S/C Bus to Instrument Interface Requirements

Mechanical / Thermal

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Top Level Requirements (1 of 8)
Mechanical Interface Definition

- **Coordinate System**
  - **The X, Y, and Z Axes of the Spacecraft Coordinate System Are Defined in Figure 1**
- **Instrument Envelope**
  - **The Launch and On-Orbit Instrument Envelope Shall Not Exceed the Envelope Defined in Figure 2**
- **Instrument Mass Allocation**
  - **The Instrument Shall Not Exceed TBD kg**
- **Lateral Center of Mass**
  - **The Instrument Shall be Designed to Minimize the Lateral Offset of the Center of Mass With Respect to the Geometric Center**
- **Mass Properties Report**
  - **Mass Properties Shall be Defined, Reported, and Controlled to Preserve the Performance Margins**
- **Natural Frequency**
  - **The Stiffness of the Instrument Shall Produce Fundamental Frequencies Above 50 Hz in All Three Axes Hard Mounted at Its Interface**

Top Level Requirements (2 of 8)
Mechanical Interface Definition

- **Factors of Safety (FOS)**
  - **The Instrument Shall Use the FOS as Defined by Tables 5-1 Thru 5-3 in the Design, Loads, and Analysis Document, NCST-D-FM017**
- **Design Limits**
  - **The Instrument Shall Be Design to the Design Limits As Defined by Section 4.0 in the Design, Loads, and Analysis Document, NCST-D-FM017**
- **Instrument Mounting Location**
  - **The Instrument Shall be Mounted to the +Z Surface of the Spacecraft Bus**
- **Instrument Mounting Orientation**
  - **The Instrument Shall Be Oriented Such That the Entrance Apertures Look 90 ±T BD Degrees From the Spacecraft Spin Axis During the Operational Configuration**
- **Instrument Mounting Interface**
  - **The Instrument Shall be Secured to the Spacecraft Bus Using a Bolted Flexure Interface As Defined in Figure 3**

Top Level Requirements (3 of 8)
Mechanical Interface Definition

- **Mounting Alignment**
  - **The Instrument Shall Be Alignment to the Spacecraft Bus to TBD at System Integration**
- **Alignment Reference**
  - **The Instrument Shall Provide a Alignment Reference Cube Such That It May Be Viewed During Spacecraft Integration Prior to Solar Array Installation**
- **Mechanical Interface Drawing**
  - **The Spacecraft Bus Shall Provide a Mechanical Interface Drawing Defining the Instrument to Spacecraft Bus Interface**
- **Star Tracker Location**
  - **The Instrument Shall Provide a Location for Mounting Both Spacecraft Star Trackers Have a Clear Field of View in the Stowed Configuration**
- **RF Antenna Location**
  - **The Instrument Shall Provide a Location for Mounting One RF Antenna Such That It Has a Clear Field of View in the Stowed Configuration**

Top Level Requirements (4 of 8)
Mechanical Interface Definition

- System Effectiveness Models
  - An Analytical Model Shall be Developed that Correlates the Structural Modes to Within 5 Percent of the Experimental Results
  - The Analytical Model Should Be Written in NASTRAN or Equivalent
- Outgassing
  - Materials Shall Be Selected for Low Outgassing Characteristics, Using the Requirements of That Meet the Requirements of SP-R0022 for Outgassing
  - Materials Exhibiting Total Mass Loss (TML) of 1.0 % or Less and Collected Volatile Condensable Material (CVCM) Values of 0.1 % or Less Shall Be Used
- Stress Corrosion
  - Materials Shall Be Selected to Control Stress Corrosion Cracking in Accordance With Design Criteria for Controlling Stress Corrosion Cracking, MSFC-SPEC-522A
- Corona Suppression
  - The FAME Observatory Shall Be Designed to Minimize the Occurrence of Corona Discharge in All Normal Operating Environments

Top Level Requirements (5 of 8)
Mechanical Interface Definition

- **Structural and Metallic Materials**
  - **Metallic Materials Shall Be Corrosion Resistant by Nature or Shall Be Corrosion Inhibited by Means of Protective Coatings**
  - **Base Metals Intended for Intermetallic Contact That Form Galvanic Couples Shall Be Plated With Those Metals That Reduce the Potential Difference or Shall Be Suitably Insulated by a Non-conducting Finish**
- **Interface Drill Template**
  - **The Instrument Shall Provide an Interface Drill Template of the Bolted Interface**
- **Magnetic Materials**
  - **The Residual Dipole of the FAME Space Segment Must Be Minimized and the Use of Magnetic Materials Should Be Avoided Whenever Possible**
- **Finishes**
  - **Cadmium, Tin, and Zinc Coatings Shall Not Be Used**
- **Positive Locking Devices**
  - **If Used, Screw-type Hardware on the Space Segment Shall Employ Positive Locking. If Used, Safety Wiring Shall Be According to MS33540**

Top Level Requirements (6 of 8)
Mechanical Interface Definition

- **Lifting Fixture**
  - **The Instrument Shall Provide a Vertical Lifting Fixture for the Instrument During System Integration**
- **Structural Fasteners**
  - **Structural Fasteners for the Spacecraft Shall Be Made From A286 Stainless Steel, Titanium, or Other Suitable High Strength Materials**
- **Test Loads**
  - **The Spacecraft Shall Be Tested to the Test Loads As Defined in the Test Plan, NCST-TP-FM001**
- **Contamination Purge**
  - **The Instrument Shall Provide a Method of Purging the Optics for Contamination Control in the Stowed Configuration During the Integration and Test Phases of the Mission**
- **Shipping Container**
  - **The Instrument Shall Provide a Shipping Container Suitable for Instrument Storage**

Top Level Requirements (7 of 8)
Thermal Interface Definition

- **Interface Temperature Limits**
  - **The Instrument Interface Temperature Shall Be Maintained Between +18 and +22 Degrees C During the Operational Configuration and TBD During the Non-operational Configuration**
- **Ground Strap Thermal Conductance**
  - **The Grounding Strap Provide by the Spacecraft Bus Shall Be Thermally Conductive Less Than TBD**
- **Electrical Cable Thermal Conductance**
  - **The Electrical Cabling Provide by the Spacecraft Bus Shall Be Thermally Conductive Less Than TBD**
- **Thermal Radiation Transfer**
  - **The Effective Thermal Emittance of the Spacecraft Bus to the Instrument Shall Be No Greater Than TBD**
- **Blanket Closeout**
  - **TBD**

Top Level Requirements (8 of 8)
Thermal Interface Definition

- **Grounding**
  - **All MLI Blankets Shall Be Redundantly Grounded to the Structure With No Single Layer Exceeding 50 Ohms to Any Point on the Structure**
- **Applied Optical Surfaces**
  - **Any Metalized Tapes or Optical Surface Reflectors Applied to Structural Surfaces External to the Spacecraft Shall Be Provided With Some TBD Path to Ground**
- **Star Tracker Thermal Interface**
  - **The Conduction and Radiation Heat Transfer From the Star Tracker to the Instrument Shall Be ± TBD Watts**
- **Omni Antenna Thermal Interface**
  - **The Conduction and Radiation Heat Transfer From the Antenna to the Instrument Shall Be ± TBD Watts**

Spacecraft Coordinate System

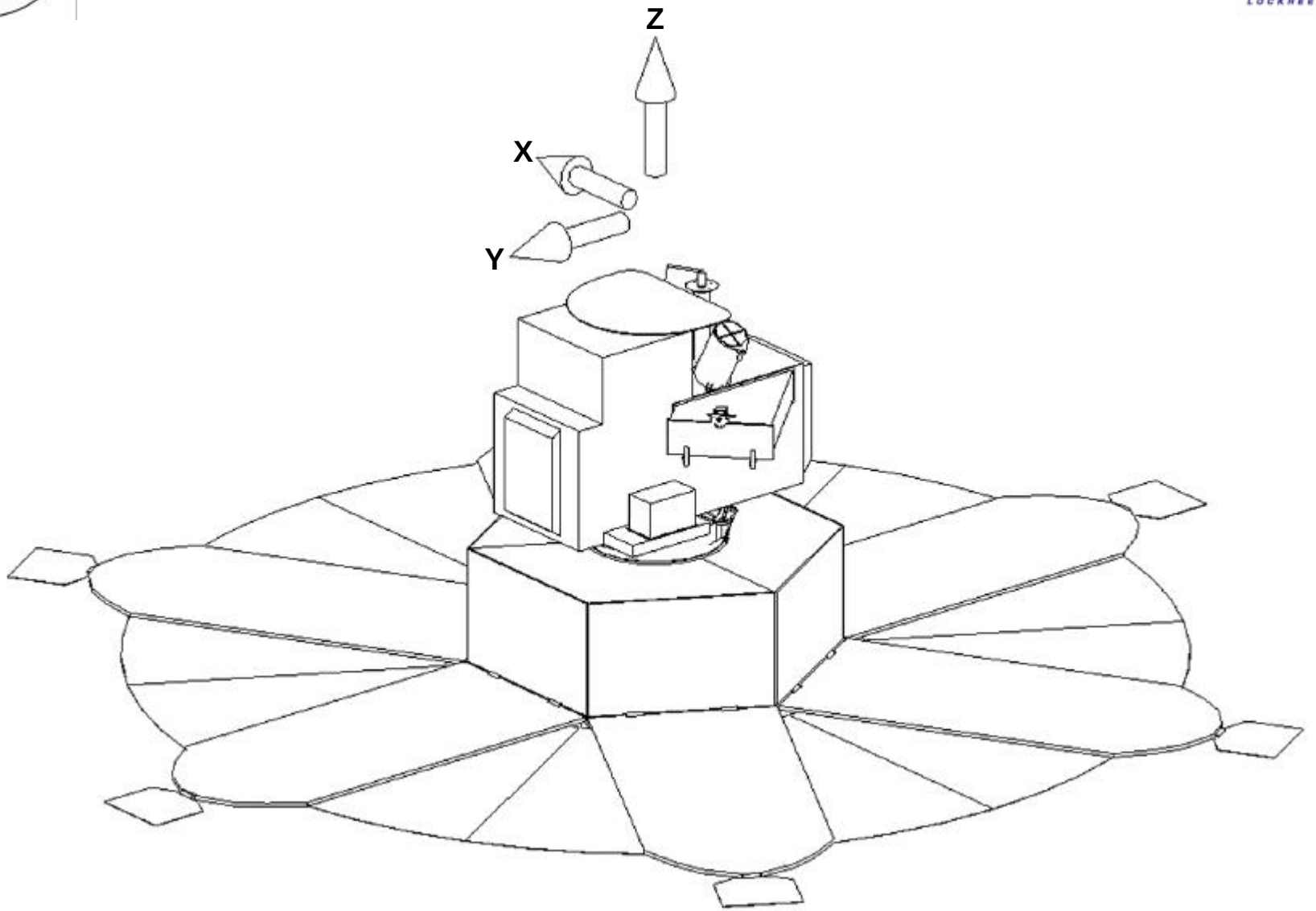

Figure 1

Instrument Envelope

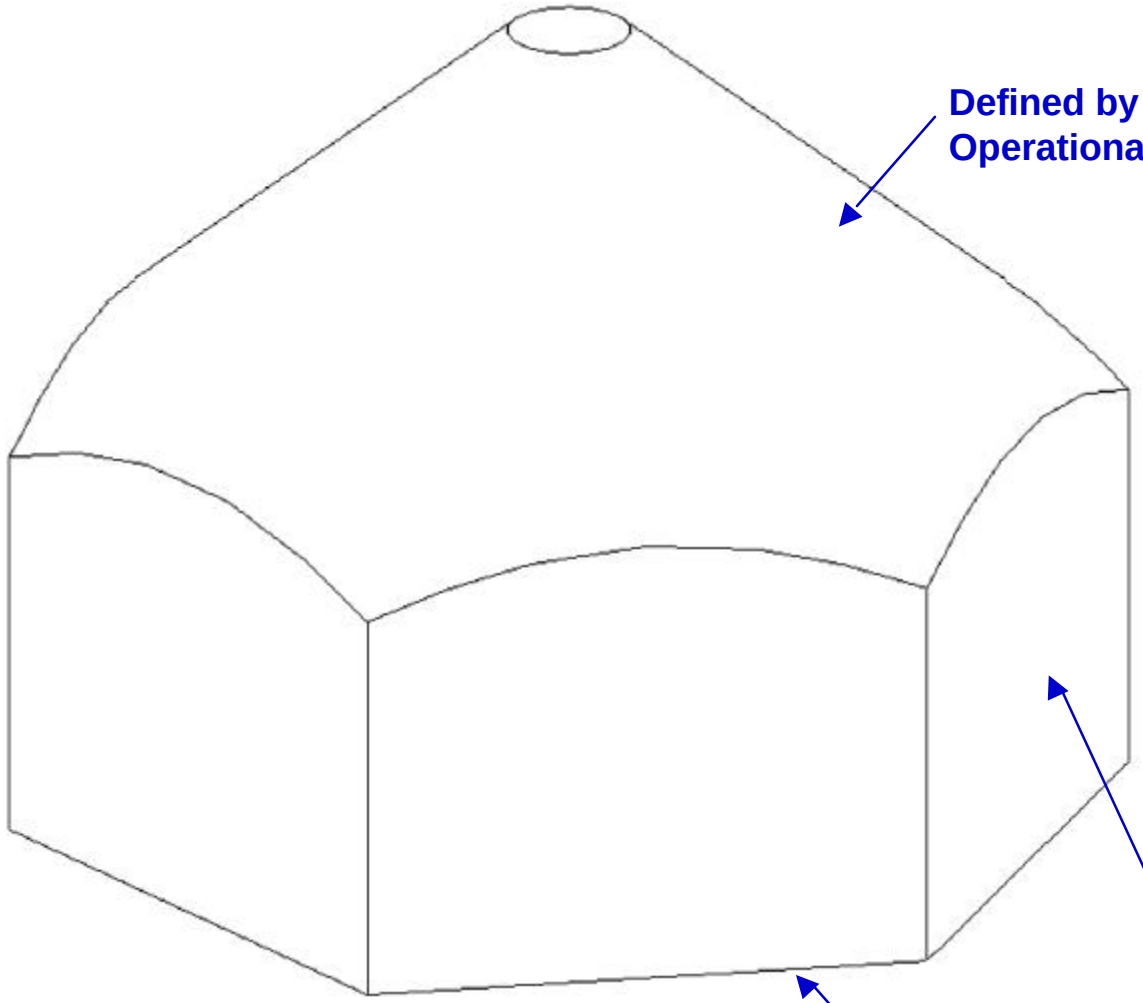

Figure 2

Mechanical Interface

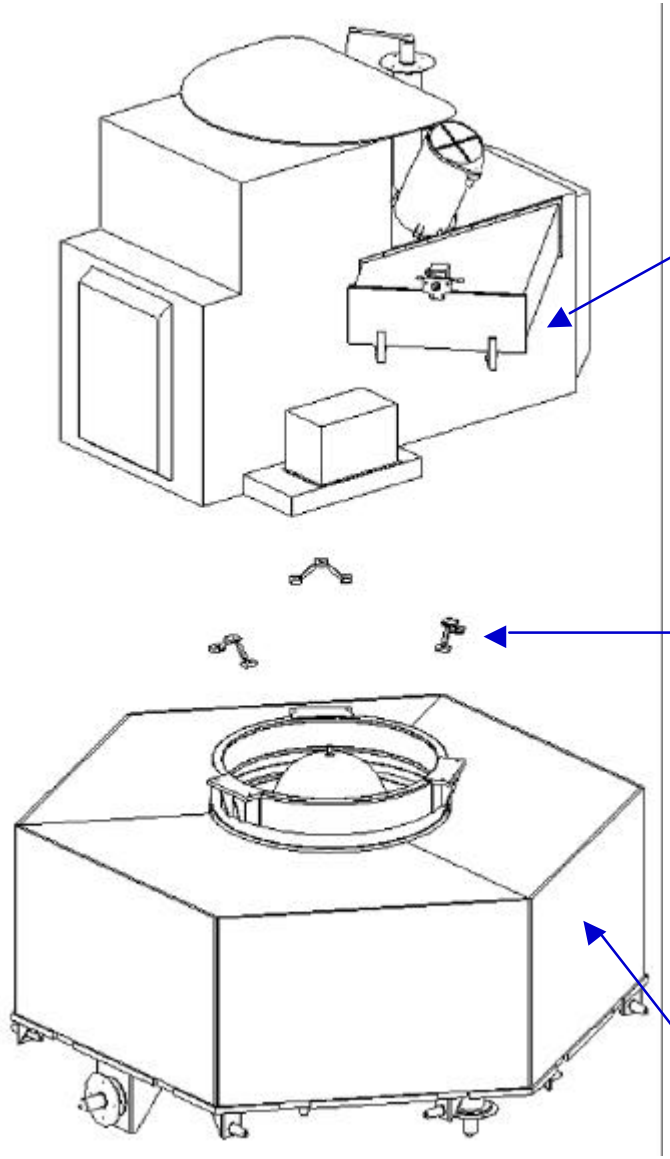

Figure 3

Instrument to Bus Design Trades

- **Star Tracker Location Trade**
- **RF Antenna Location Trade**
- **Mechanical Interface Trade**

Instrument to Bus ICD Issues and Concerns

- **Instrument's Overall Mass and Inertia Matrix**
- **Clean Field of View for Both Star Trackers in Stowed Configuration**