JEM Remote Manipulator System E-Stop

sams2, 121f05 at JPM1F5, ER4, Drawer 2:[466.80 −292.06 214.58]

500.0000 sa/sec (200.00 Hz)

Δf = 0.488 Hz, Nfft = 1024

Temp. Res. = 2.048 sec, No = 0

SAMS2, 121f05, JPM1F5, ER4, Drawer 2, 200.0 Hz (500.0 s/sec)

Start GMT 05−September−2014, 248/00:00:00.001

Sum
Hanning, k = 5273
Span = 179.95 minutes

Σ PSD Magnitude [log$_{10}$(g^2/Hz)]

Frequency (Hz)

GMT 05−September−2014, 248/hh:mm

from: /misc/yoda/pub/padtemp/, hrovat, 05−Sep−2014,17:40:48.783
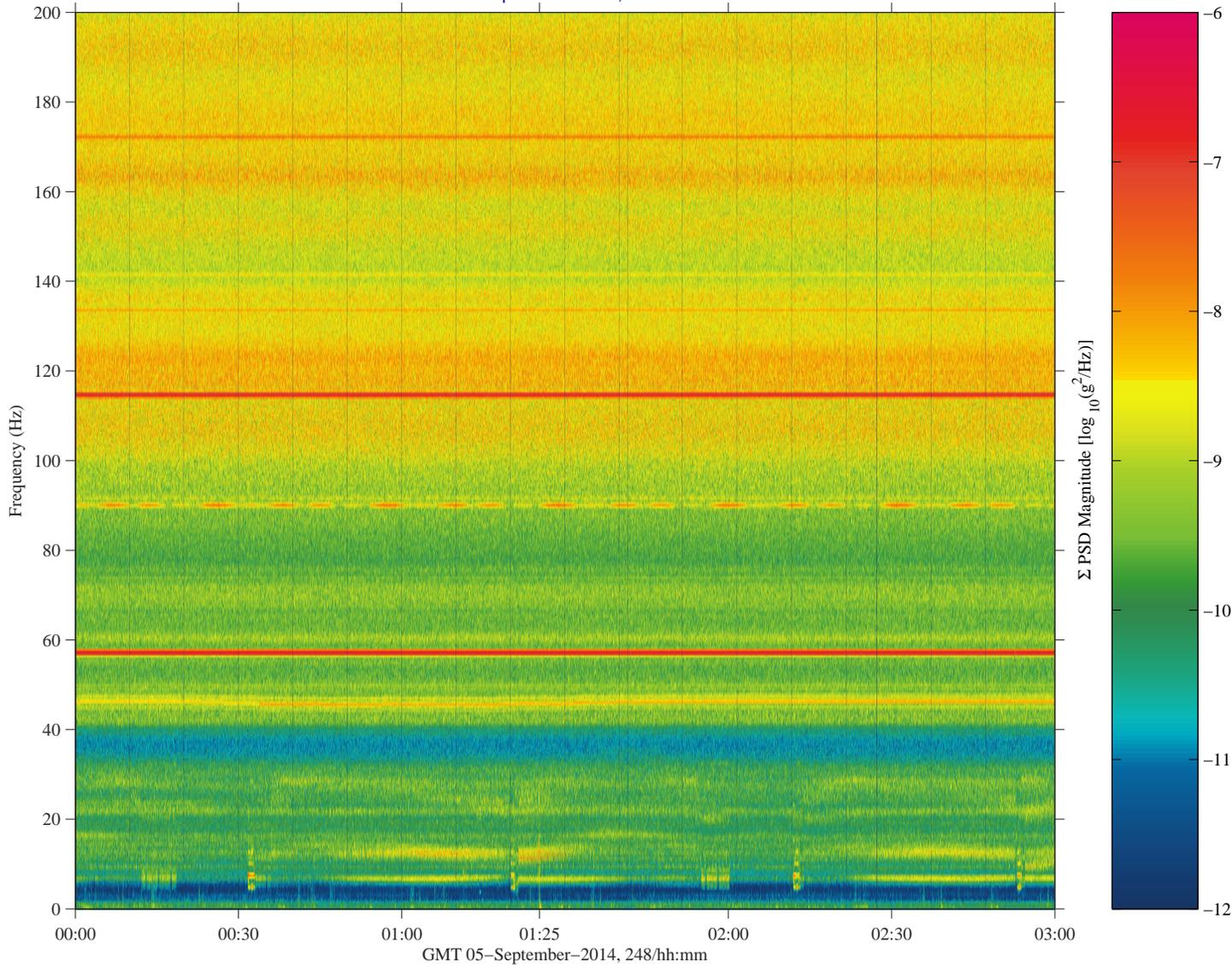
Description

Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	JPM1F5, ER4, Drawer 2
Plot Type	Spectrogram

Notes:

- From ISS operations reports, we know there was an E-stop of the JEM Remote Manipulator System performed at ~GMT 05-Sep-2014, 248/01:25.
- The spectrogram here shows SAMS vibratory data up to 200 Hz around the E-stop time.
- Notice the faint, yellowish vertical streak extending up from the bottom of the plot to about 15 Hz or so at the 01:25 time-axis tick mark.
- This plot only vaguely suggests the event of interest, but it is not ideal for characterizing this activity.

Regime:	Vibratory
Category:	Vehicle
Source:	JEM Remote Manipulator System E-Stop
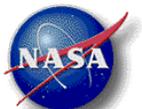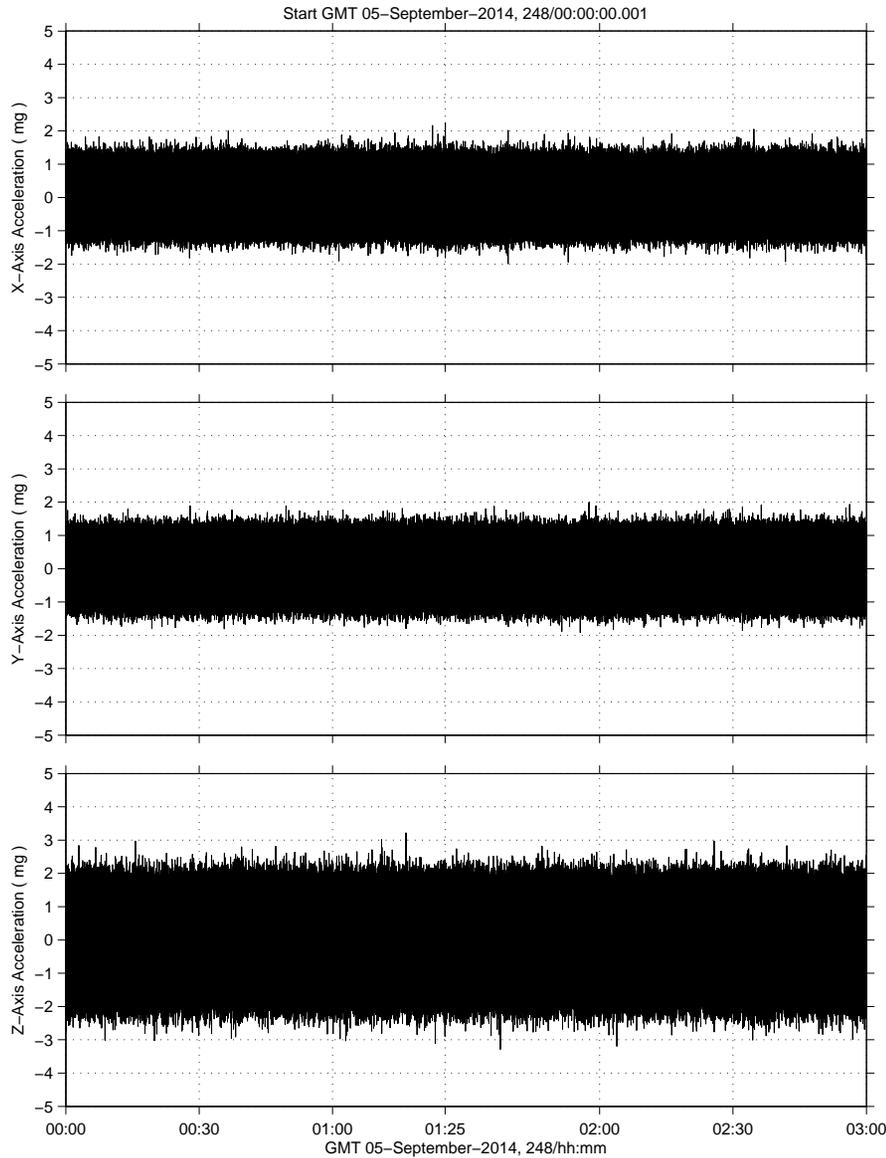
PIMS ISS Acceleration Handbook
Date last modified 2014-09-10

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sams2, 121f05 at JPM1F5, ER4, Drawer 2:[466.80 −292.06 214.58]
500.0000 sa/sec (200.00 Hz)

SAMS2, 121f05, JPM1F5, ER4, Drawer 2, 200.0 Hz (500.0 s/sec)

SSAnalysis[0.0 0.0 0.0]

Start GMT 05−September−2014, 248/00:00:00.001

X−Axis Acceleration (mg)

Y−Axis Acceleration (mg)

Z−Axis Acceleration (mg)

GMT 05−September−2014, 248/hh:mm

Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	JPM1F5, ER4, Drawer 2
Plot Type	Acceleration vs. Time

Notes:
- Just like the spectrogram on the previous page, this plot of acceleration versus time again does not clearly show the E-Stop event of interest, however...
- This plot is included to demonstrate a possible pitfall when it comes to identifying or finding this particular event when using SAMS data up to the default cut-off frequency of 200 Hz.
- This plot serves to show that higher-frequency vibrations dominate at this sensor location as you see nothing salient at the 01:25 tick mark.
- Subsequent pages and plots will make the situation clear.
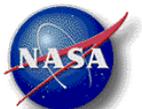
Regime:	Vibratory
Category:	Vehicle
Source:	JEM Remote Manipulator System E-Stop

sams2, 121f05006 at JPM1F5, ER4, Drawer 2:[466.80 −292.06 214.58]
142.0000 sa/sec (6.00 Hz)

SAMS2, 121f05006, JPM1F5, ER4, Drawer 2, 6.0 Hz (142.0 s/sec)

SSAnalysis[0.0 0.0 0.0]

Start GMT 05−September−2014, 248/00:00:00.007

GMT 05−September−2014, 248/hh:mm
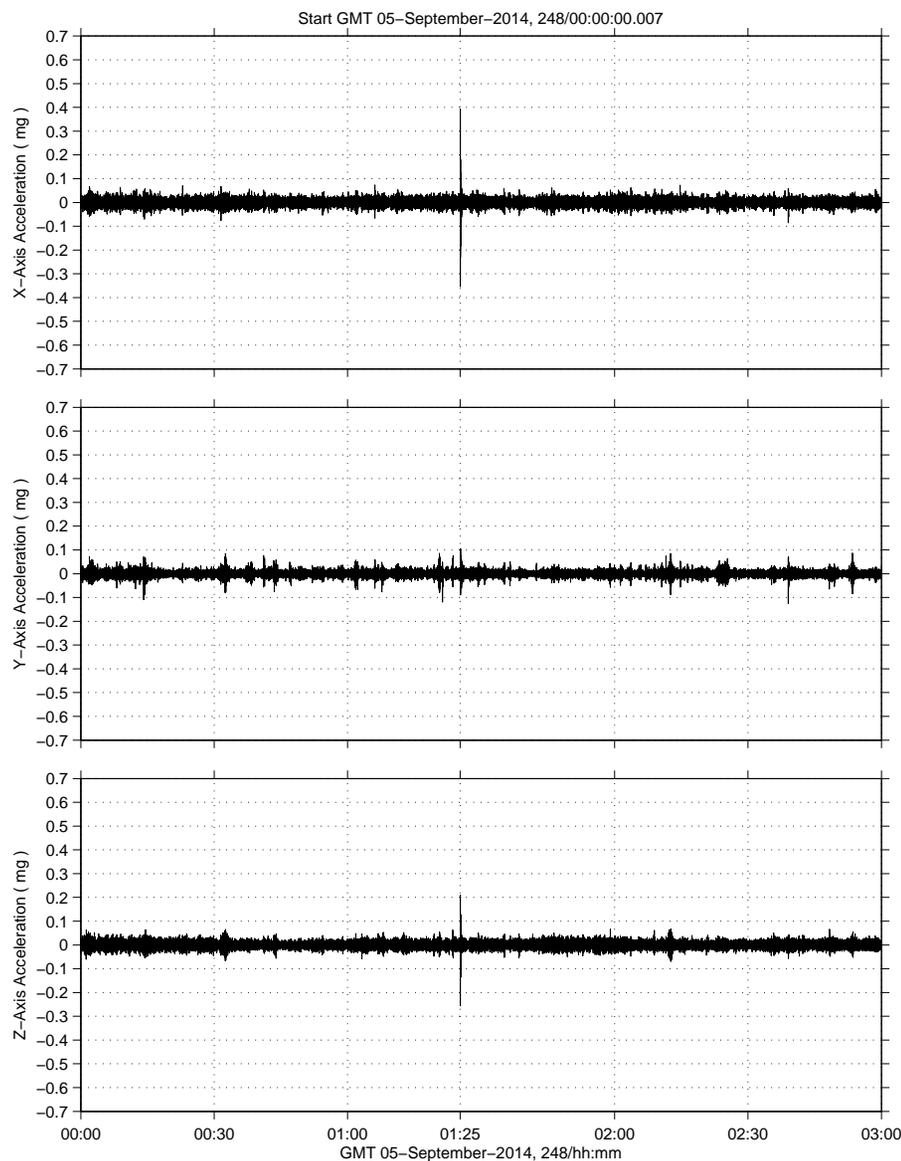
Description	
Sensor	SAMS 121f05006 142.00 sa/sec, 6.00 Hz
Location	JPM1F5, ER4, Drawer 2
Plot Type	Acceleration vs. Time

Notes:

- As seen from the previous plots, we must focus toward the lower-frequency end of the acceleration spectrum to capture the impact of the E-Stop event.
- This plot shows a 6 Hz low-pass filtered version of the same SAMS data seen on previous pages.
- These measurements were made with the SAMS sensor located in the JEM, and nearest the disturbance source.
- Note clearly at the 01:25 tick mark that an impulsive acceleration was registered primarily in the station XZ-plane, presumably the plane of motion for the JEM Remote Manipulator System E-stop.

Regime:	Vibratory
Category:	Vehicle
Source:	JEM Remote Manipulator System E-Stop

sams2, 121f08006 at COL1A1, ER3, Seat Track near D1:[371.17 193.43 165.75]
142.0000 sa/sec (6.00 Hz)

SAMS2, 121f08006, COL1A1, ER3, Seat Track near D1, 6.0 Hz (142.0 s/sec)

SSAnalysis[0.0 0.0 0.0]

Start GMT 05–September–2014, 248/00:00:00.003

GMT 05–September–2014, 248/hh:mm
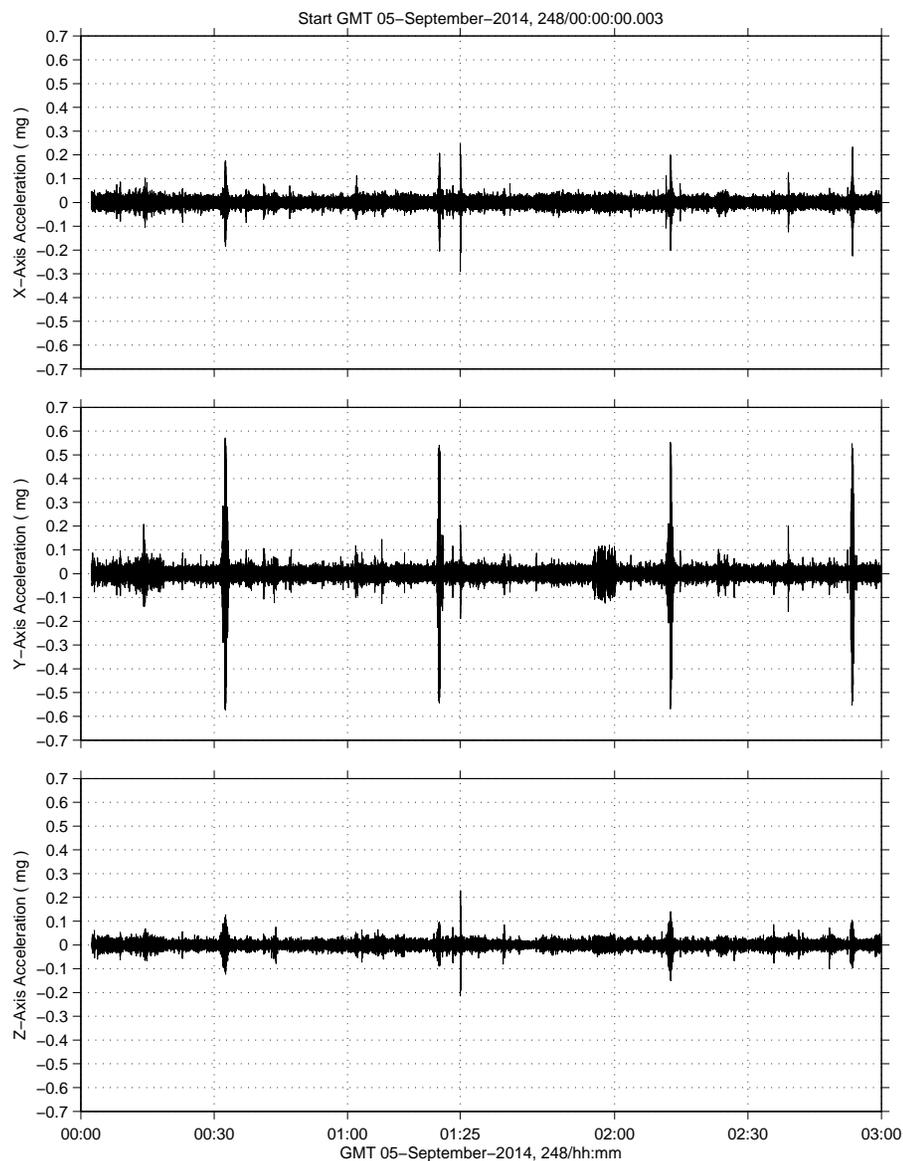
Description	
Sensor	SAMS 121f08006 142.00 sa/sec, 6.00 Hz
Location	COL1A1, ER3, Seat Track near D1
Plot Type	Acceleration vs. Time

Notes:
- This plot of acceleration versus time comes from measurements made by one of the two SAMS sensors located in the Columbus module.
- Note again the impulse at the 01:25 tick mark, but at this sensor location there are other nearby impulsive transients mostly on the Y-axis.
- The information here will be used for comparison on the next page.

Regime:	Vibratory
Category:	Vehicle
Source:	JEM Remote Manipulator System E-Stop

PIMS ISS Acceleration Handbook
Date last modified 2014-09-10

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sams2, 121f03006 at LAB1O1, ER2, Lower Z Panel:[191.54 −40.54 135.25]
142.0000 sa/sec (6.00 Hz)

SAMS2, 121f03006, LAB1O1, ER2, Lower Z Panel, 6.0 Hz (142.0 s/sec)

SSAnalysis[0.0 0.0 0.0]

Start GMT 05−September−2014, 248/00:00:00.007

GMT 05−September−2014, 248/hh:mm
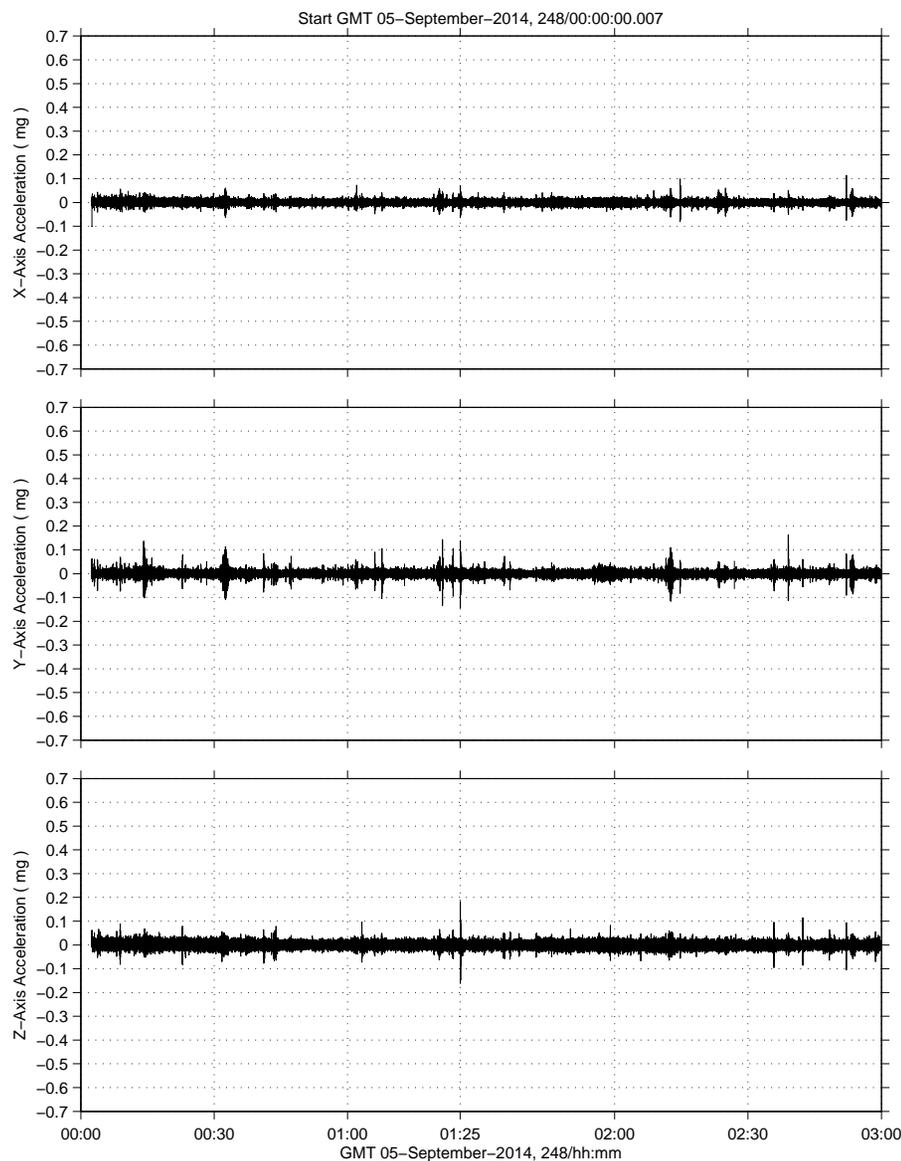
Description	
Sensor	SAMS 121f03006
142.00 sa/sec, 6.00 Hz
Location	LAB1O1, ER2, Lower Z Panel
Plot Type	Acceleration vs. Time

Notes:

- This plot of acceleration versus time comes from measurements made by a SAMS sensor located in the USL.
- Note again the impulse at the 01:25 tick mark, but at this sensor location the quick stop motion of the arm translated to an impulse mostly on the YZ-plane as the space station is not a rigid body.
- The information here along with from the previous 2 plots were used to compute acceleration vector magnitude values at the time of the E-stop event as follows for each of the 3 main labs:
  - ➢ USL = 0.22 mg
  - ➢ **JEM = 0.41 mg**
  - ➢ COL = 0.34 mg
- NOTE: the SAMS sensor in the JEM was nearest the disturbance source and data from the SAMS sensor in the Columbus module exhibited larger, unrelated impulses around the time of the E-stop.

Regime:	Vibratory
Category:	Vehicle
Source:	JEM Remote Manipulator System E-Stop

NanoRacks CubeSat Deployers (NRCSD): Ground controllers utilized the JEM Remote Manipulator System in somewhat an unorthodox fashion to assist deployment of CubeSats. That is, they performed an emergency stop shake test on the NRCSD to try and jostle free the CubeSats. No deployments were observed during the E-Stop time, however.

 The image on the bottom, left shows a zoom-out view of the JEM and the NRCSD at the end of the JEM Remote Manipulator System. The image on the bottom, right shows an earlier deployment event with CubeSats deployed.