Section 1

Microgravity Environment /Acceleration Measurement Program Overview

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Microgravity Environment Program

What is the Microgravity Environment Program (MEP) charter?

We provide the following services:

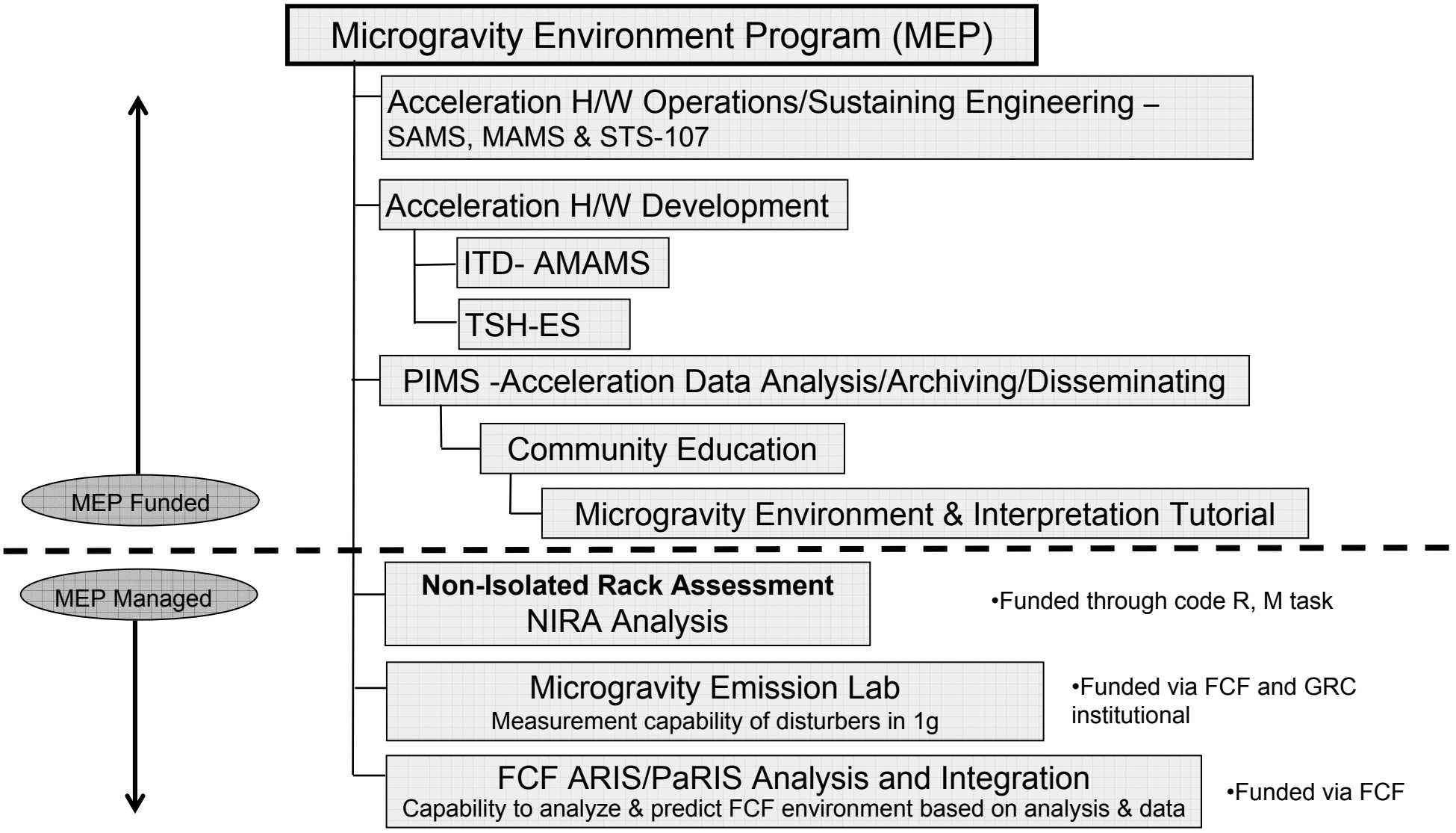
- Acceleration Measurement Instruments for space and ground applications
- Detailed acceleration data analysis
- Platform Environment Characterization (identification of disturbers)
- Environment education
- Support for ISS microgravity requirements verification with dynamics emissions characterization testing and payload analysis techniques/processes.
- ARIS/PaRIS integration and analysis
- Non-Isolated Rack Assessment - NIRA

Our customers include:

- Principal Investigators
- Crew Members
- Payload Developers
- Vehicle Developers

We are sponsored by NASA's Code U microgravity program.

Microgravity Environment Program at NASA Glenn Research Center



GRC Microgravity Environment Program Organization

Microgravity Science Division
Chief - Jack Salzman
Deputy - Steve Simons

Engineering Directorate

Structures Branch
Chief - Rick Manella
MEL Manager – Anne McNelis
NIRA Lead – Bill Hughes

Microgravity Environment Branch
Chief - David Francisco
Program Manager - David Francisco
Discipline Scientist - Richard DeLombard

ARIS/PaRIS Integration (FCF)

Integration Manager – Kathy Shepherd

Space Acceleration Measurement Systems (SAMS)

SAMS Project Manager – Bill Foster
STS/Ground Lead – Ron Sicker

Principal Investigator Microgravity Services (PIMS) Project
Project Manager - Kevin McPherson
Project Scientist - Kenol Jules

ZIN Technologies

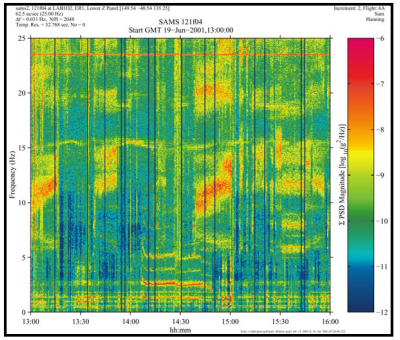
Microgravity Program Manager – Carlos Grodsinsky
SAMS Project Manager – Ray Pavlik
PIMS Lead – Nissim Lugasy
ARIS/PaRIS Lead – John Heese

Microgravity Environment Program History

- **Space Acceleration Measurement System (SAMS) – 15+ yrs**
- Missions supported on Sounding Rockets, STS, Mir
  - SAMS has characterized 20+ flights on STS & 3+ years on Mir
    - Flown on sounding rockets
  - OARE - Low frequency measurement system flown 12 times on STS
- International Space Station (ISS)
  - SAMS- II - The Vibratory Acceleration Measurement System for ISS
    - Launched on 6A
    - Operational since June 2001
  - MAMS **- Microgravity Acceleration Measurement System –**
  - Low frequency measurement system for ISS plus vibratory to 100 Hz
    - Launched on 6A
    - Operational since May 2001 – 15000+ hours of operation
- **PIMS- Principal Investigator Microgravity Services**
  - Processed over 1900 user requests and documented over 20 flights, 5 flight platforms, and multiple ground based platforms
  - Near real time ISS data on WEB, Increment reports complete
  - 6th MEIT, 21 MGMGs

SAMS on STS

SAMS II - ISS

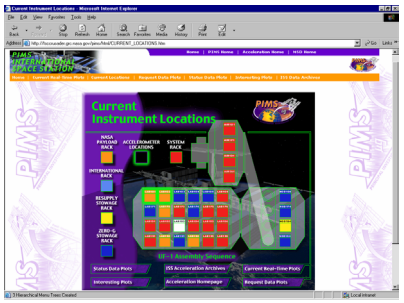


PIMS Data Processing

PIMS- Principal Investigator Microgravity Services

– Processes, analyzes, documents and disseminates real time data via the WEB and Increment Reports.

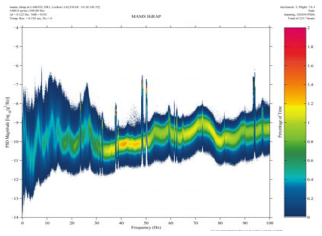
Real time data via the WEB
1000+ hits /month
http://pims.grc.nasa.gov/



Customized Data Analysis

-Principal Investigators

-Vehicle Systems



Neural Network Output

-Automatic categorization of disturbance signatures

-System designed, developed & operational

Reports

-Increment 2 Quick Look
-Increment 2 Report
-Increment 3 Report
-1 Year Summary Report
-Space Studies Board report on extended ISS-Shuttle operations
-Over ½ terrabyte of data archived

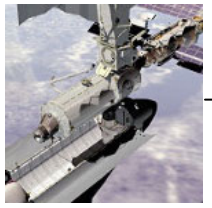
PIMS Software was 1st runner up for the NASA Software of the Year Award – Space Act Award

ISS Environment Measurement and Characterization

Crew Awake/Sleep

Progress Dockings

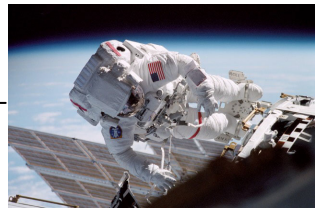
ISS Systems & Science Operations



Shuttle Dockings

Crew Exercise

ISS Vehicle Attitudes
XPOP Attitude
Torque Equilibrium Attitude



EVAs

SAMS New Sensor Developments

Two new sensors under development

ITD – AMAMS - MEMS μg Sensor Development

- Reduces volume by 33%.
- Cost < $2500, 85% reduction.
- Reduces power by 50%.
- Sensor selected, tested, engineering model designed and assembly in progress.

Triaxial Sensor Head -ES

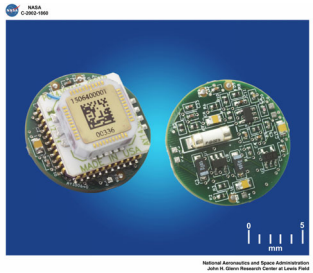
-Ethernet standalone sensor.

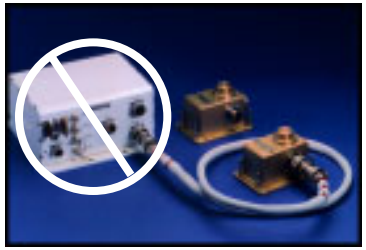
-Replaces EE and SE with one unit.

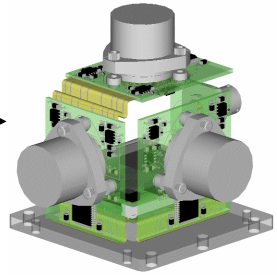
-Reduces two boxes to one

-Volume savings of 6 to 1.

-Engineering model built, delivered to FCF and in testing.







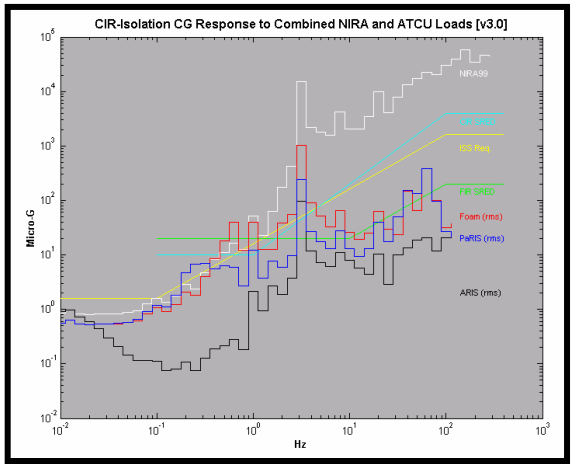
Microgravity Environment Program

- Support for ISS microgravity requirements verification by testing and analysis.

- Testing
  - Dynamics Emissions Characterization by utilizing the Microgravity Emissions Laboratory (MEL). The MEL utilizes a 6 DOF inertial measurement system, capable of characterizing disturbances (down to 0.1 μg's) of the space-flight hardware.

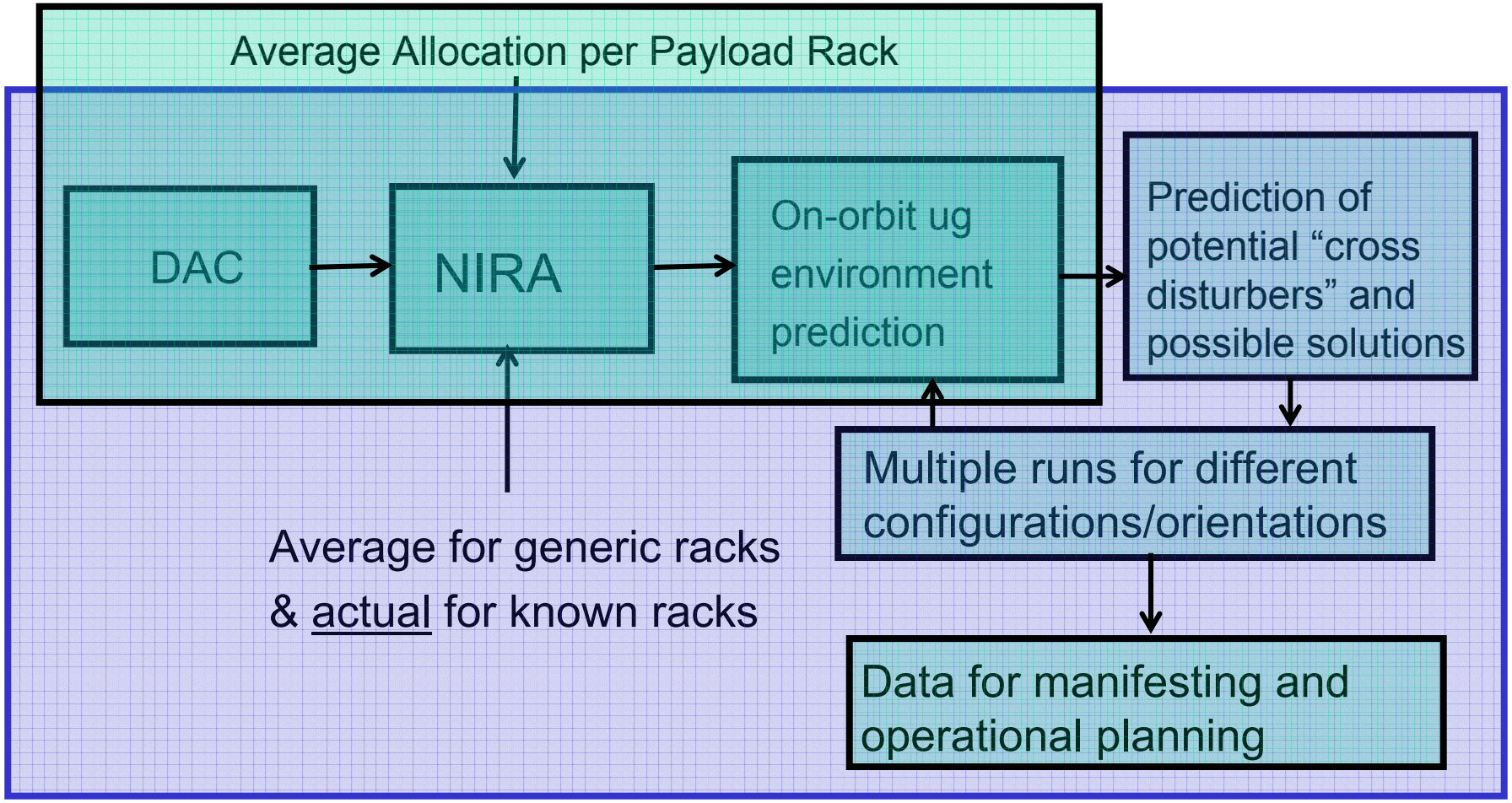
- Analysis
  - Payload analysis techniques/processes for ISS microgravity verifications which includes:
    - PIRN 110H and ARIS Rack level allocations
    - Microgravity isolation approaches and integration processes
    - ARIS, Passive vs Hardmount comparisons
    - Verification/validation approaches and model requirements

Middeck locker suspended in the MEL



Comparison of Isolation techniques for FCF CIR

Non-Isolated Rack Assessment



Microgravity Environment Program

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