Geostationary Operational Environmental Satellite (GOES)

GOES-R Series

Unique Instrument Interface Document (UIID)

Space Environment In-Situ Suite (SEISS)

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National Aeronautics and Space Administration

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1 Scope

The purpose of this Unique Instrument Interface Document (UIID) is two-fold. The first is to allocate GOES-R series spacecraft resources to the Space Environment In-Situ Suite (SEISS). The second is to serve as a core building block on which the SEISS-spacecraft interface can be designed. The spacecraft integrating contractor and the SEISS contractor **shall** meet each of their respective interface requirements as defined in this document.

The Government **will** be the system integrator until a system performance contractor or spacecraft contractor with that responsibility is selected. Until that time, the Government **will** be responsible for accommodation trades, resource allocation (weight, power, space, bandwidth, etc.), and resolving interface issues. This UIID **will** govern the development of an Interface Control Document (ICD). The ICD development **will** be a joint activity of the SEISS and spacecraft contractors.

The SEISS ICD establishes the details of the electrical, communications, mechanical, thermal, integration and test, and command and data handling (C&DH) interfaces between the SEISS instrument and the GOES-R spacecraft. After the ICD is signed and approved by all parties, the spacecraft contractor **shall** maintain the ICD.

The SEISS particle sensors **shall** monitor the proton, electron, and heavy ion fluxes at geosynchronous orbit. The particle sensors include a magnetospheric particle sensor (MPS), an energetic heavy ion sensor (EHIS), and a solar and galactic proton sensor (SGPS).

This SEISS requires primary power and command input data from the spacecraft. Instrument output data to the spacecraft contains instrument information, instrument telemetry and ancillary data.

1.1 Document Overview

Together, the General Interface Requirements Document (GIRD) and the SEISS UIID establish the SEISS spacecraft interface requirements. The GIRD applies to all GOES-R instruments while the SEISS UIID is specific to the SEISS. Section 1 explains the use of this document. Section 2 lists reference documents. Section 3 allocates spacecraft resources, such as mass, power, and data rate, to the SEISS instrument Suite. Section 4 contains government-accepted operation constraints. Section 5 contains government-accepted deviations from the GIRD. Section 6 contains a list of acronyms used within this document.

1.2 Missing Requirements

The term "(TBD)", which means "to be determined", applied to a missing requirement means that the instrument contractor determines the missing requirement in coordination with the spacecraft contractor.

The term "(TBR)", which means "to be refined/reviewed", means that the requirement is subject to review for appropriateness by both contractors, and subject to revision. The instrument contractor is liable for compliance with the requirement as if the "TBR" notation did not exist. The "TBR" merely provides an indication that the value is more likely to change in a future modification than requirements not accompanied by a "TBR".

1.3 Order of Precedence

The order of precedence of interface requirements documents is the UIID at the highest level, followed in order by the GIRD, ICD, and IDD.

1.4 Definitions

The following definitions apply:

1.4.1 Normal Operational Periods

Normal operational periods are defined as all periods except during housekeeping, stationkeeping, and eclipses.

2 Applicable Documents

The following documents are referenced in this specification.

3 Allocations

The GOES-R spacecraft **shall** provide data downlink, telemetry and power for the SEISS instruments throughout the entire spacecraft mission including transfer orbit, yaw flips and eclipse periods and on-orbit storage. The following paragraphs allocate these resources to SEISS.

3.1 Command and Data Handling

3.1.1 Instrument-to-Spacecraft Science Volume

The instrument science data rate, including all overhead **shall** not exceed 1 packet per second when averaged over any 5 second period.

3.1.2 Telemetry Data Rate

Housekeeping telemetry data rate **shall** not exceed 1 packet per second.

3.1.3 Application Process Identifiers

The SEISS **shall** use no more than 7 (TBR) consecutive APIDs for science, telemetry, and command packets.

3.1.4 Spacecraft Data Interface Connectors

The instrument **shall** supply the mating connectors to the spacecraft.

3.1.5 Spacecraft Telemetry Required for SEISS Data Processing

Spacecraft telemetry required to analyze SEISS data **shall** be provided to the SEISS ground system whenever SEISS data is available. The spacecraft data that is required to analyze the SEISS data includes the ephemeris and spacecraft attitude.

3.1.6 Spacecraft Command of SEISS after Launch

The spacecraft **shall** provide the capability to turn on the SEISS within one hour (TBR) after launch.

3.2 Power

3.2.1 Average Power

The SEISS **shall** draw no more than 92 Watts (TBR) averaged over five (5) minutes (TBR).

3.2.2 Peak Power

The SEISS **shall** draw no more than 100 (TBR) Watts over 30 seconds (TBR).

3.2.3 Survival Power

The SEISS **shall** require no more than 35 watts (TBR) to maintain survival temperatures.

3.3 Mechanical

The requirements in this section apply to the structural and mechanical components of the SEISS flight units.

3.3.1 Mass Properties

The SEISS, including all units and cabling between units, **shall** have mass less than 42 kilograms (TBR).

3.3.2 Volume

The instrument, including mounts, thermal blankets and connectors for both stowed and operational configurations **shall** have dimensions that do not exceed a total volume of 85,000 cu. cm. (TBR). The maximum dimension of any component **shall** be less than 40 cm (TBR).

3.3.3 Field of View

The spacecraft **shall** provide the following field of view (FOV) for the SEISS instruments:

3.3.3.1 Magnetospheric Particle Sensor FOV

3.3.3.1.1 Low Energy Electron and Proton Sensor

The spacecraft **shall** provide a field of view that is 170 degrees in the elevation angle by 30 degrees azimuthal angle, centered on either the Earthward or the anti-Earthward direction and symmetrical above and below the equatorial plane.

3.3.3.1.2 Medium and High Energy Electron and Proton Sensor

The spacecraft **shall** provide a field of view that is 170 degrees in the elevation angle by 30 degrees azimuthal angle, centered on either the Earthward or the anti-Earthward direction and symmetrical above and below the equatorial plane.

3.3.3.2 Solar and Galactic Proton Sensor

The spacecraft **shall** provide two look-directions with identical viewing geometries, both centered in elevation on the equatorial plane, with one centered in the eastward direction and one centered in the westward direction.

3.3.3.3 Energetic Heavy Ion Sensor

The spacecraft **shall** provide greater than TBD conical FOV for the Energetic Heavy Ion Sensor, centered on the anti-earth direction.

3.3.4 Mounting

The spacecraft **shall** provide mounting space for the SEISS on the three axis stabilized body of the spacecraft with the sensors located to provide the fields of view specified in paragraph 3.3.3.

4 Constraints

In order to ensure proper instrument performance or to prevent possible instrument damage, the following Government-approved constraints are imposed by the instrument developer on spacecraft integration and test activities, including launch, activation and operations. No constraints have been identified at this time.

5 Deviations and Waivers

This section identifies General Instrument Requirements Document (GIRD) requirements that the government has relaxed or waived for this instrument. Where appropriate, corresponding GIRD paragraph titles and numbers are identified in parentheses.
There are no deviations or waivers at this time.

6 Acronyms and Abbreviations

C&DH	Command and Data Handling
CCN	Contract Change Notice

EHIS	Energetic Heavy Ion Sensor
FOV	Field of View
GIRD	General Interface Requirements Document
GOES	Geostationary Operational Environmental Satellite
GSFC	Goddard Space Flight Center
ICD	Interface Control Document
MPS	Magnetospheric Particle Sensor
NASA	National Aeronautics and Space Administration
PORD	Performance and Operations Requirements Document
SEISS	Space Environment In-Situ Suite
SGPS	Solar and Galactic Proton Sensor
TBD	To Be Determined
TBR	To Be Reviewed
TBS	To Be Specified
UIID	Unique Instrument Interface Document