THE ELECTRICAL GROUND SUPPORT EQUIPMENT FOR SPECTROMETER/TELESCOPE FOR IMAGING X-RAYS (STIX)

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15-я УКРАИНСКАЯ КОНФЕРЕНЦИЯ ПО КОСМИЧЕСКИМ ИССЛЕДОВАНИЯМ.
## Instrument Description

<table>
<thead>
<tr>
<th>Instrument</th>
<th>PI institute</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EUI</strong></td>
<td>Centre Spatial de Liège (CSL), Belgium</td>
<td>Extreme Ultraviolet Imager</td>
</tr>
<tr>
<td><strong>METIS</strong></td>
<td>Astrophysical Observatory of Turin (INAF), Italy</td>
<td>Multi Element Telescope for Imaging and Spectroscopy</td>
</tr>
<tr>
<td><strong>PHI</strong></td>
<td>Max Planck Institute for Solar System Research (MPS), Germany</td>
<td>Polarimetric and Helioseismic Imager</td>
</tr>
<tr>
<td><strong>SoloHi</strong></td>
<td>Naval Research Lab (NRL), USA</td>
<td>Heliospheric Imager</td>
</tr>
<tr>
<td><strong>SPICE</strong></td>
<td>ESA funded</td>
<td>Spectral Imaging of the Coronal Environment</td>
</tr>
<tr>
<td><strong>STIX</strong></td>
<td>University of Applied Sciences North Western Switzerland (FHNW)</td>
<td>Spectrometer/Telescope for Imaging X-rays</td>
</tr>
<tr>
<td><strong>MAG</strong></td>
<td>Imperial College London, UK</td>
<td>Magnetometer</td>
</tr>
<tr>
<td><strong>RPW</strong></td>
<td>Laboratoire d'études spatiales et d'instrumentation en astrophysique (LESIA), France</td>
<td>Radio and Plasma Waves Experiment</td>
</tr>
<tr>
<td><strong>SWA</strong></td>
<td>Mullard Space Science Lab (MSSL), UK</td>
<td>Solar Wind Analyser</td>
</tr>
</tbody>
</table>
THE SPECTROMETER/TELESCOPE FOR IMAGING X-RAYS (STIX)

Collaboration spectrometer
Features
Polish activities in SRC include Instrument Data Processing Unit, Instrument EGSE and Instrument Thermal Modelling.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy Range</strong></td>
<td>4 – 150 keV</td>
</tr>
<tr>
<td><strong>Energy Resolution (FWHM)</strong></td>
<td>1-15 keV (energy dependent)</td>
</tr>
<tr>
<td><strong>Effective area</strong></td>
<td>6 cm²</td>
</tr>
<tr>
<td><strong>Finest angular resolution</strong></td>
<td>7 arcsec</td>
</tr>
<tr>
<td><strong>Field of view</strong></td>
<td>2°</td>
</tr>
<tr>
<td><strong>Image placement accuracy</strong></td>
<td>(\pm 4) arcsec</td>
</tr>
<tr>
<td><strong>Time resolution (statistics limited)</strong></td>
<td>(\geq 0.1) s</td>
</tr>
</tbody>
</table>
THE STIX EGSE Block Scheme

Space Wire Interface Simulator (SIIS)

Power Discrete Front End (PDFE)

Space Wire Interface

SpaceWire Interface

LAN

TCP/IP

Telemetry Packets

Power Interface

BIOS Software:

Archiving

Visualization

Ethernet Interface

Tests

Detector Simulator System:

Simulation of realistic detector signals

Flare Flag

Crossing of SEP clouds (or other increased particle background areas)

EGSE

Spacecraft Instrument Interface Simulator (SIIS)

FPGA based Detector Simulator System (DSS)

USB

TCP/IP

Telecommands

CBK Wroclaw

SSBV Noordwijk
Spacecraft Instrument Interface Simulator (SIIS) overview

• hard- and software elements which provide the tool for instrument power interface and TM/TC electrical and data protocol validation,

• specified for delivery phases of instrument models to integration,

• designed and manufactured by SSBV (NL), previously deployed and in-field proven (e.g. BepiColombo, EarthCARE)
Spacecraft Instrument Interface Simulator (SIIS) - hardware

User Workstation

- LAN
- Single Board Computer (PC)
- SpaceWire Interface (PMC)
- SpaceWire Interface Platform
- Commercial Power Supply (with multiple outputs)
- Latching Current Limiter (LCL) module
- PDTE Platform
- PDFE Control module
- Combined Power & Discrete Front-End

STIX

- SpaceWire
- PWR-IN
- SHP-ON
- SHP-OFF
- RSA-STATUS

15-я Українська конференція по космічним дослідженням.
Spacecraft Instrument Interface Simulator (SIIS) - software

15-я Украинская конференция по космическим исследованиям.
Space Wire Simulator software
EGSE connecting people

STIX Main

SIIS

Prime Contractor

VPN

LAN

VPN

EGSE Team

STIX Redundant

SpaceWire Simulator

Wrocław CBK

Warszawa CBK

LAN

VPN

Software Team

15-я Українська конференція по космічним ісследований
### TM/TC

#### CCSDS Secondary header flag = 0
- **PUS Version** = 1
- **Ack** = Enumerated (3 bits)
- **Service Type** = Enumerated (4 bits)
- **Service Subtype** = Enumerated (8 bits)
- **Source ID** = Enumerated (8 bits)

#### Packet Header (48 bits)

<table>
<thead>
<tr>
<th>Packet ID</th>
<th>Packet Sequence</th>
<th>Packet Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version Number</td>
<td>Packet Type</td>
<td>Data Field Header Flag</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Packet Data Field

<table>
<thead>
<tr>
<th>Data Field Control</th>
<th>Packet Sequence Control</th>
<th>Packet Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version Number = 0</td>
<td>Packet Type = 1</td>
<td>Data Field Header Flag</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Note

15-я Українська конференція по космічним ісследуванням.
Set of TM/TC

SFT - Short functional tests
FFT - Full functional tests
• test procedures designed and implemented by STIX team,
• demonstrates the functionality of the instrument and all of its operational modes,
• performed before the delivery of the instrument to generate reference test data,
• maximal duration is 8 hours,
• planned to run twice after integration to the spacecraft: once before and once after environmental tests campaign
• simplified procedures derived from I-FFT and implemented by STIX team,

• demonstrates the integrity, functionality of the instrument and verifies the command and telemetry paths,

• performed before the delivery of the instrument to generate reference test data,

• maximal duration is 1 hour,

• planned to be performed a number of times at set points as the monitor of health during environmental tests campaign
IDeF-X HD front-end ASIC architecture. The 32 analog channels with level discrimination stages are connected to a global trigger signal and a common output buffer. A digital part allows slow control communication for configuration and readout.

1. Arrival of a second photon in the coincidence window
2. Pile-up: one count missed, incorrect amplitude
3. Arrival of a second photon during the readout phase
   - dead time
   - missed count
4. Arrival of a second photon at the end of the readout sequence
   - partial event
   - incorrect amplitude
   - missed count

Table 3-2 The cases of particle detection
SCIven of Alcalá, Spain
USA, ESA

sion functions of suprathermal and energetic particles. Scientific topics to be addressed include the sources, acceleration mechanisms, and transport processes of these particles.

United Kingdom

s of the heliospheric magnetic field with high precision. This will facilitate detailed studies into the way the Sun’s magnetic field links into space and evolves over the solar cycle; how particles are accelerated to the Earth; how the corona and solar wind are heated and accelerated.

ervatoire de Paris, France
Czech Republic, Austria

other instruments in that it makes both in situ and remote-sensing measurements. RPW will measure magnetic and electric fields at high time resolution using a number of sensors/antennas, to determine the waves in the solar wind.

ace Science Laboratory, United Kingdom
Italy, France, USA

uite of sensors that will measure the ion and electron bulk properties (including, density, velocity, and temperature) of the solar wind, thereby characterising the solar wind between 0.28 and 1.4 AU from the Sun. SWA will provide measurements of solar wind ion composition for key elements (e.g. the C, N, O group and Fe, Si or Mg).

lie, Belgium
Kingdom, France, Germany, Switzerland

pheric layers above the photosphere, thereby providing an indispensable link between the solar surface and outer corona that ultimately shapes the characteristics of the interplanetary medium. EUI will also provide measurements of the solar wind plasma temperature in the range from 0.28 to 1.4 AU from the Sun.

ical Observatory of Turin, Italy
Czech Republic

et and extreme ultraviolet emission of the solar corona and diagnose, with unprecedented temporal coverage and spatial resolution, the structure and dynamics of the full corona in the range from 1.4 to 3.0 AU (maximum) perihelion during the nominal mission. This is a region that is crucial in linking the solar atmospheric phenomena to their evolution in the inner heliosphere.

t für Sonnenforschung, Germany
France

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