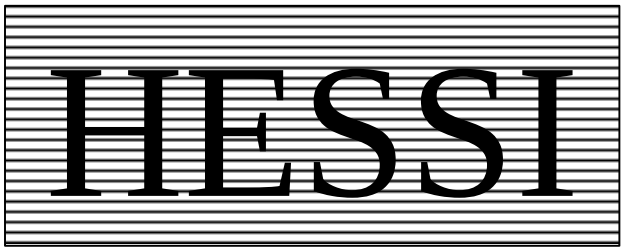

High Energy Spectroscopic Imager (HESSI)
Spacecraft to Imager
Interface Control Document (ICD)

HSI_SYS_016E.doc
Version E – 1999-Mar-11

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Document Revision Record

Rev.	Date	Description of Change	Approved By
A	1998-May-19	Preliminary Draft	-
B	1998-Sep-18	Incorporate SA comments	-
C	1998-Oct-15	Incorporate SA comments	JP, JJ, DC, PH
D	1999-Mar-5	Change ICD Drawing	-
E	1999-Mar-11	• Add details to ICD Drawing • Set SAS FOV • Replace harness drawing (HSI_SYS_005) reference to harness specification reference (HSI_SYS_022)	

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1. Introduction

This document shall describe the interface between the HESSI spacecraft bus and the Instrument Imager.

1.1. *Imager Description*

The Imager holds the nine precision grid pairs that modulate the incoming solar radiation flux before it reaches the Germanium detectors in the Spectrometer. These modulated signals are then processed on the ground to produce the desired 2D images of the full sun. We note that the finest grid pairs must be aligned with micron (0.00004 inch) precision to generate the desired modulation.

1.2. *Document Conventions*

In this document, TBD (To Be Determined) means that no data currently exists. A value followed by TBR (To Be Resolved) means that this value is preliminary. In either case, the value is typically followed by UCB (University of California at Berkeley) and / or SA (Spectrum Astro) indicating who is responsible for providing the data, and a unique reference number.

1.3. *Applicable Documents*

The following documents include drawings and HESSI Project policies, and are part of the Interface Requirements. In the event of a conflict between this ICD and the following documents, this ICD takes precedence. All ICD documents and drawings can be found on the Berkeley HESSI FTP site:

ftp://apollo.ssl.berkeley.edu/pub/hessi/released/icd

Pre-released versions of these documents may be found at:

ftp://apollo.ssl.berkeley.edu/pub/hessi/icd

1. HESSI Spacecraft to Imager ICD Drawing, File HSI_SYS_009C
2. HESSI Spacecraft to IDPU-ICD, File HSI_SYS_001G
3. HESSI IDPU Block Diagram, File HSI_IDPU_001D
4. HESSI Instrument Harness Specification, File HSI_SYS_022G
5. HESSI Instruments Power Spreadsheet, File HSI_SYS_006H
6. HESSI Instruments Mass Spreadsheet, File HSI_SYS_010E
7. Spectrum Astro HESSI Product Assurance Plan, Rev-, December 17 1997, Document number 1110-EP-Q09920, File epq09929

2. Mechanical Interface

2.1. *Interface Drawing*

The mechanical configuration of the Imager is shown in the Imager ICD Drawing (reference 1).

2.2. *Mass Properties*

Reference (6) shows the instrument mass properties, including current best estimate and maximum (with margin).

2.3. *Field of View and Alignment.*

The circular half angle fields of view of grid pairs range from 0.5° to 8°. All of the view directions are aligned to the +Z axis of the Imager. The SAS lenses on the upper grid tray must have a 1° clear Field of View. The spacecraft Attitude Control System (ACS) must point the Imager (and spin axis) to within 0.2° of the sun center.

The Imager will be aligned to be concentric to the spacecraft Z-axis to within 1mm. The Imager Z axis will also be aligned to the spacecraft Z-axis within 0.1 degrees. This alignment is achieved when installing the Imager on the spacecraft by shimming at the kinematic mounting points.

2.4. *Mechanisms*

The Imager is a passive system that contains no active mechanisms.

3. Thermal Interface

3.1. *Thermal Design*

The thermal design shall address radiative and conductive heat transfer between the Imager, spacecraft, and space. The design shall meet the thermal constraints listed in section 3.3. Thermal dissipation shall be primarily radiative. The Imager is conductively insulated from the spacecraft by central fiberglass tube kinematic mounts shown in the Imager ICD drawing. Thermal properties of the exposed surfaces of the Imager (both MLI and radiator surfaces) are also shown in the Imager ICD Drawing.

3.1.1. Thermal Design Responsibilities

The Imager thermal design is the responsibility of UCB. The design of the Imager shall allow for very low conduction between the Imager and the spacecraft bus. UCB shall provide sufficient information to Spectrum Astro to allow Spectrum Astro to accurately model the Imager thermal properties as input to the spacecraft bus thermal model. Spectrum Astro shall verify that the spacecraft bus meets its thermal control system

requirements using this information. Spectrum Astro shall deliver the spacecraft bus thermal model to UCB as input to the spacecraft thermal model that is integrated and verified by UCB.

3.2. *Imager Power Dissipation*

The Imager is mostly passive, but does use some power in the Solar Aspect System (SAS) readouts, as shown in Reference 5 (the difference between Imager Normal mode power and Standby mode power in Table 2 is the SAS dissipation; the rest is the estimated Grid Tray Heater requirement).

3.2.1. Imager Heaters

The Imager contains front and rear grid tray heaters that are used to keep the front and rear grid trays at the same temperature. The allowed variation between trays is 3°C. Both grid trays are also desired to be near room temperature. The heaters are controlled by the IDPU. The estimated power consumption is shown in Reference 5 (Imager Standby mode power in Table 2).

3.3. *Imager Temperature Requirements*

The Non-Op temperature limits apply when the instrument power is off. There is no start-up temperature requirement for the Imager. Thermal limits of the Imager are shown in Table 3.3-1.

Table 3.3-1 Thermal Limits

Range	Imager Temperature, °C	Bus Side Interface Temperature, °C
Non-Op Limits	0 - +40	-24 - +61
Start-up Limits	N/A	N/A
Operational Limits	+10 - +30	-24 - +61

4. Electrical Interface

The IDPU will be the single-point electrical interface between the spacecraft and the instruments. Details of the operation, power consumption, harnessing are all contained in the IDPU ICD, reference 2.