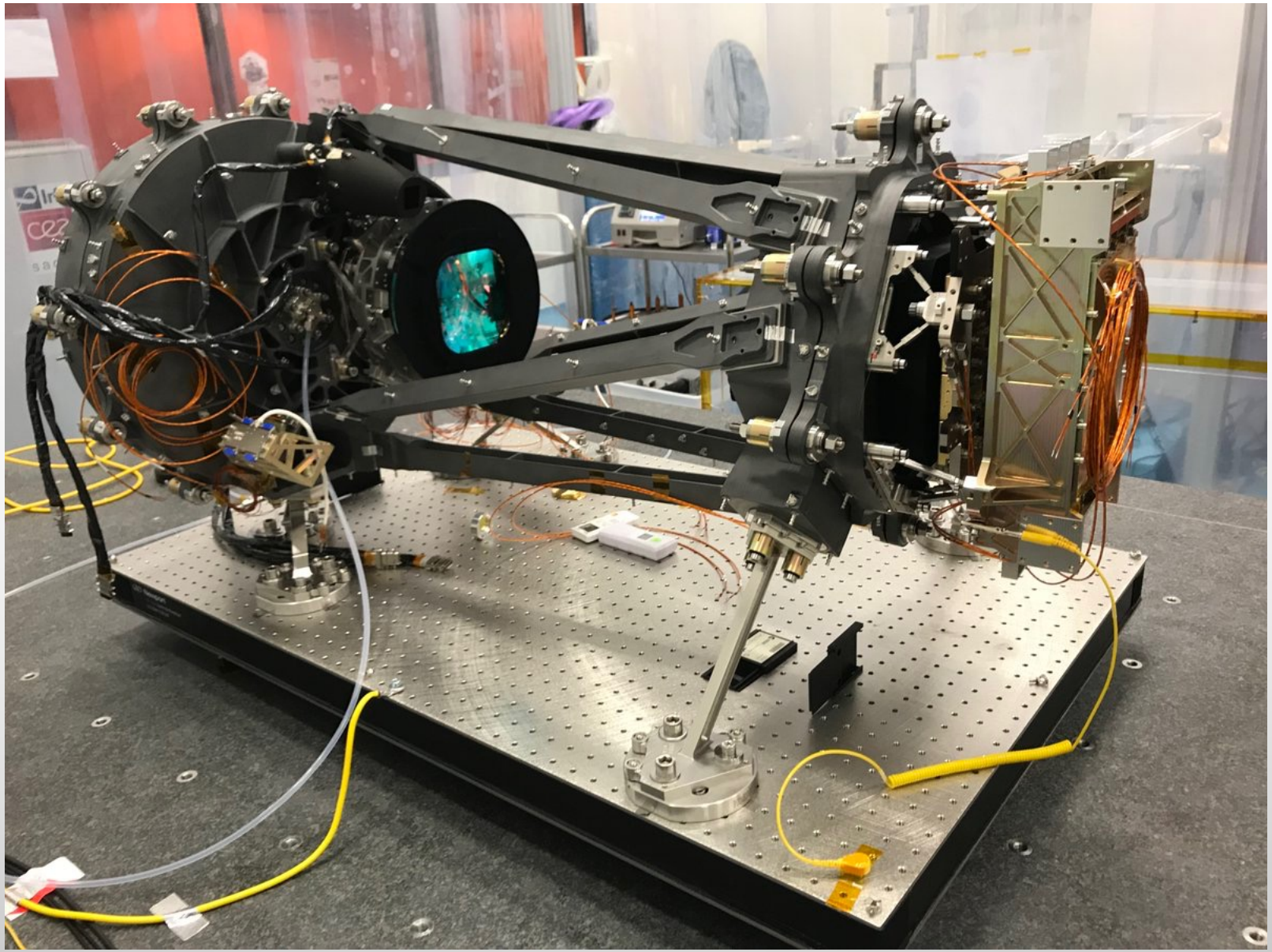
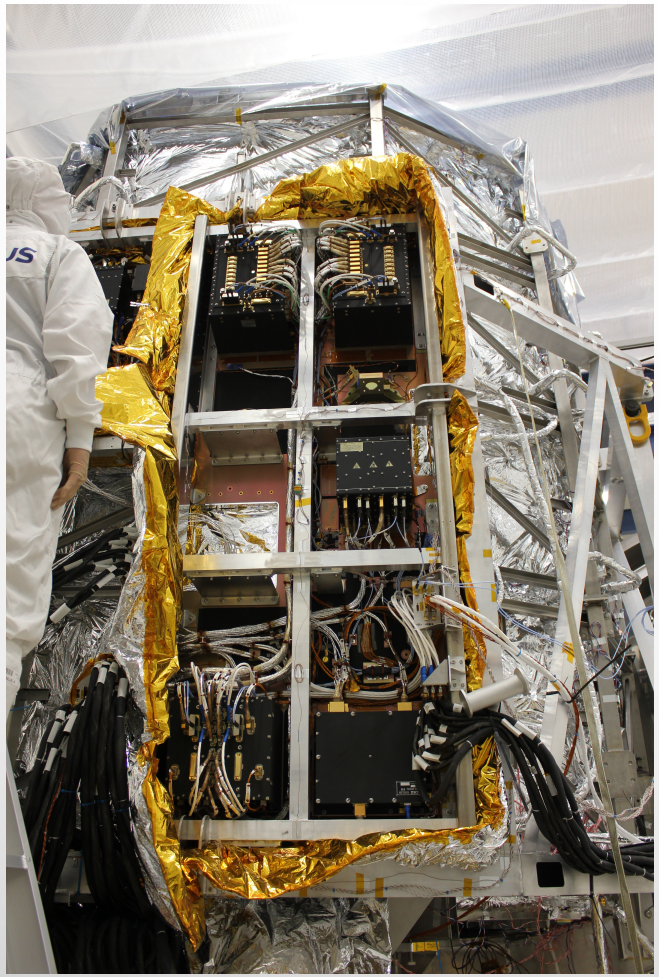
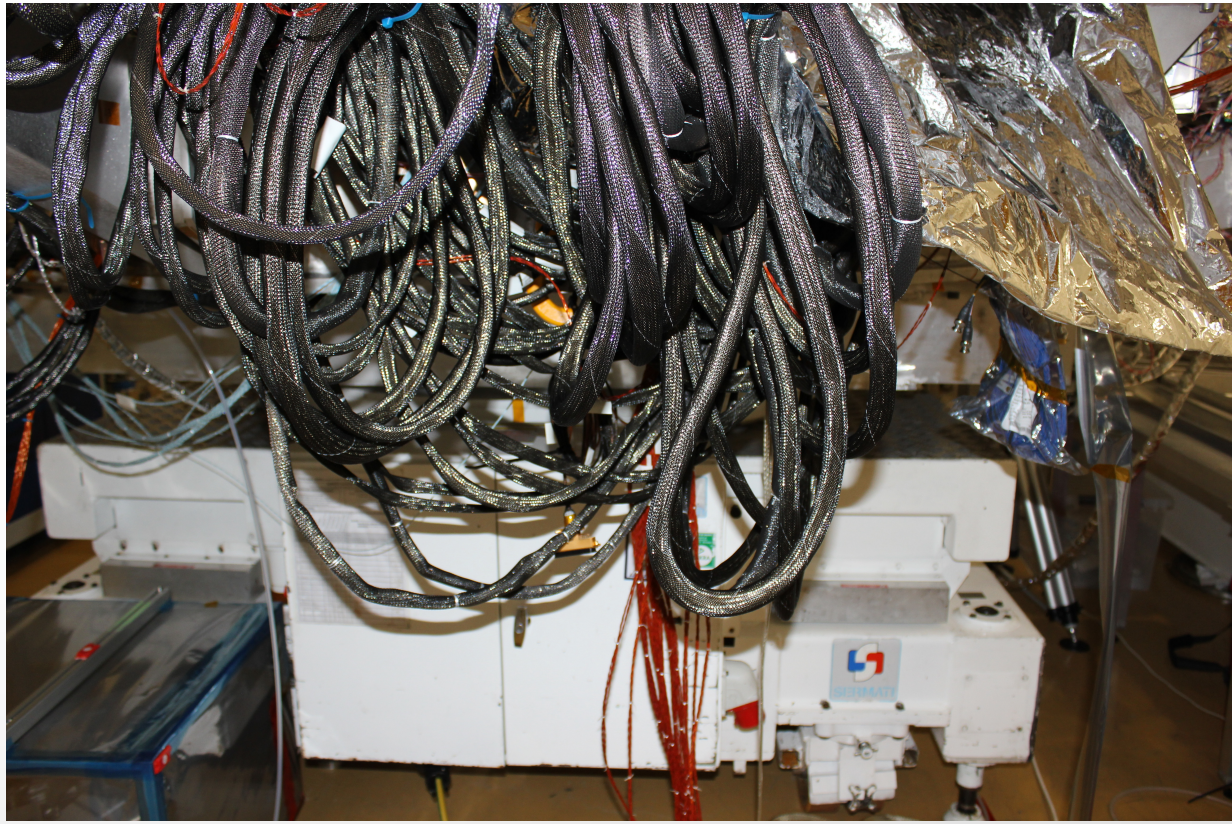
NISP STATUS

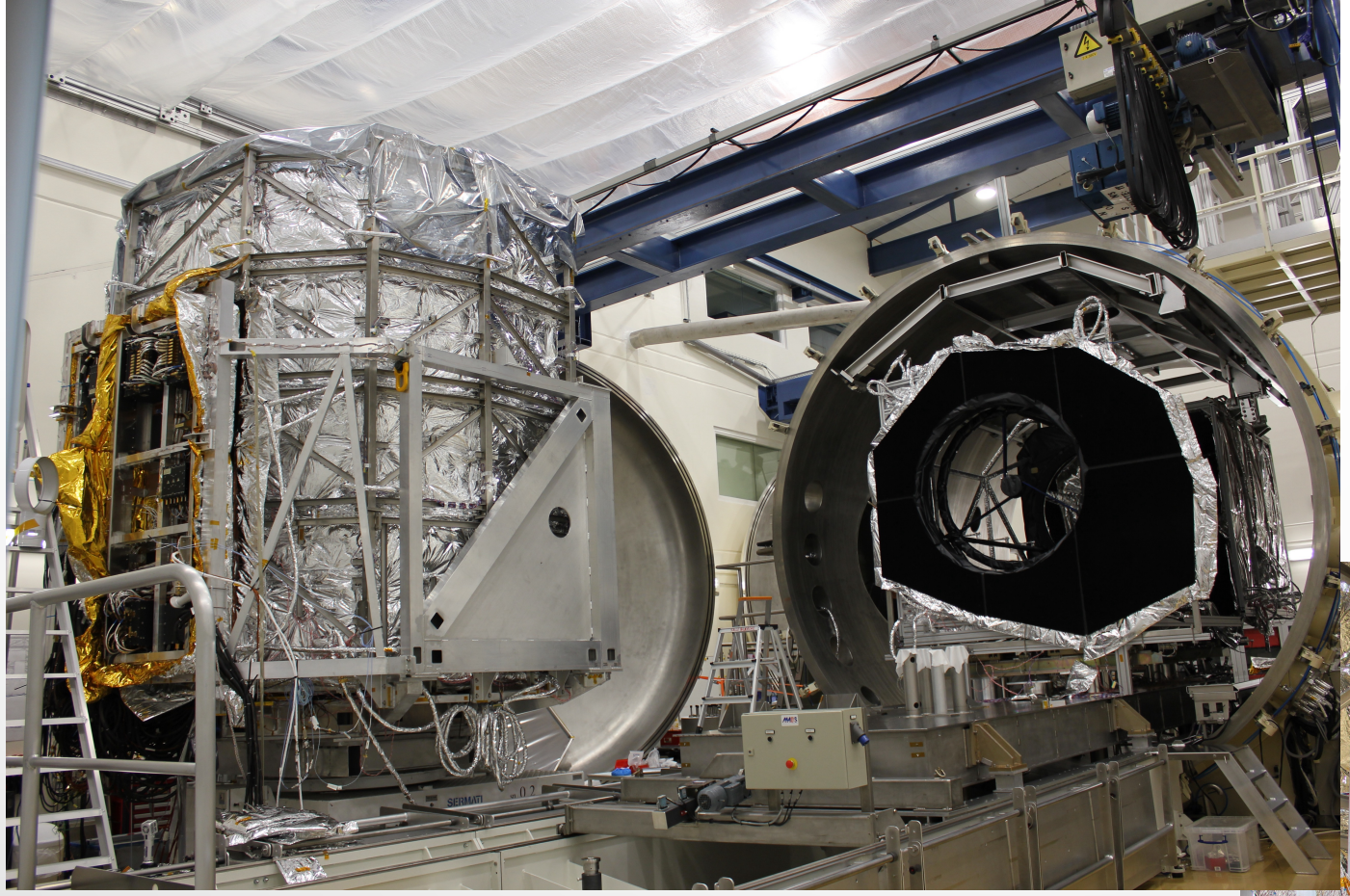
SEBASTIANO LIGORI (INAF –OA TORINO)

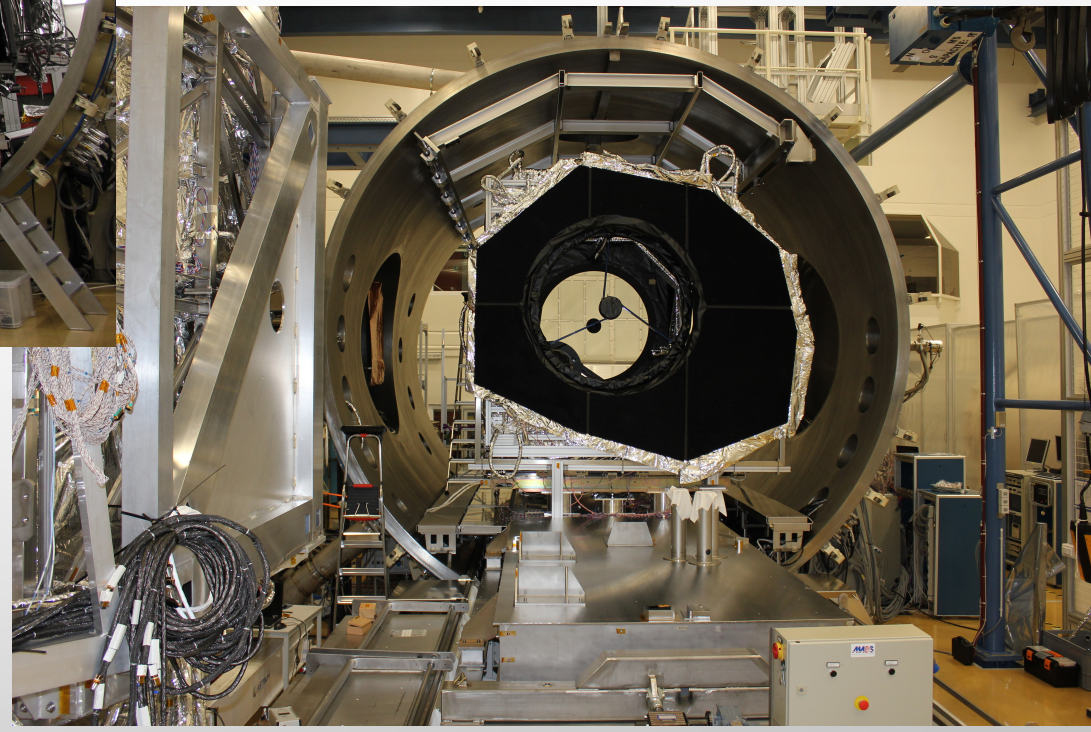
ON BEHALF OF NISP IDT

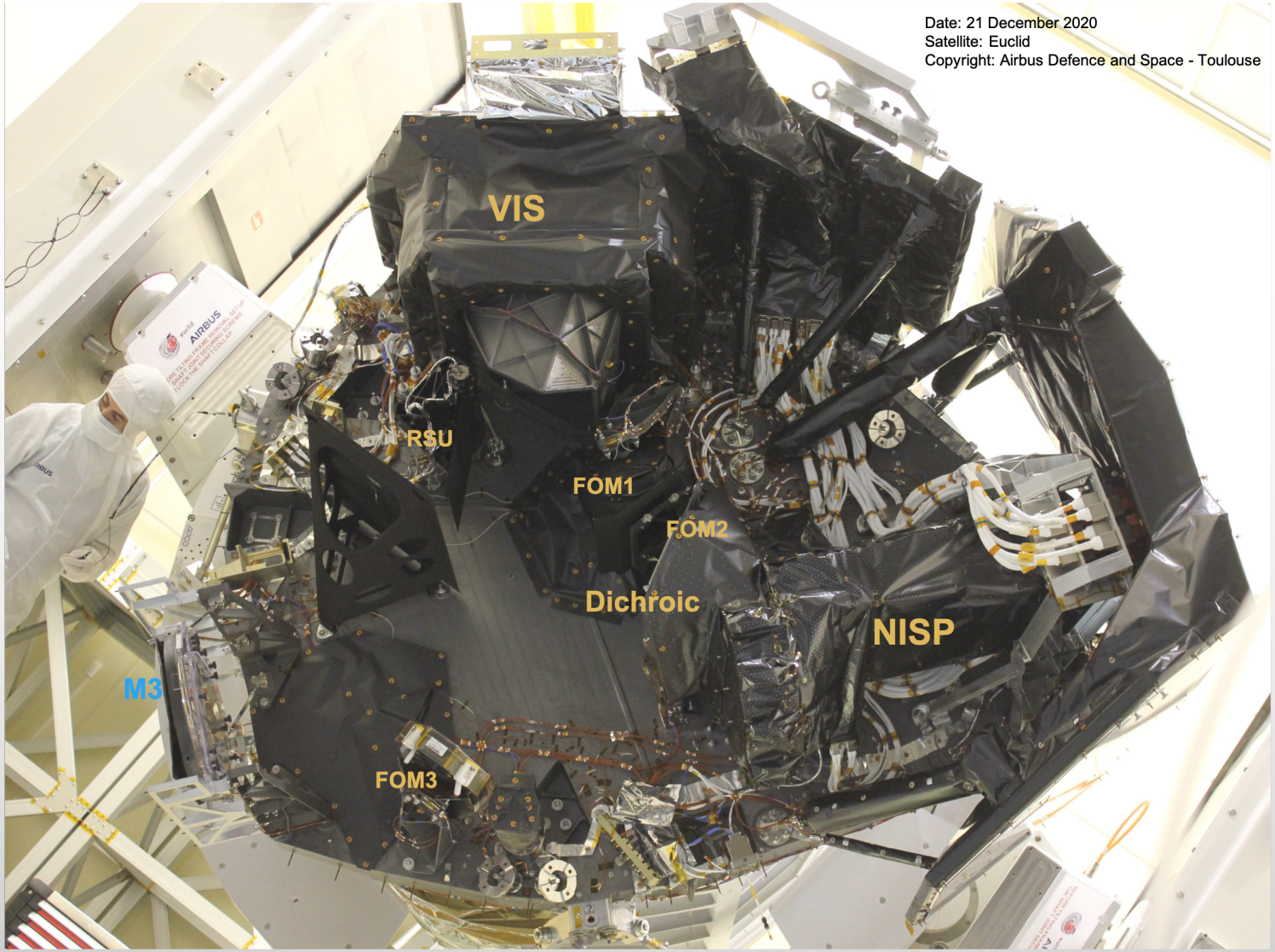










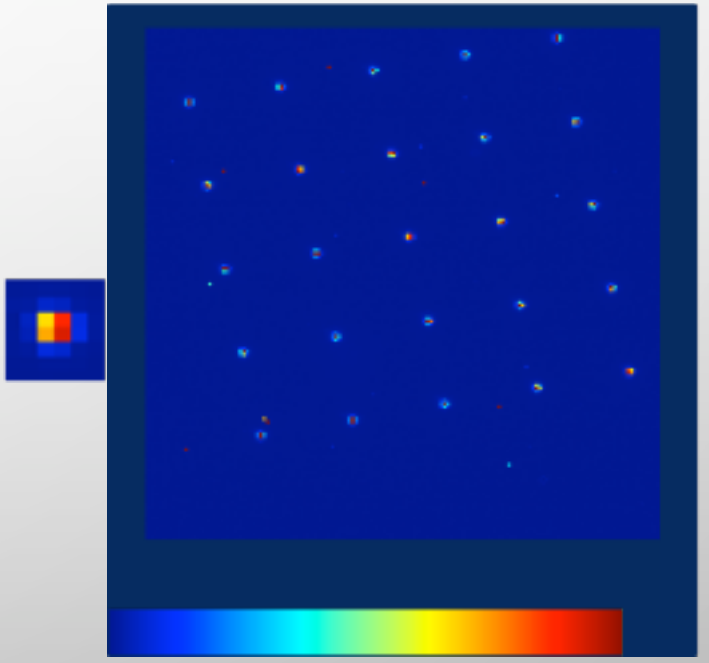

Date: 21 December 2020
Satellite: Euclid
Copyright: Airbus Defence and Space - Toulouse
VIS
RSU
FOM1
FOM2
Dichroic
NISP
M3
FOM3

MAIN ACTIVITIES IN 2021

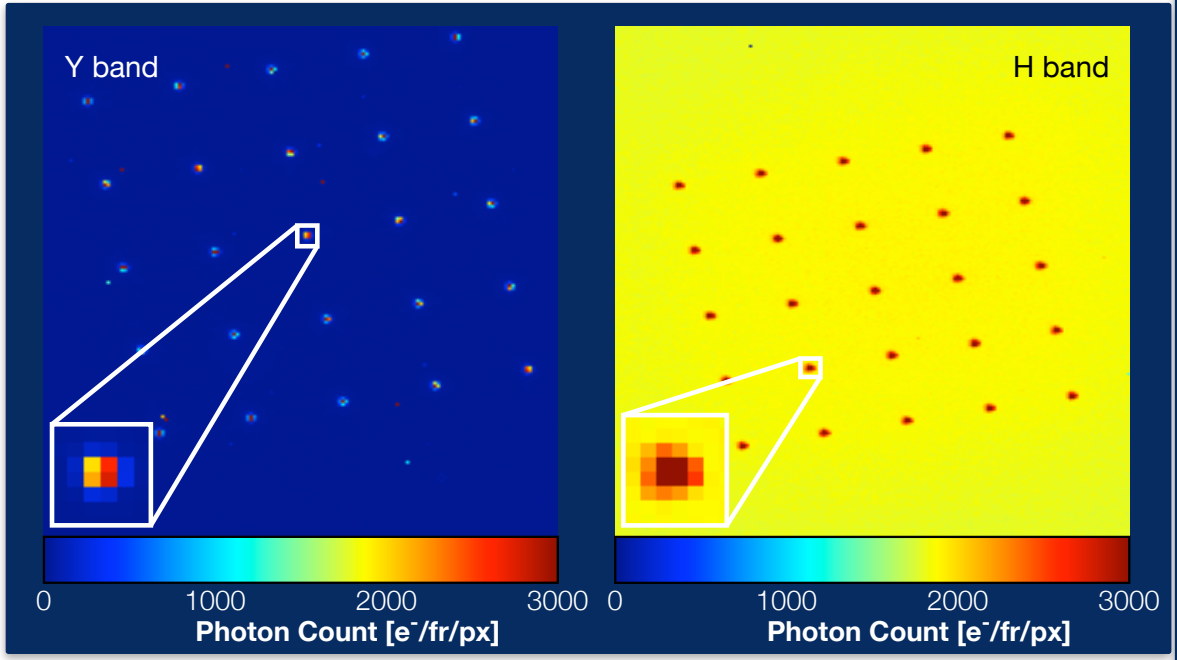
- Euclid integrated cryo-vacuum tests at CSL
- SVT
- SOVT

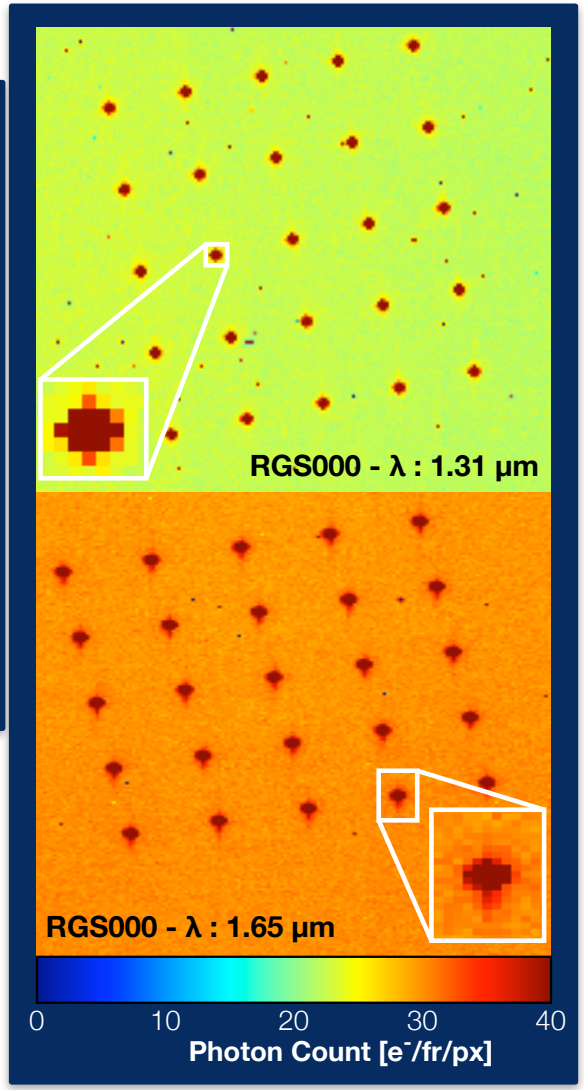
PLM CRYOVAC TESTS AT CSL

- Complicated by issue on DPU (see later slides); limited FOV since only a subset of detectors was used
- Nonetheless mostly successful in verifying the NISP performances in the final configuration and at operating temperature
- Focus verified and well aligned wrt VIS, i.e.: when M2 is produced best focus on VIS it is also giving a good focus for NISP
- NISP image quality well within specs
- No compatibility issues with VIS
- More details in the following presentation by Louis and Antonino



NISP image quality verification



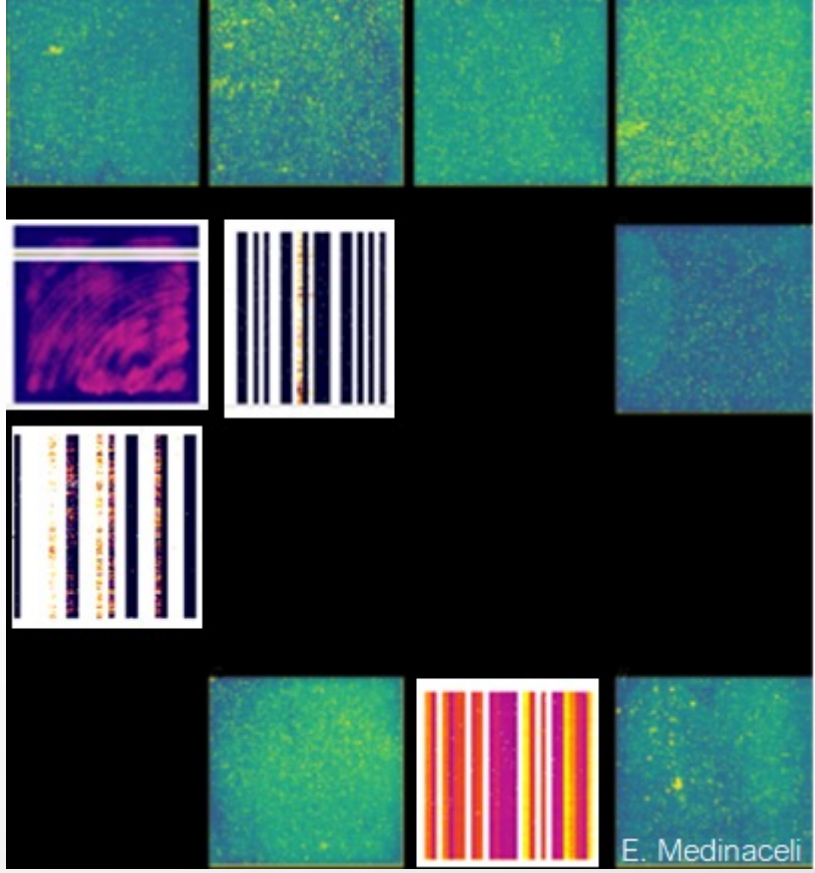


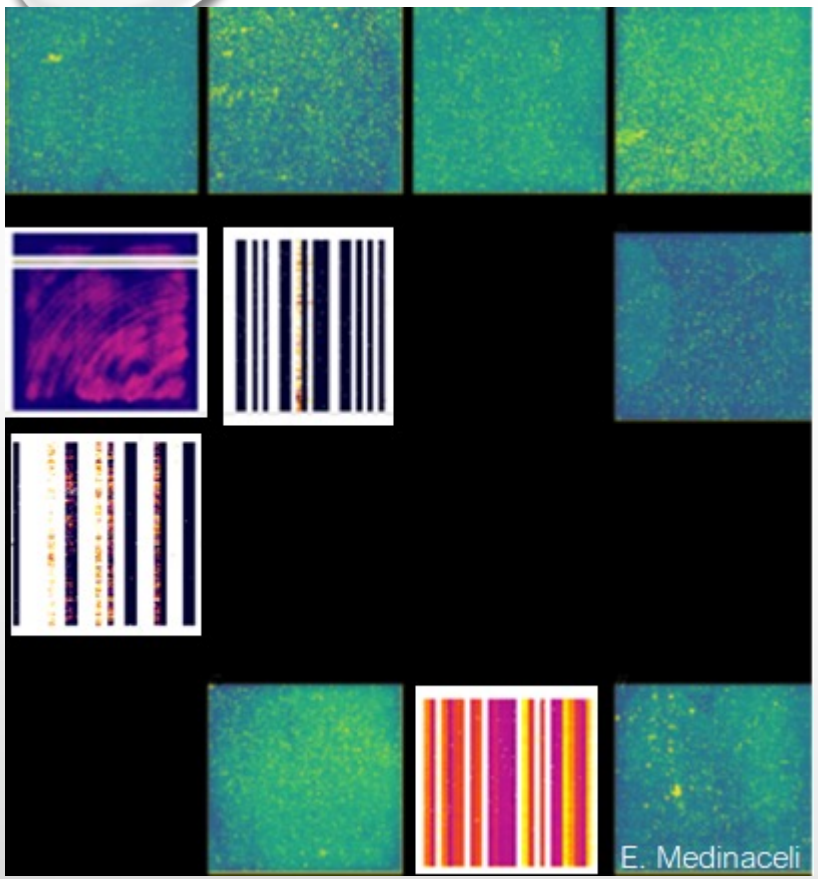
Thermal emission of the PLM collimator produces an important background in red (Photo-H and red grisms)

Courtesy: W. Gillard

DCU-SIDECAR I/F ISSUE

- Problem arose apparently (but only apparently...) linked to HW
  - Temperature dependent (At ambient temperature all detectors working, at cold in some cases only 4 worked normally)
- slight changes in setup (a difference in the harnesses lengths between DCUs and SCEs) at CSL caused a new condition never tested and not correctly managed
  - Driver SW/ASW issue identified and corrected
  - No issues on HW: all detectors and SCE are fine
- The CSL tests have been completed with only 7 detector chains
- The issue has been covered in EUCL-ASF-NCR-1-3-00090 "DCU-SCE communication errors"





Example of NISP FPA composition @ CSL:
only 7 out of 16 detectors working nominally,
lead to EUCL-ASF-NCR-1-3-00090
DCU-SCE communication errors.

- At cryogenic temperatures several detectors show errors during science data transmission (artifacts shown in the figure); while with some of the detectors was not possible to produce data continuously (missing images in the figure); only 7 detectors worked nominally (green colour scale)
  A dependency of the number of nominally operating detectors with the temperature was observed during the different test phases i.e. during ARTs the entire FPA was correctly working (reference case); during phase 61 (operational Tmax) only 4 detectors were working nominally (worst case), and during phase 70 (decontamination) only 3 were in the error condition.

- In this setup NISP after the 1st exposure enter in a non-recuperable error condition using the entire FPA

- During the CSL test campaign dedicated tests were conducted by NISP supported by NASA and industrial partners to address the issue without a clear identification of the error source – operations with a new HW setup configuration were addressed (e.g. new harnesses lengths)

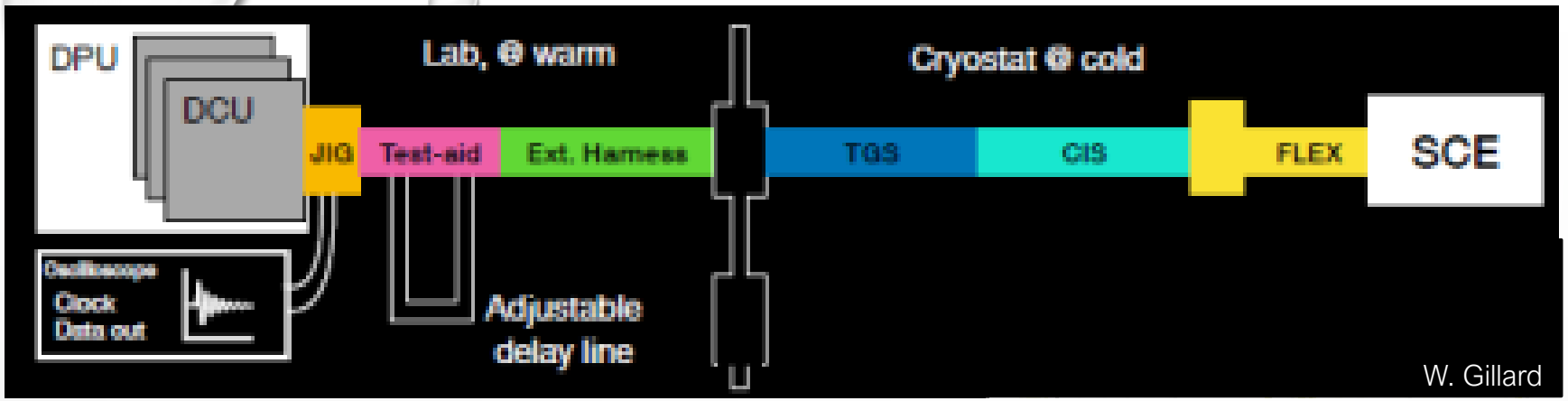
- It was decided to complete the CSL campaign only with 7 detector chains (FPA borders and centre partially covered).

- Further analysis/tests identify the main cause of the issue in the DCU-SIDECAR I/F composed by a LVDS line managing commanding and data retrieval. Data transmission implements a double sampling (using two FIFO) with a phase difference of 50 ns to correct transmission asynchronization.
  Table 6-2 shows the assumed FIFO counters wrongly assumed as errors in the DCU_ERROR_REG

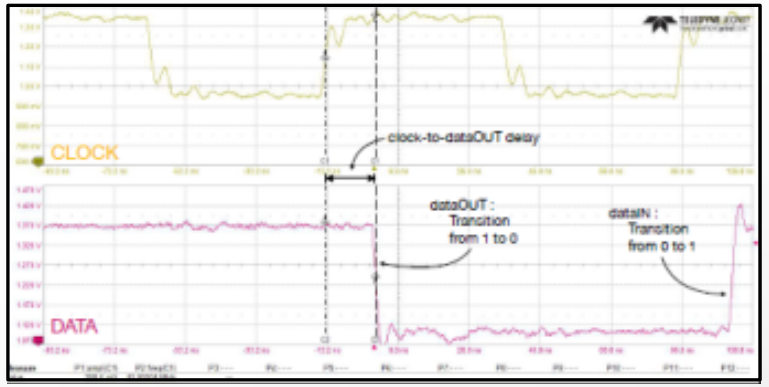
CRC 0	CRC 1	PACKET VALIDATED	COUNTER INCREMENTED
wrong	wrong	The packets received are discarded	Not incremented
correct	wrong	The packet is taken by the FIFO 0	Incremented FIFO 1 error counter
wrong	correct	The packet is taken by the FIFO 1	Incremented FIFO 0 error counter
correct	correct	The packet is taken by the FIFO identified by the configuration of EDGE_SEL	Not incremented

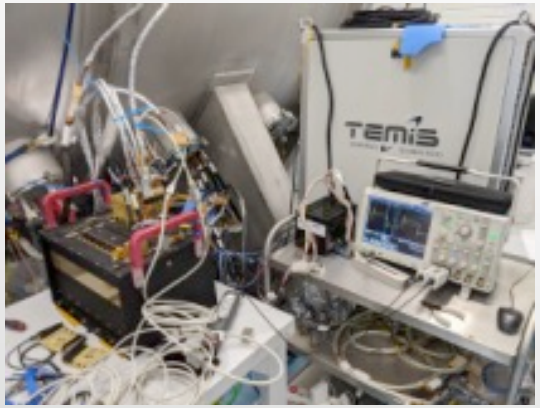
Table 6-2: double FIFOs CRC errors effect

Dedicated TV campaign at LAM using EQM units



With this setup the delay of the data exchanged between SCE and DCU can be modified triggering the 'error' condition observed at CSL





DPU-ASW development setup @ LAM

Errors on the DCU-SCE I/F are a function of the signal delay induced by the cable lengths (values different than 0x0 are errors):

FIFO 0		
Configuration	Total Clock-to-DataOut_0 delay (ns)	DCU error register
Short Harness test-aid 0 m delay line	80.8	0x7
Short Harness test-aid 0.5 m delay line	83.2	0x7
Short Harness test-aid 0.75 m delay line	84.6	0x0
Short Harness test-aid 1 m delay line	85.6	0x0

FIFO 1		
Configuration	Total Clock-to-DataOut_0 delay (ns)	DCU error register
Short Harness test-aid 10 m delay line	126.6	0x0
Short Harness test-aid 10.25 m delay line	128.4	0x0
Short Harness test-aid 10.5 m delay line	130.6	0x38

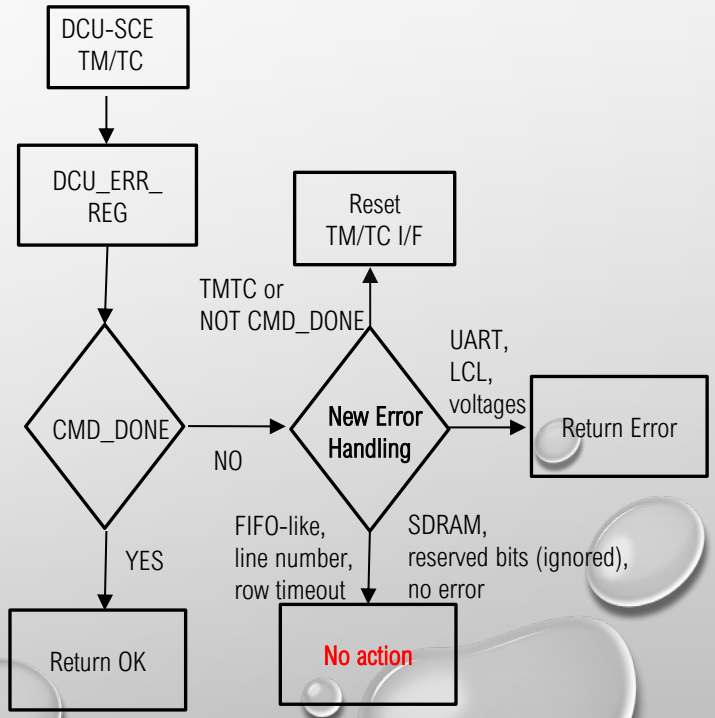
Error cause

Due to a misinterpretation of the HW documentation, DPU drivers/ASW include 'FIFO-like events' in the error treatment.

Solution – implemented in the DPU-ASW v1.3.8(Flight)

DPU HW provider updated the documentation allowing a new implementation of the DCU-SCE I/F error handling strategy, taking no corrective action for FIFO-events

Validation with this setup the new implementation was tested at RT and at cold (SCE @ 120 K) and with NISP-FM at warm.



New DCU-SCE error handling strategy

E. Medinaceli – DPU-ASW

DPU MOSFET ISSUE

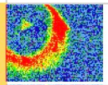
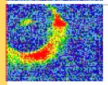
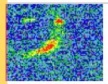
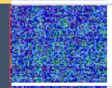
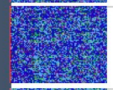
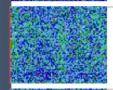
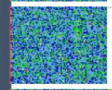
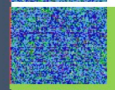
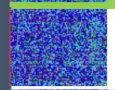
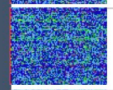
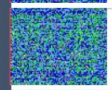
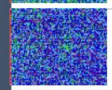
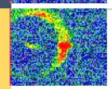
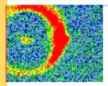
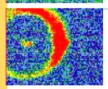
- OHB discovered a design error that causes some MOSFETS (on the DCU and on the PSB) to operate well outside the rated voltage
- NCR issued: NCR-EUC-ATI-C-085
- NO mosfet has actually failed until now
- DPUs have been dismounted from the SVM and are at OHB for repair
- Up to now the repair is going according to plans
- Luckily there should be no scheduling impact on SVM activities

ICU STATUS: HOME SENSOR ISSUE

- Root cause of the wrong output still not identified. A resistor has been added to the home sensor excitation lines of the harness but it has not been demonstrated that it cures the problem
- Sense signal appears noisy and because of that the conditioning electronics doesn't give the correct results; as a consequence, the algorithm fails to find the home position
- An alternative "Dark plateau" method has been demonstrated for FWA Homing in case of unrecoverable Home Sensor failure
- Alternative method for homing of GWA is more straightforward using spectra image analysis (still cumbersome from the operations point of view)

DARK PLATEAU METHOD (FWA)

as already presented last year by S. Dusini

Images	UTC	Dark/light	Images visu			
nisp_fm_test_DPU1NN_20200217_085958_01952_000001	2020-02-17T21:49:07	light				
nisp_fm_test_DPU1NN_20200217_085958_01960_000001	2020-02-17T21:50:58	light				
nisp_fm_test_DPU1NN_20200217_085958_01968_000001	2020-02-17T21:52:48	light				
nisp_fm_test_DPU1NN_20200217_085958_01976_000001	2020-02-17T21:54:38	Dark				
nisp_fm_test_DPU1NN_20200217_085958_01984_000001	2020-02-17T21:56:28	Dark				
nisp_fm_test_DPU1NN_20200217_085958_01992_000001	2020-02-17T21:58:17	Dark				
nisp_fm_test_DPU1NN_20200217_085958_02000_000001	2020-02-17T22:00:07	Dark				
nisp_fm_test_DPU1NN_20200217_085958_02008_000001	2020-02-17T22:01:55	Dark		Center of the FWA close position		
nisp_fm_test_DPU1NN_20200217_085958_02016_000001	2020-02-17T22:03:46	Dark				
nisp_fm_test_DPU1NN_20200217_085958_02024_000001	2020-02-17T22:05:35	Dark				
nisp_fm_test_DPU1NN_20200217_085958_02032_000001	2020-02-17T22:07:25	Dark				
nisp_fm_test_DPU1NN_20200217_085958_02040_000001	2020-02-17T22:09:14	Dark				
nisp_fm_test_DPU1NN_20200217_085958_02048_000001	2020-02-17T22:11:03	light				
nisp_fm_test_DPU1NN_20200217_085958_02056_000001	2020-02-17T22:12:53	light				
nisp_fm_test_DPU1NN_20200217_085958_02064_000001	2020-02-17T22:23:49	light				

ICU ASW STATUS

- Minor bugs identified (mostly during our own tests in Torino) and fixed
- Modified management of telemetry queues to better cope with completely saturated bandwith (in response to one Anomaly report from SVT1)
- No recent NCR on ASW
- No unexpected crashes signaled during CSL tests
- Current version is 1.10 and is the flight candidate
- ASW EEPROM image file has been delivered and validated by MOC

ICU/DPU ASW MAINTENANCE

- Maintenance team at OA Torino with EBB+DPU emulator can produce, compile and test any new ASW version if the need arises
- Continuous integration environment provides automatically the deliverables after unit tests
- Complete Qualification test suite can be performed at OA Torino before integrated tests
- Integrated tests can be performed in the NISP WE Maintenance setup at OAS Bologna. All functionalities can be verified before delivery to MOC
- DPU ASW Team can test new versions of SW on the NISP Maintenance setup.

NISP MAINTENANCE SETUP

- ICU EQM (no redundant unit)
- DPU EQM (1 unit, no redundant board)
- 8 detector chains
- FWA and GWA EQM
- Calibration Unit EQM
- CCS and SCOE

SVT (SYSTEM VALIDATION TEST)

- SVT1 p2 (27/28 July 2021)
  - Objectives (concerning NISP): Validation of reference observation sequence
  - TM/TC Validation
- The test has been declared as successful
- NISP TMTC Validation Partially Achieved (completed later on)
  - Anomaly reports: 6 anomalies signaled, all closed either by correcting procedures or fixing minor SW bugs
- SVT1 p3 preparation (test now planned for April 2022)

SOVT (SYSTEM OPERATIONS VALIDATION TEST)

- SOVT1 (24/29 October 2021)
- Main test objectives:
  - Run 5 days of routine operations
  - Exercise nominal planning cycle between SOC and MOC
  - Exercise end to end flow (from MTL uplink to data dissemination)
  - Instrument contingency recovery procedure validation
  - Instrument TM/TC re-validation
- The test has been declared successful
  - One anomaly signalled for NISP: EUCSCPRE-249 (DCU-SCE Link Errors causing transition to SAFE). Issue closed (problem with test setup)

- Small personal complain: the distribution list is incomplete (not a drama, but don't expect feedback from me if I am not in the loop...); this is true also for the SVT. To be corrected for the future

NISP People

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