Solar Probe Plus

A NASA Mission to Touch the Sun

Integrated Science Investigation of the Sun
Energetic Particles

Preliminary Design Review

05 – 06 NOV 2013

Ground Support Equipment

Reid Gurnee

Board-Level GSE

- Each lead engineer is responsible for developing their own board-level GSE.
  - **Power Board**: Load board, active load, HV load, breakout box, breakout board, I2C stimulus
  - **Event Board**: energy and TOF preamp boards, event board, test port box, breakout box, I2C slave, commercial pulsers
  - **Anode Board**: Commercial pulsers, scope, HV power supply
- All GSE is peer reviewed and XXX (talk to Jim Burgum)

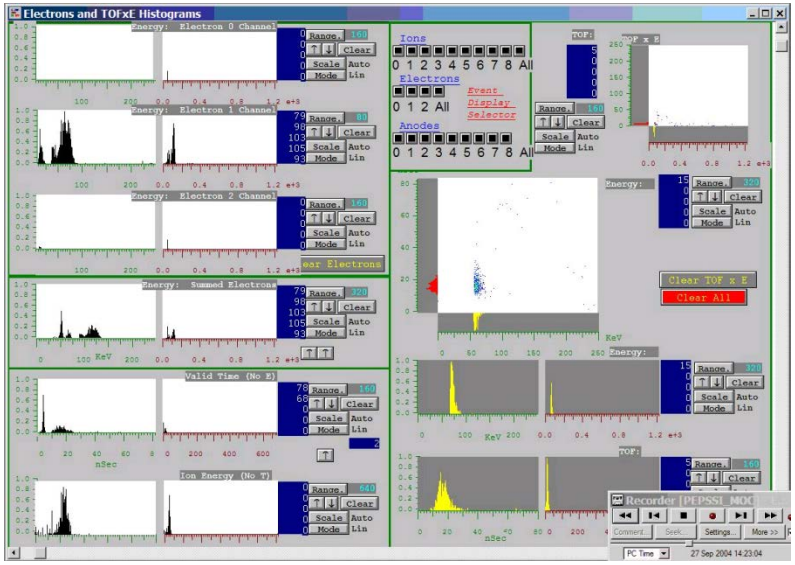
Need EPI-Hi inputs

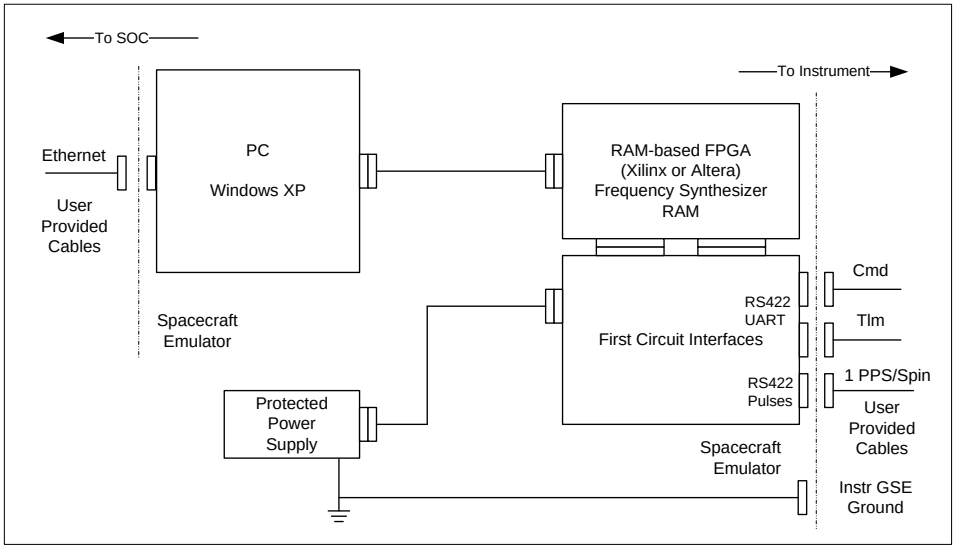
Spacecraft Emulator

- Mini emulator
  - Provides Instrument Data Interfaces only, No Power Interfaces, No Temperature Interfaces
  - Also provides 1PPS and Gated_PPS Interfaces for Instrument EGSE
  - GSEOS Interface is fully compliant
  - Non-flight use only
- Full emulator
  - Provides Instrument Data, Power and Temperature Interfaces
  - Also provides 1PPS and Gated_PPS Interfaces for Instrument EGSE
  - Designed for use with Flight hardware
- GSE verification performed by project
- QTY provided to ISIS?

GSEOS

- Common GSE software for all instruments
- Display screens and instrument customizations can be used through all development cycles from bench testing, I&T deployment, to flight operations
- Same platform used for EM, Flight, and Spacecraft operations
  - Test scripts can be developed by individual teams, tested on EMs, and then executed at the S/C level
- Software verification performed by project



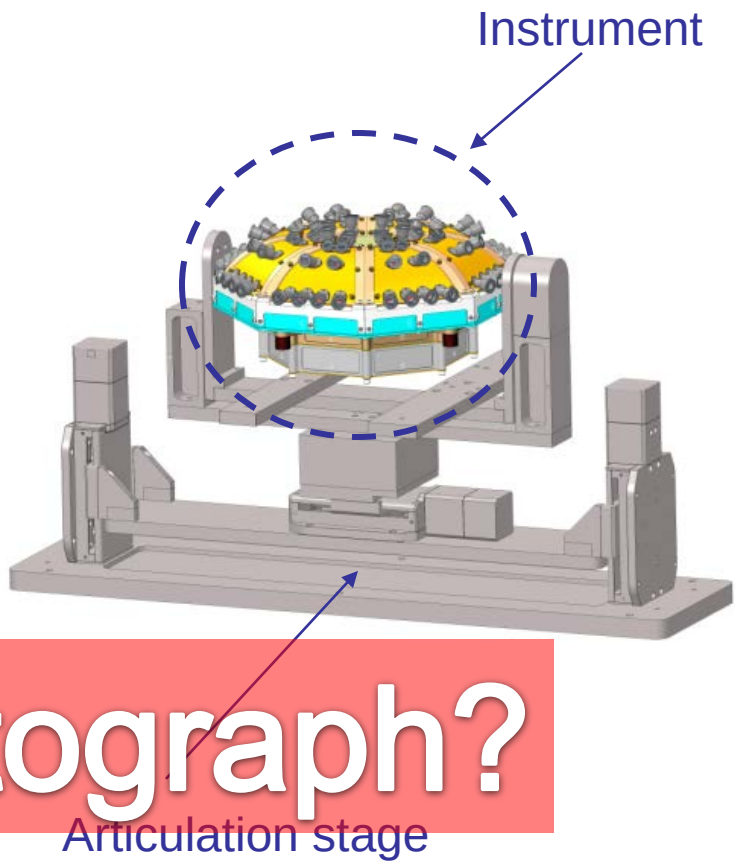


Safe / Arm plugs

- EPI-Lo has a HV air-safe plug
  - When installed HV is limited to air safe levels
  - Plug will be removed for S/C TV testing
  - Plug will be permanently removed during final closeout
- EPI-Hi???
- Instrument covers
  - ISIS instruments will have red-tag covers to protect the apertures
  - Covers will be temporarily removed for S/C TV testing
  - Covers will be permanently removed during final closeout

Calibration GSE for Instrument Articulation

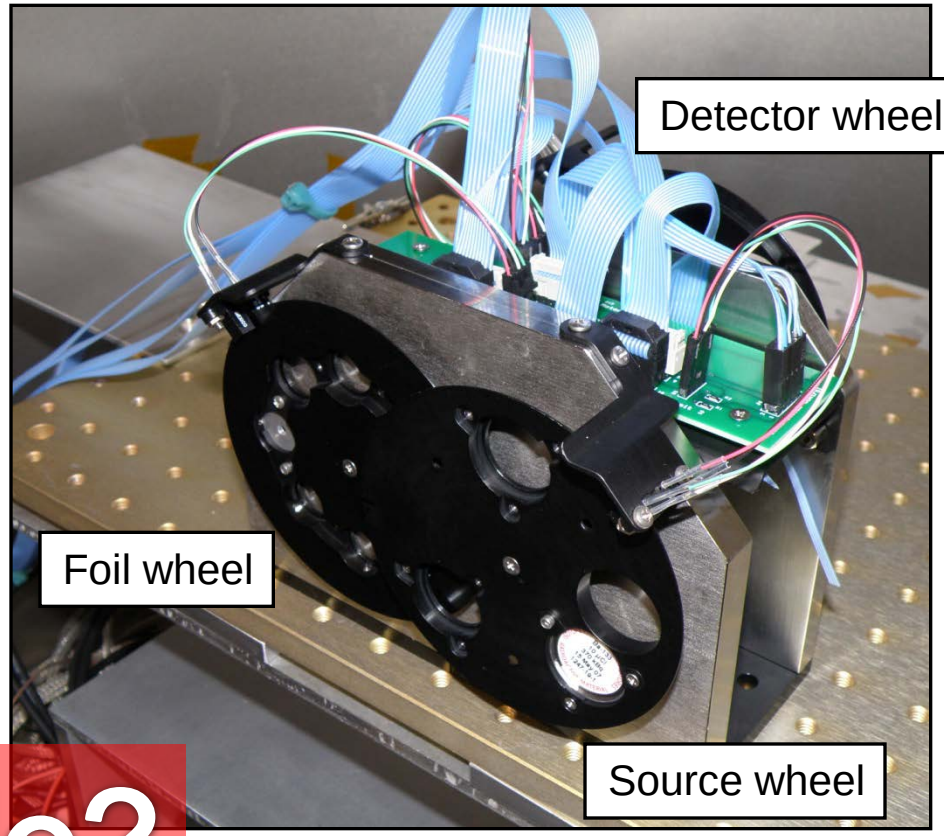
- Requirements
  - Use in APL accelerator facility
    - Vacuum compatible (low outgassing)
  - Accommodate vertical and horizontal-mount instrument with open doors
  - Cover full FOV
- Status
  - Specified and purchased custom system from Newmark Systems
  - Received January ‘09
  - Fit tested with instrument
  - Remote software interface under development
- Future Work
  - Make small modifications for mounting
  - Test with mass prototype and EM instrument



Photograph?

Calibration GSE for Beam Generation

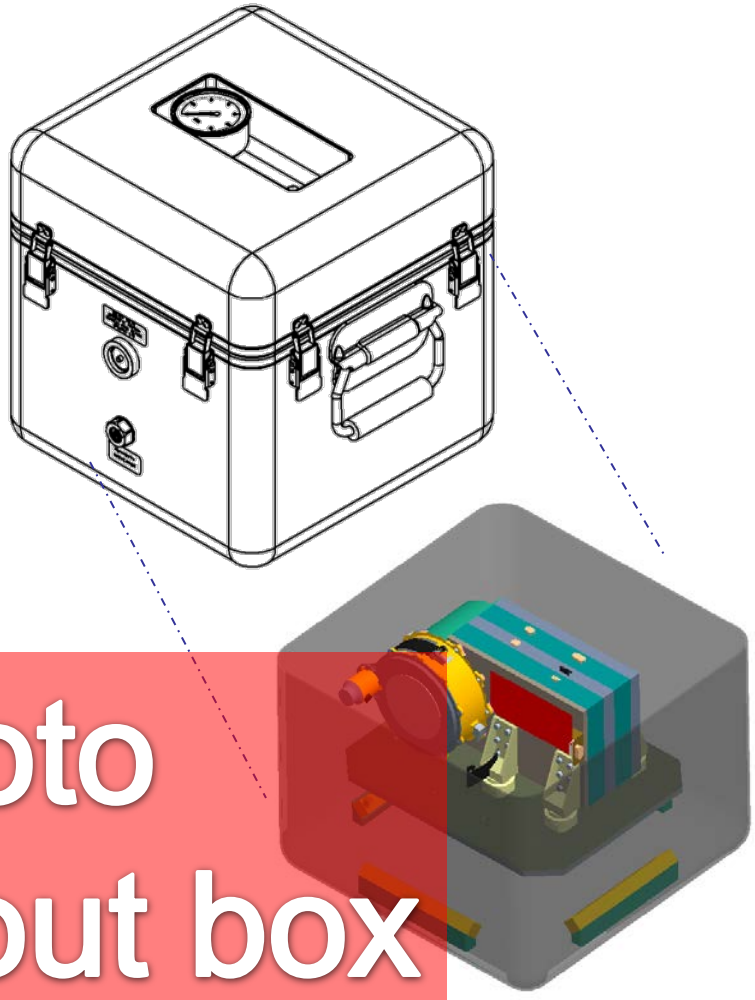
- Requirements
  - Use in APL calibration facility with particle accelerator
    - Vacuum compatible (low outgassing)
  - Allow user to select ion or electron calibration source and intensity
  - No stray light from optical switches
- Status
  - Designed and built custom system
    - Three-wheel implementation
    - Optical switches off when not homing
  - Installed and in use in APL facility



Optional slide?

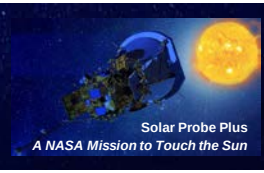
Mechanical GSE

- Shipping Container
  - Requirements
    - N2 purged, humidity controlled and monitored
    - Low outgassing
    - Shock mounted and monitored
    - Hermetically sealed with pressure relief valve
  - Status: Under design
- Environmental Test Fixtures
  - Thermal Vacuum Fixture
  - Vibration Plate Fixture
  - To be based on JEDI fixtures
- Purge Suitcase



Update Photo
Learn more about box

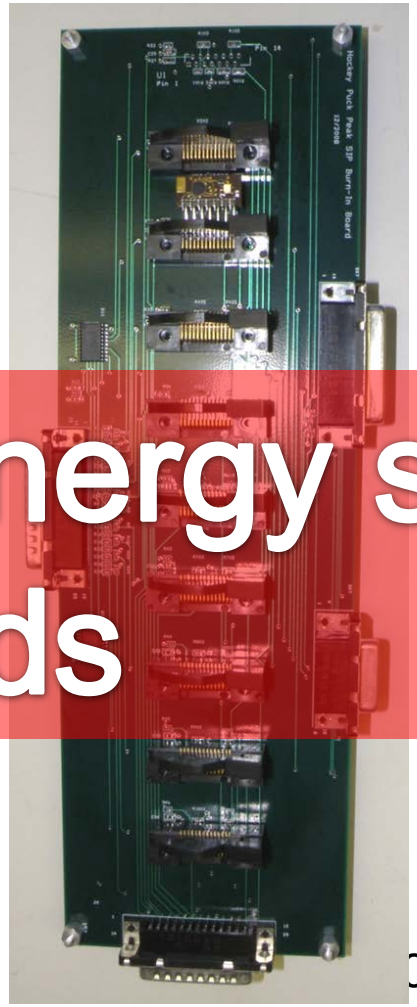
Alignment Requirements



- EPI-Lo
- EPI-Hi

Component-Level Electrical GSE

- Component-Level GSE designed and reviewed for supporting flight build
- Requirements
  - **Functionality to test component requirements**
  - **Fail-safe flight component interface**
- Status
  - **Energy board test board**
    - **Board is designed, built and tested**
    - **Used to test EM and flight Energy boards**
  - **Energy board burn in board**
    - **Schematic is complete**



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Test boards

Outline

- EGSE
  - S/C Emulators
  - Safe/Arm Plugs
- EGSE software should be described including requirements, design and verification of EGSE software
- MGSE
  - Aperture covers
  - Handling fixtures
  - Transport cases
- Instrument purge equipment
- Alignment requirements and features
- << Reid, the MGSE isn't very complex and are things you are very used to. The ME's will supply the details, but I thought you would be a good person to make the overall pitch since you have some of the best knowledge of the latest versions of the EGSE from your RBSP experience >>