NISP Status

Enrico Franceschi

INAF OAS-BO

On behalf of NISP IT Team

6° Meeting Nazionale Collaborazione Euclid ITALIA
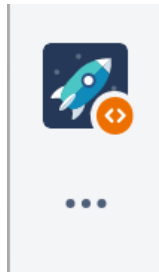19 - 20 Gennaio 2023

NISP Status

NISP is ready to fly.

But…

Some long-standing issues on the Home Sensor signal, as well as some issues encountered in ground tests, have required the development of new functions in the ICU ASW and a maintenance of the DPU ASW

Data Processing Unit's Application Software maintenance

Version DPU-ASW_v1.3.8 RELEASED

📅 Start: 01/Oct/21   Released: 15/Nov/21   Release Notes

Flight - post dedicated LAM tests (after CSL issues)

○ Current release deployed in the Flight Model: DPU-ASW v1.3.8 (Flight Candidate)

- Used successfully in the latest test campaign – environmental PFM @ Cannes
- One month of continuous nominal operations (thermal balance)
- Operations at different non-operative conditions (thermal cycling)
- ➤ Conclusion: Ready for flight

○ Latest system test using PFM @ room temperature SVT2

- calibration strategy (pixel coverage) for the Inter Pixel Capacitance (CalBlock-PV-011) was found to be incompatible with the parametrization allowed by the DPU-ASW (although the physical calibration process was correctly executed)

○ Release of a new version – DPU-ASW v1.3.9 (Flight Candidate)

- New IPC calibration strategy included allowing the use of reference pixels, and diminishing the distance between pixels under test (reducing the test duration)
- Two other minor changes included to facilitate the troubleshooting during contingency scenarios

IPC PATTERN   2047 [px]

detector's single readout channel
repeated for all 32 channels
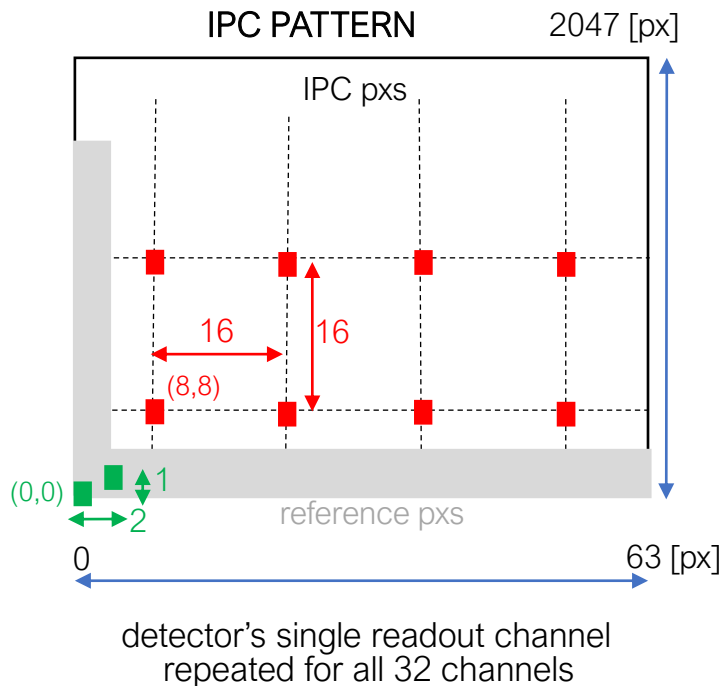
IPC calibration pattern parametrization	MIN VALUES	
	OLD v1.3.8	NEW v1.3.9
StartX,Y (IPC pattern start location)	(8,8)	(0,0)
IPC stepY (space between IPC pxs)	16	1
IPC stepX (space between IPC pxs)	16	2

○ The new release was successfully validated using the AVM setup (EQM/EM models) at Thales Torino (16-17 January 2023)

○ It is not yet foreseen the deployment in the Flight Hardware before flight, due to the tight industrial schedule

ICU ASW Status

People involved: S. Ligori, L. Corcione, V. Capobianco,
D. Bonino (INAF-OATo): ASW design development and test
G. Sirri, C. Valieri, F. Giacomini, L. Patrizii (INFN):
ASW testing and support on continuous integration
N. Auricchio (INAF - OAS): ASW PA

The ASW V1.10 has been thoroughly tested on the FM and has no issues.
However, the Home search/check algorithm cannot work in a reliable way on the FM, because of the erratic behaviour of the sensor output.

A special SW diagnostic version (TSW) has been produced, and delivered in August 2022.
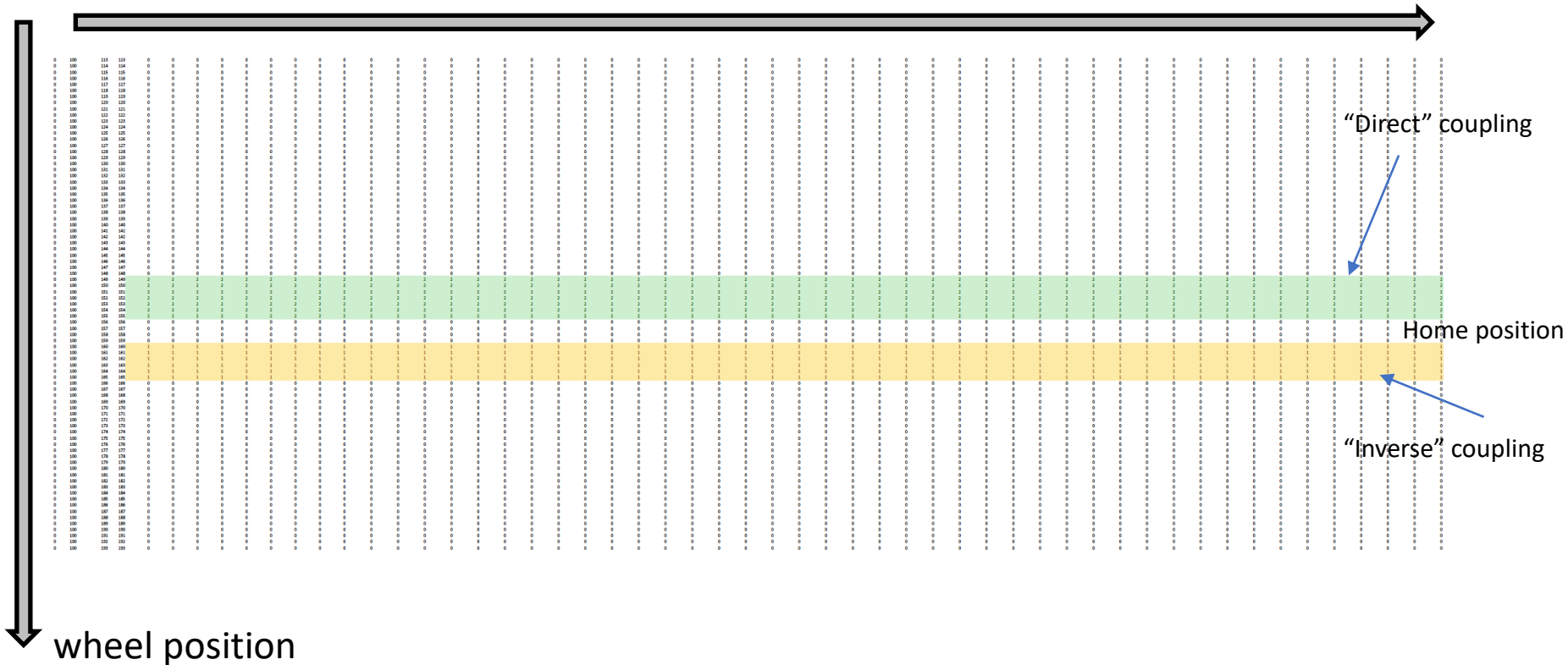
The TSW has been loaded as alternative image on the ICU FM (both nominal and redundant units). The diagnostic tool has been used at warm during the SVT tests and at operating temperature during the TVTB tests in Cannes, at the end of October 2022.

This TSW has proven to be a valuable tool for characterizing the home sensor output but also for guessing the actual wheel position, so all parties agreed it should be available in flight.

The ICU ASW team has therefore produced a new version of the ASW (v1.11) integrating the home sensor diagnostic function (HSS) in the ASW.
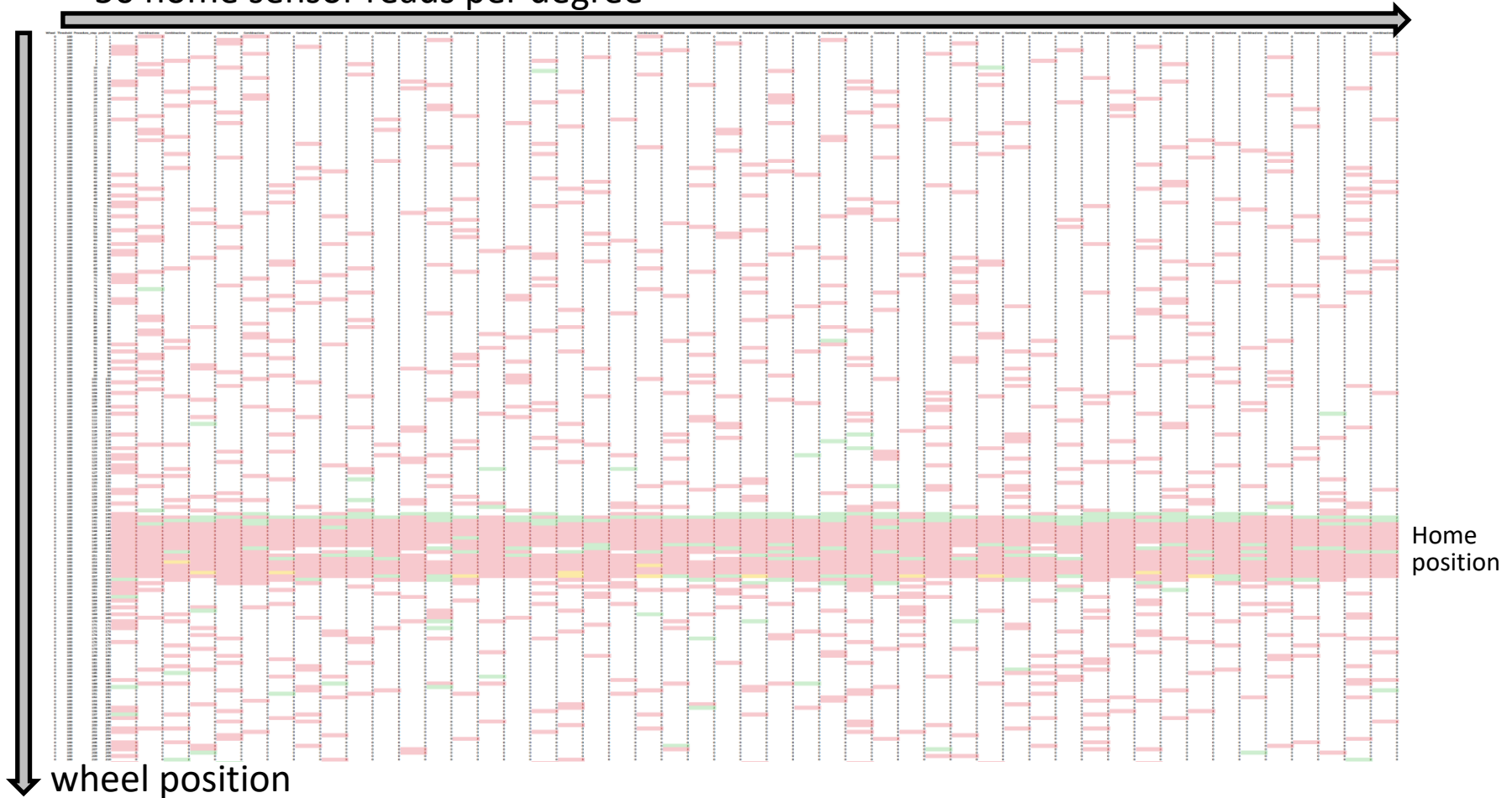This has now been installed on the NISP AVM and will be installed on the FM in February.

"Direct" coupling

Home position

"Inverse" coupling

wheel position

This is the nominal behavior, that we see only on the ICU EQM. In these conditions the automatic algorithm would also work
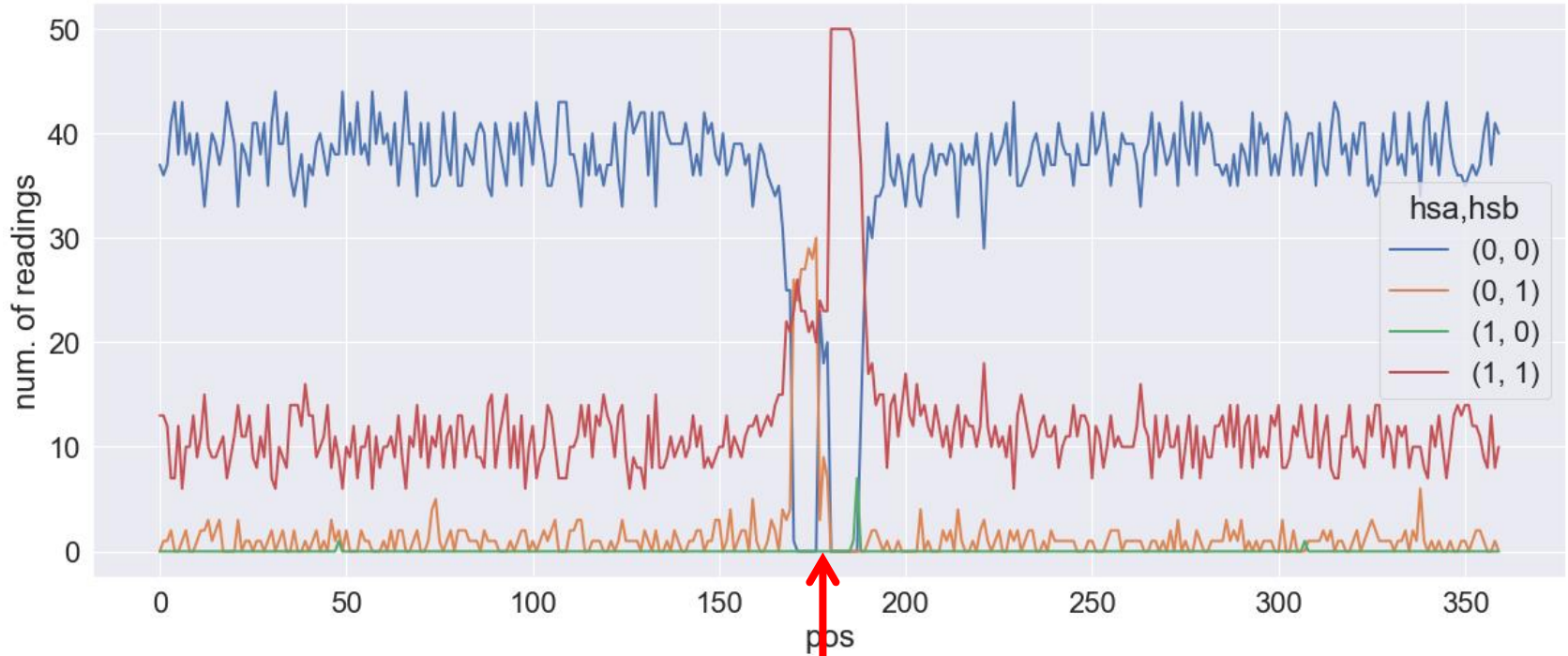
50 home sensor reads per degree

Home position

wheel position

On the FM the signal can be quite noisy (the red cells according to the ICD represent a "forbidden" value), but the home position can still be inferred by looking at the diagnostic output
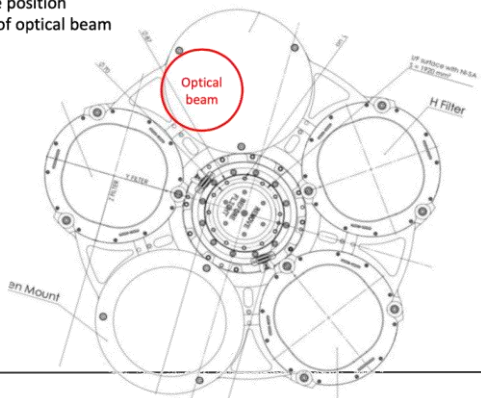
Pre-launch

⇨ Rough alignment of FWA and GWA with Home Sensor Scan (HSS) routine

Expected position of Home Sensor

16Deg from close position
Area open to sky = 1% of optical beam

Even with an accuracy of ± 8º wrt reference position, NISP is still in "dark"

After separation

⇨ With NISP in Standby (Focal Plane OFF), do run Home Sensor Scan to
1. evaluate possible misalignment of the wheels after launch
2. evaluate the "quality" of FWA/GWA Home Sensor signal
    - ✓ if as by design (ICD) → use nominal home search & home check routine to align the wheels
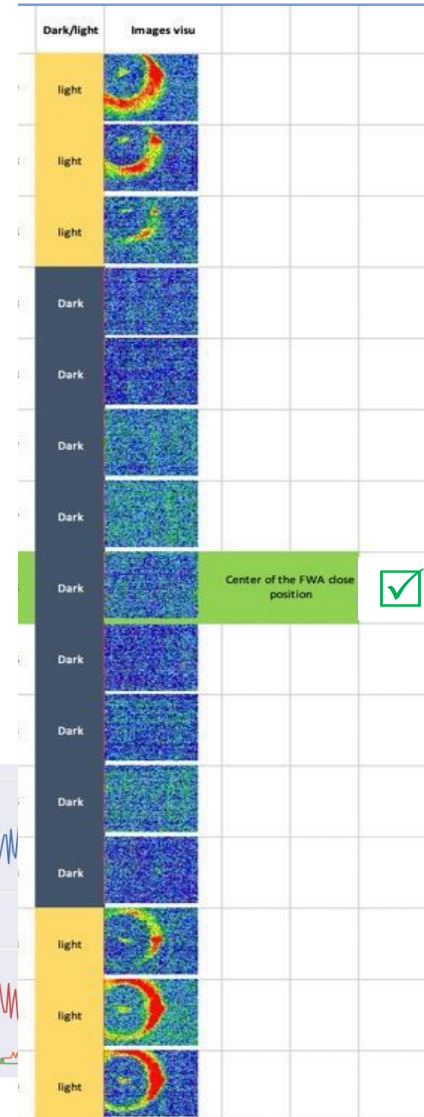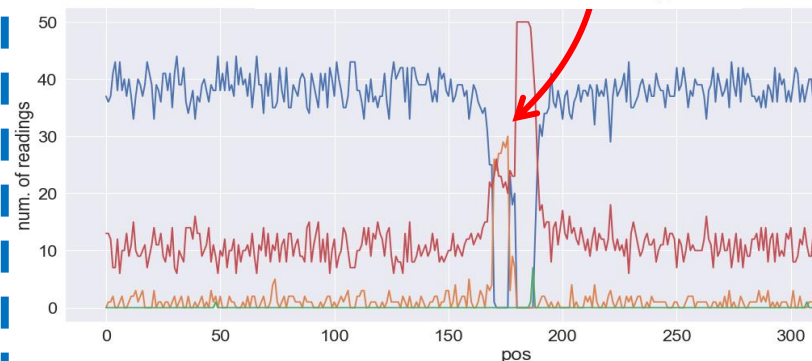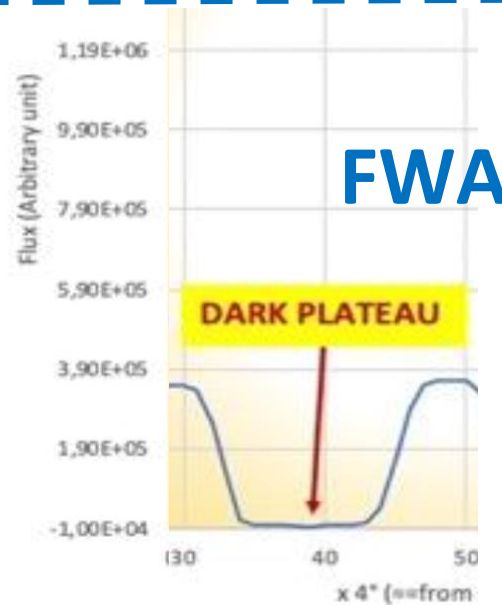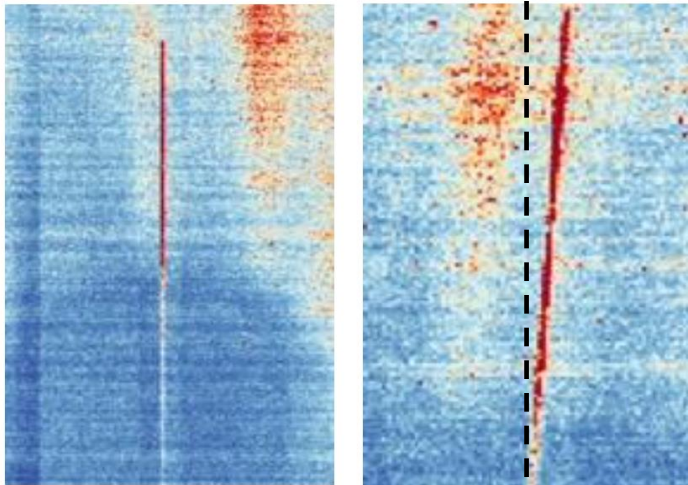   - ✓ if not as ICD → use HSS routine for alignment
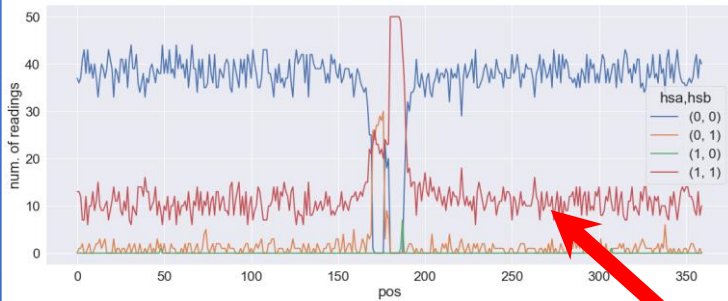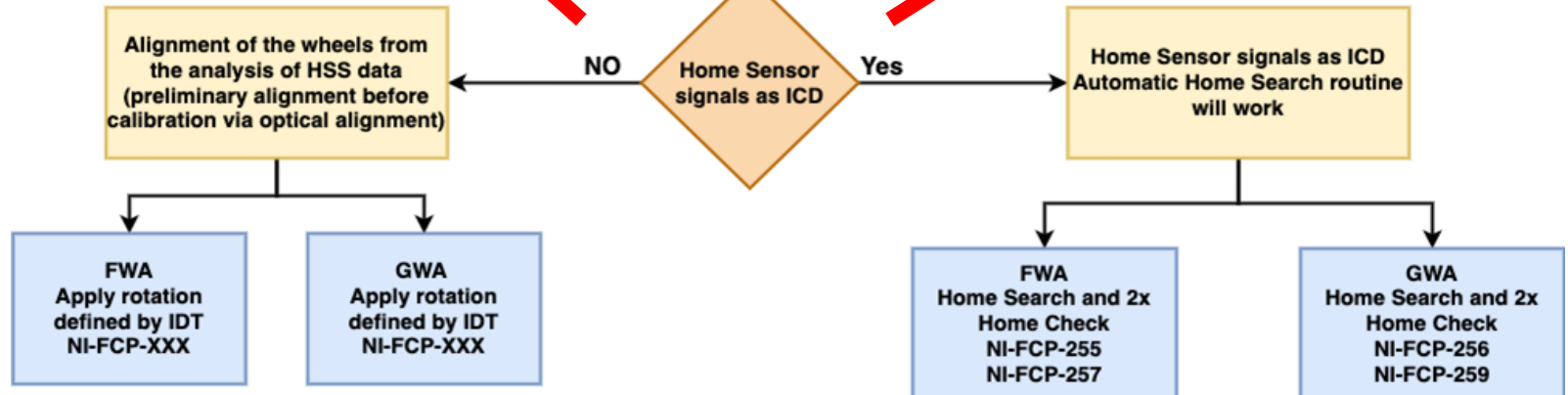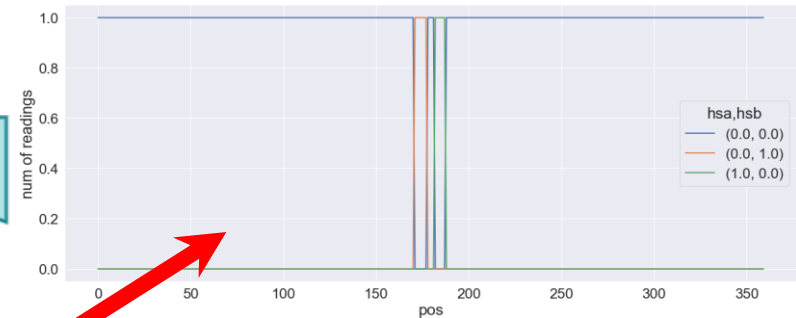
⇨ After powering ON the Focal Plane do perform **optical** alignment of the wheels and calibration of the HSS routine
  - GWA = orientation of the dispersion spectra
  - FWA = Dark Plateau

GWA

FWA

DARK PLATEAU

NISP commissioning

SCOPE

- Power ON of the instrument
- Verify all NISP interfaces
- Verify the integrity of ASW
- Configure the instrument for COLD operation
- Verify main functionalities of the Instrument
  - Heater
  - Calibration Unit
  - FWA/GWA alignment
  - Link to MMU
  - different type of exposure (IPC, RawMode…)
  - ROS (Reference Observation Sequences)
  - PV operations
- Monitor the correct cooling down
- Evaluate the environmental background
  - Noise
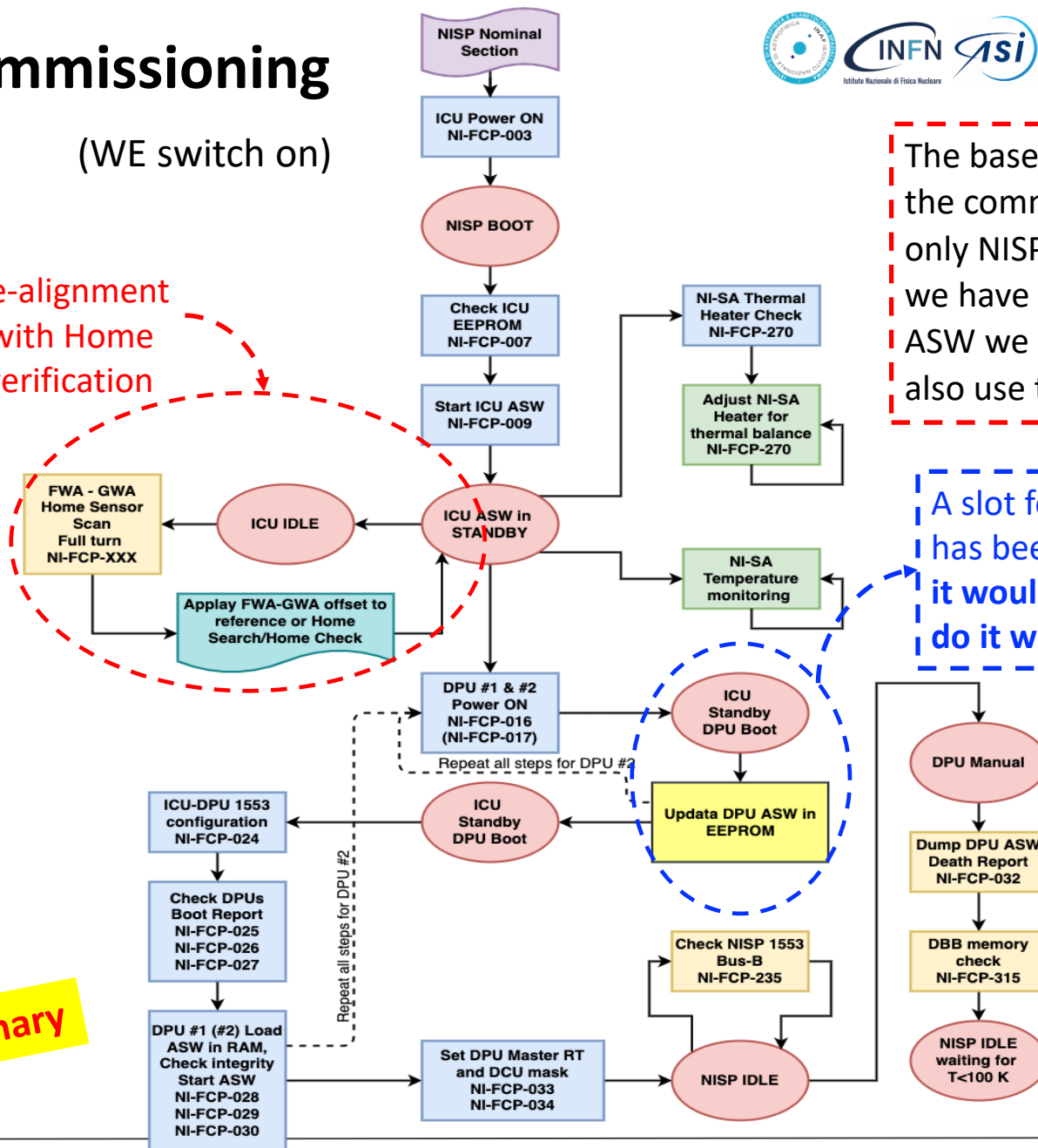 - Cosmic ray / Snow-Ball

Preliminary timeline (TBC)

Duration of Euclid commissioning
- 29 days (end L + 29d)
- ICU ON : ~ L + 100'
- DPU and FPA ON : ~ L + 11d

NISP Commissioning part #1 (WE switch on)

After-launch re-alignment of FWA/GWA with Home Sensor signal verification

The baseline was to perform the commissioning by using only NISP Nominal section. If we have to upload the DPU ASW we could be forced to also use the Redundant one.
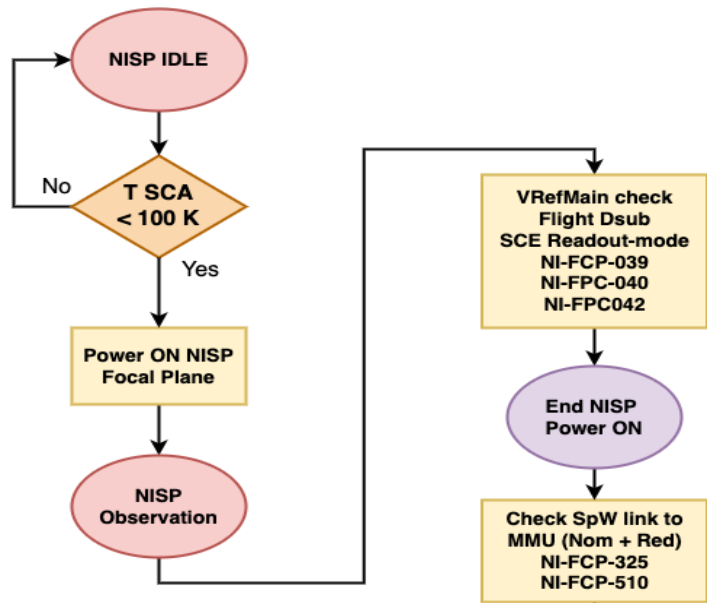
A slot for DPU ASW update has been foreseen (**even if it would be preferable to do it when still on ground**)
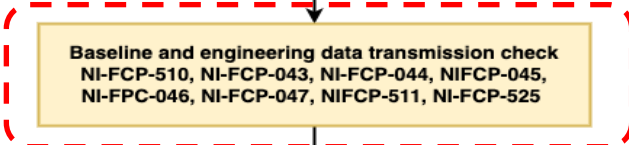
Preliminary

NISP Commissioning part #2

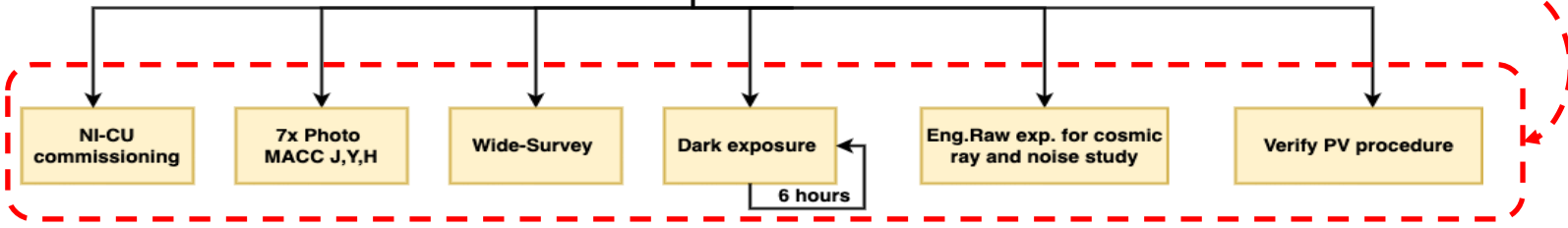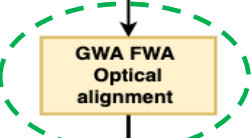Powering ON of the NISP Focal Plane

Preliminary

Optical verification of the FWA/GWA

- Verification of the main functionalities of the Instrument
- Monitor the correct cooling down
- Evaluate the enviromental background

NISP Commissioning preparation

- Most of the operations to be performed during NISP commissioning have already been exercised by MOC during SVT1p3

- The TSW, with the preliminary HSS version, has been exercised during SVT2

- Home Sensor Scan feature could be further exploited during SOVT2 (TBC)

- **The definition of a detailed commissioning timeline is in progress**

- Additional NISP IDT meetings are planned to review tools and organize verification activities during NISP commissioning