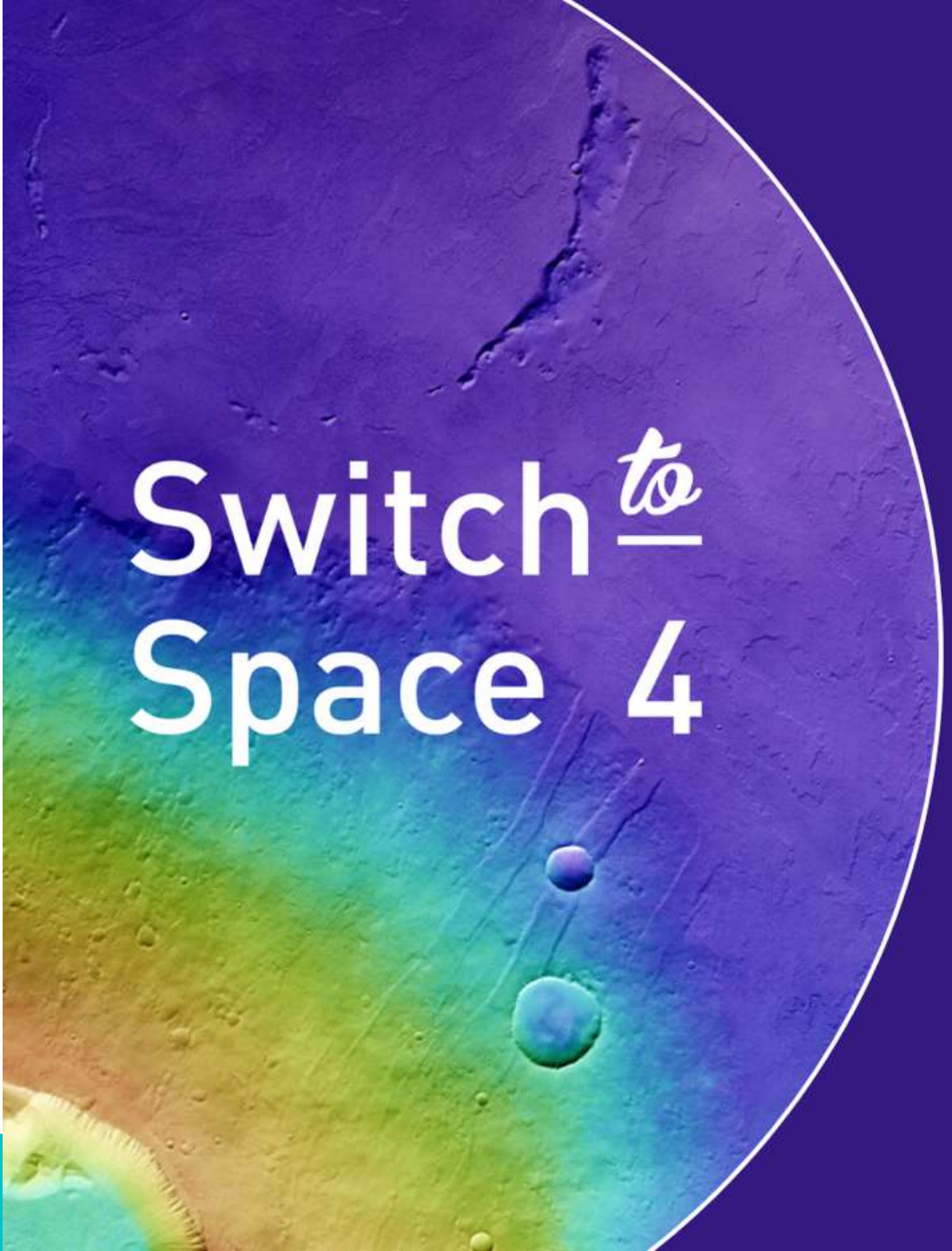
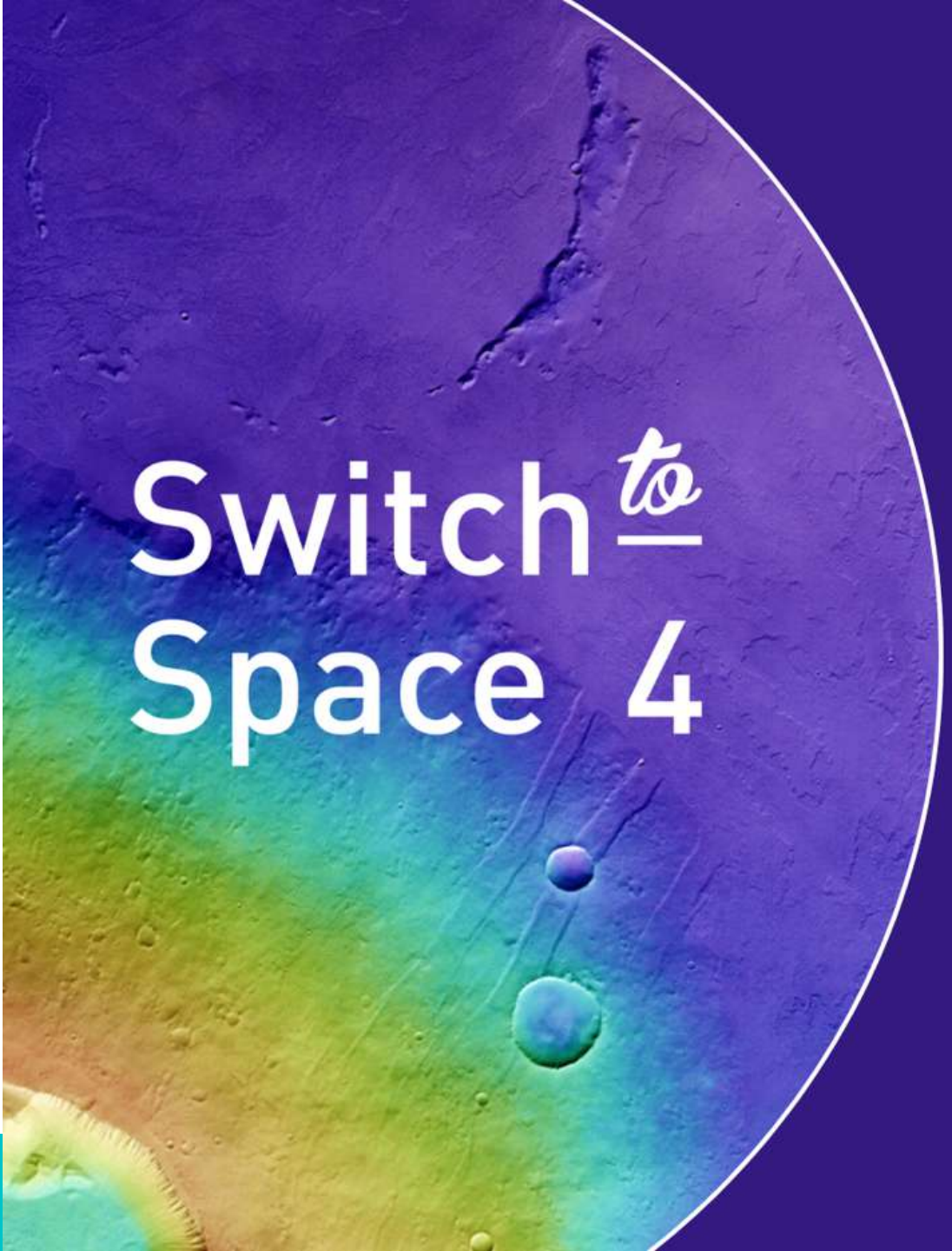


October 2, 2024

Space for a Safer World

Careers - Opportunities - Knowledge

www.switchtospace.org



DELTATEC

LET'S DESIGN THE FUTURE

WHO IS DELTATEC?

BELGIAN

COMPANY

With international activities

1986

DESIGN ACTIVITY

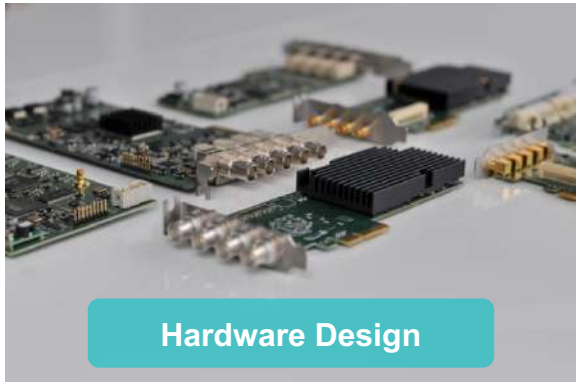
With strong focus on embedded electronics

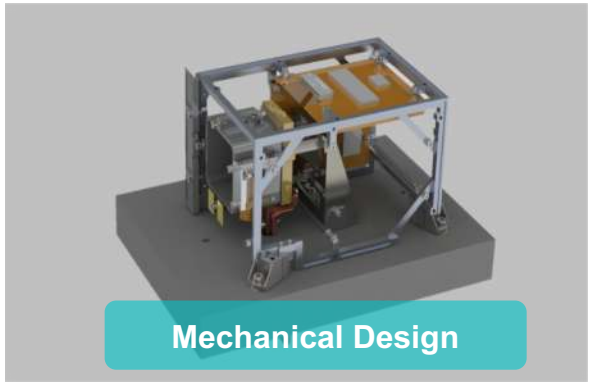
100

EMPLOYEES

Constantly growing

OUR SOLUTIONS





High-Tech ELECTRONIC and SOFTWARE design

5 ACTIVITIES AND BUSINESS UNITS

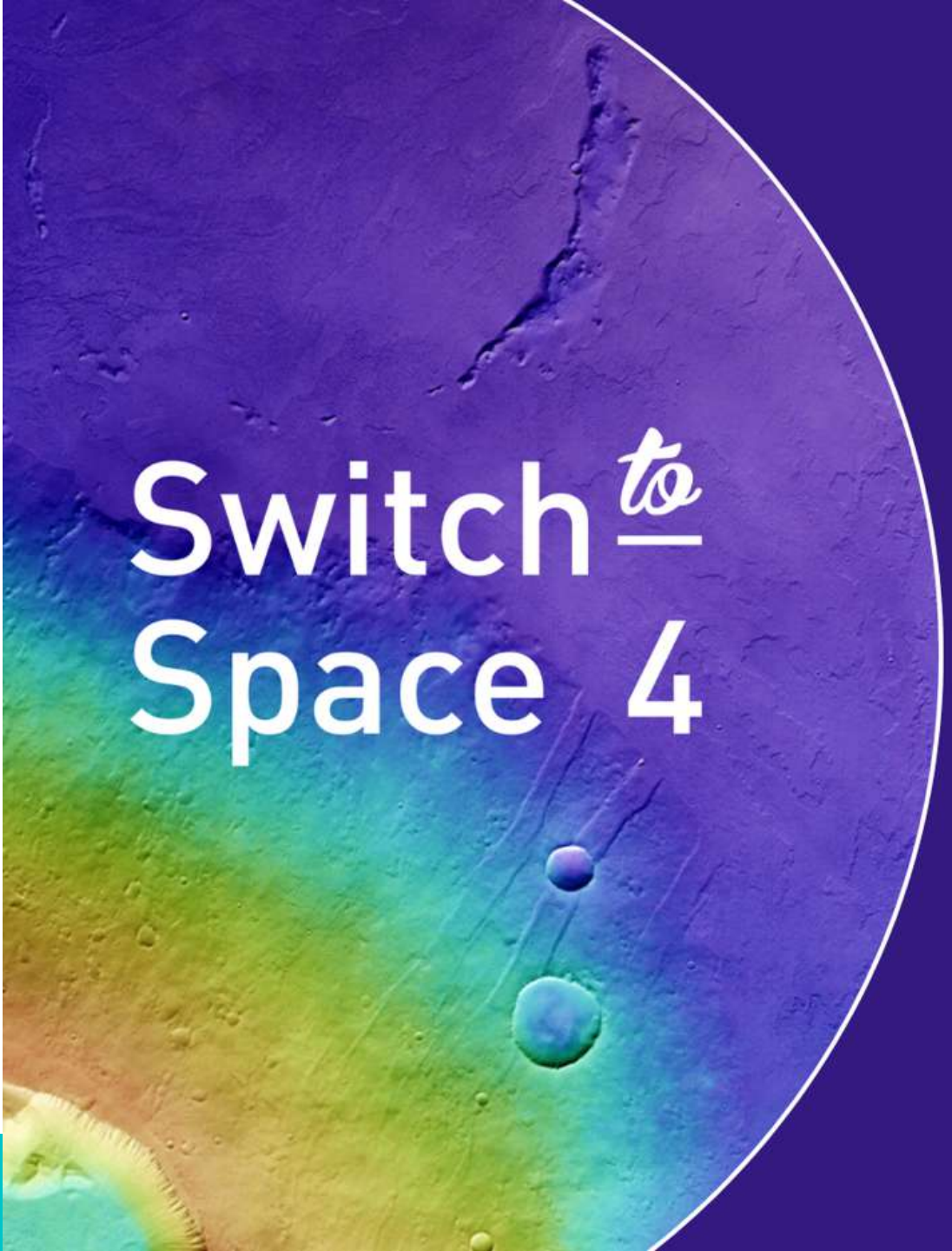
SERVICES

PRODUCTS

DELTACAST
VIDEO SOLUTIONS FOR DEVELOPERS

DELTACAST
VIRTUAL GRAPHICS FOR SPORTS

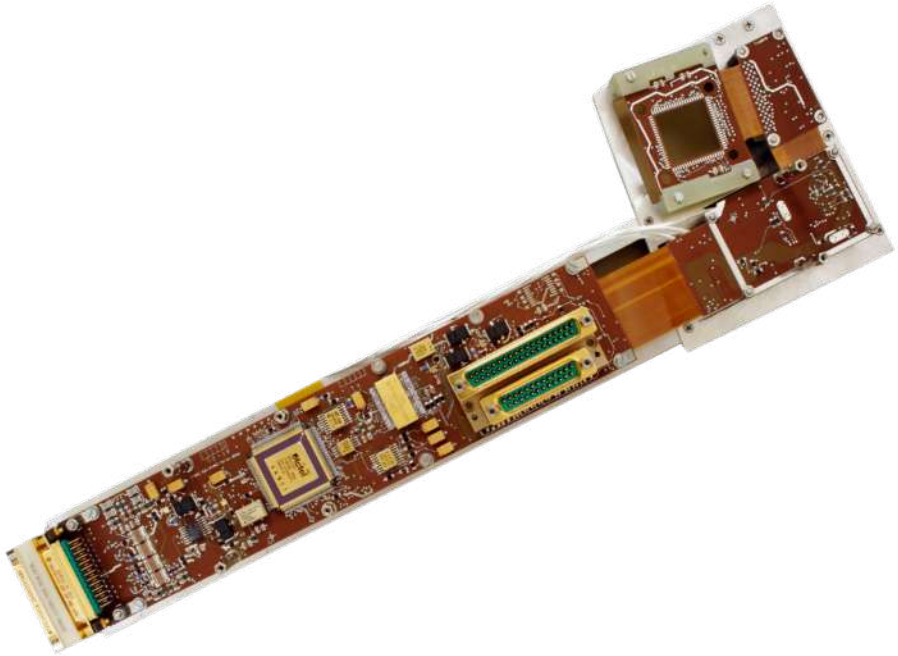
Based on a shared skilled engineering team



Sun observation using CMOS Sensors

SWAP Instrument ROE

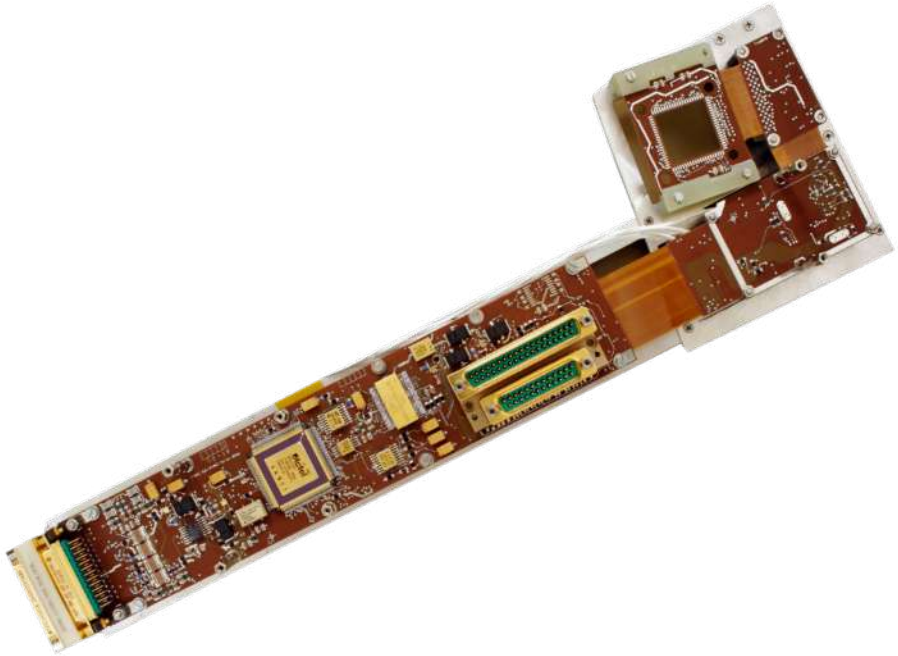
- In a nutshell
  - First collaboration between CSL and DELTATEC
    Started in 2003



SWAP Instrument ROE

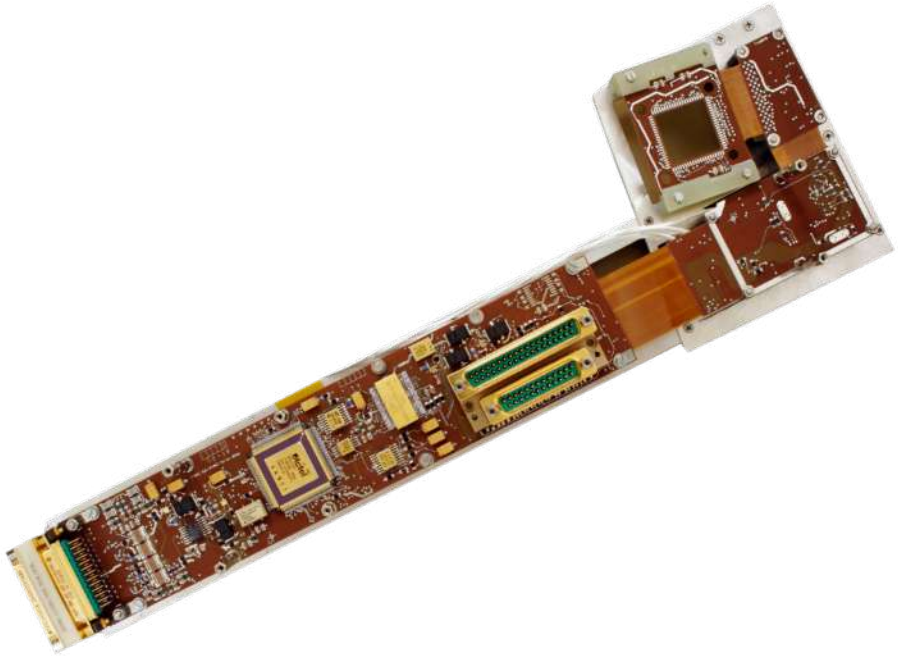
- In a nutshell
  - First collaboration between CSL and DELTATEC
  - First Space project for DELTATEC

    … but not the last !



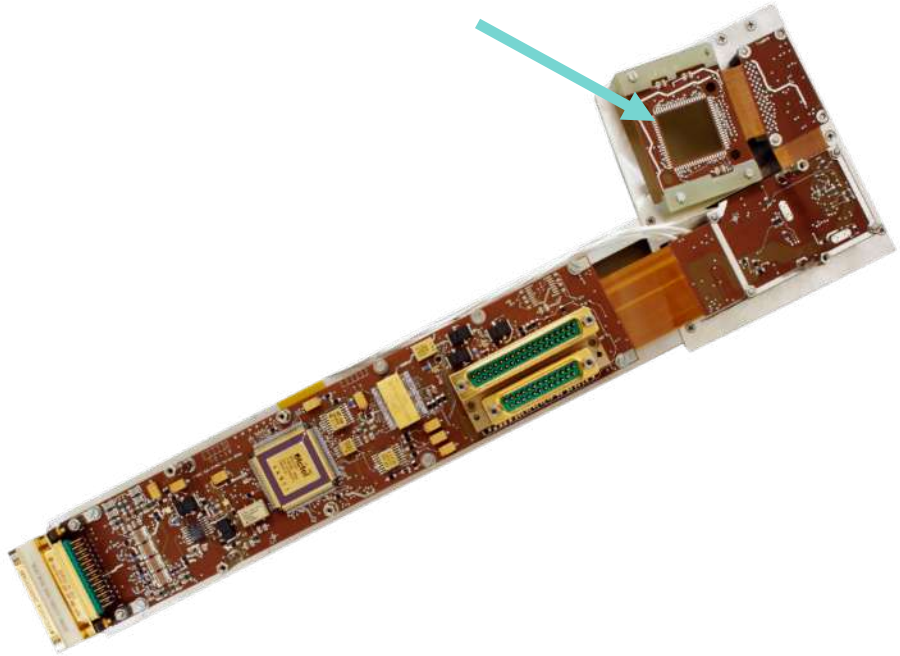
SWAP Instrument ROE

- In a nutshell
  - First collaboration between CSL and DELTATEC
  - First Space project for DELTATEC
  - Designed for a 2 years operation
    … and still in operation 13 years later!



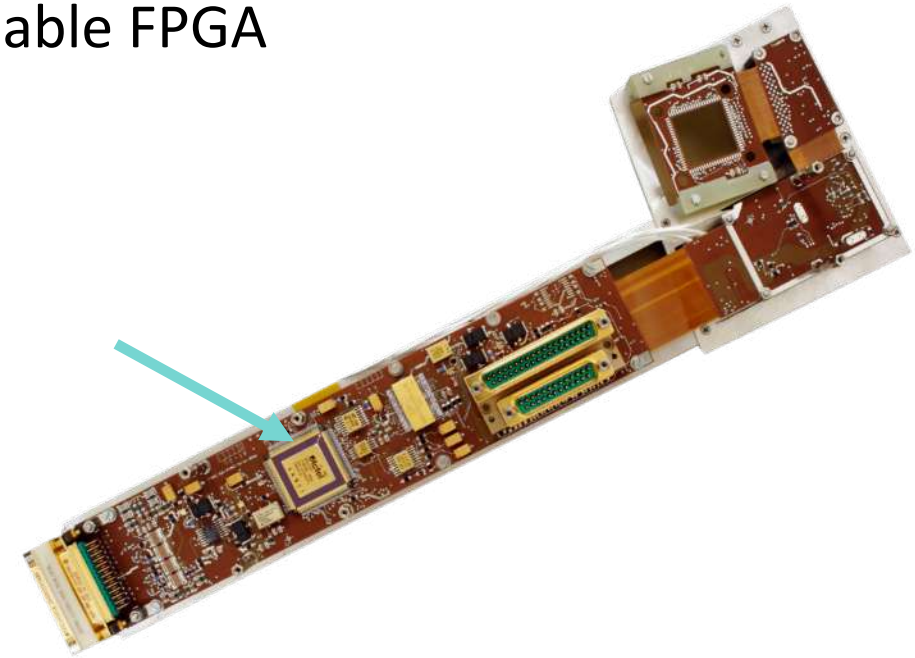
SWAP Instrument ROE

- In a nutshell
  - Based on HAS CMOS Sensor
  - ✓ High Accuracy Star tracker (HAS)
  - ✓ Radiation Tolerant
  - ✓ 1024 x 1024 pixels, 18um
  - ✓ 90-100 ke full well capacity
  - ✓ Designed in Belgium



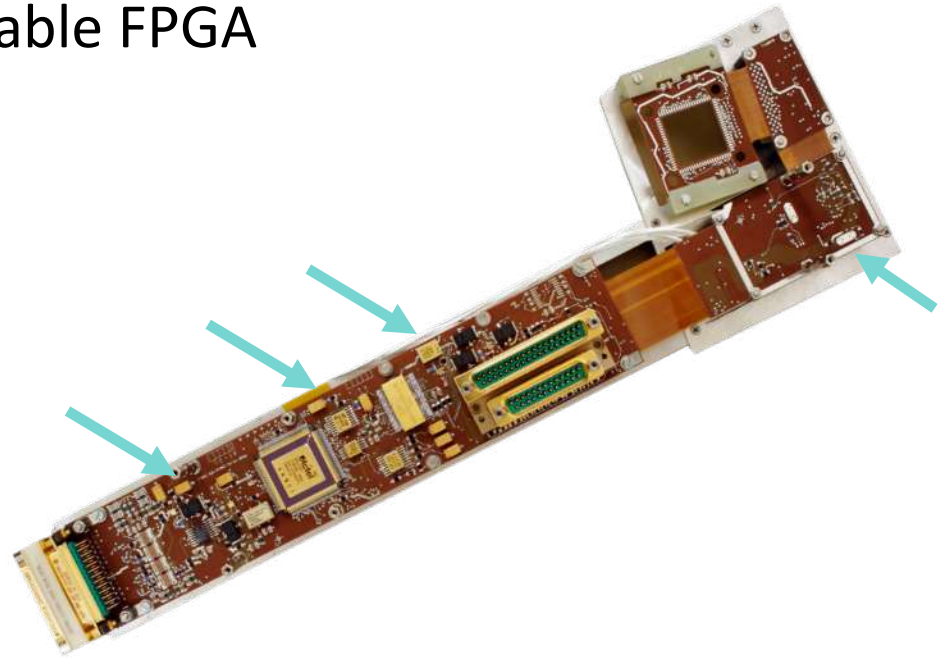
SWAP Instrument ROE

- In a nutshell
  - Based on HAS-2 CMOS Sensor
  - Sensor Control & Pixel extraction based on ACTEL/Microchip RTSX One Time Programmable FPGA



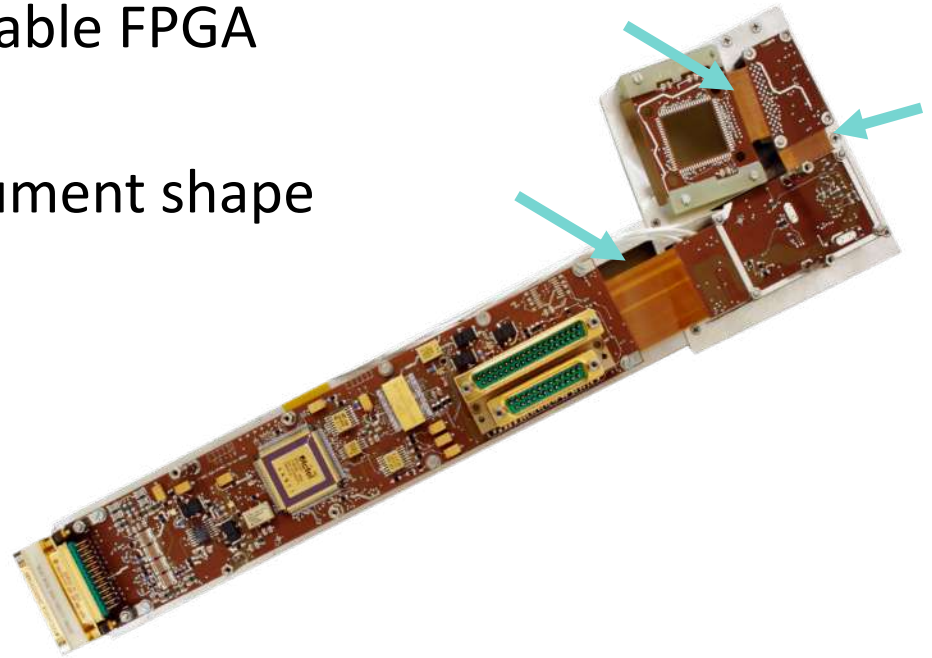
SWAP Instrument ROE

- In a nutshell
  - Based on HAS-2 CMOS Sensor
  - Sensor Control & Pixel extraction based on ACTEL/Microchip RTSX One Time Programmable FPGA
  - Rad-Hard / Rad-Tolerant EEE components

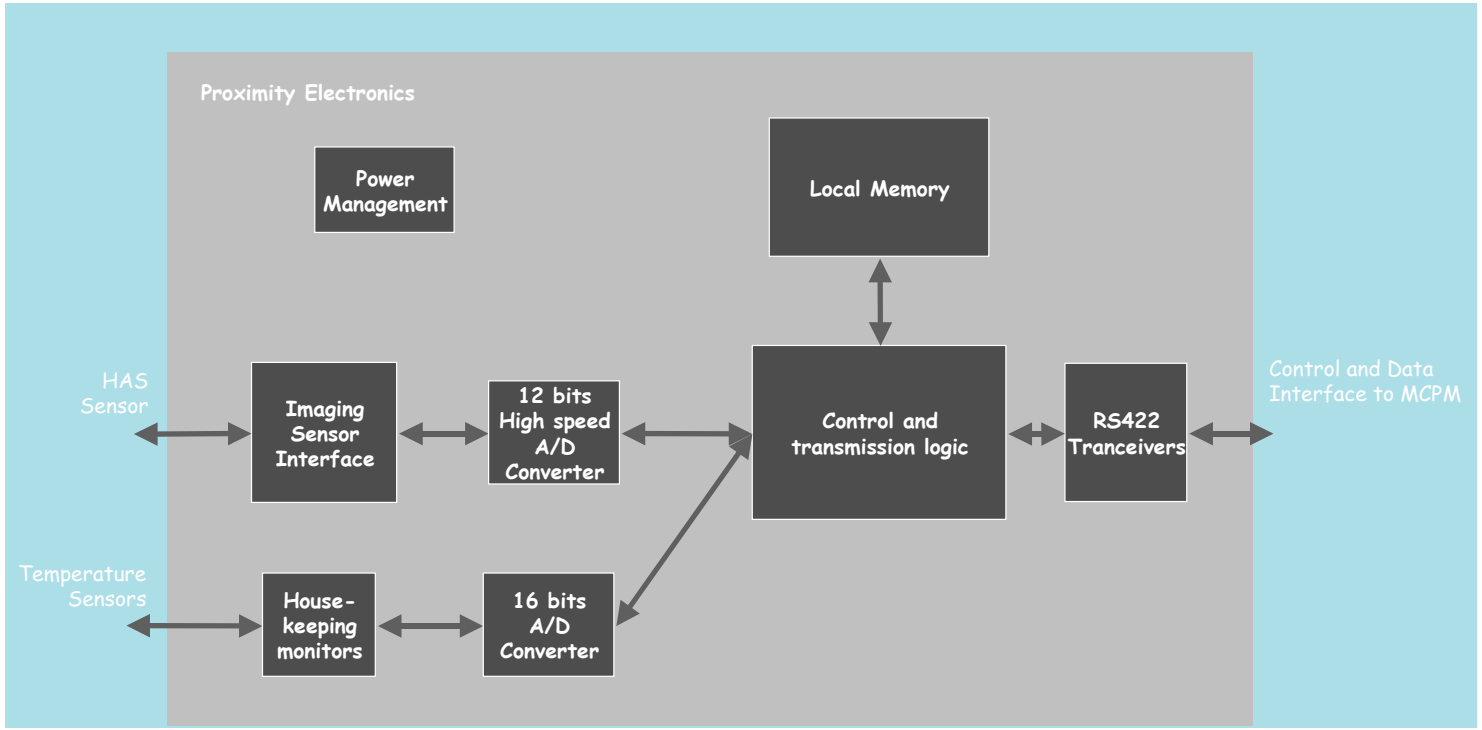


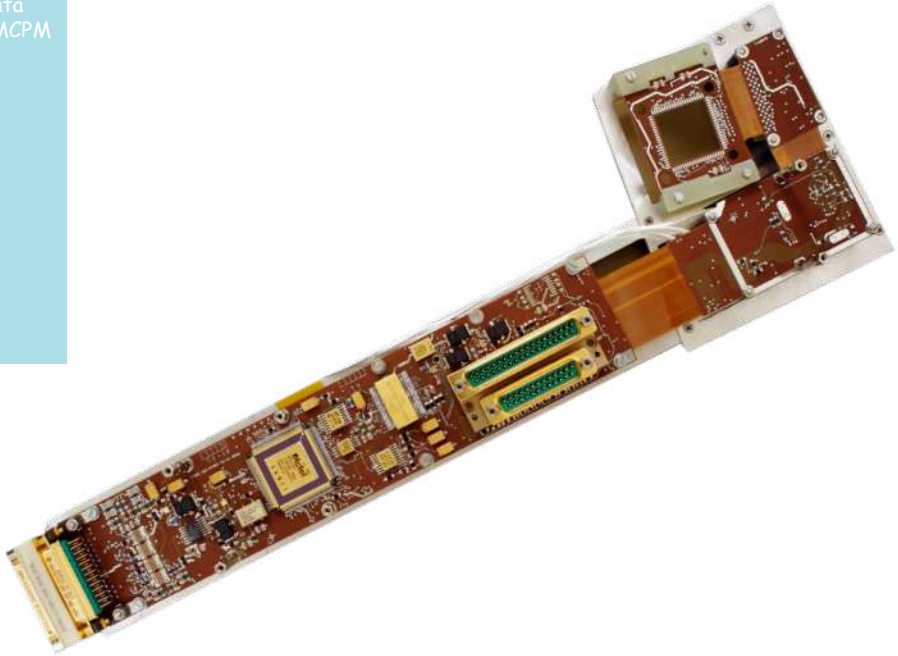
SWAP Instrument ROE

- In a nutshell
  - Based on HAS-2 CMOS Sensor
  - Sensor Control & Pixel extraction based on ACTEL/Microchip RTSX One Time Programmable FPGA
  - Rad-Hard / Rad-Tolerant EEE components
  - Flex-Rigid PCB to accommodate the instrument shape

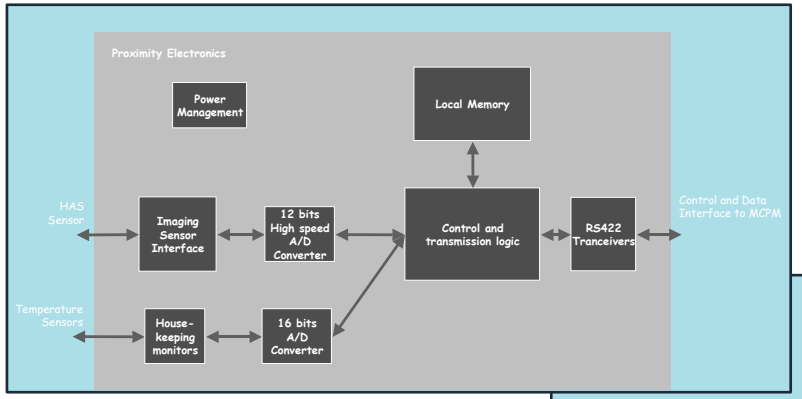


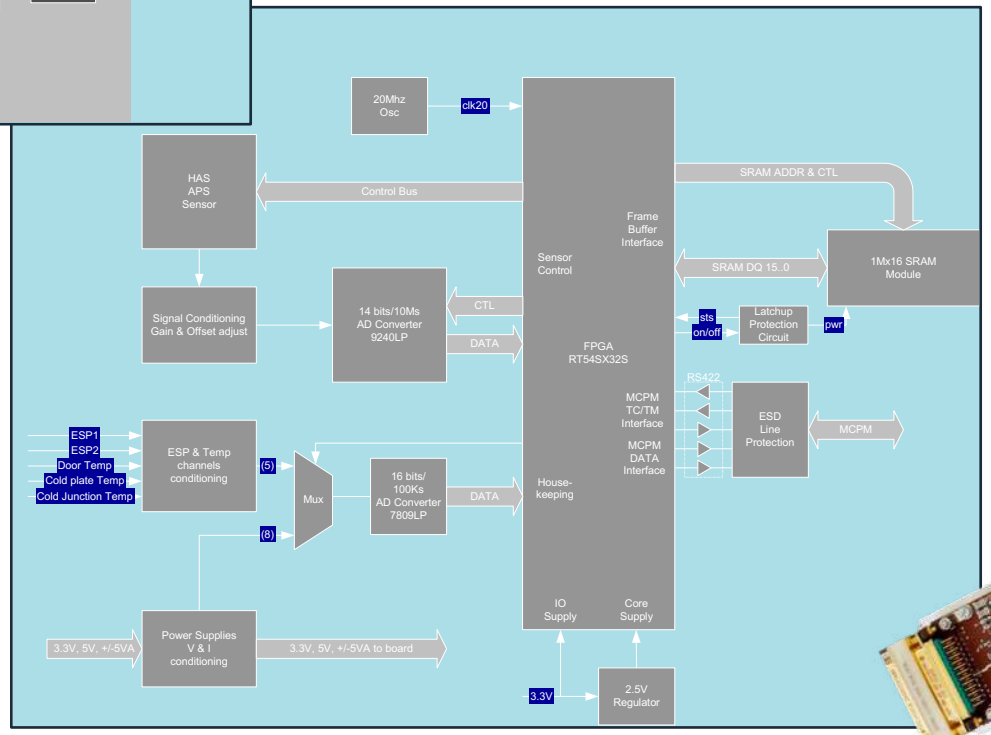
SWAP Instrument ROE

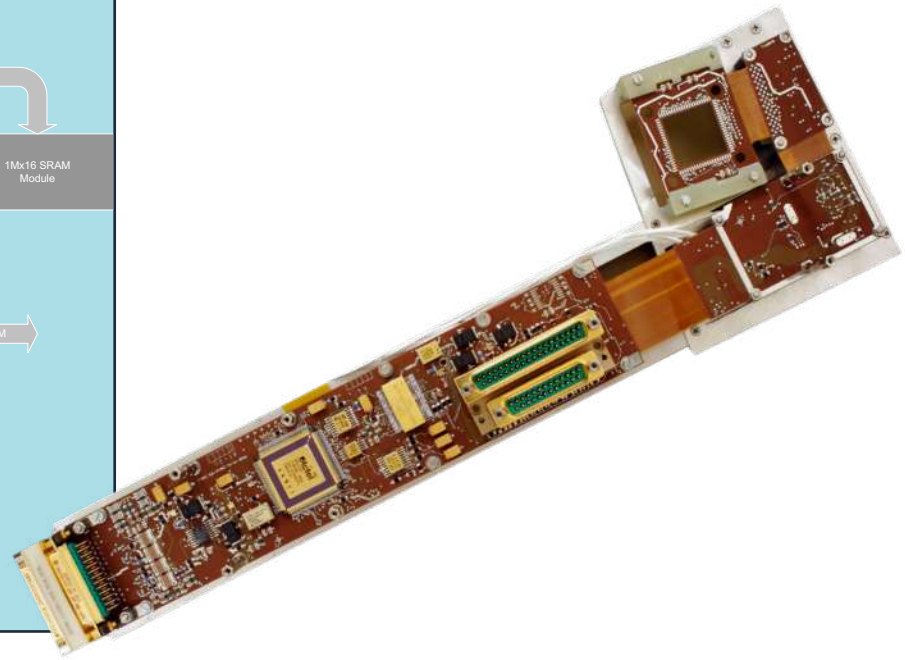




SWAP Instrument ROE

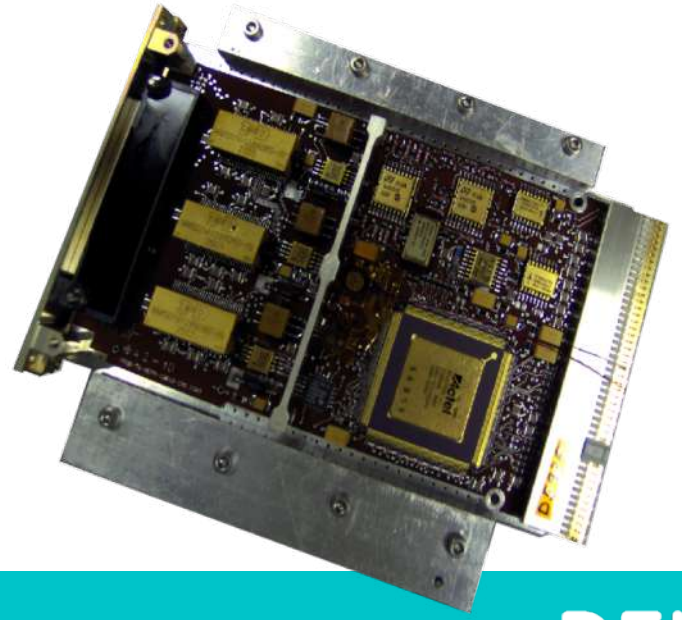






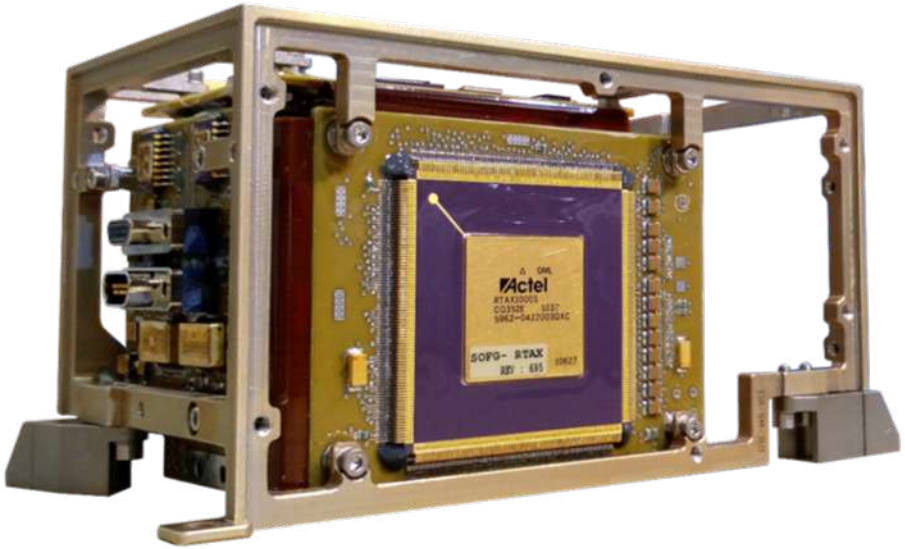
THE ROE … and Our first MMU

- COMPACT-PCI form factor (plugs in OBC)
- SDRAM technology
  - High density (4 Gb) … we are in 2004 ☺
  - Limited board space
  - High Bandwidth requirements
- Specific issues to tackle
  - Limited power
  - Radiation hardness
  - Error detection & correction (SEU)
  - Latchup/SEFI recovery
  - Thermal constraints



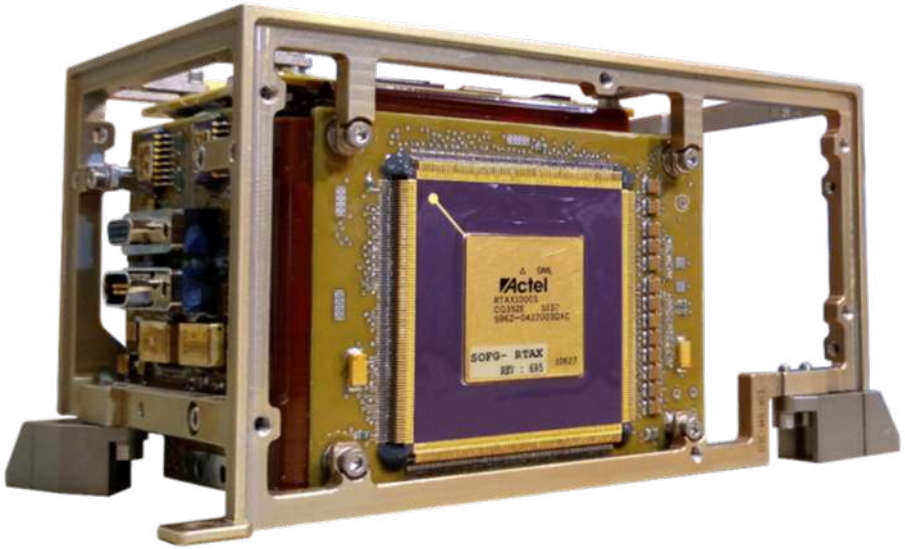
SOLAR ORBITER EUI Instrument ROE

- In a nutshell
  - New collaboration between CSL and DELTATEC, Following SWAP successful experience.



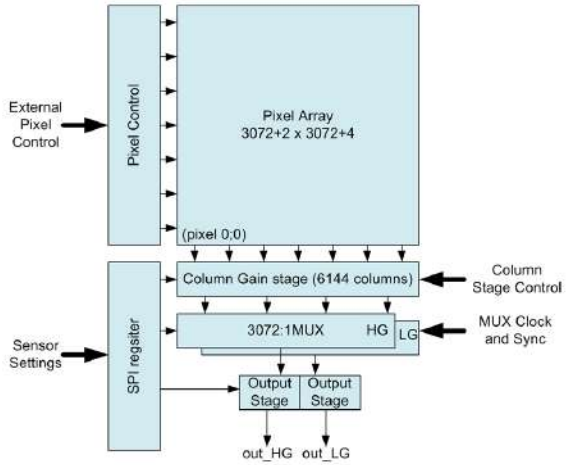
SOLAR ORBITER EUI Instrument ROE

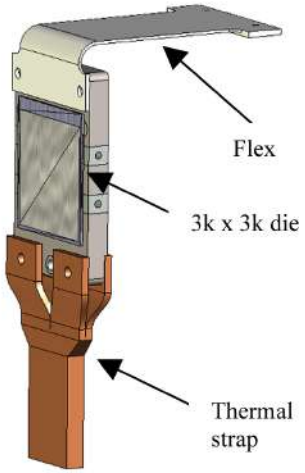
- In a nutshell
  - Renewed collaboration between CSL and DELTATEC, Following SWAP successful experience.
  - Class 1 mission

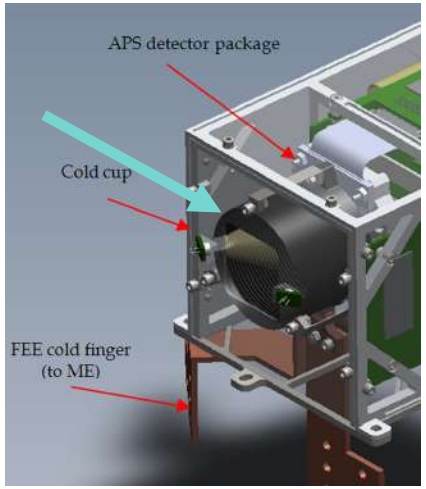


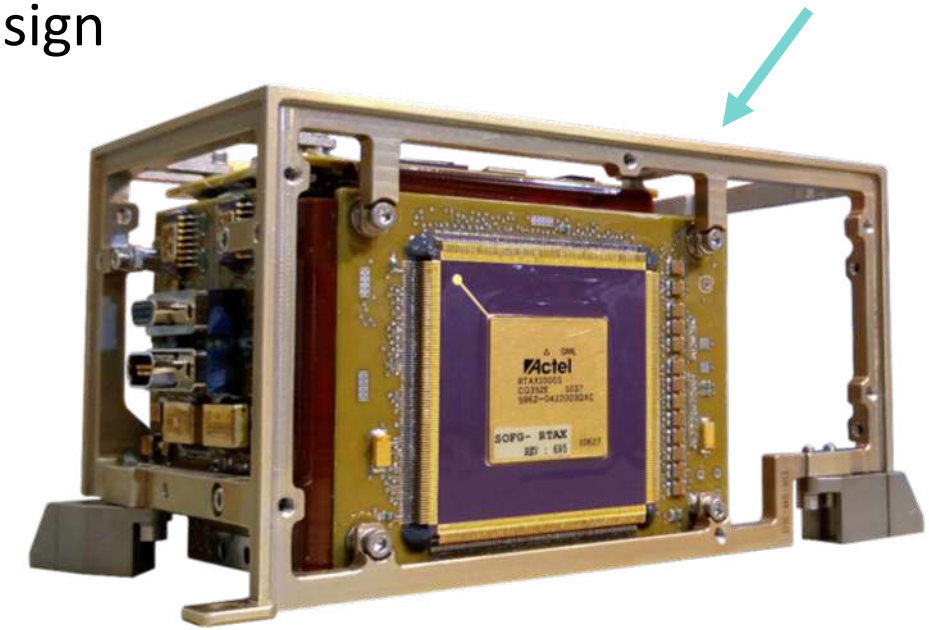
SOLAR ORBITER EUI Instrument ROE

- In a nutshell
  - Mission specific APS CMOS sensors designed by CMOSIS/AMS (be)
  - ✓ dual-gain 10 µm back-thinned 3k x 3k
  - ✓ Not available at the time of the preliminary design
  - ✓ DELTATEC designed a sensor emulator







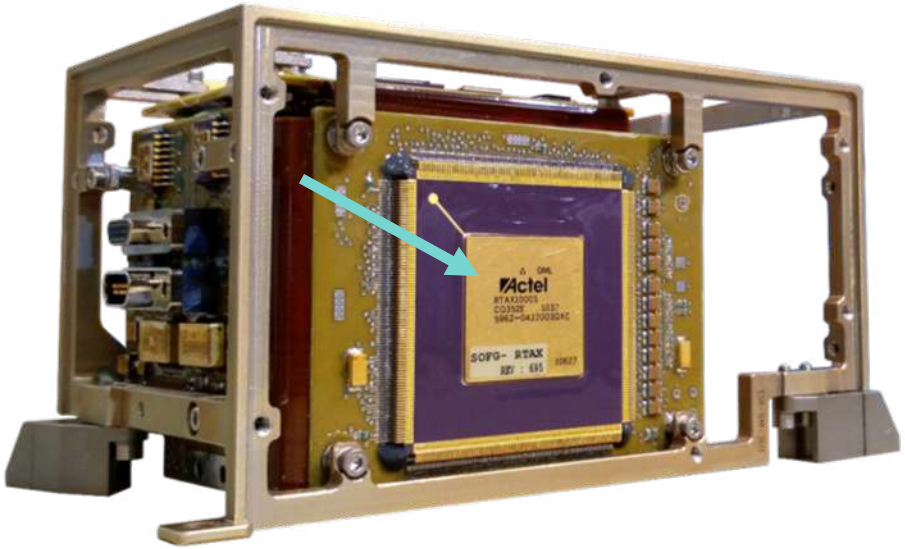


SOLAR ORBITER EUI Instrument ROE

- In a nutshell
  - Mission specific APS CMOS sensors designed by CMOSIS/AMS (be)
  - Sensor Control & Pixel extraction based on

ACTEL/Microchip RTSX One Time programming FPGA

✓ High-Reliability, Radiation-Tolerant, Antifuse

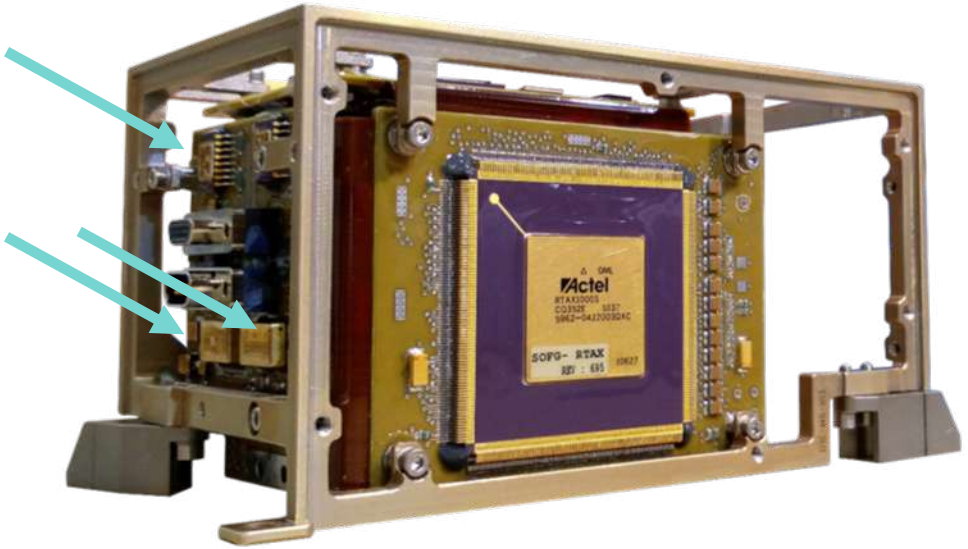


SOLAR ORBITER EUI Instrument ROE

- In a nutshell
  - Mission specific APS CMOS sensors designed by CMOSIS/AMS (be)
  - Sensor Control & Pixel extraction based on

ACTEL/Microchip RTSX One Time programming FPGA

  - Class1 Mission Rad-Hard EEE components

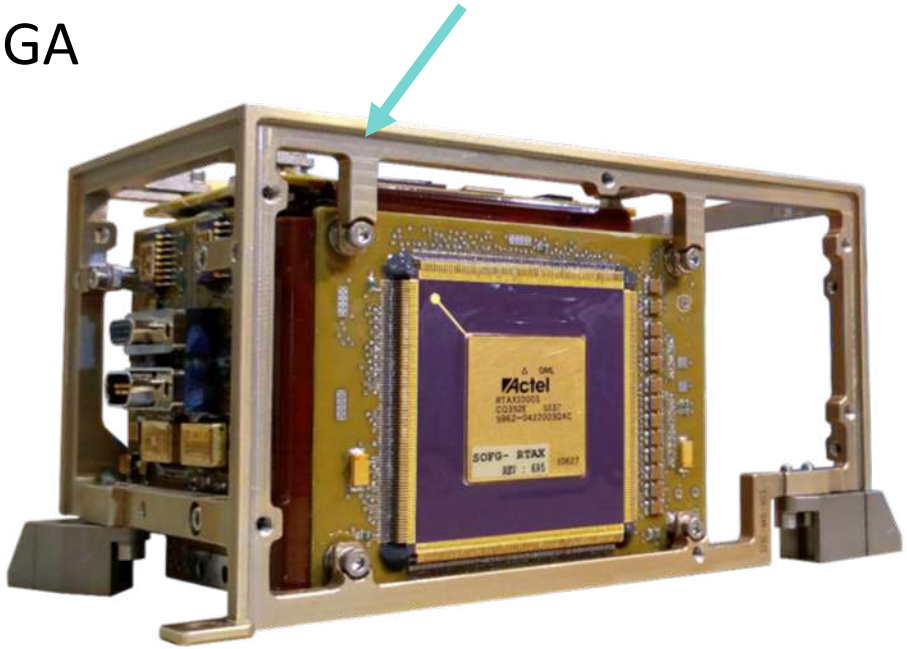


SOLAR ORBITER EUI Instrument ROE

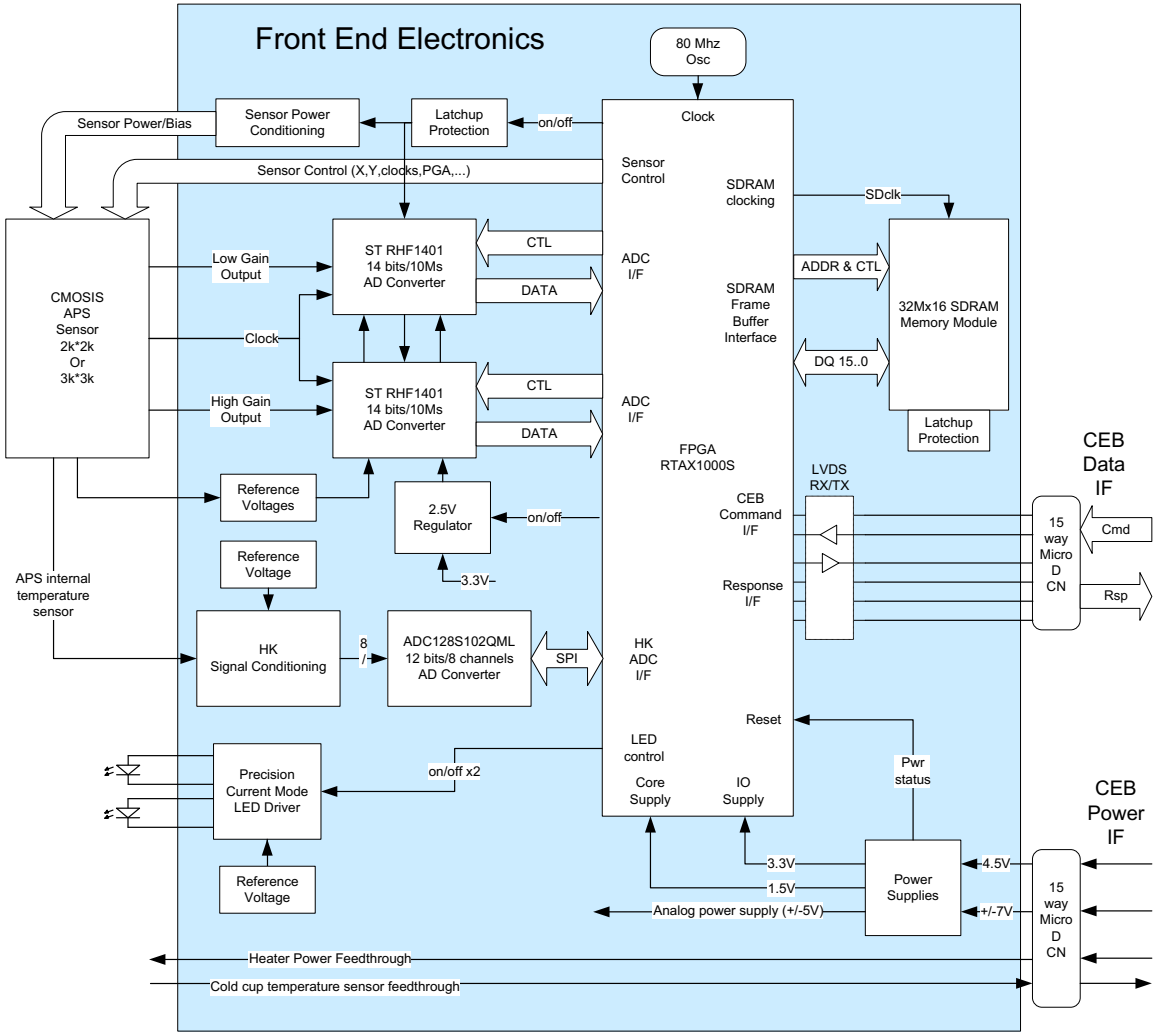
- In a nutshell
  - Mission specific APS CMOS sensors designed by CMOSIS/AMS (be)
  - Sensor Control & Pixel extraction based on

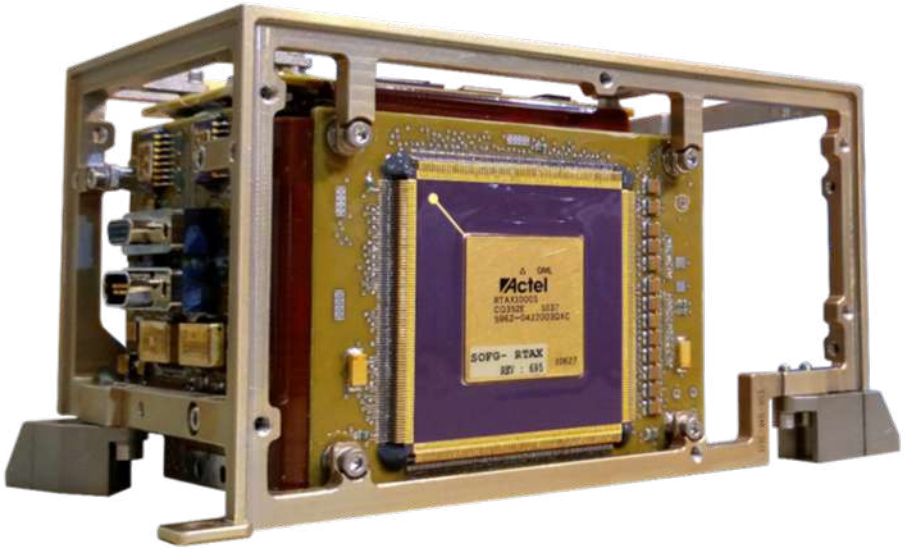
ACTEL/Microchip RTSX One Time programming FPGA

  - Class1 Mission RadHard EEE components
  - Stringent Thermo-Mechanical constraints



SOLAR ORBITER EUI Instrument ROE





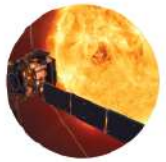
Space activities

The adventure continues

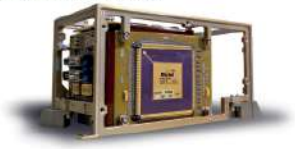
CAMERAS

EUI

Extreme UV Instrument on SOLAR ORBITER mission



- Triple focal plane: mechanics & electronics
- Custom 9 MP CMOS detector from CMOSIS
- Stringent thermal / mechanical constraints
- TRL-9, launched in 2020



SWAP

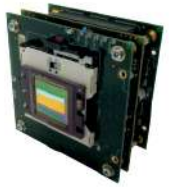
EUV solar telescope (PROBA-2)

- Focal plane electronics
- HAS2 CMOS APS image sensor
- TRL-9, launched in 2009, designed for 2 years lifetime, still operating

CSIMBA IOD

GSTP IOD Hyperspectral program

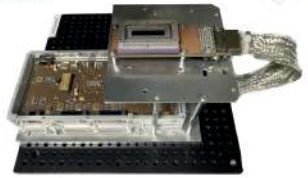
- Flexible and high speed sensor readout electronics
- 150 VIS spectral bands
- 1TB Mass Storage
- Gb ethernet interface
- TRL-7, launch target 2025



ELOIS ROES

GSTP IOD Hyperspectral program

- VNIR Electronics
- SWIR Electronics
- Payload Computer
- TRL-7, launch target 2025



THERMAL INFRARED (TIR)

For Earth Observation and in-orbit servicing

- NewSpace TIR Camera Core
- [8 - 14µm] SXGA 12µm pitch microbolometer
- Improved NETD and along track GSD
- CameraLink or LVDS interface
- 60Fps, 14 bits quantization
- TRL-4, ongoing RnD

CLS

Coarse Lateral Sensor for formation flying missions (PROBA-3)

- Optical detector head mechanics & electronics
- Operates with sun in the field of view
- EM delivered
- TRL-6

DELTATEC

DATA HANDLING AND PROCESSING

MMU

Mass Memory Units

SDRAM Based (512 Mb)

- Compact PCI I/F
- TRL-9, launched in 2009

Nand Flash Based (512/1024 Gb)

- SpaceWire I/F
- Leon3 + RTG4 architecture
- TRL-7, launch target 2025

AIS MISSIONS

Global ship traffic monitoring from space (Satellite-based Automatic Identification Systems of vessel)

- Dual redundant On-Board Computers
- Payload Computer including software
- TRL-9, launched in 2020

ELOIS PLC

GSTP IOD Hyperspectral program

- Dual payloads acquisition/processing/ recording system
- Hybrid architecture (Cost + Hardened Components)
- Integrates Radiation effects design mitigation technics
- Up to 6 LVDS I/F lines per payload at 100Mhz
- 1 TBytes of data Storage
- Cold redundant architecture
- TRL-5, launch target 2025

VESSELSAT 1&2

Microsatellite-based Automatic Identification System of vessels (**ORBCOMM**)

- Low-power OBC (2W)
- COTS design, 160 Mhz RISC processor, extensive radiation mitigation
- TRL-9, launched in 2011 and 2012

Thank You

DELTATEC

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