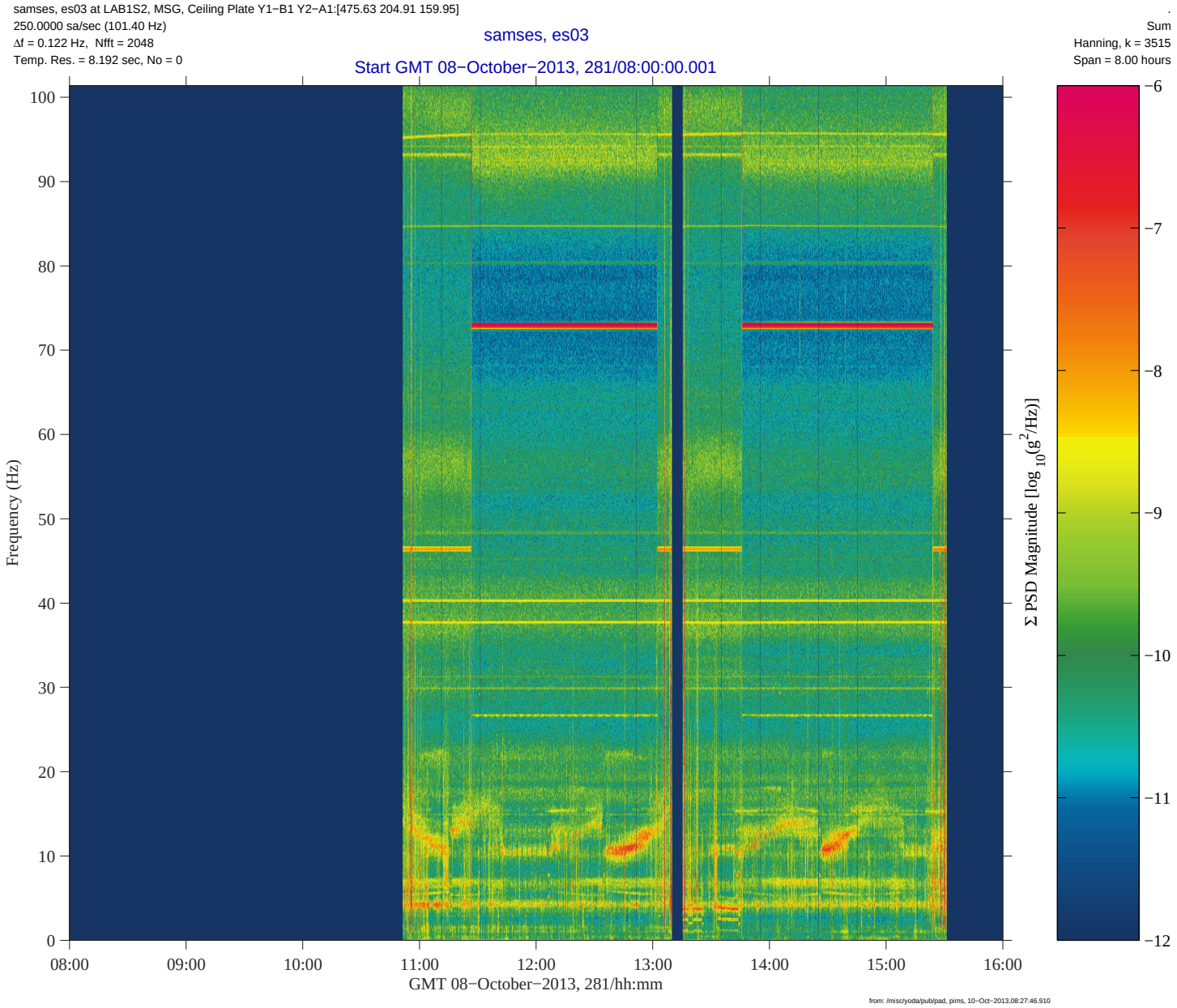
MSG Operations Qualify

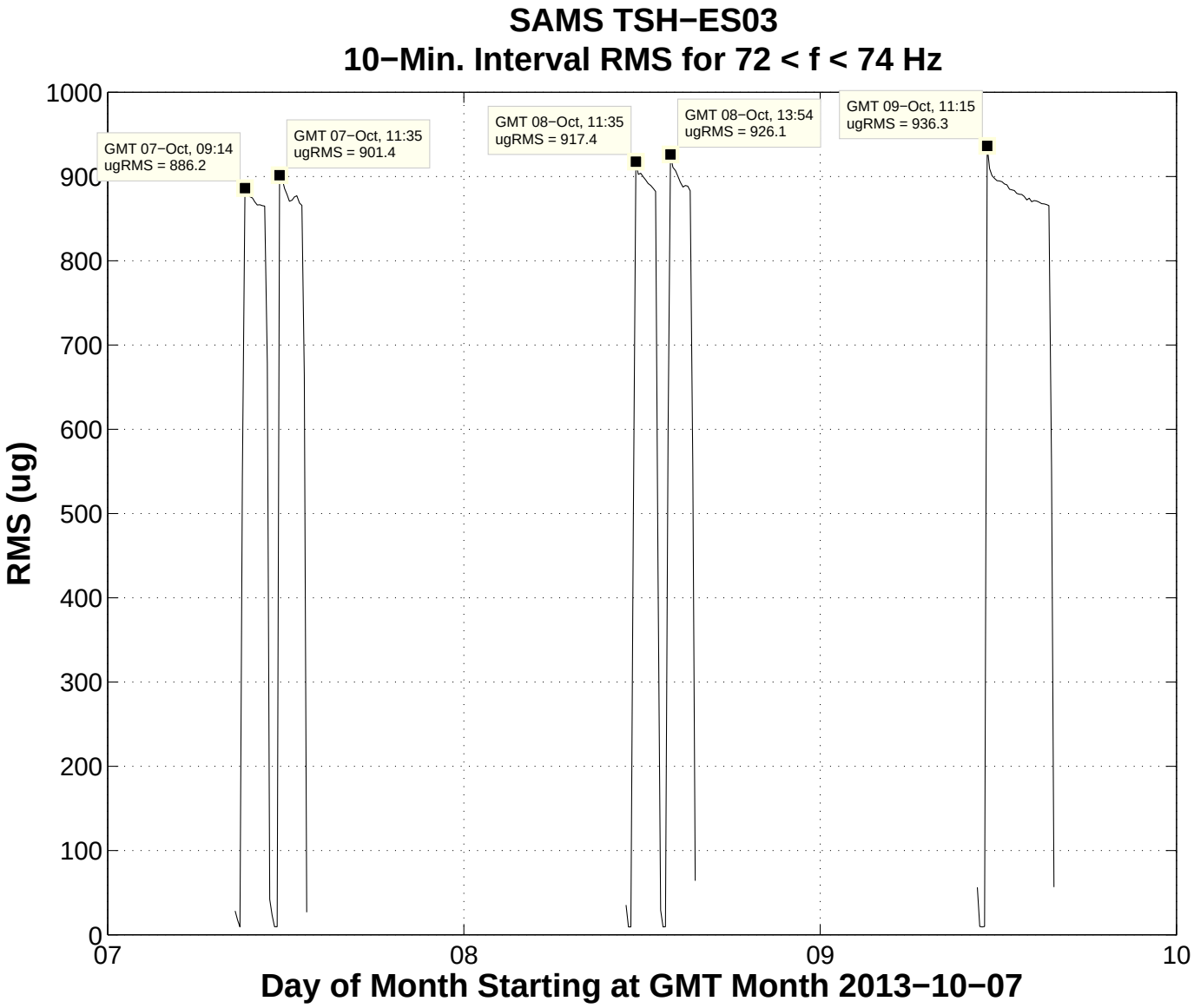


Description	
Sensor	SAMS es03 250.0000 sa/sec (101.40 Hz)
Location	MSG, Ceiling Plate
Plot Type	Spectrogram

Notes:

- The Microgravity Science Glovebox (MSG) has 3 work volume fans involved with at least 2 of its 4 modes of operation: normal mode, and open mode.
- Normal mode is when all ports are closed and air is circulating normally in the work volume.
- Open mode is when the work volume fans are circulating air with fan speed maximized to create the greatest negative pressure possible.
- During InSPACE3 experiment operations, the crew has to sometimes switch between these modes and this can be observed from the fan operating speed perspective in the spectrogram shown here.
- Note the orange-to-red horizontal streaks that alternate at the two speeds (frequencies) of about 46.5 Hz and about 73 Hz for the 3 work volume fans.

Regime:	Vibratory
Category:	Equipment
Source:	MSG Operations

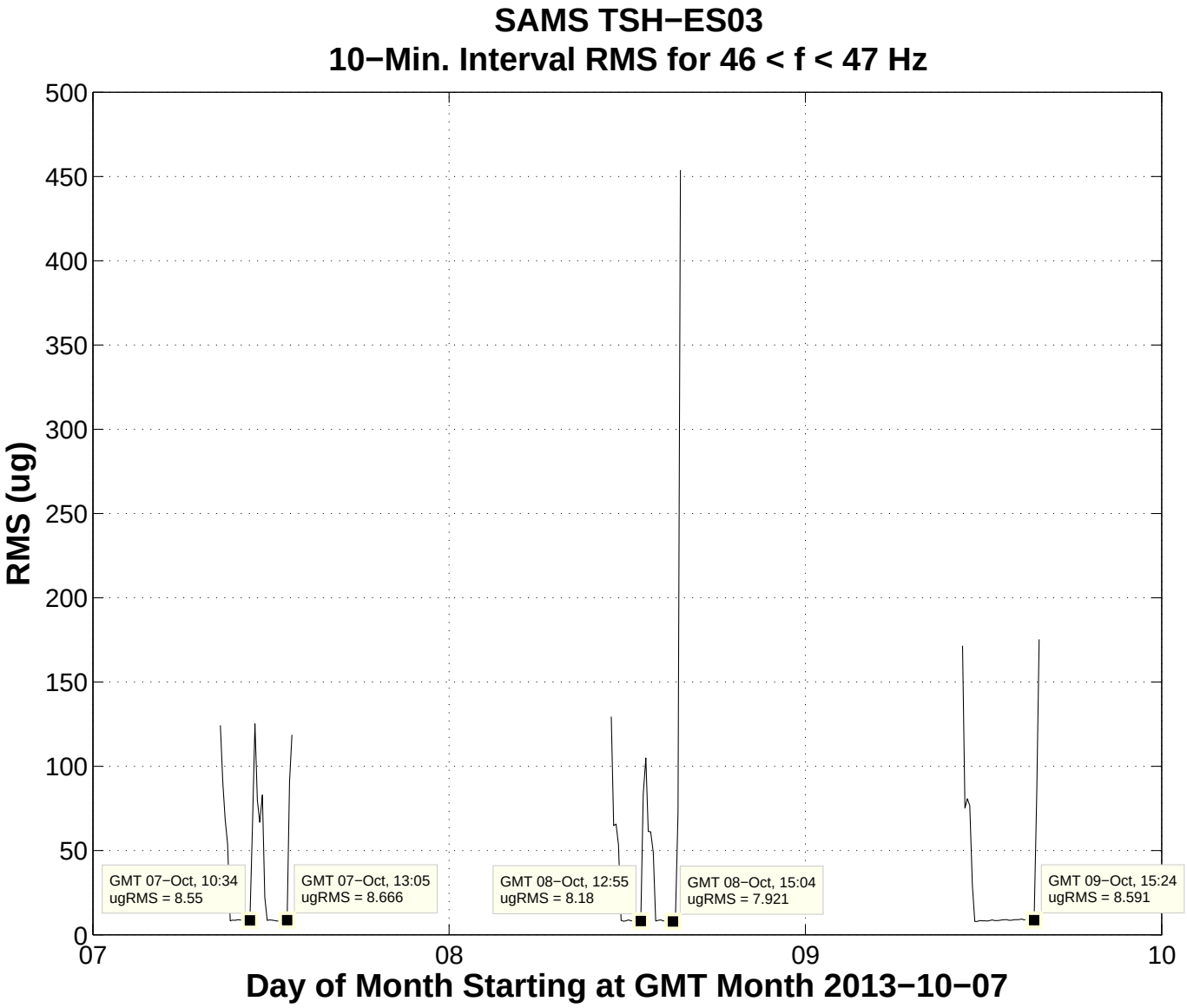


Description	
Sensor	SAMS es03 250.0000 sa/sec (101.40 Hz)
Location	MSG, Ceiling Plate
Plot Type	Interval RMS, 72 < f < 74 Hz

Notes:

- This plot of RMS acceleration magnitude versus time over 3 days of InSPACE3 ops in the MSG shows the telltale pattern of the 3 MSG work volume fans switching between normal and open modes.
- In this plot, the start of open mode is shown to happen 5 times in the period covered by these SAMS data (this sensor is turned off when science ops are off).
- The 5 onsets of open mode fan operation are marked by the GMT/ugRMS text callouts on the plot.
- Since the SAMS vibratory data are only collected during science ops, there are significant gaps in the acceleration data for this particular sensor over the span of these 3 days.

Regime:	Vibratory
Category:	Equipment
Source:	MSG Operations

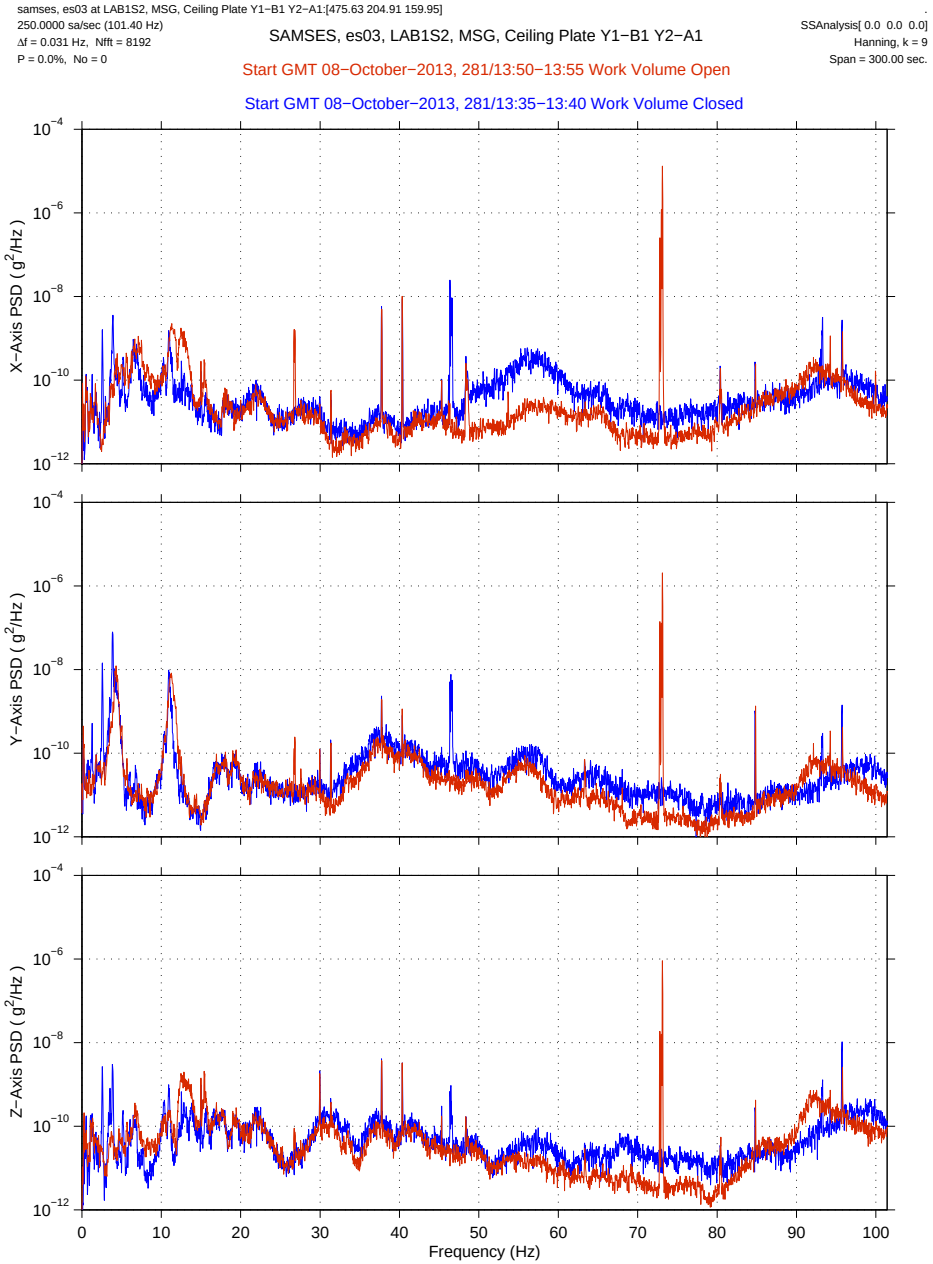


Description	
Sensor	SAMS es03 250.0000 sa/sec (101.40 Hz)
Location	MSG, Ceiling Plate
Plot Type	Interval RMS, 46 < f < 47 Hz

Notes:

- This plot is similar to the previous one except that here we focus on the portion of the acceleration spectrum that is the domain of the normal mode fan speed.
- For the range 46 < f < 47 Hz, the RMS ranged from about 9 ug to over 100 ug.
- The text callouts on the plot show transition times from open mode to normal mode as the fans resume the lower speed.

Regime:	Vibratory
Category:	Equipment
Source:	MSG Operations



MSG Operations Qualify

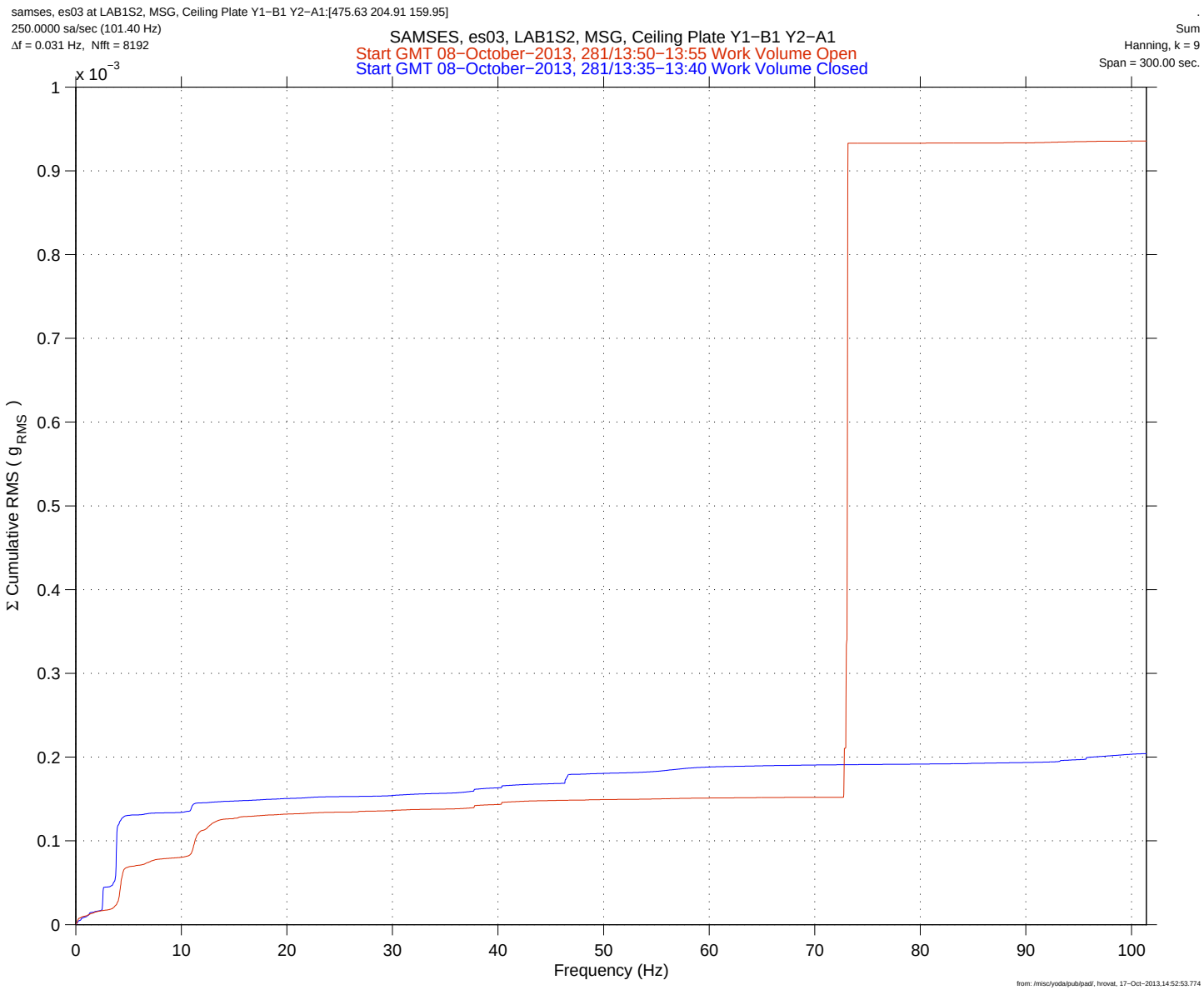
Description	
Sensor	SAMS es03 250.0000 sa/sec (101.40 Hz)
Location	MSG, Ceiling Plate
Plot Type	Power Spectral Density

Notes:

- This 3-panel plot of acceleration spectra shows the per-axis impact from both the normal mode and the open mode.
- The red trace is for a 5-minute period during “open mode” starting at the GMT shown in the red title text.
- The blue trace is for a 5-minute period during “normal mode” starting at the GMT shown in the blue title text.
- We see from the blue trace of normal mode the spectral signatures of the MSG work volume fans near about 47 Hz.
- The red trace contains the open mode spectral signatures of those fans right around 73 Hz.
- For both modes, the Z-axis shows less of an impact, so we presume the plane that the fan blades rotate in is primarily aligned with the XY-plane.

Regime:	Vibratory
Category:	Equipment
Source:	MSG Operations

MSG Operations
Quantify



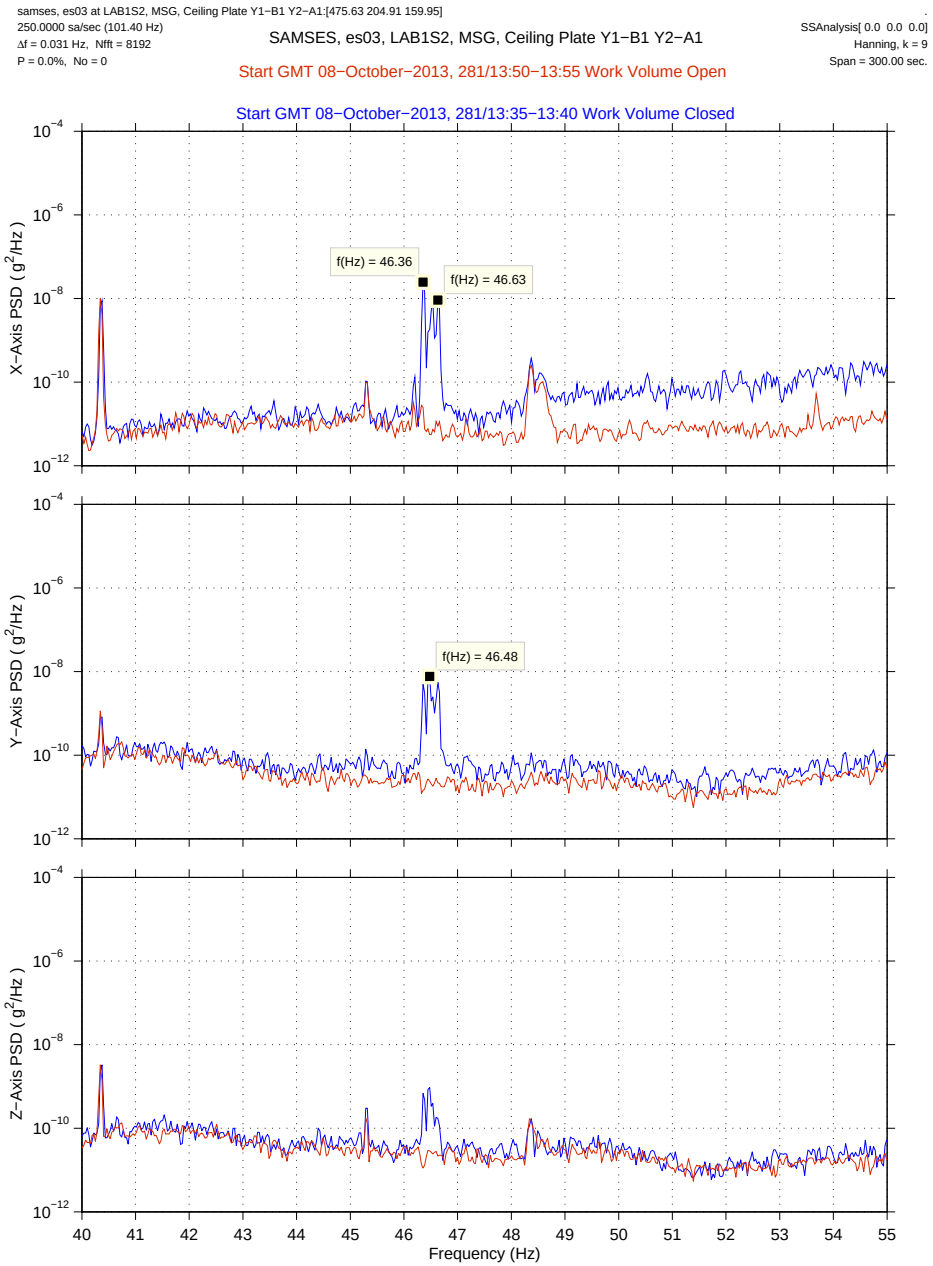
Description	
Sensor	SAMS es03 250.0000 sa/sec (101.40 Hz)
Location	MSG, Ceiling Plate
Plot Type	Cumulative RMS vs. Frequency

Notes:

- The plot shown on this page is cumulative RMS versus frequency calculated from the PSDs shown on the previous page; where the red trace is open mode for the 3 MSG fans, and the blue trace is normal mode.
- Notice the tiny step up at about 47 Hz for the blue trace, here indicating the impact of the MSG work volume fans in normal mode to the overall RMS levels measured by this SAMS sensor.
- The large step up at about 73 Hz in the red trace shows that these fans dominate the acceleration spectrum in terms of contribution to overall RMS level, all focused in a somewhat narrow band between about 72 and 74 Hz.

Regime:	Vibratory
Category:	Equipment
Source:	MSG Operations

MSG Operations Qualify



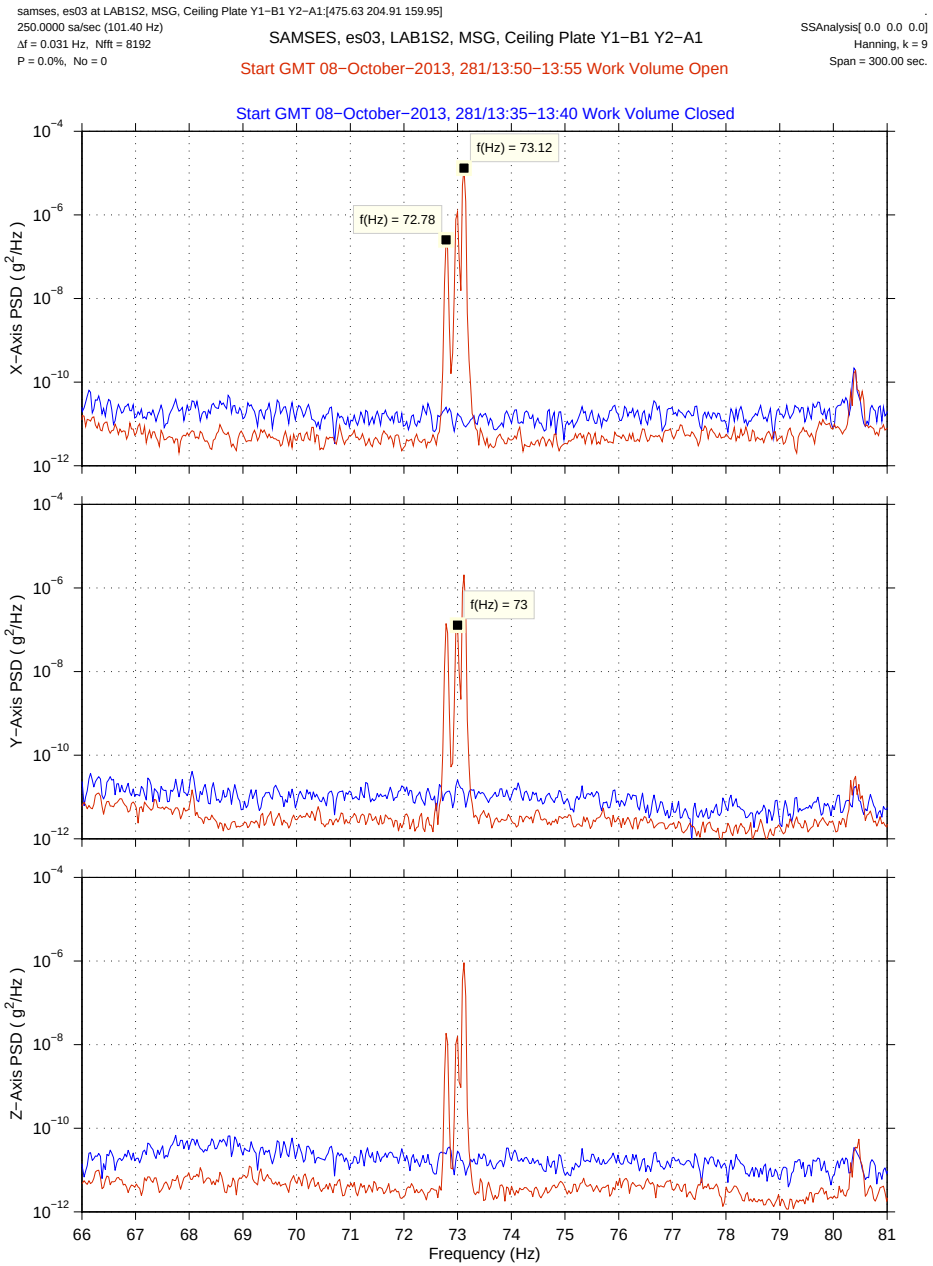
Description	
Sensor	SAMS es03 250.0000 sa/sec (101.40 Hz)
Location	MSG, Ceiling Plate
Plot Type	Power Spectral Density

Notes:

- The plots on this page are a subset, zoom-in on the PSDs we have been looking at on previous pages.
- The PSDs here are zoomed in around the normal mode operating frequency for the 3 work volume fans.
- With this zoomed view, we now clearly see the 3 distinct, slightly different operating speeds of the 3 fans.
- The text callouts on the plots show the 3 fan speeds as about 46.36 Hz, 46.48 Hz, and 46.63 Hz.
- Note again that these fans mainly impact the XY-plane.

Regime:	Vibratory
Category:	Equipment
Source:	MSG Operations

MSG Operations Qualify



Description	
Sensor	SAMS es03 250.0000 sa/sec (101.40 Hz)
Location	MSG, Ceiling Plate
Plot Type	Power Spectral Density

Notes:

- The plots on this page are another subset, zoom-in on the PSDs we have been looking at on previous pages.
- The PSDs here are zoomed in around the open mode operating frequency for the 3 work volume fans.
- With this zoomed view, we now clearly see the 3 distinct, slightly different operating speeds of these fans.
- The text callouts on the plots show the 3 fan speeds going all out as about 72.78 Hz, 73 Hz, and 73.12 Hz.
- At the higher speeds, we start to see more of an impact on the Z-axis too.

Regime:	Vibratory
Category:	Equipment
Source:	MSG Operations

When the crew opens up the Microgravity Science Glovebox (MSG) work volume, there are 3 fans inside that go to open mode which steps them up to max speed (mode 7). This is done automatically when the delta pressure inside the work volume drops below 1.3 mbar. The system senses a leak (or in this case, an open work volume) and automatically adjusts to compensate. When the work volume is closed again, and the pressue delta exceeds the 1.3 mbar threshold, the system returns to nominal mode and those fans return to the lower speed (mode 4).