

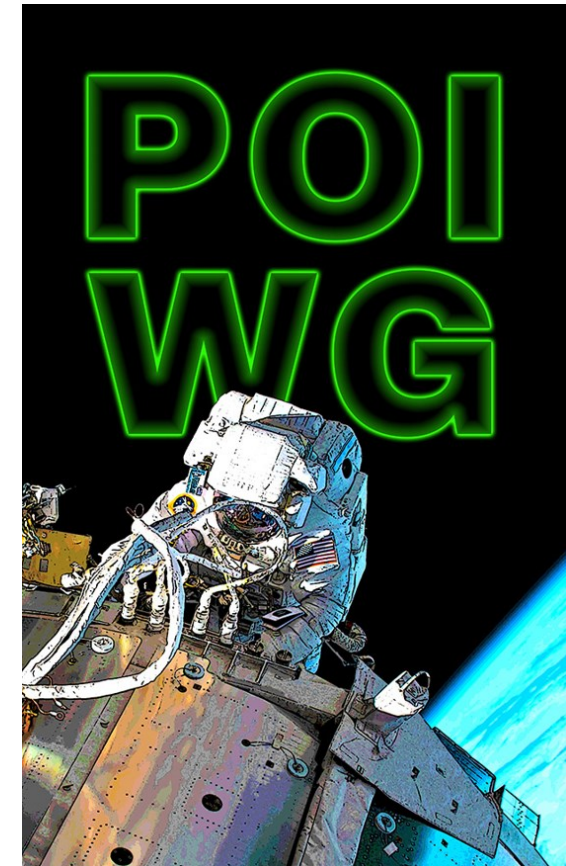


Title: POIWG 52
Splinter Session
Space Acceleration Measurement System (**SAMS**)

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A Voyager Space Company

April 26, 2023





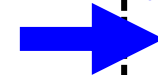
Space Acceleration Measurement System (SAMS)

Outline

1. Brief Overview
2. Topology
3. Customer Support
4. More Overview
5. Microgravity Acceleration Measurement System (MAMS)

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Brief Overview

SAMS Program Goals:

- provide timely and readily-accessible acceleration measurement data
- maintain web archive of the measurement data from the International Space Station (ISS)
- provide routine/daily analysis plus custom routines, plots, and services
- primary customers are scientific payloads & technology developers
- SAMS also plays a key role in daily ISS structural dynamics monitoring

SAMS Capabilities and Services:

- measure the local vibratory regime in **all 3 ISS labs**
- goal is continuous, **24x7** operations (*CIR, FIR, and MSG turn on/off as needed*)
- measurement frequency range: **$0.01 < f < 200$ Hz**

As of 3/17/2023, SAMS had collected **over 699,000 sensor hours (over 18 terabytes)** of data on ISS.

For questions, email: hrovatk@zin-tech.com OR pimsops@grc.nasa.gov



Topology: SAMS Sensor Locations

2023-03-22

National Aeronautics and Space Administration (NASA) Glenn Research Center



Version # Increment 68
Generated On 2022-05-13

Increment: 68

SAMS Sensor Head Locations

- 2 SE F02, COL1A1, ER3, Seat Track
 - 3 SE F03, LAB1O1, ER2, Lower Z Panel
 - 4 SE F04, LAB1P2, ER7, Cold Atom Lab Front
 - 5 SE F05, JPM1F1, ER5, Inside RTS/D2
 - 8 SE F08, COL1A3, EPM, near PK-4
 - 9 TSH-ES09, LAB1S2, MSG
 - 5 TSH-ES05, LAB1S3, CIR
 - 6 TSH-ES06, LAB1S4, FIR
 - 18 TSH-ES18, LAB1O3, MSRR, KERMIT *hard-wired*
 - 20 TSH-ES20, LAB1P4, ER11B, 4BCO2 *hard-wired*
- TSH-ES03, -ES19, stowed spares

LEGEND:

Sensor that does not move

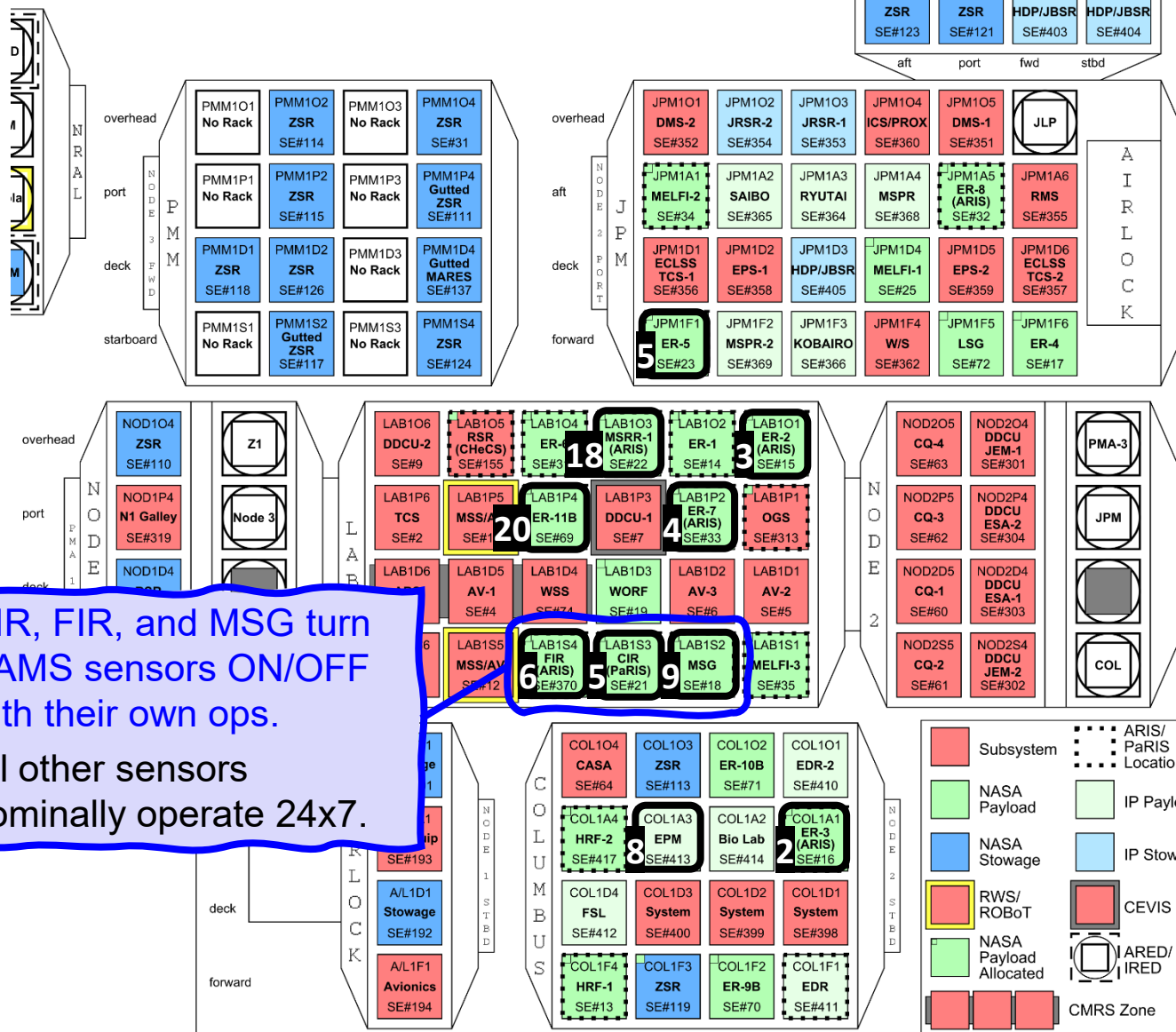
Sensor that has moved or may move

Sensor that has never moved

Stowed or not currently connected

MSG sensor gets installed for some payloads

- CIR, FIR, and MSG turn SAMS sensors ON/OFF with their own ops.
- All other sensors nominally operate 24x7.





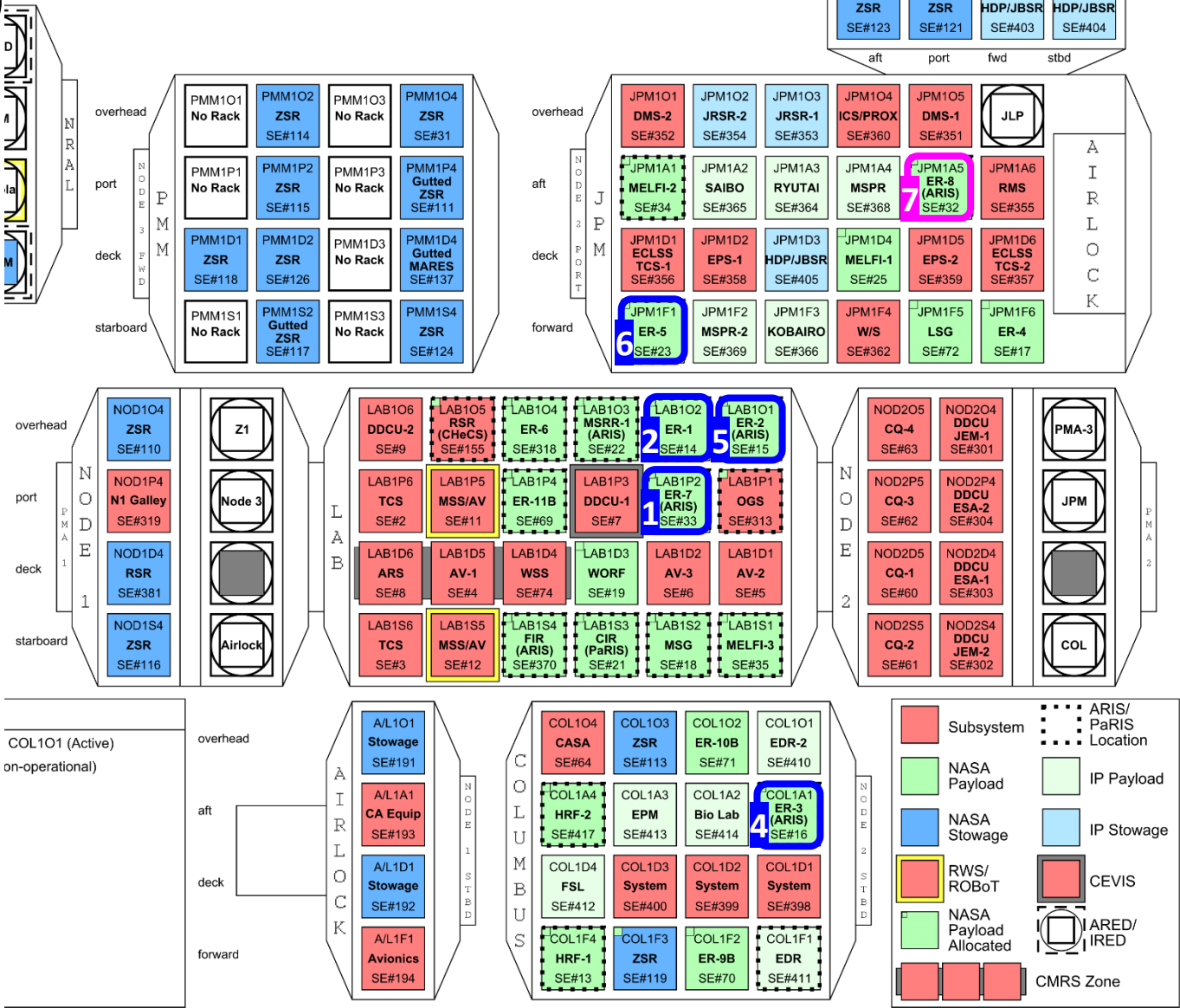
Version # Increment 68
Generated On 2022-05-13

Increment: 68

Topology:
SAMS Electronics Enclosure (EE)
Locations 2023-03-22

Code	EE	Location	Rack	Type
1	EE-F01	LAB1P2	ER7	embedded
2	EE-F02	LAB1O2	ER1	RTS/D1
6	EE-F06	JPM1F1	ER5	RTS/D2
4	EE-F04	COL1A1	ER3	embedded
5	EE-F05	LAB1O1	ER2	embedded
7	EE-F07	JPM1A5	ER8	embedded

As of GMT 2023-03-22, this EE is not hosting any sensors and is not powered





Gantt Chart



Heat Transfer Host wil not need SAMS (using PLDR)



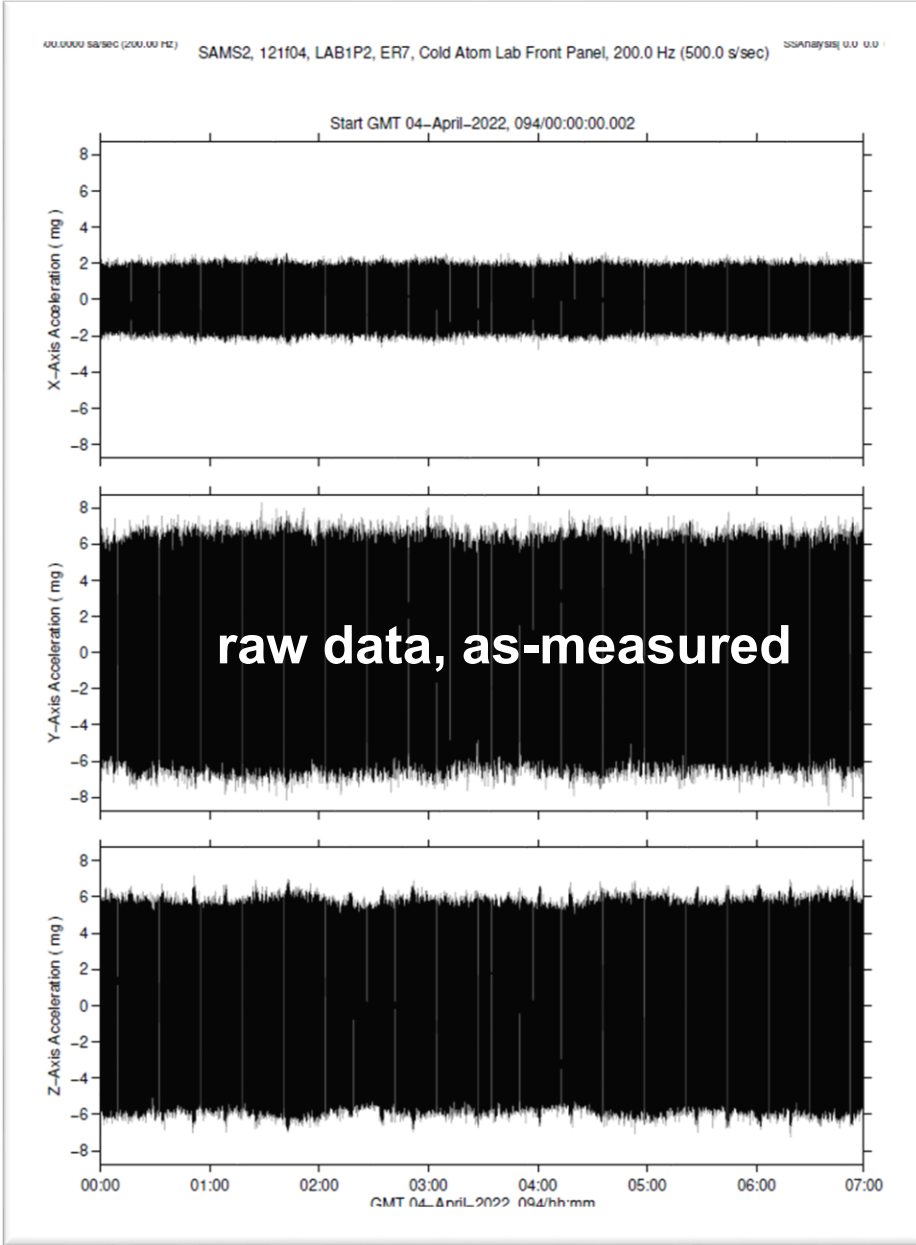
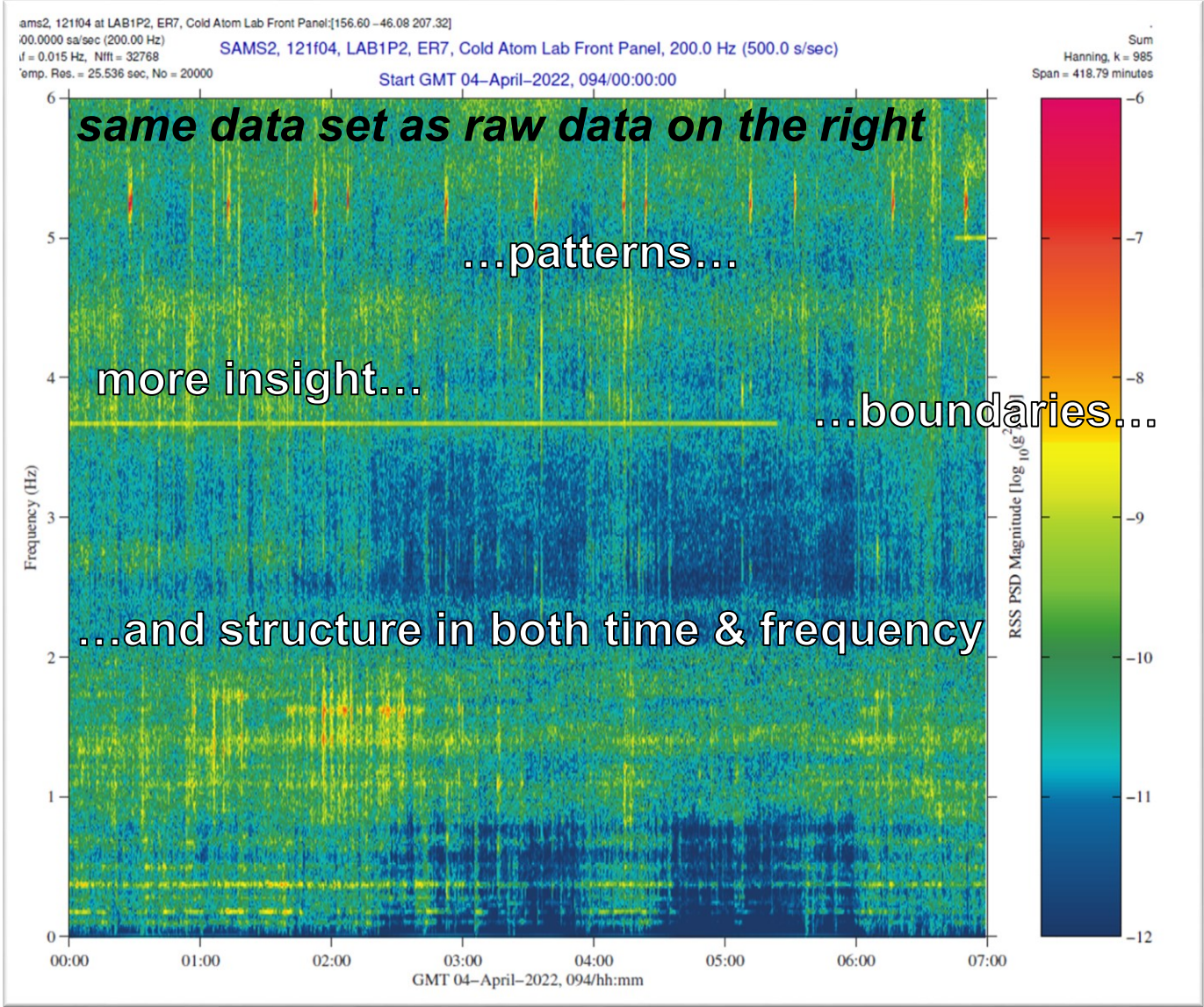
More Overview

If I want to...	then...
download SAMS data	visit https://gipoc.grc.nasa.gov/pims/pub/pad -- <i>e.g. use the vibration measurements recorded by SAMS in your own models or correlate with your results</i>
read the binary acceleration data files	visit the link shown just below here to see <i>how you can start working with acceleration data</i> https://gipoc.grc.nasa.gov/pims/plots/user/mohan/how2read_pad_binary_files.html
browse daily summary “roadmap” plots	visit https://gipoc.grc.nasa.gov/pims/roadmap -- <i>these roadmap plots show patterns, structure and boundaries in both time and frequency; these are updated daily</i>
browse acceleration handbook pages	visit https://gipoc.grc.nasa.gov/wp/pims/handbook -- <i>these are a collection of PDF files that briefly quantify & qualify various events, activities and various aspects of the microgravity acceleration environment</i>
monitor vibratory environment, near real-time	visit https://gipoc.grc.nasa.gov/wp/pims/current-real-time/



More Overview

Why use spectrograms for near real-time monitoring?





More Overview

If I want to...

browse cache of last 2 days of near real-time spectrogram plots

then...

visit <https://gipoc.grc.nasa.gov/pims/plots/user/buffer> --
links to recent, 2-day buffer of real-time spectrogram plots updated every half hour

...and again, these show patterns, structure and boundaries in both time and frequency

GMT 07-Apr-2022

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EXAMPLE

For the link above, the screenshot shown to the left was taken at GMT 07-Apr-2022/10:32, so you see these links for the day up to 10:30 on a per-sensor basis. These are hyperlinks and if you scroll down that page, then you would see all other active SAMS sensors plus another full set with links every half hour for the previous day too. This gives users a buffer of time to check recent data.



Microgravity Acceleration Measurement System (MAMS)



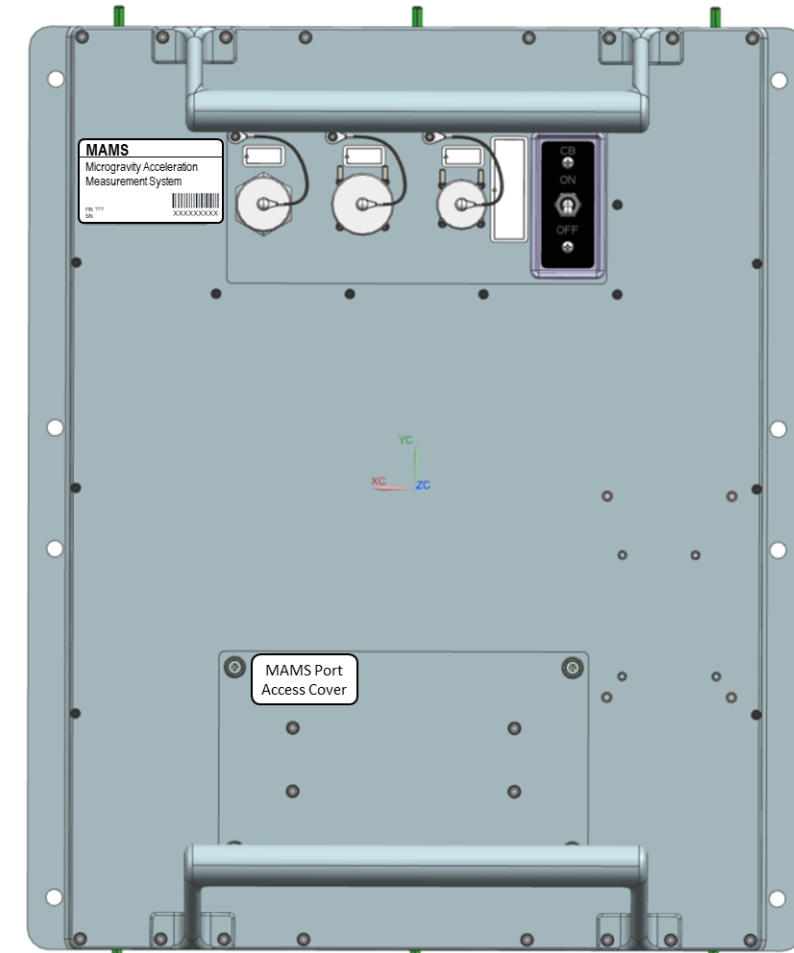
Original MAMS Hardware photo

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New MAMS Hardware sketch



Microgravity Acceleration Measurement System (MAMS)

Capabilities:

- Provides centralized measurement of the quasi-steady (low-frequency, low magnitude) portion of the acceleration spectrum (below 0.01 Hz) to complement SAMS (> 0.01 Hz).
- Designed for continuous, 24x7 measurement similar to SAMS.
- Measurements can be mapped mathematically to an arbitrary location. This assumes that the space station is a rigid body at low-frequencies.

History & Future:

- Launched on STS-100/6A on April 19, 2001 with nearly flawless, nearly continuous operation on the ISS from GMT 2001-05-03 to 2017-04-22. MAMS collected over 217,615 sensor hours (5 TB) of data in that span. Currently on the ground being re-furbished at ZIN Technologies in Cleveland, Ohio.
- Customers are anybody interested in the quasi-steady environment, and we have heard from at least 3 high-profile payloads wanting MAMS support already: ZBOT-NC, Cold Atom Lab and GTCS.
- Manifested on NG-20 (**Increment 70**), to be located in ER-6 (LAB1O4).