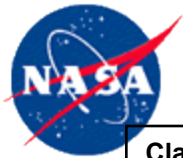




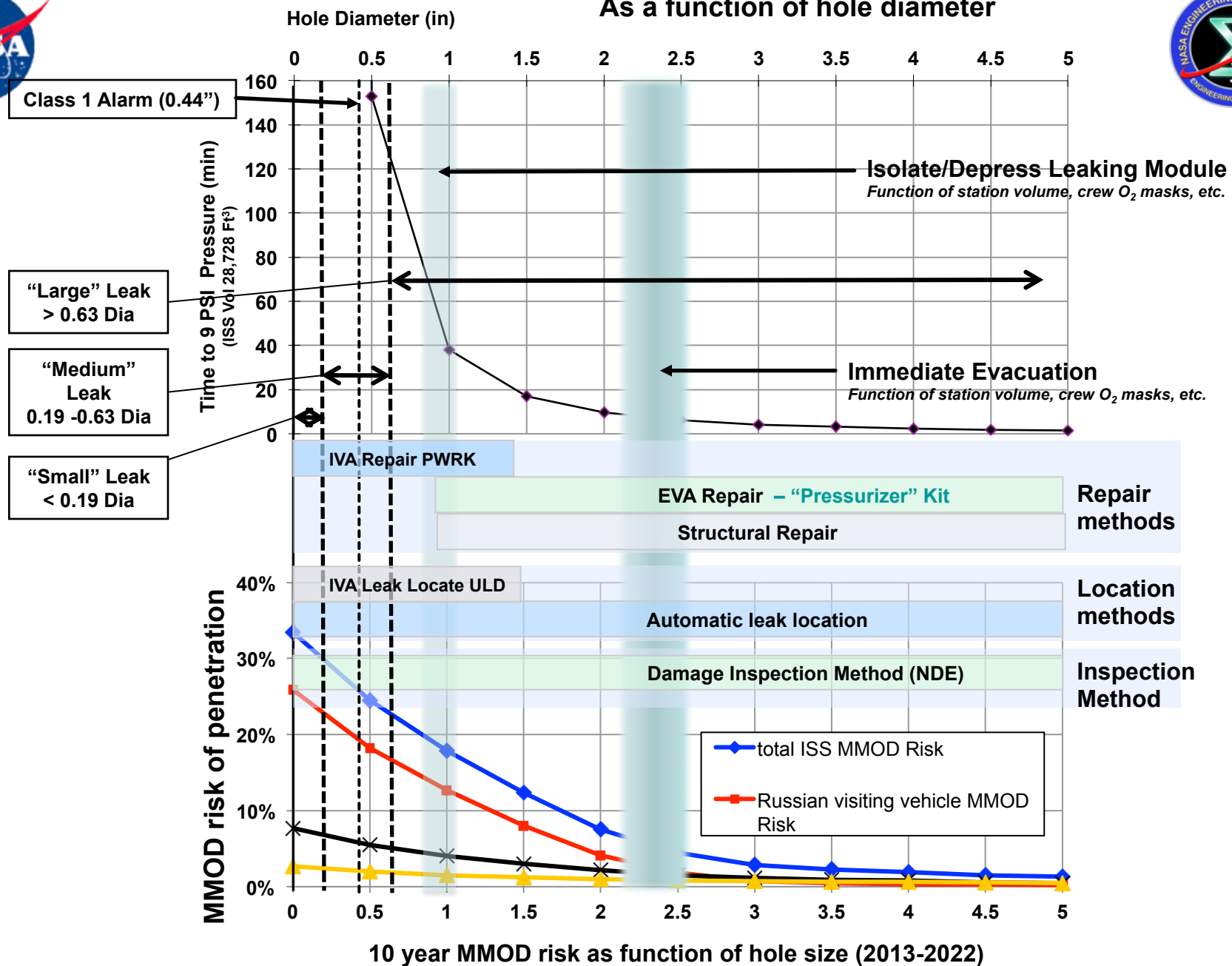
Ultrasonic Background Noise Test

April 10, 2013

Eric Madaras



Hole size distribution and Time to 9 PSI Pressure As a function of hole diameter



This briefing is for status only and may not represent complete engineering information



On-Orbit Atmospheric Leak Location and Repair Development Plan for ISS – Risk 4669

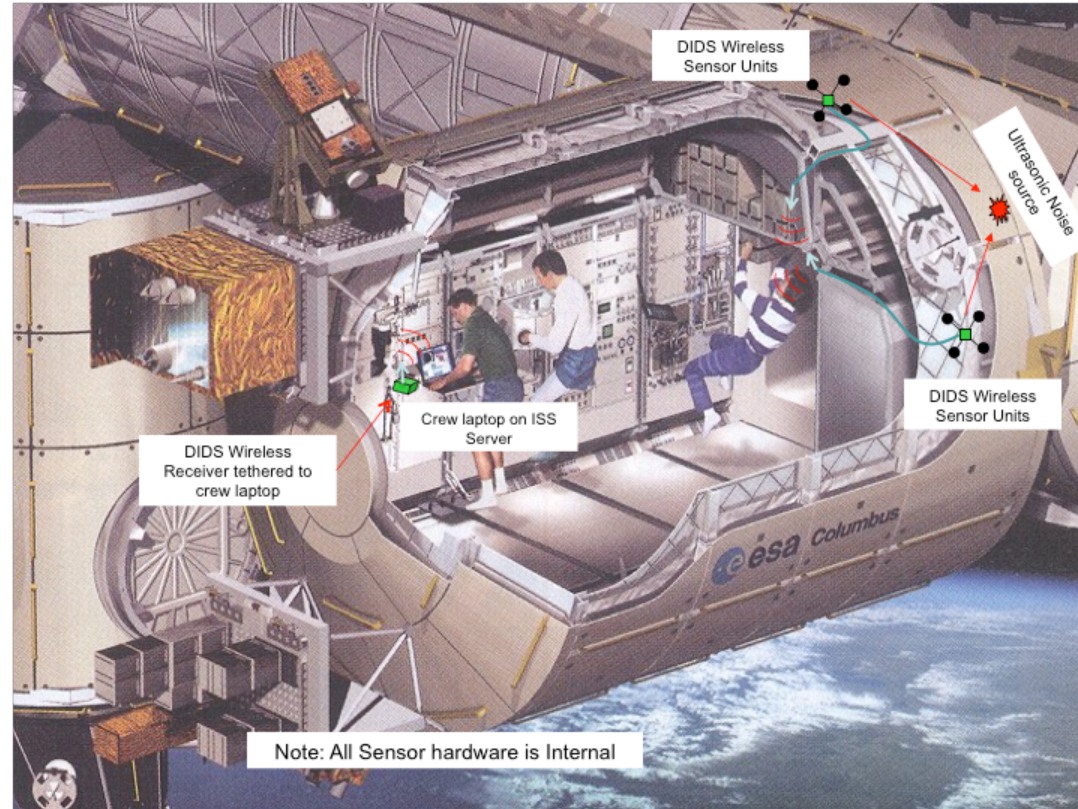
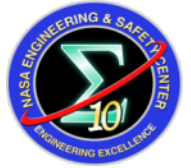


Status of mitigation tasks for Risk 4669: Autonomous Leak Location System

- **Environment characterization tests**
 - US UBNT Phase I ground tests completed
 - US UBNT Phase I on orbit tests in progress
 - RS UBNT Phase II ground test planning in work with RSC E and Khrunichev
 - RS UBNT Phase II on orbit test planning in work with RSC E and Khrunichev
- **Autonomous Leak Detection system deployment**
 - UBNT hardware option proposes the installation of UBNT hardware in each ISS module
 - The system will use leak location software instead of UBNT software
 - *This task is on hold pending the results of UBNT testing completion*



Leak Location Concept





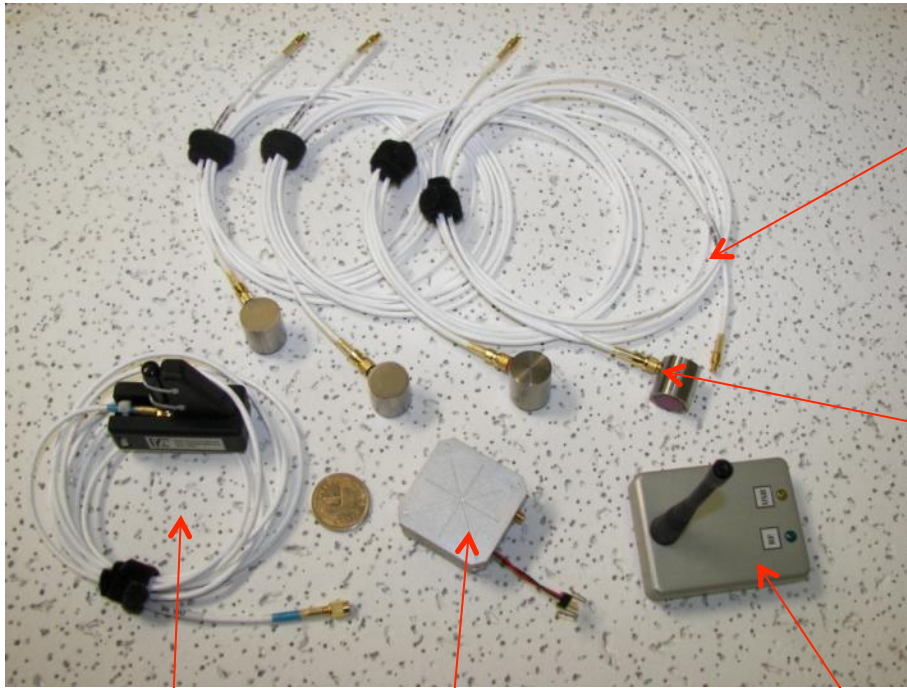
Hardware Work Completed



- Hardware
 - Utilized existing hardware. (SBIR origins)
 - 6 DIDS units, 2 transceivers, 40 transducers
 - Acquired additional hardware to augment existing equipment.
 - 3 DIDS units, 2 transceivers, 38 2m flight sensor cables
 - Modified hardware to
 - Accommodate external WLEIDS L91 battery.
 - Converted internal antenna to external remote configuration antenna with 2 meter cable.
 - Replaced Micro-SD card with greater capacity card.
 - Increased system's gain.
 - Developed a system for dispensing adhesive that was acceptable to the ISS Program Office.



UBNT Hardware (modified)



Transducer Cables

L $\approx$ 78.7"
Dia = 0.13
Weight = 1.0 OZ (each)
= 28 g



UBNT Transducers (AE)

Dia = 0.94" (w/protruding connector)
Dia = 0.75" (Base)
H = 0.78"
Weight = 1.31 OZ (each)
= 37 g
P/N: B225.5

Main Batteries (WLEIDS)

W = 2.12"
L = 1.20"
H = 0.97"

Pigtail

L = 1.48"
Weight = 1.4 Oz
= 40g

DIDS Extension Cable with Antenna

L $\approx$ 80.1"
Weight = 1.5 OZ
= 42 g

P/N: IVC4181004-701

DIDS

W = 1.71"
L = 1.72"
H = 0.82"
Weight = 1.2 oz
= 34g

UBNT Transceiver

W = 2.77"
L = 2.13"
H = 0.73"
Top Connector Dia = 0.25"
H = 0.29"
Weight = 68g

- ❖ **Each DIDS unit has 4 input channels for data acquisition of the Acoustic Emission (AE) transducers.**



USB Cable

(Type A to mini-B)
L $\approx$ 78.7"
Weight = 1.9 OZ
= 52 g



UBNT Micro-SD Card

W = 0.61"
L = 0.38"
H = 0.03"
Weight < 1g
Model #: TS1GUSD



Software Work Completed



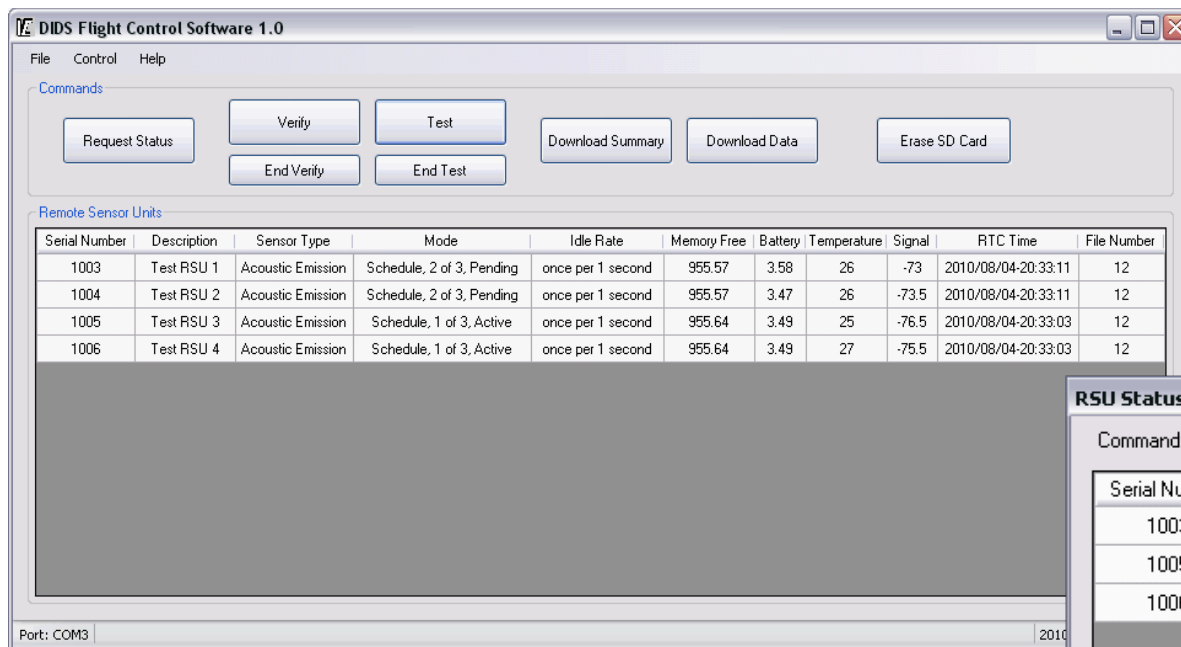
- Software
 - Built a new Flight GUI for astronaut's use.
 - Added ability to program sensors via ground written configuration files.
 - Added the ability for flexible triggering schedule capabilities.
 - Modified software to automatically find the correct USB port for communications.
 - Added the ability to download summary data for review.
 - Added the ability to use configuration file to direct event data download.
 - Increased the number of files that could be written from 999 to 9999.



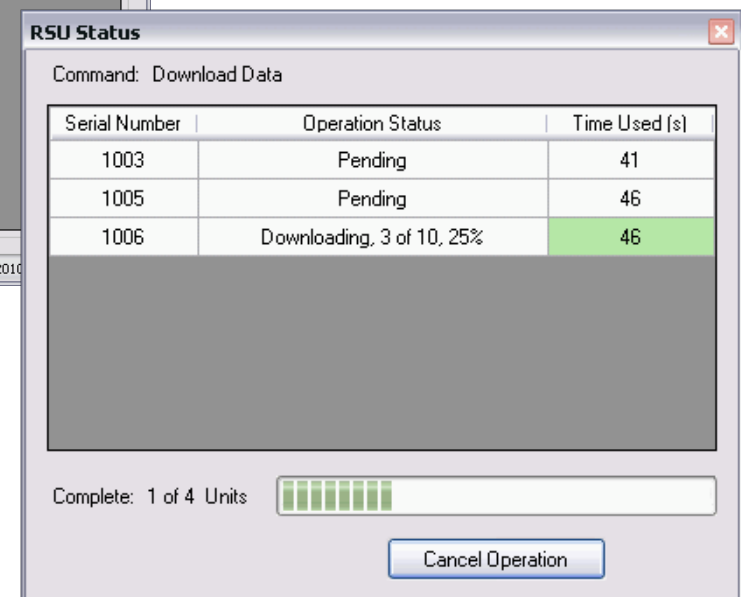
Work Completed To Date



- Software.



Status window example



Flight GUI



Certification Work Completed

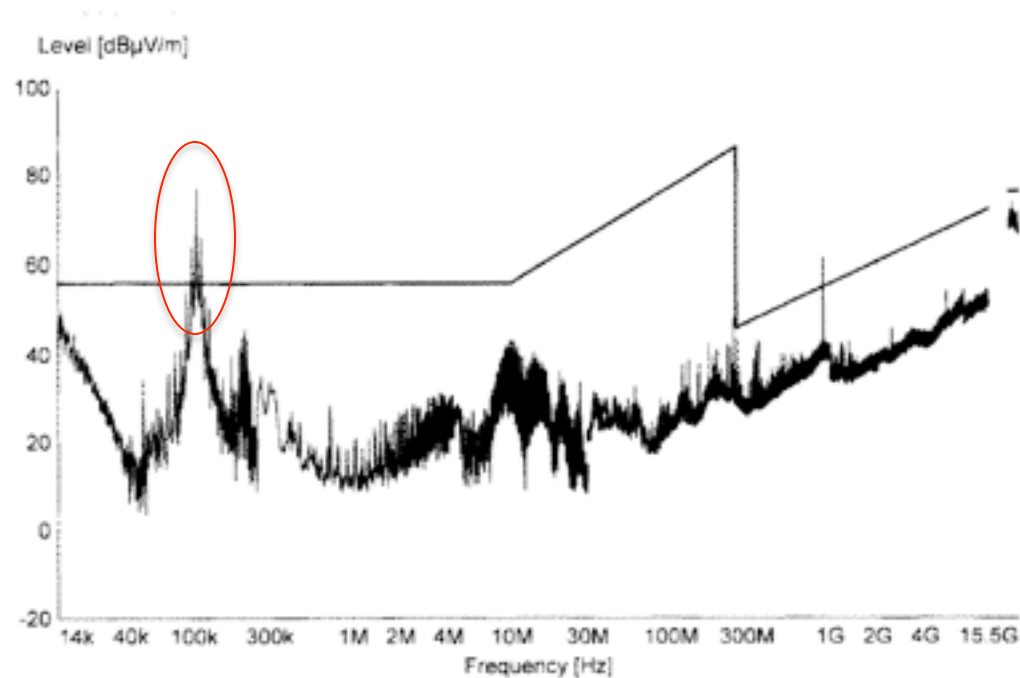
- Certification
 - Meets ISS CIRD requirements for ISS approved vehicles
 - Offgas/VOC certification
 - VOC for curing and cured adhesive
 - Offgas of hardware at WSTF
 - EMI/electrical testing
 - EMI Emissions testing
 - EMI Susceptibility testing (Per request of ISS Program)
 - Battery cert. (addition of Nomex® material)
 - Radiation Susceptibility (Per request of ISS Program)
 - Material certification.
 - Thermal
 - Strength, Fracture, and Venting
 - Flight safety certification, Safety Data Package.
 - Bench Review and shipment



Work Completed To Date



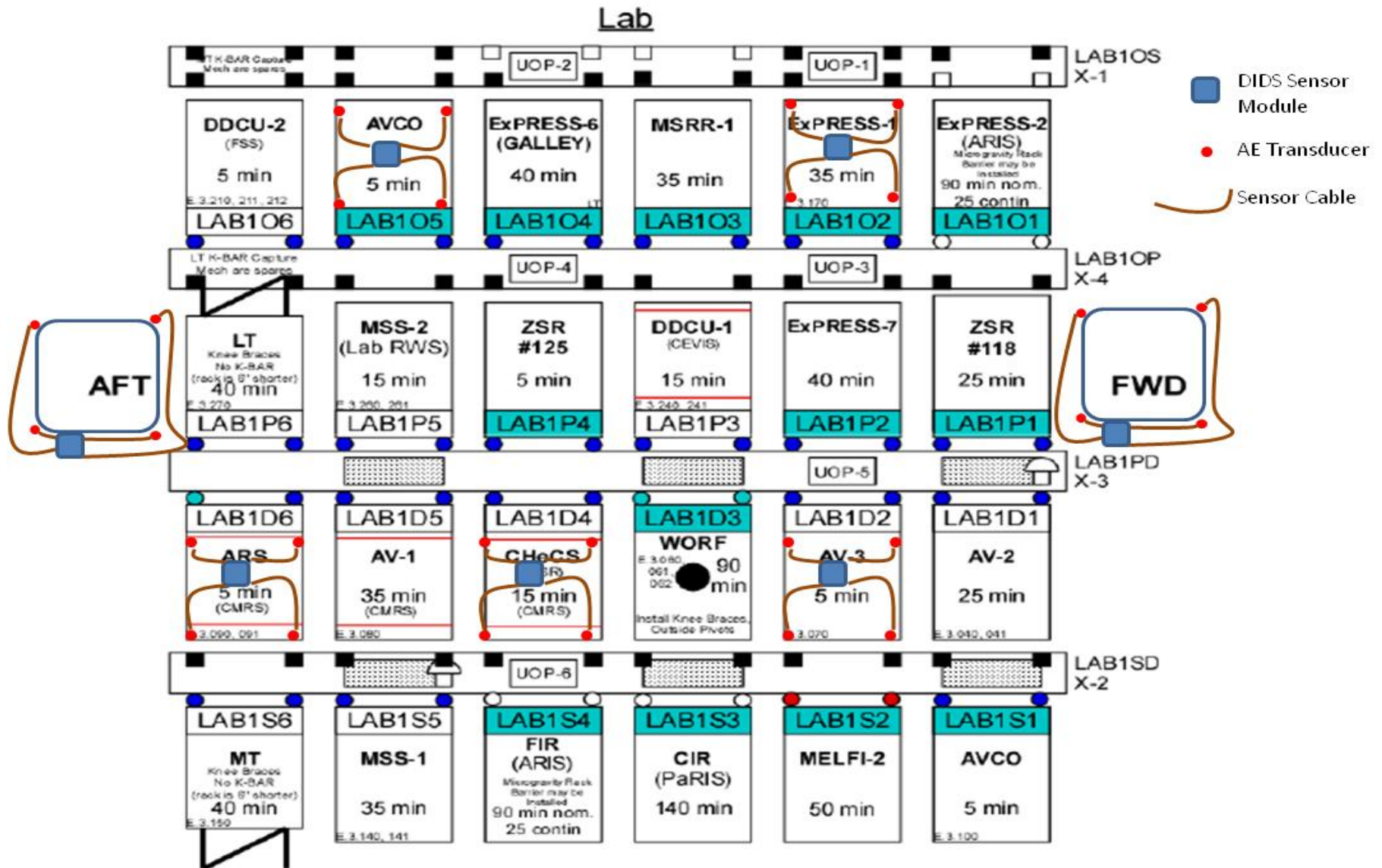
- EMI test results



EMI generated by DIDS



Proposed US LAB Sensor Configuration





Work Completed

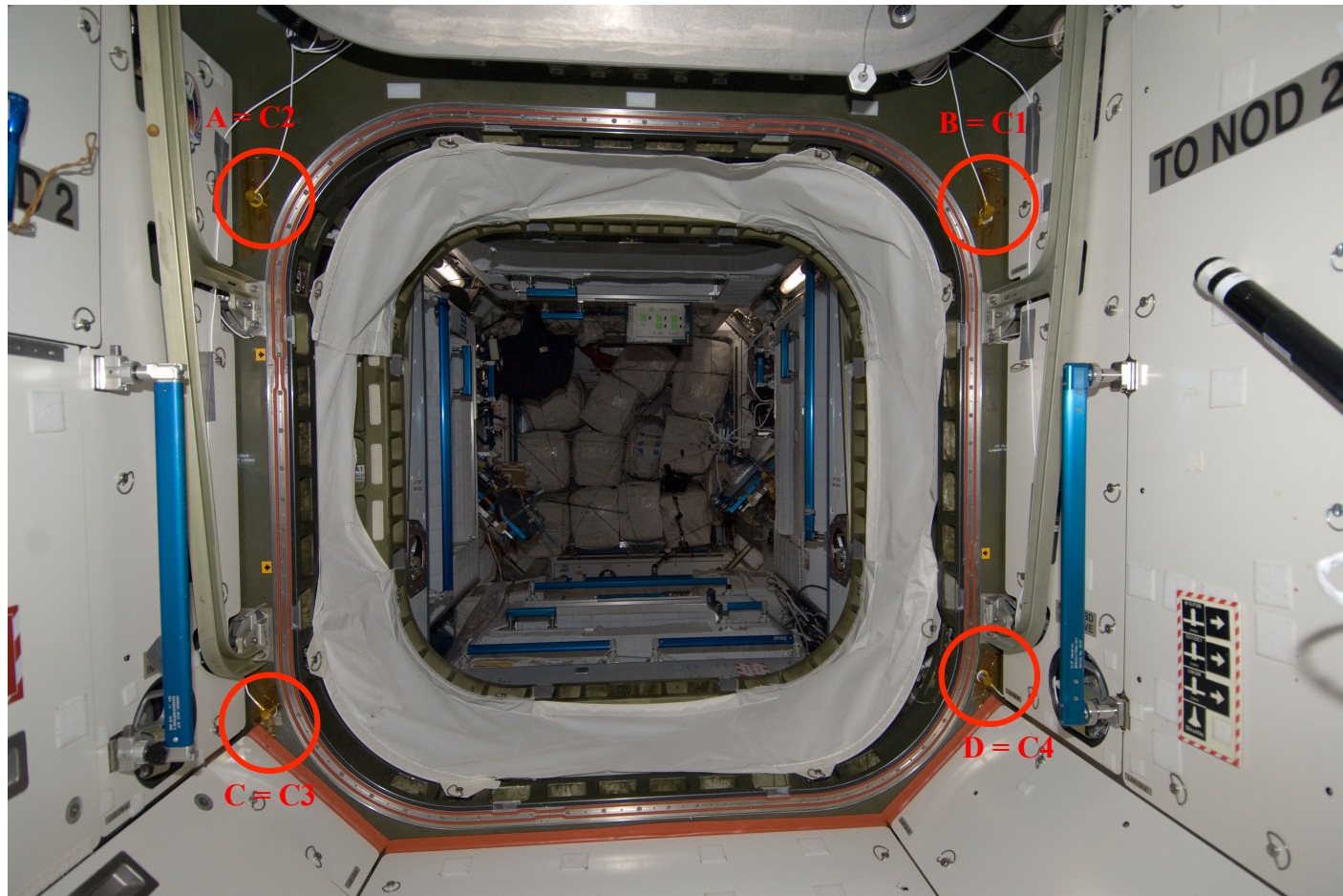
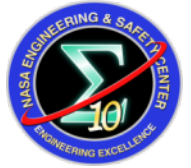


- Shipped to Kourou, French Guiana on 1/6/2011 and subsequently the hardware was loaded onto ESA's ATV2
- It was launched on February 16, 2011.
- A Technical Assessment Report for the NESC was completed in 2011.
- First of seven sensor unit installations in the US Lab occurred on Nov. 14, 2012.
- Sensor system was installed around the US Lab's forward hatchway.
- First data take occurred in Dec. 2013
- Remaining six installations behind rack and around the aft hatchway were completed on Feb. 1, 2013





Photo of Forward Hatch with UBNT Sensors Installed

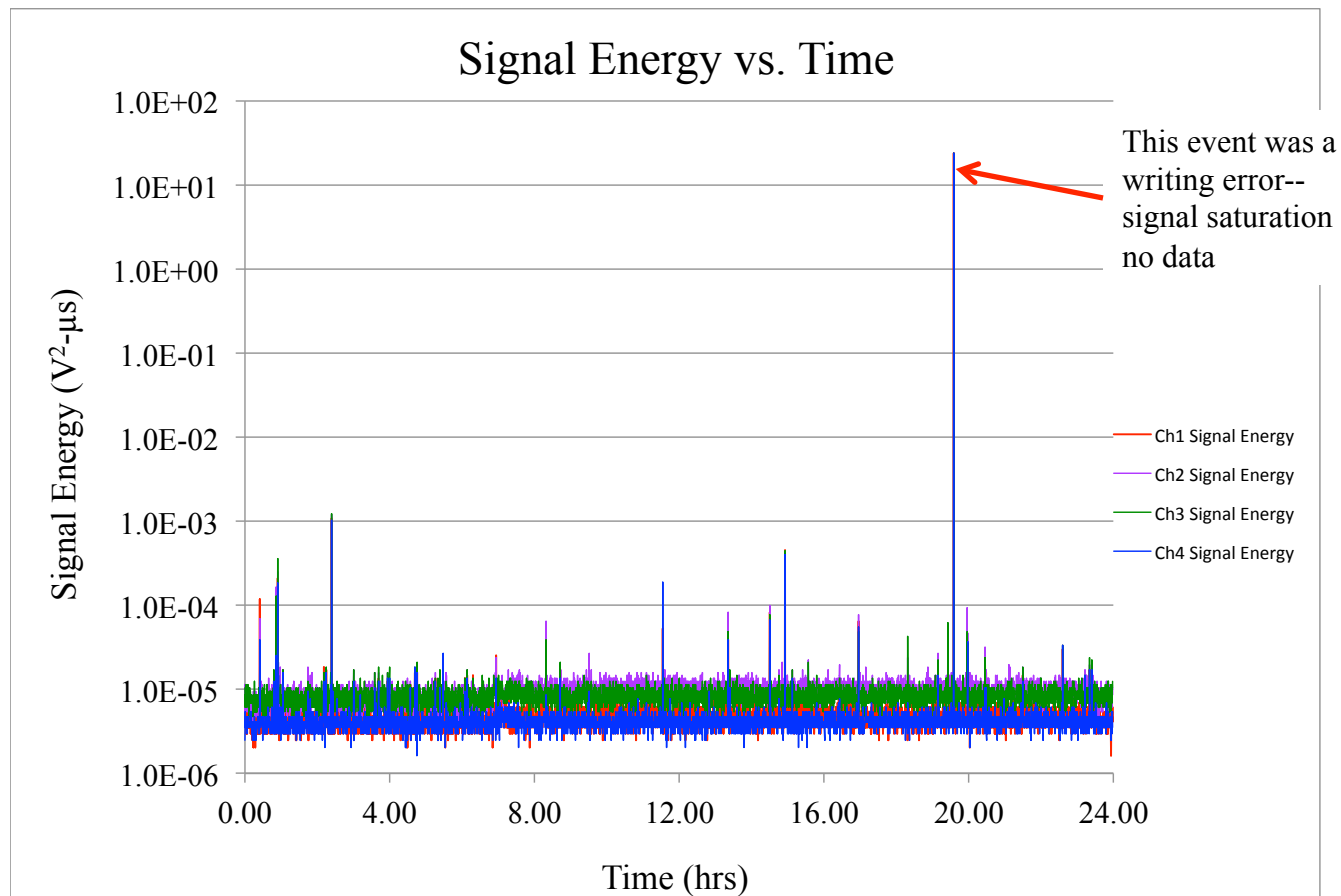


Data recorded on Dec. 12, 2012. Twenty-four hour data take.

This briefing is for status only and may not represent complete engineering information



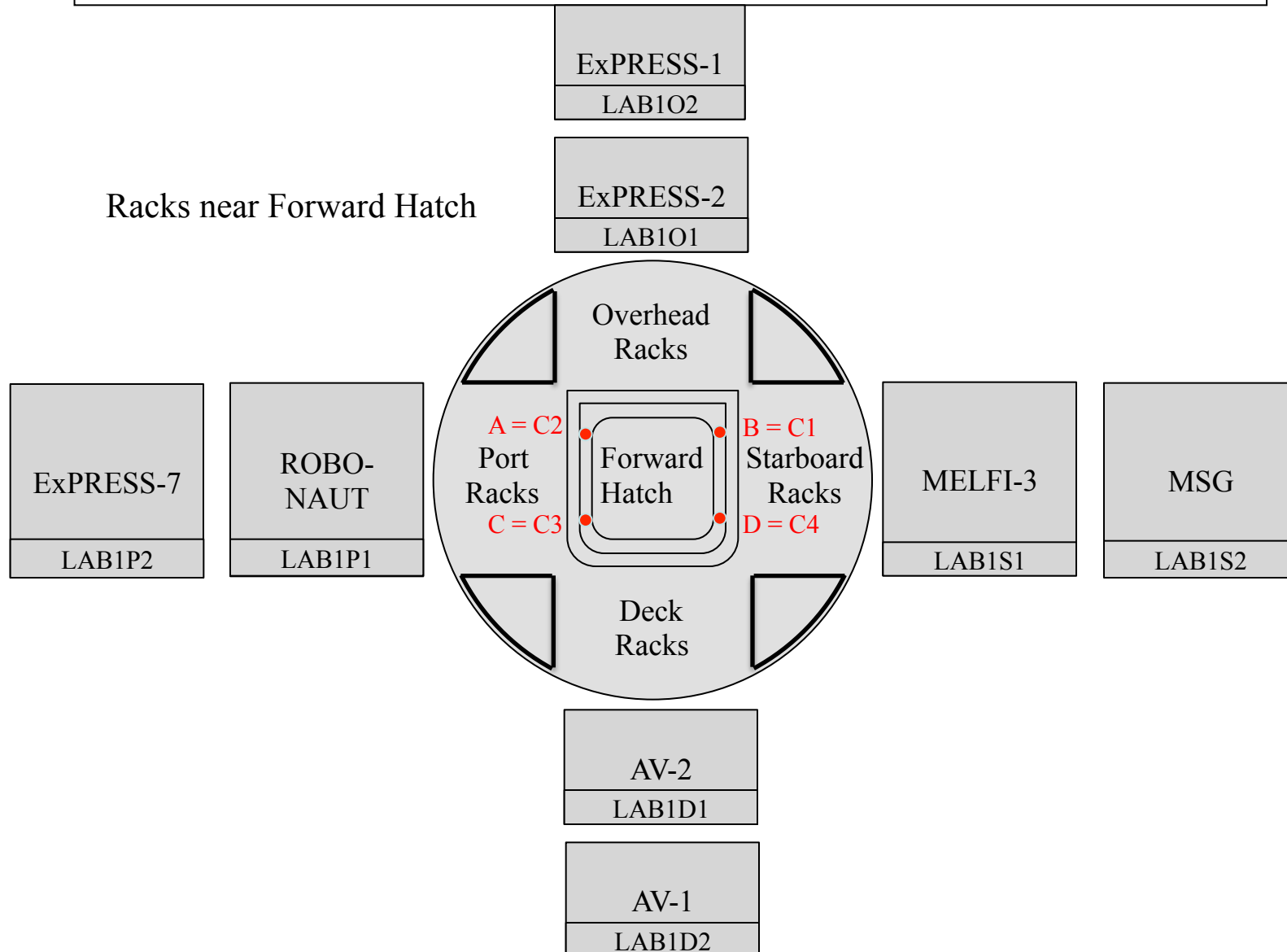
Signal Energy vs. Time



First data -- recorded on Dec. 12, 2012. Twenty-four hour data acquisition.

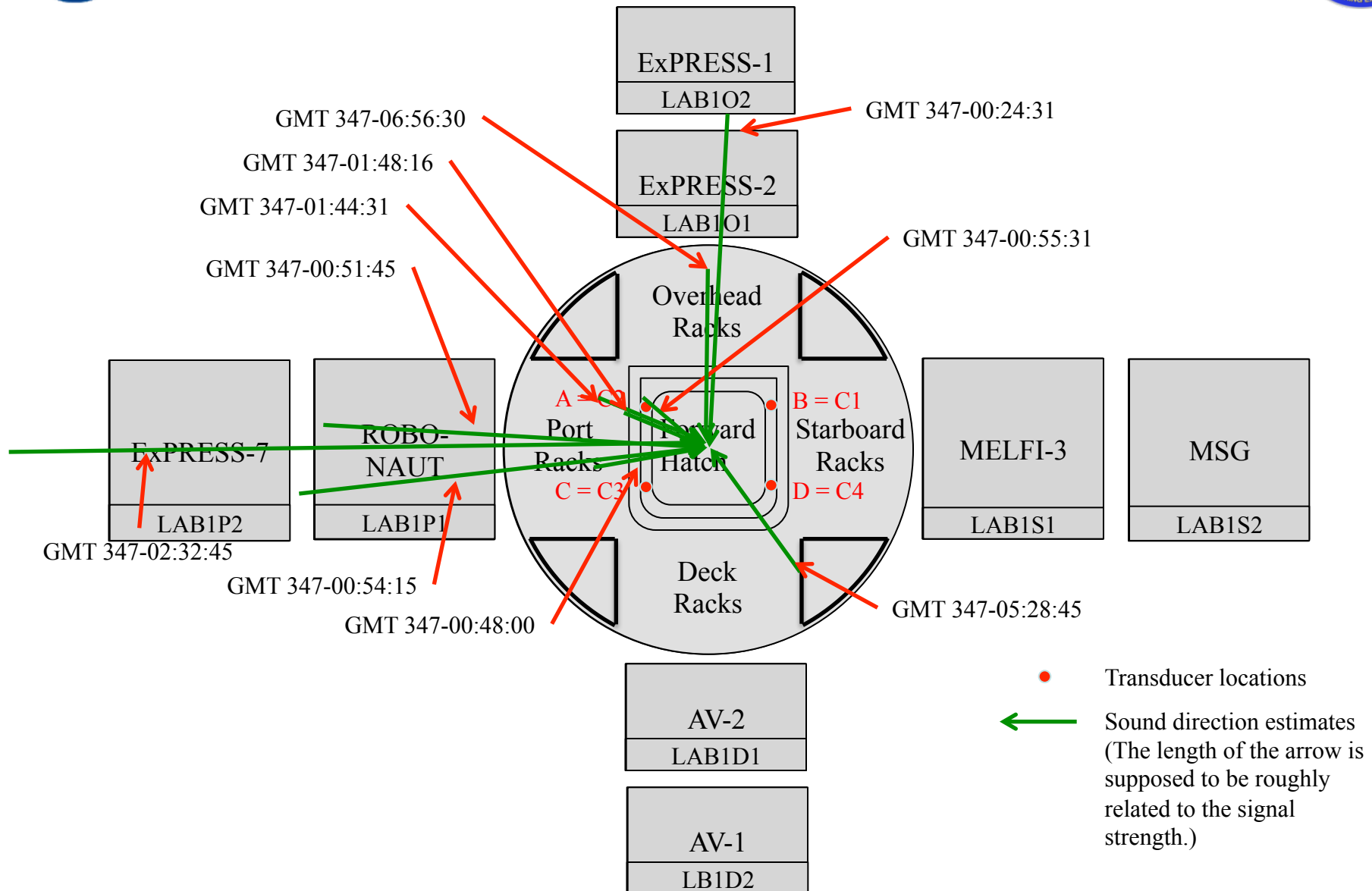


Sensor Locations on Forward Hatch





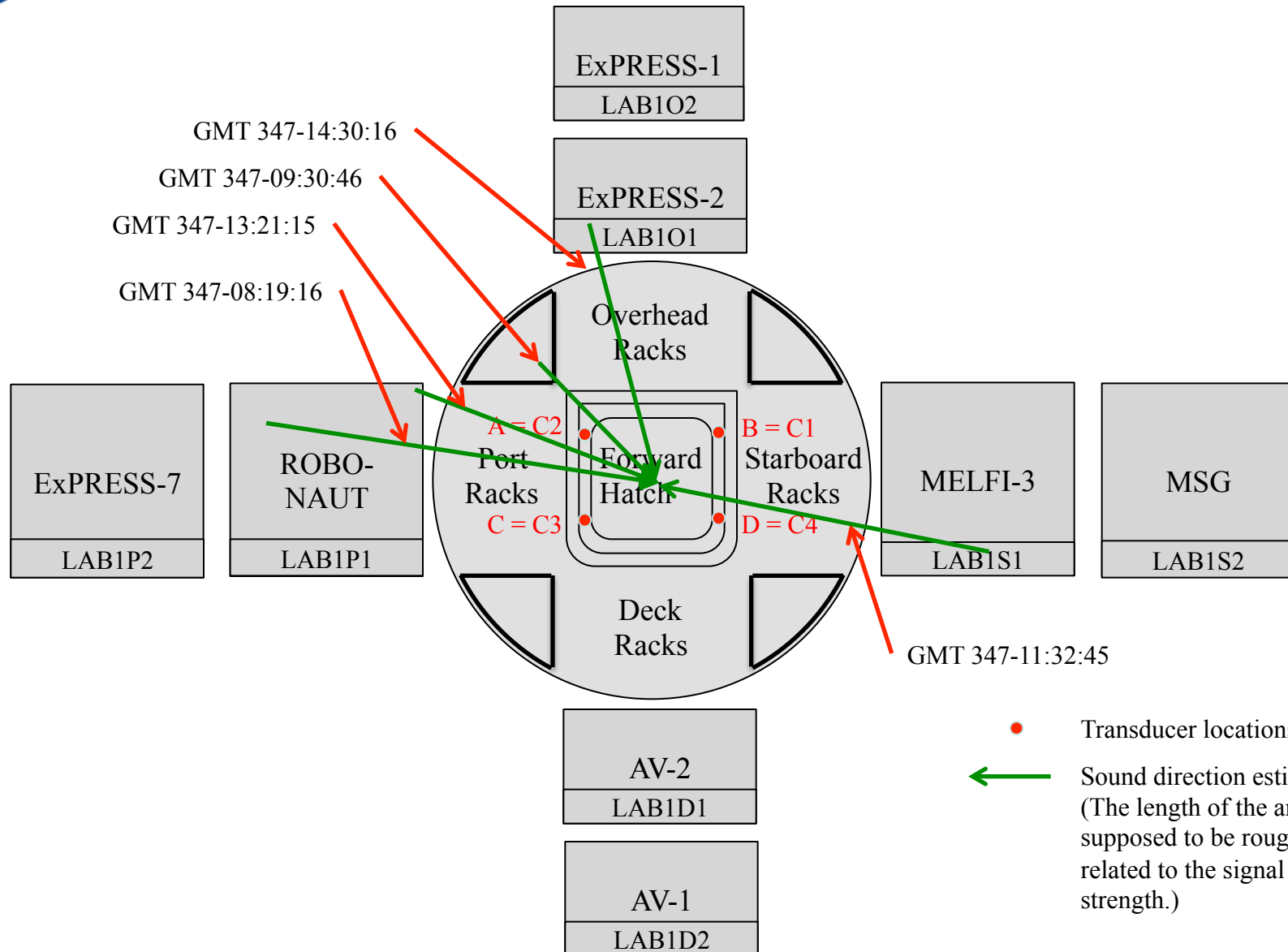
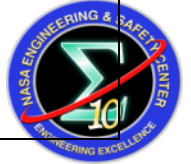
Estimates of Sound Source Directions of Large Events from Midnight - 8:00

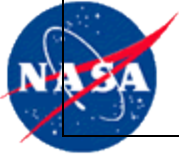


This briefing is for status only and may not represent complete engineering information

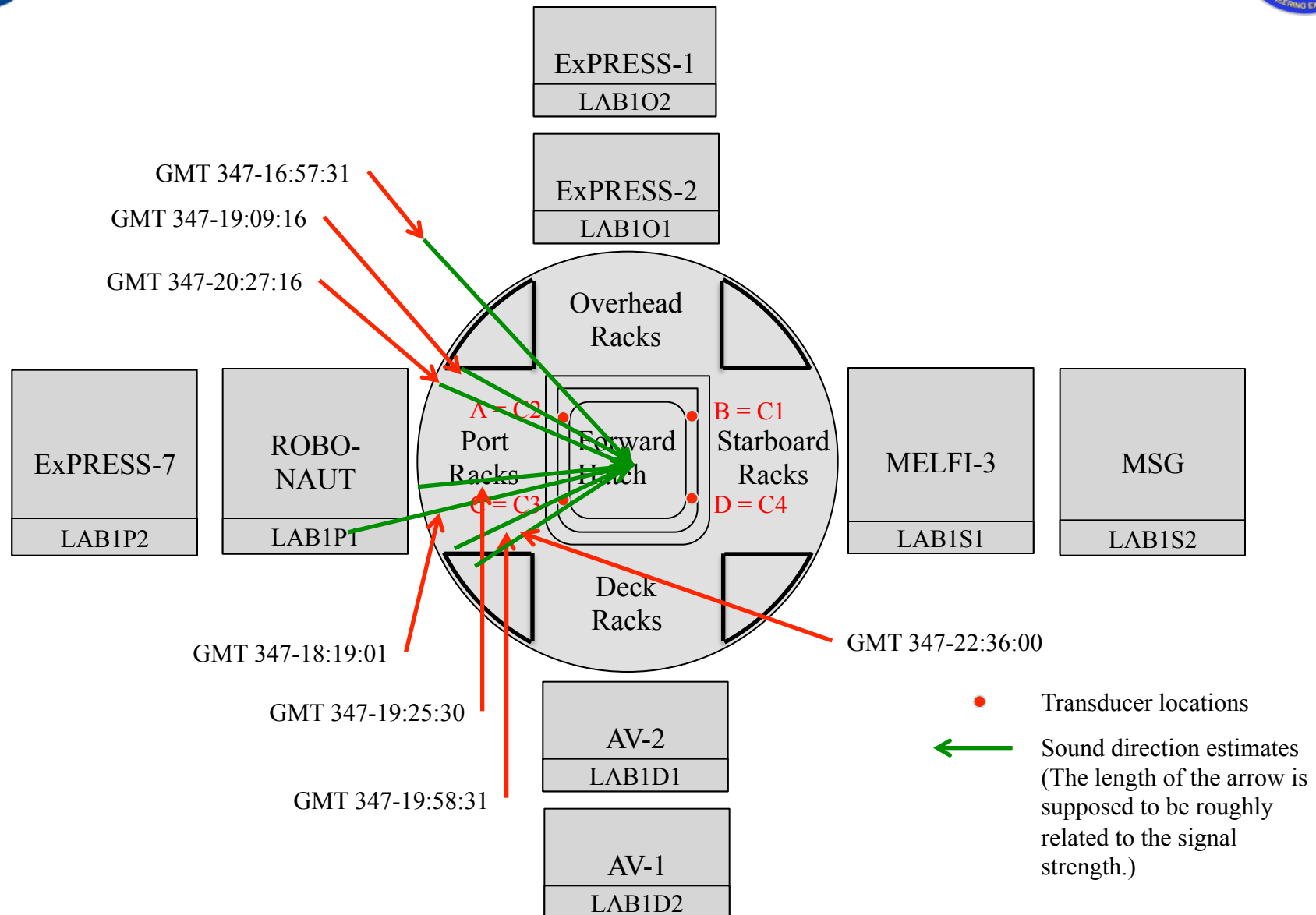


Estimates of Directions of Large Events from 8:00 AM- 4:00 PM





Estimates of Directions of Large Events from 4:00 PM - Midnight

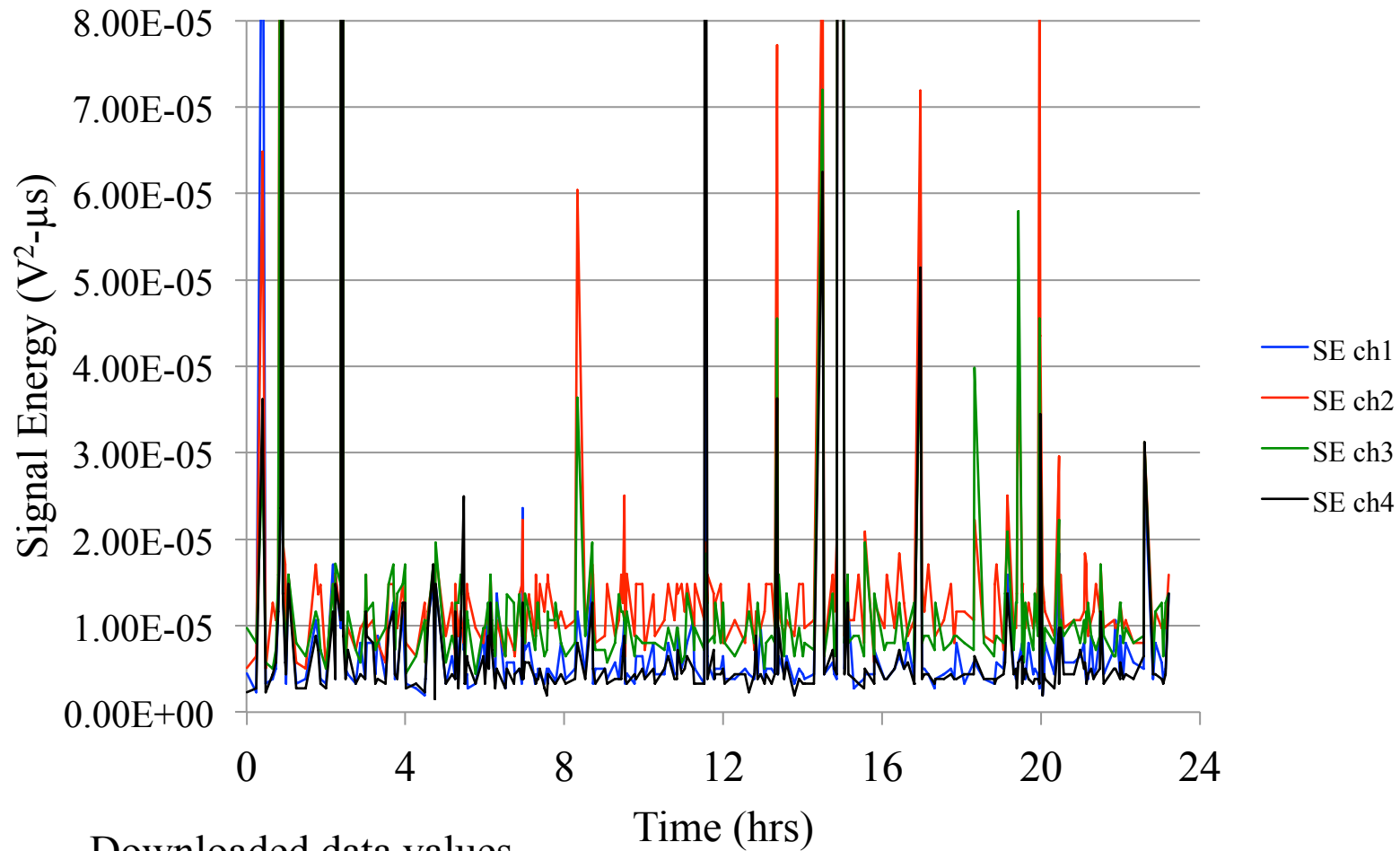


This briefing is for status only and may not represent complete engineering information



Signal Energy vs. Time

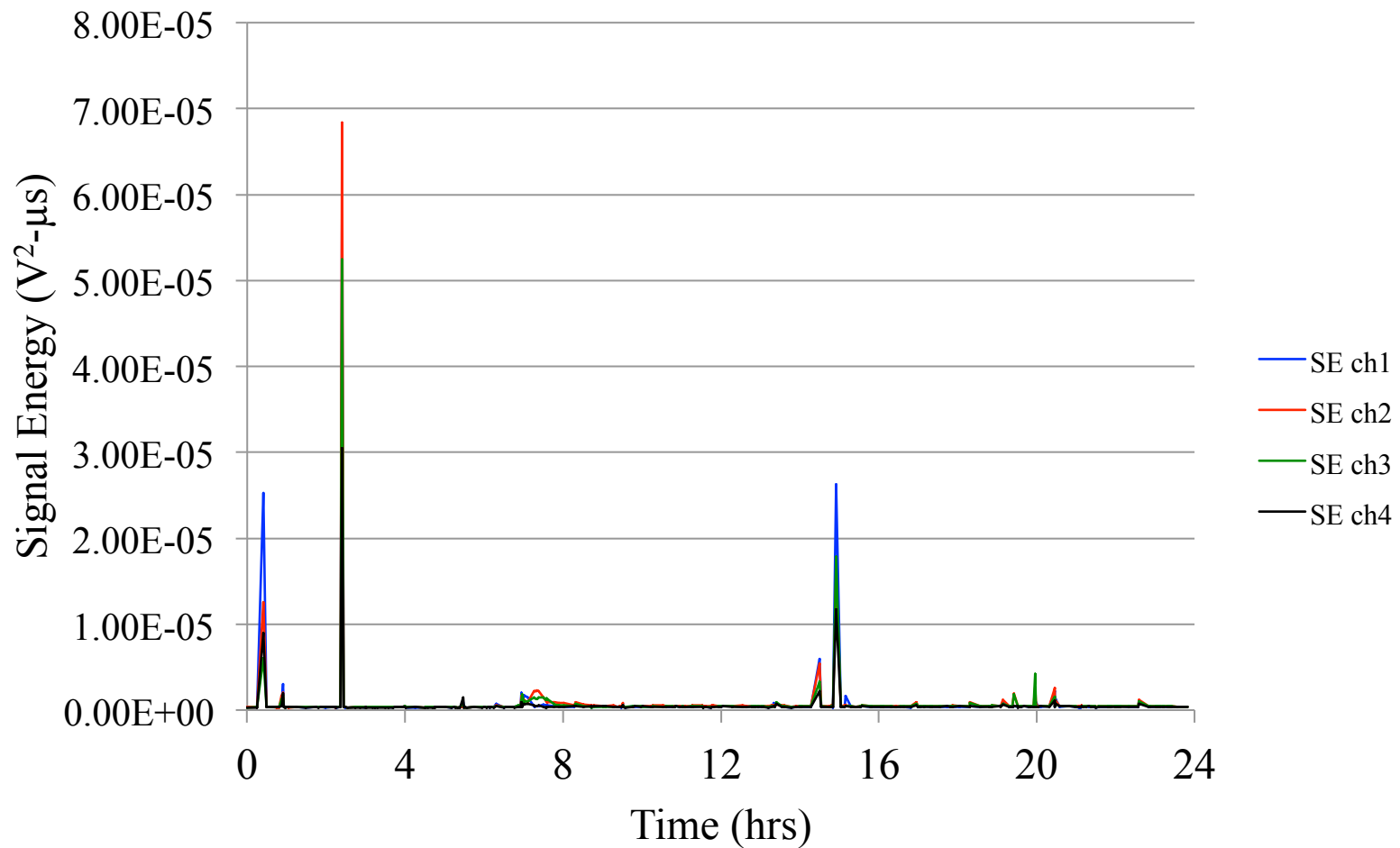
Signal Energy vs. Time





Signal Energy vs. Time

Signal Energy vs. Time



Downloaded data values after 40 KHz filter.



Summary

- With NESC support, a small, light weight, high speed digitizer was further developed to measure background noises on the ISS
- The hardware and software were certified for flight and launched to the ISS in Feb. 2011.
- The first set of sensor units were installed around the US Lab forward hatch in Nov. 2012.
- The first data acquisition from the first sensor unit (around the US Lab forward hatch) was executed in Dec. 2012. (a 24 hours acquisition)
- The data is being analyzed.
 1. Initial analysis shows that the system functions as expected.
 2. No unexpected noise anomalies have been experienced.



Back-up Data

