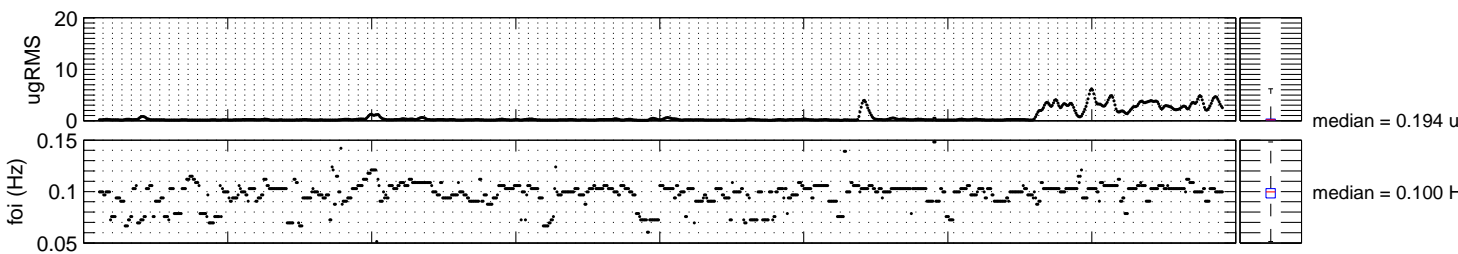


Three-Man Crew Qualify



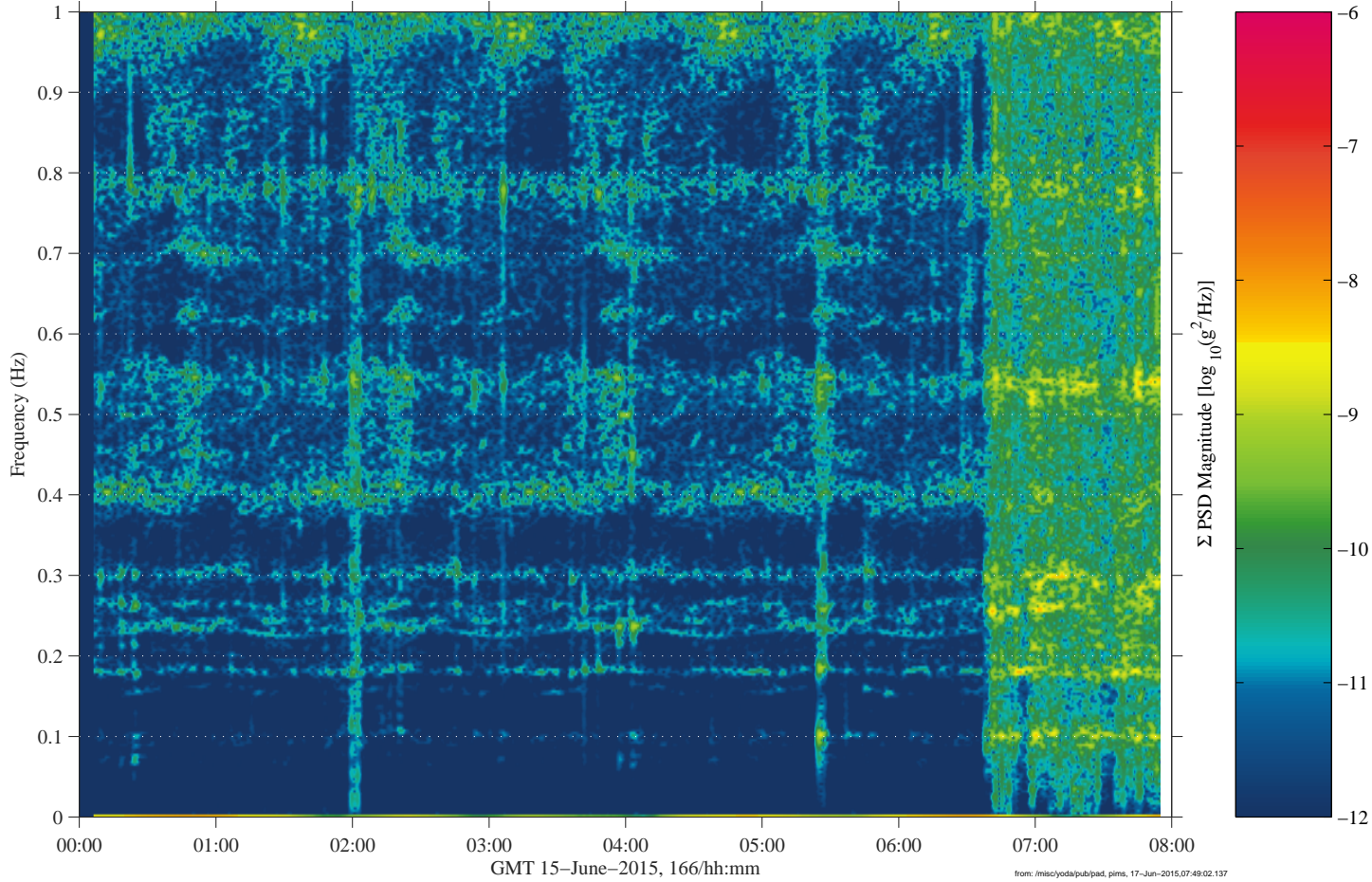
mams, hirap006 at LAB1O2, ER1, Lockers 3,4:[138.68 -16.18 142.35]
 198.0000 sa/sec (6.00 Hz)
 $\Delta f = 0.003$ Hz, Nfft = 65536
 Temp. Res. = 27.960 sec, No = 60000

mams, hirap006
 Start GMT 15-June-2015, 166/00:00:00.001

median = 0.194 ug

median = 0.100 Hz

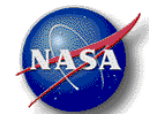
Sum
 Hanning, k = 1019
 Span = 7.91 hours



| Description | |
|-------------|---|
| Sensor | MAMS hirap006 198.00 sa/sec, 6.00 Hz |
| Location | LAB1O2, ER1, Lockers 3,4 |
| Plot Type | Spectrogram (below 1 Hz) |

- Notes:**
- This color spectrogram shows the sharp transition in the low-frequency regime of the space station's acceleration spectrum below 1 Hz when a small, three-man crew contingent is aboard the ISS.
 - The reduced number of crew members appears to reduce the chance of early risers. Early risers would tend to make the transition from sleep to wake not as sharp in terms of structural vibrations.
 - The dramatic vertical (broadband) transition at about 06:39 is the tell-tale signs of the crew going from a resting state to the wake state when push-offs and landing required for locomotion around the space station are what give rise to reaction forces and thus, structural mode excitation.
 - The odd transition time of 06:39 might lead some to believe the alarm was set for 06:30, and crew movement did not begin until after precisely one iteration of a 9-minute snooze button cycle.

| | |
|-----------|----------------|
| Regime: | Vibratory |
| Category: | Crew |
| Source: | Three-Man Crew |

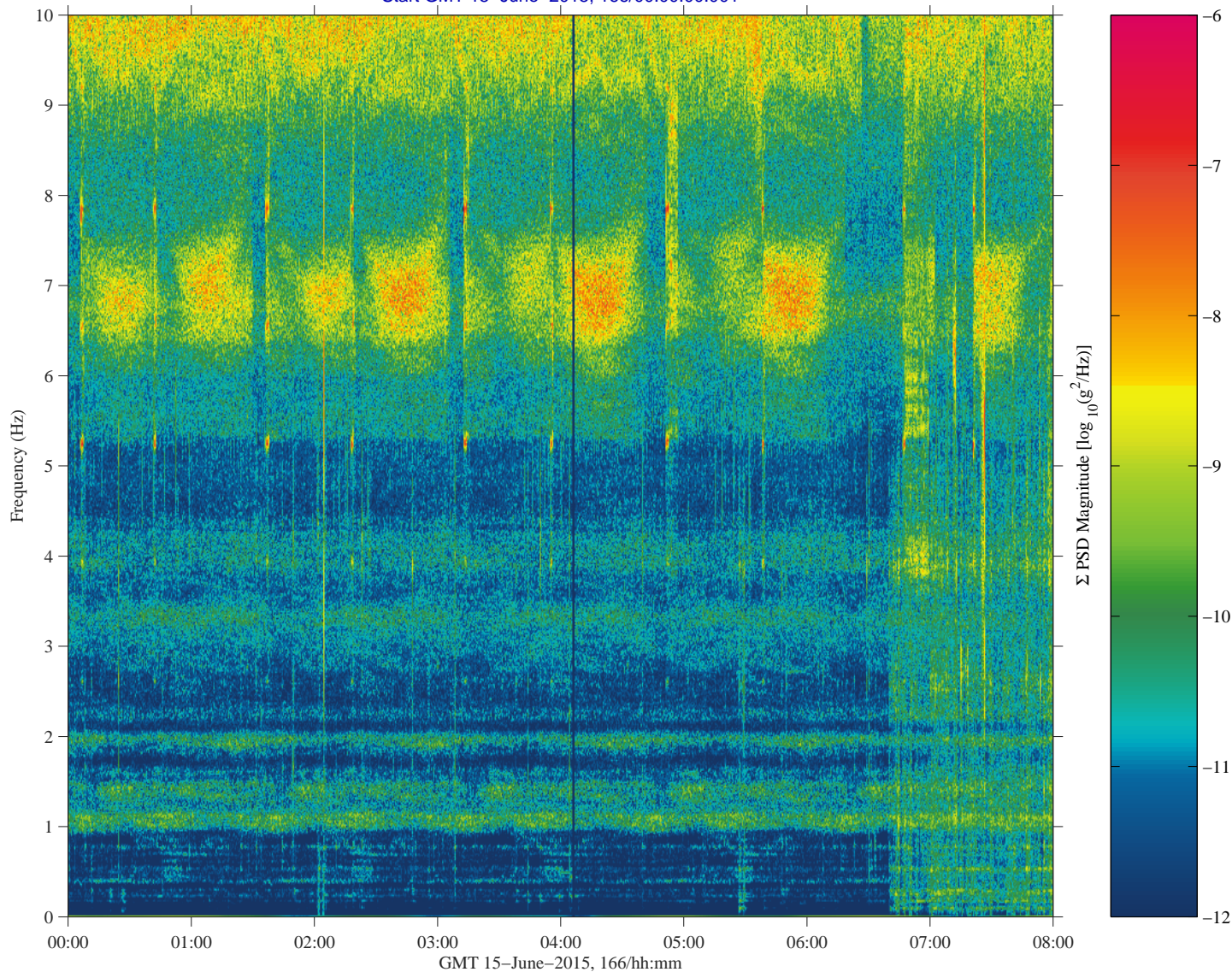


Three-Man Crew Qualify

mams, hirap at LAB1O2, ER1, Lockers 3,4:[138.68 -16.18 142.35]
 1000.0000 sa/sec (100.00 Hz)
 $\Delta f = 0.015$ Hz, Nfft = 65536
 Temp. Res. = 32.768 sec, No = 32768

mams, hirap

Start GMT 15-June-2015, 166/00:00:00.001



from: misc:yoda/pub/pad_pims, 17-Jun-2015,08:36:10.056

| Description | |
|-------------|-------------------------------------|
| Sensor | MAMS hirap 1000.0 sa/sec, 100 Hz |
| Location | LAB1O2, ER1, Lockers 3,4 |
| Plot Type | Spectrogram (below 10 Hz) |

Notes:

- This color spectrogram shows the same time frame as the previous, but now for the acceleration spectrum up to 10 Hz.
- Again we see the sharp transition at 06:39 when the crew awoke, particularly below about 6 Hz or so.
- Notice here though that above about 6 Hz, the transition from sleep to wake is difficult, if not impossible, to detect.
- Above about 6 Hz, other sources of vibration such as the Ku-band antenna tracking or various equipment tend to dominate regardless of sleep versus wake period.
- Most of what is observed between about just over 5 Hz up to 10 Hz is attributed to vibrations that arise as a result of the Ku-band antenna tracking or acquiring track of a communications satellite.

| | |
|-----------|----------------|
| Regime: | Vibratory |
| Category: | Crew |
| Source: | Three-Man Crew |



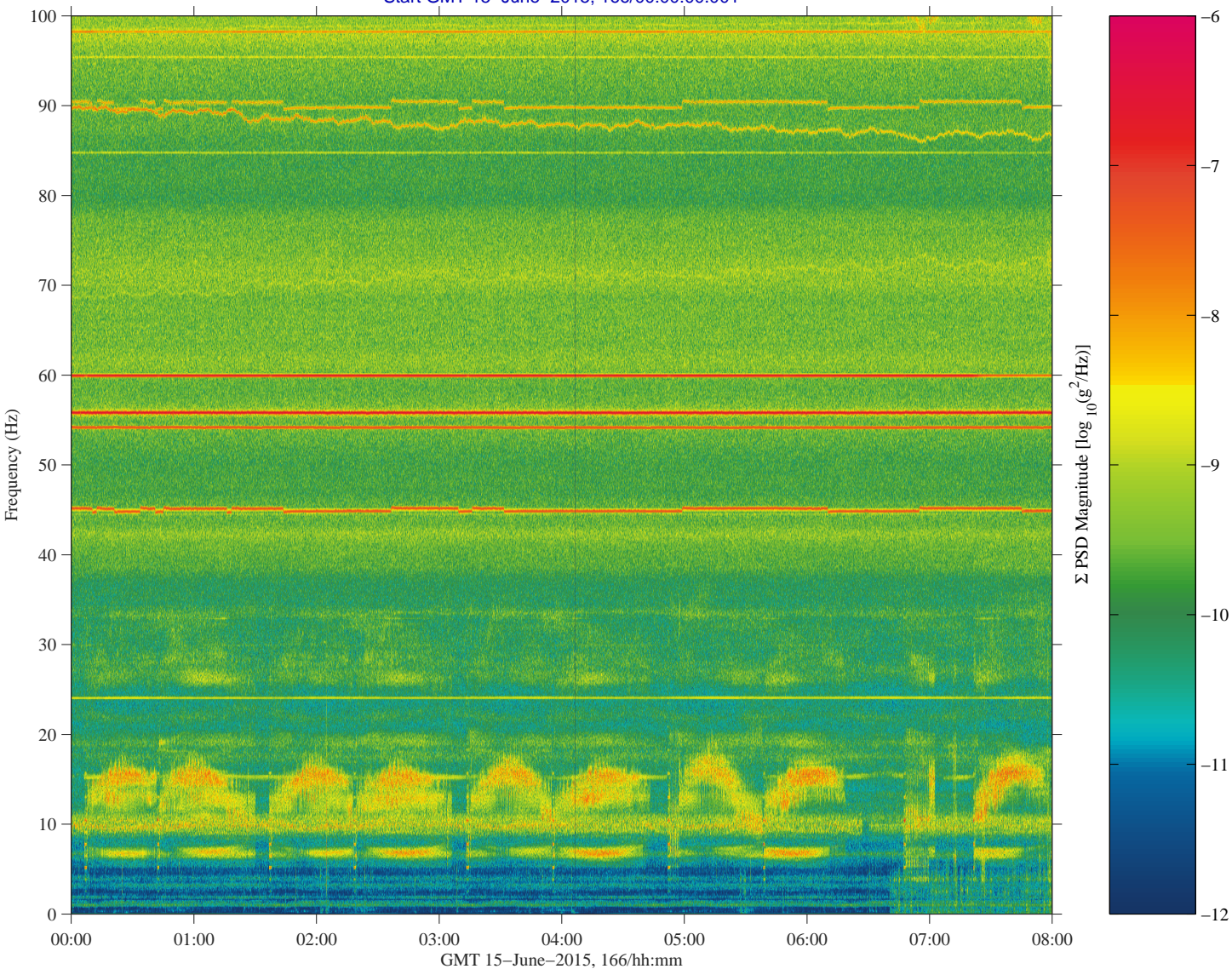
Three-Man Crew Quality

mams, hirap at LAB1O2, ER1, Lockers 3,4:[138.68 -16.18 142.35]
 1000.0000 sa/sec (100.00 Hz)
 $\Delta f = 0.122$ Hz, Nfft = 8192
 Temp. Res. = 8.192 sec, No = 0

mams, hirap

Start GMT 15-June-2015, 166/00:00:00.001

Sum
 Hanning, k = 3517
 Span = 8.00 hours



from: misc/yoda/pub/pad_pims_17-Jun-2015,07:28:04.018

| Description | |
|-------------|-------------------------------------|
| Sensor | MAMS hirap 1000.0 sa/sec, 100 Hz |
| Location | LAB1O2, ER1, Lockers 3,4 |
| Plot Type | Spectrogram (below 100 Hz) |

Notes:

- This spectrogram shows the same time span as the previous 2, but now up to 100 Hz.
- The transition is still distinctive if you know where to look (below about 6 Hz at 06:39) crammed along the bottom of the plot.
- Like the previous 10 Hz spectrogram, this plot shows higher-frequency vibrations from various equipment/sources dominate regardless of whether the crew is awake moving about or not.
- This spectrogram shows clearer the Ku-band antenna vibrations which spread most distinctly from about 5 Hz up to 20 Hz.

| | |
|-----------|----------------|
| Regime: | Vibratory |
| Category: | Crew |
| Source: | Three-Man Crew |



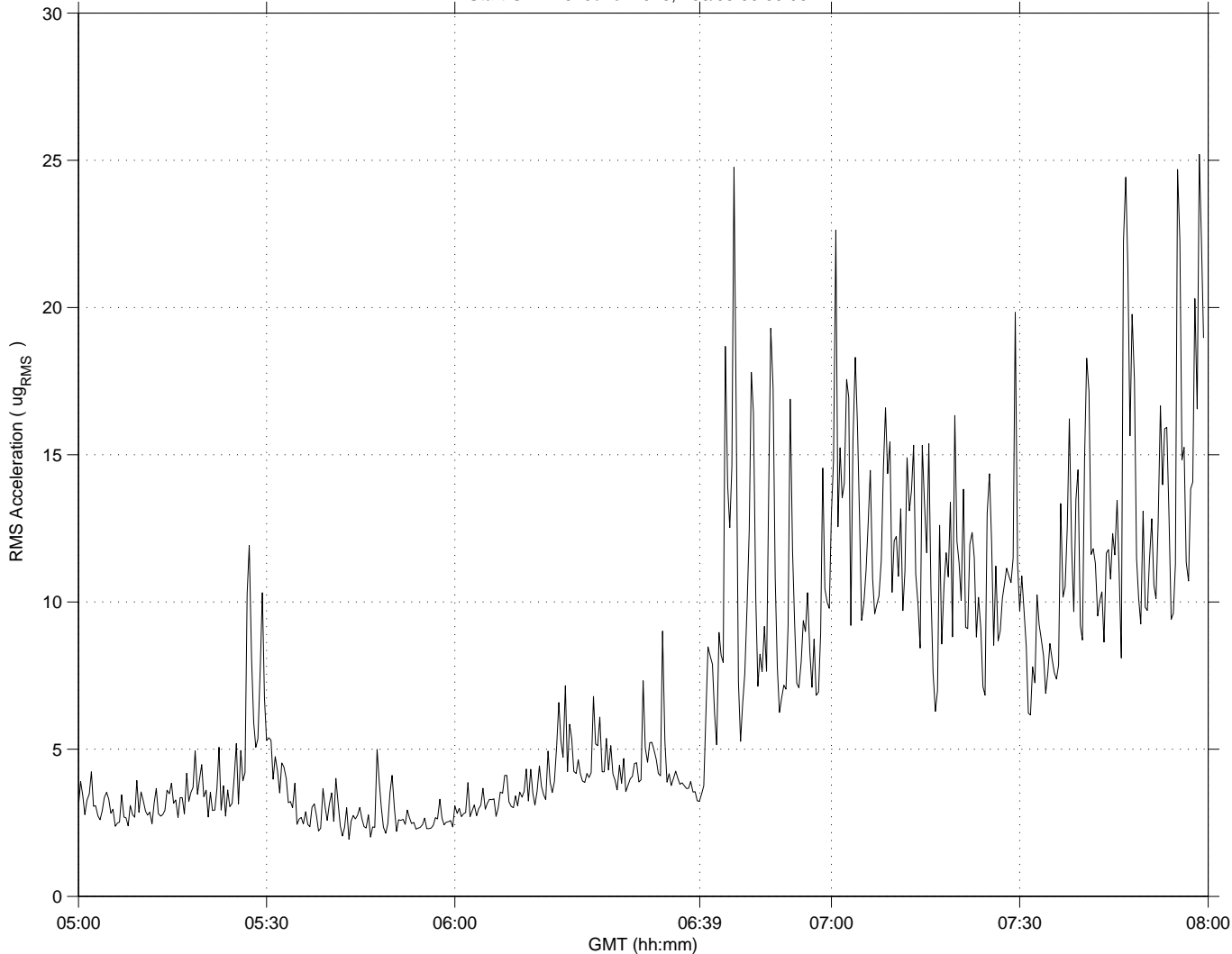
Three-Man Crew Quantify

mams, hirap006 at LAB1O2, ER1, Lockers 3,4,[138.68 -16.18 142.35]
 198.0000 sa/sec (6.00 Hz)
 Δf: 0.024 Hz, Range: 0.01 – 1 Hz
 Temp. Resolution: 20.687 sec

MAMS HIRAP, hirap006, LAB1O2, ER1, Lockers 3,4, RMS 0.01 to 1 Hz

SSAnalysis[0.0 0.0 0.0]
 Hanning, k = 1

Start GMT 15-June-2015, 166/05:00:00.004



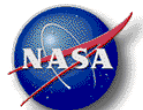
Description

| | |
|-----------|---|
| Sensor | MAMS hirap006 198.00 sa/sec, 6.00 Hz |
| Location | LAB1O2, ER1, Lockers 3,4 |
| Plot Type | RMS vs. Time (below 1 Hz) |

Notes:

- This plot shows RMS acceleration under 1 Hz versus time for the last 3 hours of the time span covered by the spectrograms shown on the previous pages, that is, GMT 05:00-08:00.
- This helps to quantify what we observed as a sharp transition in the spectrogram. Note the step at 06:39.
- Before wake from 05:00 to 06:39, the RMS level below 1 Hz was mostly under 5 ug.
- After wake from 06:39 to 08:00, the RMS level under 1 Hz was mostly between about 10 ug and 15 ug.

| | |
|-----------|----------------|
| Regime: | Vibratory |
| Category: | Crew |
| Source: | Three-Man Crew |



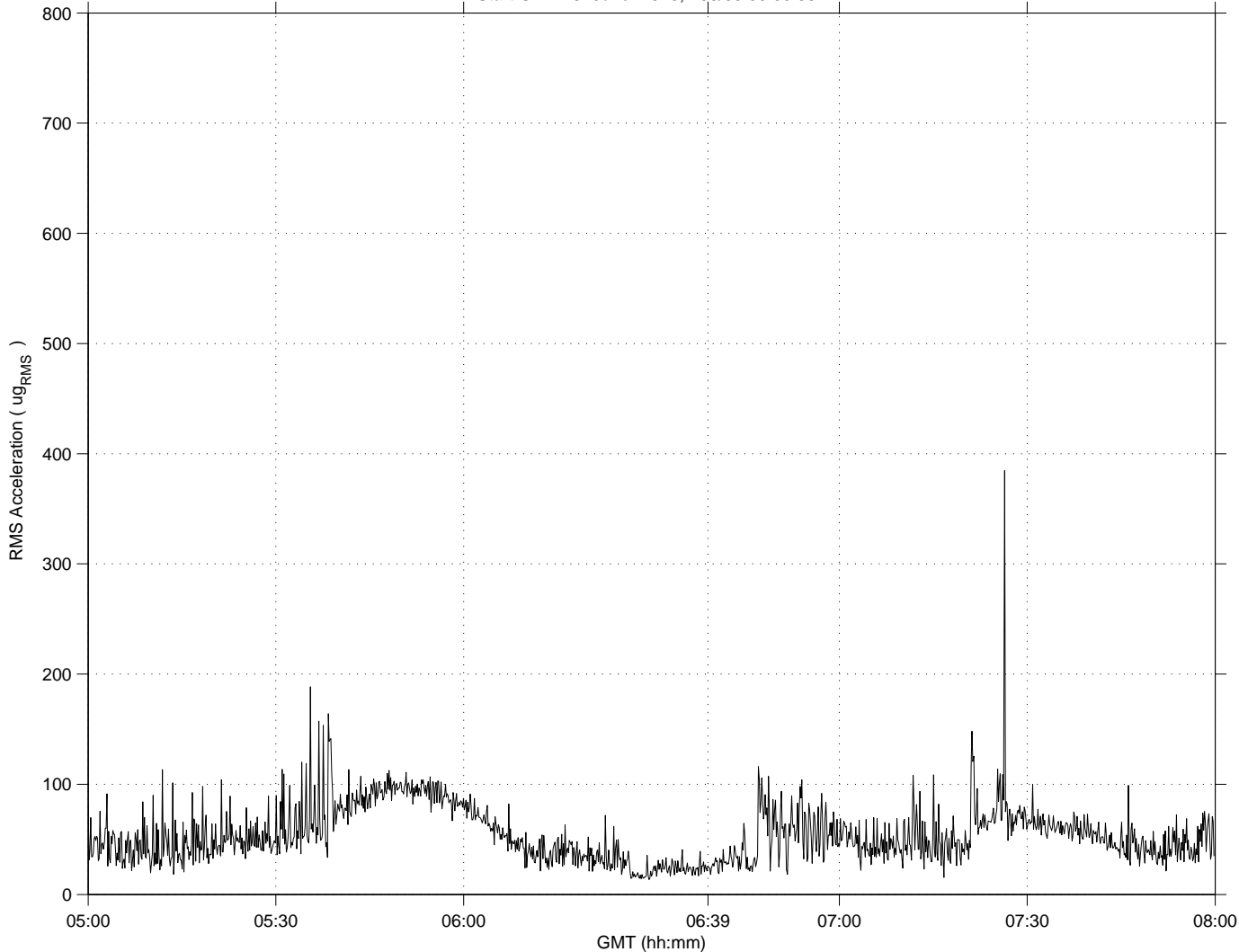
Three-Man Crew Quantify

mams, hirap at LAB1O2, ER1, Lockers 3,4[138.68 -16.18 142.35]
 1000.0000 sa/sec (100.00 Hz)
 Δf: 0.122 Hz, Range: 0.01 - 10 Hz
 Temp. Resolution: 8.192 sec

MAMS HIRAP, hirap, LAB1O2, ER1, Lockers 3,4, RMS 0.01 to 10 Hz

SSAnalysis[0.0 0.0 0.0]
 Hanning, k = 1

Start GMT 15-June-2015, 166/05:00:00.001



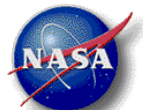
Description

| | |
|-----------|-------------------------------------|
| Sensor | MAMS hirap 1000.0 sa/sec, 100 Hz |
| Location | LAB1O2, ER1, Lockers 3,4 |
| Plot Type | RMS vs. Time (below 10 Hz) |

Notes:

- This plot shows RMS acceleration under 10 Hz versus time for the same time span covered by the RMS plot shown on the previous page, that is, GMT 05:00-08:00.
- This somewhat helps to quantify what we observed as a less discernible transition in the 10 Hz spectrogram. Note the lack of an obvious step at 06:39.
- Before wake from 05:00 to 06:39, the RMS level below 10 Hz was variable but mostly confined below 100 ug.
- After wake from 06:39 to 08:00, the RMS level below 10 Hz was once again variable and still mostly confined below 100 ug.
- Higher-frequency vibrations, mainly from the Ku-band antenna, tend to dominate the RMS we see here below 10 Hz.

| | |
|-----------|----------------|
| Regime: | Vibratory |
| Category: | Crew |
| Source: | Three-Man Crew |



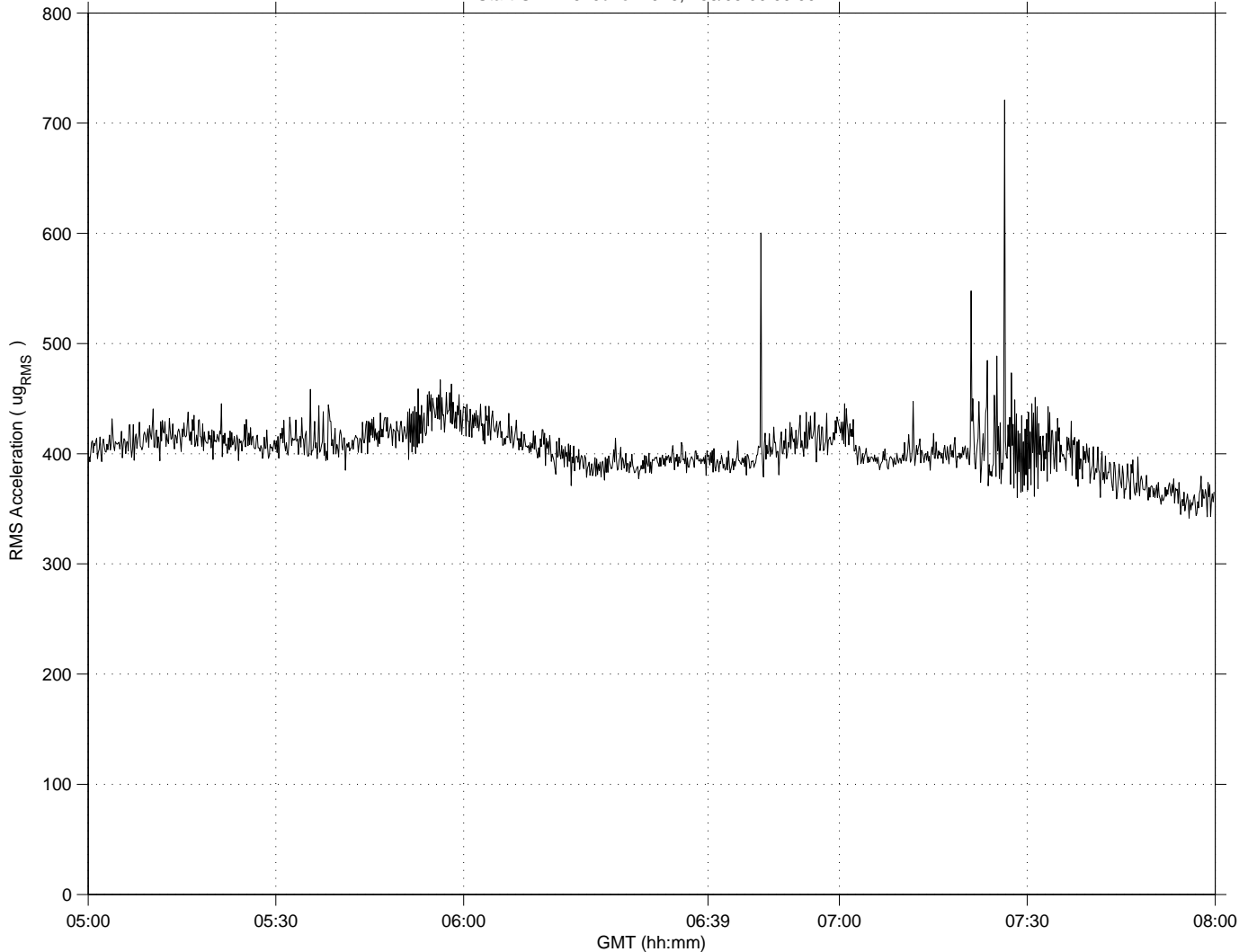
Three-Man Crew Quantify

mams, hirap at LAB1O2, ER1, Lockers 3,4[138.68 -16.18 142.35]
 1000.0000 sa/sec (100.00 Hz)
 Δf: 0.122 Hz, Range: 0.01 - 100 Hz
 Temp. Resolution: 8.192 sec

MAMS HIRAP, hirap, LAB1O2, ER1, Lockers 3,4, RMS for 0.01 to 100.0 Hz

SSAnalysis[0.0 0.0 0.0]
 Hanning, k = 1

Start GMT 15-June-2015, 166/05:00:00.001



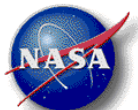
Description

| | |
|-----------|-------------------------------------|
| Sensor | MAMS hirap 1000.0 sa/sec, 100 Hz |
| Location | LAB1O2, ER1, Lockers 3,4 |
| Plot Type | RMS vs. Time (below 100 Hz) |

Notes:

- This plot shows RMS acceleration under 100 Hz versus time for the same time span covered by the RMS plot shown on the previous pages, that is, GMT 05:00-08:00.
- This plot helps to quantify what we observed as a much less discernible transition in the 100 Hz spectrogram. Note again the lack of an obvious step at 06:39.
- Before wake from 05:00 to 06:39, the RMS level below 100 Hz was variable but mostly never strayed too far from 400 ug.
- After wake from 06:39 to 08:00, the RMS level below 100 Hz was once again variable and stayed close to 400 ug and even dipped some after 07:30.
- Higher-frequency equipment-related vibrations from multiple sources now completely dominate the RMS we see here below 100 Hz.

| | |
|-----------|----------------|
| Regime: | Vibratory |
| Category: | Crew |
| Source: | Three-Man Crew |



Three-Man Crew Ancillary Notes

The photograph below shows Expedition 43 crew members taking a break from training at NASA's Johnson Space Center to pose for a crew portrait. Pictured from the right are NASA astronaut Terry Virts along with Russian cosmonaut Mikhail Kornienko, European Space Agency astronaut Samantha Cristoforetti, Russian cosmonaut Anton Shkaplerov, NASA astronaut Scott Kelly and Russian cosmonaut Gennady Padalka. Photo credit: NASA/Bill Stafford

For the crew awake analysis shown on the previous few pages, the only 3 crew members aboard the ISS at the time were Padalka, Kelly, and Kornienko.

