TITLE:	**NI-DPU ASW v1.3.8 Test Plan and Test Report**		
Date:	24/11/2020	**Issue:**	1.0
Reference:	EUCL-IBO-TN-7-037		
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Change Log

Issue	Date	Page	Description Of Change
1.0	24/11/2021	All	First issue

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1. Purpose and Scope

The objective of this document is to provide the test plan carried out on v1.3.8 of the DPU ASW and to report the test results. All tests were done at system level.
This document is focused on the ASW test phase carried out on DPU AVM at TAS premises in Turin after its qualification to validate the applicative before installing it on DPU FM units.

2. Reference Documents

RD	Title / Author	Document Reference	Issue	Date
0	NISP Acronyms List	EUCL-IAP-LI-1-001	2.0	04/05/2013
1	NI-DPU ASW post QAR Configuration Control – Issues/SPR	EUCL-IBO-TN-7-028	1.1	16/11/2021
2	NI-DPU ASW v1.3.8 – Software Release Notes	EUCL-IBO-TN-7-036	1.0	16/11/2021
3	NI-DPU ASW: blocking communication issue between SCE and DCU	EUCL-IBO-NCR-7-030	1.0	28/09/2021

3. Acronyms

See RD0

4. Validation test dedicated to v1.3.8 of DPU ASW

Date and Location
From 10/11/2021 till 12/11/2021 in TAS-I Torino
Tests performed by Eduardo Medinaceli – INAF OAS (on site)
Anton Zadeja TASI (on site)
Chiara Sirignano INFN – Pd (remote)

- Setup at TASI used for the tests was a rearrangement of the SOVT1 setup:
  DPU1 (DPU-EM) using only DCU1 and DPU2 (DPU-EQM) equipped with 8 x SCEs (SCE7 was excluded from the setup because the detection chain was not stable).

- The list of SW interventions on DPU-ASW v1.3.7 implemented in DPU-ASWv1.38 are detailed in RD-1, and RD-2.

4.1 Software version

The SW configuration used to perform the tests is as follow:

ICU ASW v 1.9 - DPU ASW 1.3.8 – MIB TA2_3-17 (that contains NISP_3-67).

4.2 DPU-ASWv1.3.8 Validation Test Plan

pre-requirement:
- Load on DPU's E2PROM image2 DPU-ASWv1.3.8

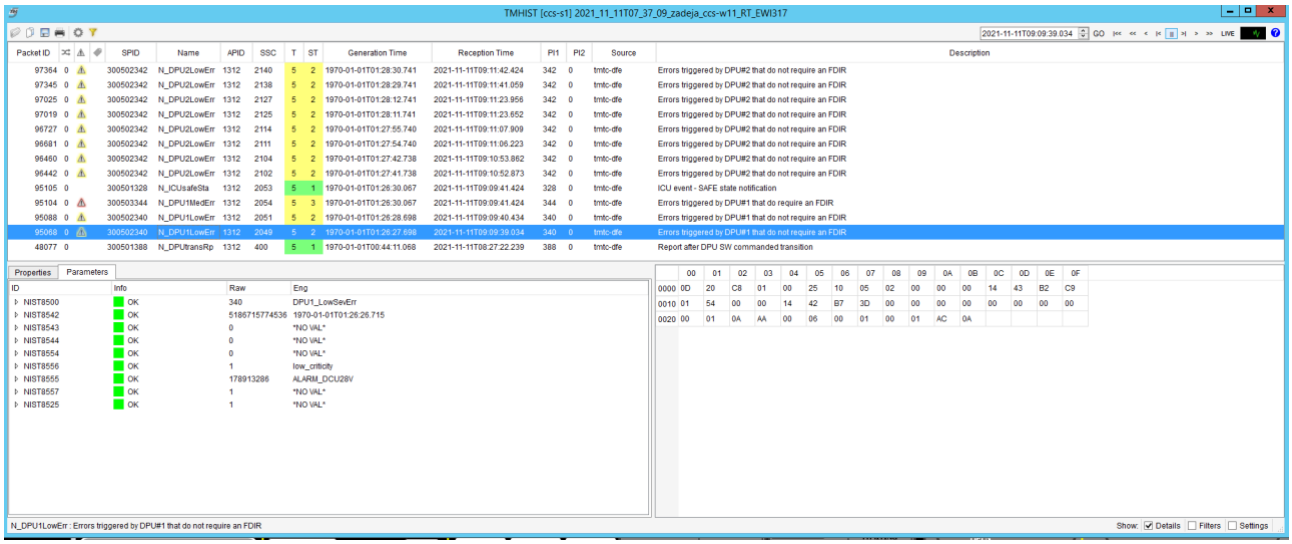
Sequence	Description	Execution Time Forecast
power up:		
1. SST_01, SST_03	(ICU on)	(15 min)
2. SST_04	(DPU/DCU on)	(3 min) (1 DPU – 1DCU)
exposures:		
3. SST_05	(exposure preparation)	(1 min)
4. SST_11	(SIM exposure)	(5 min)
5. SST_12	(grounded exposure)	(5 min) (+ optional K-sequence)
6. SST_13_01,_02, _03,_04,_05	(engineering modes and calibrations)	(5*5 min)
Dither abort:		
7. send_dither_abort	(Dither abort)	(5 min)
fdirs:		
8. FFT20	(DPU FDIRs)	(15 min)
9. Program a Dither with 2 Exp and executed only one	covers case (1) ALARM_DCU28V, and DCUASW_ALLDCUOFF cover case (2) WCD_WD_PROC_EXPIRED*	

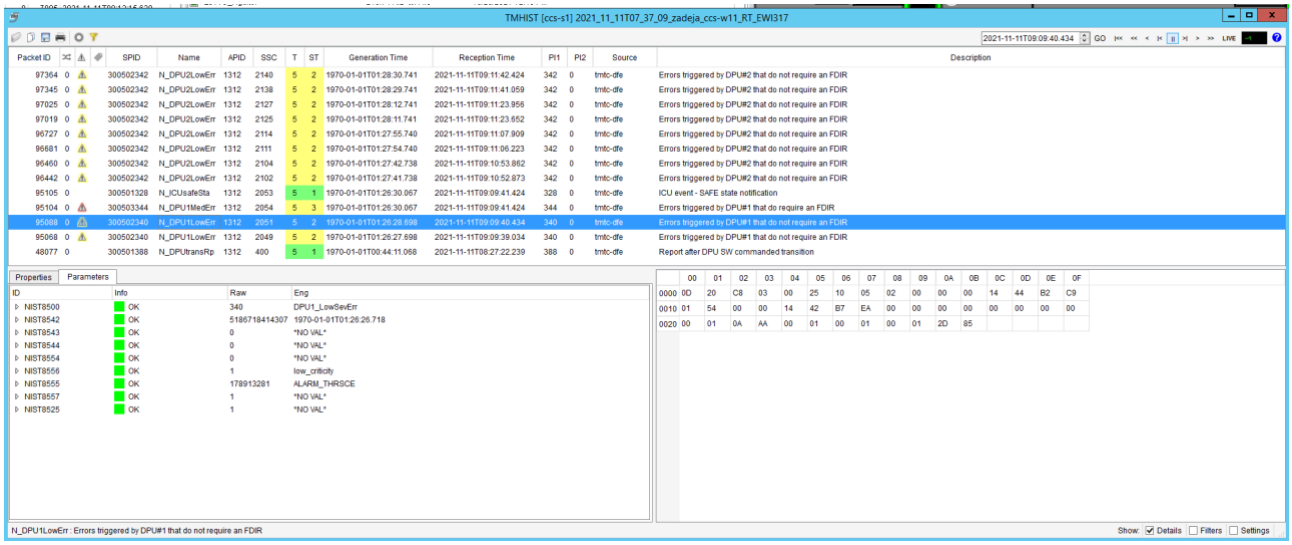
reboot:
10. FFT22/CONT_20_BOTH_DPU_CPU_RESET (DPU reboot) (10 min)
power down:
11. command transition to SAFE (DCUs off) (3 min) (1 DPU -1 DCU)
covers case (3)
ASW_FUNC_TURNOFFFOCALPLANE
12. SST_17 (DPUs off) (1 min)
13. SST_18 (ICU off) (1 min)

total time: E2PROM write time +
~ 90 minutes (additional operations between sequences are not considered) +
K-seq time not considered + *sequence non considered in time budget

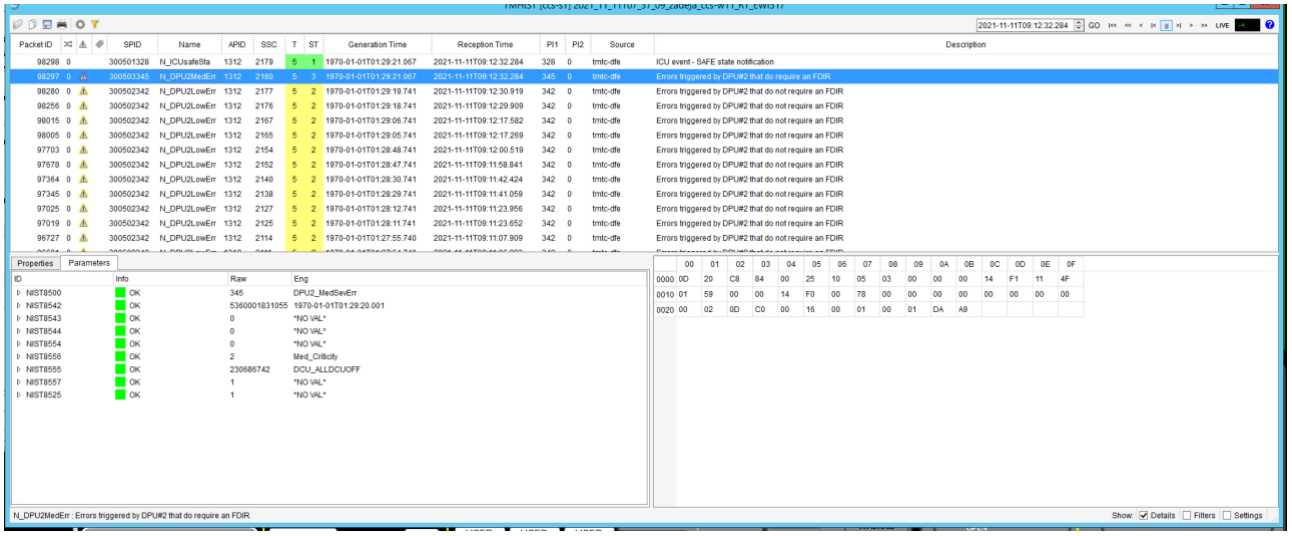
4.3 Test Results

For case 8, DPU nominal thresholds were modified to trigger FDIRs inducing error injection, for example for the VDDA thresholds of the SCE were set to 39 mA. The following screenshots shows events ALARM_DCU28V, ALARM_THRSCE correctly formatted (including the OBT)





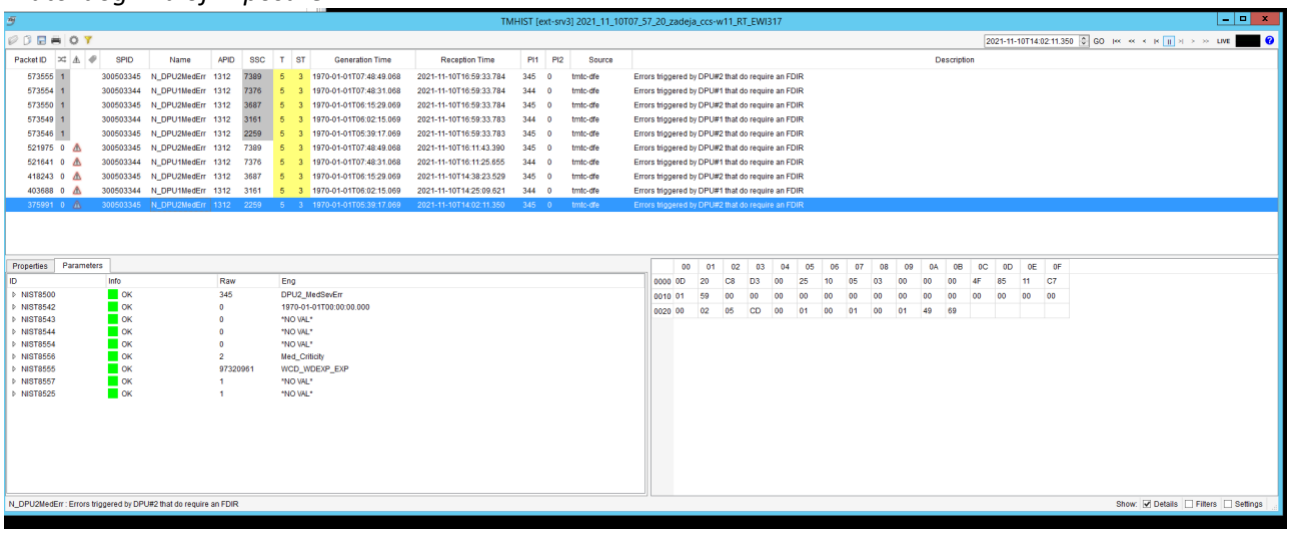
Each one of the FDIRs shown before were triggered for all the detectors resulting on NISP system FDIR:



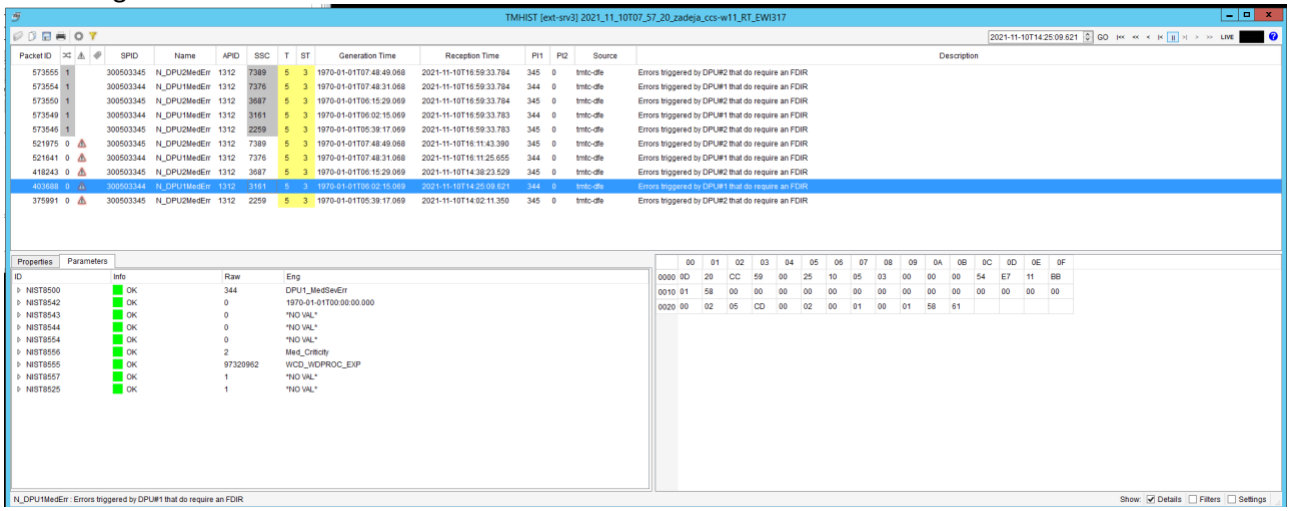
Instead, errors injected with sequence 9 programming a Dither for which not all the exposure commands were send, the watchdog systems were successfully triggered but the OBT contained in the DPU error table were not correctly retrieved.

This didn't produce a limitation for the NISP recovery action because the telemetry table send by the ICU reported correctly the OBT. This issue will be discussed in a separate document.

Watchdog End of Exposure



Watchdog end of Dither



All 290 errors injected (generated) during the current test session were analysed (including the ones originated from the non-correct setup leading to the exclusion of DPU2-SCE7). Besides for errors coming from the Watchdog system, all the others have correctly saved the OBT in the DPU ERROR_TAB as well as all the other fields on the table; for example, errors ASW_FOCALPLANEOFF and SCE_EHSK (time initialized to 01/01/1970):

DPU-ASW OBT coarse	DPU-ASW OBT fine	Sub system	CMD/ Function ID	Criticality	ASW error code (error name)	Multiplicity	OBT DPU-ASW_ERROR_TAB
00006dce	42b7	0000 (not used)	00eb	0002	0x0a5703f2 (ASW_FOCALPLANEOFF)	0001	01/01/1970 07:48:31
00004dcd	31e1	0006 (DCU7)	00e7	0001	0x073d0005 (SCE_EHSK)	0001	01/01/1970 05:31:57

in the table the driver error (errno) is not shown because is not trapped in any of these two cases.

The comparison of the ICU-OBT and the DPU-OBT is shown in Figure 1, where events from the watchdog systems were excluded:

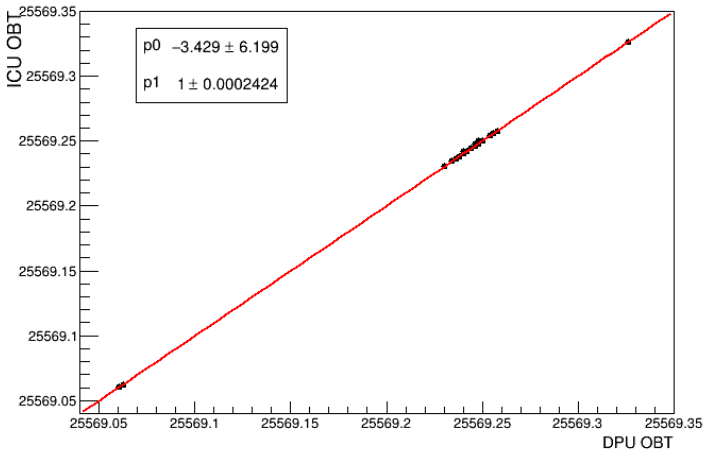


Figure 1, NISP events, OBT comparison between ICU and DPU; the linear fit shows the perfect correlation between these two times.

4.4 Results summary

In the following table are summarized the results of the validation procedures where general features of NISP were tested, **the results are as expected for all cases besides errors generated by the watchdog systems (test ID = 9).**

Test procedure Id	Description	Results
1	ICU ON pre-requirement	OK
2	DPU/DCU power ON	OK
3	Exposure preparation	OK
4	Simulated exposure	OK
5	Grounded exposure (nominal cycle, using Zero Bias)	OK
6	Engineering modes: IPC, KTC, Debug, Raw mode, Compression Verification	OK
7	Dither abort	OK
8	Error injection: ALARM_DCU28V, ALARM_THRSCE, DCUASW_ALLDCUOFF	OK
9	Errors from watchdog systems: WCD_WD_EXP_EXPIRED, WCD_WD_PROC_EXPIRED	NOT OK
10	- CPU_RESET with focal plane OFF - CPU_RESET with focal plane ON	OK
11	ASW_FUNC_TURNOFFFOCALPLANE	OK
12	DPU/DCU power OFF	OK
13	ICU OFF	OK

Specific tests done at LAM using a dedicated setup used to investigate the new DCU_ERROR_REG management are document in EUCL-IBO-TN-7-028-NI-DPU-ASW post QAR Configuration Control Issues/SPR v1.1 [RD-1].
Attached to this document can be found the slides of the dedicated test done at LAM with a dedicated setup (description included) used in the resolution of the 'DCU-SCE communication issue'- RD-3.

4.5 Issues found

(1) related to test ID = 9: failed to get correct time tag for errors from watchdog systems: WCD_WD_PROC_EXPIRED and WCD_WD_EXP_EXPIRED.
Two out of 181 error injection entries (1.3%) found during the validation tests.

(2) related to test ID = 10: FFT22/CONT_20_BOTH_DPU_CPU_RESET (DPU reboot) reboot executed correctly, restore of nominal operations FAILED because the SCE's flag SCE_IDLE was not set and SCE commanding was therefore not enabled.

Limitations on normal operations

(1) none for NISP nominal operations because no functionalities are compromised including error injection (all error parameters are OK), and timing. The OBT of the event associated to the DPU error is correctly reported.
(2) procedural limitation during the recovery action applied to the CPU reset is needed, in the current implementation the flag SCE_IDLE is not set, and this flag can be rise by applying command CPU_DABT (Dither Abort).

Both minor limitations will be discussed in a dedicated NRB.

5. Attachments

In attachment are the following presentations:

- DCUerrorsStrategy.pdf
- DPU-ASW_ProveOfConcept_FIFOerrors_update.pdf
- 1stLAMtestssession.pdf
- 2ndTestSession@LAM.pdf