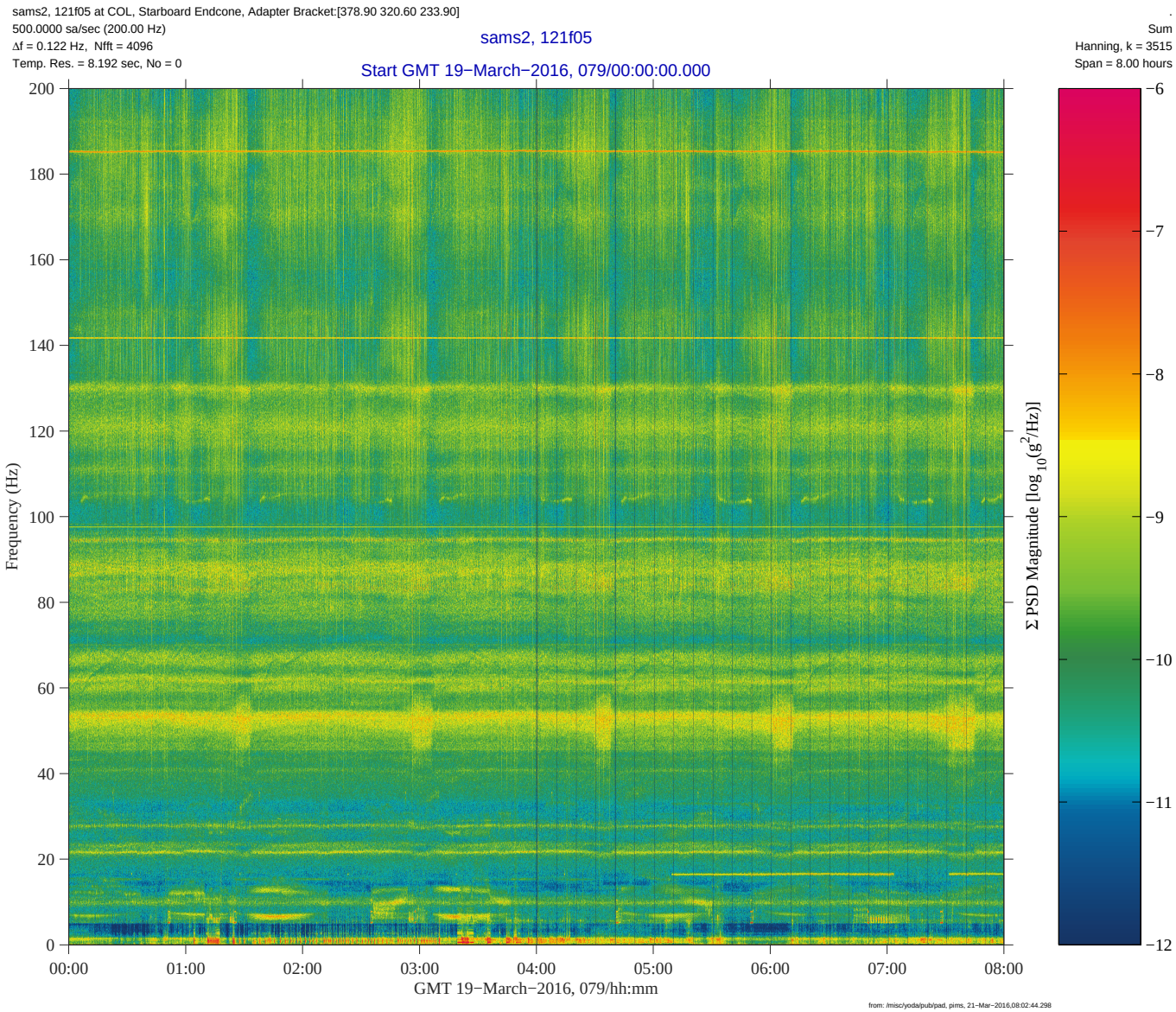
Soyuz 46S Docking 19-Mar-2016
Qualify



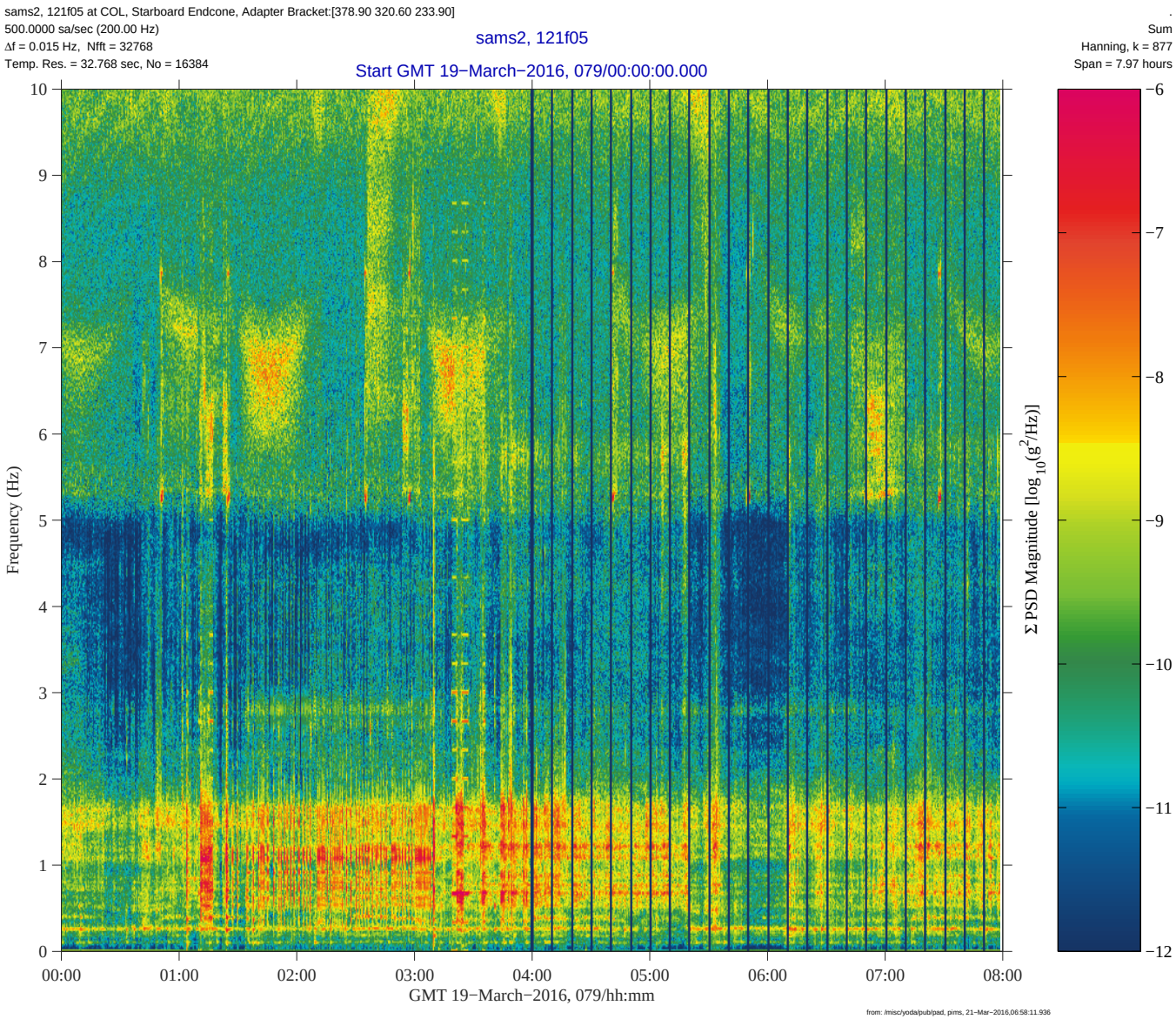
Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	COL, Starboard Endcone, Adapter Bracket
Plot Type	Spectrogram

Notes:

- This color spectrogram shows SAMS measurements on the Columbus Starboard Endcone for an 8-hour period to give context around the Soyuz 46S Docking event.
- The as-flown timeline reports that docking took place at GMT 03:11:47.
- The most obvious impact of docking is clear below about 2 Hz or so.
- The initial impact shows up starting at about 01:00 when US handover to RS for attitude control.
- Between 01:04 and 01:20, we see signs of the maneuver used to get the space station into the desired docking attitude.
- From 03:09 to 03:19, the ISS goes free drift for docking the Soyuz on MRM-2.
- From 03:19 to 03:45, there is a follow-up maneuver to post-docking LVLH TEA.
- At 04:02, the final activity for docking is handover back from RS to US for attitude control.

Regime:	Vibratory
Category:	Vehicle
Source:	Soyuz 46S Docking 19-Mar-2016

Soyuz 46S Docking 19-Mar-2016
Qualify



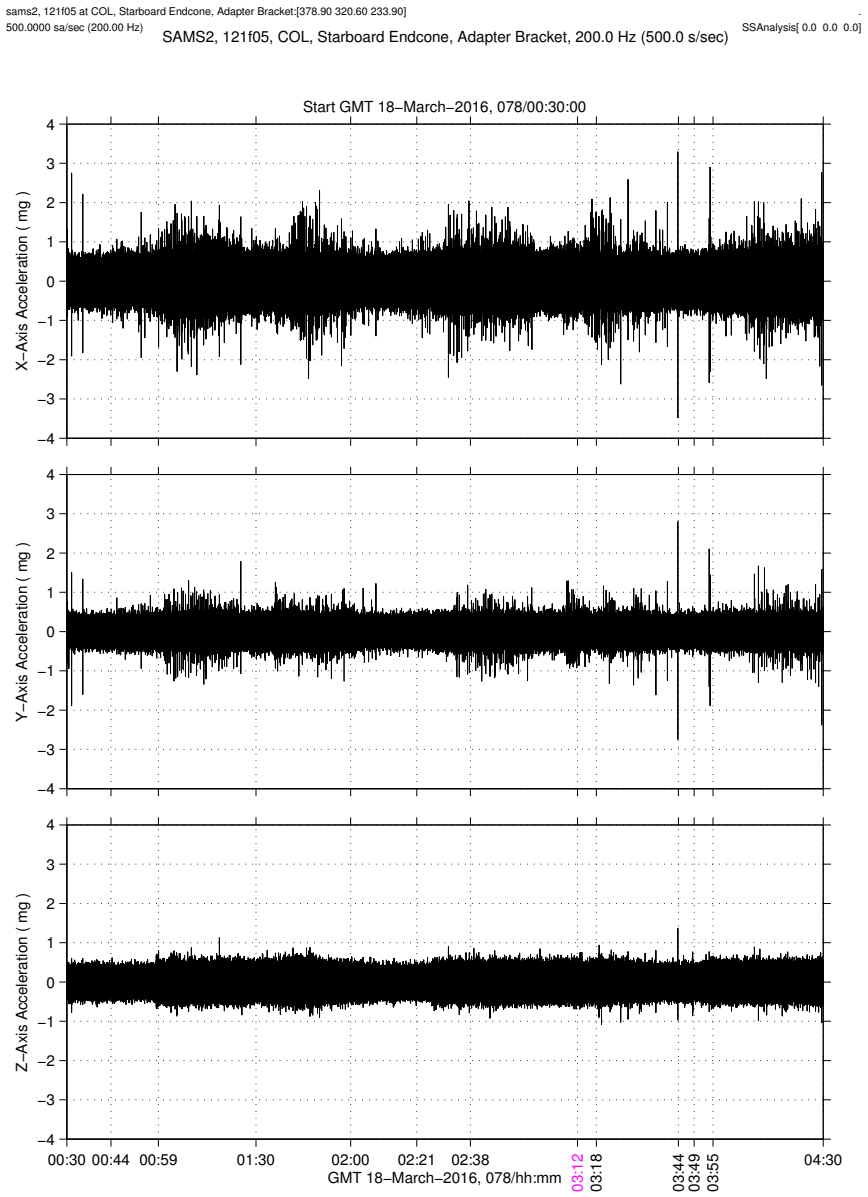
Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	COL, Starboard Endcone, Adapter Bracket
Plot Type	Spectrogram

Notes:

- This plot is identical to that on the previous page, but now we focus below 10 Hz, and particularly better see the impact of the Soyuz docking below about 2 Hz or so.
- The as-flown timeline reports that docking took place at GMT 03:11:47.
- The initial impact shows up starting at about 01:00 when US handover to RS for attitude control.
- Between 01:04 and 01:20, we see signs of the maneuver used to get the space station into the desired docking attitude.
- From 03:09 to 03:19, the ISS goes free drift for docking the Soyuz on MRM-2.
- The docking event itself shows up as a brigt vertical streak near 03:11.
- From 03:19 to 03:45, there is a follow-up maneuver to post-docking LVLH TEA.
- At 04:02, the final activity for docking is handover back from RS to US for attitude control.

Regime:	Vibratory
Category:	Vehicle
Source:	Soyuz 46S Docking 19-Mar-2016

Soyuz 46S Docking 19-Mar-2016
Quantify



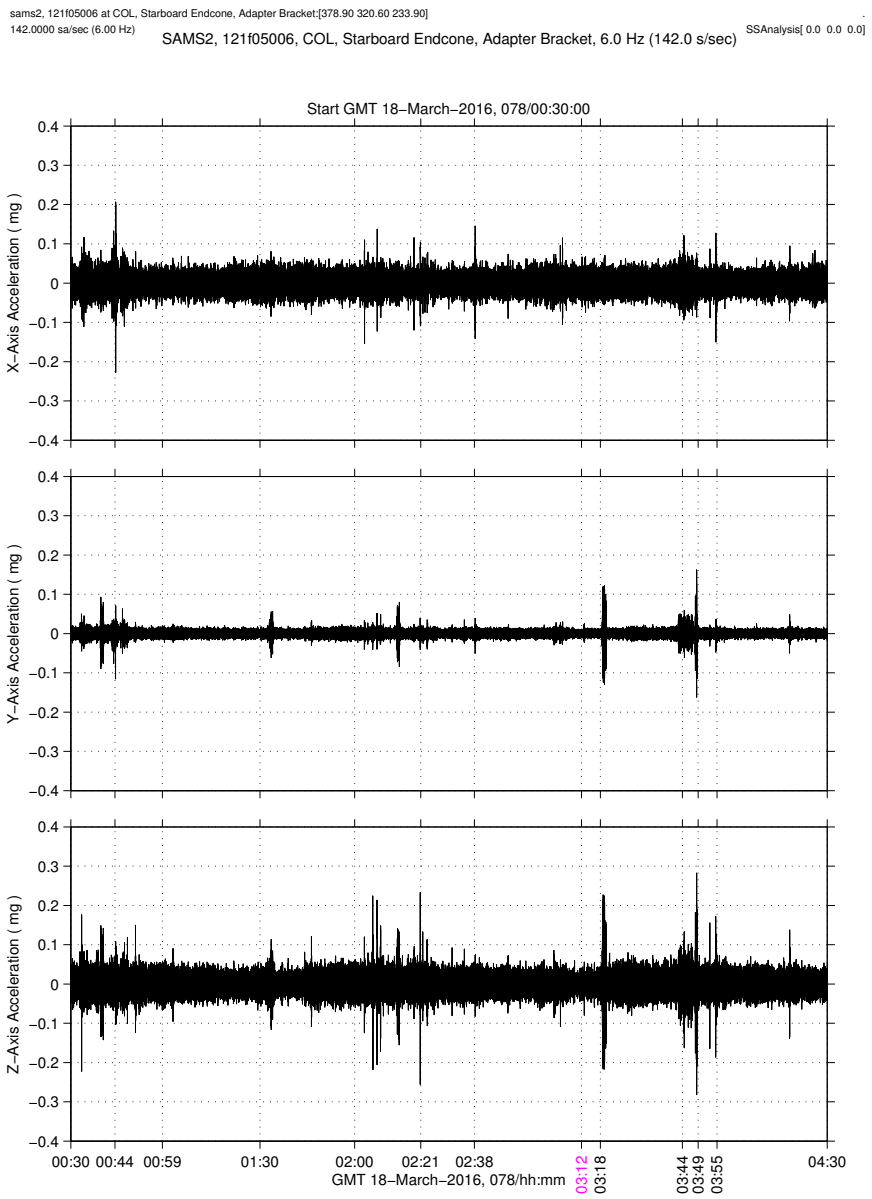
Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	COL, Starboard Endcone, Adapter Bracket
Plot Type	XYZ Accel. vs. Time

Notes:

- This plot shows the full pass-band (200 Hz) of as-measured SAMS data from the Columbus Endcone location.
- The magenta time tick mark at 03:12 is the approximate marker for the time reported as docking in the as-flown timeline (03:11:47).
- Higher-frequency vibrations tend to dominate and obscure the actual impetus from the docking impulse on MRM-2.

Regime:	Vibratory
Category:	Vehicle
Source:	Soyuz 46S Docking 19-Mar-2016

Soyuz 46S Docking 19-Mar-2016
Quantify



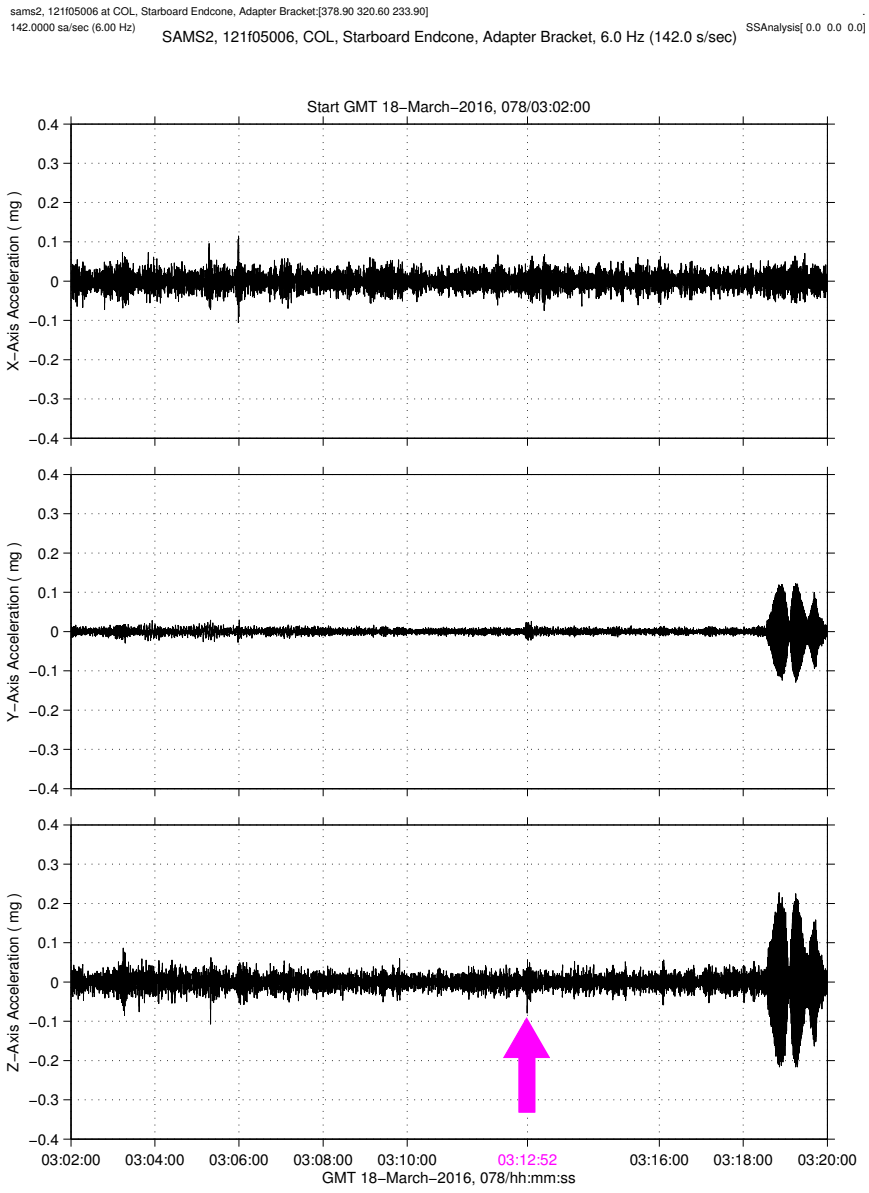
Description	
Sensor	SAMS 121f05 142.0 sa/sec, 6.0 Hz
Location	COL, Starboard Endcone, Adapter Bracket
Plot Type	XYZ Accel. vs. Time

Notes:

- The plot shows the same time span as the previous for the same data set with the exception that it was low-pass filtered below 6 Hz.
- At lower-frequencies, we start to see more distinctive impulsive events, but still not a large peak near the reported docking time.
- We would expect a +ZA acceleration since the docking occurred aft and above the station's center-of-mass.
- Note that for SAMS inverted polarity, we would expect a brief, negative ZA acceleration impulse at the time of docking.

Regime:	Vibratory
Category:	Vehicle
Source:	Soyuz 46S Docking 19-Mar-2016

Soyuz 46S Docking 19-Mar-2016
Quantify



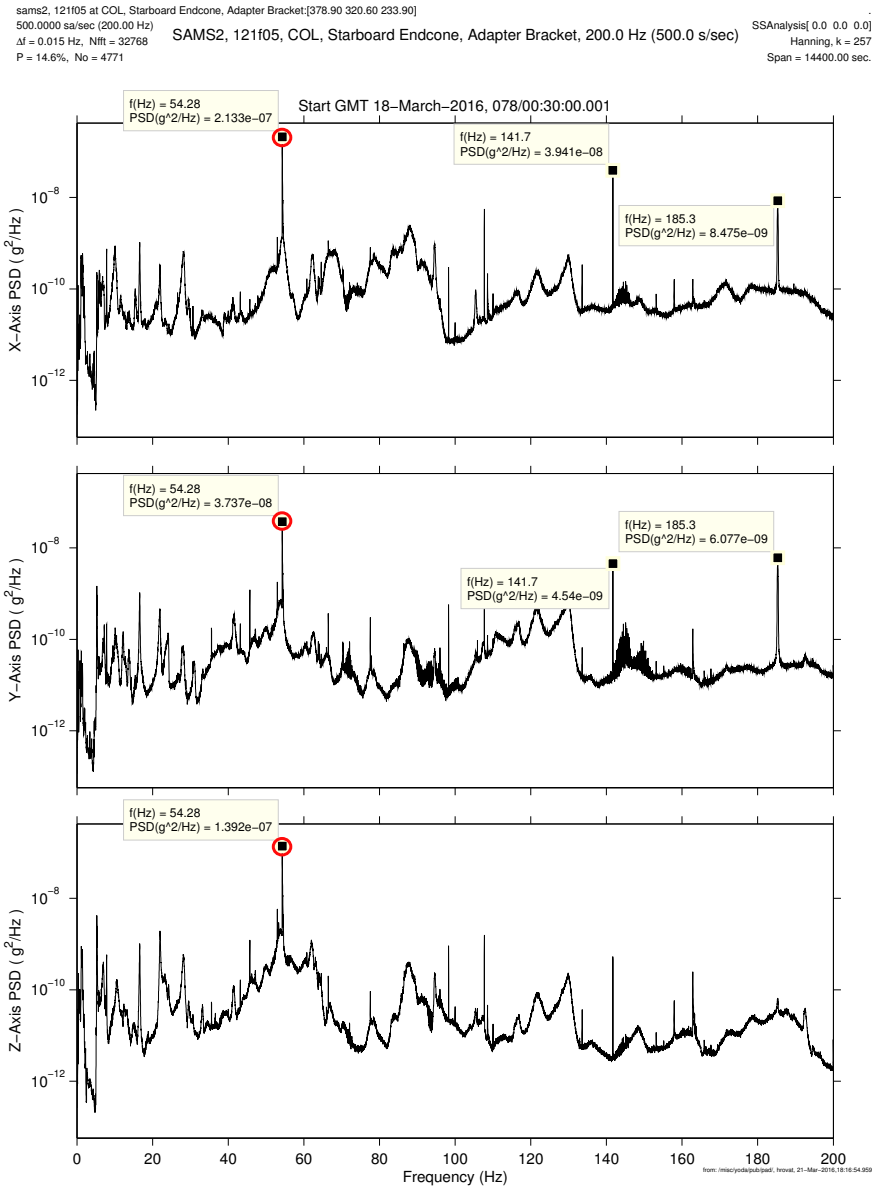
Description	
Sensor	SAMS 121f05 142.0 sa/sec, 6.0 Hz
Location	COL, Starboard Endcone, Adapter Bracket
Plot Type	XYZ Accel. vs. Time

Notes:

- This plot is similar to the previous with the exception that we now zoom-in on the time axis to see if the docking impulse shows up clearer on the Z-axis.
- It seems we do see a somewhat subtle Z-axis peak at 03:12:52, which is about a minute after the as-flown timeline.
- The large blooms that appear on the YZ-plane between about 03:19 and 03:20 are the start of a maneuver to post-docking attitude for the ISS.

Regime:	Vibratory
Category:	Vehicle
Source:	Soyuz 46S Docking 19-Mar-2016

Soyuz 46S Docking 19-Mar-2016
Quantify



Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	COL, Starboard Endcone, Adapter Bracket
Plot Type	XYZ Power Spectral Density

Notes:

- This 3-panel set of XYZ power spectral density plots show that the dominant spectral component between GMT 00:30 and 04:30 was at 54.28 Hz.
- This narrowband disturbance was aligned primarily with the XZ-plane.

Regime:	Vibratory
Category:	Vehicle
Source:	Soyuz 46S Docking 19-Mar-2016