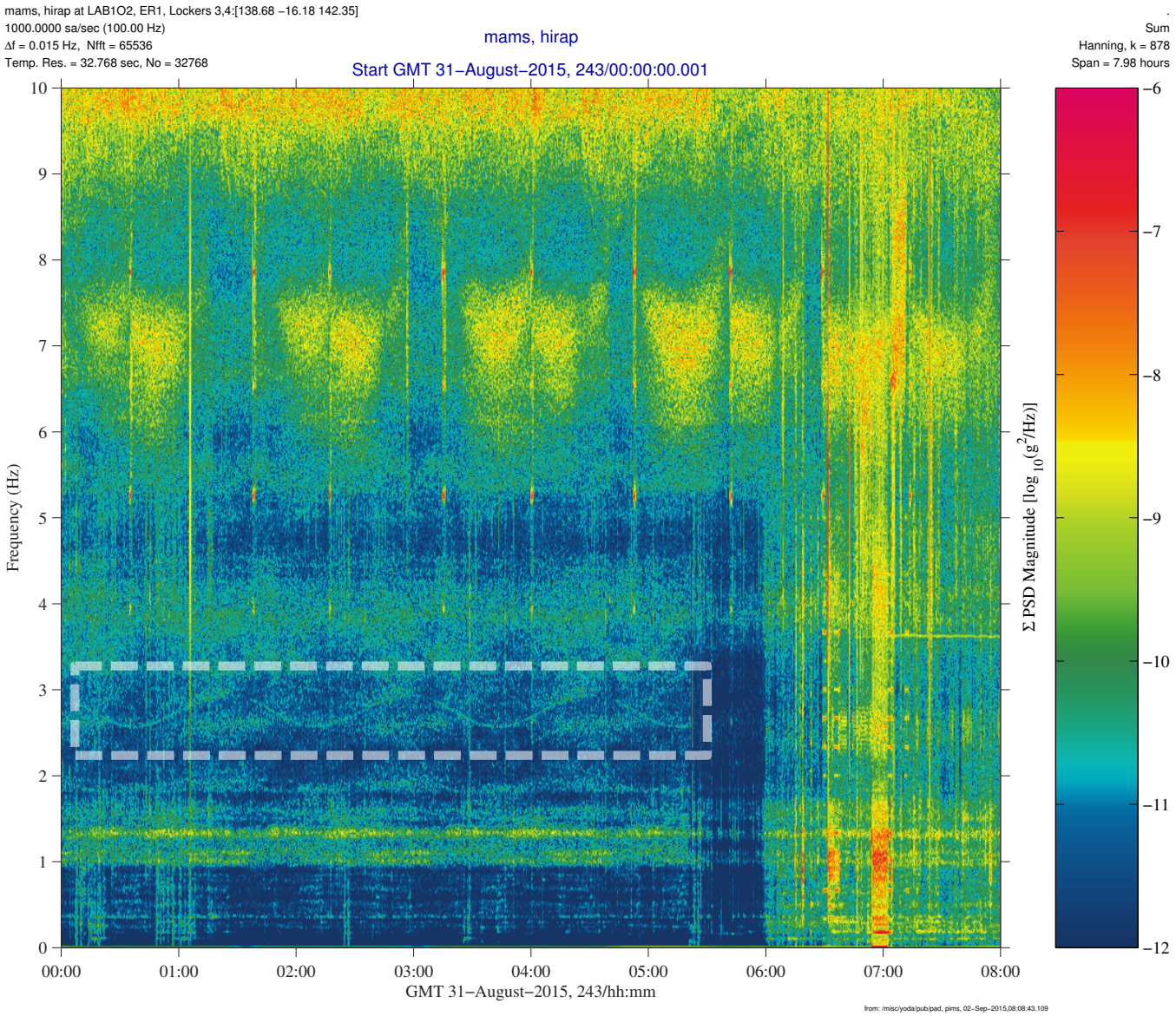
SARJ Joint Angle Sinusoidal Correlation Qualify



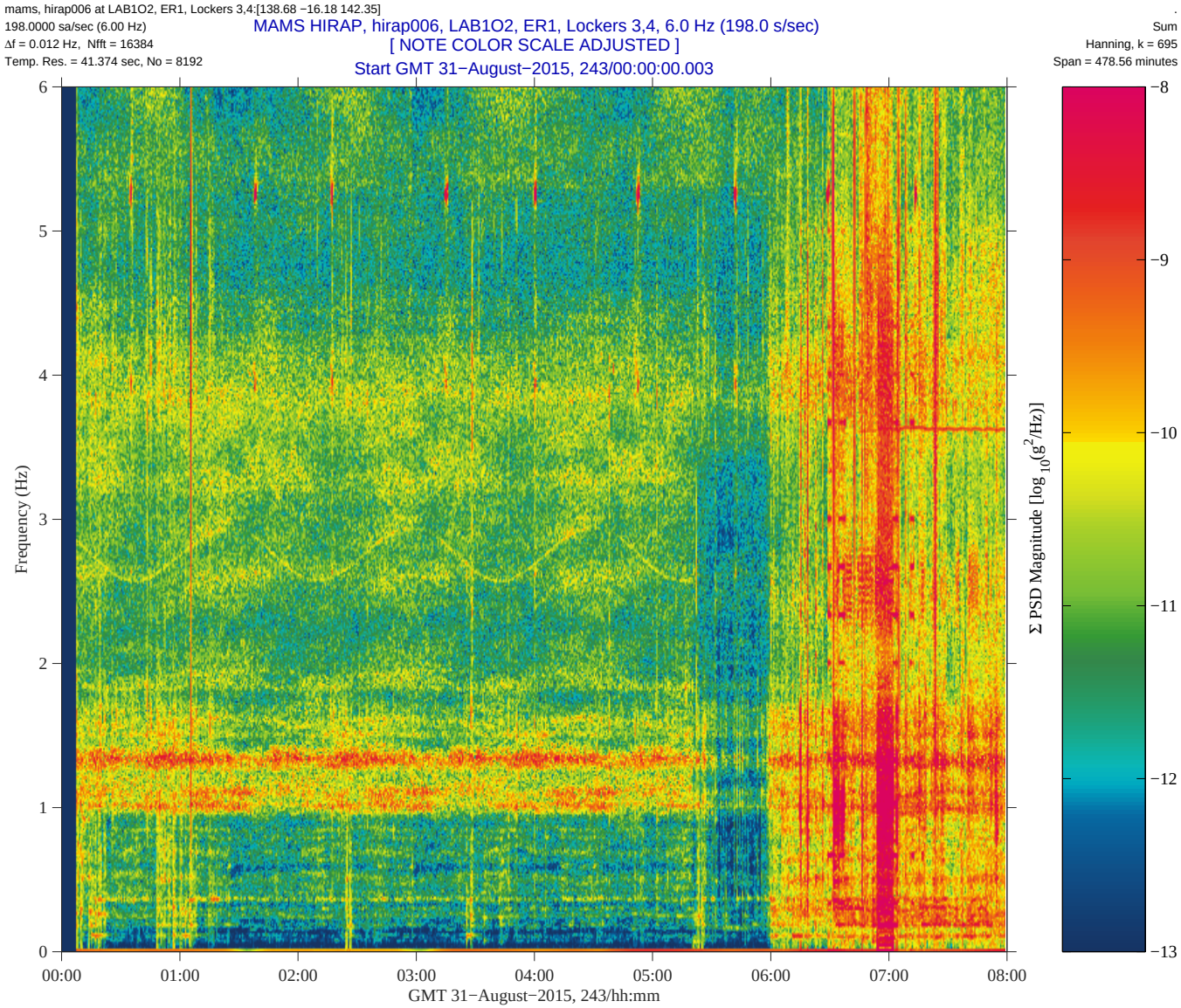
Description	
Sensor	MAMS hirap 1000.0 sa/sec, 100.0 Hz
Location	LAB1O2, ER1, Lockers 3,4
Plot Type	Spectrogram

Notes:

- This 8-hour roadmap spectrogram shows MAMS HiRAP measurements from this sensor's ER1 location.
- The first 6 hours show the vibratory environment below 6 Hz during crew sleep. Note the quiet (blue) of sleep before 06:00.
- With crew wake time evident at GMT 06:00, we see a transition from relative quiet below 6 Hz to an environment that reflects excited structural vibrations due ostensibly to crew locomotion (push-offs, landings, and such to move around the space station).
- Notice the sinusoidal nature of the faint disturbance between about 2.5 Hz and about 3 Hz before 05:30.
- This oscillating frequency disturbance is attributed to vibratory changes in the Solar Array Joint (SARJ).
- Note that when the SARJ was parked, this resulted in the sinusoidal oscillations stopping abruptly just before 05:30.
- The plots on following pages intend to show this sinusoidal oscillation more clearly.

Regime:	Vibratory
Category:	Vehicle
Source:	SARJ Joint Angle Sinusoidal Correlation

SARJ Joint Angle Sinusoidal Correlation Qualify



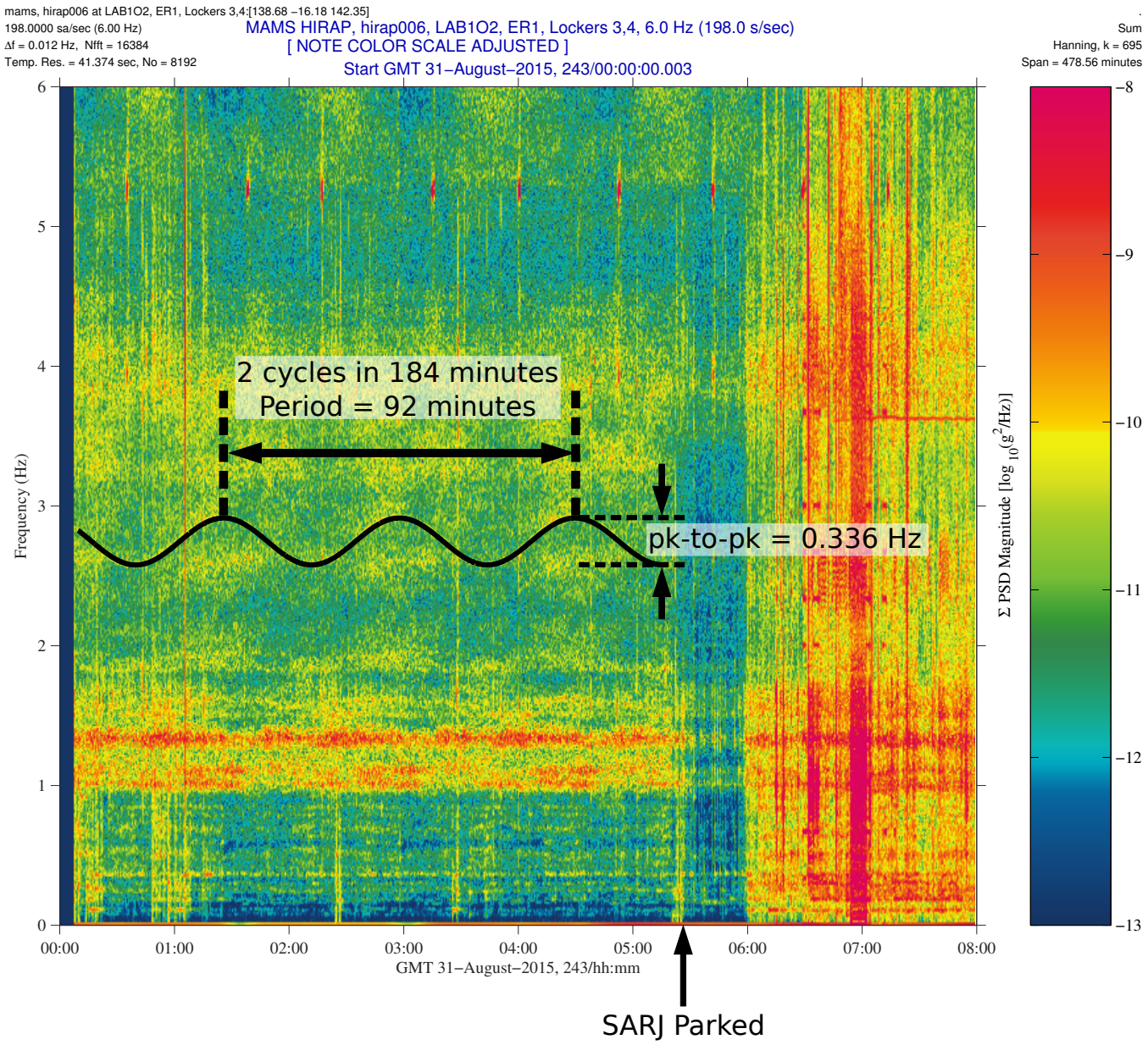
Description	
Sensor	MAMS hirap 198.0 sa/sec, 6.0 Hz
Location	LAB1O2, ER1, Lockers 3,4
Plot Type	Spectrogram

Notes:

- This spectrogram shows the same 8-hour period as the previous, but only up to 6 Hz.
- Also, the color scale was adjusted to help bring emphasis to the sinusoid clearly seen oscillating between about 2.5 Hz and about 3 Hz before about 05:30.

Regime:	Vibratory
Category:	Vehicle
Source:	SARJ Joint Angle Sinusoidal Correlation

SARJ Joint Angle Sinusoidal Correlation Quantify



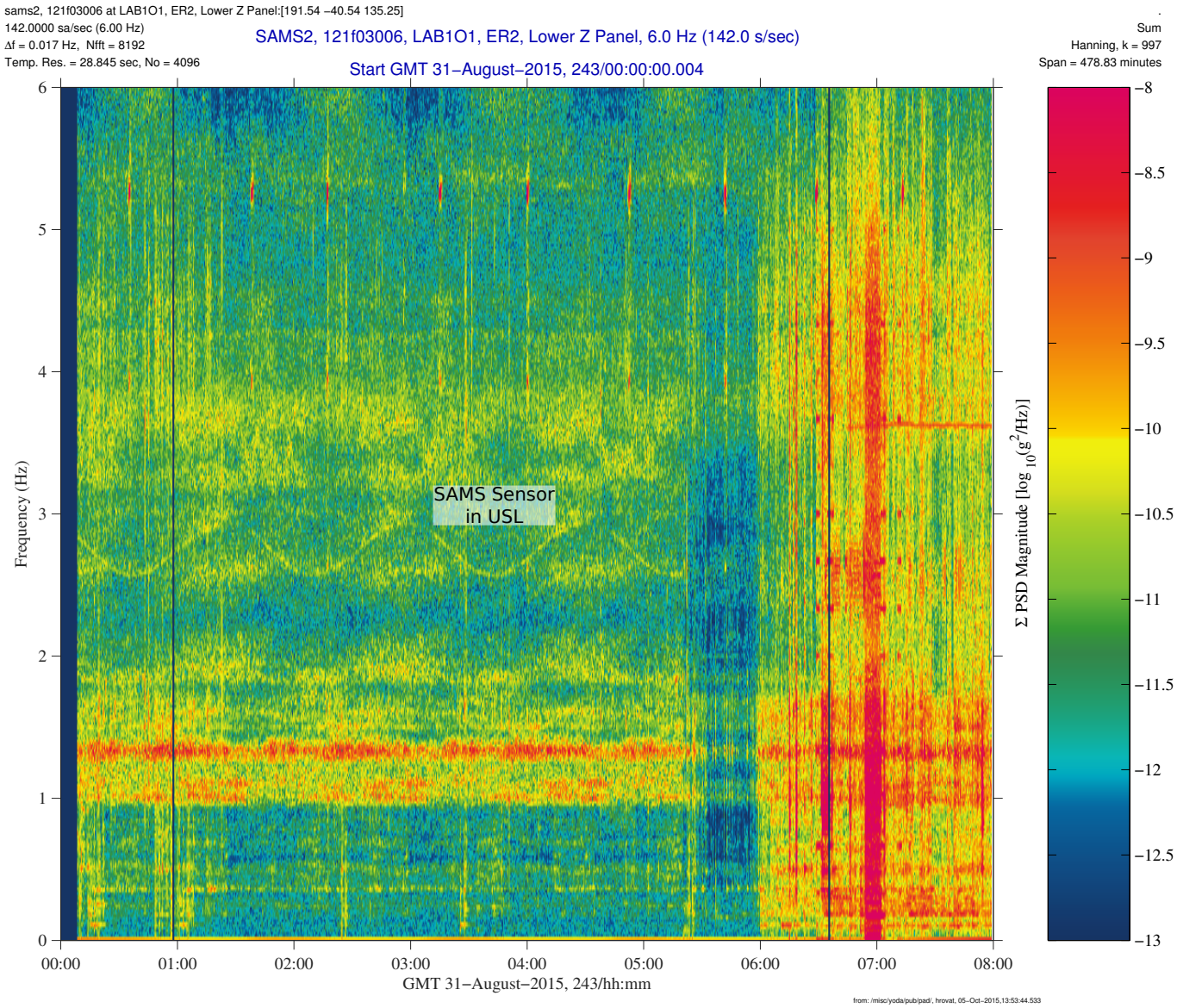
Description	
Sensor	MAMS hirap 198.0 sa/sec, 6.0 Hz
Location	LAB1O2, ER1, Lockers 3,4
Plot Type	Spectrogram

Notes:

- This spectrogram is identical to the previous one, but now with a black overlay of a sine fit to the sinusoidal variations seen between about 2.5 Hz and about 3 Hz before 05:30.
- The function we used for this fit is described like this: yfit = a * sin(b*x + c) + d
- A least squares (minimization) fit was done to get the following parameters:
  a = 0.168; half of pk-to-pk = (0.336 / 2) Hz
  b = 2*pi/T; where T = 92 minutes
  c = 2 radians (phase)
  d = 2.7456 Hz (mean value)

Regime:	Vibratory
Category:	Vehicle
Source:	SARJ Joint Angle Sinusoidal Correlation

SARJ Joint Angle Sinusoidal Correlation Qualify



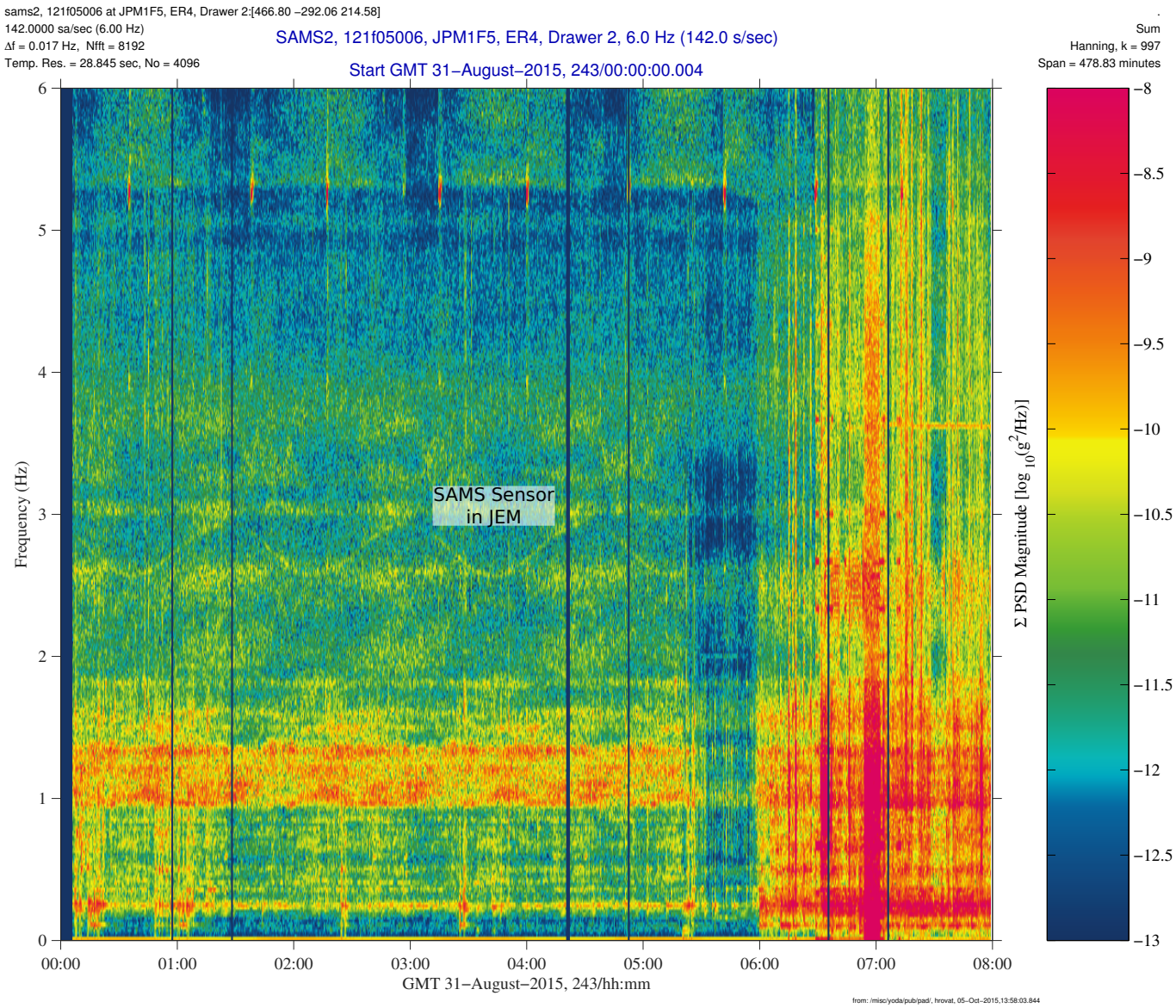
Description	
Sensor	SAMS 121f03 142.0 sa/sec, 6.0 Hz
Location	LAB1O1, ER2, Lower Z Panel
Plot Type	Spectrogram

Notes:

- This is identical to the previous one, but here we show SAMS data from a sensor on ER2 in the USL.
- Note that the color scale is still set to serve the purpose of highlighting the sinusoidal oscillation between about 2.5 Hz and about 3 Hz before 05:30.

Regime:	Vibratory
Category:	Vehicle
Source:	SARJ Joint Angle Sinusoidal Correlation

SARJ Joint Angle Sinusoidal Correlation Qualify



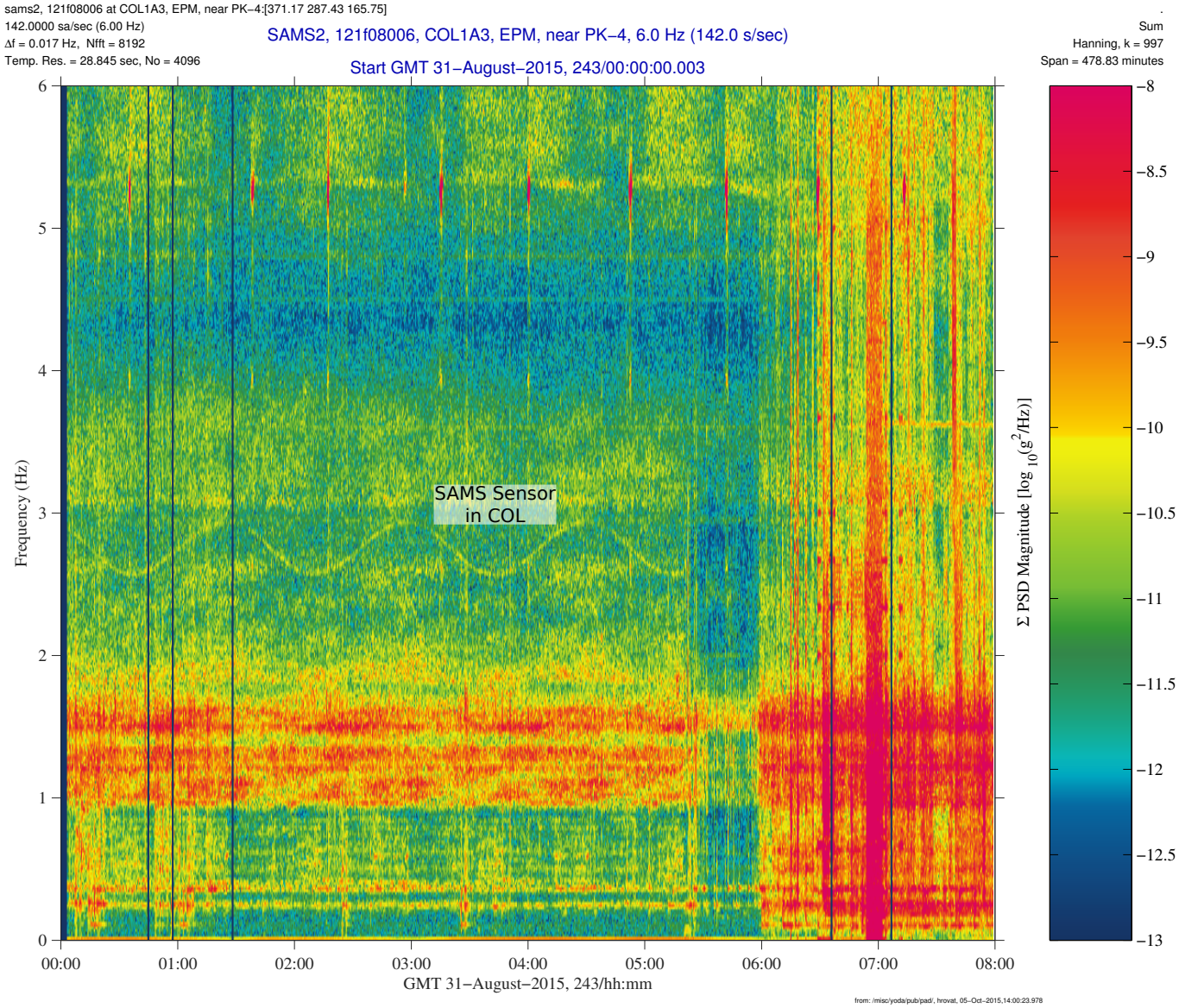
Description	
Sensor	SAMS 121f05 142.0 sa/sec, 6.0 Hz
Location	JPM1F5, ER4, Drawer 2
Plot Type	Spectrogram

Notes:

- This is identical to the previous one, but here we show SAMS data from a sensor on ER4 in the JEM.
- Note that the color scale is still set to serve the purpose of highlighting the sinusoidal oscillation between about 2.5 Hz and about 3 Hz before 05:30.

Regime:	Vibratory
Category:	Vehicle
Source:	SARJ Joint Angle Sinusoidal Correlation

SARJ Joint Angle Sinusoidal Correlation Qualify



Description	
Sensor	SAMS 121f08 142.0 sa/sec, 6.0 Hz
Location	COL1A3, EPM, near PK-4
Plot Type	Spectrogram

Notes:

- This is identical to the previous one, but here we show SAMS data from a sensor on EPM in the Columbus module.
- Note that the color scale is still set to serve the purpose of highlighting the sinusoidal oscillation between about 2.5 Hz and about 3 Hz before 05:30.

Regime:	Vibratory
Category:	Vehicle
Source:	SARJ Joint Angle Sinusoidal Correlation

The disturbance described in the previous pages helps to highlight some of the benefits of a 24x7 microgravity environment vibratory monitoring system. A role uniquely filled by the Space Acceleration Measurement System (SAMS). This disturbance falls squarely into the vehicle structural dynamics regime. As such, it is important to identify and characterize this disturbance, especially since it had not (yet) been part of the mathematical model of the dynamics of the ISS. With the 24x7 monitoring coverage provided by the SAMS, structural analysts can be on the lookout for blind spots in their models (such as this one) and use empirical data to improve their estimates related to the space station's structural integrity and life cycle. Modal analyis such as this helps the ISS Program gain confidence in the estimates of structural integrity and better positions the space station for the potential of extended service life.