S3-A SLSTR Cyclic Performance Report

Cycle No. 009

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**Disclaimer**

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# Changes Log

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Figure 2: Blackbody temperature and baseplate gradient trends. -------------------------------------------

Figure 3: Baffle temperature trends. ------------------------------------------------------------

Figure 4: OME temperature trends showing the paraboloid stops and flip baffle (top two plots) and optical bench and scanner and flip assembly (lower two plots). The top two plots only show data starting from 30th July 2016. --------------------------------

Figure 5: Scanner and flip jitter, showing mean, stddev and max/min position compared to the expected one for the nadir view. Cycles 008 and 009 are indicated by vertical dashed lines. ----------------------

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Figure 7: VIS and SWIR channel signal-to-noise. Different colours indicate different detectors. --------

Figure 8: NEDT trend for the thermal channels. Blue points were calculated from the cold blackbody signal and red points from the hot blackbody. Horizontal lines indicate the requirement (dashed) and goal (dotted) as well as the measured values on ground (red and blue dashed). Cycles 008 and 009 are indicated by the vertical dashed lines. ----------------------------------

Figure 9: VISCAL signal trend for VIS channels (nadir view). Cycles 008 and 009 are indicated by the vertical dashed lines. -----------------------------------

Figure 10: VISCAL signal trend for SWIR channels (nadir view). Cycles 008 and 009 are indicated by the vertical dashed lines. --------------
1 Instrument monitoring

1.1 Instrument temperatures

- A decontamination of the IR-FPA was started on 30th September and nominal temperatures reached after cool-down on 6th October.

- The decontamination was performed following the instrument anomaly that occurred in July (EUM/Sen3/AR/2054) where the detector temperatures failed to recover to their nominal operating temperatures. The cause of the anomaly was primarily due to the presence of water ice on the FPA that had not been removed prior to the last cooldown. The effect could be seen by a small increase in NEDT and a 6% change in the VIS channel gains. The purpose of the decontamination was to remove any residual water ice from the system and see if the FPA temperatures could achieve their nominal temperatures. The nominal operating temperatures were reached [Figure 1] showing that the decontamination was successful and there was no degradation in the cooler performance.

- Other instrument temperatures (blackbody, baffles and OME) have remained stable before and after the decontamination phase with no change in level.

![Detector Temps VIS Channels](image1)

![Detector Temps SNIR and TIR Channels](image2)

*Figure 1: Detector temperatures for each channel from 1st March 2016. Discontinuities occur for the infrared channels where the FPA was heated for decontamination or following an anomaly. Cycles 008 and 009 are indicated by the vertical dashed lines and the decontamination phase occurs in the middle of cycle 009 between 30th September and 6th October.*
Figure 2: Blackbody temperature and baseplate gradient trends.
Figure 3: Baffle temperature trends.
Figure 4: OME temperature trends showing the paraboloid stops and flip baffle (top two plots) and optical bench and scanner and flip assembly (lower two plots). The top two plots only show data starting from 30th July 2016.
1.2 Scanner performance

- Scanner performance has been consistent with previous operations and within required limits.

*Figure 5: Scanner and flip jitter, showing mean, stddev and max/min position compared to the expected one for the nadir view. Cycles 008 and 009 are indicated by vertical dashed lines.*
Figure 6: Scanner and flip jitter, showing mean, stddev and max/min position compared to the expected one for the oblique view. Cycles 008 and 009 are indicated by vertical dashed lines.

1.3 Detector noise levels

1.3.1 VIS and SWIR channel signal-to-noise

The VIS and SWIR channel signal-to-noise remains stable and consistent with previous cycles. There is a very small increase in SNR following the decontamination phase performed between 30th September and 6th October, making the level consistent with the SNR before the anomaly on 25th July.
Figure 7: VIS and SWIR channel signal-to-noise. Different colours indicate different detectors.
1.3.2 TIR channel NEDT

The thermal channels NEDT values are consistent with previous cycles and are within the requirements. After the decontamination phase performed between 30th September and 6th October, the NEDT level has reduced slightly as expected with the reduced detector temperatures, and consistent with the previous decontamination phases performed in May and June.

![NEDT trend for the thermal channels](image)

Figure 8: NEDT trend for the thermal channels. Blue points were calculated from the cold blackbody signal and red points from the hot blackbody. Horizontal lines indicate the requirement (dashed) and goal (dotted) as well as the measured values on ground (red and blue dashed). Cycles 008 and 009 are indicated by the vertical dashed lines.
1.4 Calibration factors

1.4.1 VIS and SWIR VISCAL signal response

Signals from the VISCAL source for the VIS channels show oscillations due to the build-up of ice on the optical path within the IR FPA. This is not caused by a degradation in the calibration system or the warm optics (scanner, paraboloid, flip and fold mirrors).

After the anomaly on 25th July, the overall VISCAL signal had a step reduction of approximately 5% for S1 and S2. Following the decontamination performed between 30th September and 6th October, the signals have returned to the expected levels for S1-S3 (i.e. close to 100% of the level at the beginning of commissioning phase before cooling down the FPA). The return of the signals to the expected levels confirms that the drop after the anomaly was most likely caused by ice build-up within the cold FPA, which has been successfully removed by the decontamination procedure.

The signal level for the VIS channels following the decontamination phase begins to show oscillations again and this indicates that there is still some water vapour in the system which is condensing back onto the optical surfaces. This behaviour is expected.

The signal level for the SWIR channels has returned to the expected value at 100% of the level when SWIR detectors had been cooled down at the beginning of commissioning phase.
Figure 9: VISCAL signal trend for VIS channels (nadir view). Cycles 008 and 009 are indicated by the vertical dashed lines.
Figure 10: VISCAL signal trend for SWIR channels (nadir view). Cycles 008 and 009 are indicated by the vertical dashed lines.
2 Events

SLSTR has been switched on and operating nominally during the cycle, with SUE scanning and autonomous switching between day and night modes.

A decontamination operation was started on 30th September 2016. The decontamination was initiated following an instrument anomaly that occurred in 25th July (EUM/Sen3/AR/2054) where the detector temperatures failed to recover to their nominal operating temperatures. The aim of the procedure was to remove water ice from the cold FPA to reduce the detector temperatures back down to the nominal operational values. The decontamination phase ended on 4th October when the cool down of the detectors was started.

SLSTR was commanded to ON DUTY mode on 6th October with cold finger temperature stable at the nominal target temperature of 77.5K.
Other reports related to the Optical mission are:

- S3-A OLCI Cyclic Performance Report, Cycle No. 009 (ref. S3MPC.ACR.PR.01-009)

All Cyclic Performance Reports are available on MPC pages in Sentinel Online website, at: https://sentinel.esa.int

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