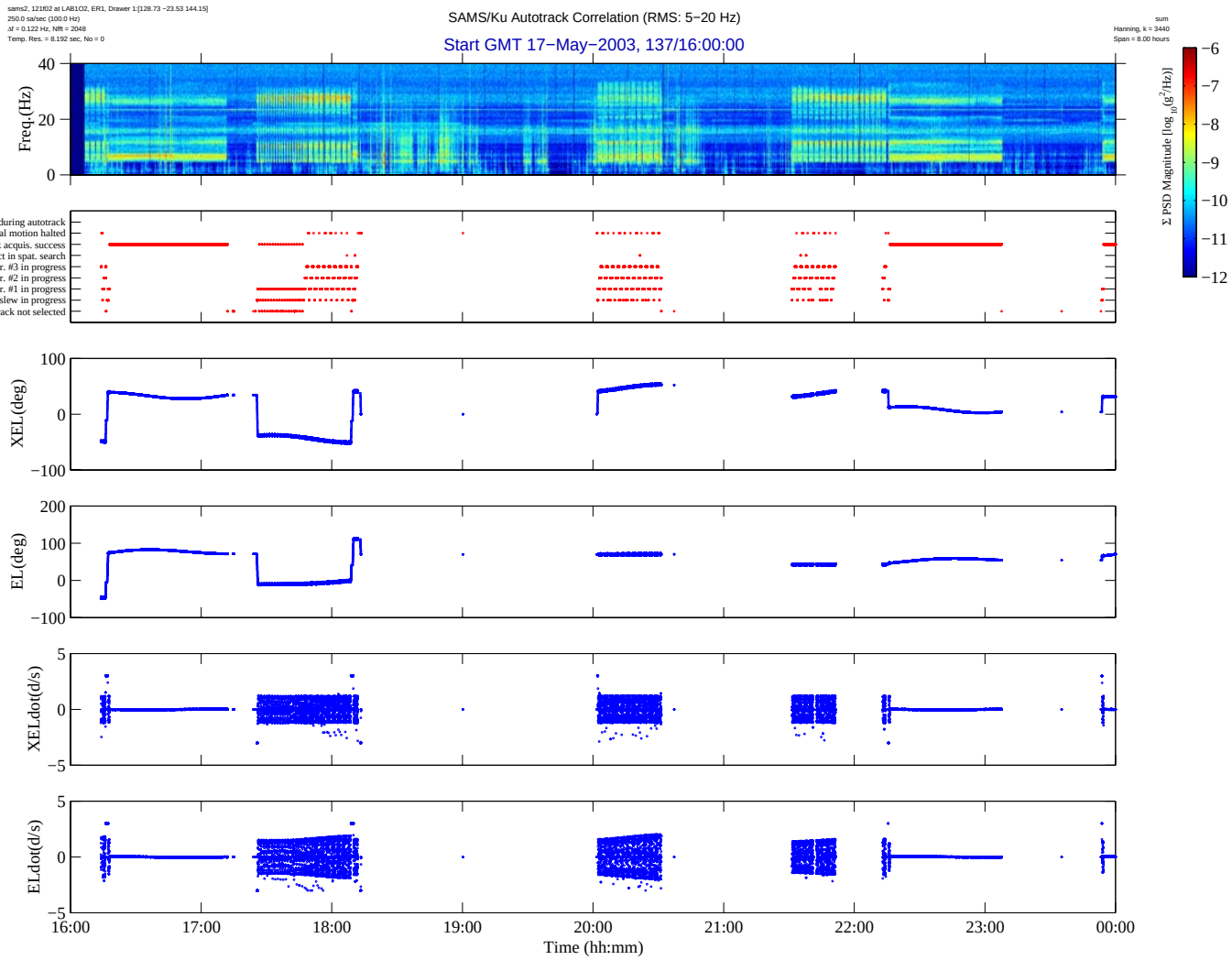
Ku-Band Antenna Qualify



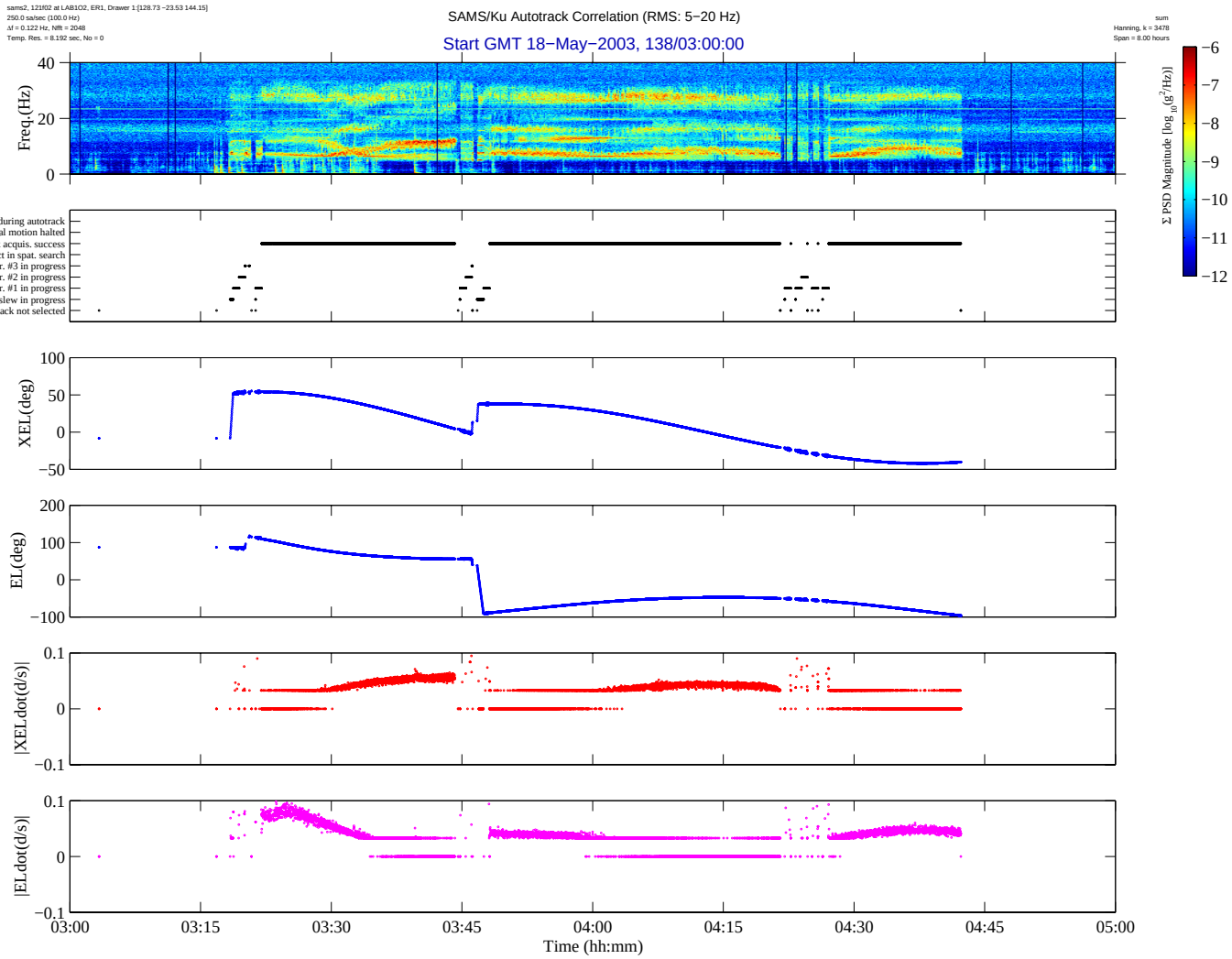
Data Description	
Sensor	121f02 250 sa/sec (100 Hz)
Location	LAB1O2, ER1, Drawer 1
Inc/Flight	
Plot Type	spectrogram

Notes:
Extensive comparison of RMS accelerations calculated from SAMS measurements between about 5 and 20 Hz* to Ku-band antenna operations shows a strong correlation. Close comparison of the figures at the left shows that gimbal motion during autotrack accounts for what had previously been referred to as the “unknown swoosh” vibratory signature (like between GMT 16:30 and 17:00), while combinations of “gimbal motion halted” and various forms of searching account for the punctuated signature (formerly referred to as the “unknown picket fence” signature). This punctuated motion signature can clearly be seen around GMT 22:00.

* Correlation up to about 30 Hz is apparent in color spectrograms, but the confounding influence of the Russian air conditioner (SKV) signature at about 23.5 Hz was intentionally avoided in the RMS calculations to produce the plots above.

Regime:	Vibratory
Category:	Vehicle
Source:	Ku-Band Antenna

Ku-Band Antenna Qualify

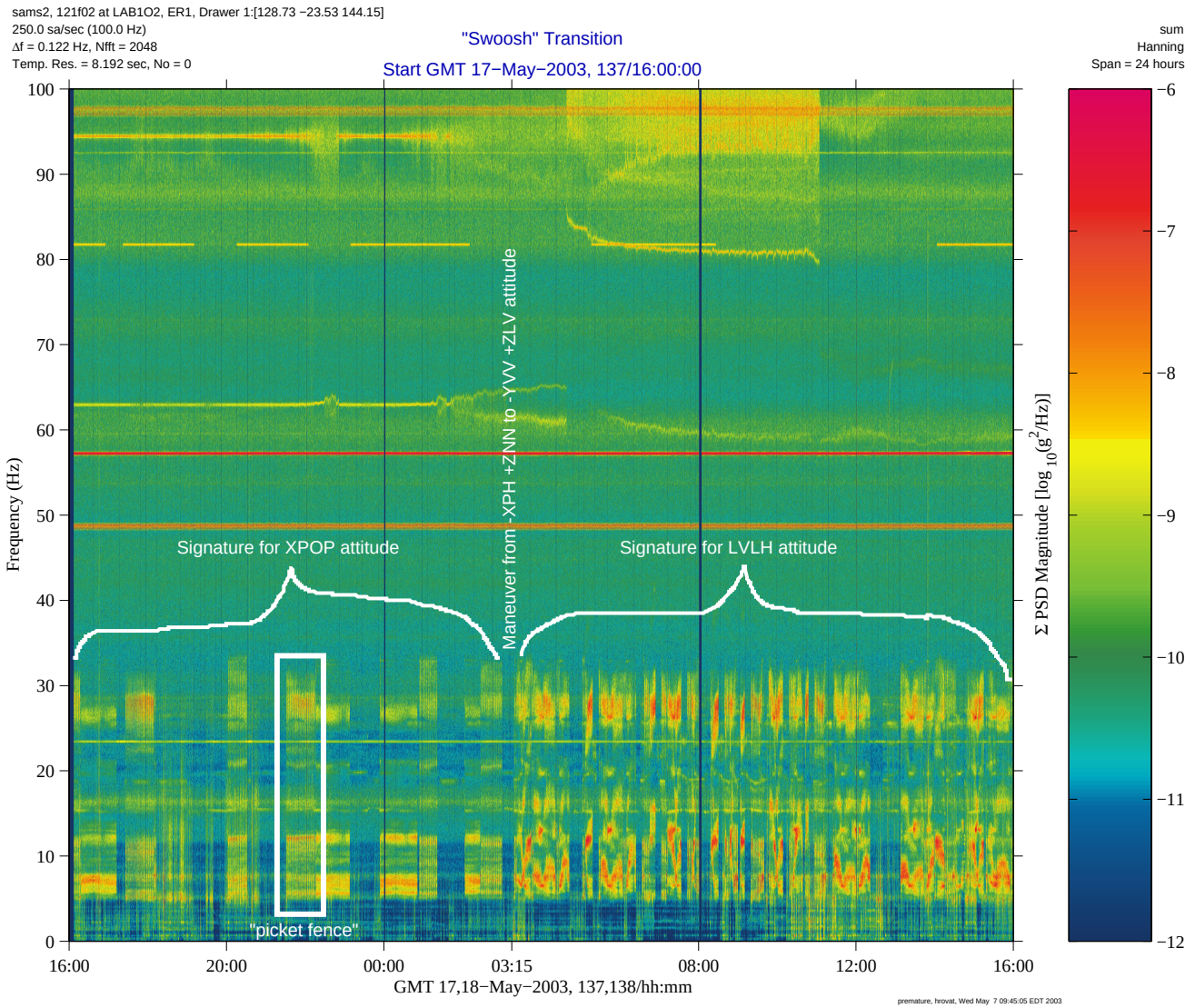


Data Description	
Sensor	121f02 250 sa/sec (100 Hz)
Location	LAB1O2, ER1, Drawer 1
Inc/Flight	
Plot Type	spectrogram

Notes:
The series of figures at the left are intended to show the frequency fluctuations in the Ku-band antenna vibratory signature. Comparing the two "fuzzy" yet narrowband traces that cross at about 10 Hz just after 03:30 on the topmost spectrogram plot with the 2 velocity magnitude plots (the red and magenta traces toward the bottom of this page), we conjecture that the XEL gimbal produces the ascending fuzzy narrowband acceleration signature, while the EL gimbal produces the descending signature. These frequency fluctuations have been previously correlated with the LVLH attitude of the space station (the as-flown attitude timeline for the period described here was an LVLH attitude = -YVV +ZLV TEA). The next page shows transition from XPOP to LVLH.

Regime:	Vibratory
Category:	Vehicle
Source:	Ku-Band Antenna

Ku-Band Antenna Qualify



Data Description	
Sensor	121f02 250 sa/sec (100 Hz)
Location	LAB1O2, ER1, Drawer 1
Inc/Flight	
Plot Type	spectrogram

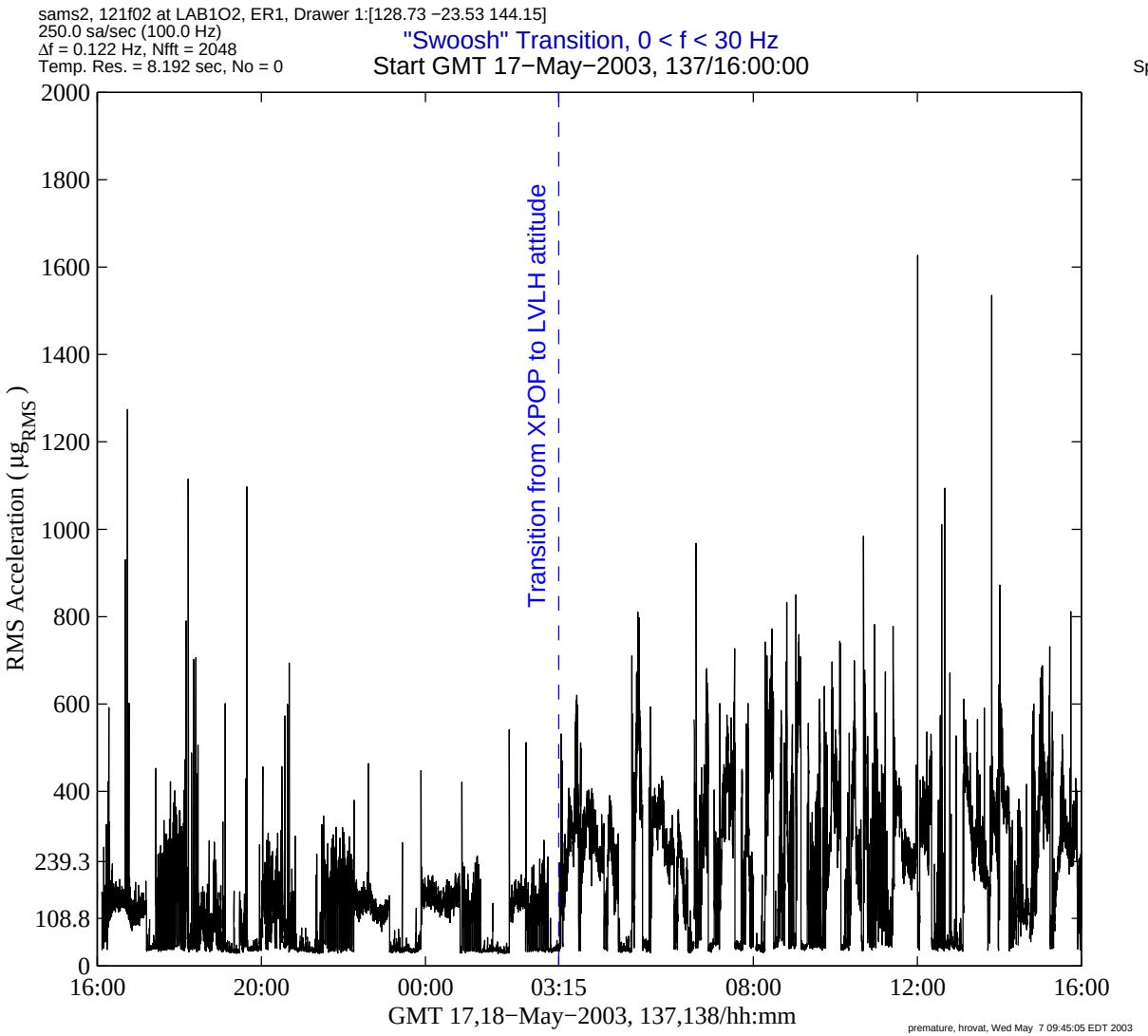
Notes:
The spectrogram here shows the variable nature of the Ku-band antenna's vibratory signature. Focusing on the acceleration environment below about 30 Hz, we see that a distinct shift in its signature occurs with transitions between XPOP and LVLH attitudes of the space station. The figure here shows a transition from XPOP to LVLH attitude. The "swoosh" nickname previously associated with this disturbance came from the frequency variations observed primarily around 10 Hz during LVLH attitudes. Another somewhat subtle variation is shown in the white rectangle and was dubbed the "picket fence". This depicts times when the antenna is alternatively halted and moved to search for optimal satellite tracking.

Regime:	Vibratory
Category:	Vehicle
Source:	Ku-Band Antenna

Microgravity Science Division

Glenn Research Center

Ku-Band Antenna Quantify

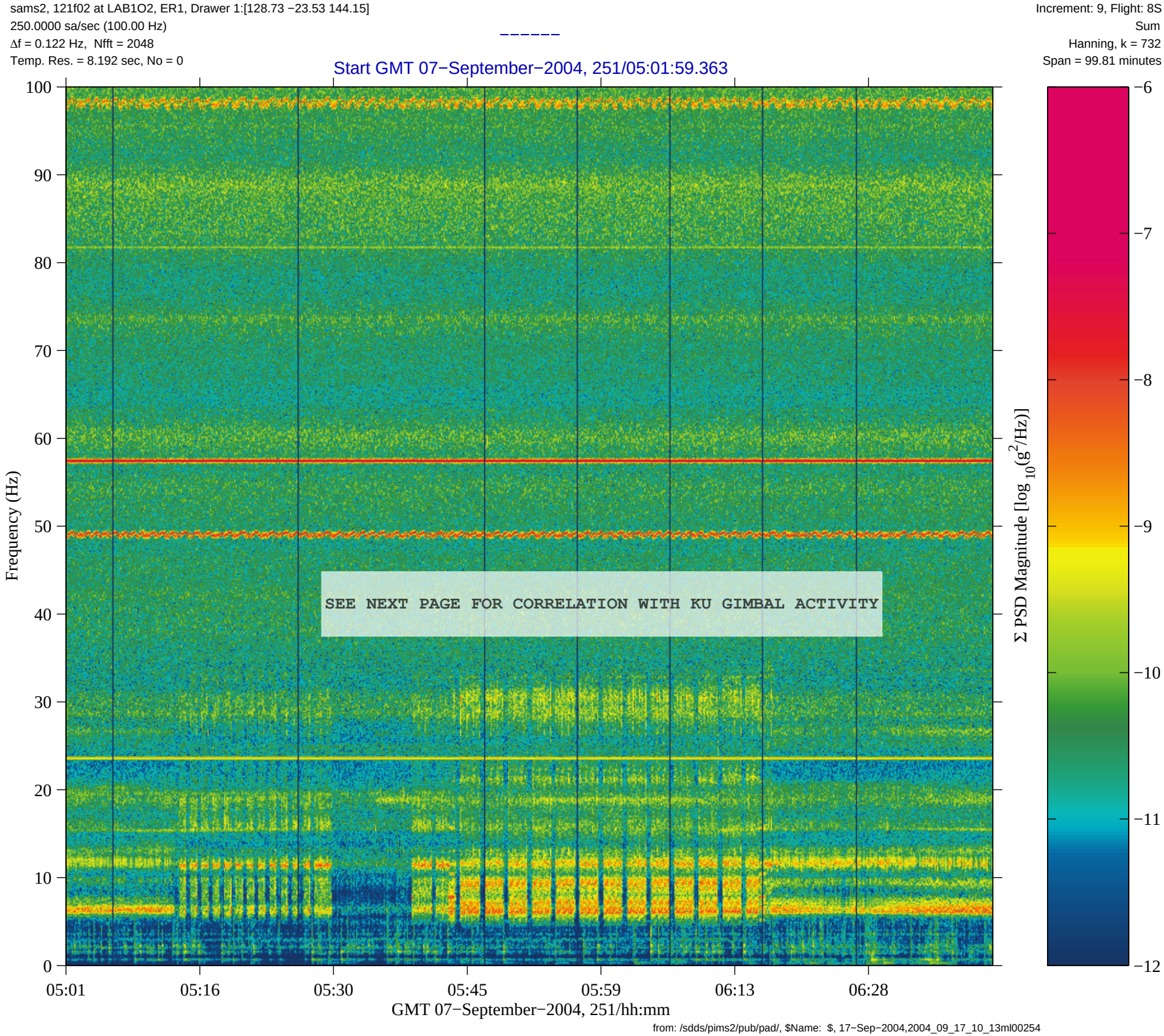


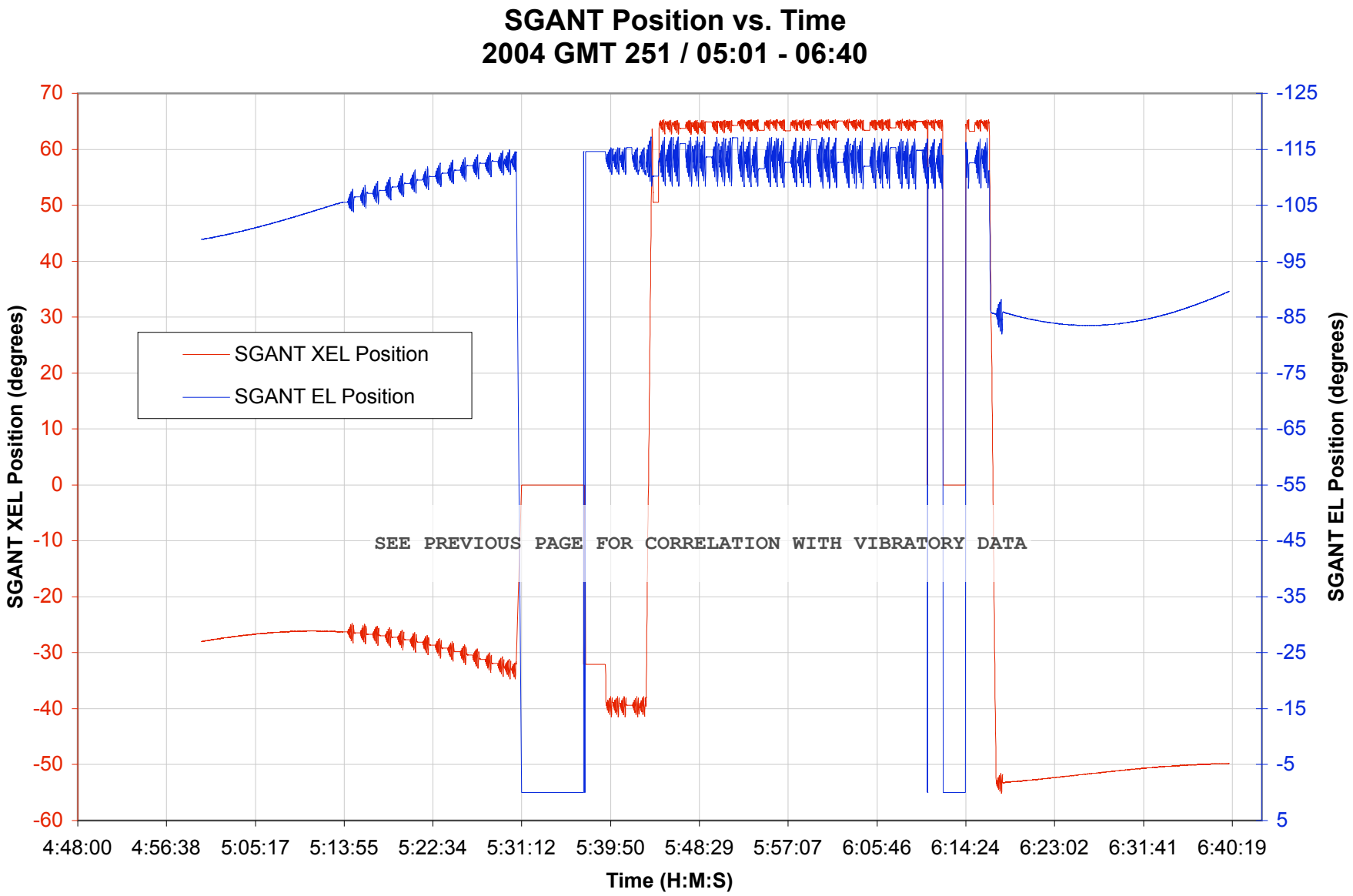
Data Description	
Sensor	121f02 250 sa/sec (100 Hz)
Location	LAB1O2, ER1, Drawer 1
Inc/Flight	
Plot Type	Interval RMS

Notes:
Operation of the Ku-band plays a major role in shaping the vibratory environment below about 30 Hz. As indicated by the vertical line at about GMT 18-May-2003,138/03:15, the space station maneuvered from XPOP to LVLH attitude. This interval RMS plot for the frequency band below 30 Hz shows that the LVLH manifestation of the Ku-band "swoosh" (after 03:15 in the figure) has substantially greater impact on the vibratory environment than that for XPOP (before 03:15 in the figure). The XPOP value below is for the 11 hours 15 minutes before the transition, while the LVLH value is for the 12 hours 45 minutes after the transition.

Attitude	Median μg_{RMS}
-XPH +ZNN (XPOP)	108.8
-YVV +ZLV (LVLH)	239.3

Regime:	Vibratory
Category:	Vehicle
Source:	Ku-Band Antenna


sams2, 121f02 at LAB1O2, ER1, Drawer 1:[128.73 −23.53 144.15]
250.0000 sa/sec (100.00 Hz)
Δf = 0.122 Hz, Nfft = 2048
Temp. Res. = 8.192 sec, No = 0
Increment: 9, Flight: 8S
Sum
Hanning, k = 732
Span = 99.81 minutes
Start GMT 07−September−2004, 251/05:01:59.363
SEE NEXT PAGE FOR CORRELATION WITH KU GIMBAL ACTIVITY
Frequency (Hz)
100
90
80
70
60
50
40
30
20
10
0
05:01
05:16
05:30
05:45
05:59
06:13
06:28
GMT 07−September−2004, 251/hh:mm
Σ PSD Magnitude [log 10(g2/Hz)]
−6
−7
−8
−9
−10
−11
−12
from: /sdds/pims2/pub/pad/, $Name: $, 17−Sep−2004,2004_09_17_10_13ml00254


SGANT Position vs. Time
2004 GMT 251 / 05:01 - 06:40
SGANT XEL Position (degrees)
SGANT EL Position (degrees)
SGANT XEL Position
SGANT EL Position
SEE PREVIOUS PAGE FOR CORRELATION WITH VIBRATORY DATA
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-125
-115
-105
-95
-85
-75
-65
-55
-45
-35
-25
-15
-5
5
4:48:00
4:56:38
5:05:17
5:13:55
5:22:34
5:31:12
5:39:50
5:48:29
5:57:07
6:05:46
6:14:24
6:23:02
6:31:41
6:40:19
Time (H:M:S)