# New features in FSW 3.4.6

This new release FSW 3.4.6 addressed the following items:

* Separate compression/packet stream formatting activities for:
	+ EAS1/2 NM
	+ EAS1/2 Strahl exstraction
	+ PAS NM

The DPU SW now will manage these activities on a separate thread of execution in order to “survive” to blockage in these functionalities and continue to execute its nominal activities.

## Error injection in FSW 3.4.6

In order to test the above mechanism and the proper restoring of the offending procedure, an “hard-coded” error injection has been introduced in one of the SDP\_SW function (“pkAECAutomatonRunOneStep”) able to execute every activation a piece of compression/packet stream formatting activities.

This function has been modified to introduce a null pointer bug with a probability of $(3\*10^{-5})$ every time the **pkAECAutomatonRunOneStep** is called. This bug will lead the compression task to be blocked. The main DPU task will detect this problem, send a dedicate TM(5,2) and restart the task in charge to deal compression stuff.

The following couple of telemetries will be handled each time a failure is injected:

* 0xAA2C 0x00FF 0x00FF 0x0000 0xcccc : reporting the SDPSW offending function source line of code (0xcccc)
* 0xAA2C 0x00FF 0xyyyy 0x000y 0xFFFF where
	+ 0xyyyy is the procedure involved
		- NM\_COMPRESSION = 0xFE
		- STRAHL = 0xFD
		- RB\_FREEZE = 0xFC
	+ 0x000y is sensor identifier
		- EAS1 = 0x00
		- EAS2 = 0x01
		- PAS = 0x02

# Testing approach for new FSW 3.4.6

Here below a general strategy able to test in MSSL the new features coming with FSW 3.4.6

## NM compression

The following test scenarios should be considered:

1. TEST 1
	1. DPU in OPS
	2. Compression Disabled
	3. EAS1,EAS2 in high cadence for 4 hours
	4. PAS in NM for 4 hours
2. TEST 2
3. DPU in OPS
4. Compression Enabled
5. EAS1,EAS2 in high cadence for 4 hours
6. PAS in NM for 4 hours
7. TEST 3
8. DPU in OPS
9. Compression Disabled
10. EAS1,EAS2, PAS in NM cadence for 1 hours
11. Compression Enabled
12. EAS1,EAS2, PAS in NM cadence for 1 hours

Scientific products shall be checked to verify correctness in content and delivery rate, also in terms of SID and SID counter, moment and strahl.

## RPW Trigger mode

The following test scenarios should be considered. The scope of this test is verified restoring of operation following a block in the trigger buffer mechanism:

1. TEST 1
	1. DPU in OPS
	2. Compression Disabled
	3. EAS1,EAS2,PAS in NM
	4. Execute EM2 on both EAS1 and EAS2
	5. Wait 10 minutes
	6. Repeat (h-j) 4 times
	7. Enable Compression
	8. Repeat (h-j) 5 times

# Test result for new FSW 3.4.6 D

The test to verify fault injection in FSW 3\_4\_6 run from 14 to 17 November and was constituted by the procedures described in above section. Here below the test result.

The pre-processed data are stored on IRAP web site at the following link:

[2023-11-14 - solarorbiter.irap.omp.eu > documents > ISSUES > 2023-11-14](http://solarorbiter.irap.omp.eu/documents/ISSUES/2023-11-14/)

[2023-11-14 - solarorbiter.irap.omp.eu > documents > ISSUES > 2023-11-14](http://solarorbiter.irap.omp.eu/documents/ISSUES/2023-11-17/)

## EAS High rate not compressed

The following diagrams show delta time between EAS header packets, which typically should be 10 seconds, against SW warning indicating a scientific activities block.

When 10 second gap-condition is not met the reason is due to injected failure (orange dot).

Note that the DPU restarts EAS data processing 10 seconds after the EAS data elaboration went blocked. So in high rate the next 10th second packet processing is missing completely (neither header nor scientific packet are sent).

## EAS1 High rate compressed

The following diagrams show delta time between EAS header packets, which typically should be 10 seconds, against SW warning indicating a scientific activities block.

When 10 second gap-condition is not met the reason is due to injected failure (orange dot).

Note that the DPU restarts EAS data processing 10 seconds after the EAS data elaboration went blocked. So in high rate the next 10th second packet processing is missing completely (neither header nor scientific packet are sent).

Note that 30 seconds gap is properly preceded by 2 SW warning.

## EAS1 strahl extraction

The following diagrams show delta time between EAS strahl packets, which typically should be 100 seconds, against SW warning indicating a scientific activities block.

When 100 second gap-condition is not met the reason is due to injected failure (orange dot).

Note that the DPU restarts EAS data processing 10 seconds after the EAS data elaboration went blocked and a blockage in EAS 3D processing will also prevent strahl extraction activities.

## EAS1 NM not compressed

The following diagrams show delta time between EAS header packets, which typically should be 100 seconds, against SW warning indicating a scientific activities block.

When 100 second gap-condition is not met the reason is due to injected failure (orange dot).

## PAS

The following diagrams show delta time between PAS header packets, which typically should be 4 seconds, against SW warning indicating a scientific activities block.

When 4 second gap-condition is not met the reason is due to injected failure (orange dot).

Note that the DPU restarts PAS data processing 4 seconds after the PAS data elaboration went blocked.

## EAS ENG2 management

In the files below have been analysed the DPU behaviour when an error occurs during Rolling buffer management (i.e. RPW or Engineering mode management).

Following a fault injection, the current execution will terminate with an execution failure, and the task in charge to deal with these functions will be resumed after 30 minutes.





## Further considerations

PAS moment seems to be fine according to PAS team analysis.

EAS moments deliveries are corrects from packet construction point of view, anyway the moment are not valid due to STIM input data (MSSL to confirm please)

## Conclusion

All results indicate a proper working of DPU SW following a fault injection happen at SDP compression level.