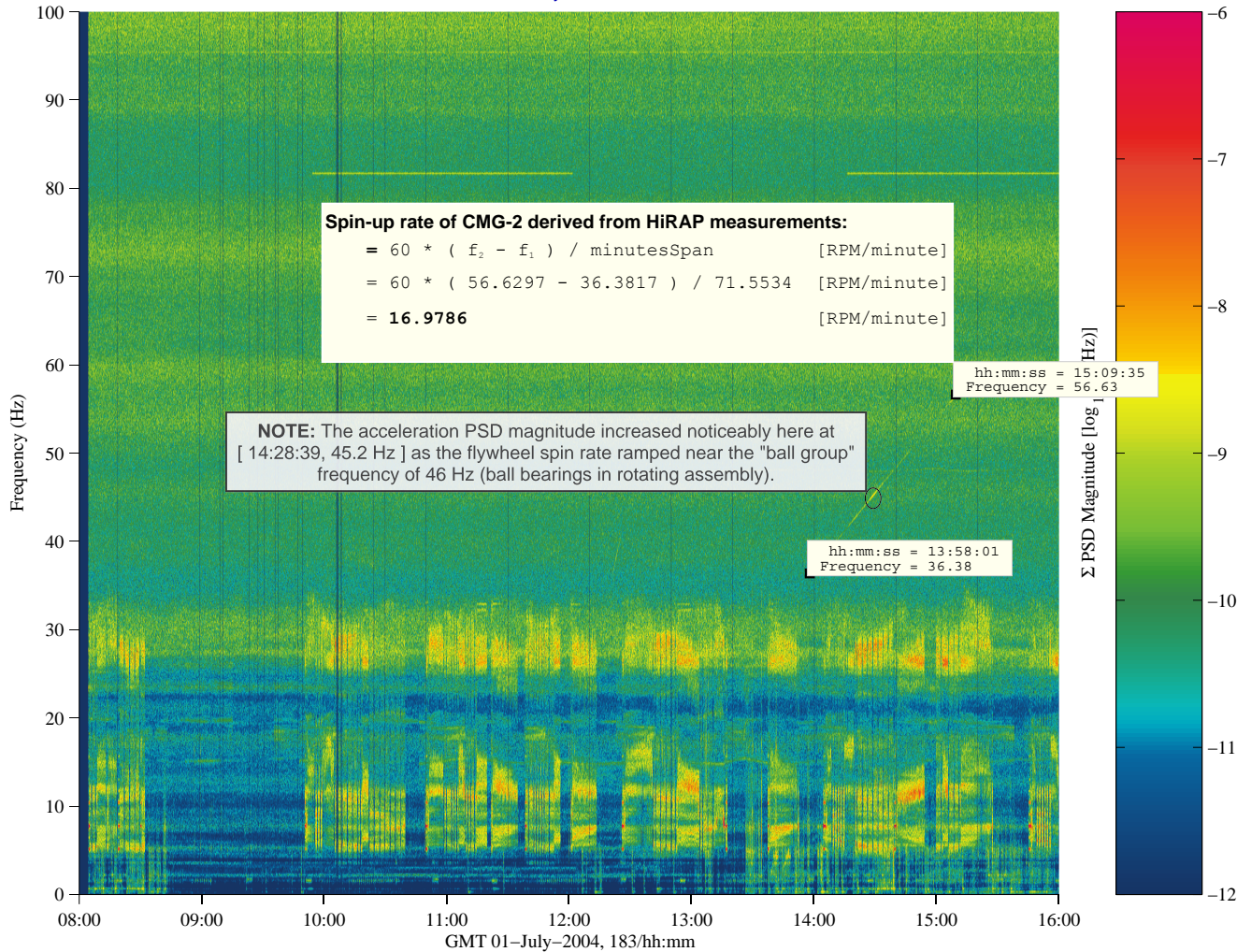


# Control Moment Gyroscope (CMG) Spin Up Qualify

mams, hirap at LAB102, ER1, Lockers 3,4:[138.68 -16.18 142.35]  
 1000.00 sa/sec (100.00 Hz)  
 Δf = 0.122 Hz, Nfft = 8192  
 Temp. Res. = 8.192 sec, No = 0

CMG-2 Spin Up

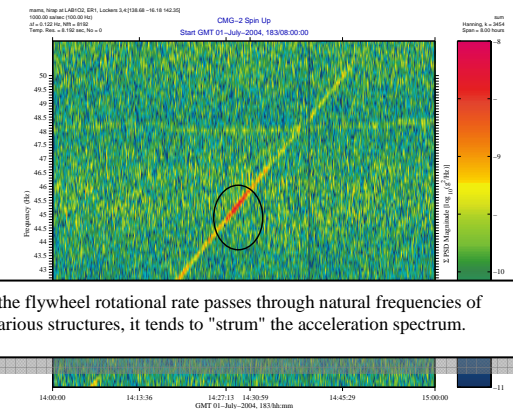
Start GMT 01-July-2004, 183/08:00:00



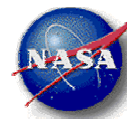
Data Description	
Sensor	HiRAP 1000 sa/sec (100 Hz)
Location	LAB102, ER1, Lockers 3,4
Inc/Flight	Increment: 9, Flight: 8S
Plot Type	Spectrogram

## Notes:

After a faulty circuit breaker was replaced, CMG-2 was commanded to spin up for inclusion back in with the two other functional CMGs for station attitude maintenance. Guidance and navigation controllers expected a spin up rate of 17 RPM per minute toward a steady state of 6,600 RPM (110 Hz). Vibratory measurements collected on GMT 01-Jul-2004 by the HiRAP were used to derive the spin up rate. For the period from 13:58:01 to 15:09:35, calculations based on HiRAP data show a ramp up of about 16.98 RPM/minute. Also, detailed examination of these HiRAP data shows that the acceleration power spectral density magnitude heightens at about 14:28:39 just below 46 Hz – the expected "ball group" frequency (ball bearings in rotating assembly).



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Regime:	Vibratory
Category:	Vehicle
Source:	Control Moment Gyroscope (CMG) Spin Up

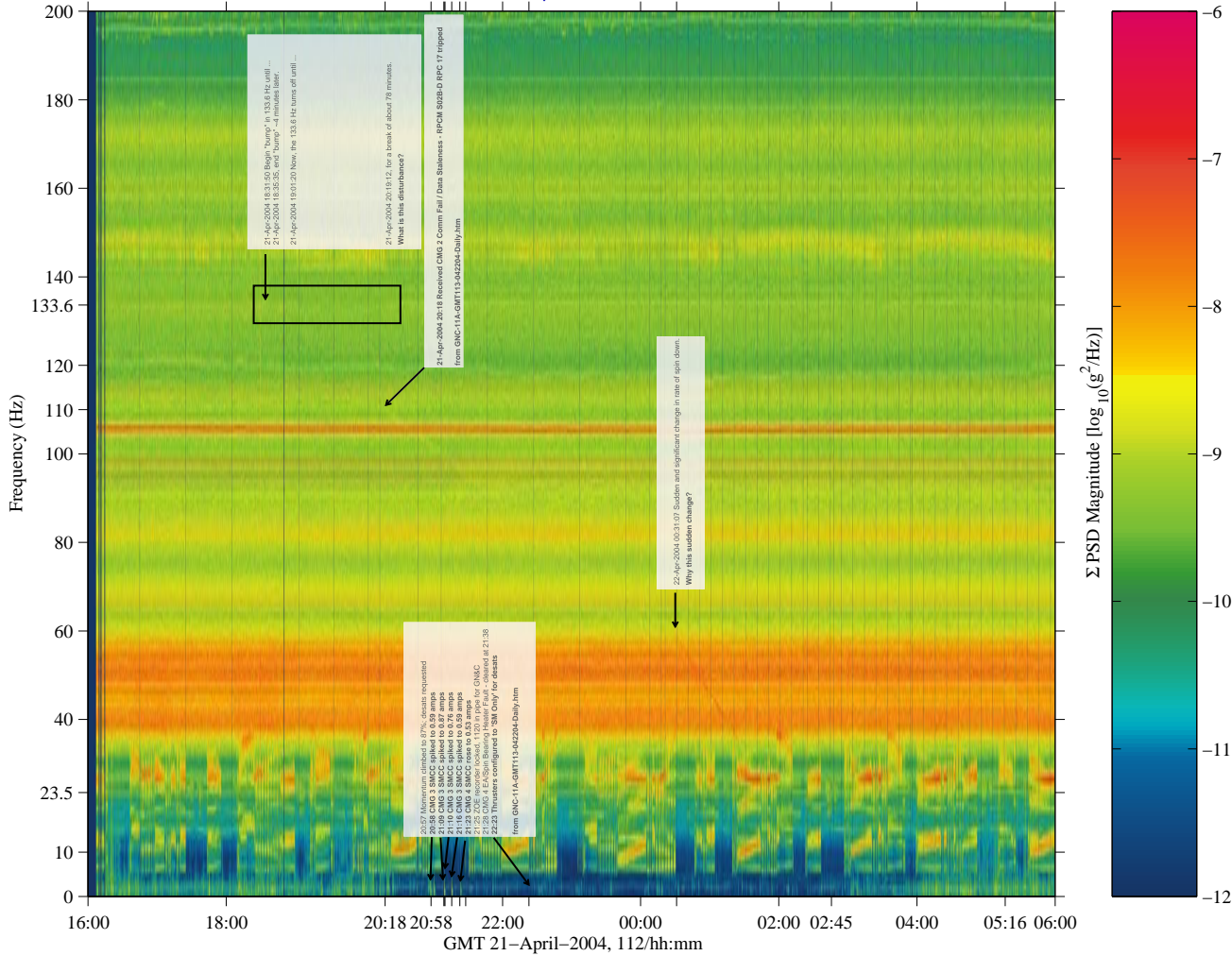


# Control Moment Gyroscope (CMG) Spin Down Qualify

sams2, 121f04 at LAB1O2, ER1, Lower Z Panel:[149.54 -40.54 135.25]  
 500.0 sa/sec (200.0 Hz)  
 Δf = 0.122 Hz, Nfft = 4096  
 Temp. Res. = 8.192 sec, No = 0

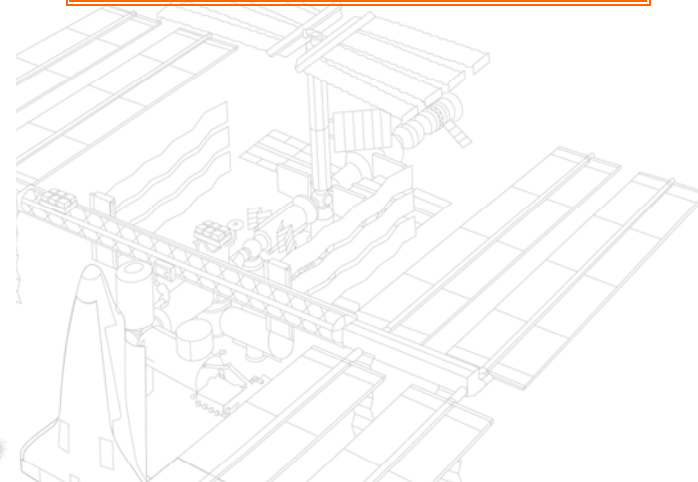
CMG-2 Tripped Off-Line

Start GMT 21-April-2004, 112/16:00:00

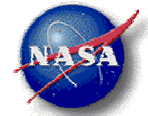


Data Description	
Sensor	HiRAP 1000 sa/sec (100 Hz)
Location	LAB1O2, ER1, Lockers 3,4
Inc/Flight	Increment: 8, Flight: 7S
Plot Type	Spectrogram

**Notes:**  
 At about GMT 21-Apr-2004, 112/20:18, CMG-2 went offline due to a faulty circuit breaker located on the S0 truss. By some accounts, the time cited was actually the beginning of a representative CMG spin-down sequence given that power was removed (unlike the demise of CMG-1). Correspondence with flight controllers at the JSC confirmed that spin-down does not proceed linearly with respect to time. Instead, “the spin-down rate is a function of the back-EMF and the inherent bearing drag. The bearing drag is not linear across the speed range due to the elastrohydrodynamic lubricant film while the back-EMF power decreases with wheel-speed.”



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PIMS ISS Acceleration Handbook  
 Date last modified 7/8/04

Regime:	Vibratory
Category:	Vehicle
Source:	Control Moment Gyroscope (CMG) Spin Down