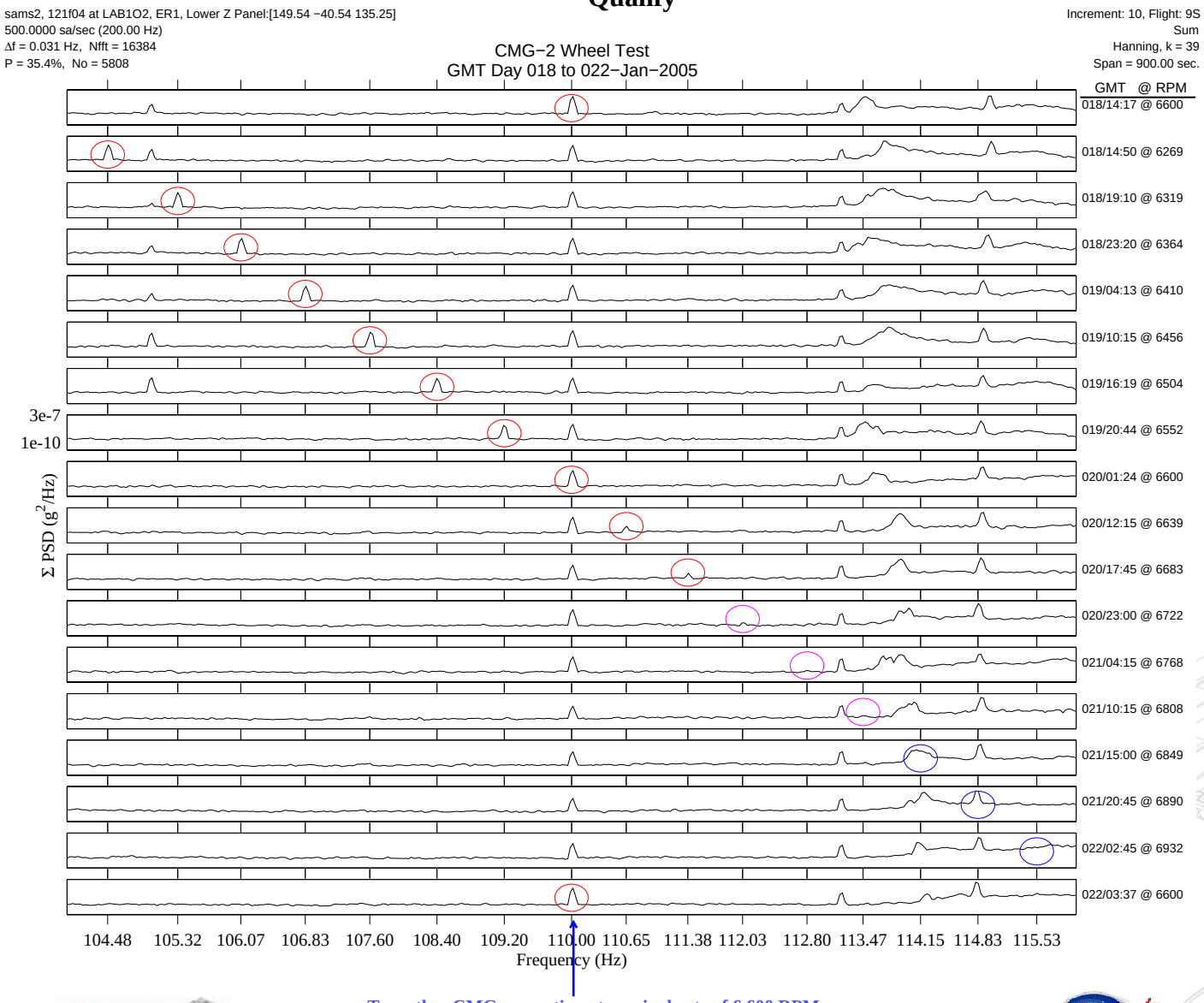
Control Moment Gyroscope #2 (CMG-2) Wheel Speed Test Qualify



Data Description	
Sensor	121f04 500 sa/sec (200 Hz)
Location	LAB1O2, ER1, Lower Z Panel
Inc/Flight	Increment: 10, Flight: 9S
Plot Type	Power Spectral Density (PSD)

Notes:

This CMG-2 wheel speed test was conducted to characterize vibrations and spin motor current at the 16 different wheel speeds from 6269 to 6932 RPM (that is, from about 104.5 to 115.5 Hz). Prior to this, there were only on-board data for one wheel speed, 6600 RPM (110 Hz). The test was performed over more than a 3-day span starting on GMT 18-Jan-2005. Baseline data at all operational speeds would assist flight controllers with CMG evaluations, should the CMGs have to be operated at any operational speed other than the nominal 6600 RPM.

Each of the plots shown in the figure represents a 15-minute PSD for the wheel speed frequency range of interest. The top and bottom plots show the vibration spectra before and after the test, respectively. Starting with the 2nd plot from the top, each subsequent plot shows a PSD calculated after the wheel had reached its desired speed. The data shown were calculated from measurements made in the US Lab with the CMG (vibration source) located on the Z1 truss. While the peaks marked with red ovals show perhaps expected vibration spectral responses, the magenta markers show little or no discernible response above the ambient vibratory environment for wheel speeds of 6722, 6768 and 6808 RPM. No conclusion for the blue markers because of ambient dominance.

Regime:	Vibratory
Category:	Vehicle
Source:	Control Moment Gyroscope #2 (CMG-2) Wheel Speed Test

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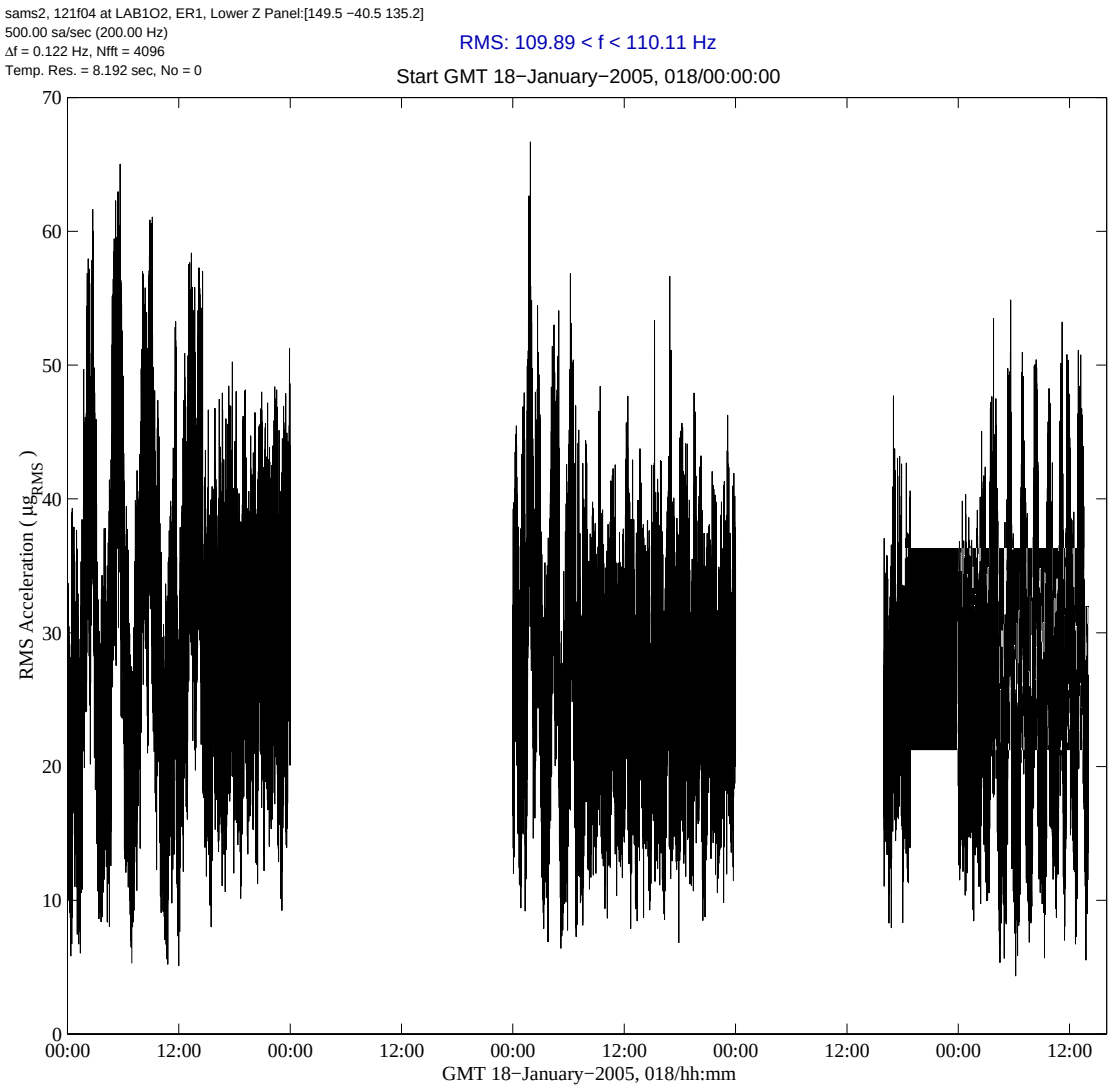

For the 112-hour period that started at GMT 18-Jan-2005 018/00:00:00, around the nominal CMG frequency range (109.89 to 110.11 Hz), the following statistics were derived:

Quantity	RMS Acceleration for Nominal Wheel Speed (μg_{RMS})
MIN	4.4
AVG	27.7
MAX	66.7

Data Description	
Sensor	121f04 500 sa/sec (200 Hz)
Location	LAB1O2, ER1, Lower Z Panel
Inc/Flight	Increment: 10, Flight: 9S
Plot Type	Interval RMS

Notes:

Compare data in the table below, which are based on SAMS 121f04 measurements, to baseline values shown along side the figure at the left.

GMT Start	CMG Wheel Speed (RPM)	RMS Acceleration* (μg_{RMS})	
018/14:17	6600	57.6	
018/14:50	6269	46.0	
018/19:10	6319	40.0	
018/23:20	6364	42.7	
019/04:13	6410	37.0	
019/10:15	6456	41.0	
019/16:19	6504	40.7	
019/20:44	6552	40.0	
020/01:24	6600	43.3	
020/12:15	6639	19.6	
020/17:45	6683	18.3	
020/23:00	6722	15.6	No discernible spectral peak.
021/04:15	6768	14.6	
021/10:15	6808	17.3	
021/15:00	6849	70.0	Ambient environment dominates.
021/20:45	6890	86.7	
022/02:45	6932	45.7	
022/03:37	6600	45.8	

* for frequency band within ±0.1% of CMG-2 wheel speed

Note downward trend in RMS acceleration as wheel speed increases.

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