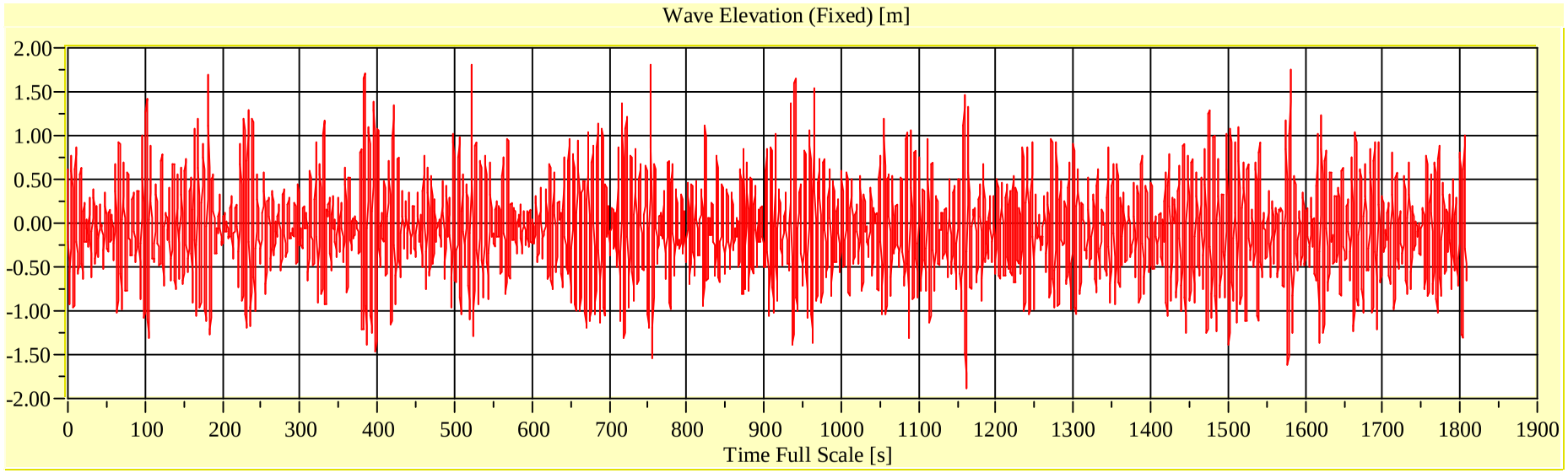



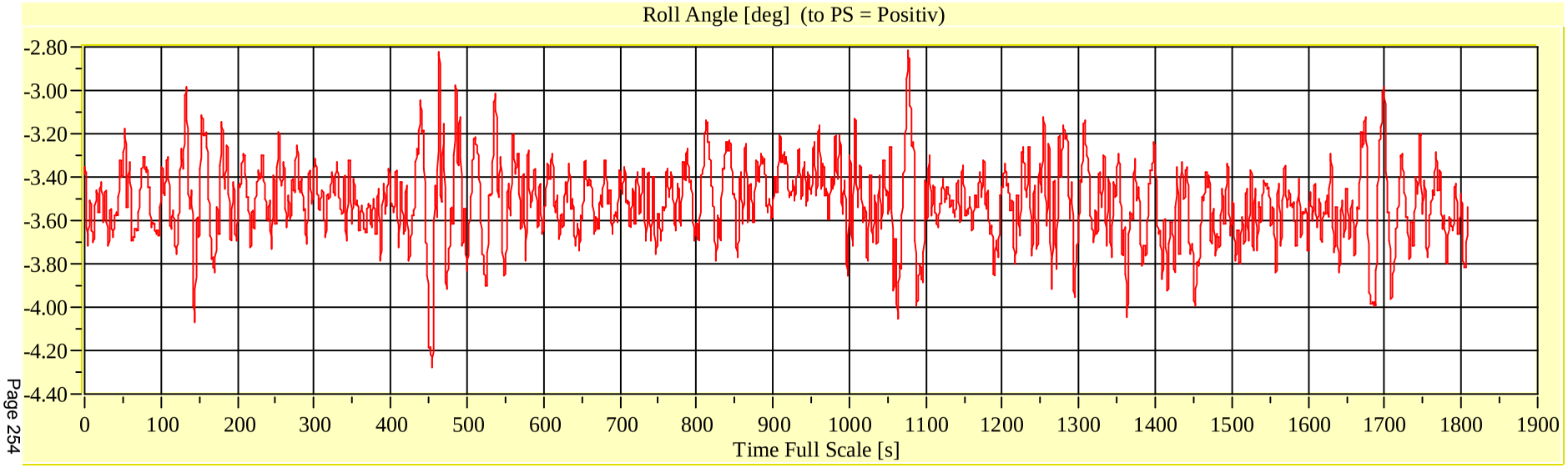



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-06 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



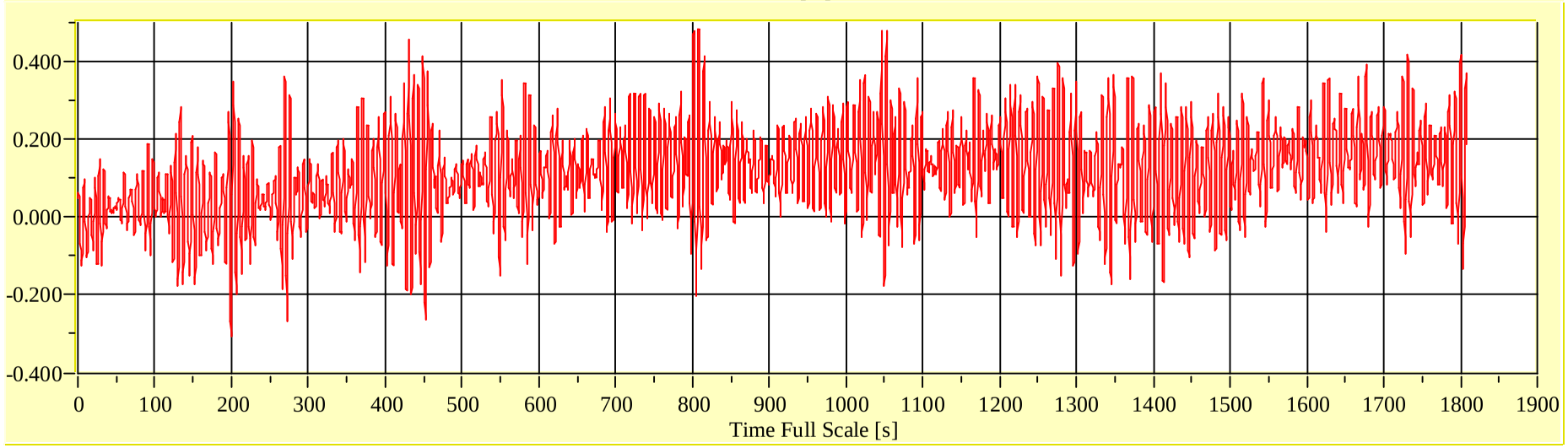



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

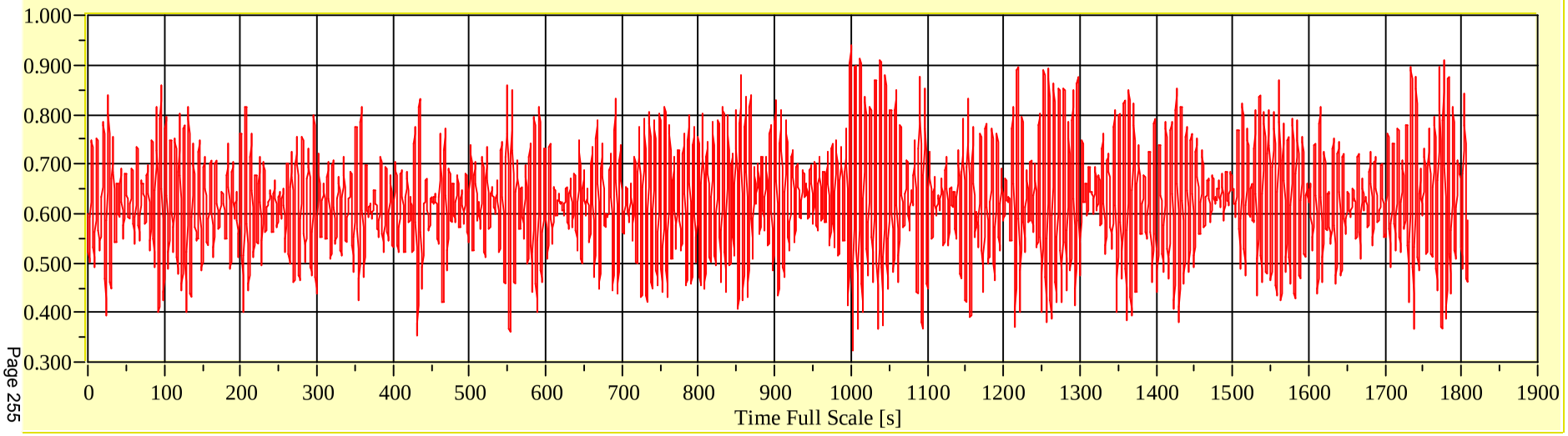
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-06 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Stern Trim = Positiv)

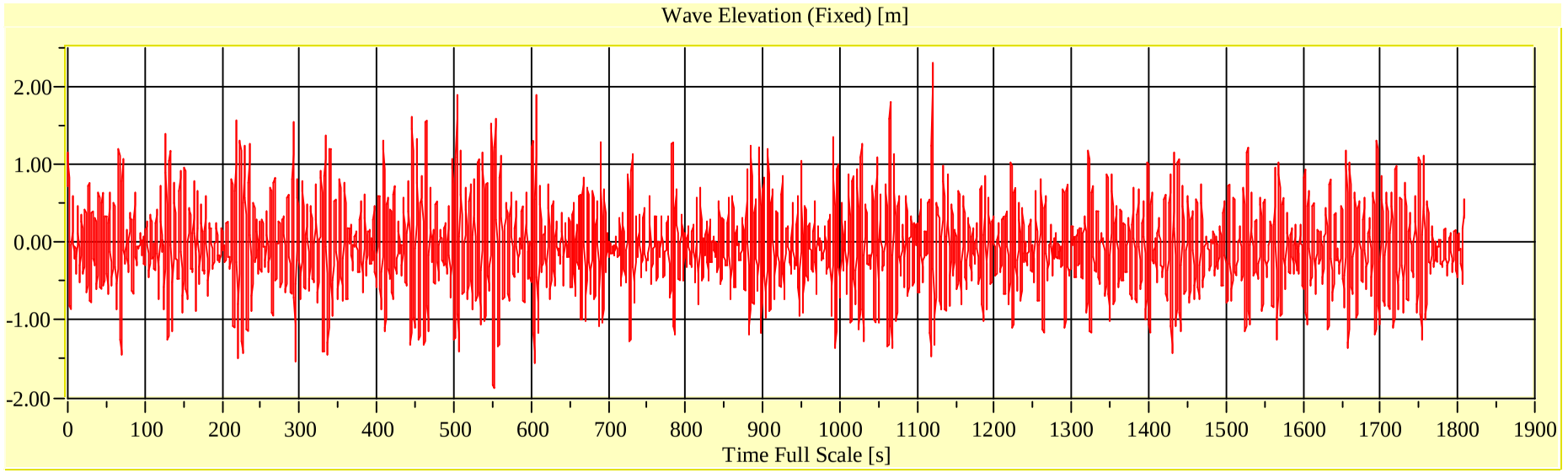


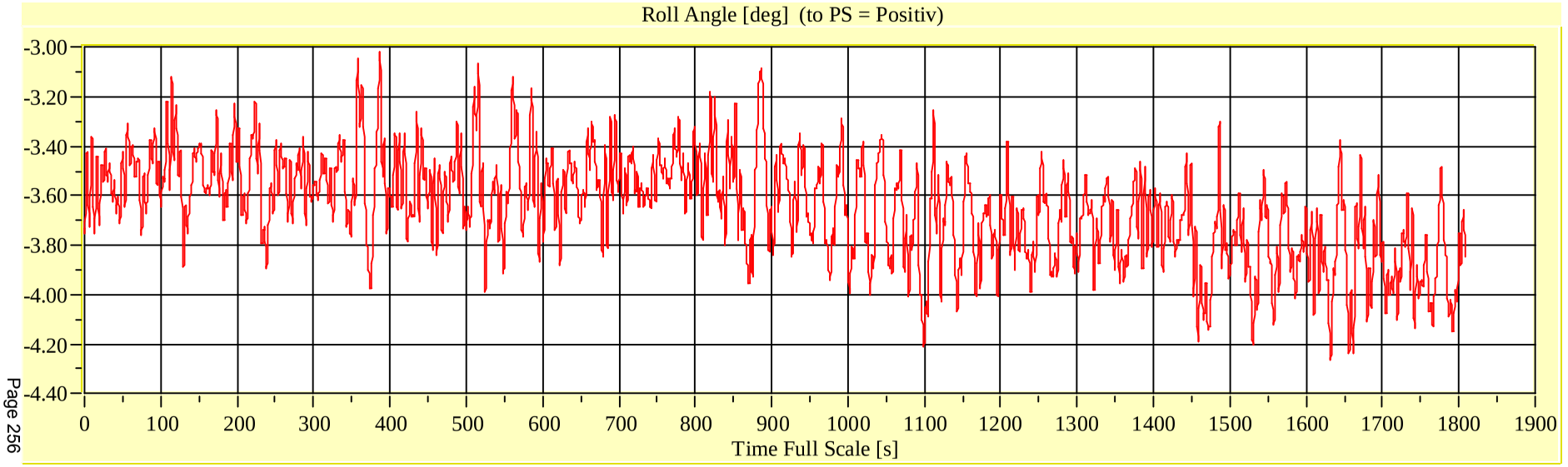



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-07 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



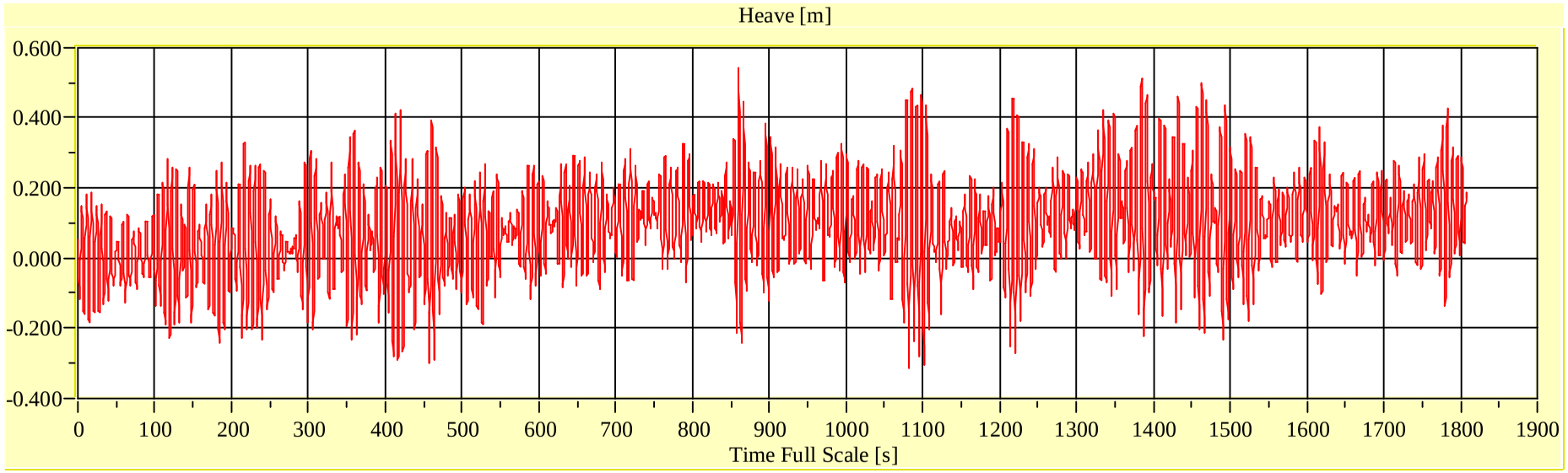



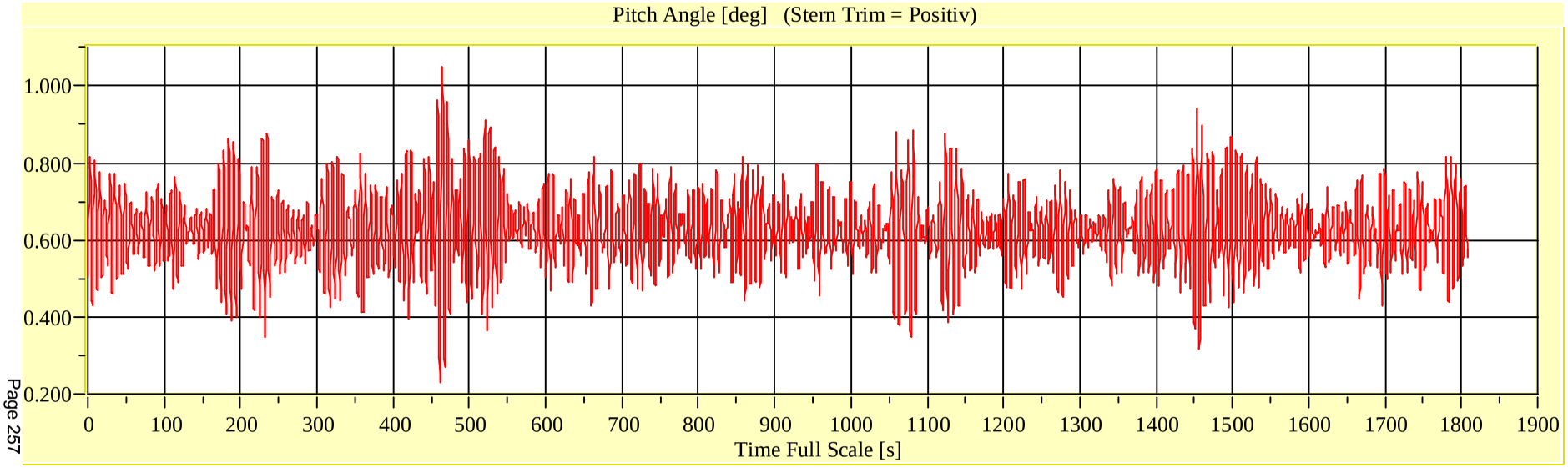



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-07 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



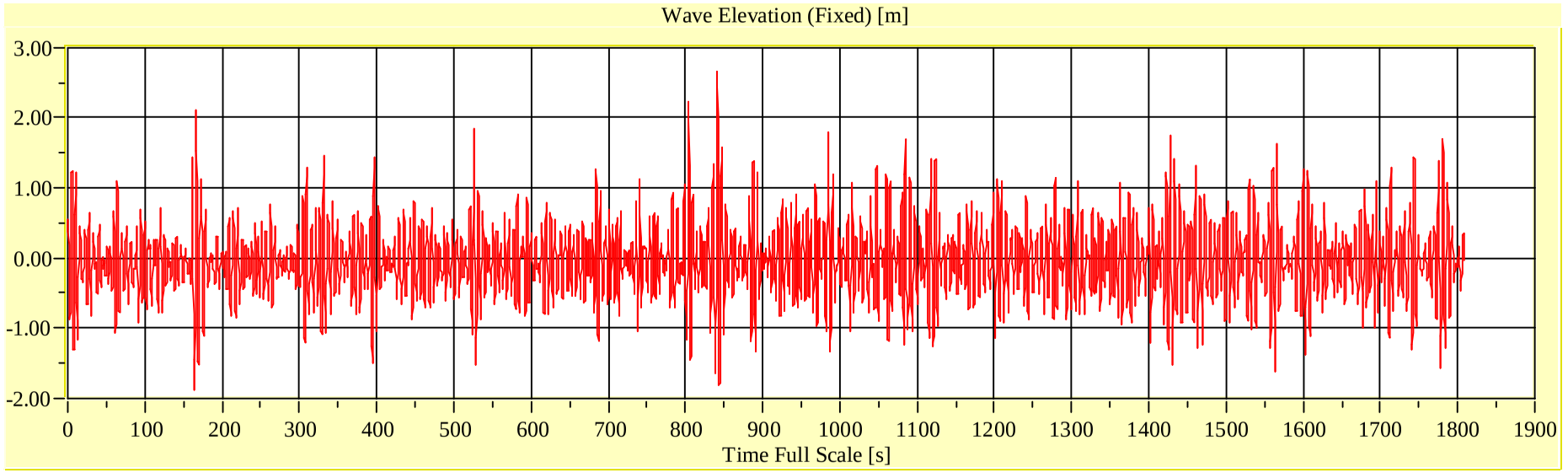



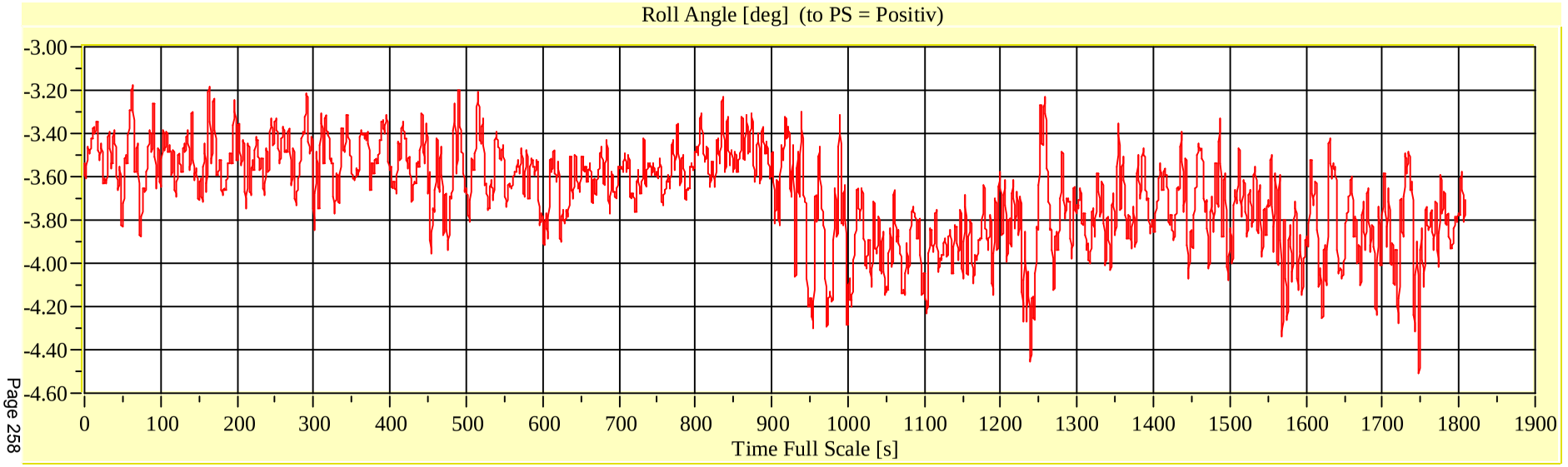



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-08 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



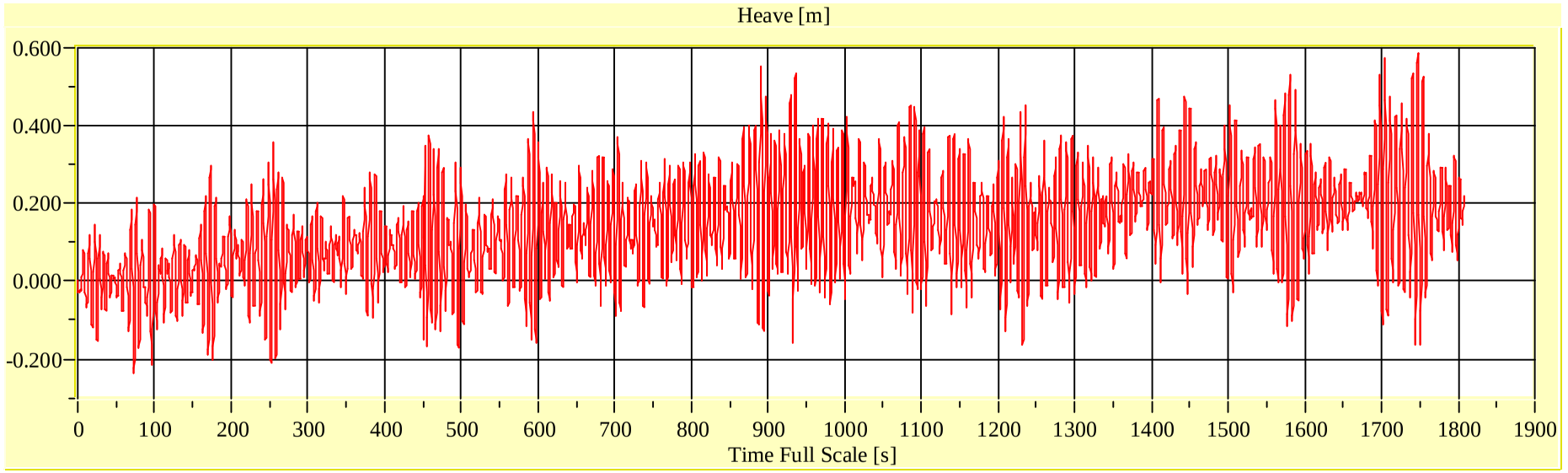



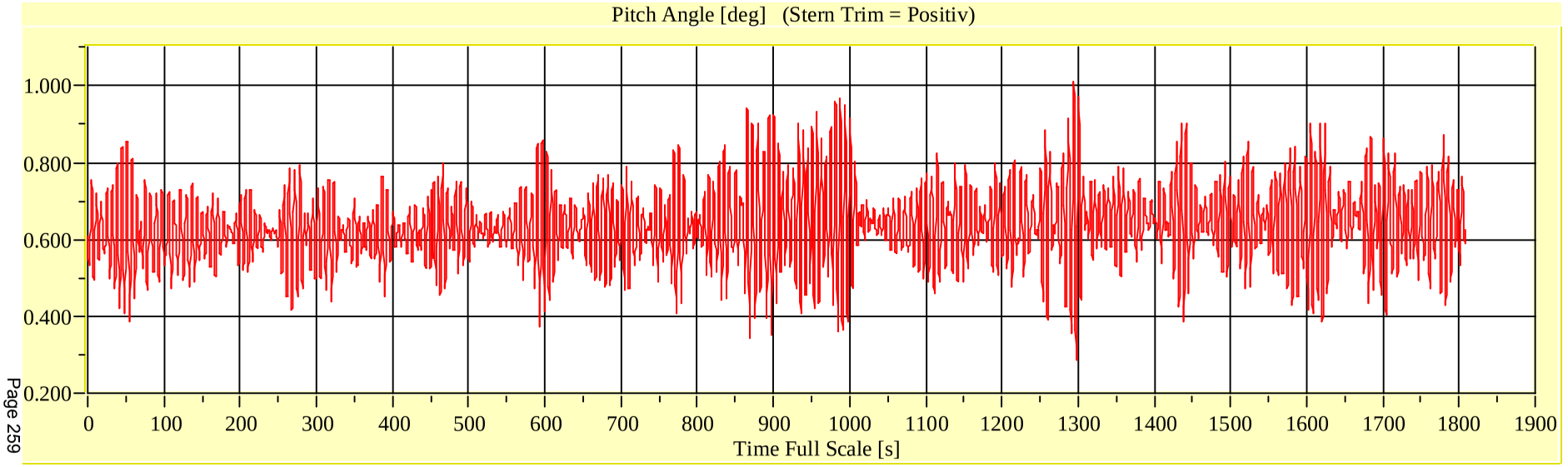



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-08 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



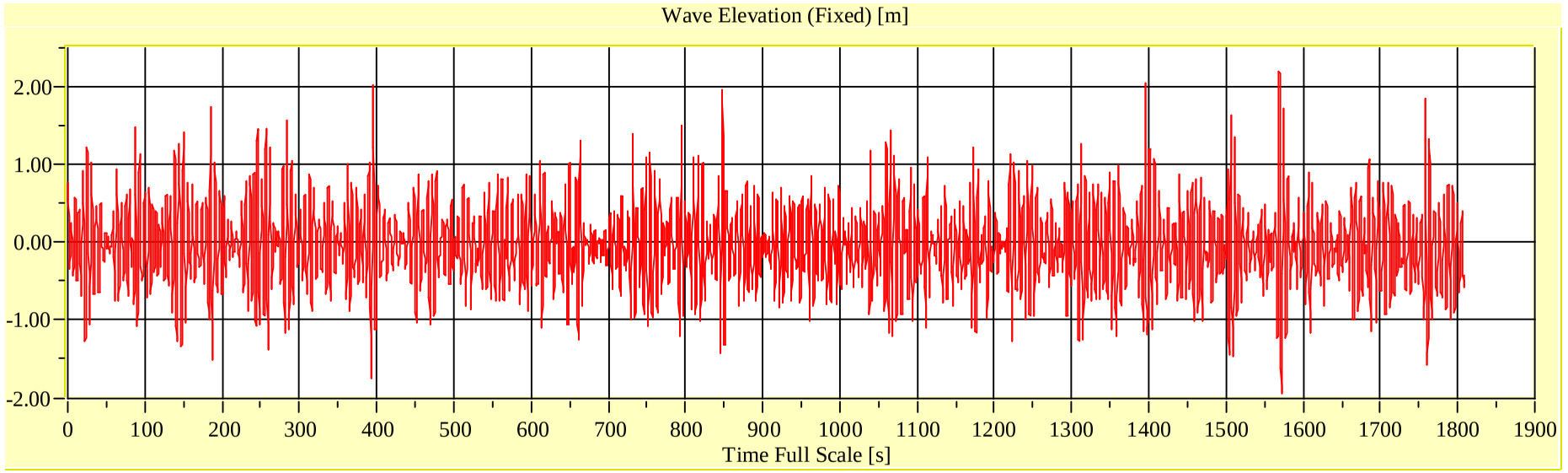



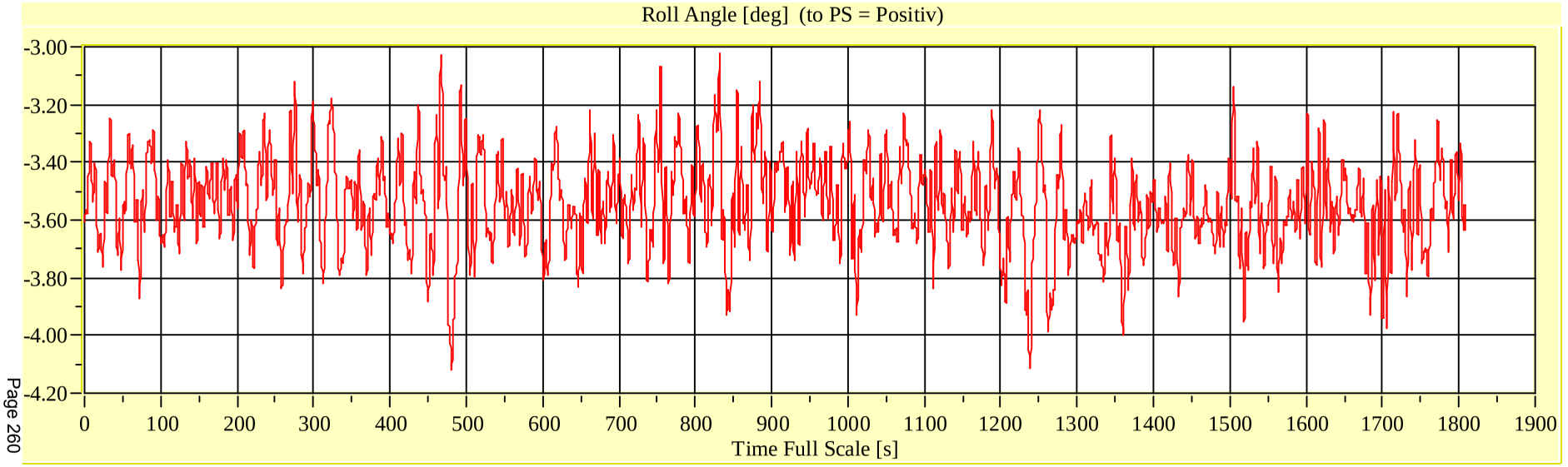



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-09 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



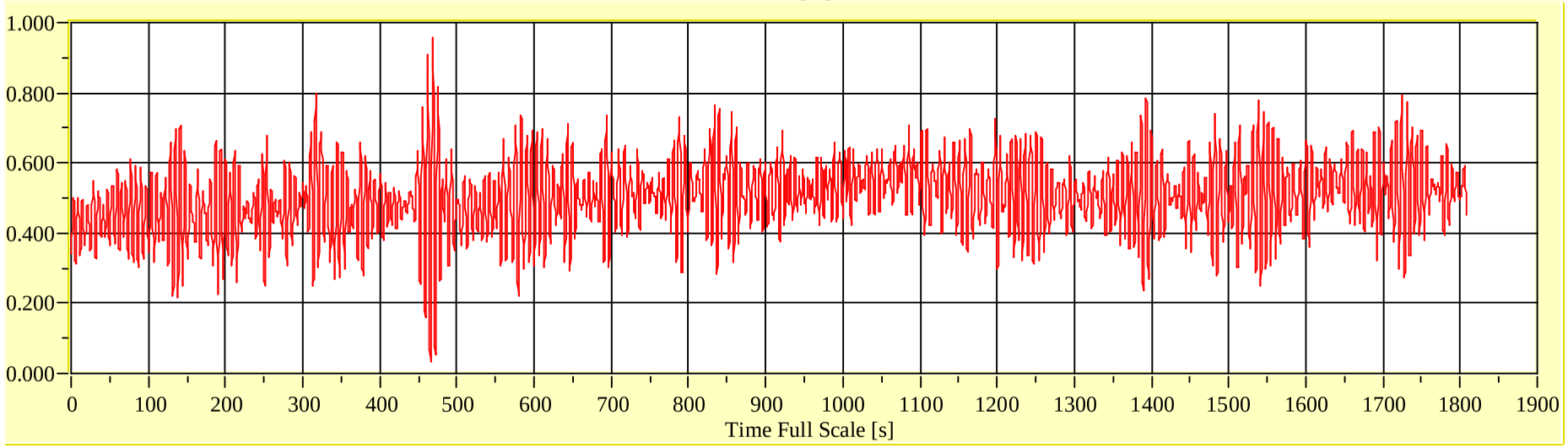



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

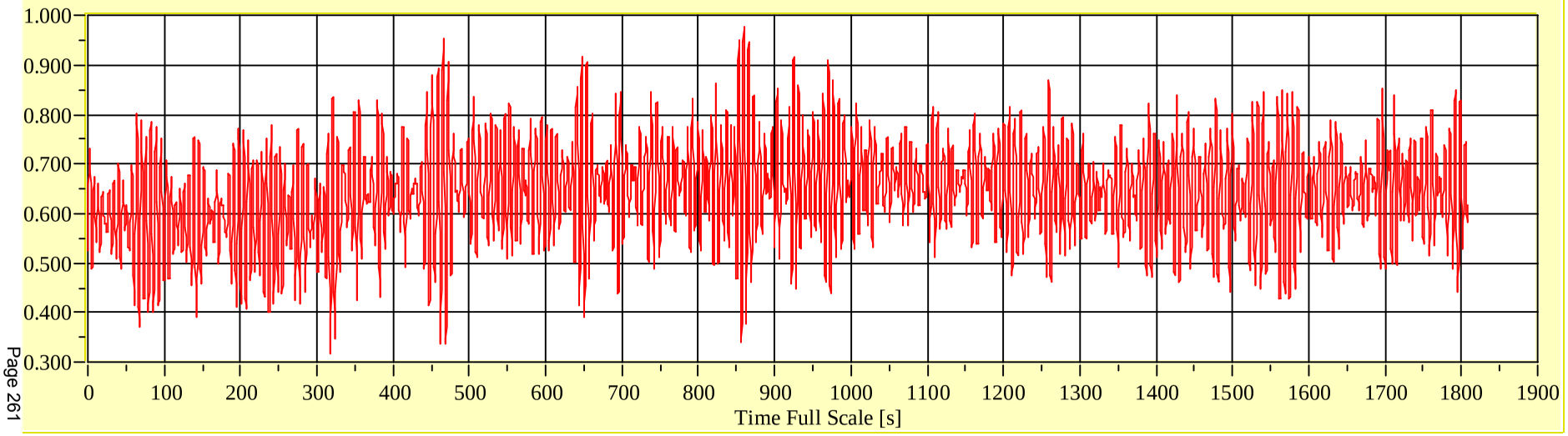
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-09 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Stern Trim = Positiv)

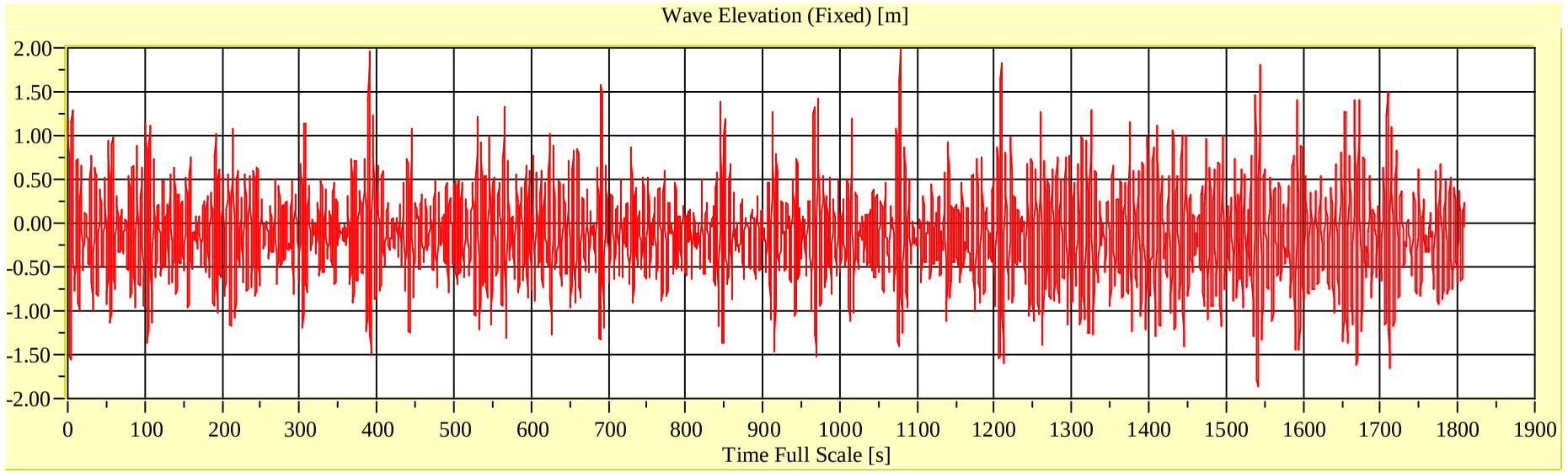


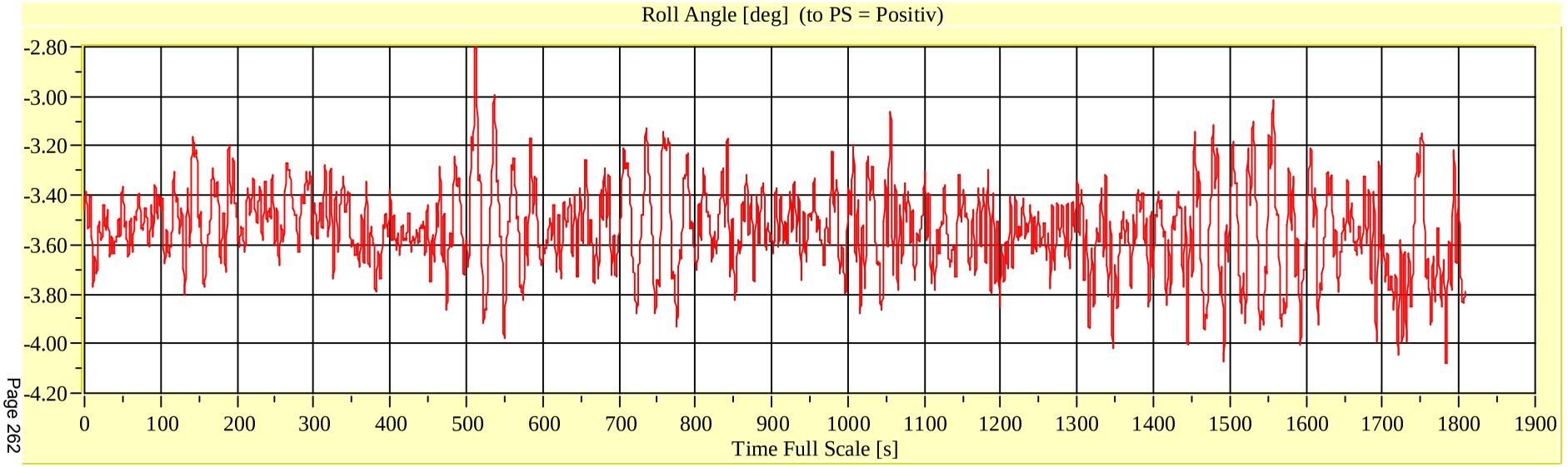



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-10 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|



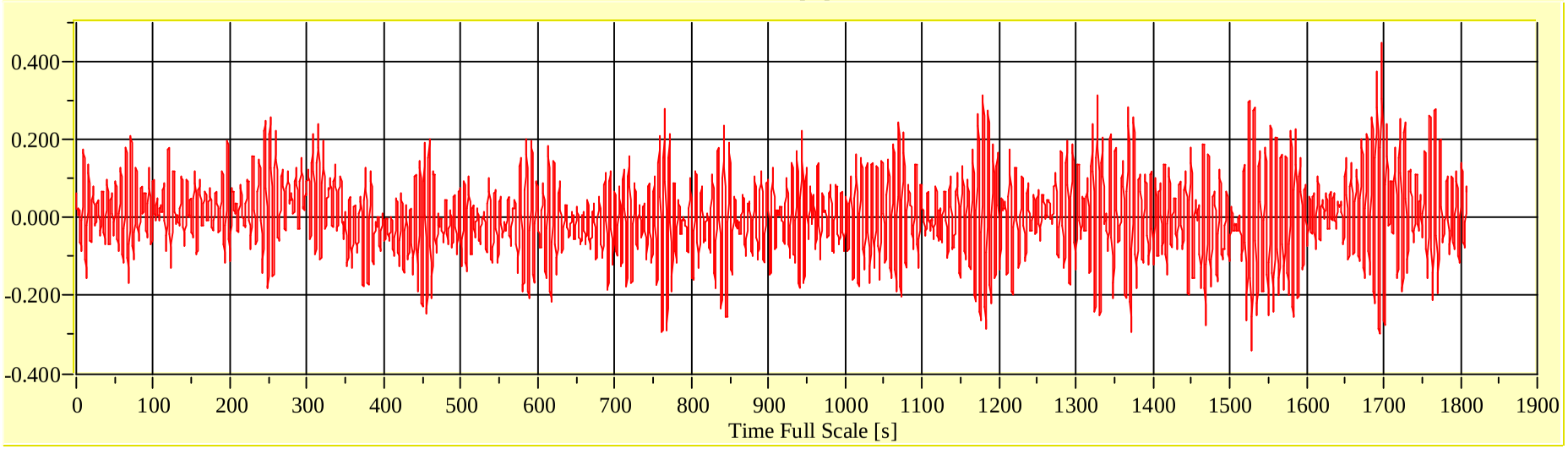



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

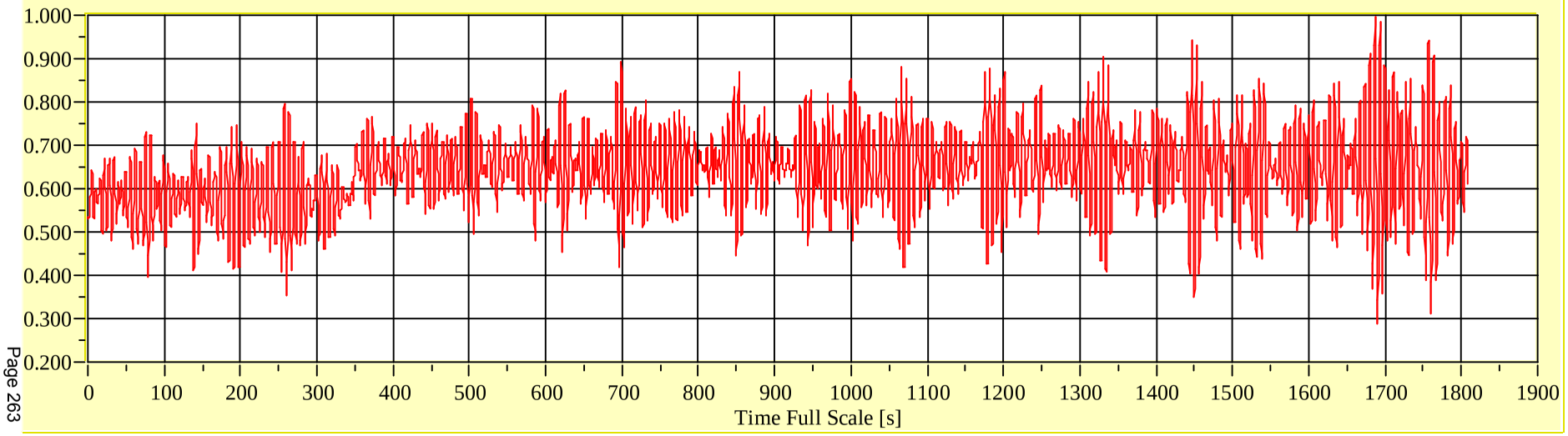
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29708-10 | Target Waves: Hs = 2,0 m Tp = 5,657 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Stern Trim = Positiv)

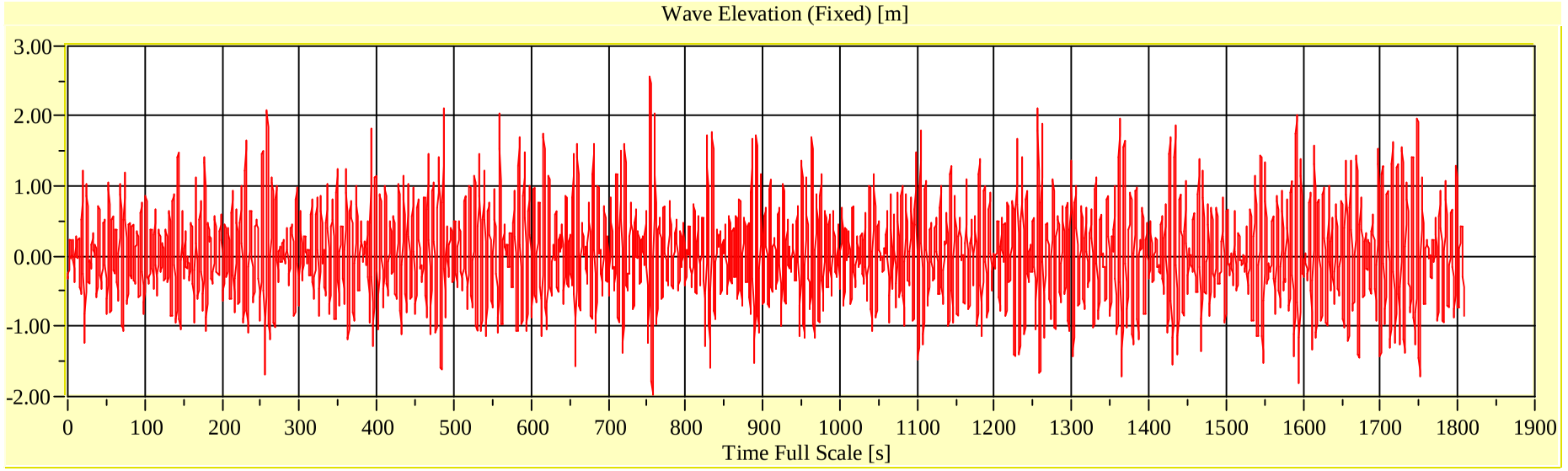


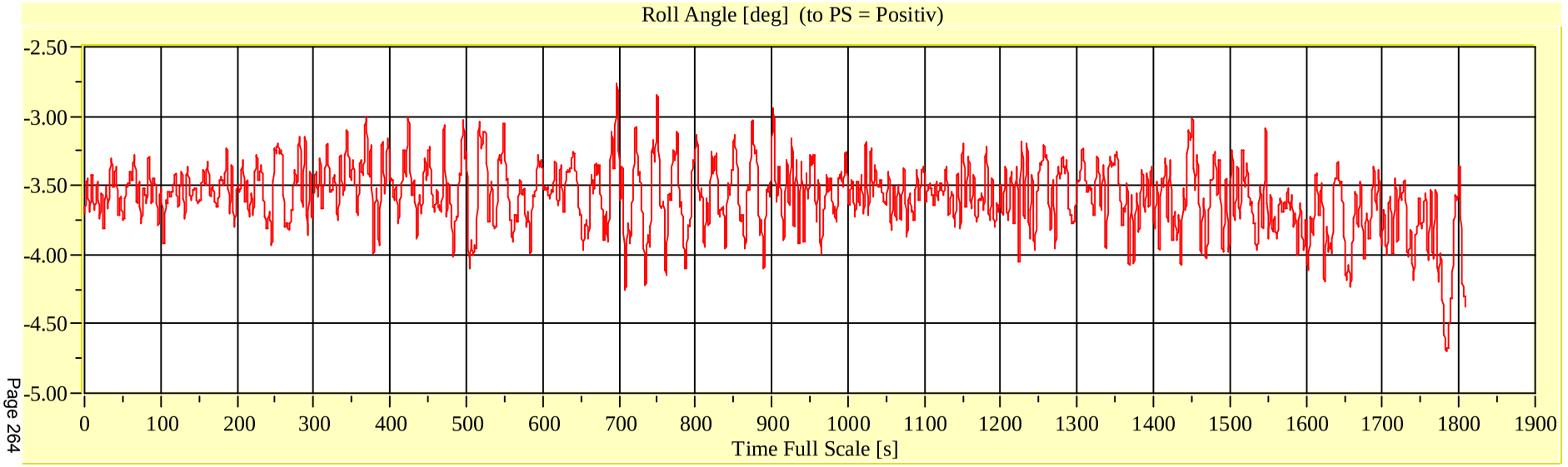



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-01 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



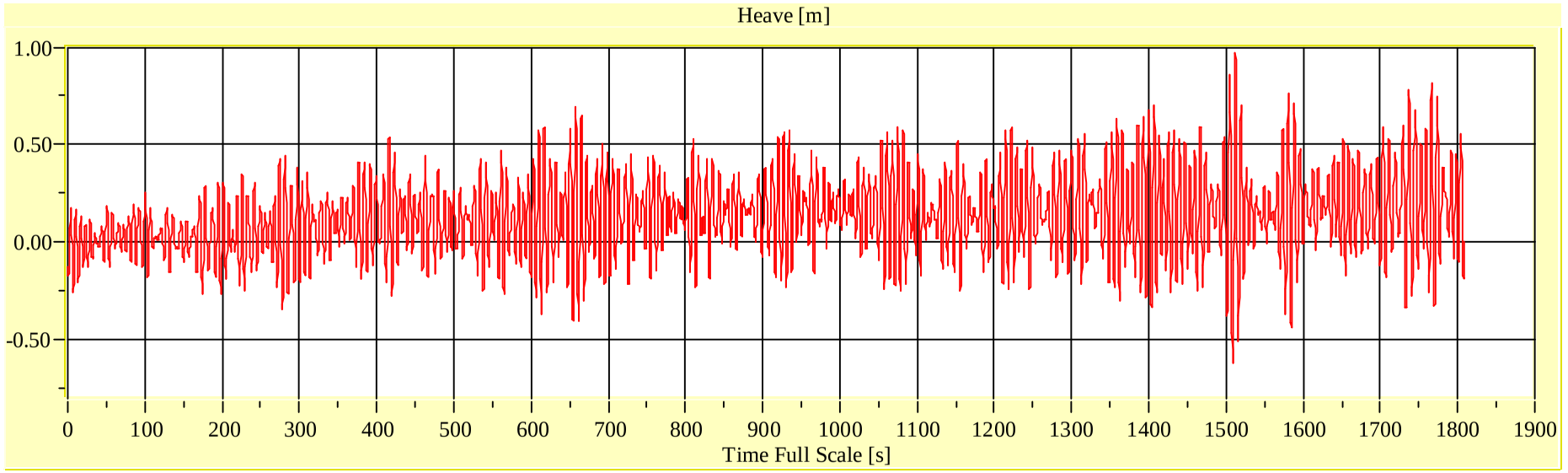



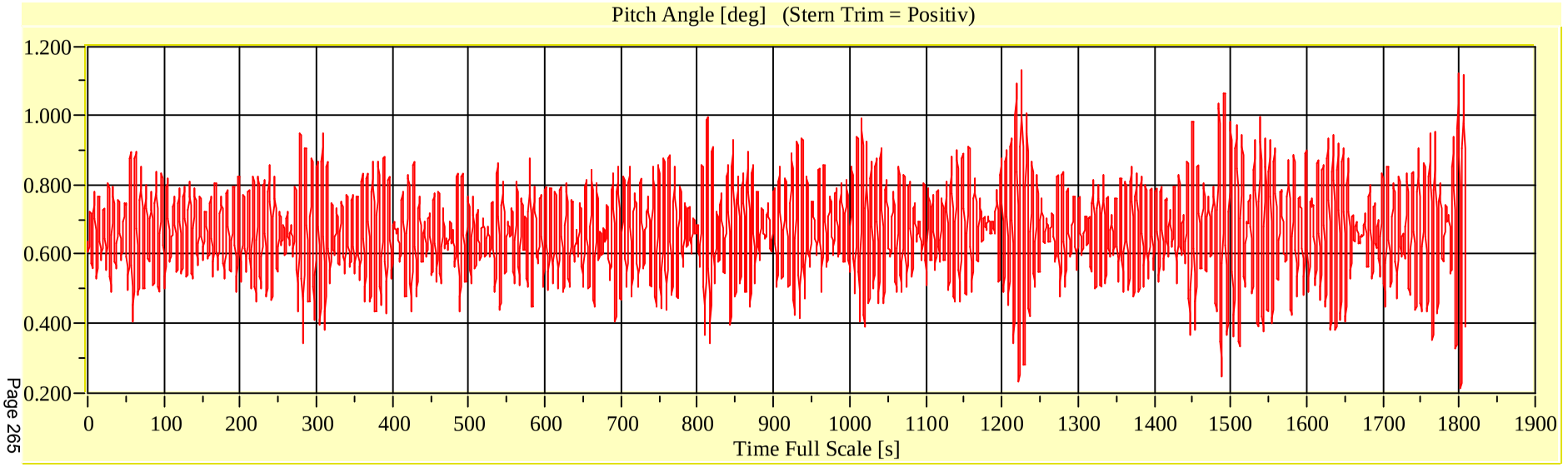



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-01 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



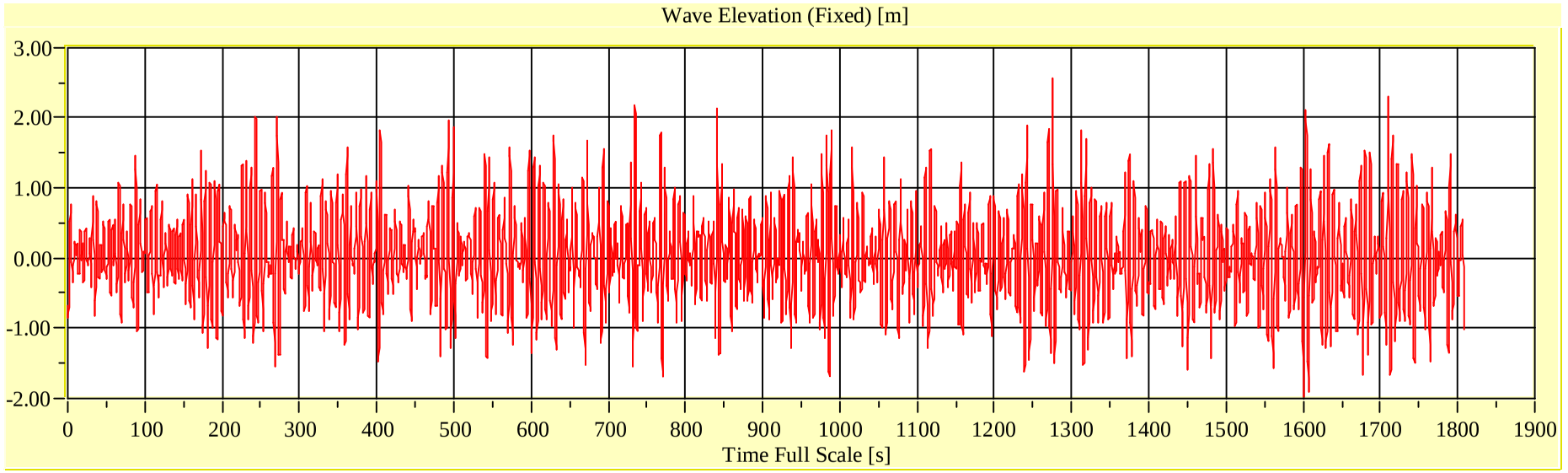



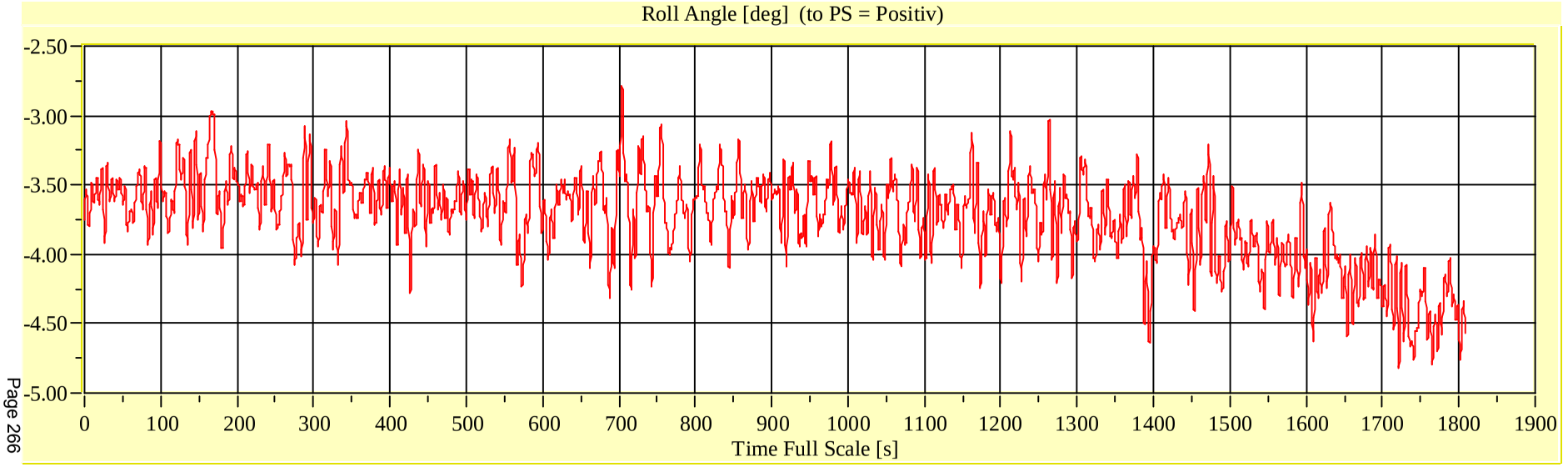



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-02 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



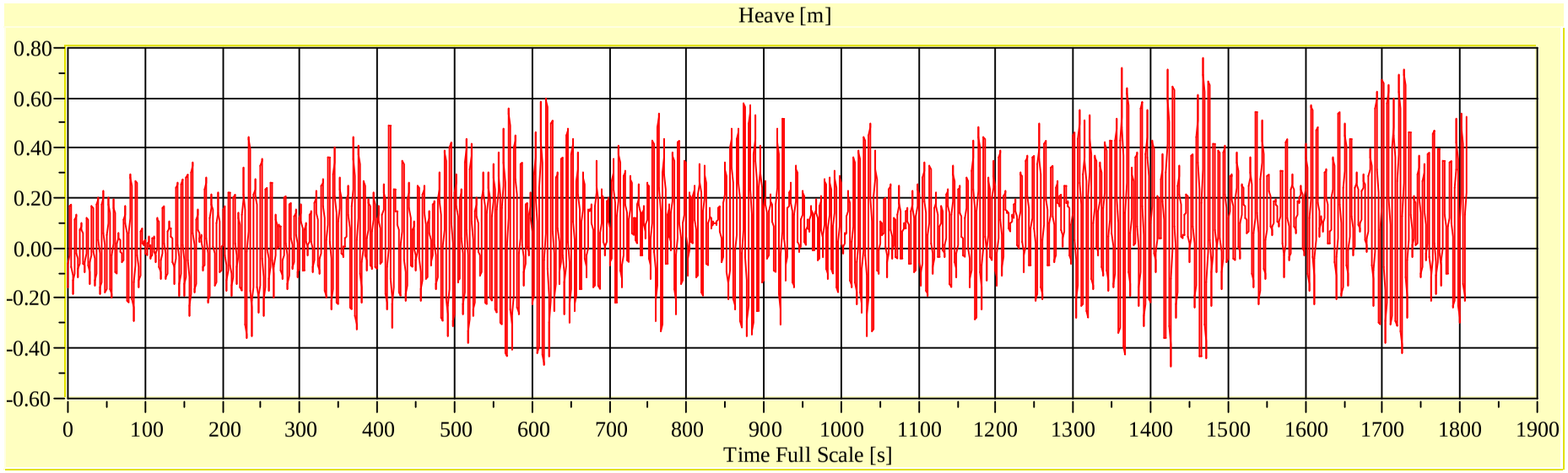



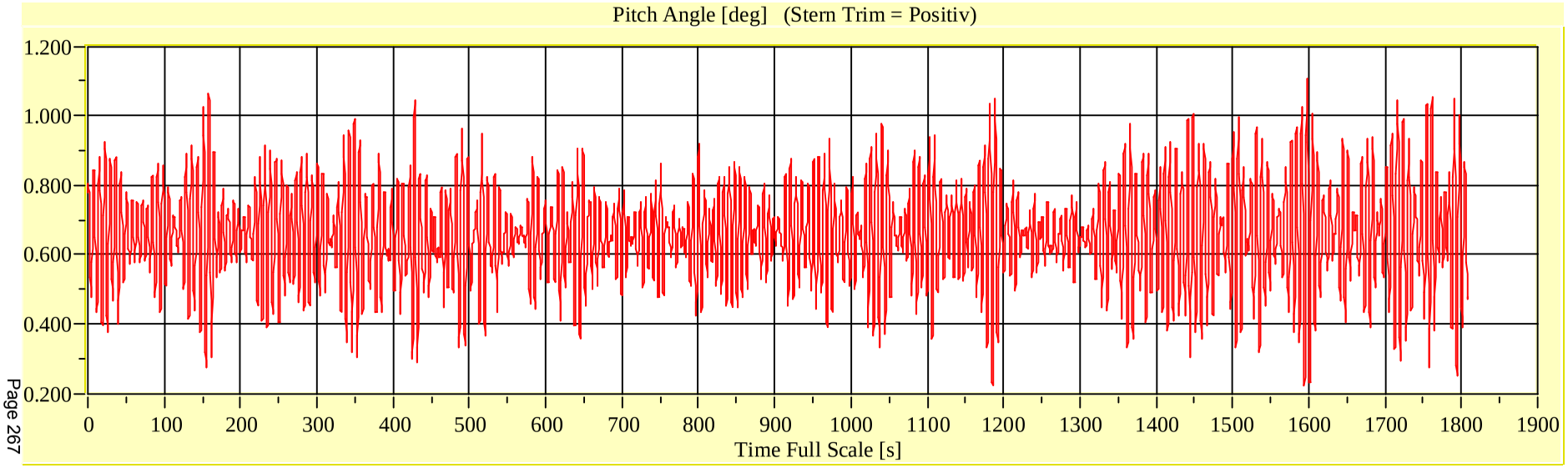



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-02 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



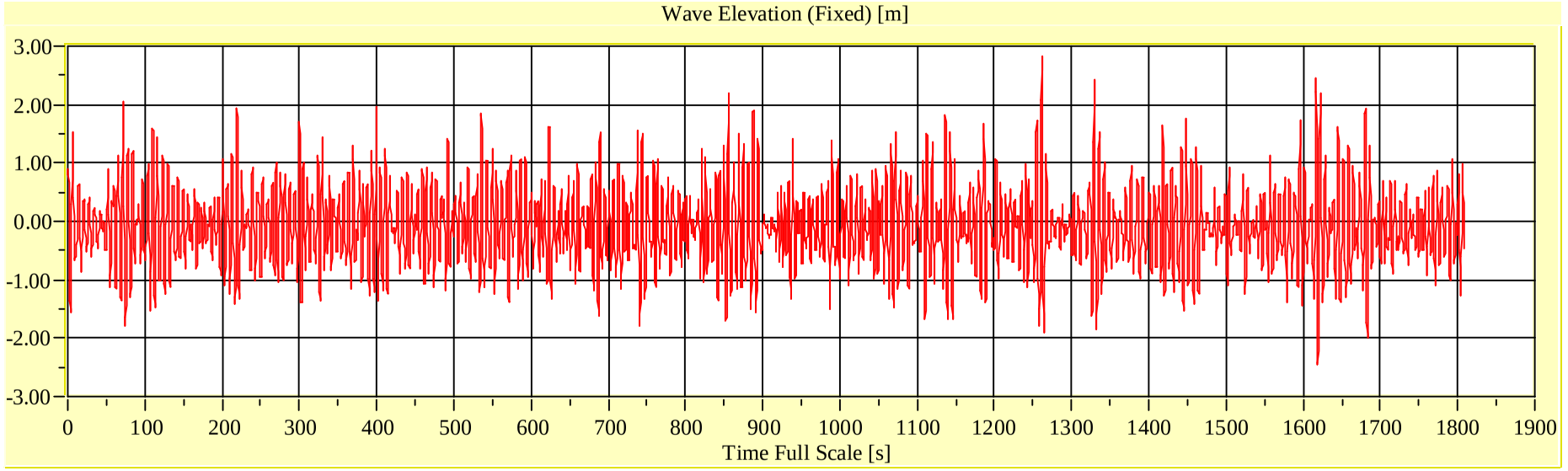



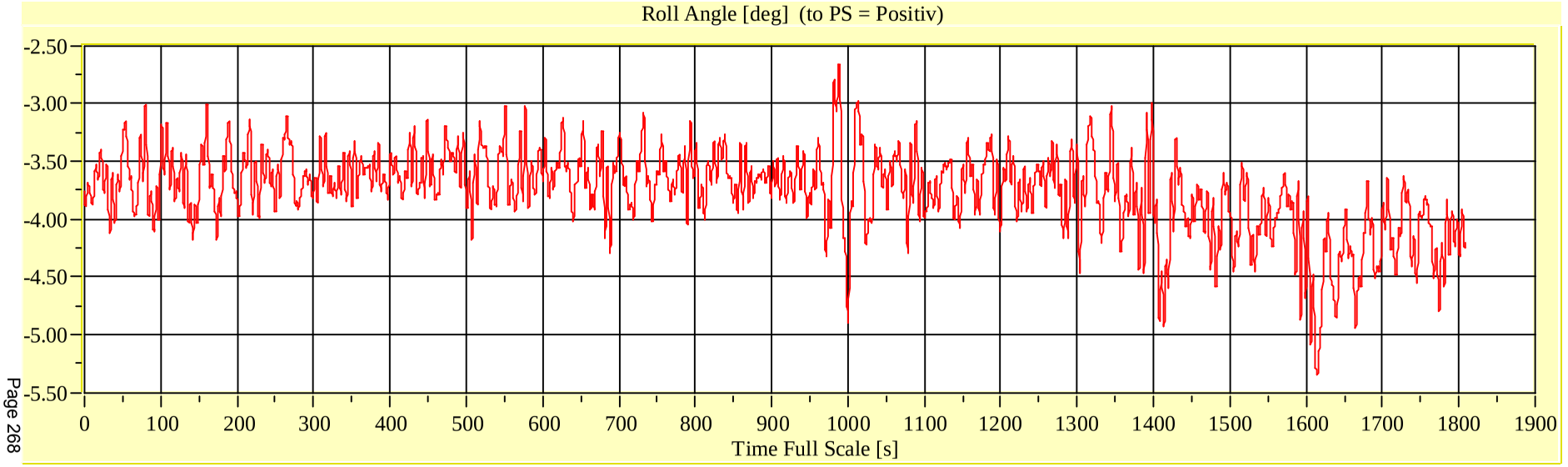



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-03 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



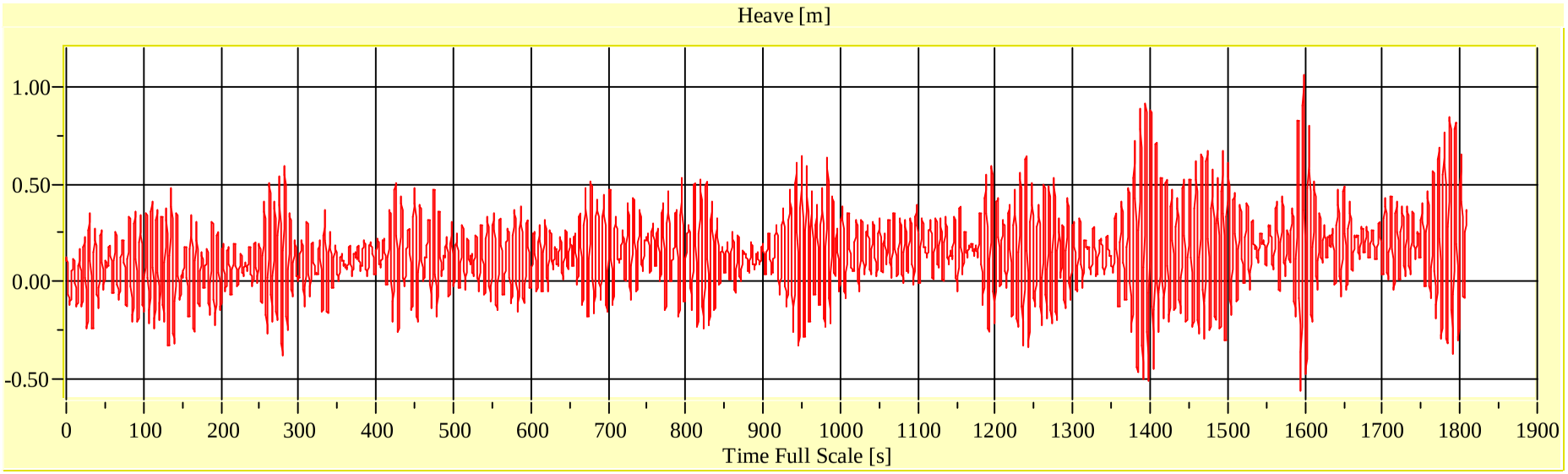



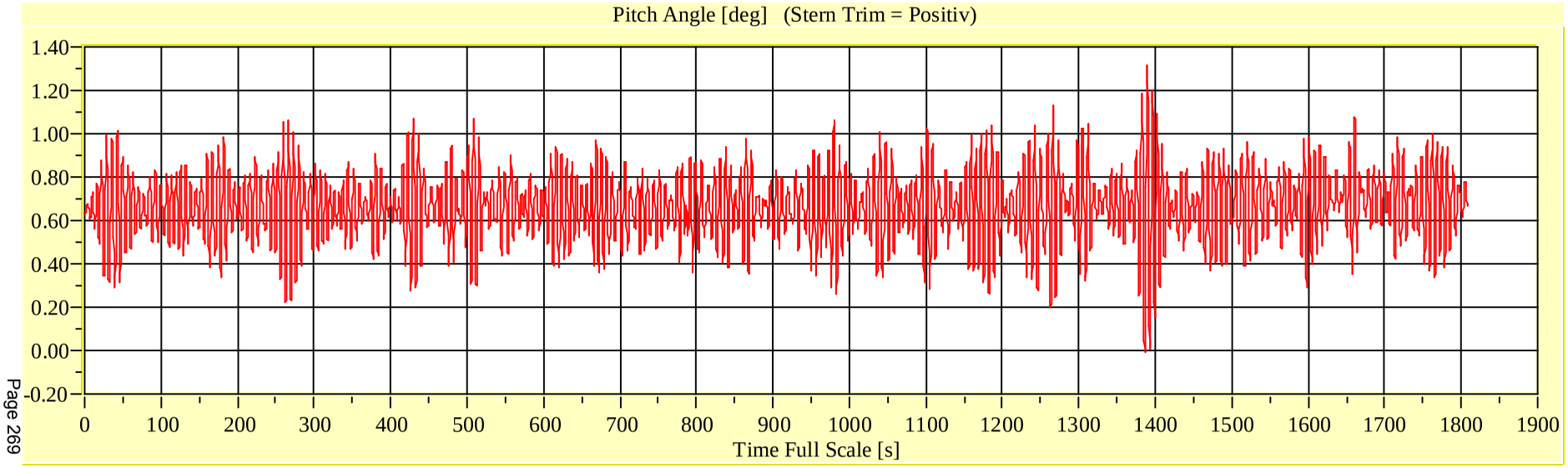



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-03 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



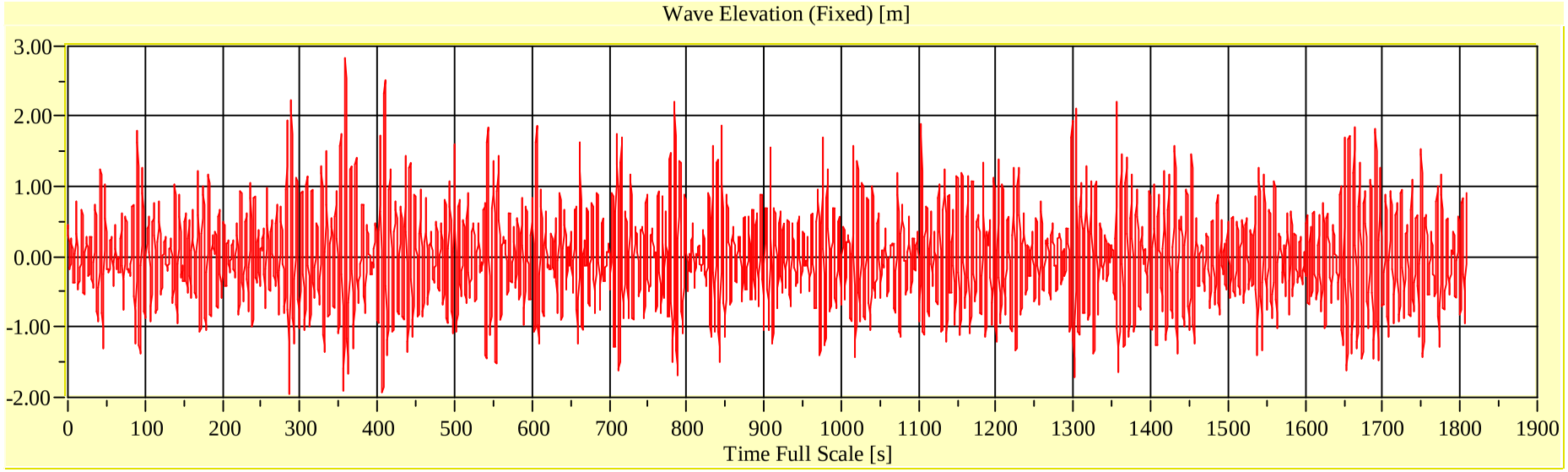



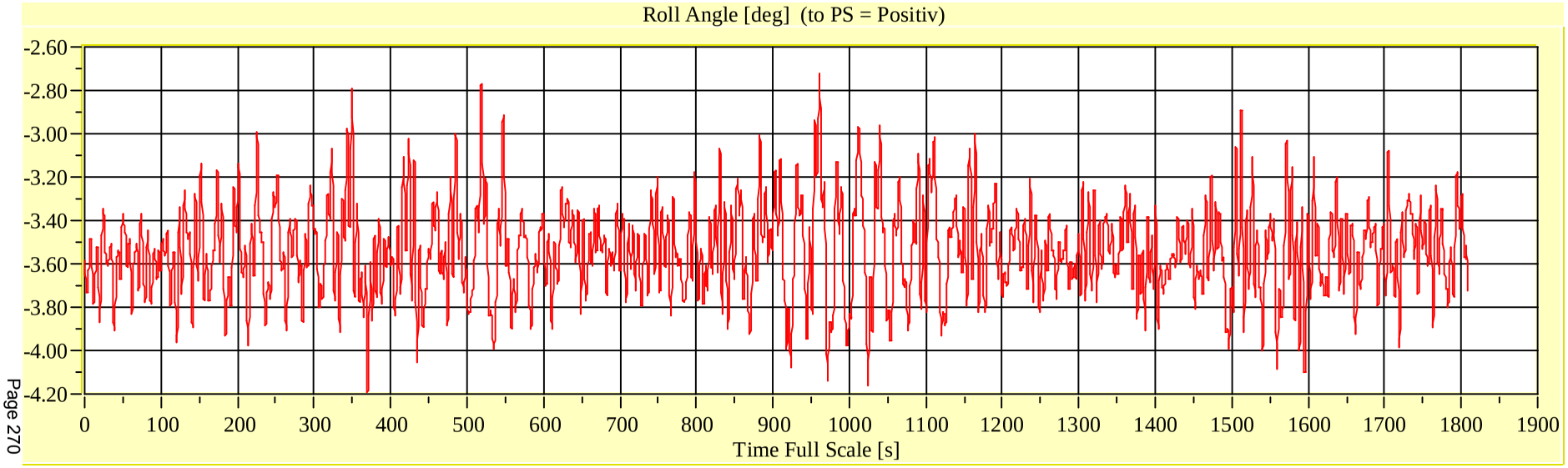



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-04 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



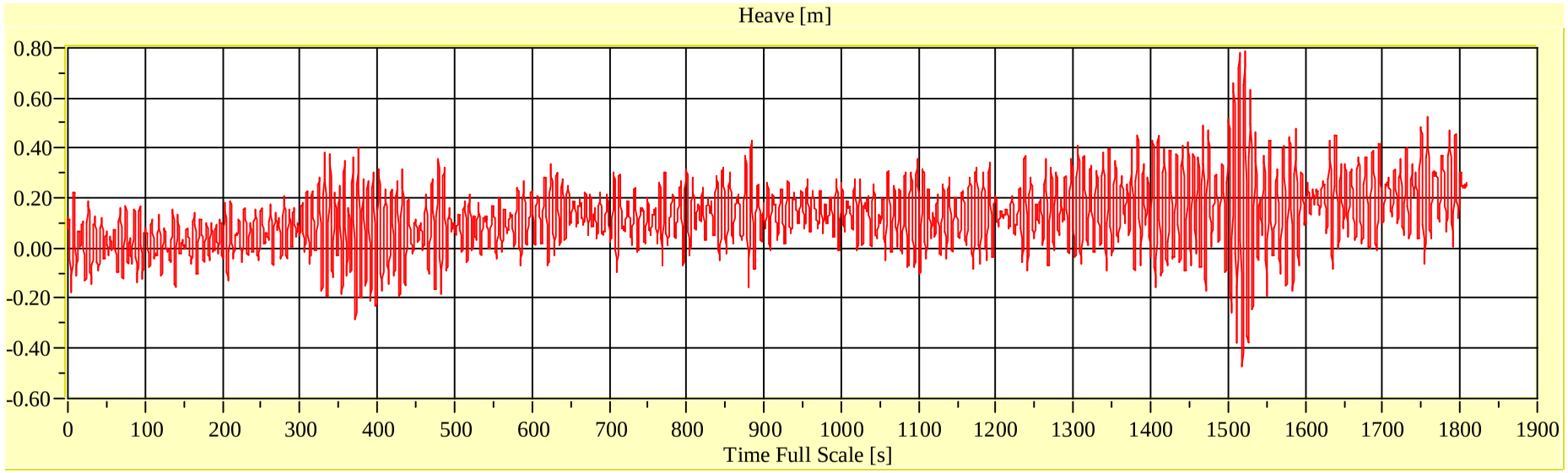



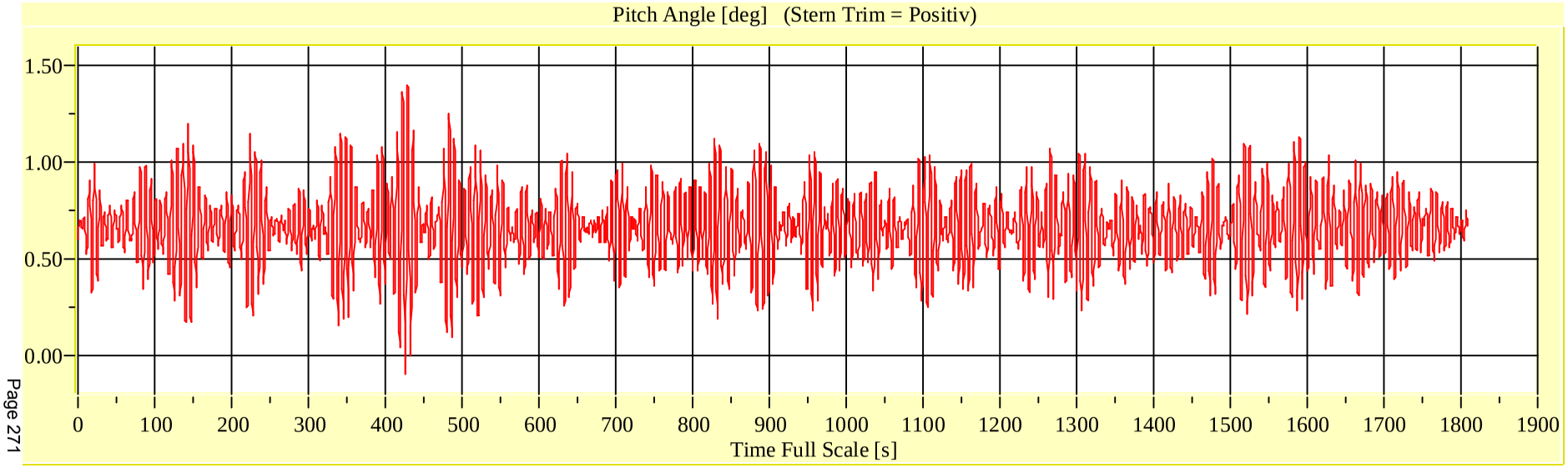



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-04 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



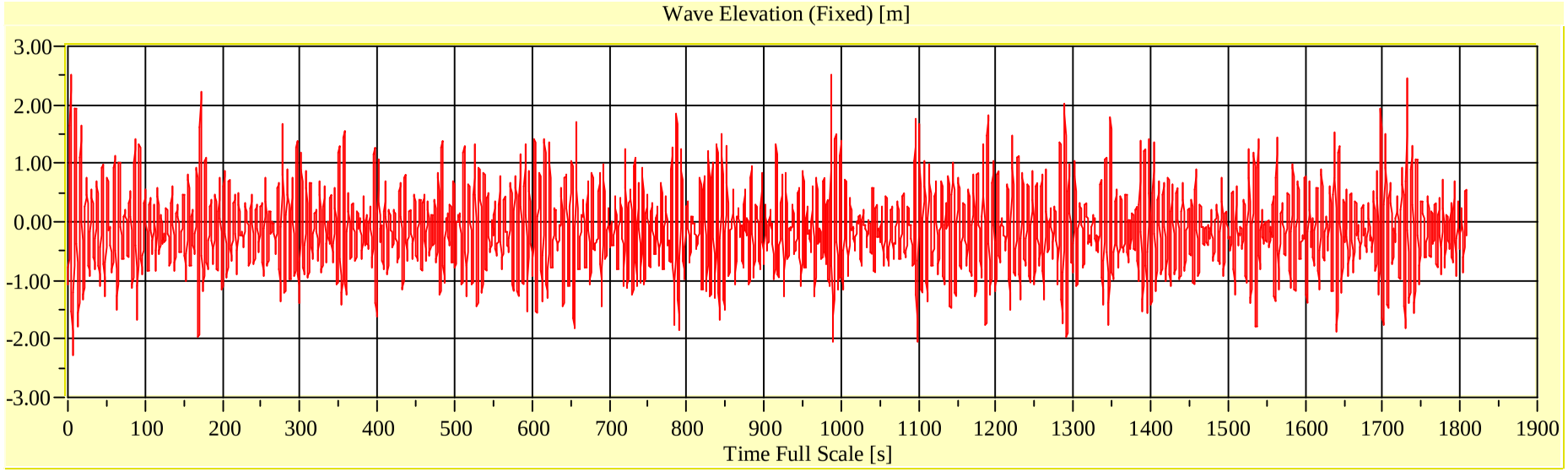



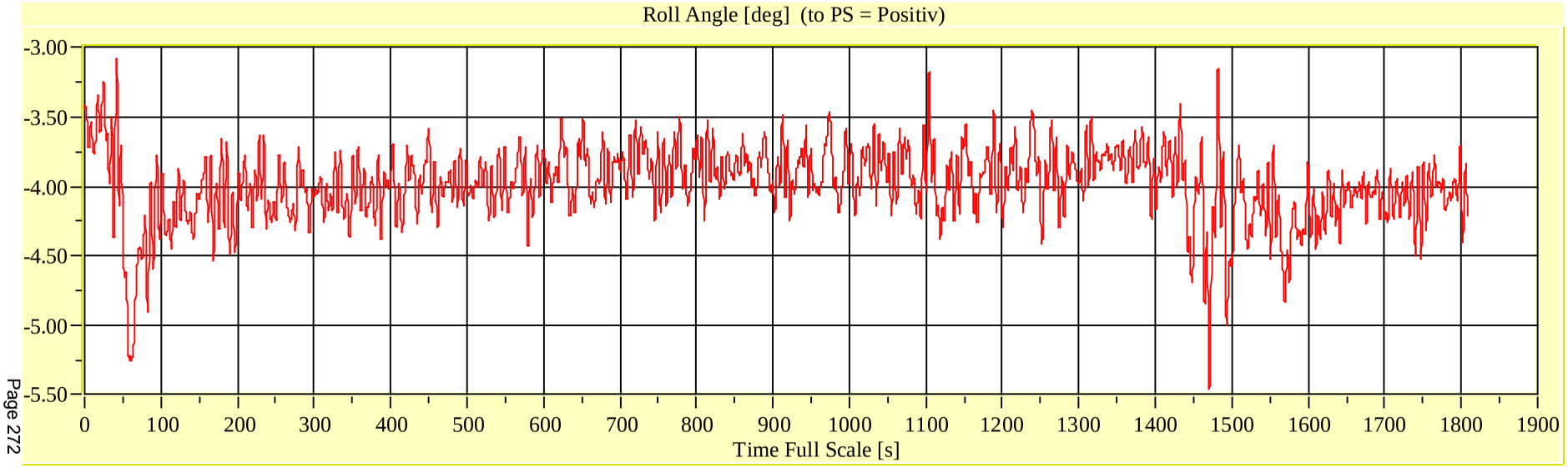



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-05 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



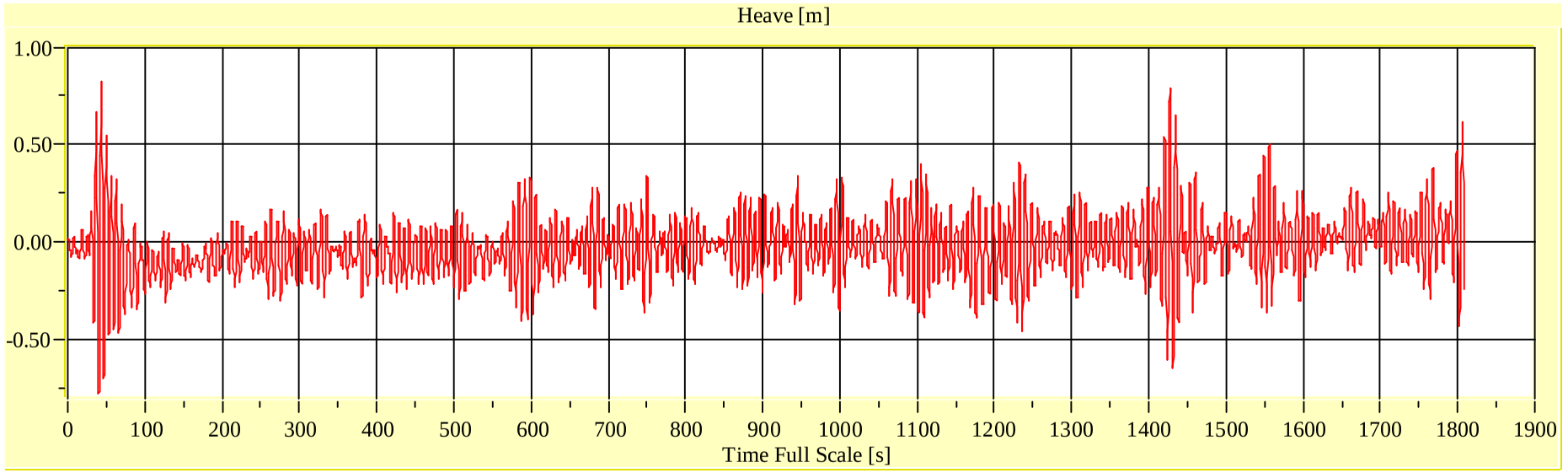



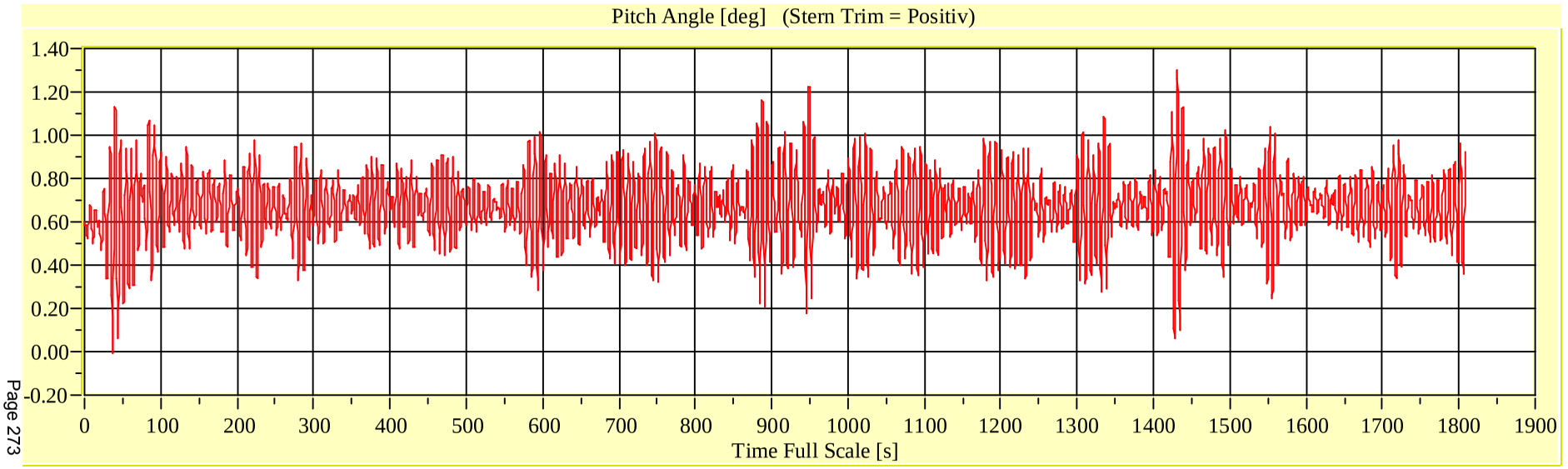



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29709-05 | Target Waves: Hs = 2,5 m Tp = 6,325 s | gamma = 3,3 |
|---|---|---|---|---|



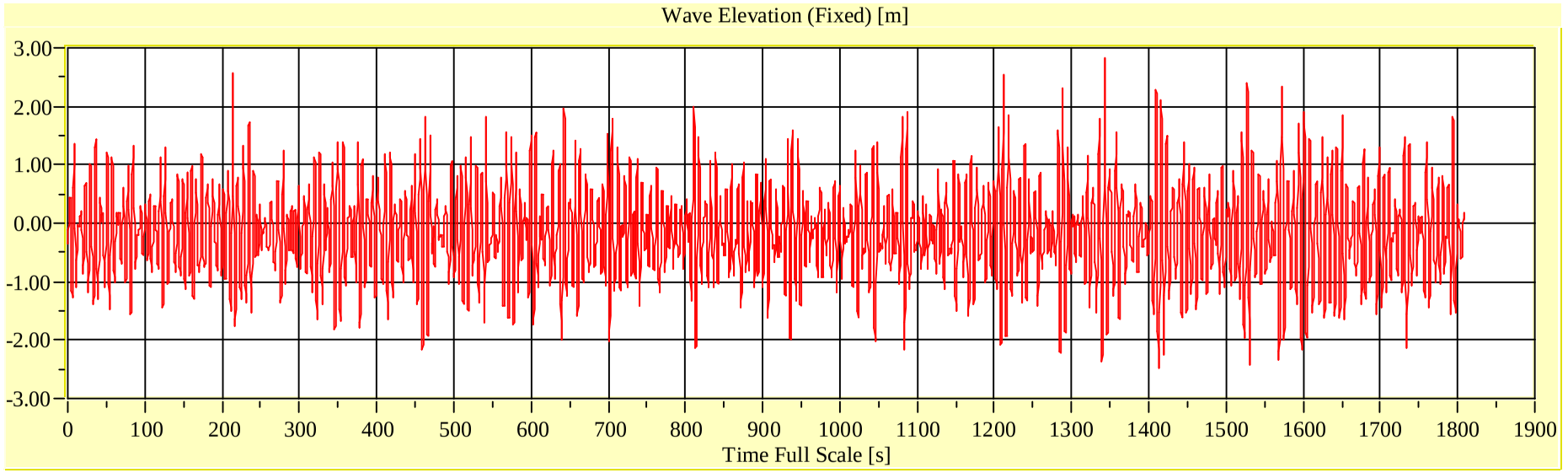



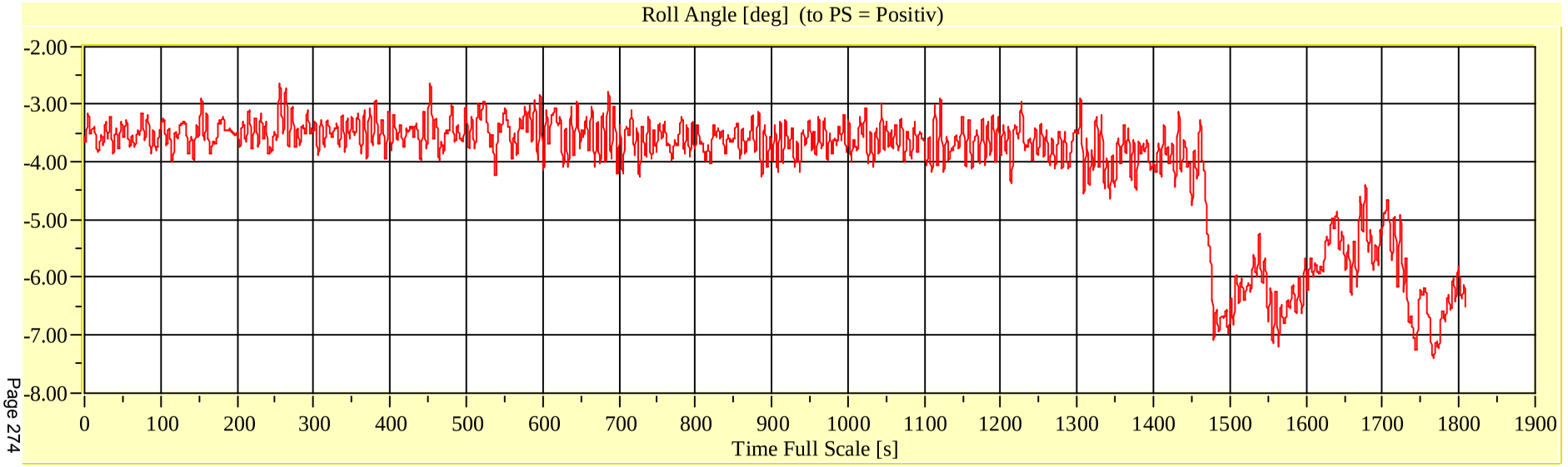



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-01 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



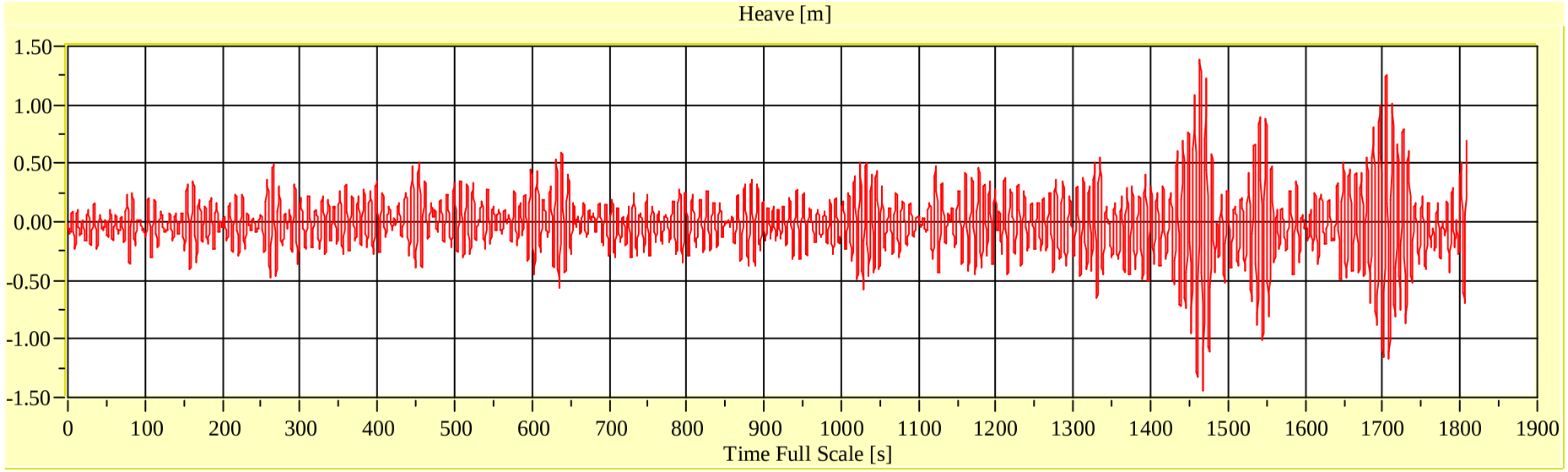



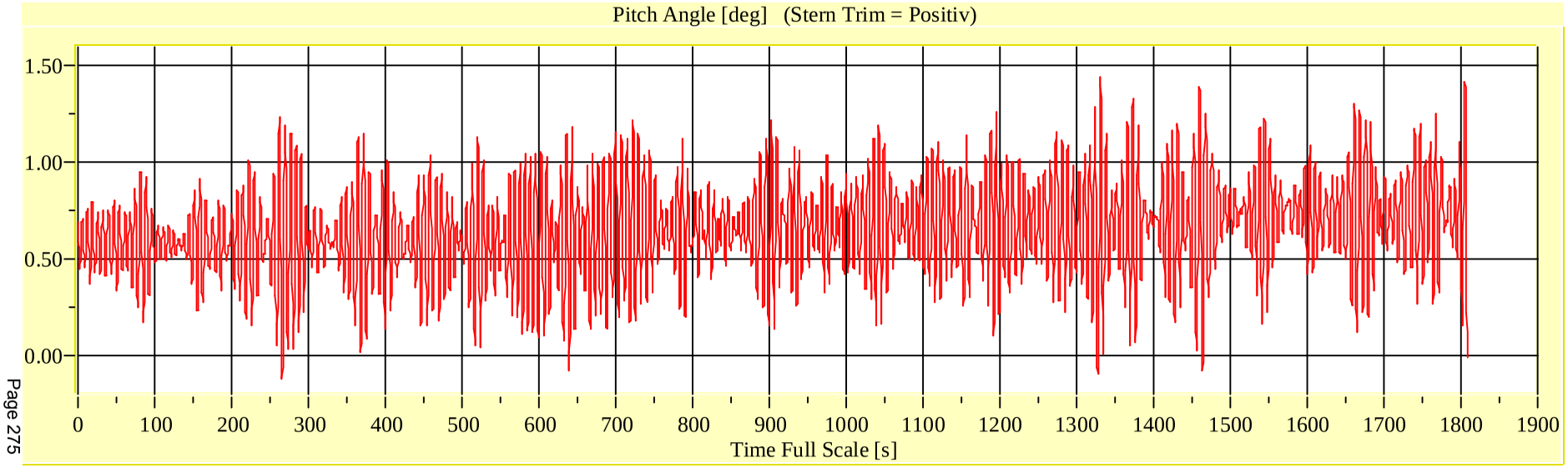



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-01 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



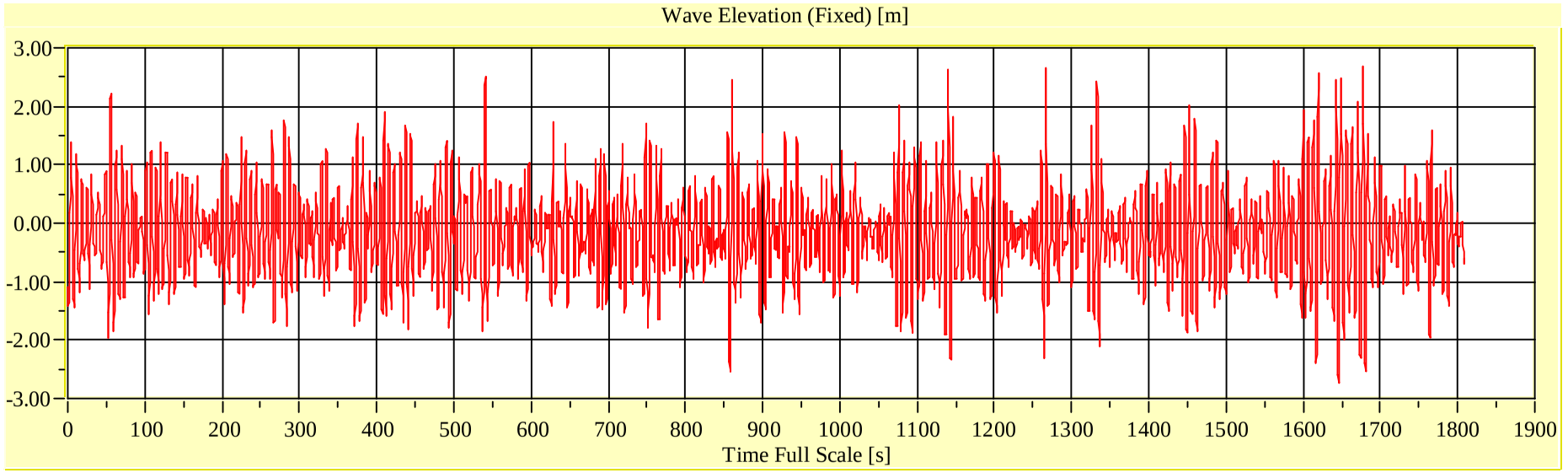



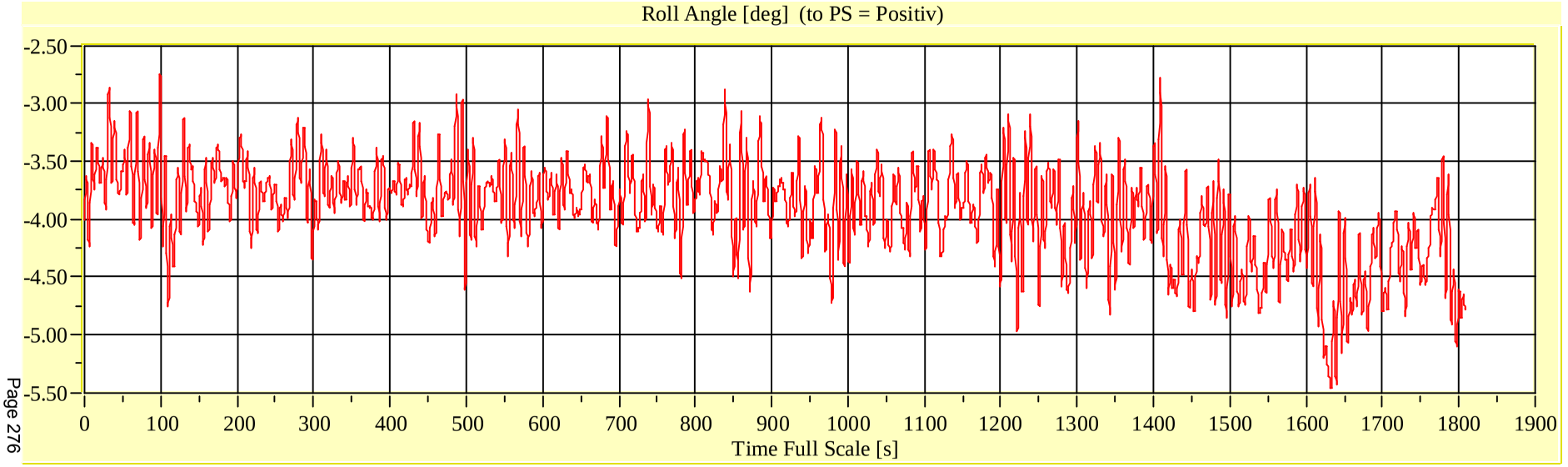



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-02 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



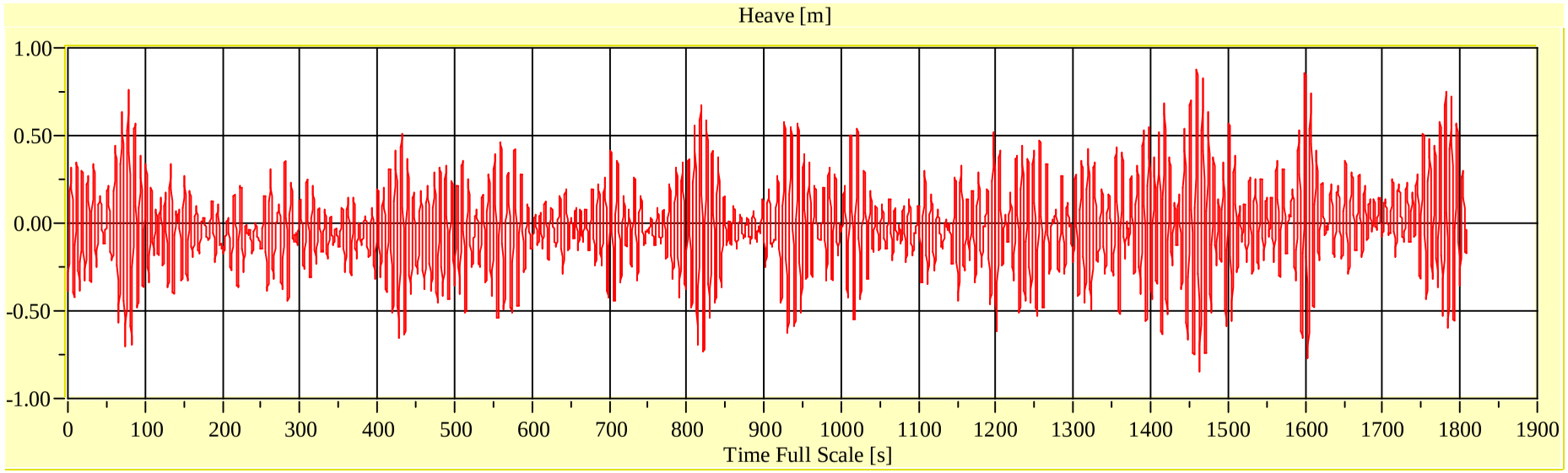



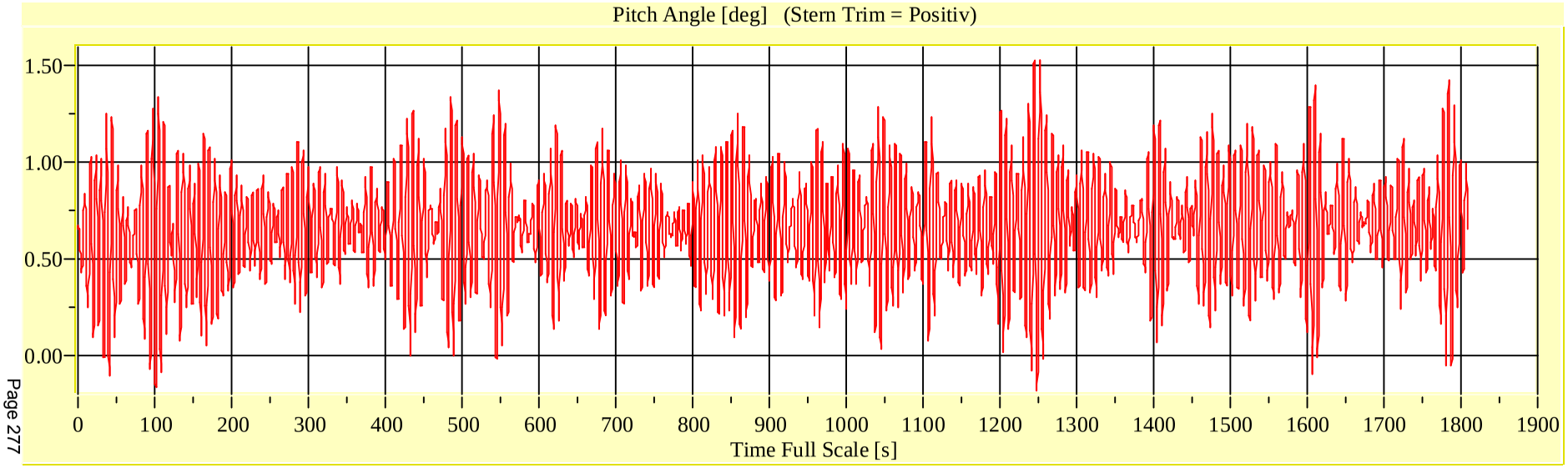



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-02 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



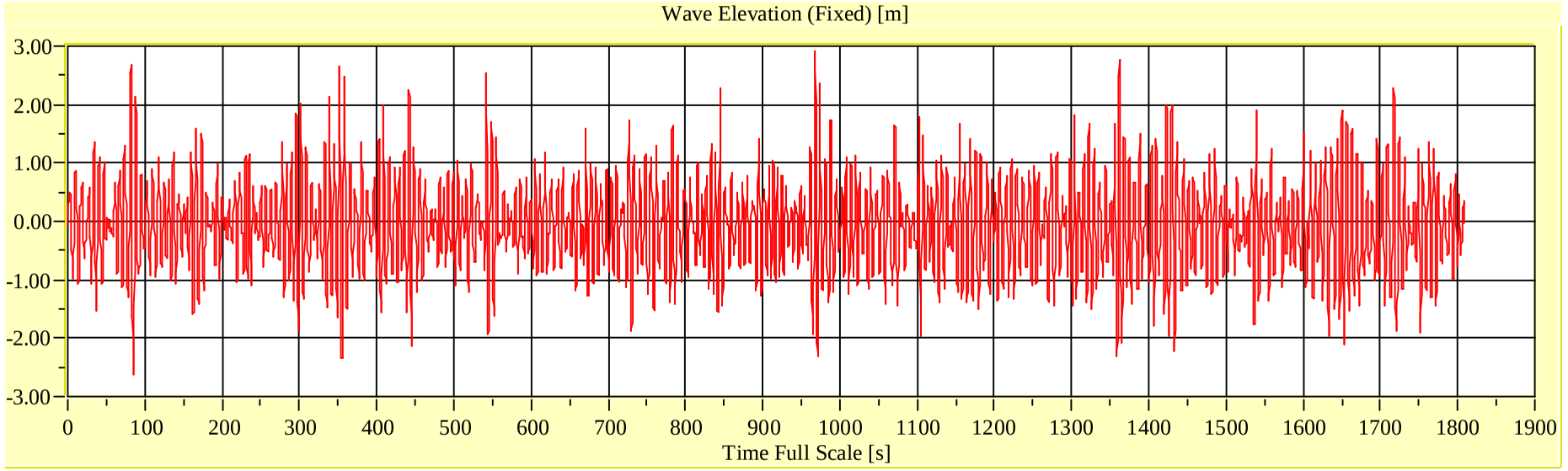



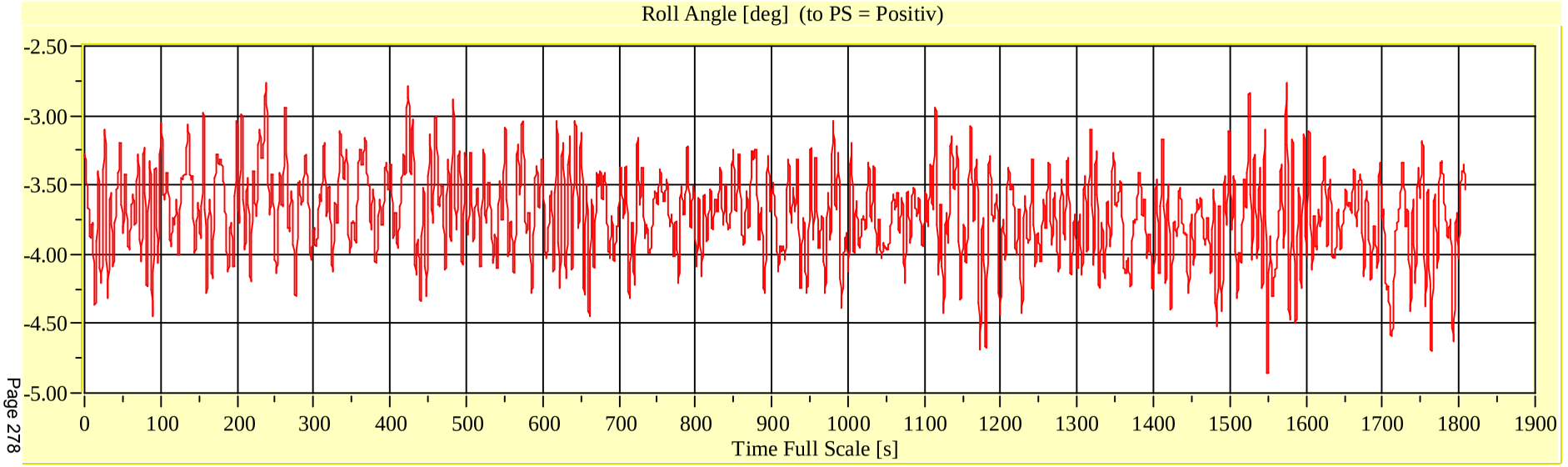



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-03 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



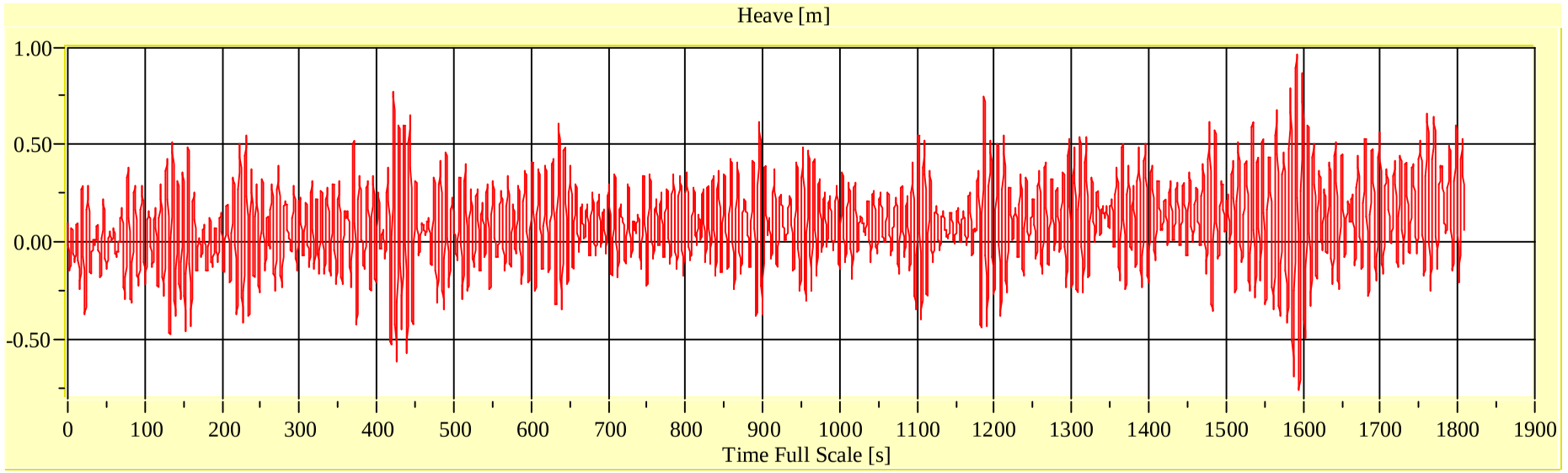



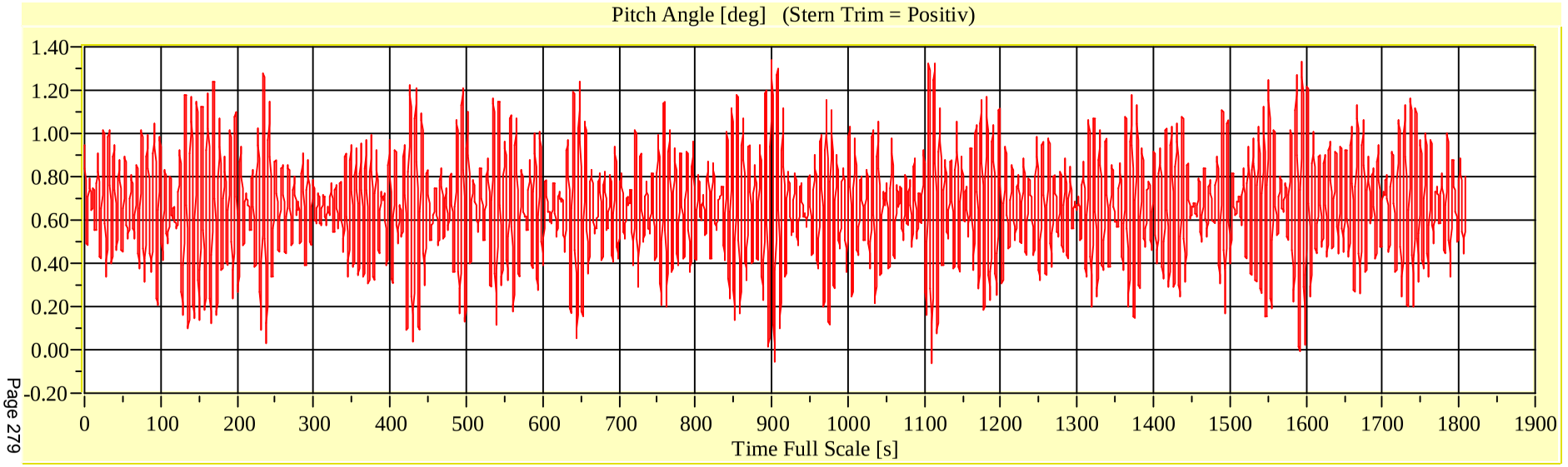



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-03 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



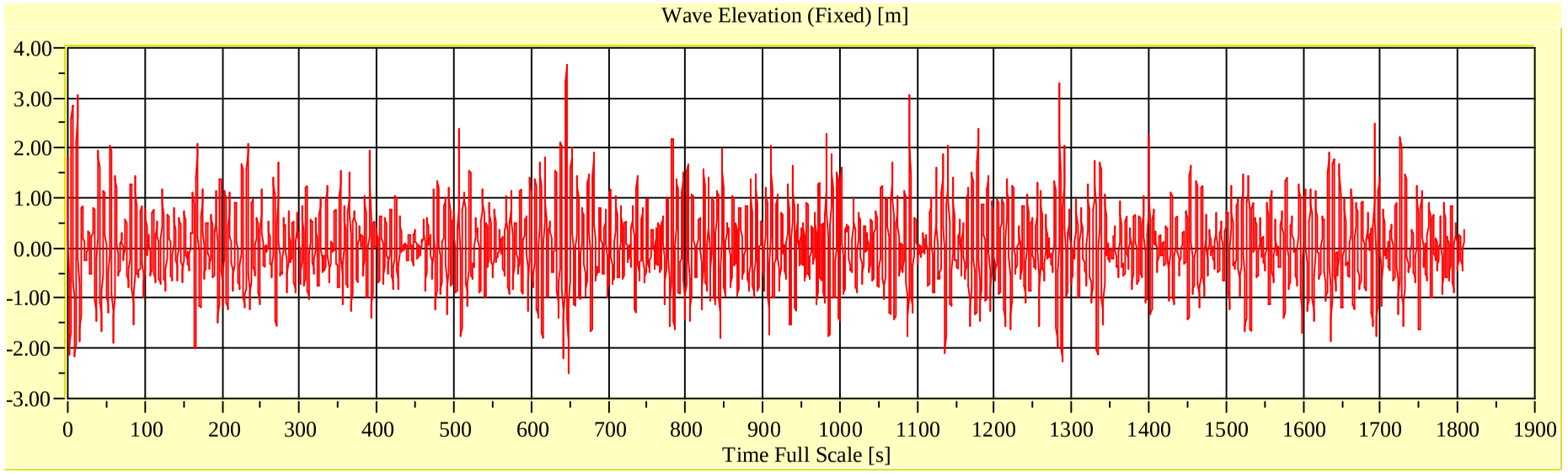



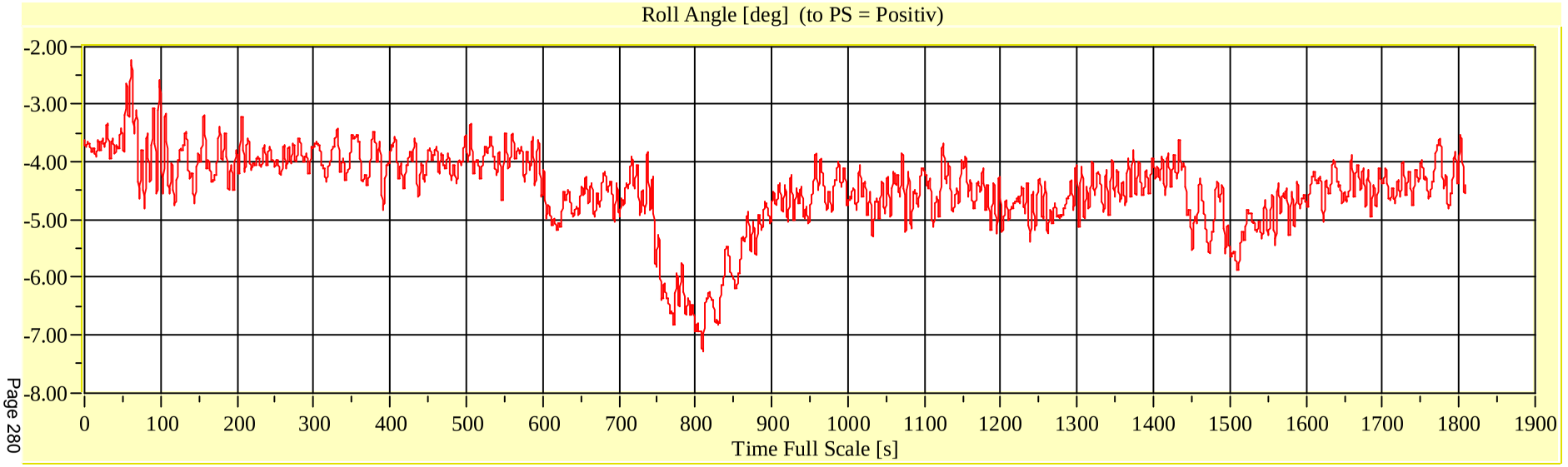



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-04 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



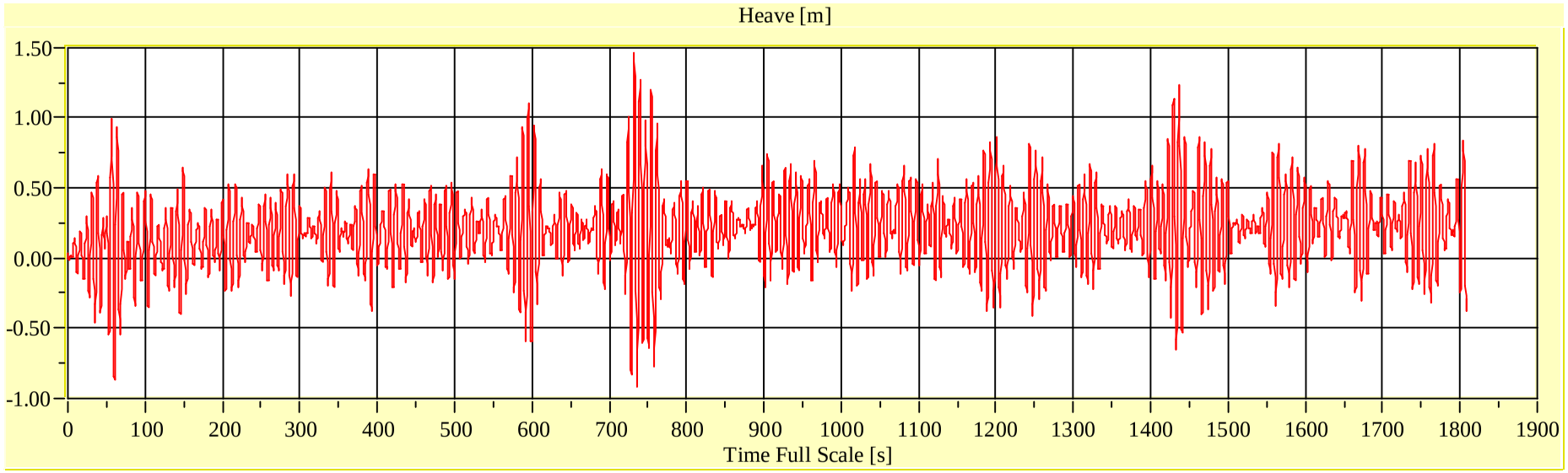



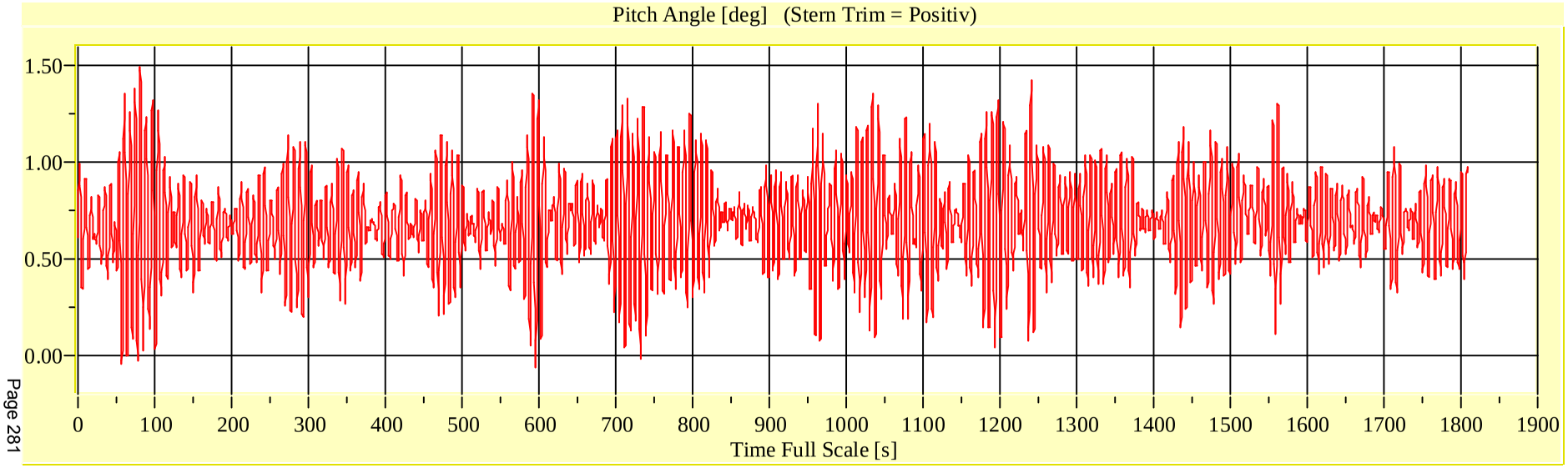



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-04 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



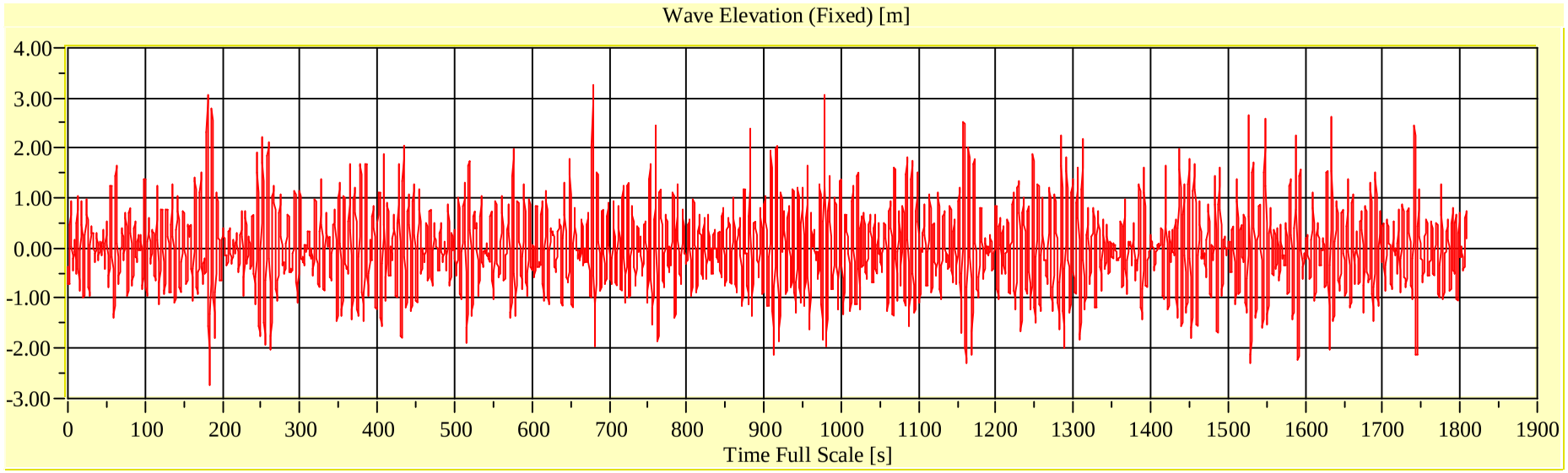



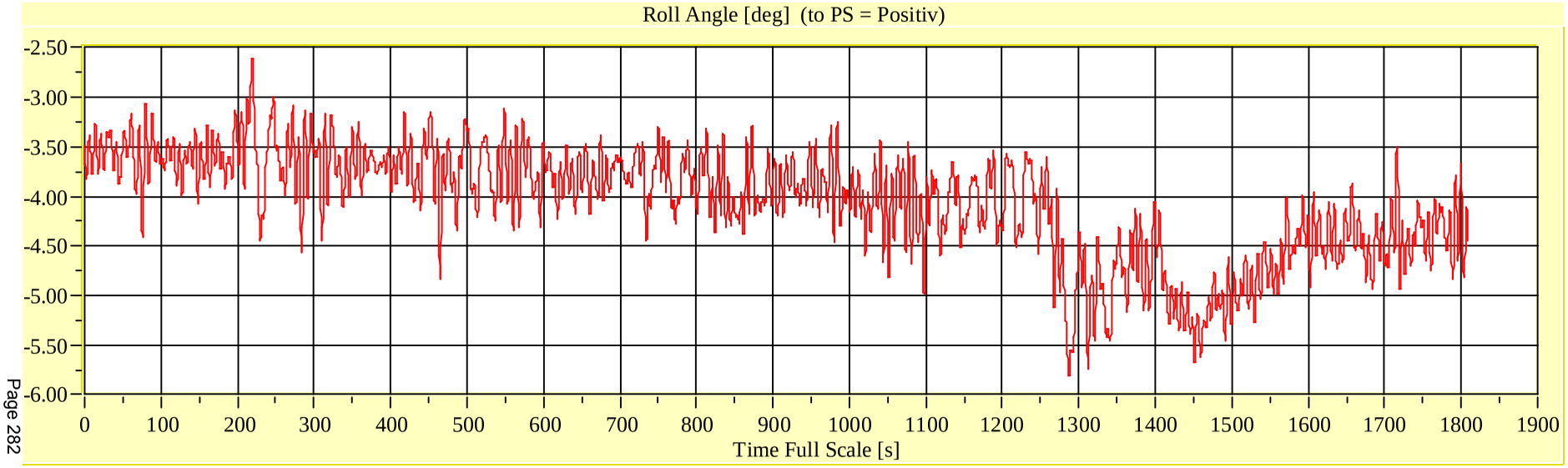



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-05 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



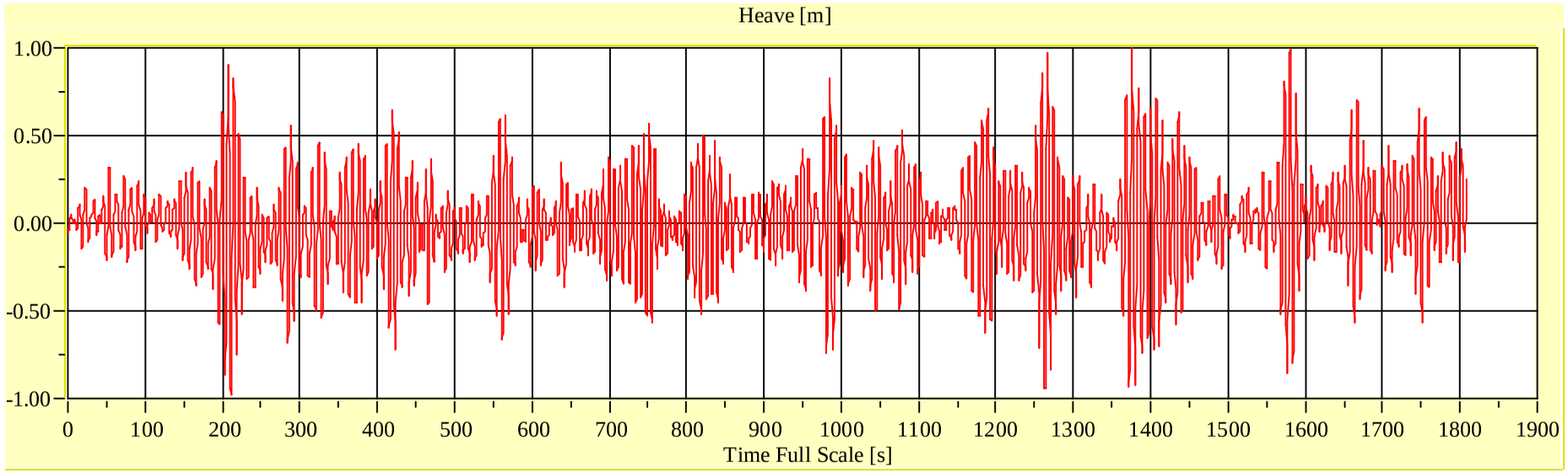



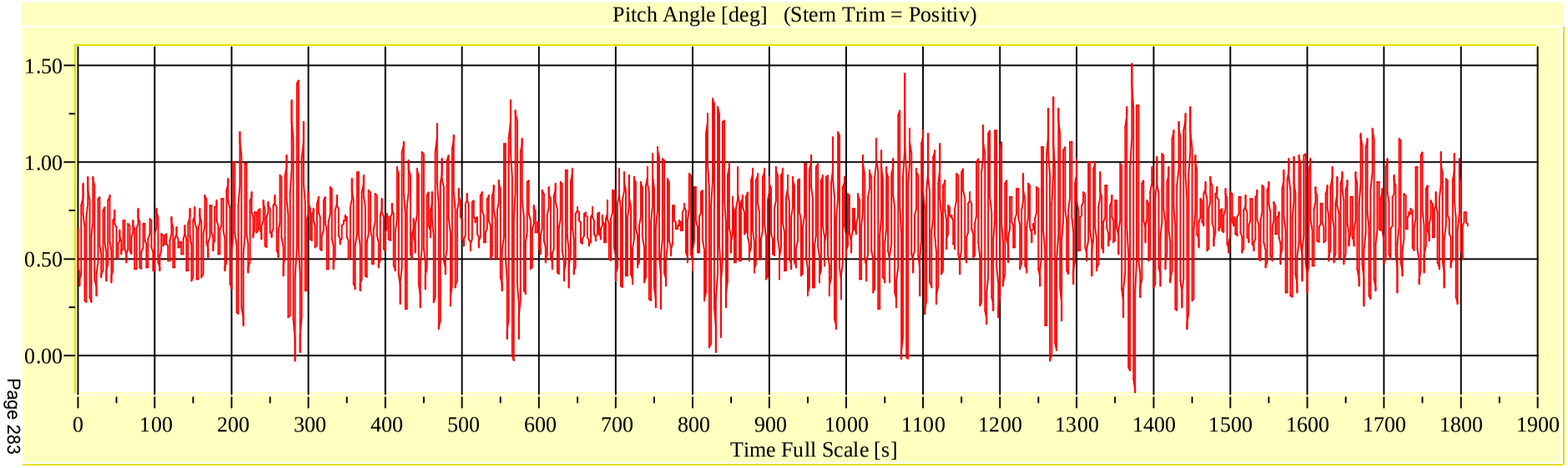



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-05 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



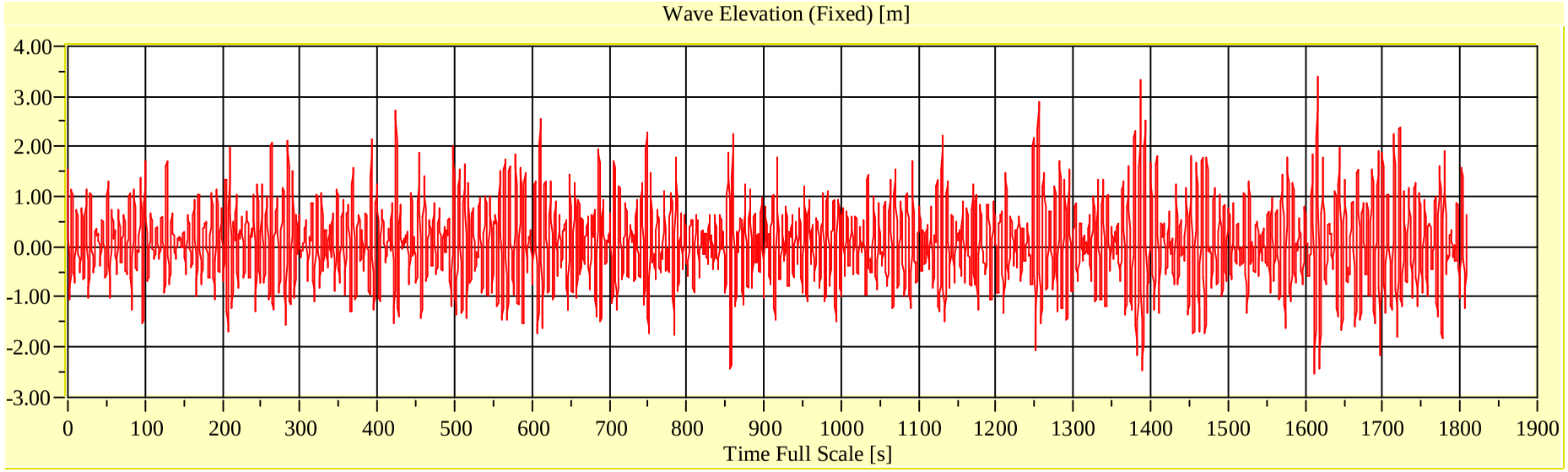



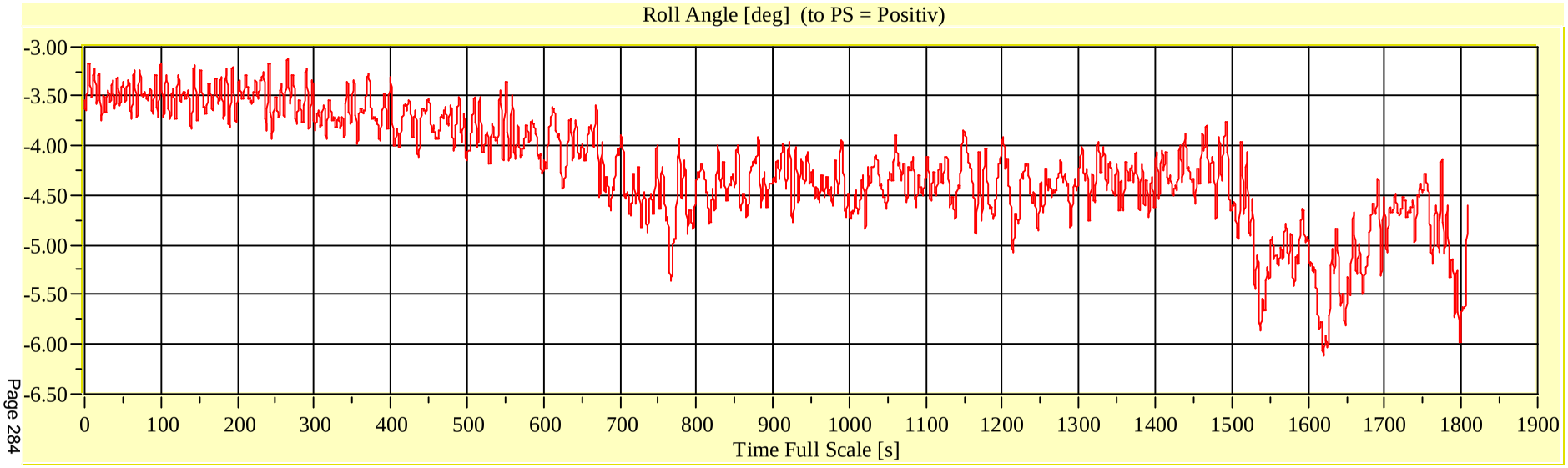



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-06 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



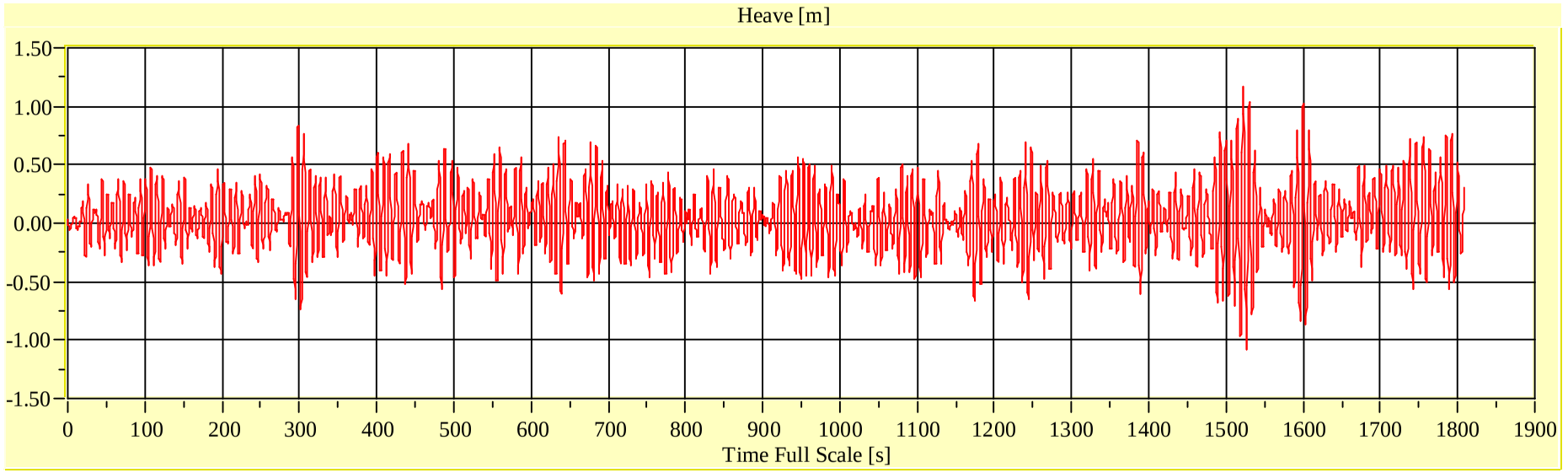



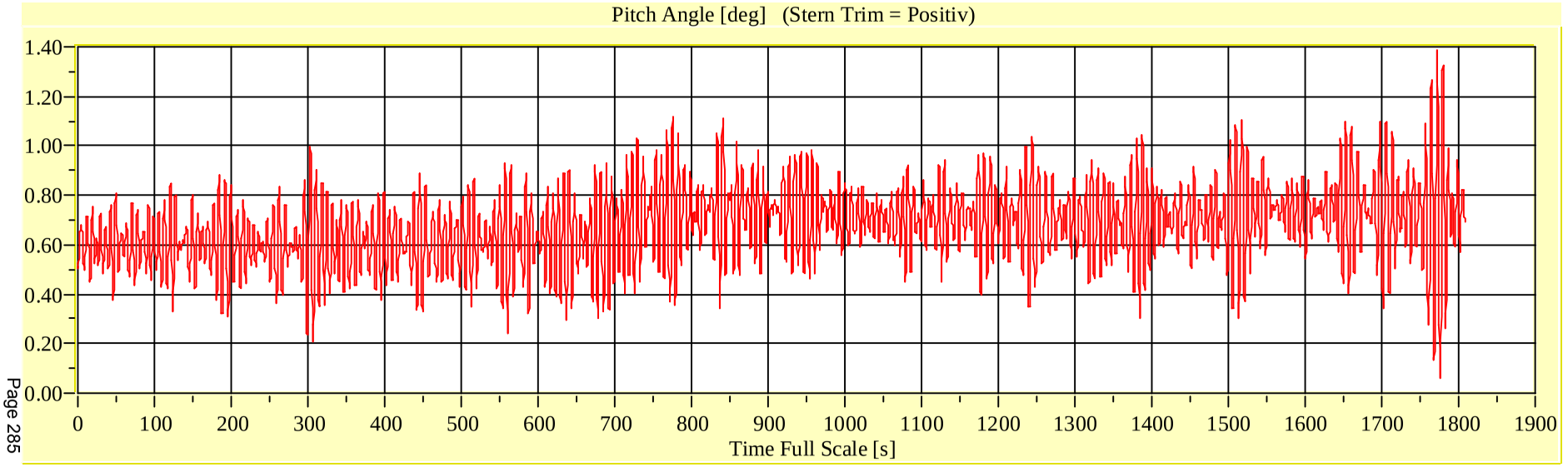



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-06 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



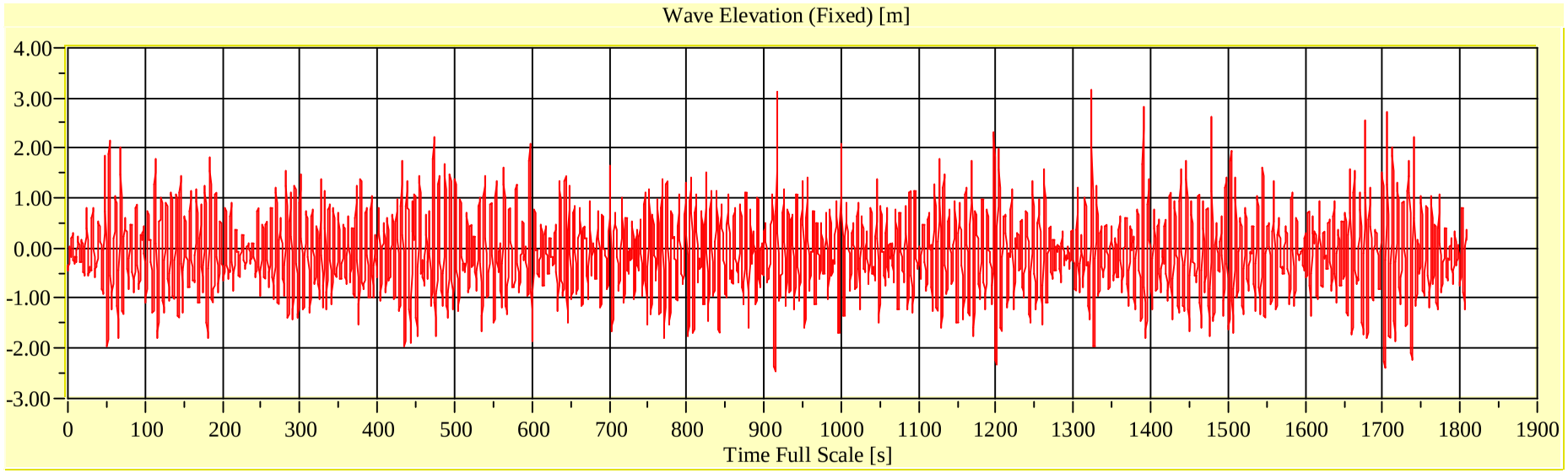



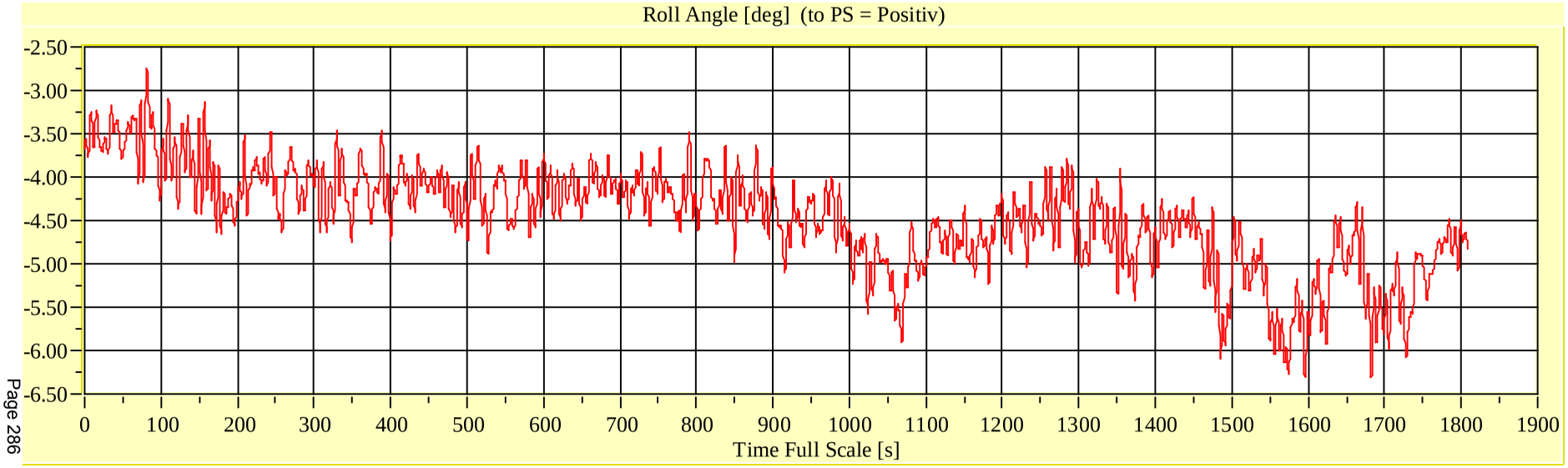



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-07 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



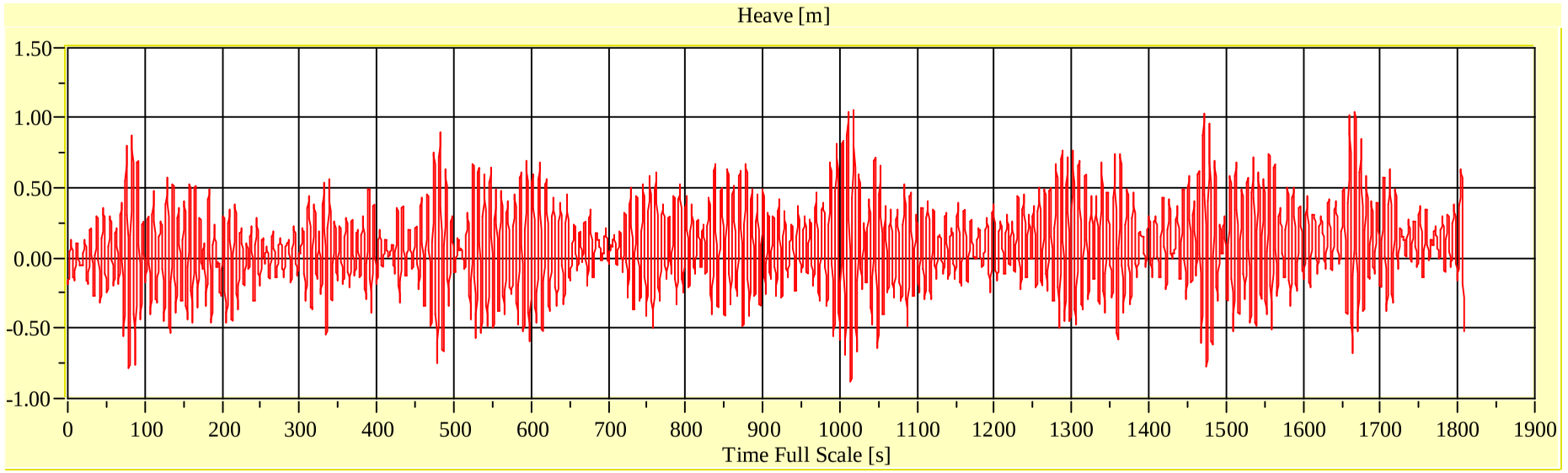



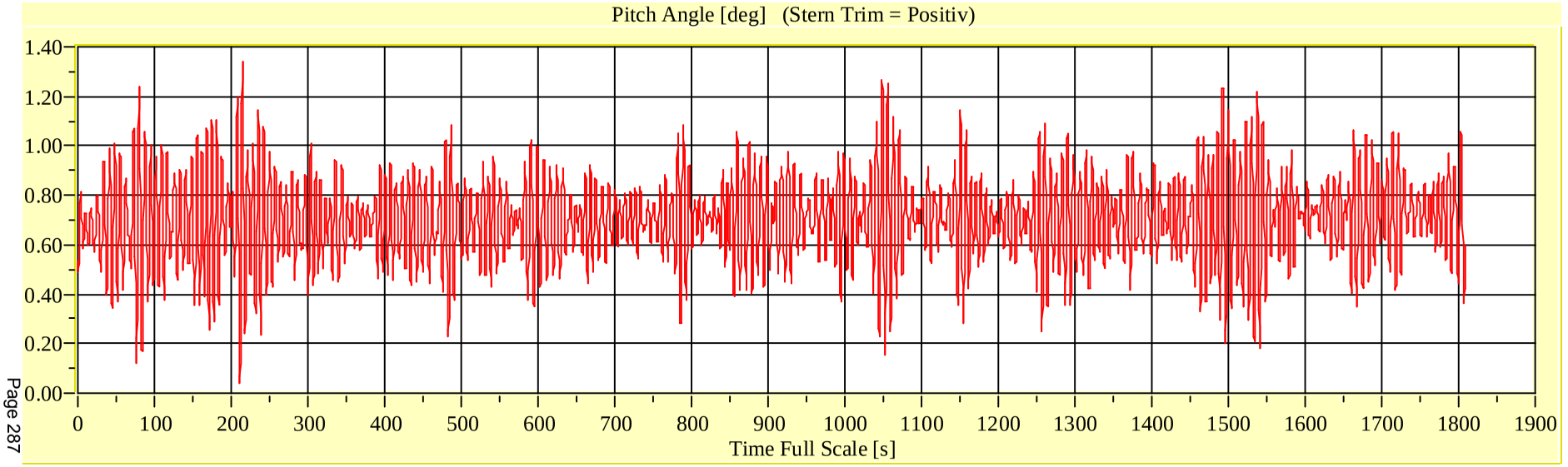



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-07 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



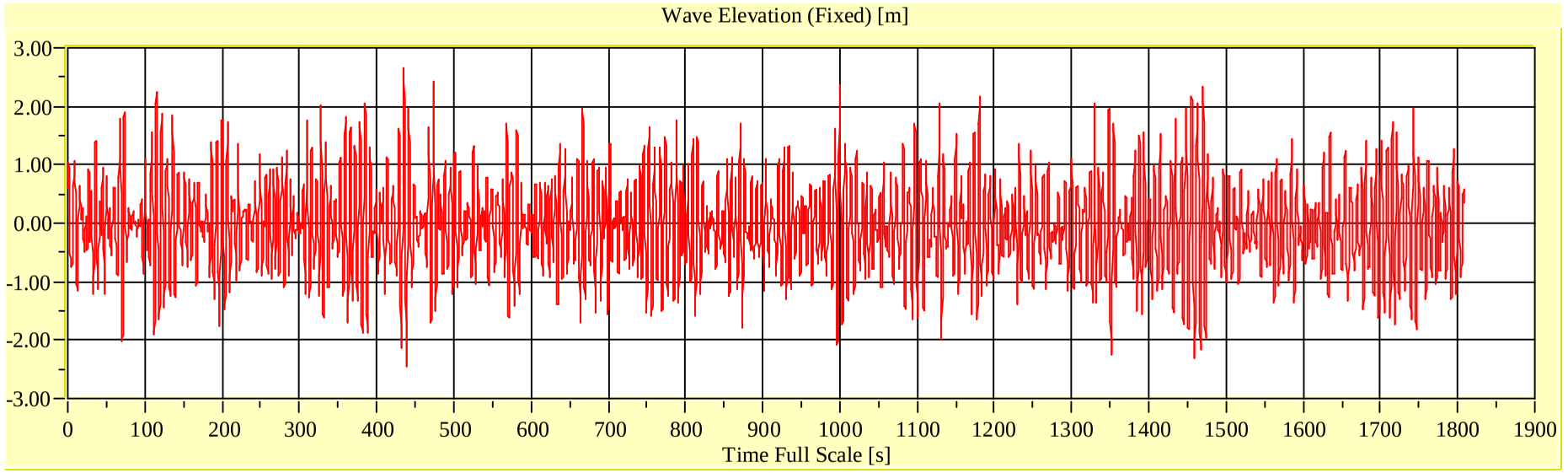



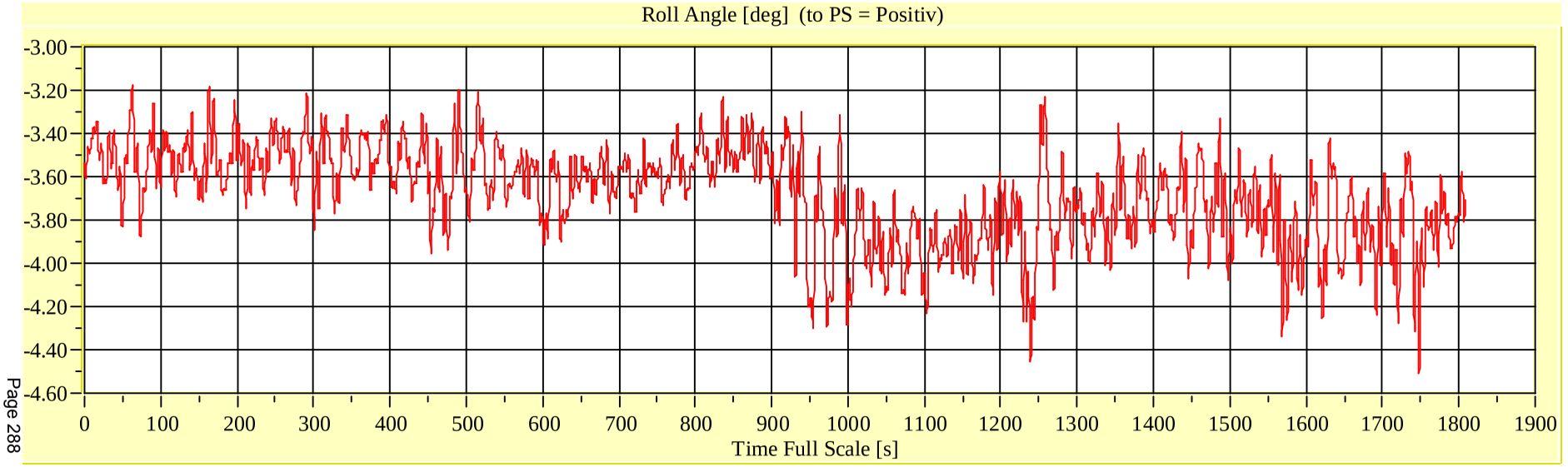



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-08 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



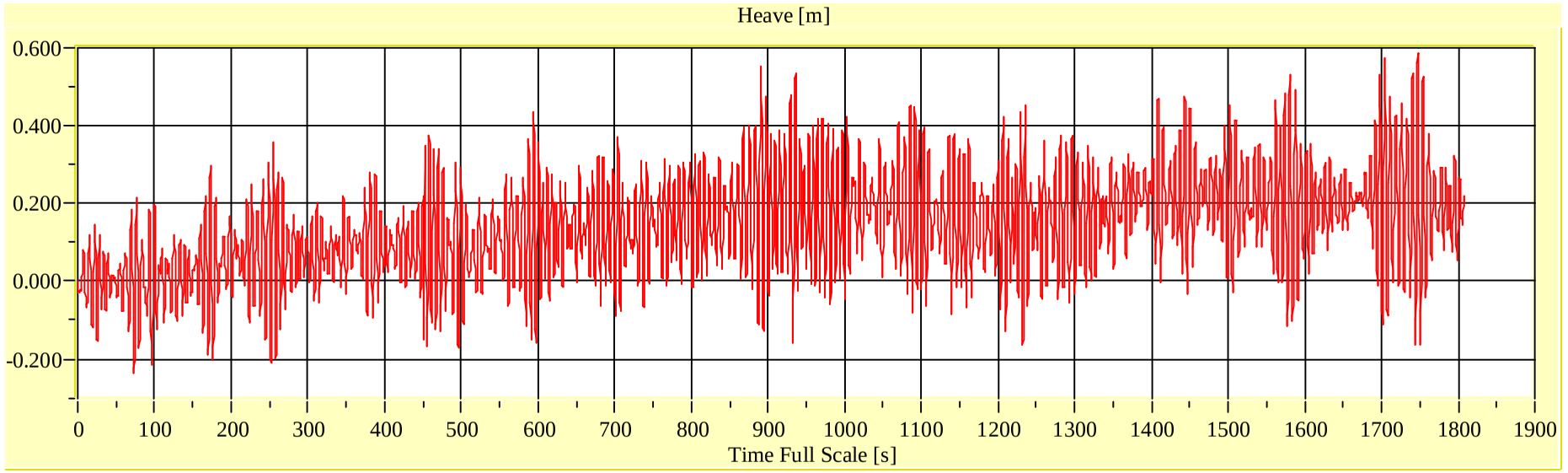



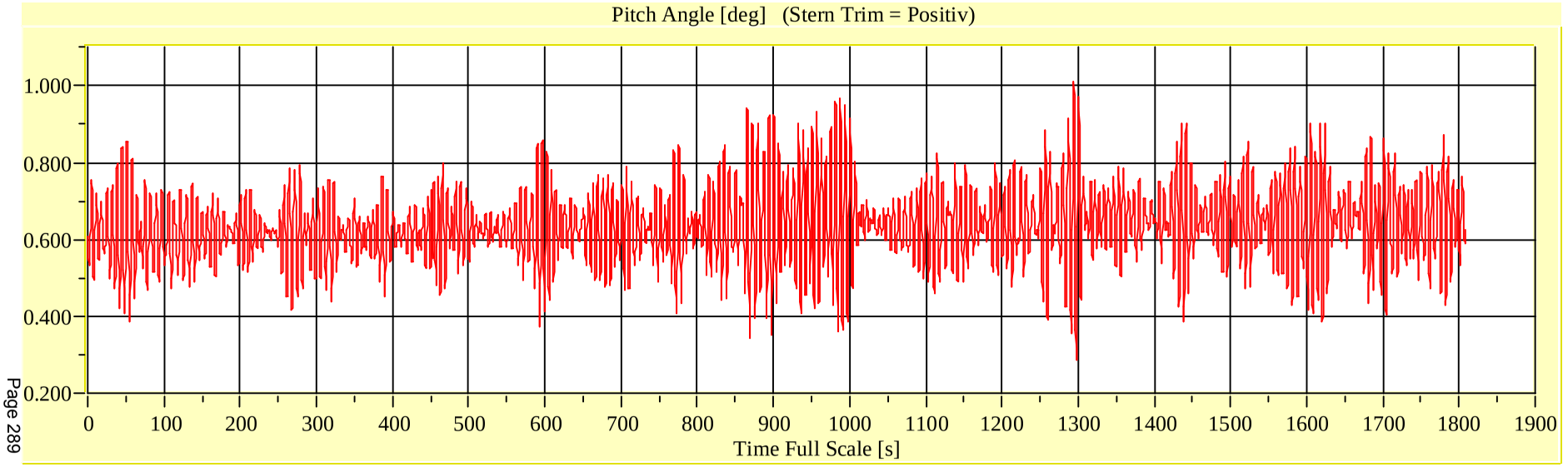



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-08 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



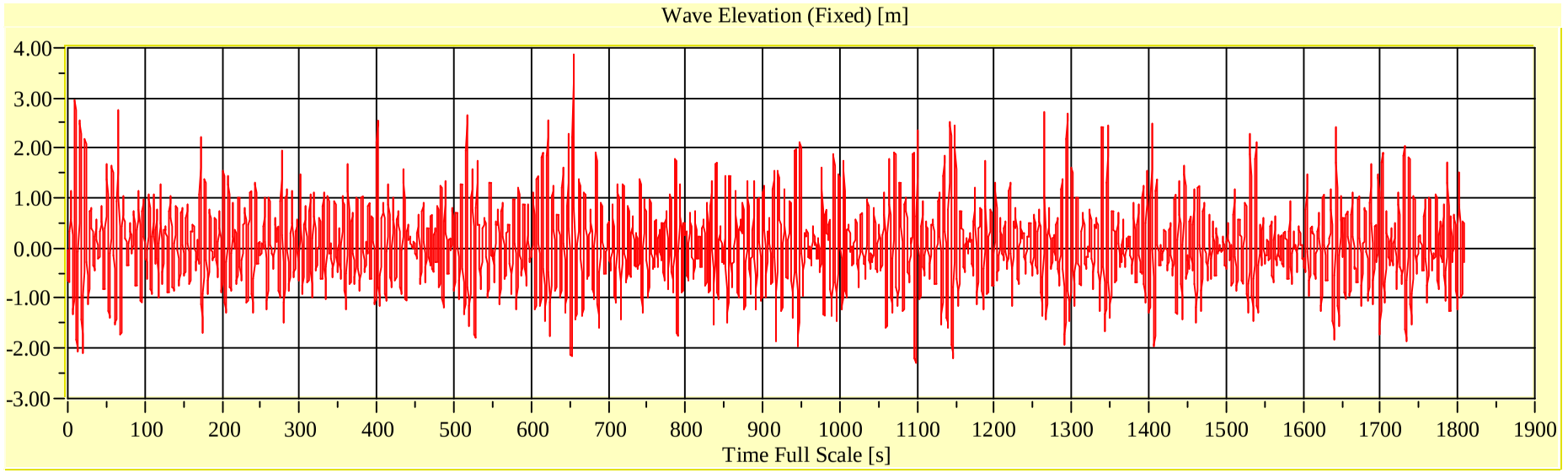



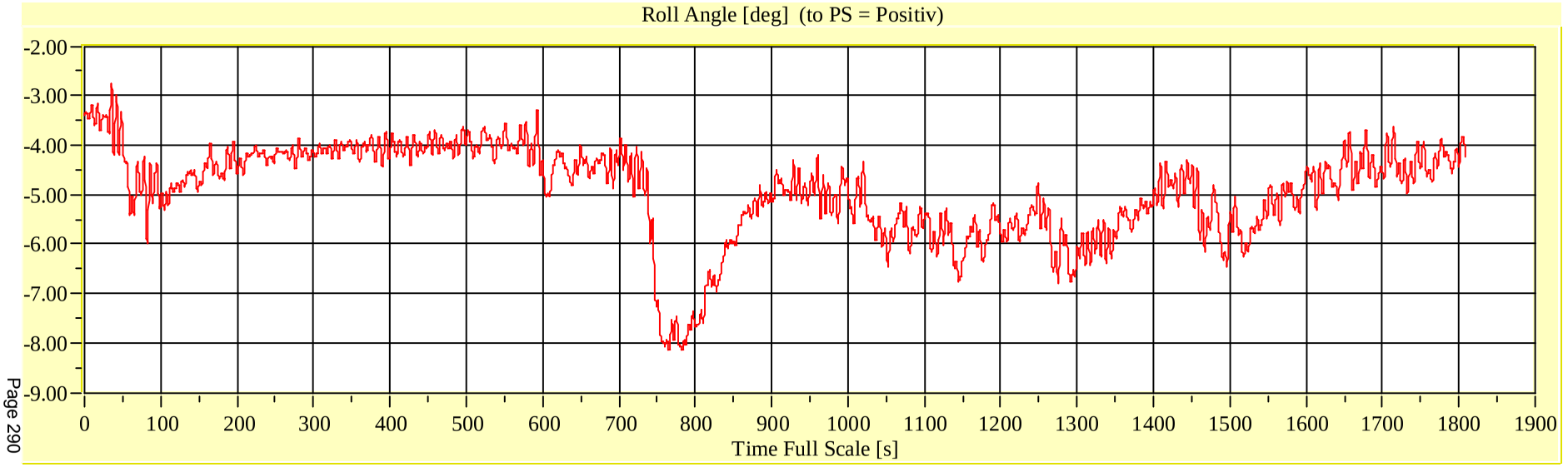



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-09 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



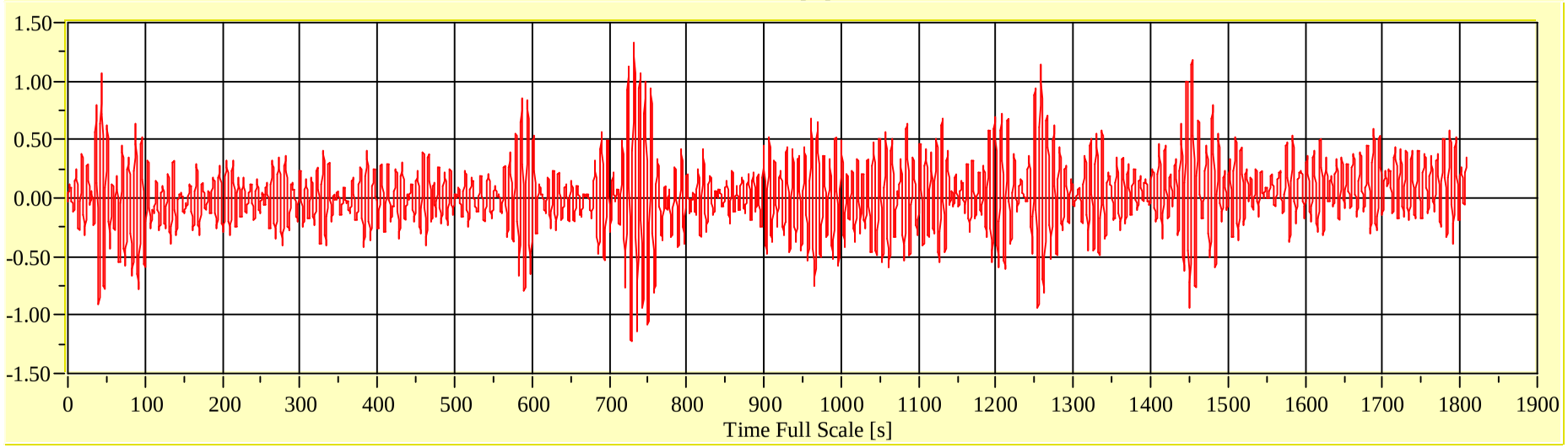



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

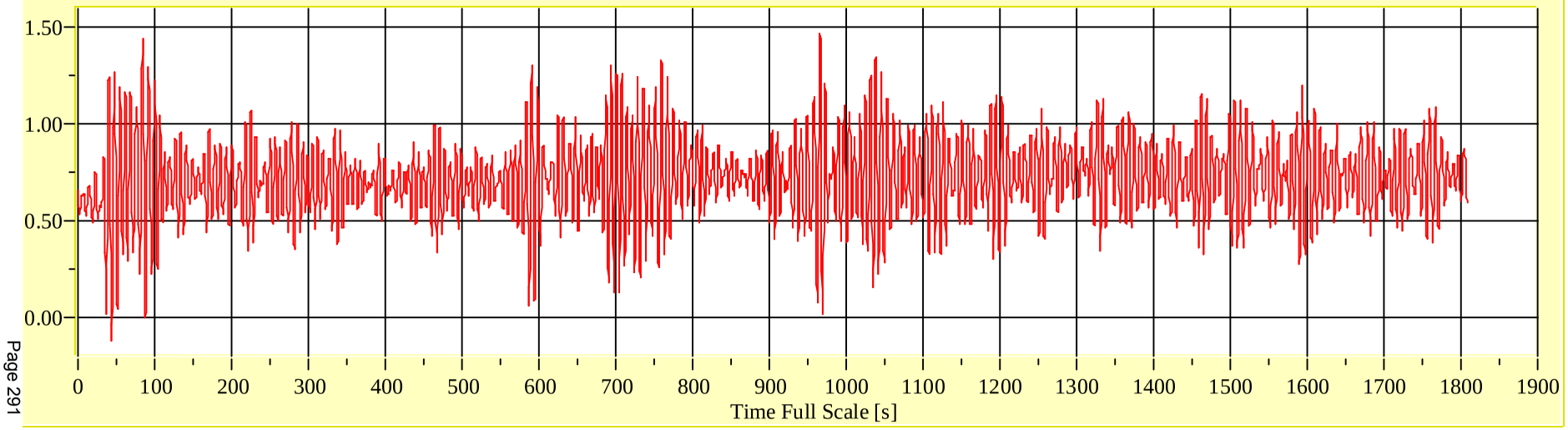
**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-09 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|

Heave [m]




Pitch Angle [deg] (Stern Trim = Positiv)

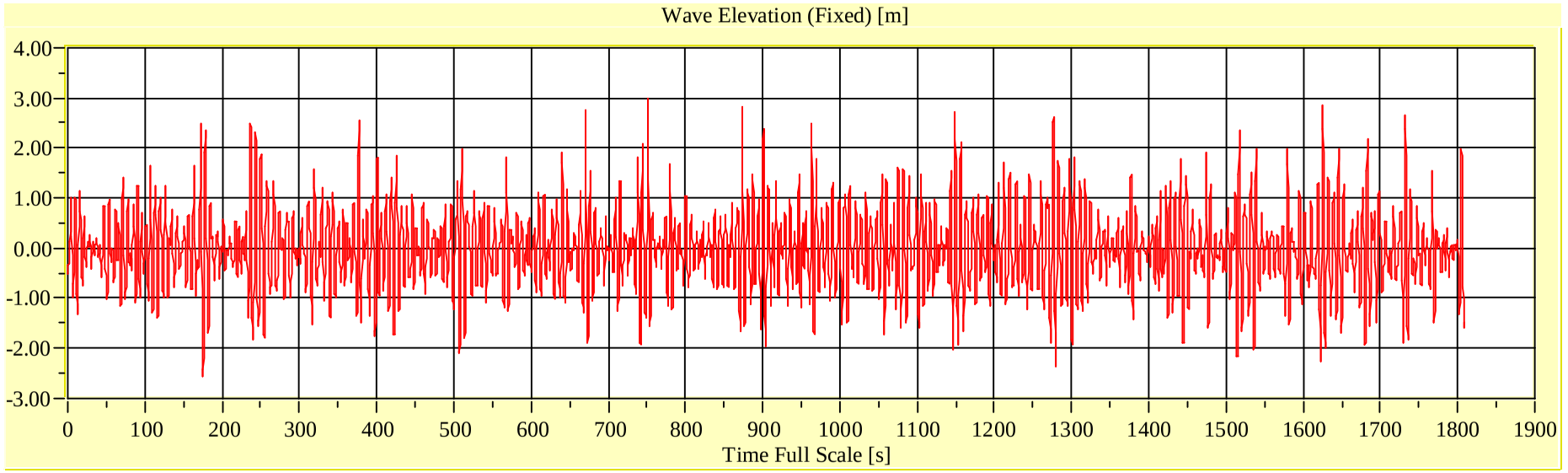


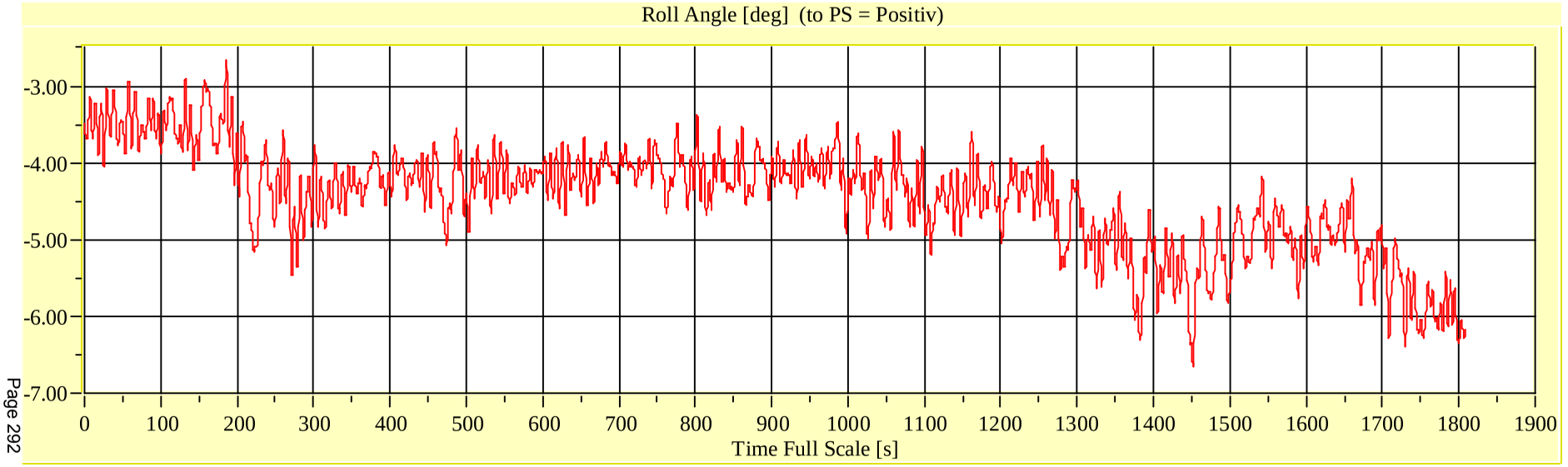



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-10 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



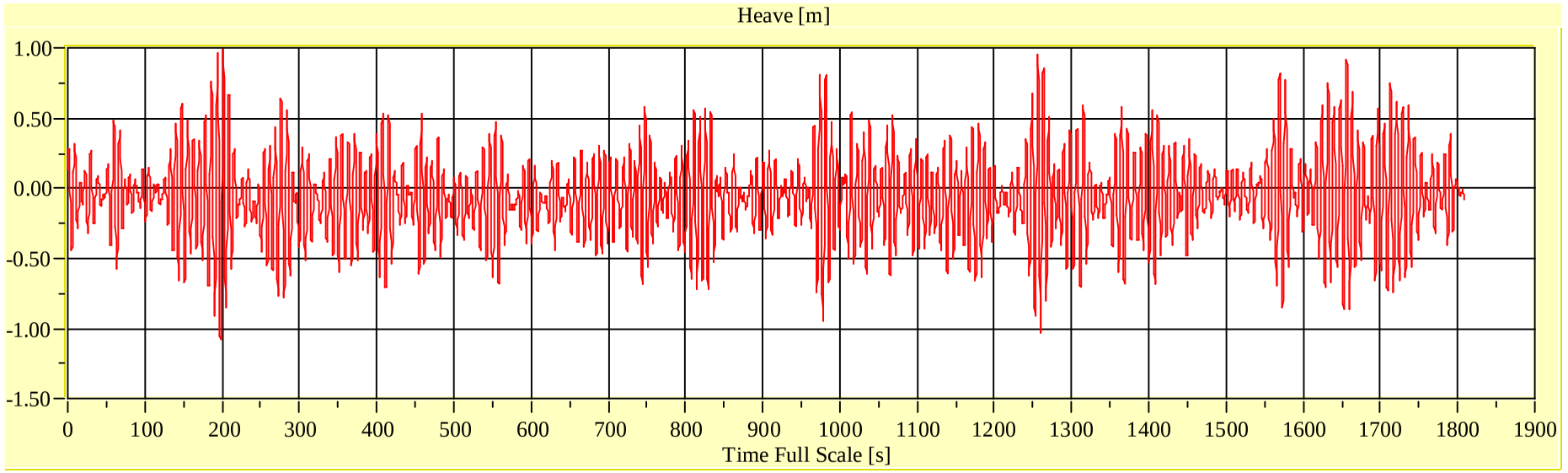



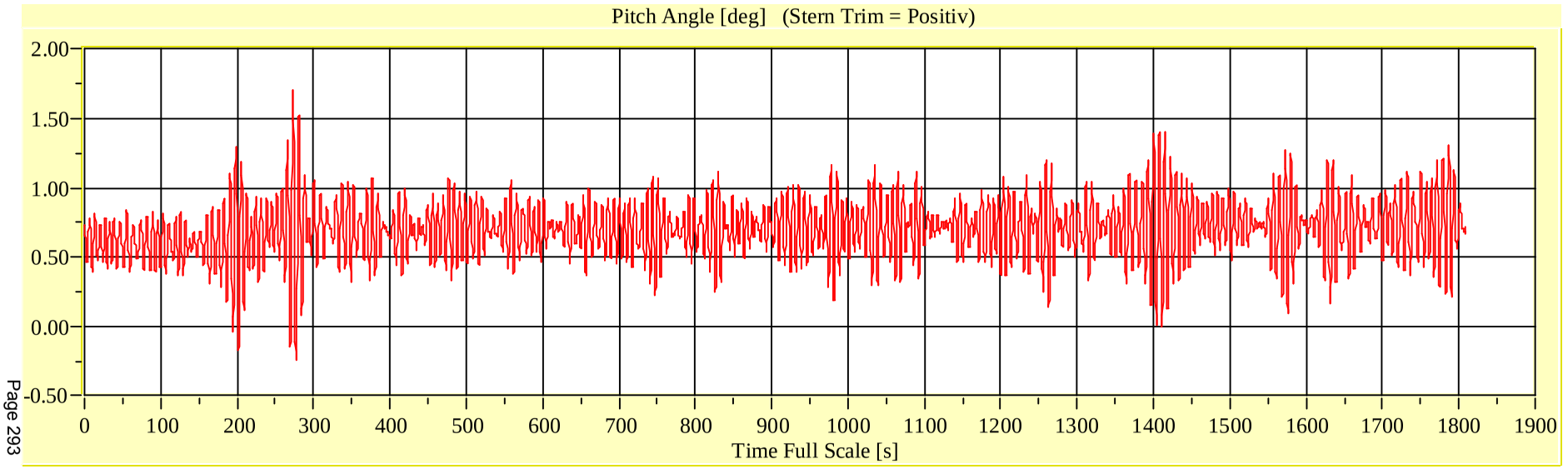



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29710-10 | Target Waves: Hs = 3,0 m Tp = 6,928 s | gamma = 3,3 |
|---|---|---|---|---|



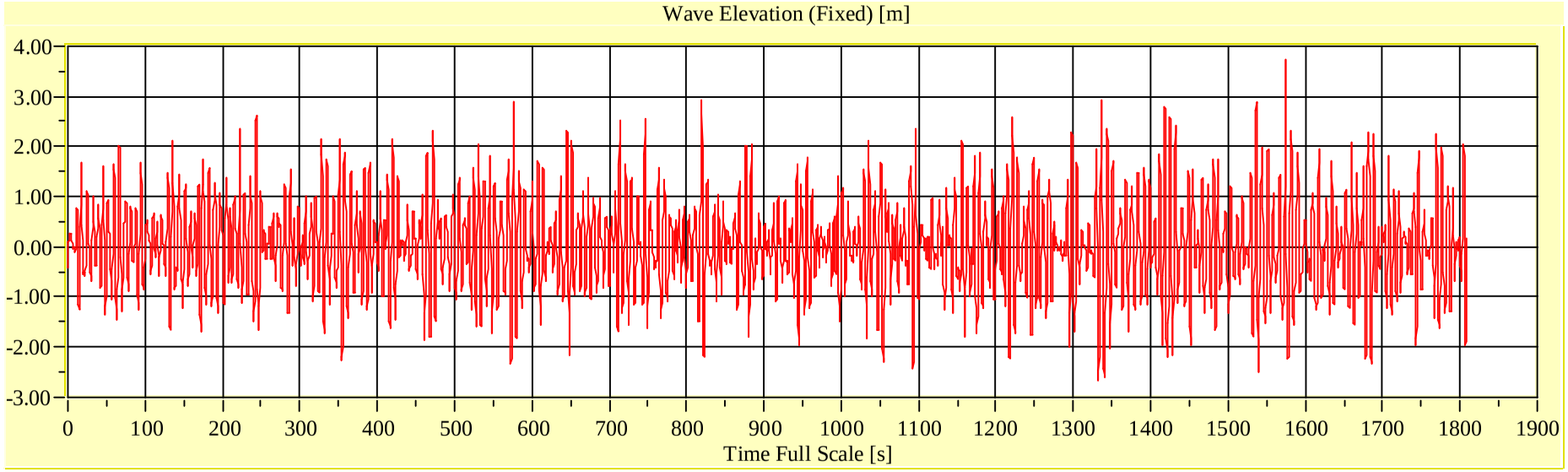



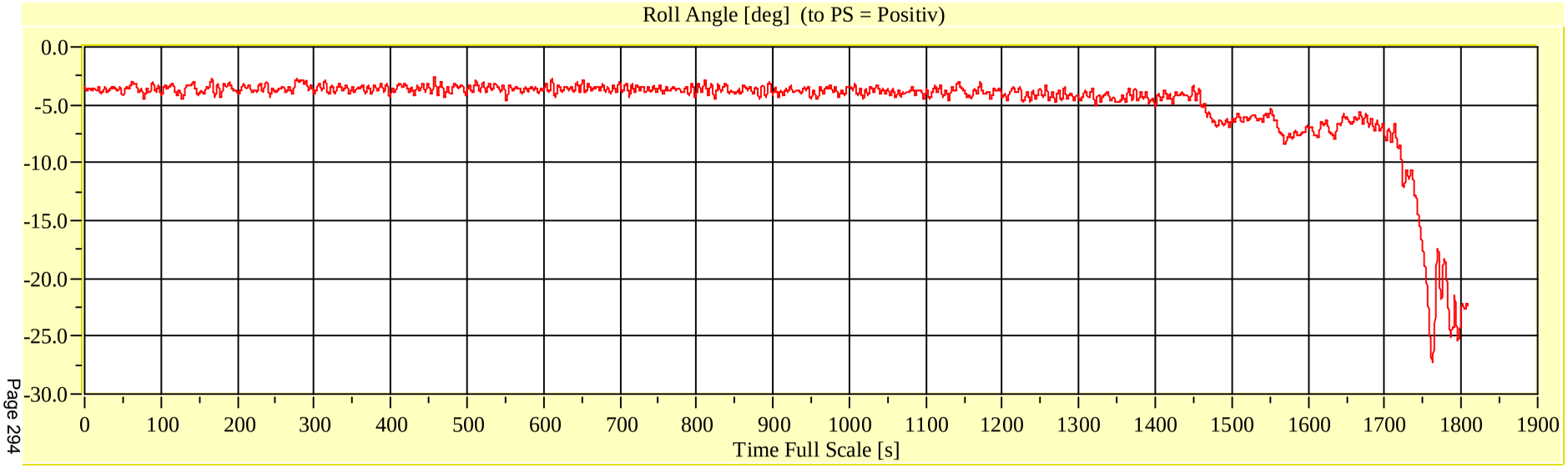



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-01 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



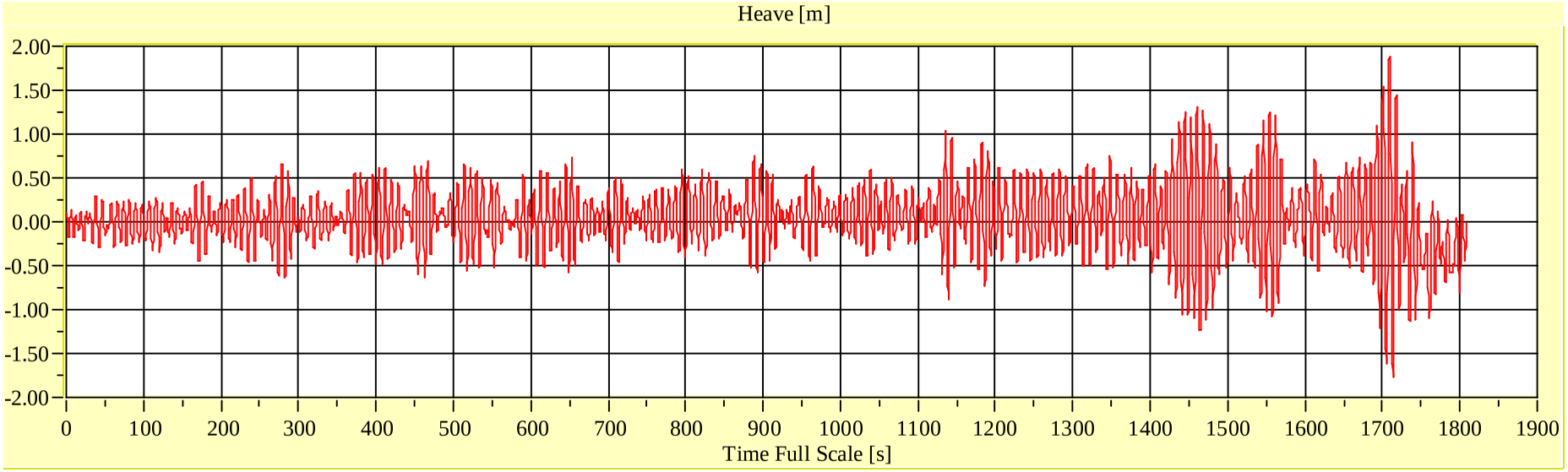



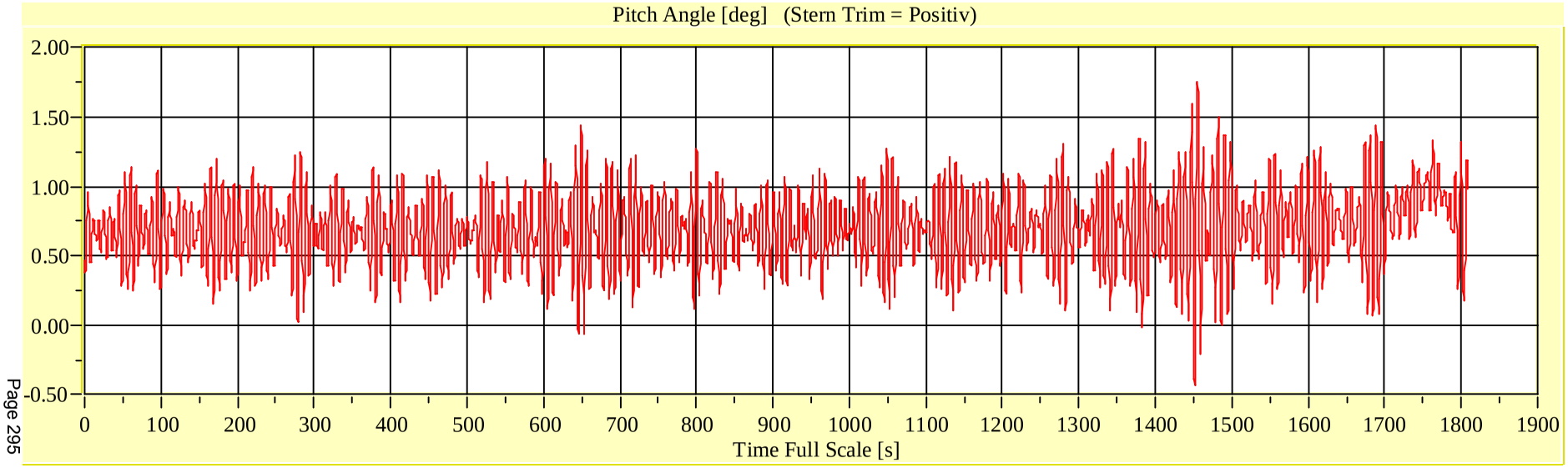



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-01 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



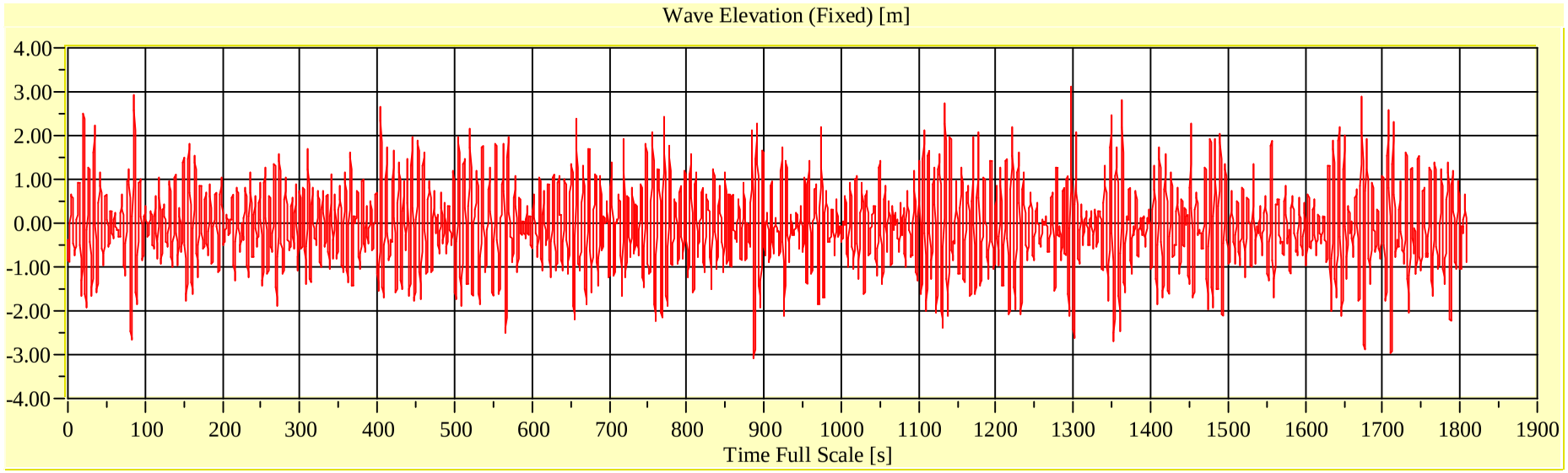



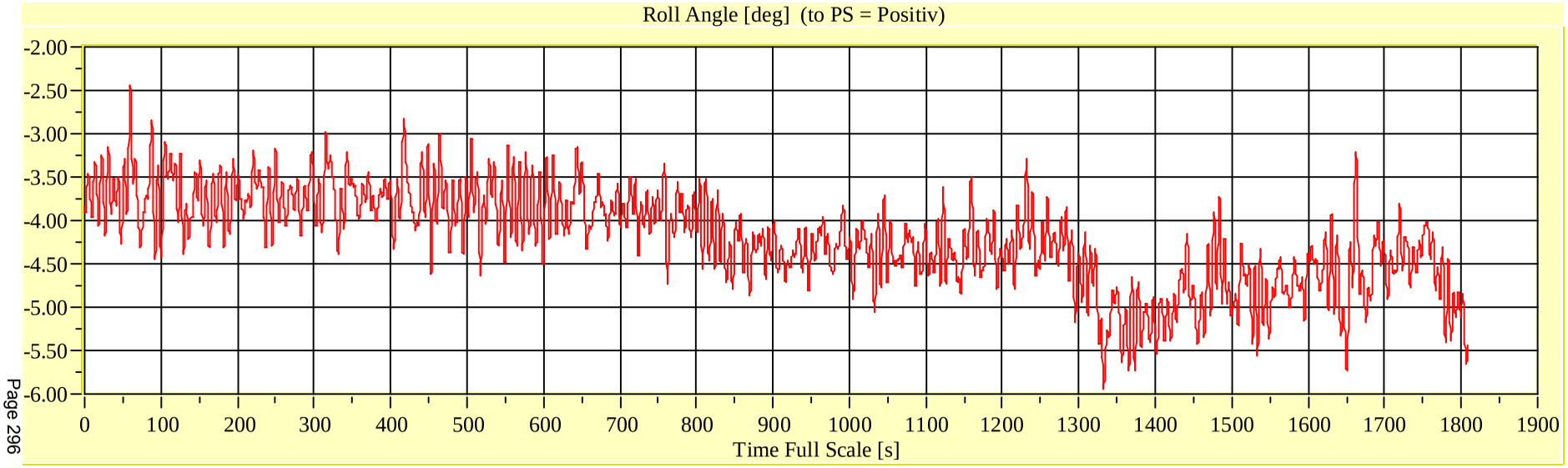



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-02 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



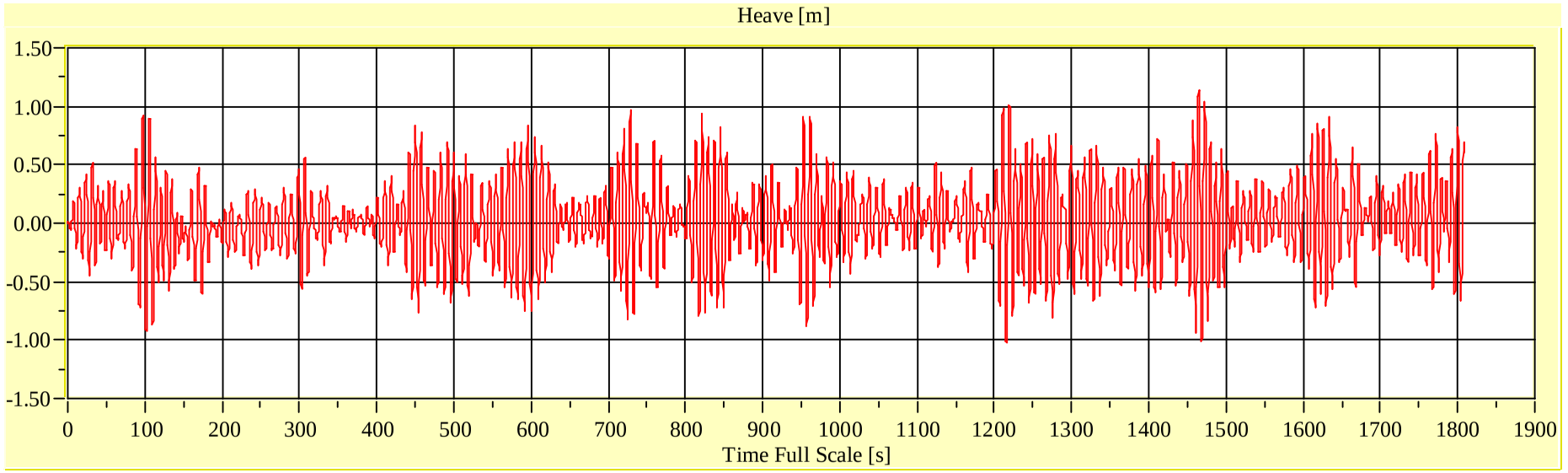



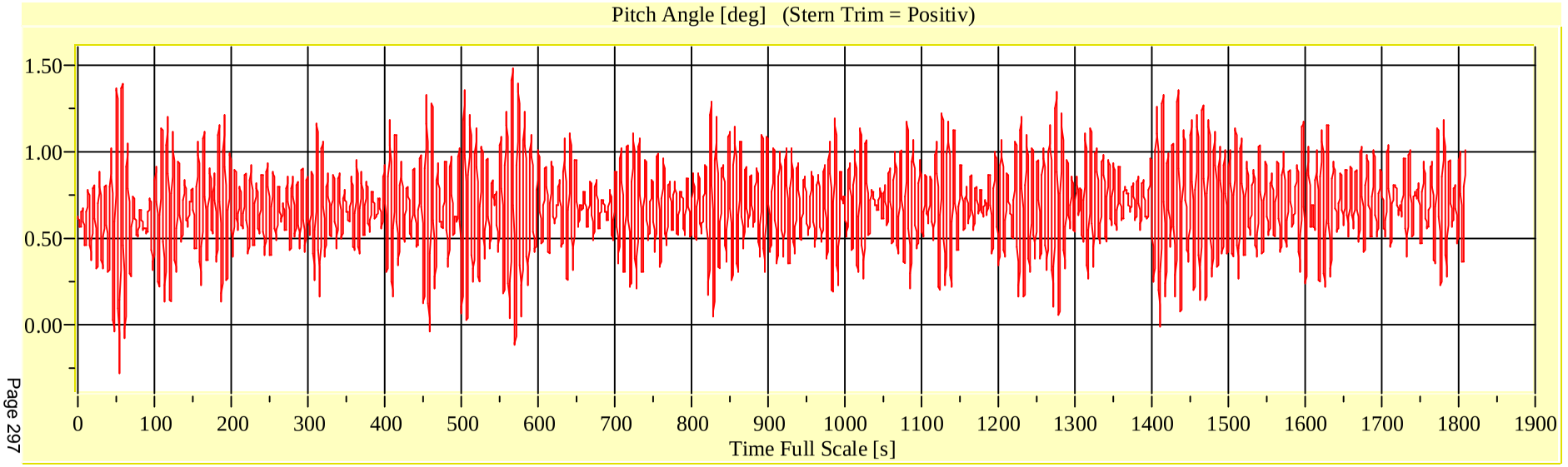



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-02 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



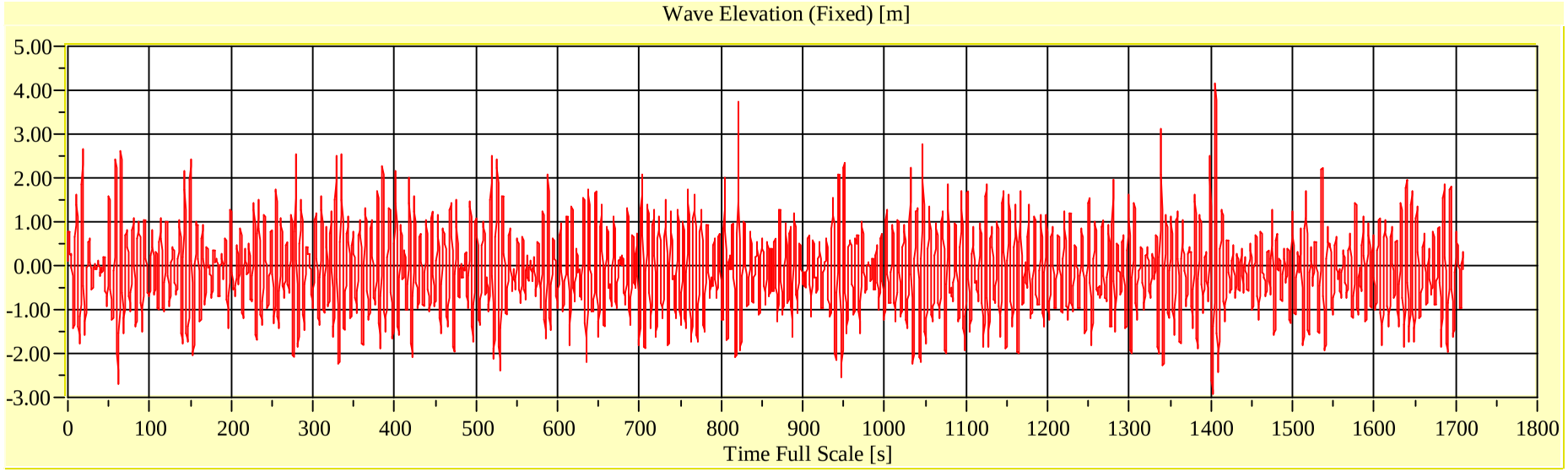



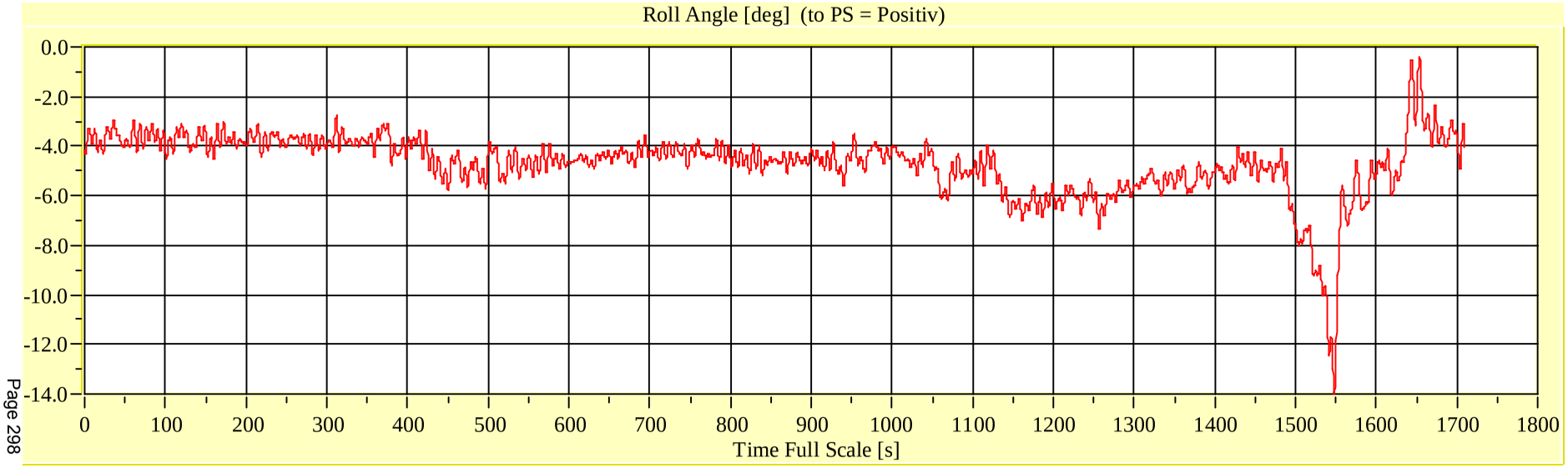



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-03 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



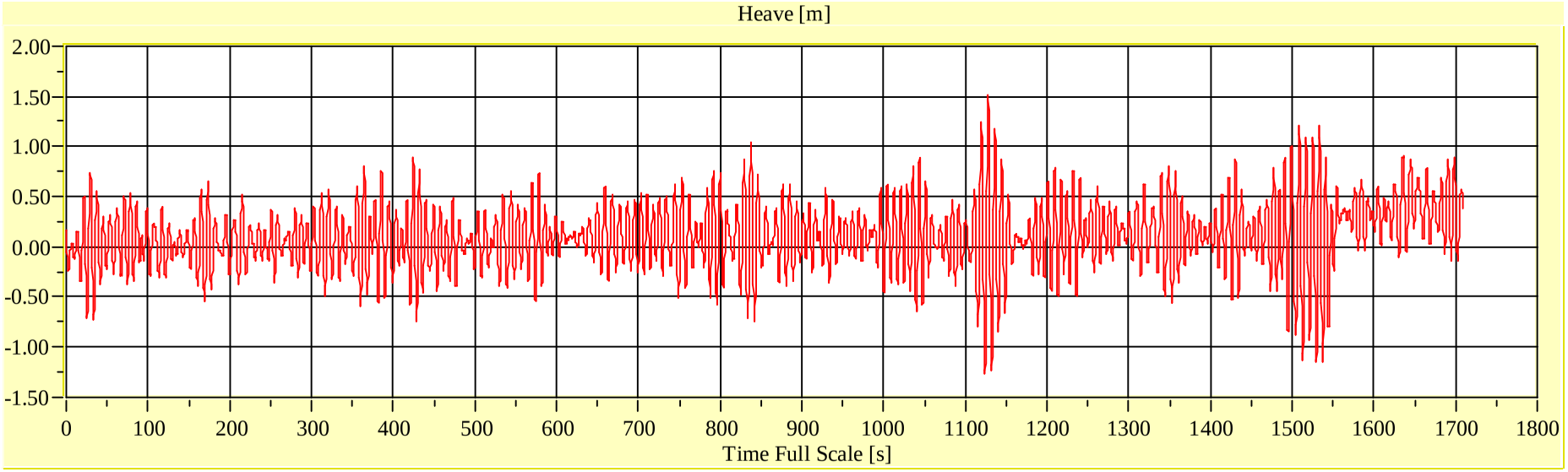



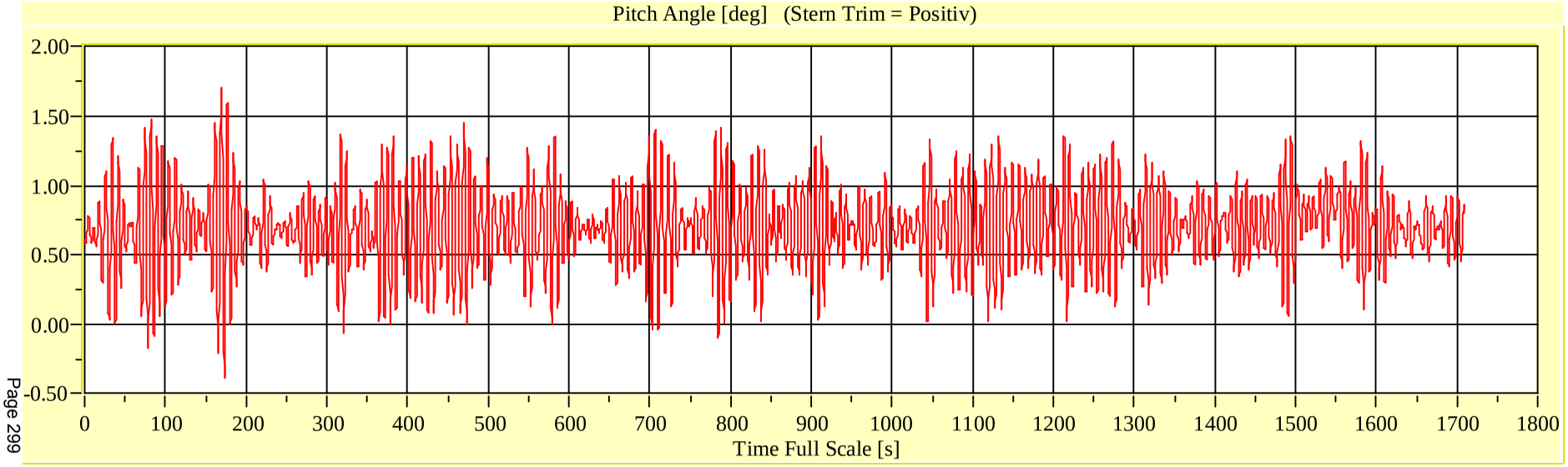



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-03 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



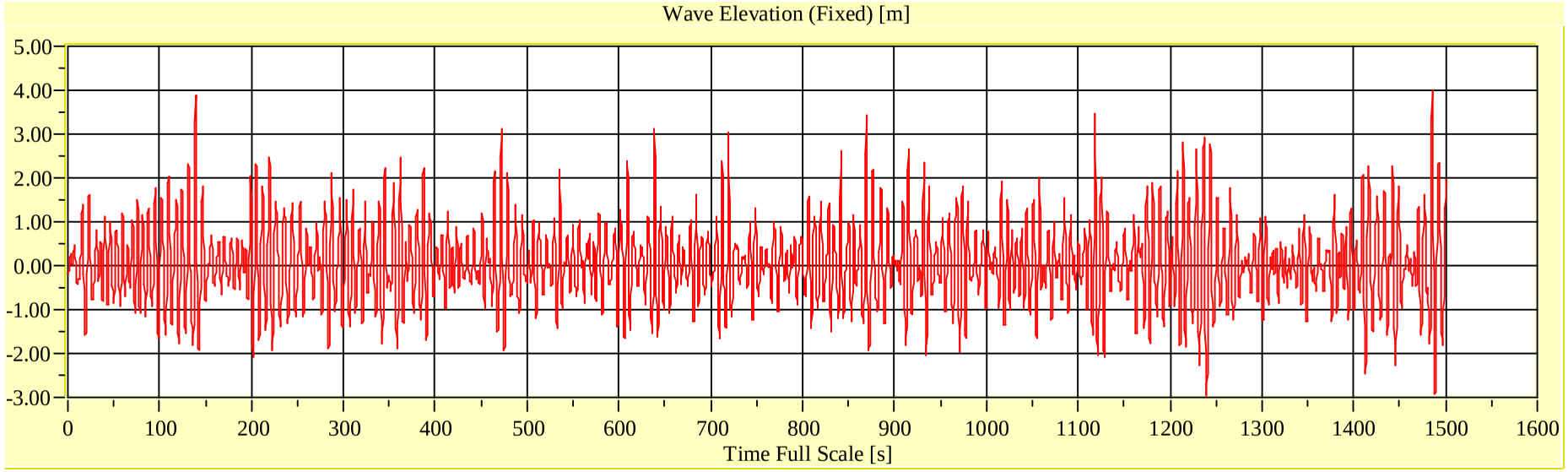



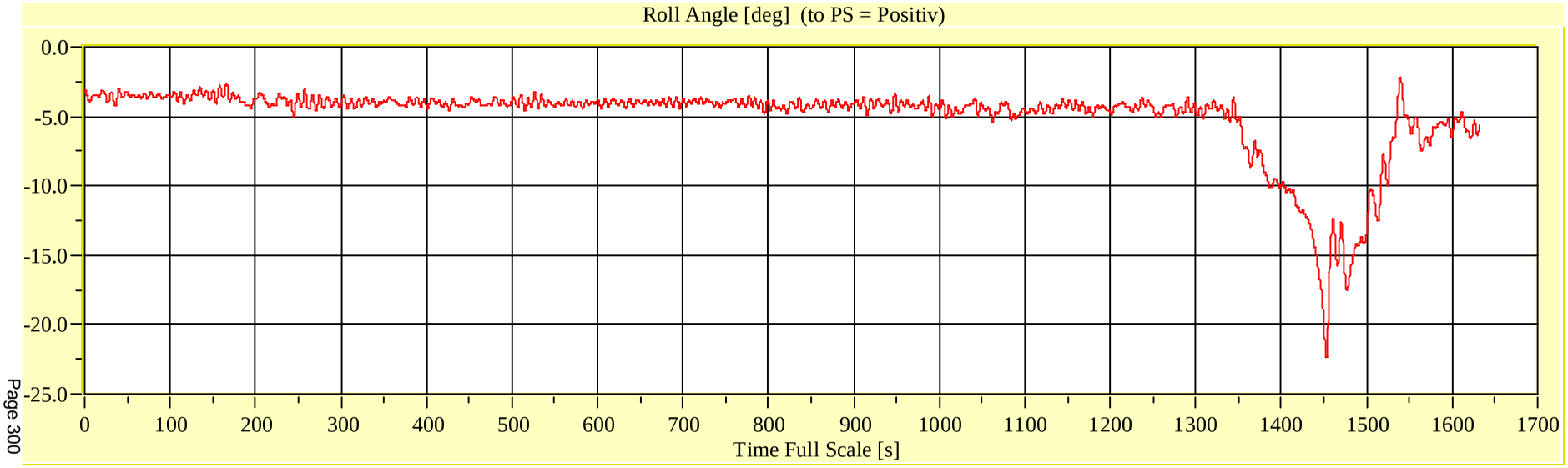



| Date: 10.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-04 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



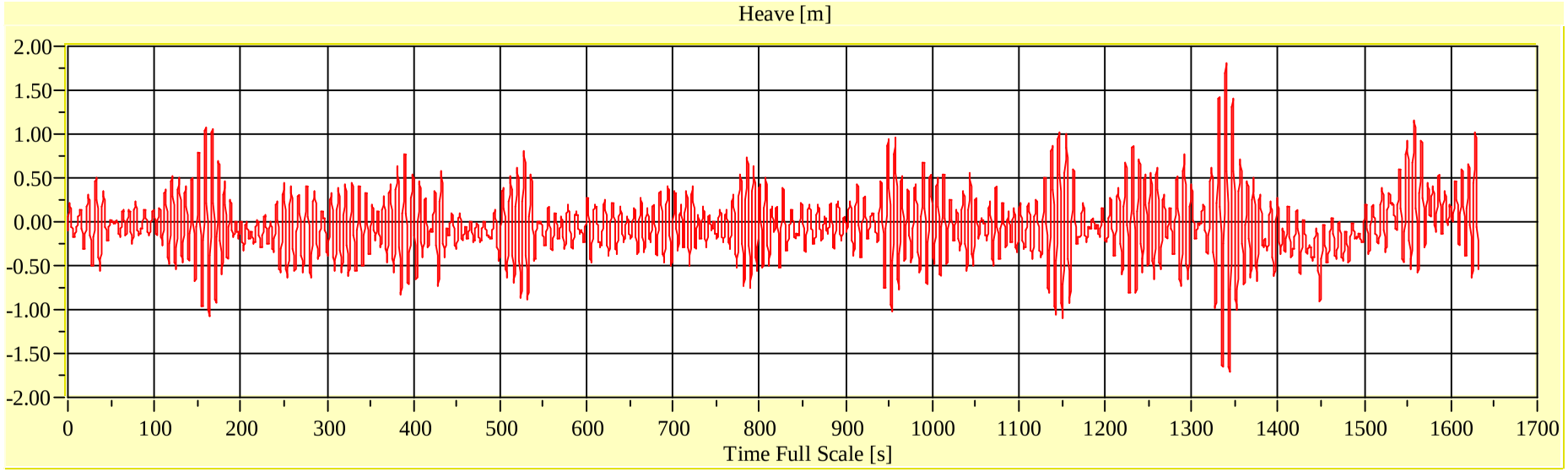



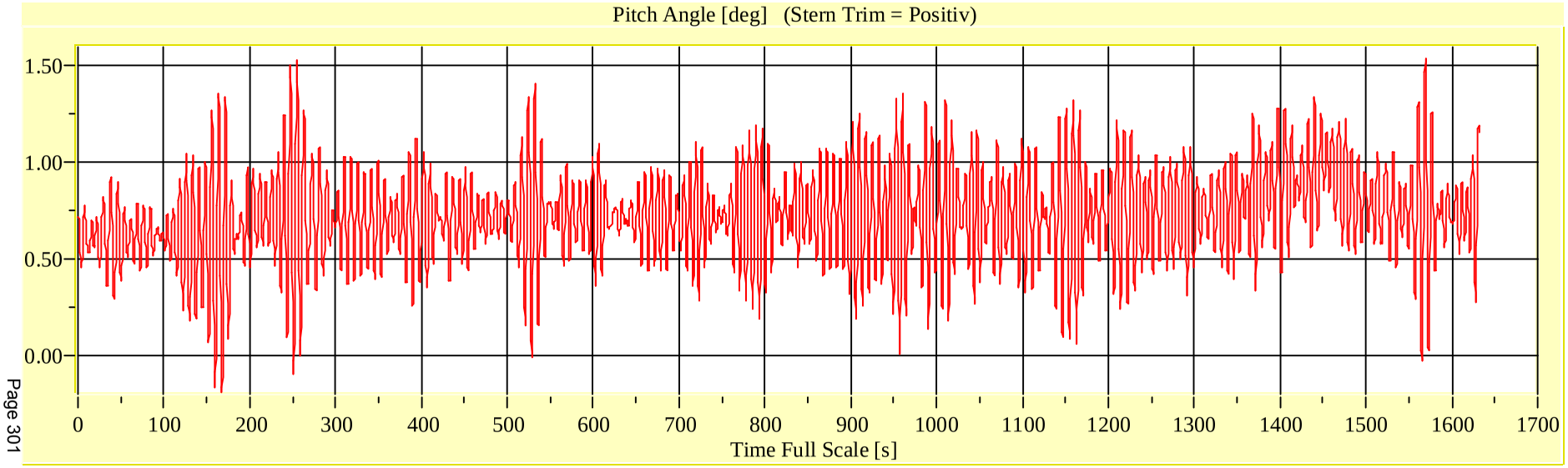



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-04 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



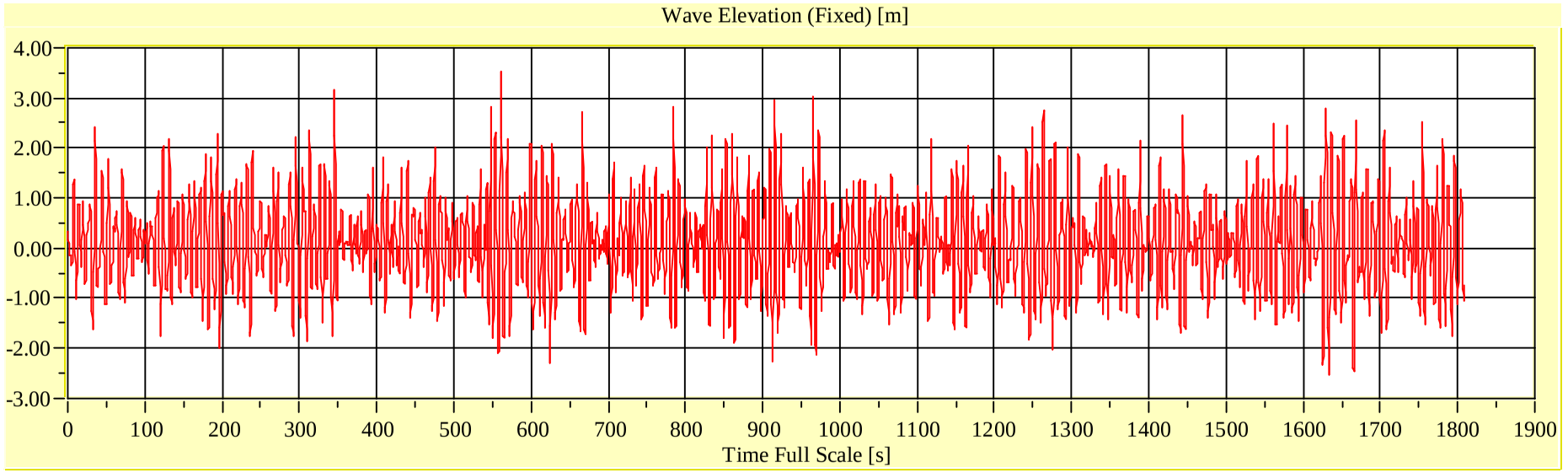



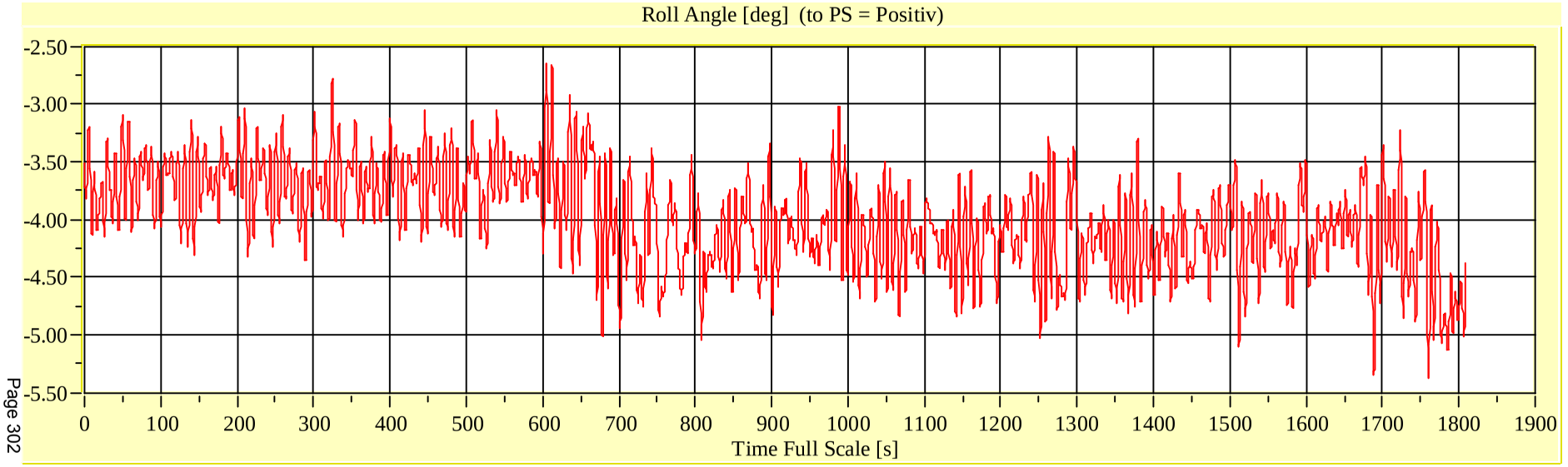



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-05 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



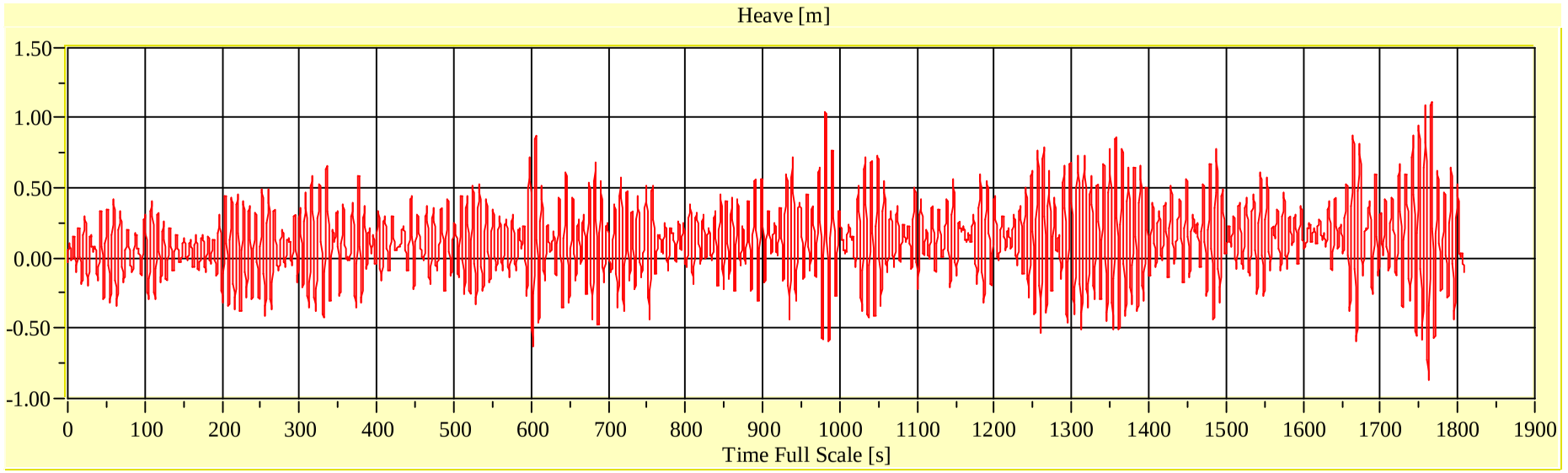



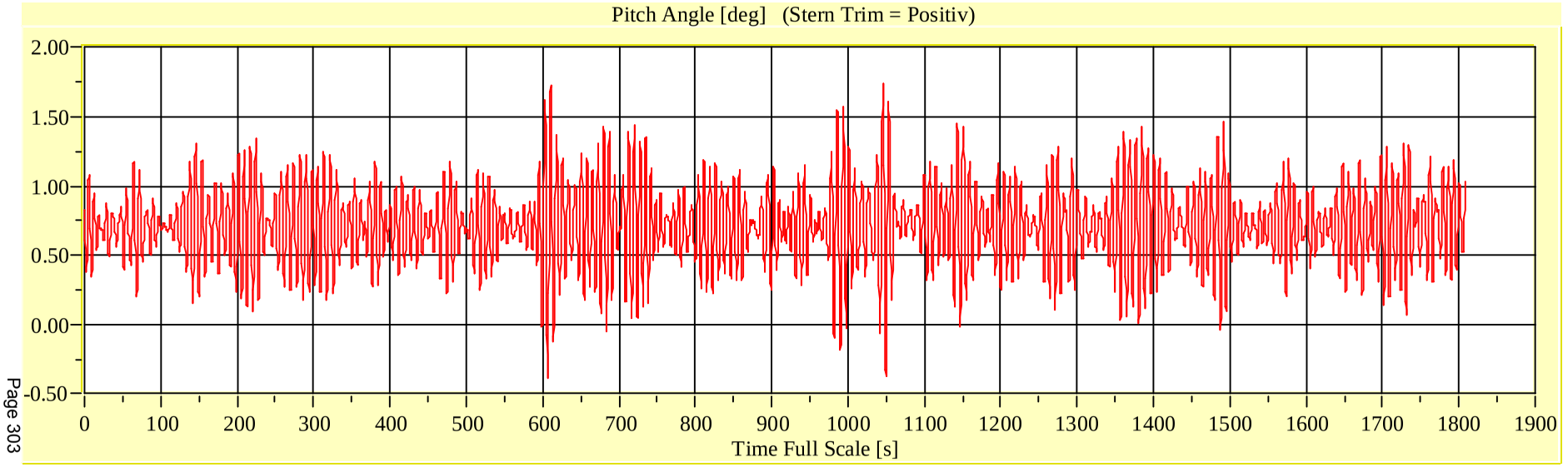



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-05 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



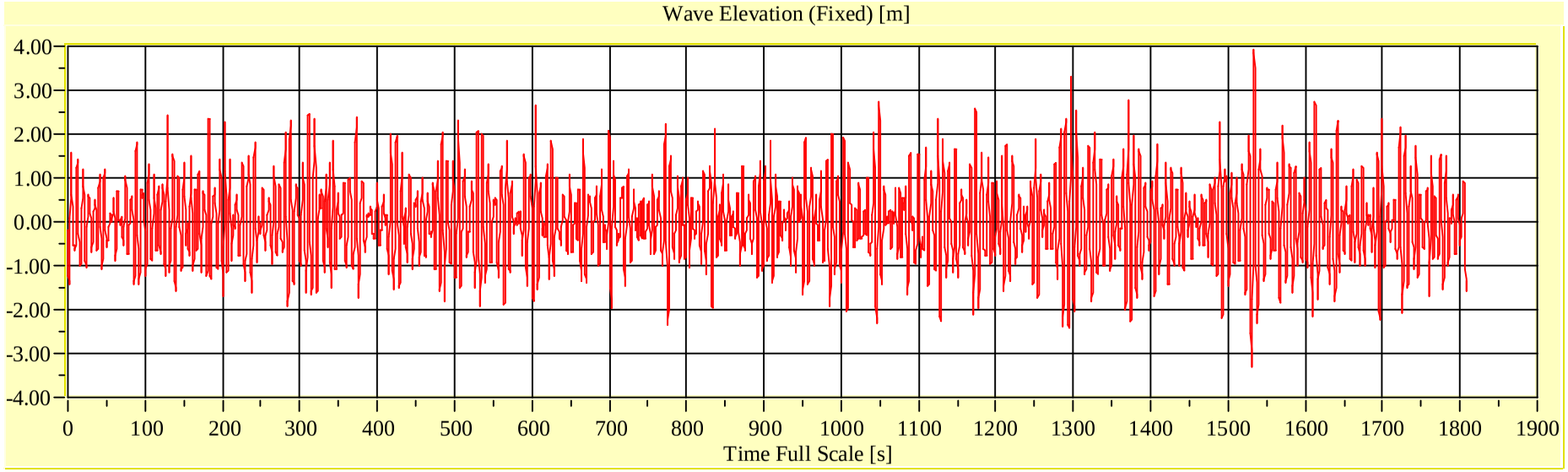



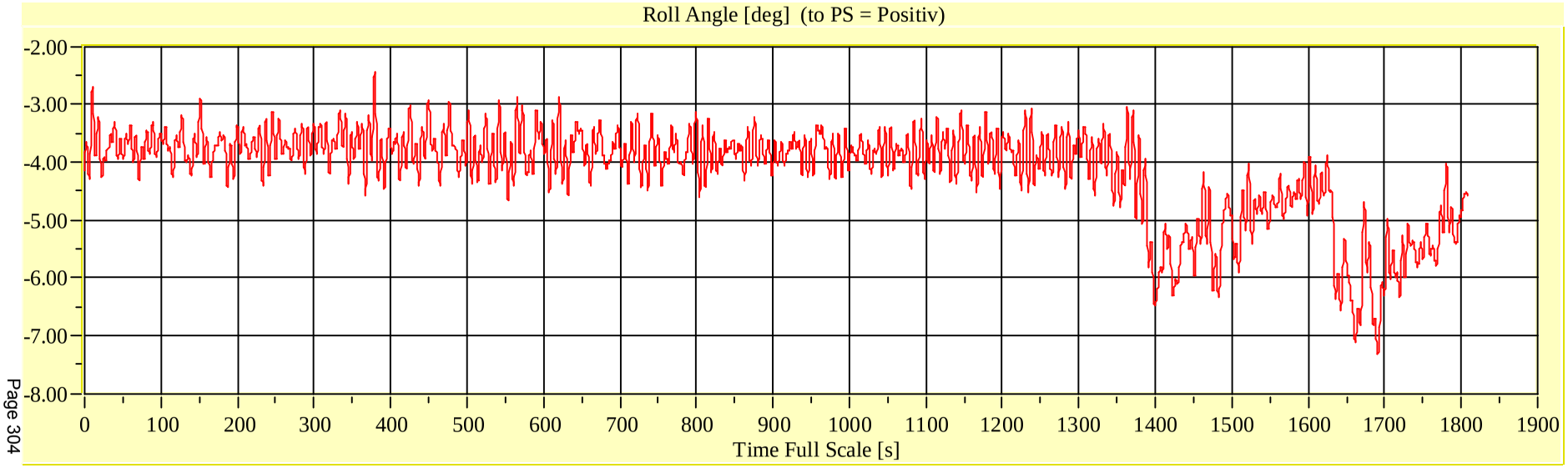



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-06 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



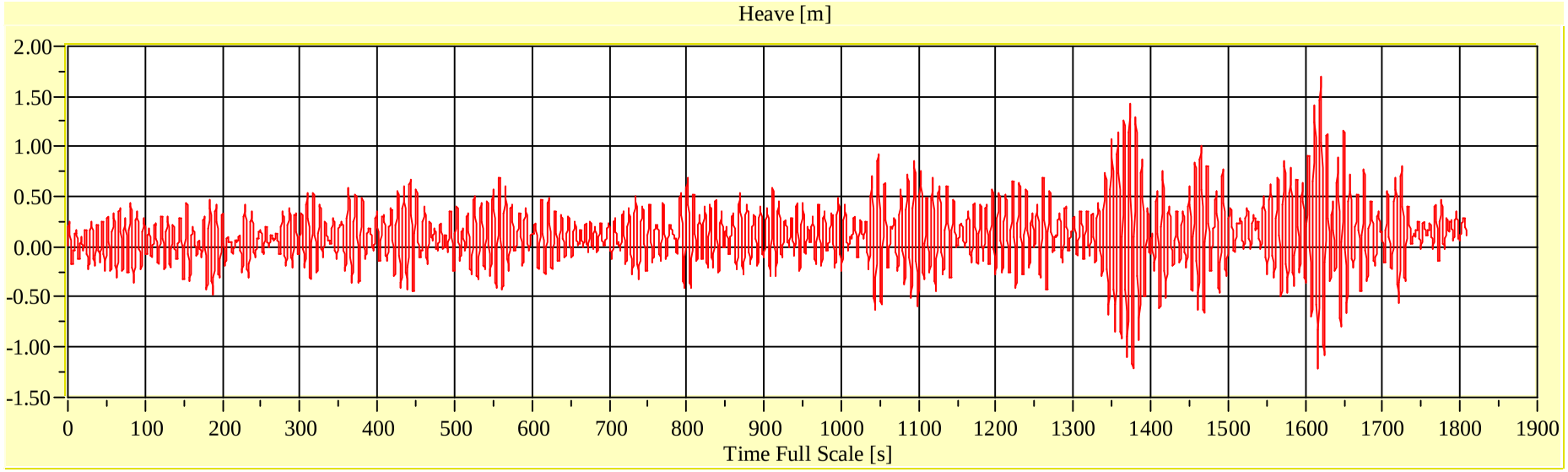



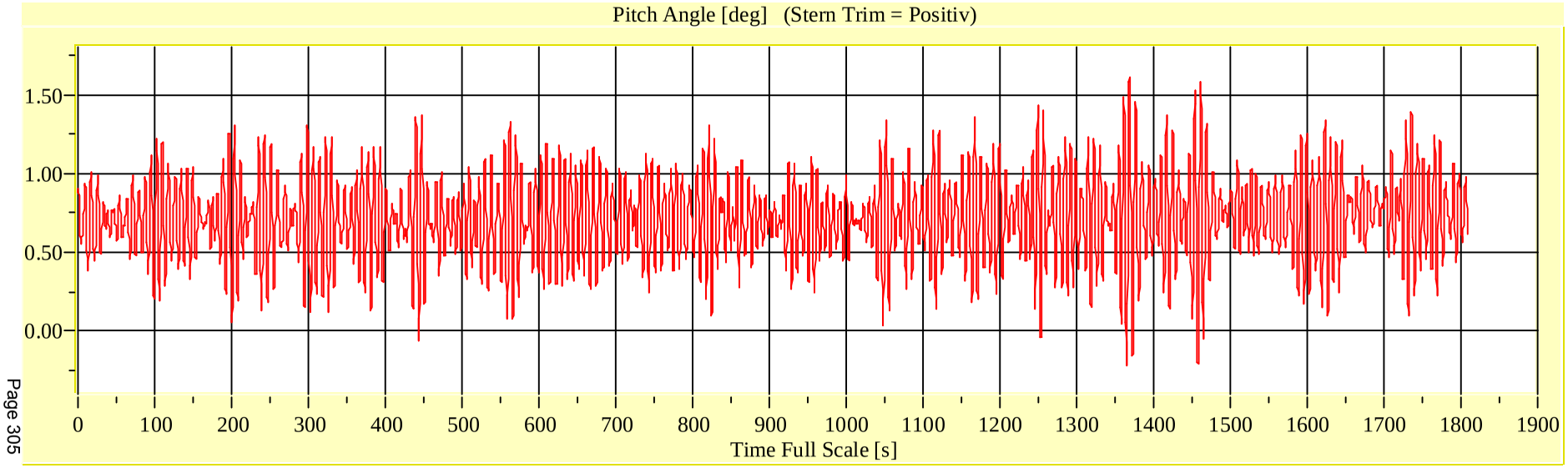



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-06 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



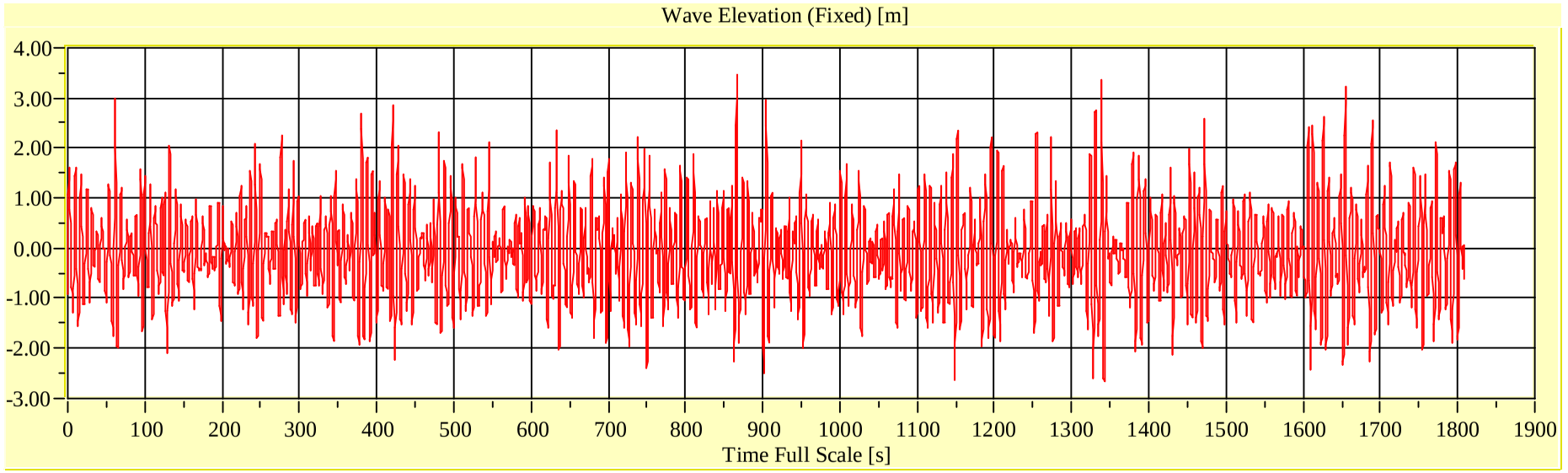



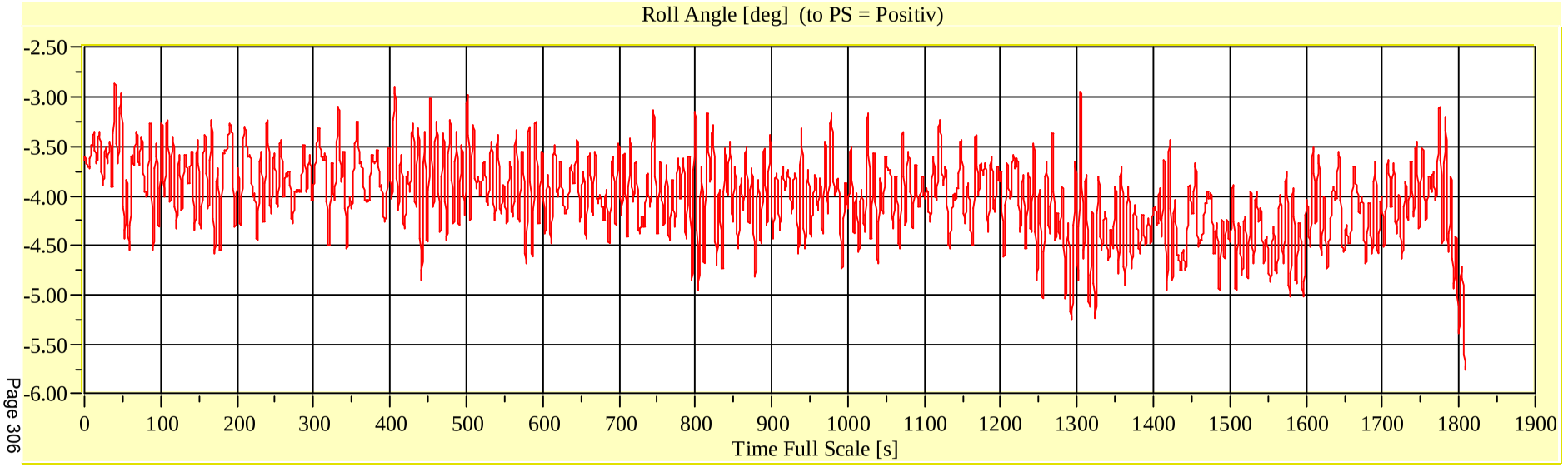



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-07 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



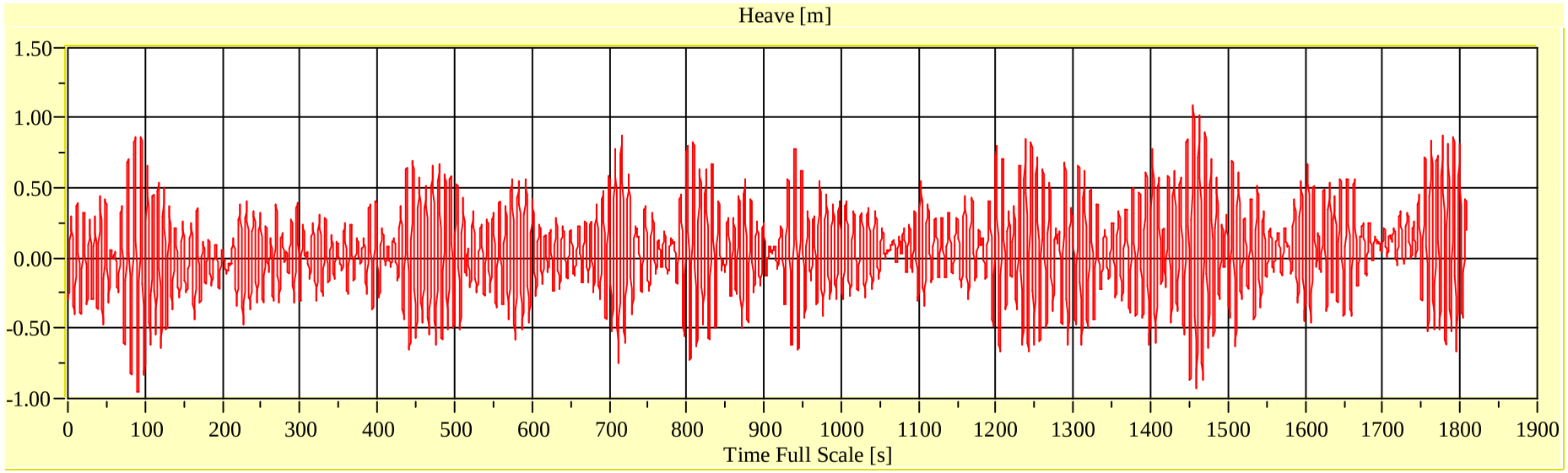



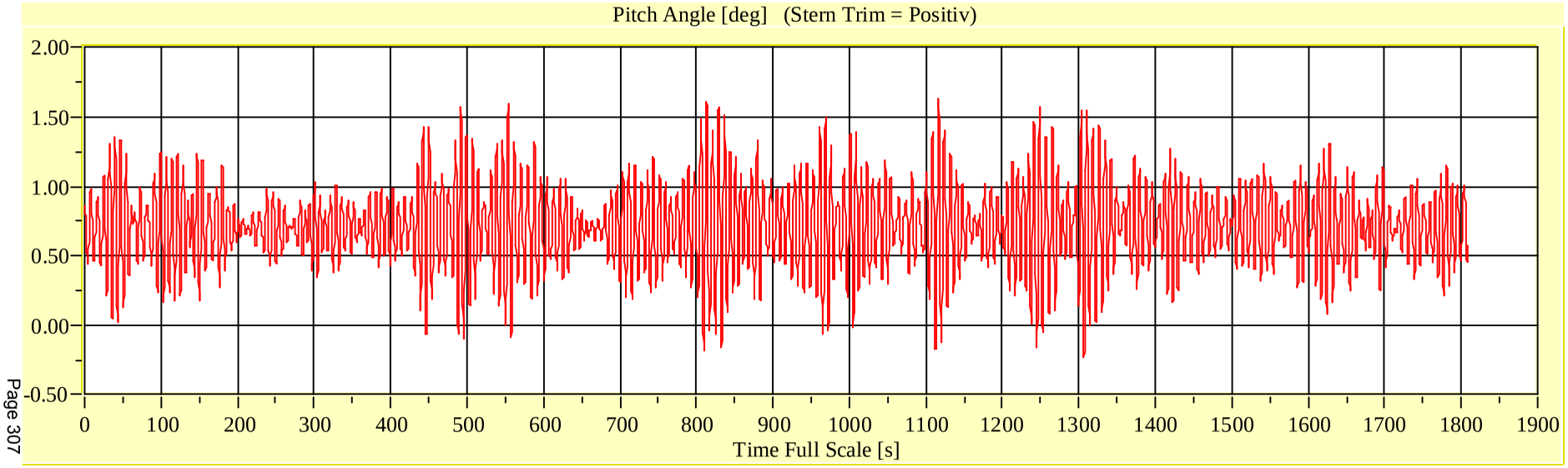



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-07 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



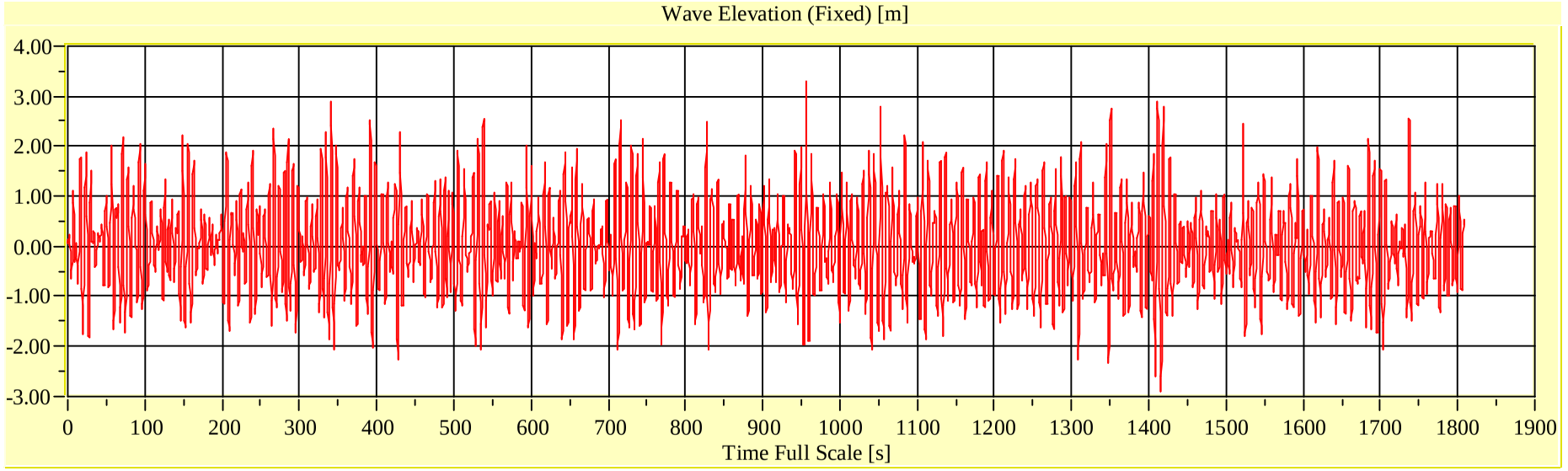



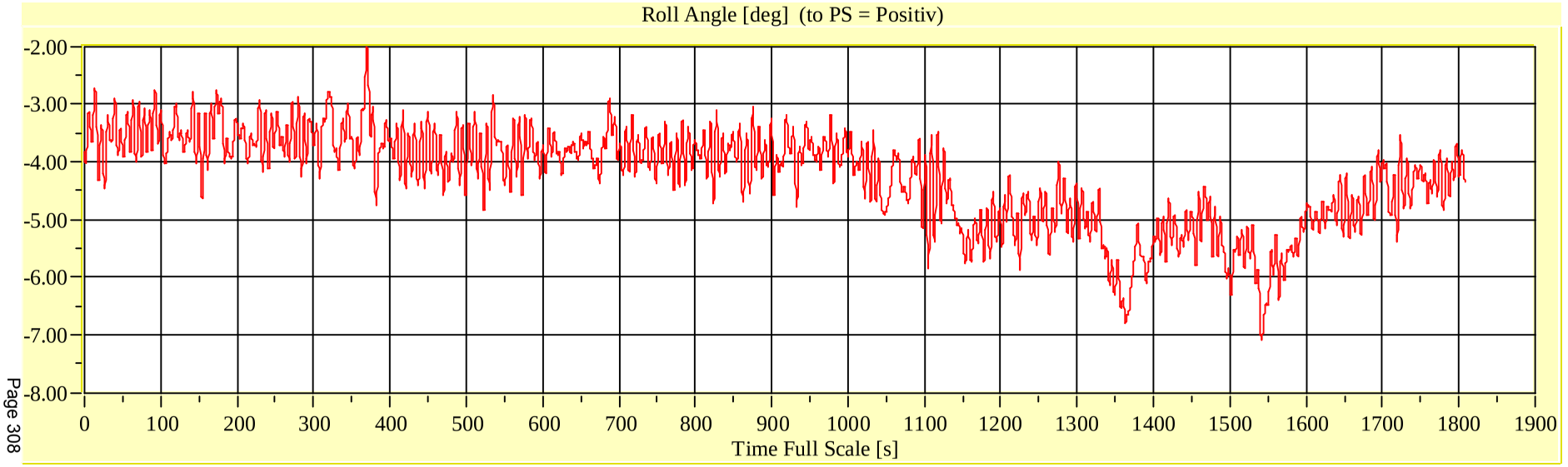



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-08 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



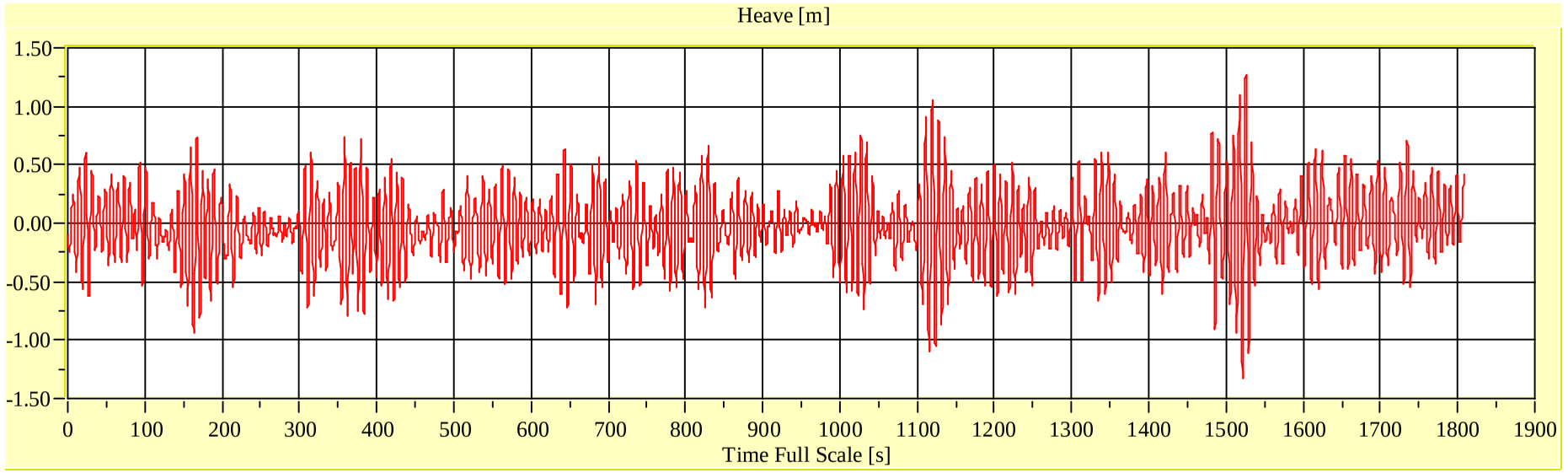



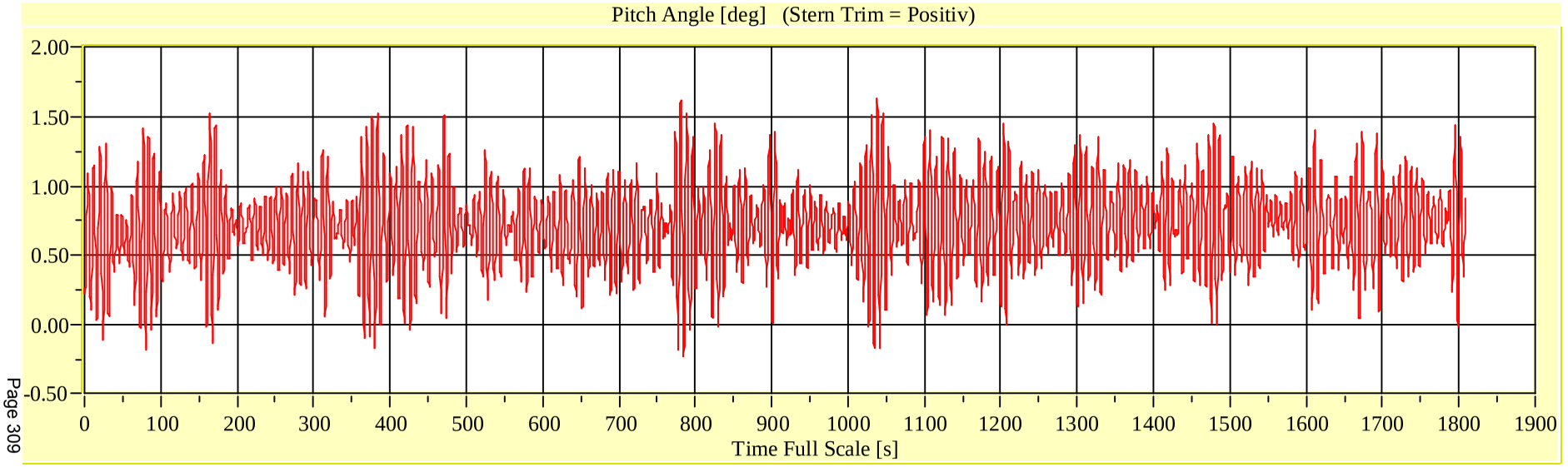



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-08 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



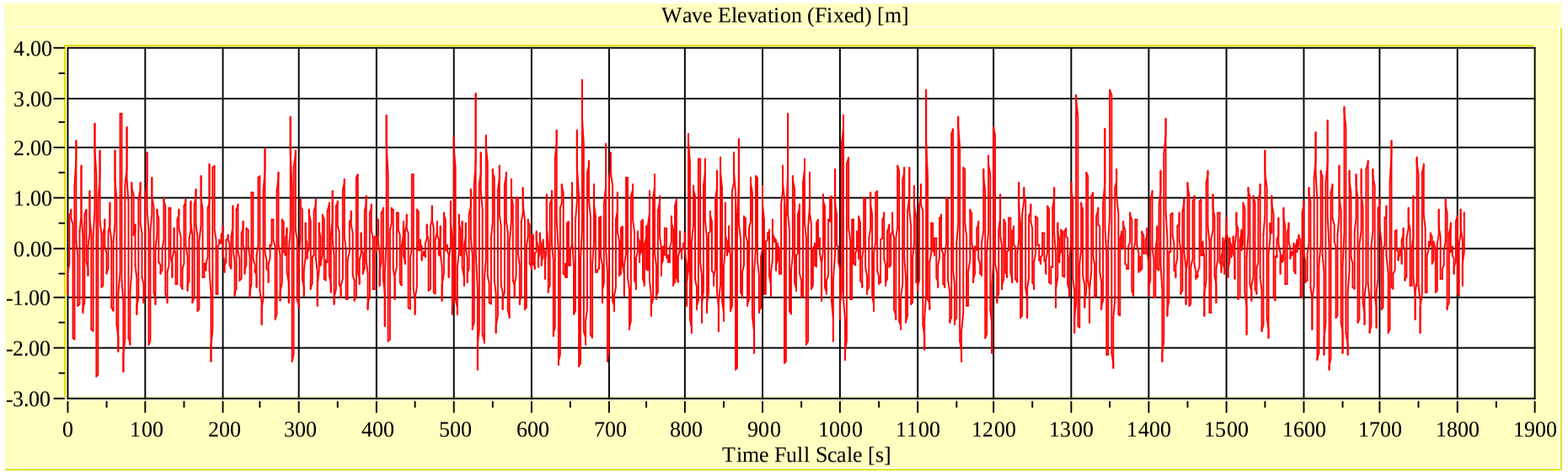



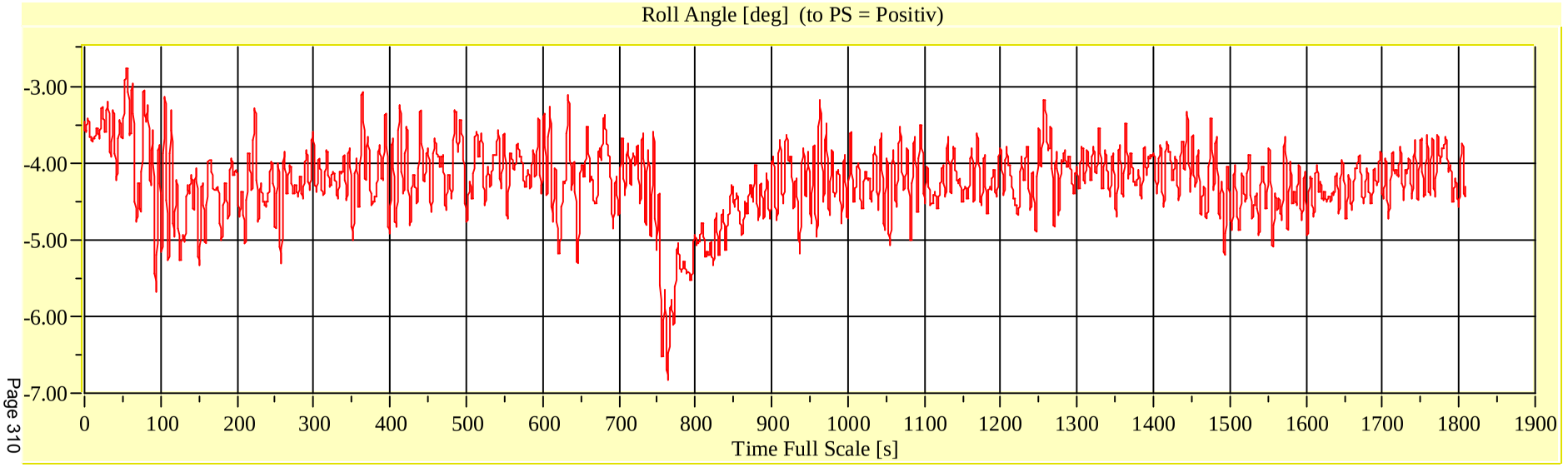



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-09 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



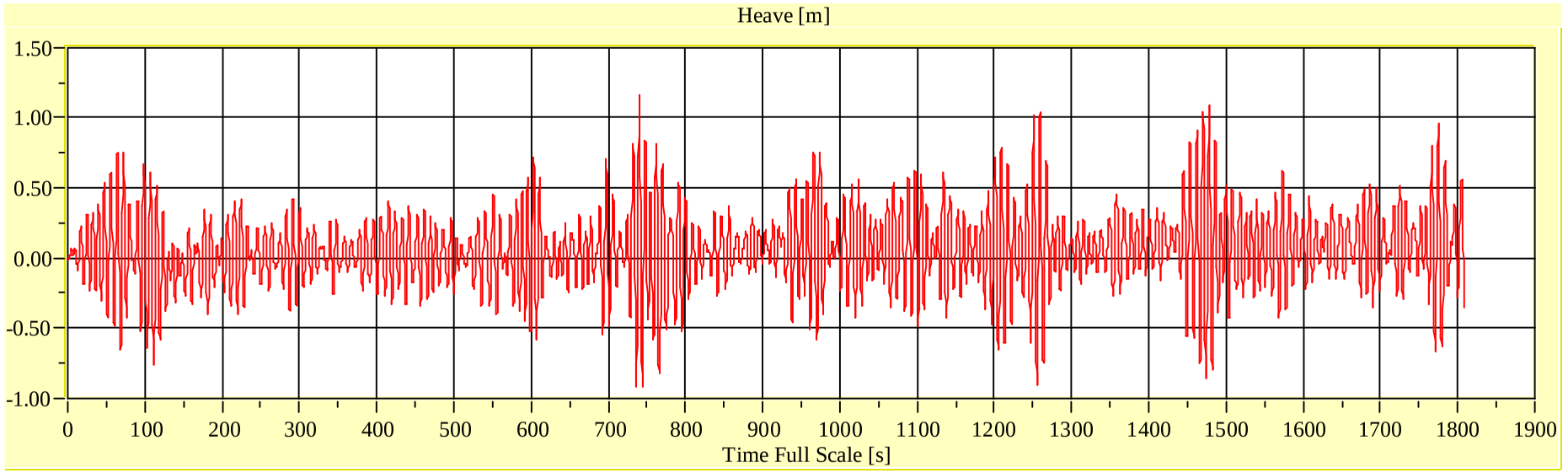



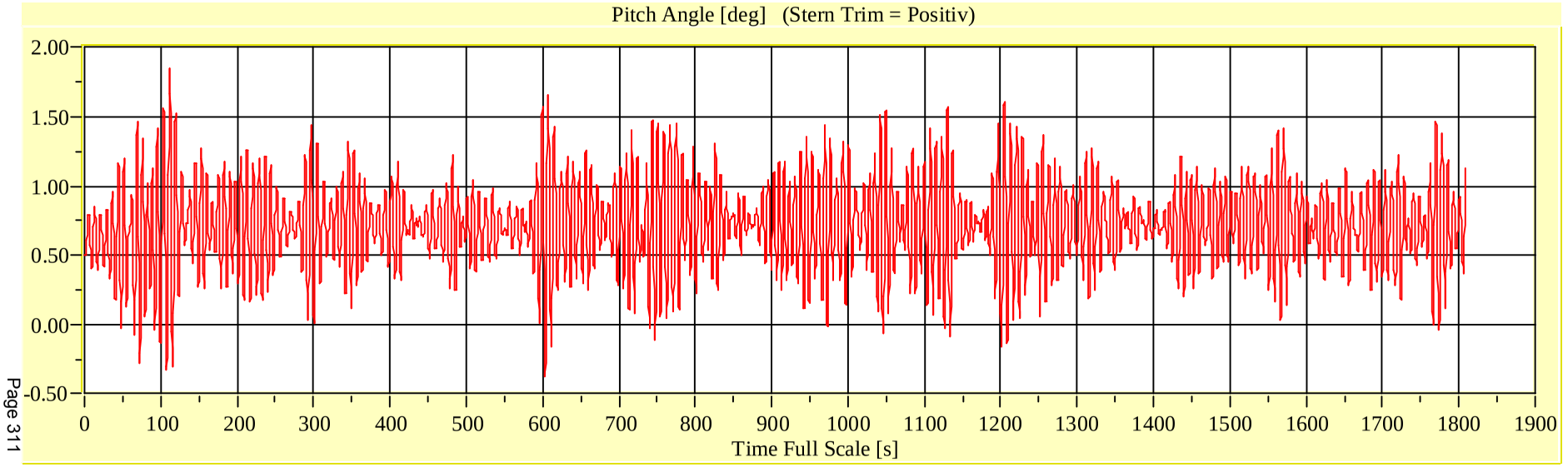



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-09 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



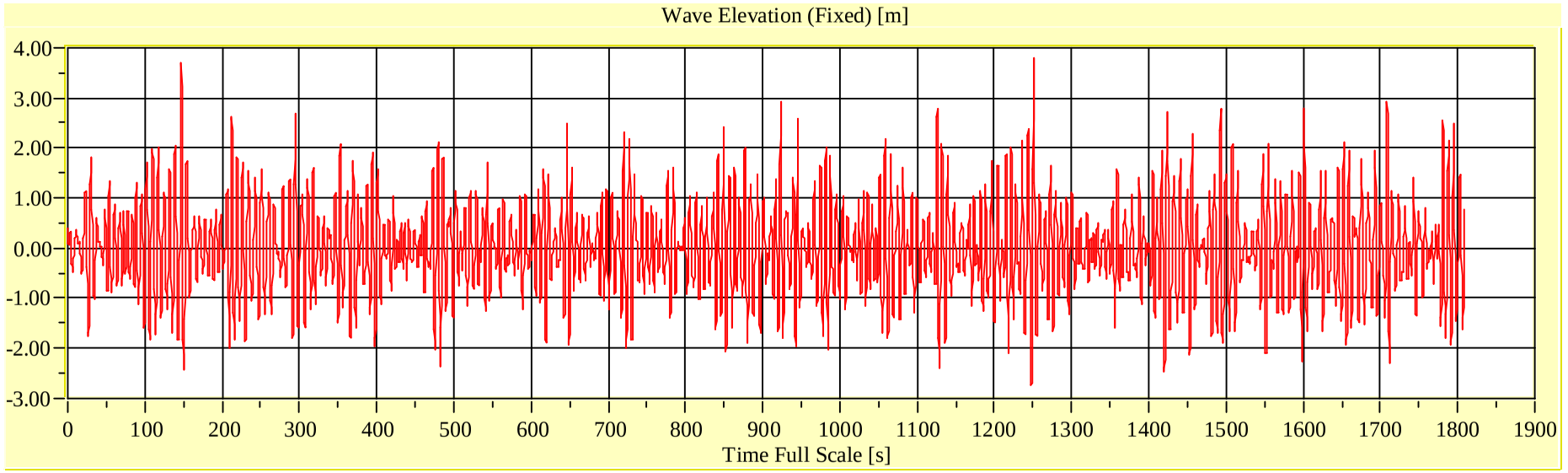



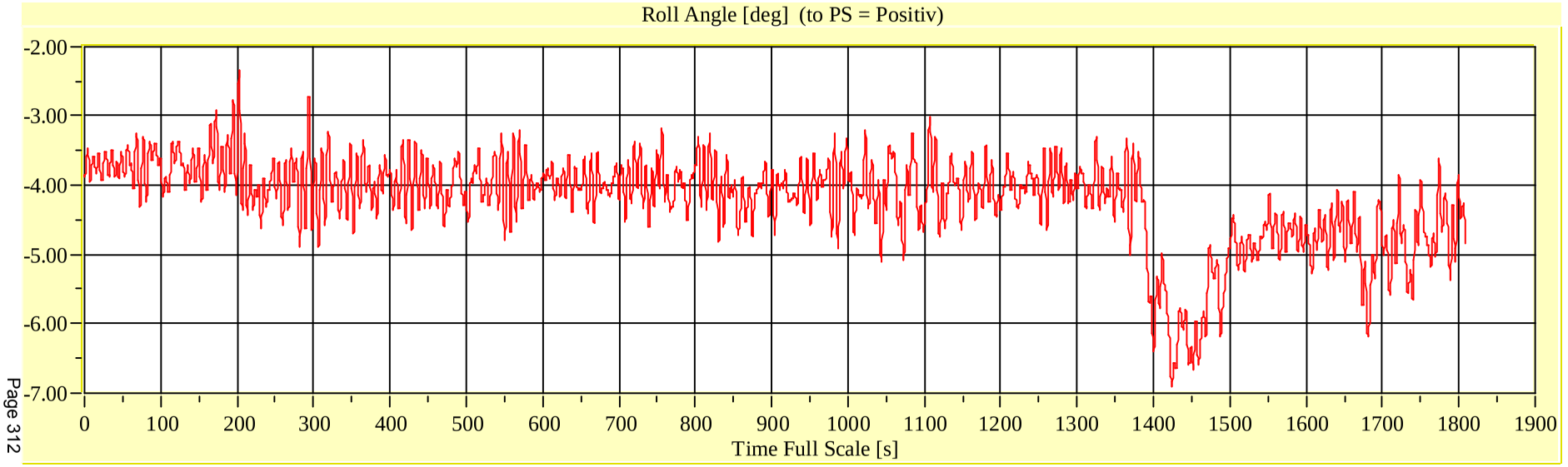



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-10 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



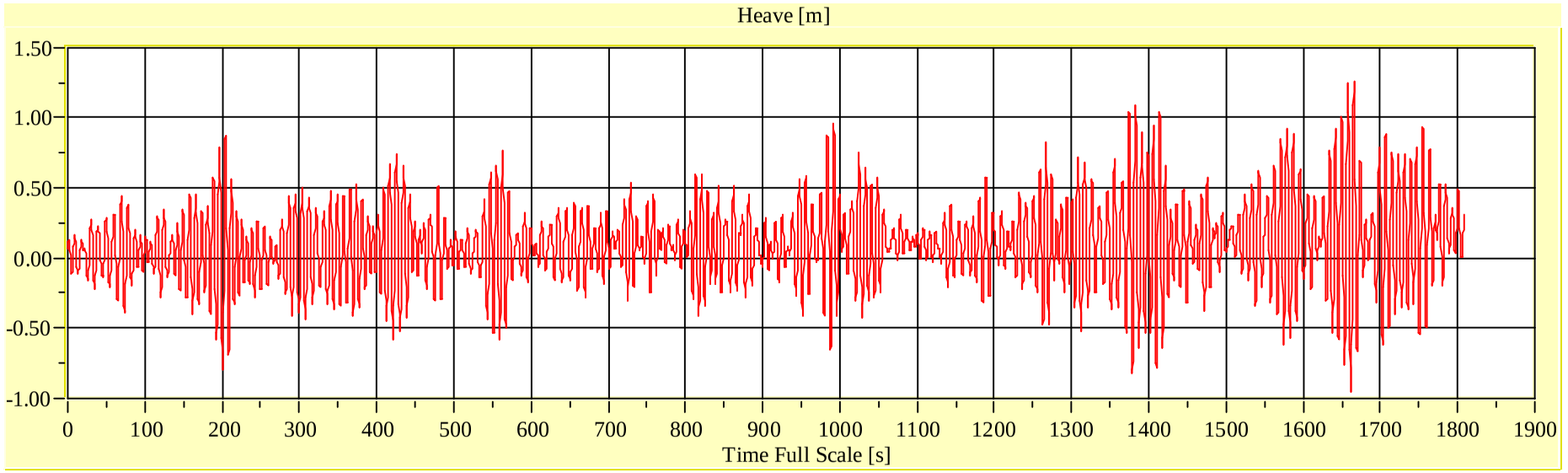



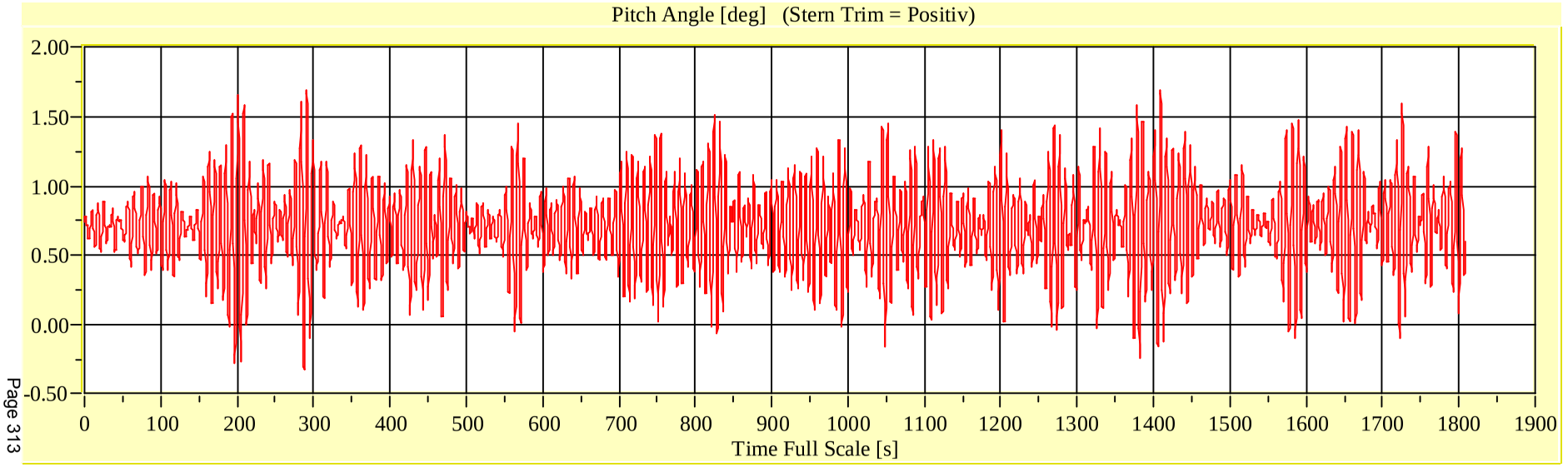



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29711-10 | Target Waves: Hs = 3,5 m Tp = 7,483 s | gamma = 3,3 |
|---|---|---|---|---|



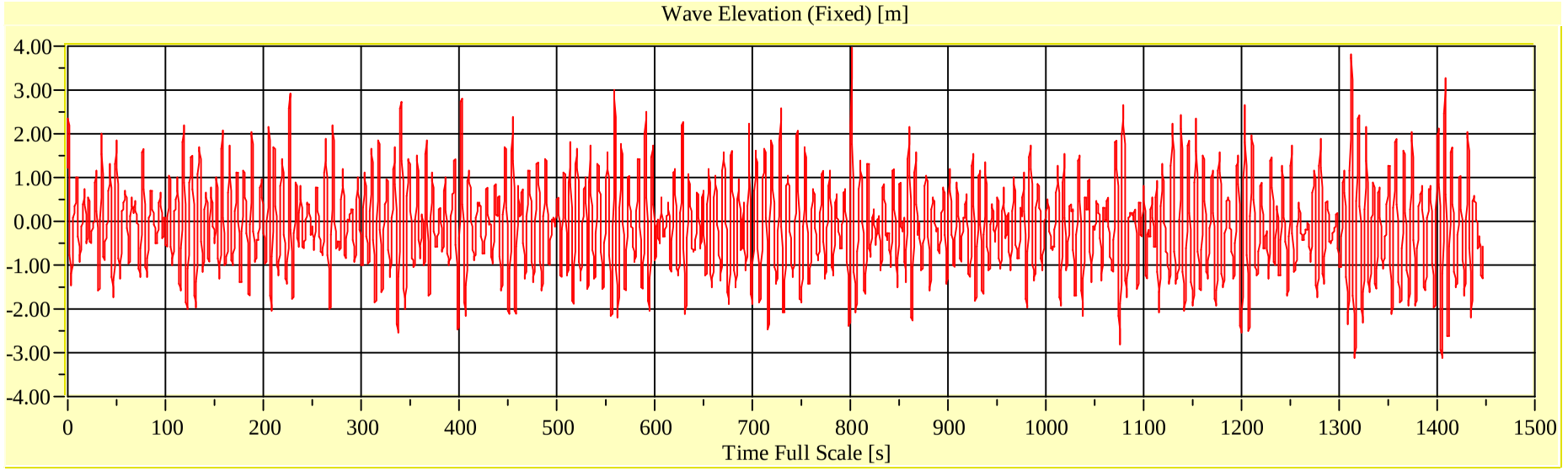



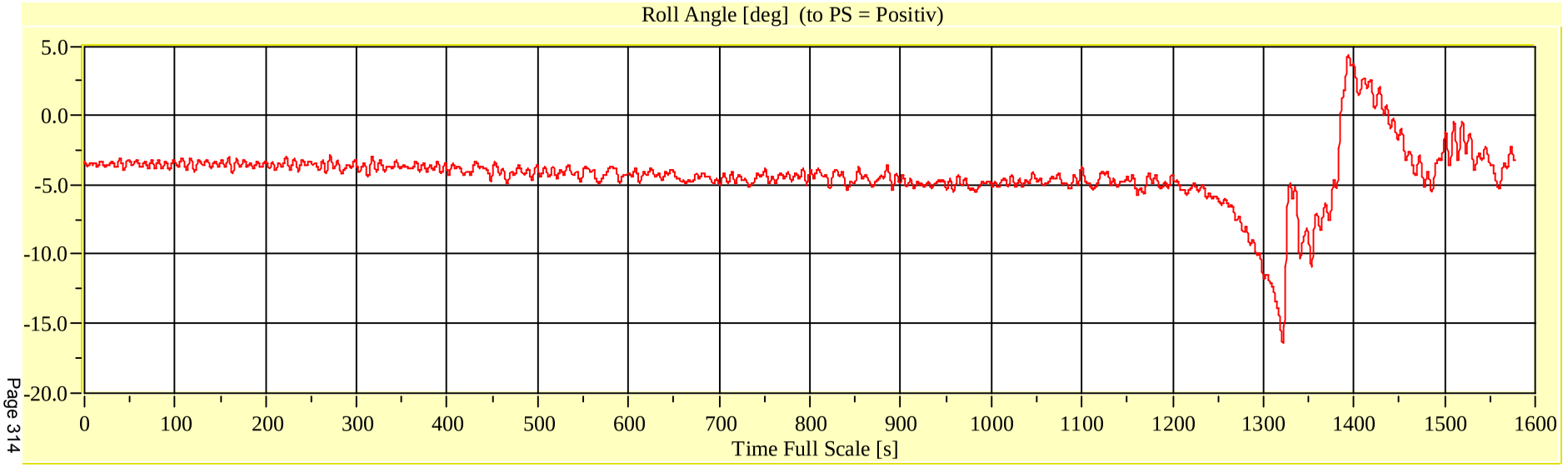



| Date: 14.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29712-01 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



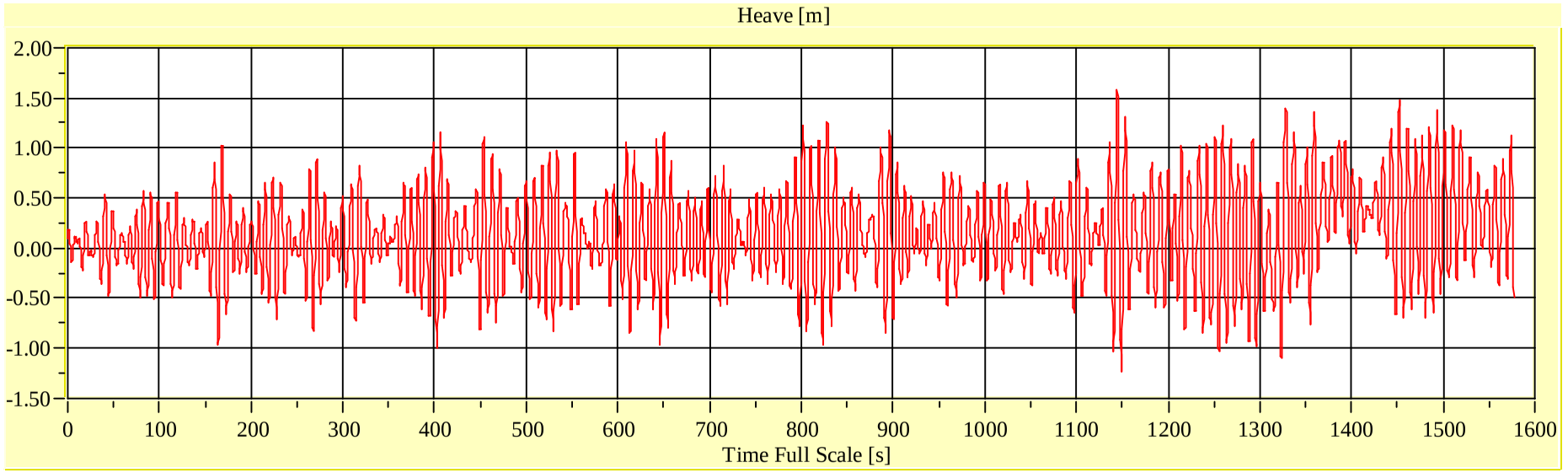



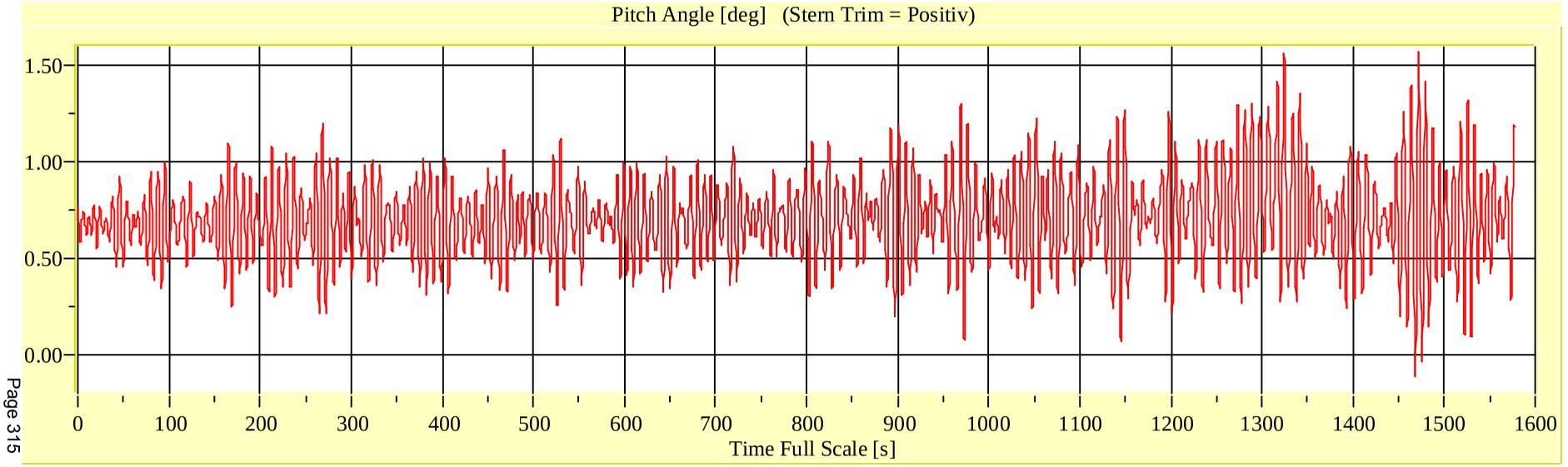



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29712-01 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



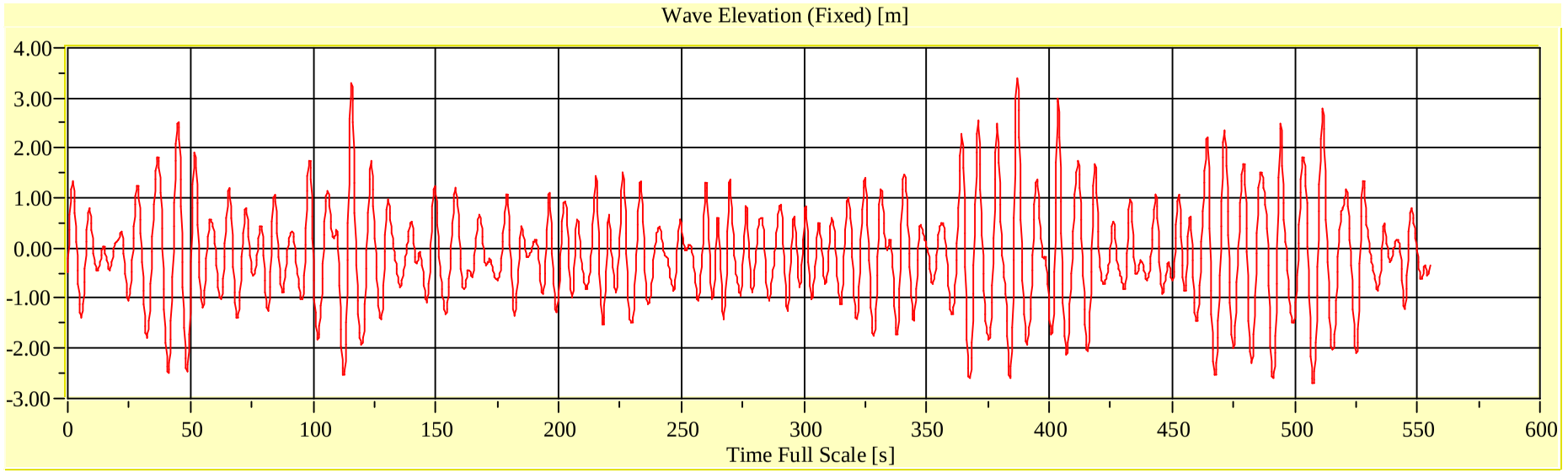



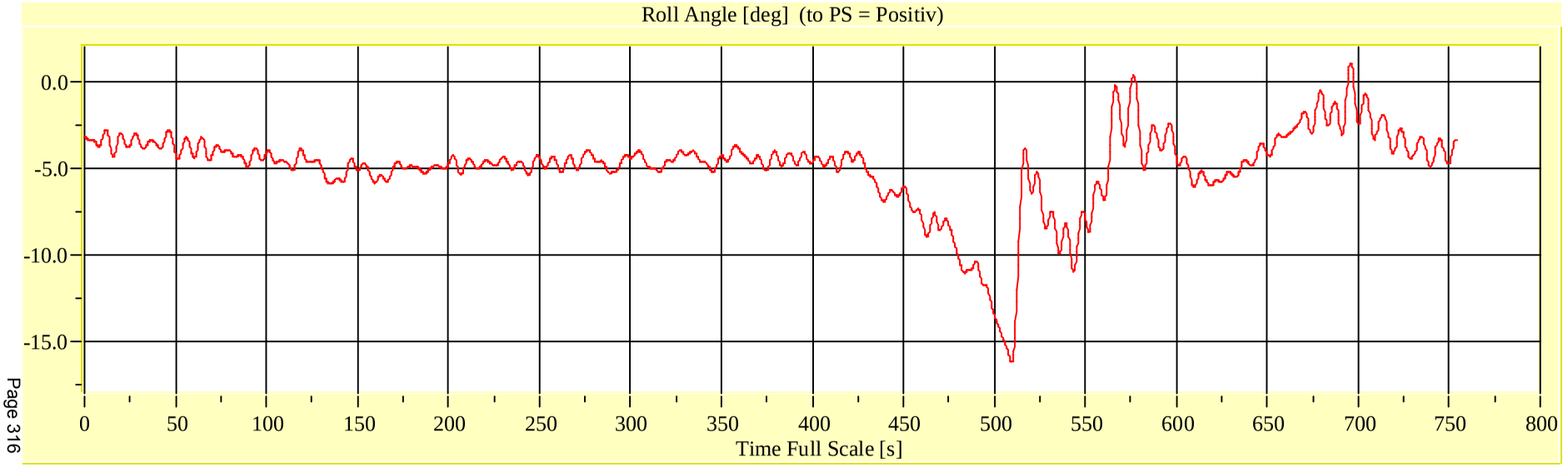



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29712-02 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



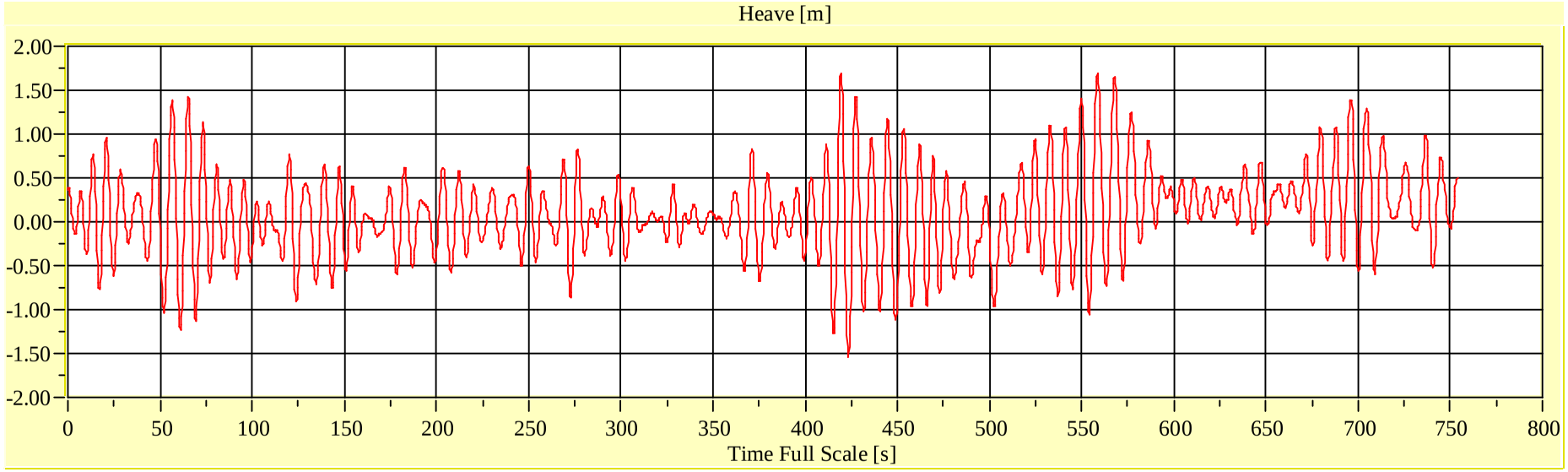



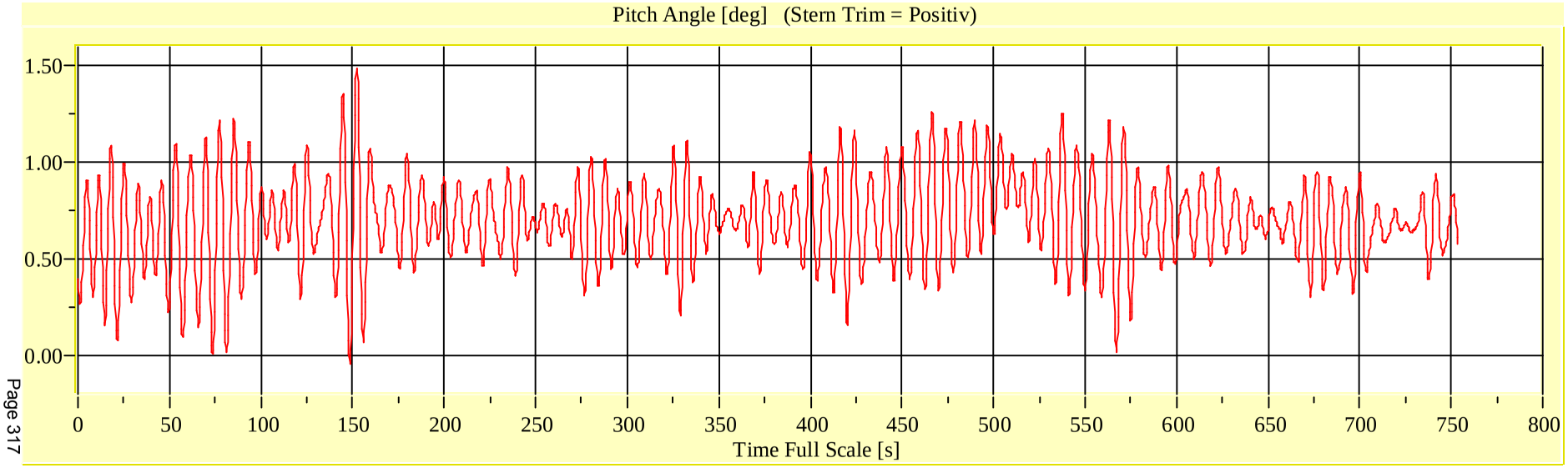



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29712-02 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



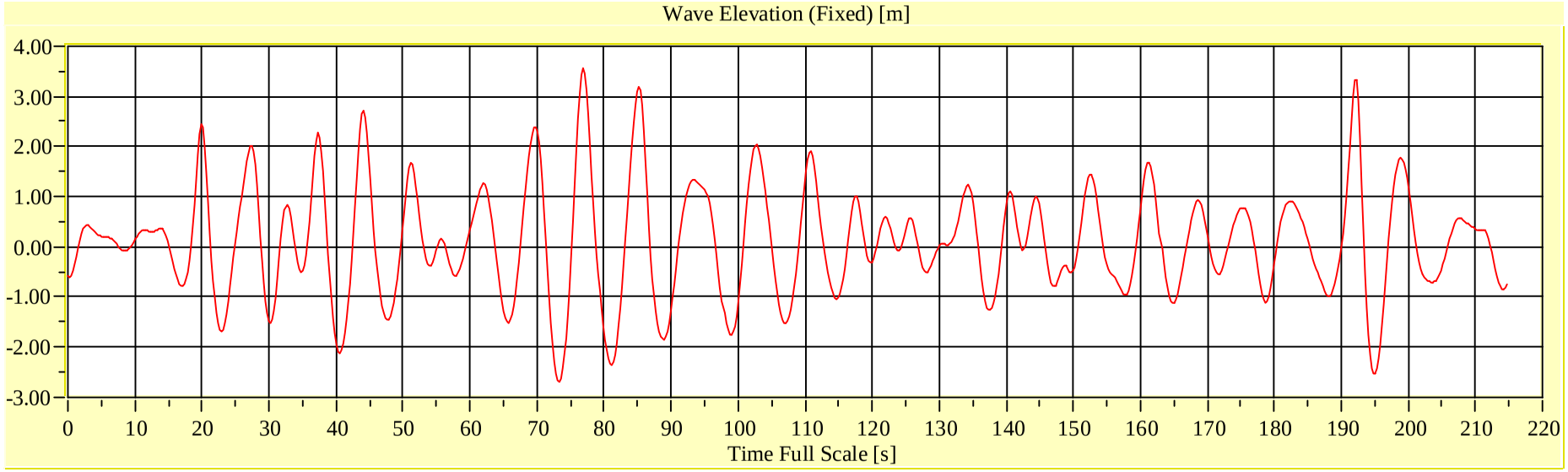



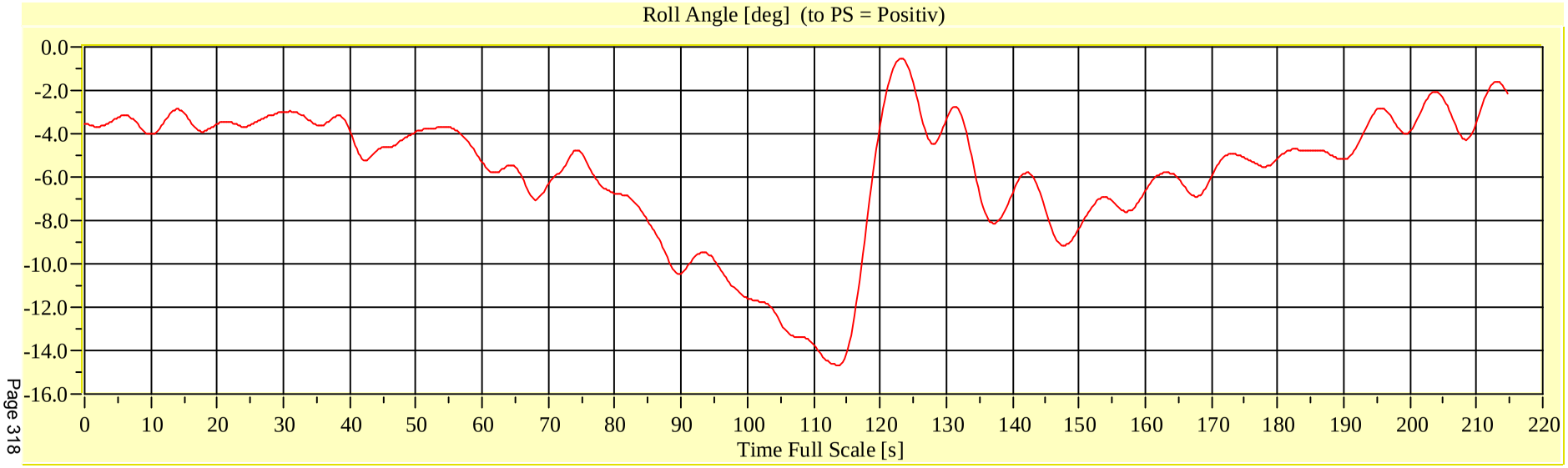



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29712-03 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



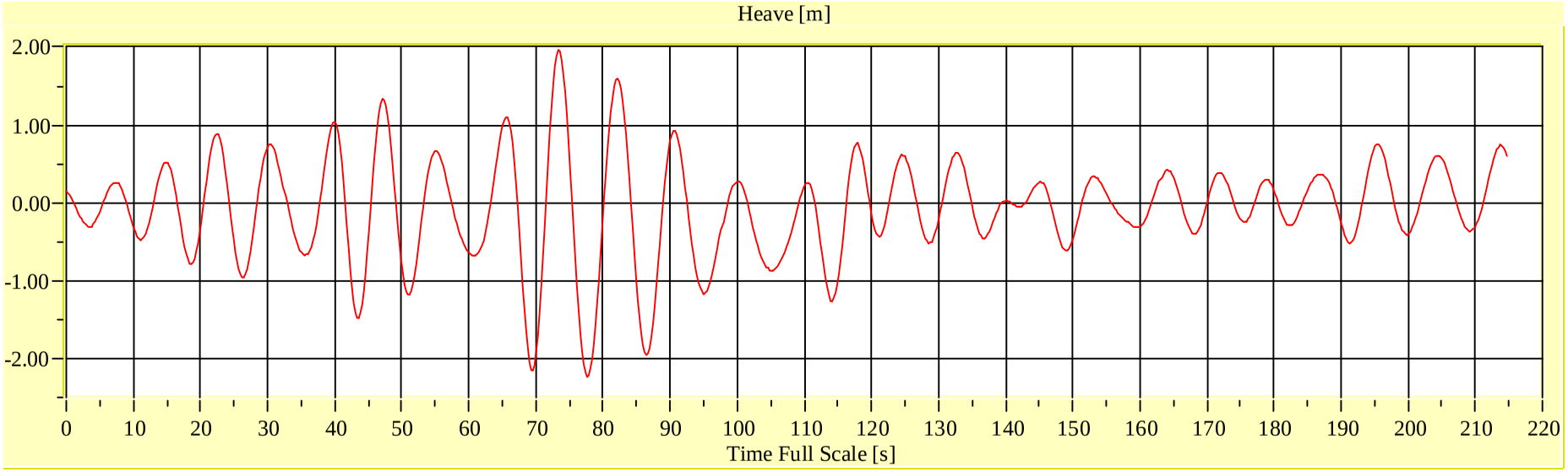



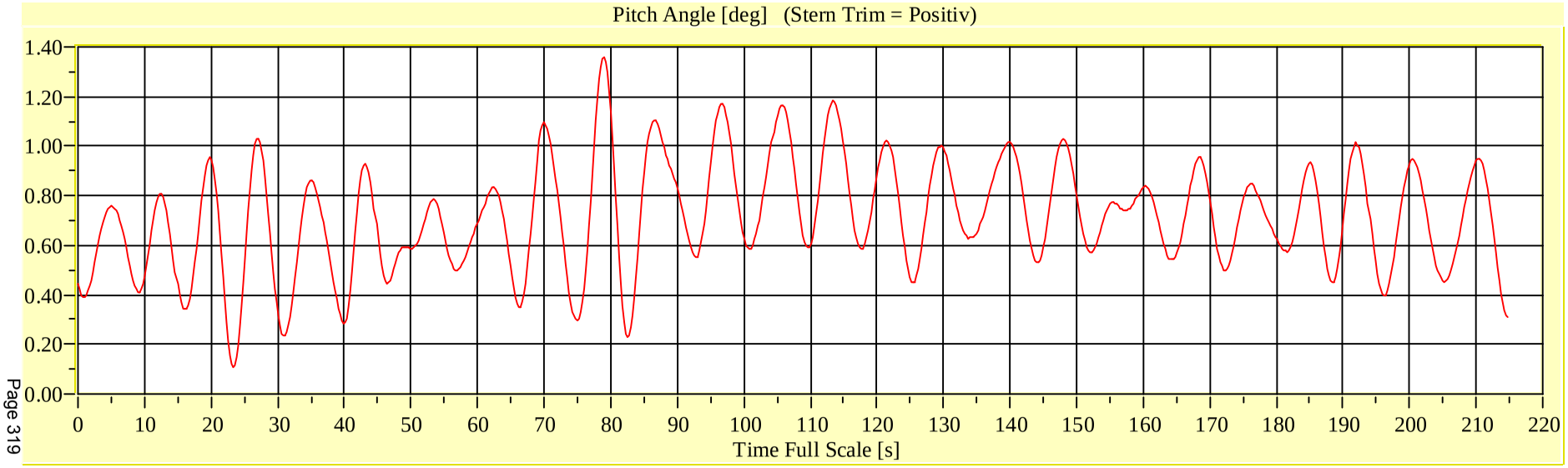



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29712-03 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|



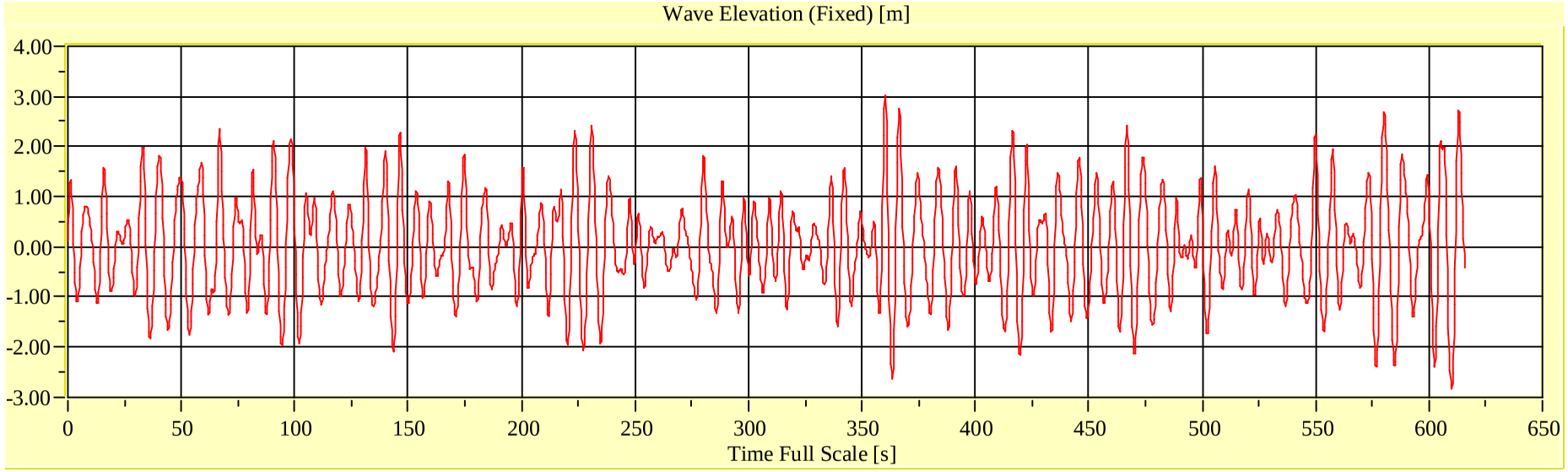



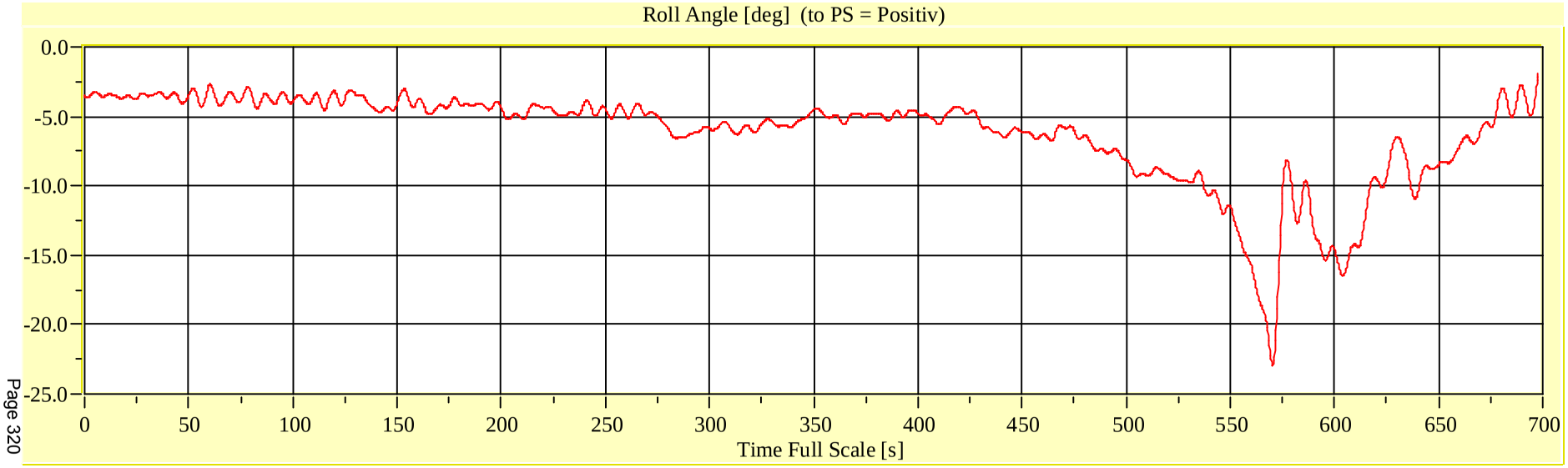



| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|

**Irregular Beam Seas**

| Vienna Model Basin | Model No. 2458 | Test No. 29712-04 | Target Waves: Hs = 4,0 m Tp = 8,0 s | gamma = 3,3 |
|---|---|---|---|---|






| Date: 11.06.2010 | Project: EMSA 2 | Damage 2: R7P15-16.2.0-1 |
|---|---|---|