PREPARATION AND OPERATIONS OF THE MISSION PERFORMANCE CENTRE (MPC) FOR THE COPERNICUS SENTINEL-3 MISSION

S3-A SLSTR Cyclic Performance Report

Cycle No. 014

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List of Changes

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1 Instrument monitoring

1.1 Instrument temperatures

- Instrument temperatures were stable and consistent with previous operations until an anomaly on 14th February (see Section 2 for more details). Following the anomaly, a decontamination phase was performed between 15th and 19th February where the detectors were warmed up to evaporate residual water ice. After the subsequent cooldown, the infra-red detector temperatures have returned to a slightly lower value than before, but this is as expected and within about 0.5 K of the detector temperatures used for the SLSTR ground calibration.
- Blackbody, baffle and OME temperatures all showed a systematic increase in temperature during previous cycles due to the fact that the Earth was getting closer to the Sun until perihelion on January 3rd and causing the instrument to slowly heat up. The trend is now reversed and temperatures are decreasing slightly as we move away from the Sun.
- The blackbody and instrument temperatures were affected during the decontamination phase, but have returned to their normal values following the cooldown of the detectors after decontamination.



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. The vertical dashed lines indicate the start and end of each cycle.



Figure 2: Blackbody temperature and baseplate gradient trends. The vertical dashed lines indicate the start and end of each cycle.





Figure 3: Baffle temperature trends. The vertical dashed lines indicate the start and end of each cycle.





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. The vertical dashed lines indicate the start and end of each cycle.



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. The vertical dashed lines indicate the start and end of each cycle.





Figure 6: Scanner and flip jitter, showing mean, stddev and max/min position compared to the expected one for the oblique view. The vertical dashed lines indicate the start and end of each cycle.

1.3 Detector noise levels

1.3.1 VIS and SWIR channel signal-to-noise

The VIS and SWIR channel signal-to-noise is stable and consistent with previous operations. Noise levels haven't changed significantly following the anomaly and decontamination.

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

1.3.2 TIR channel NEDT

The thermal channel NEDT values are consistent with previous operations and within the requirements. Noise levels haven't changed significantly following the anomaly and decontamination.

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).

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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 FPA. Decontamination is carried out periodically, in order to warm up the FPA and remove the ice. The last decontamination cycle was successfully performed following the anomaly on 14th February (see Section 2). The viscal signals seem to be showing that the oscillations have reset in period, consistent with previous decontaminations. The viscal signal level seems to be consistent with its value before the anomaly rather than returning 100% of its level after launch.

Figure 9: VISCAL signal trend for VIS channels (nadir view).

Figure 10: VISCAL signal trend for SWIR channels (nadir view).

2 Events

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

- VIS and SWIR channels S1-S4 were switched on at night to enable gas flare detection in the following orbits (some of which were in the previous cycle):
 - 23 January 2017, 21.35 (relative orbit 284 in cycle 013)
 - 24 January 2017, 21.09 (relative orbit 298 in cycle 013)
 - 26 January 2017, 21.58 (relative orbit 327 in cycle 013)
 - 27 January 2017, 21.32 (relative orbit 341 in cycle 013)
 - 29 January 2017, 22.20 (relative orbit 370 in cycle 013)
 - 30 January 2017, 21.54 (relative orbit 384)
- A Floating Point Unit (FPU) trap anomaly occurred on the 14th February 2017 at 08.09. This type of event has happened twice before during the mission, the last time being on 25th July 2016. Following the anomaly the instrument was set into CDE Standby-Refuse mode, and recovery carried out by running a full decontamination cycle.
- The decontamination cycle was started at 13.35 on 15th February 2017, with the instrument warmed up to evaporate any residual water ice. The temperatures were then reset to their normal levels with a cooldown period that started on 17th February 2017 at 18.40. Normal operational temperatures were reached at approximately 09.00 on 19th February, and the instrument was commanded to its default configuration at 13.32, with all channels available again from 13.37.
- Note that the calibration and signal to noise were degraded during the decontamination phase and when the instrument was warmed up, the thermal channels were not available at all. Data obtained between 08.09 on 14th February and 13.37 on 19th February should not be used.

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3 Appendix A

Other reports related to the Optical mission are:

S3-A OLCI Cyclic Performance Report, Cycle No. 014 (ref. S3MPC.ACR.PR.01-014)

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

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