

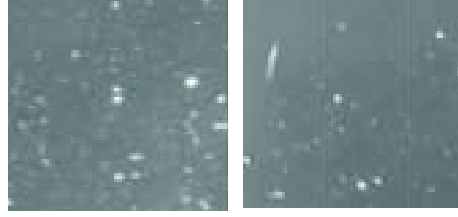
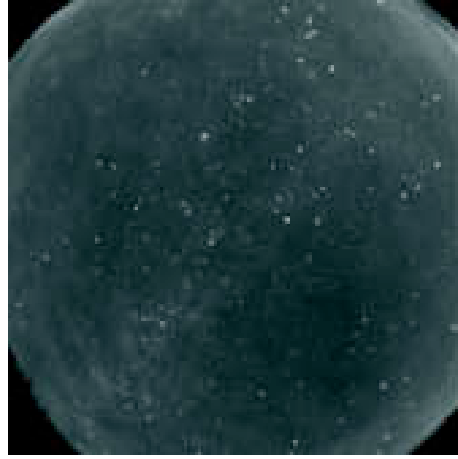
SPOSH

Smart Panoramic Optical Sensor Head

The Earth encounters approximately 1000 tons of extraterrestrial material every day. Much of this material arrives in the form of small objects ("meteoroids") in the mass range from 10^{-1} to 10^6 grams that disintegrate in the upper atmosphere. These atmospheric entries are associated with the celestial phenomenon of small "shooting stars" or large "fireballs".

SPOSH performs with its features meteor observation from space as well as from earth:

- 1024 x 1024 CCD chip
- custom made optical system
- field of view $120^\circ \times 120^\circ$
- processing unit for event detection



Main features:

- Online image obtaining and processing at high rates.
- Meteor identification on images with a custom-made software.
- Implemented algorithms to detect phenomena on the night hemispheres of planets.
- Excellent low light level performance and geometric performance over the large field of view.

The Jena-Optronik GmbH belongs to the Photonics Business Division of the JENOPTIK AG. Jena-Optronik has an excellent international reputation in the fields of optoelectronic instruments and systems, software and guidance, navigation and control sensors. Within Jenoptik Jena-Optronik takes the lead function for complex opto-electronic system solution for aerospace and security, making use of the competence centres and the expertise of the whole group.



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Camera head

CCD imager CCD type

E2V CCD-47-30 Backthinned;
 Midband Coating; Frame transfer
 Peltier cooling;
 1024 x 1024
 13,3 x 13,3 µm
 ≥100000 e⁻
 up to -20°C
 6 e⁻/sec/pixel

Number of active pixels
 Pixel dimensions
 Full well
 CCD chip temperature
 Dark signal at -10°C

CCD control

CCD operational modes:
 CCD readout modes:
 Programmable image formats
 Horizontal and vertical binning
 Programmable exposure time
 Max frame rate:
 in Draft mode (at 1Mhz readout rate)
 in Fine mode (at 1Mhz readout rate)

Continuous, Single frame, Trigger mode
 5 MHz readout rate
 programmable (2.5MHz - 300 kHz) readout rate
 up to 8
 10 msec, 1000-sec
 3.5 Hz (without binning)
 0.7 Hz (without binning)

Draft (DR)
 Fine (FN)

Videocassett processing

14-bit analog-to-digital conversion
 System dynamic range:
 in Draft mode
 in Fine mode (at 1Mhz readout rate)

> 5000
 > 8000

Electronic box

Power input: 12V (designed for car adaptor)
 Integrated power supply for camera & notebook
 EMC designed

Camera head interface

Dual enable buffer 2 x 3 MByte
 Serial command & data interface max: 15 Mpixel per second
 LVDS signal levels

GPU (evaluation board)

Leon2 (SPARC) processor running in Xilinx XCV2000 FPGA
 70 MHz core clock
 8 MByte flash rom (2M x 32), 1 MByte static ram (256K x 32), 64 MByte PC133 SDRAM (16M x 32)
 Ethernet PHY 10/100 Mbit transceiver
 Standard RS-232 interfaces
 120-pins memory and custom I/O expansion connectors JTAG and slave-serial FPGA programming capability
 LEON-F1 version available

Software support and science support

Onboard software (plain camera mode)
 Continuous imaging (windowing and binning support)
 Send data over TCP/IP as formatted FITS images

Onboard software (SPS mode)

Continuous imaging (windowing and binning support)
 Meteor detection ~1 Mpixel/sec
 Typical imaging rates 1024x1024 at 0.5 fps, 512x512 at 2 fps, 256x256 at 8 fps
 Only detected events are sent via telemetry
 Camera head control and deflection parameters by telecommands
 32 MByte telemetry buffer, 16 MByte imaging buffer
 Optional snapshot and overlaid image transfer

Spacecraft simulator software

Software simulator for typical spacecraft interface over UDP/IP protocol
 Onboard time, housekeeping and telemetry services