Proba-V
QWG#5
Platform & GS status

9 - 10 May 2017
Turino

Orbit status

Orbit status

LTDN evolution:

26 Apr. 2017: 10:36:26

Oct 2017: 10:30

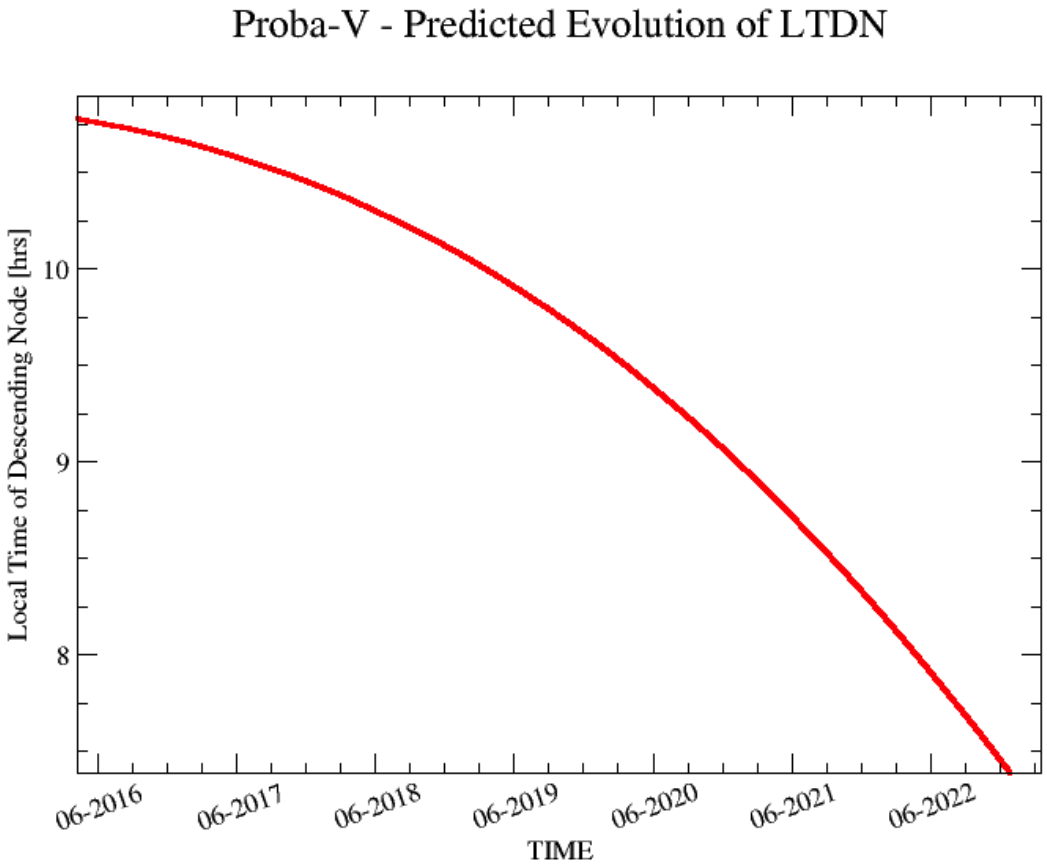
After 5 years:

June 2018: 10:20

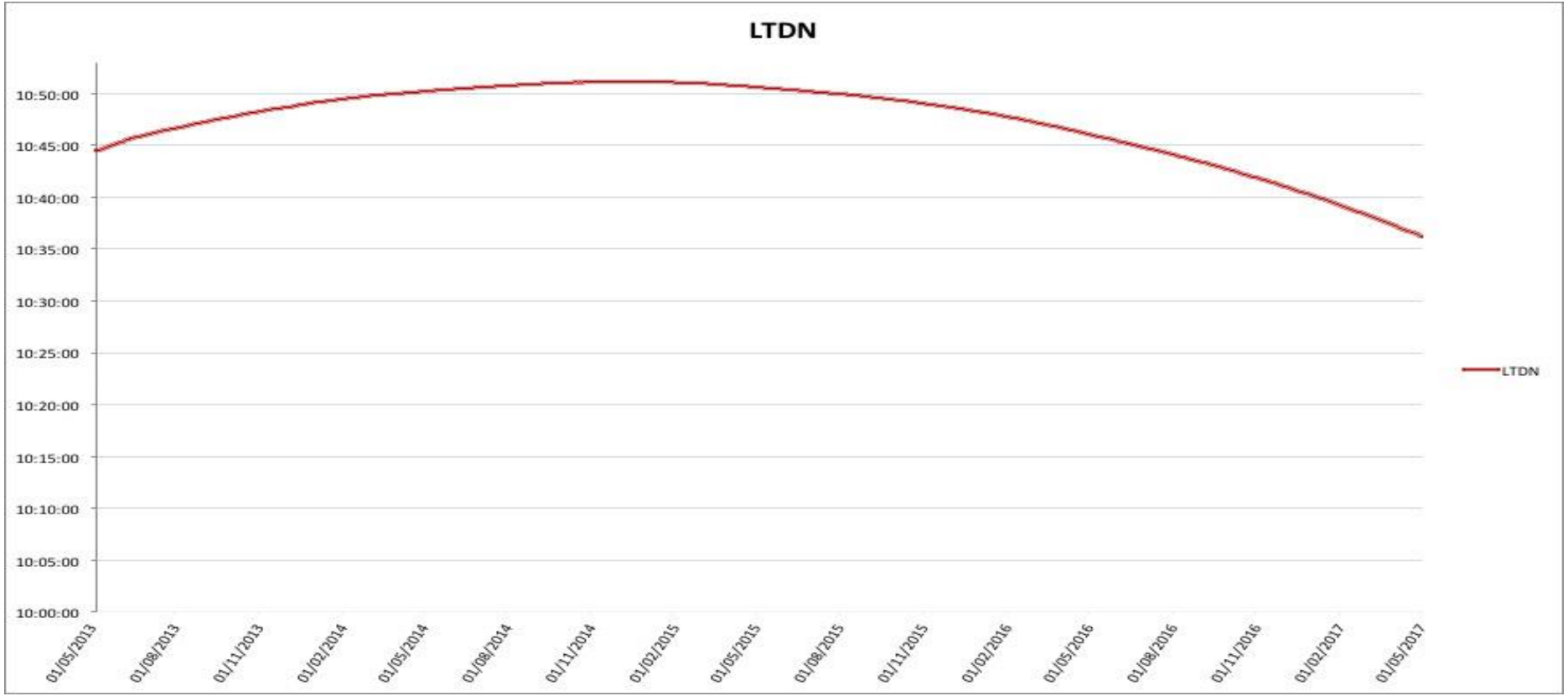
Jun 2019: 09:55

Dec 2019: 9:40

Jun 2020: 9:25



Orbit status



Platform status

Platform key parameter

Satellite System mode : Nominal Observation with automatic transition to Calibration mode.

AOCS mode: Geodetic with all the units available. Redundant lane selected with the use of associated units (AOCS IF 2, GPS 2, MM 2, XTX 2/3) and of the wheels 1, 3 and 4. Sun bathing mode enabled (with GPS ON).

At the request of Project, since March 15 2017, the experimental X-band transmitter (XTX 3) is used for each X-band pass.

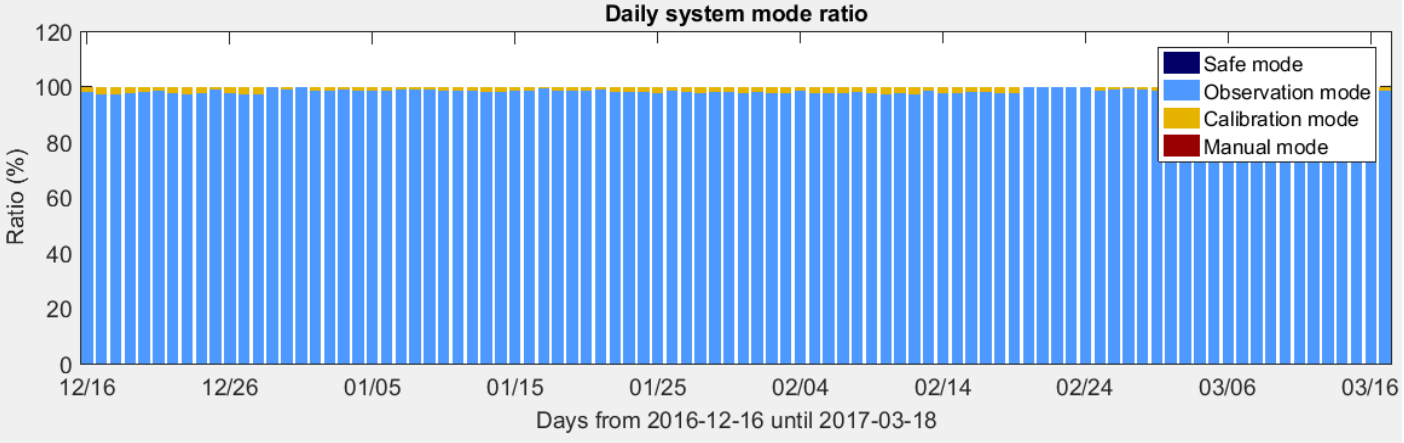
During this period the system was very stable:

- Minimum Platform availability > 98.5% for the last 6 months.
- Maximum Platform availability < 99.8% for the last 6 months.
- Pointing performances well within requirements
- Power budget largely positive and stable
- Thermal subsystem stable
- No safe mode, no on-board failure, both primary and redundant chains available.

Platform key parameter

Extracted from QS quarterly report 2017/Q1

Parameter	Value
Minimum platform availability[1]	>98.9%
Maximum platform availability[2]	<99.8%
Safe mode ratio	0.0%



Status AOCS: pointing performance

Observation mode: obtained pointing accuracies 2017/Q1 (almost identical than previously reported)

Error at confidence level	Error required [arcsec]	Error measured nominal [arcsec]
APE 68%		17.34
APE 95%	360	28.51
APE 99.7%		45.62
RPE 1.5s 95%	80	4.99

→ The AOCS pointing performance is far better than the requirement

Status AOCS units

Unit	Status	remark
Star tracker	nominal	Temp Head nominal well below 0 C: Maximum: -4.14C and -1.94C Average: -9.41C and -7.30C QS report 2017/Q1
GPS receiver	nominal	98.3% fix availability (ADS-B known interference on the GPS and GPS events 8-9 April AR 16) QS monthly report 3/05/2017
magnetometer	nominal	
Reaction wheels	nominal	No wear detected so far
Magnetic torquers	nominal	
AOCS IF	nominal	

→ **AOCS overall status: all is nominal and performances met by far**

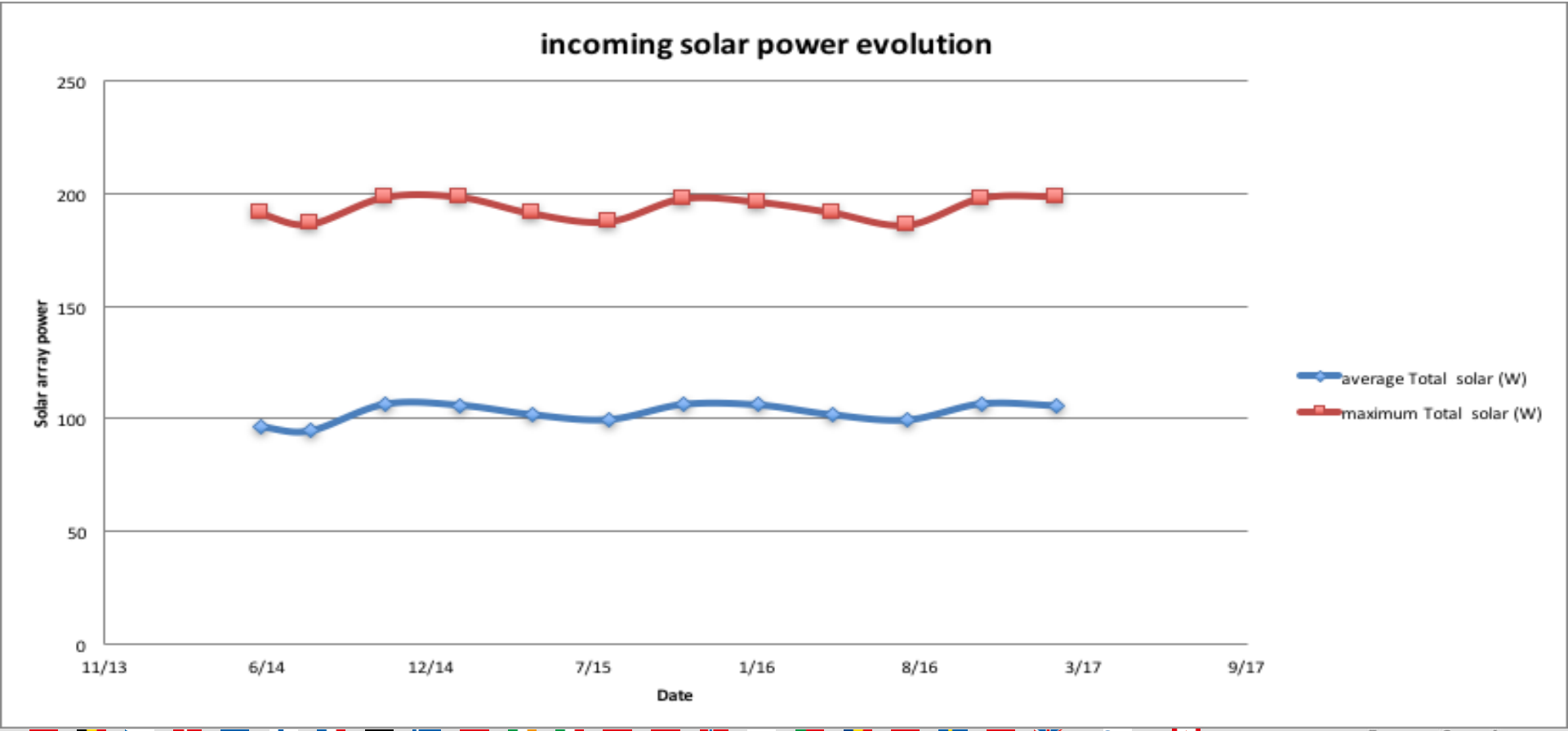
Status Power

Power summary 2017/Q1

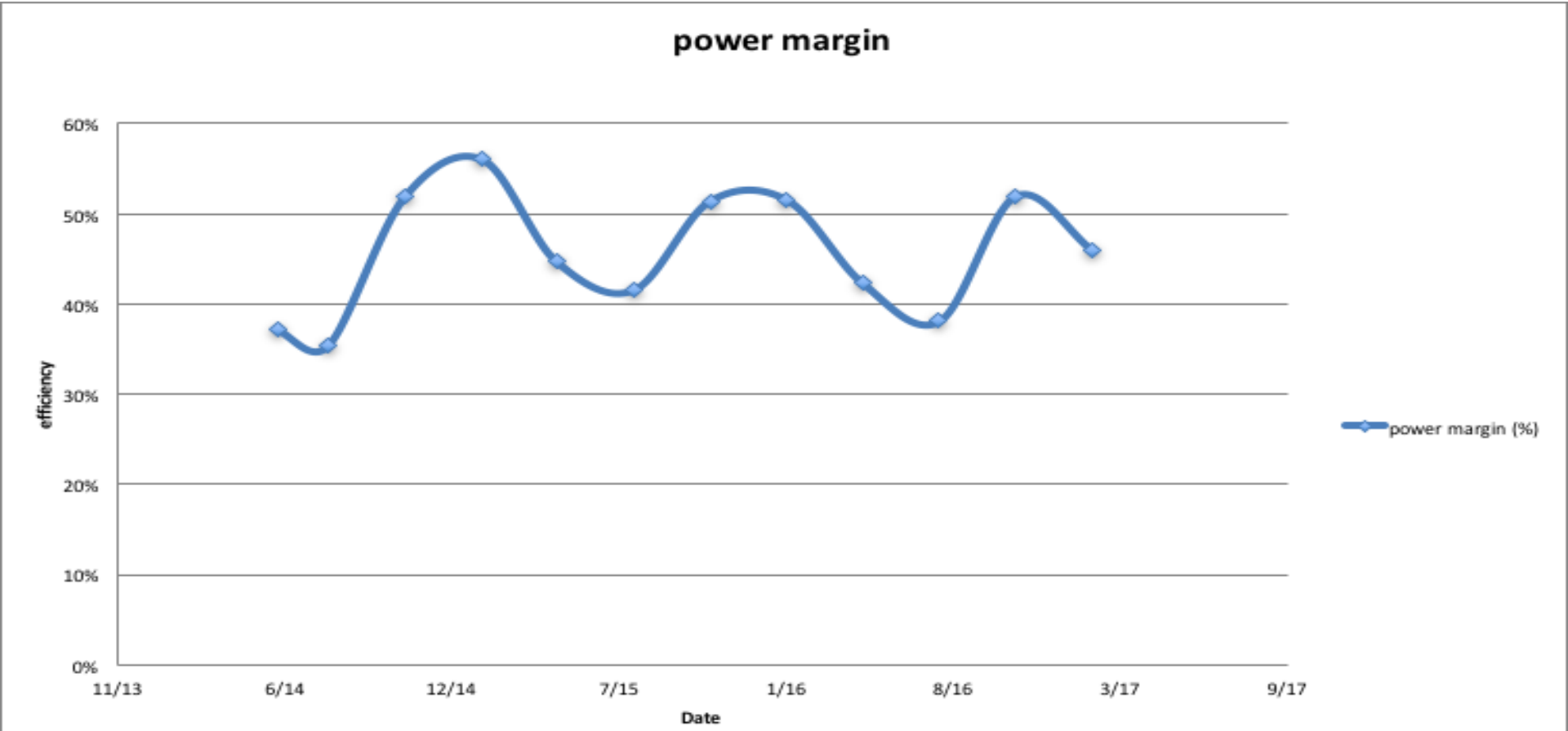
Mode	Bus average consumption [W]	S/A average generated power [W]	Energy budget margin	Minimum battery voltage (max = 29.2V)
Nominal mode	70.58	105.85	>40%	27.9 V

→**Power budget largely positive and stable in time**

Status Power



Status Power



Status Power Units

Unit	In-orbit status	
Battery	nominal	Battery voltage nominal. Temperature nominal (2017/Q1 average 16.97 C, min 13.94 C) nominal (> 6 C no heater required)
Solar arrays	nominal	No degradation of the solar cells can be observed (2017/Q1)
Power conditioning (ADPMS)	nominal	Power conditioning (efficiencies) as expected

→ **All units within power budget**

→ **The power situation is very stable, showing no apparent degradation of the solar arrays, battery, nor power distribution system**

Data handling status

Unit	In-orbit status	remark
ADPMS	nominal	Only events are single bit error (automatically corrected) in the MPM (8 occurrences on redundant MPM SDRAM since 2016/04/17). Full flash dump monthly execution for bit-by-bit comparison purpose.
Mass memory	Nominal with work around	Latch-up behaviour detected in orbit On board S/W work around in place

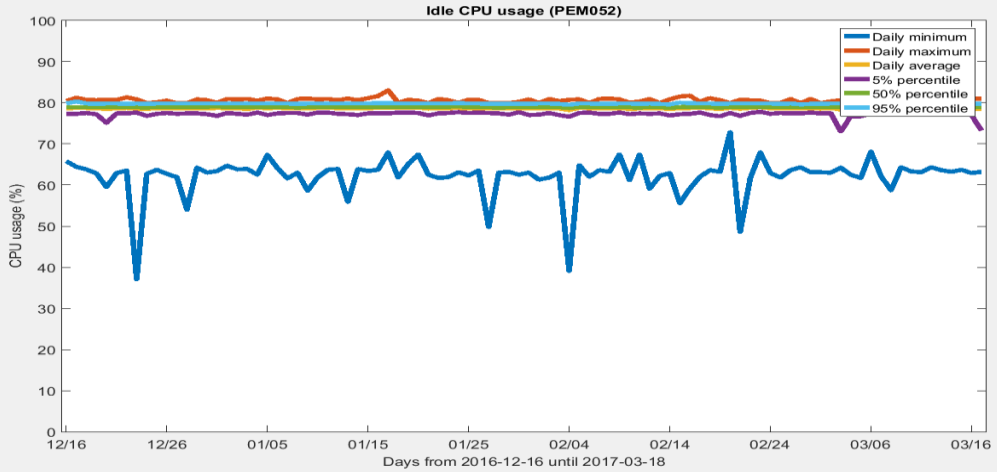


Figure 4-63: CPU idle time during last quarter

Processor load

- 20 % in nominal mode (average). The drops shown in daily minimum are due to a higher CPU usage during store dumps with large packets.

→ **Comfortable processor budget margin**

Data handling mass memory anomaly

Mass memory anomaly statistics

- Location: Generally SAA
- Occurrence: on average once per 2.8 days for lane 1 and 1.1 for lane 2
- Potential data gap: 3 min per occurrence (when over land)

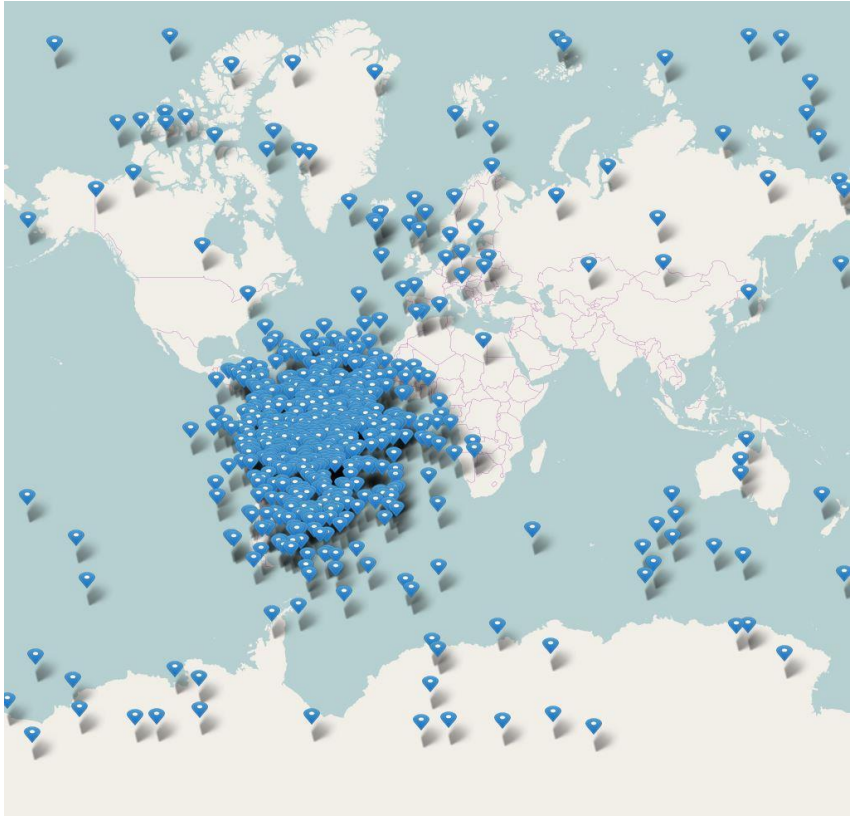


Figure 6-20: MMM SRAM multiple or many single (>1000) EDAC error map since launch

Data handling mass memory anomaly

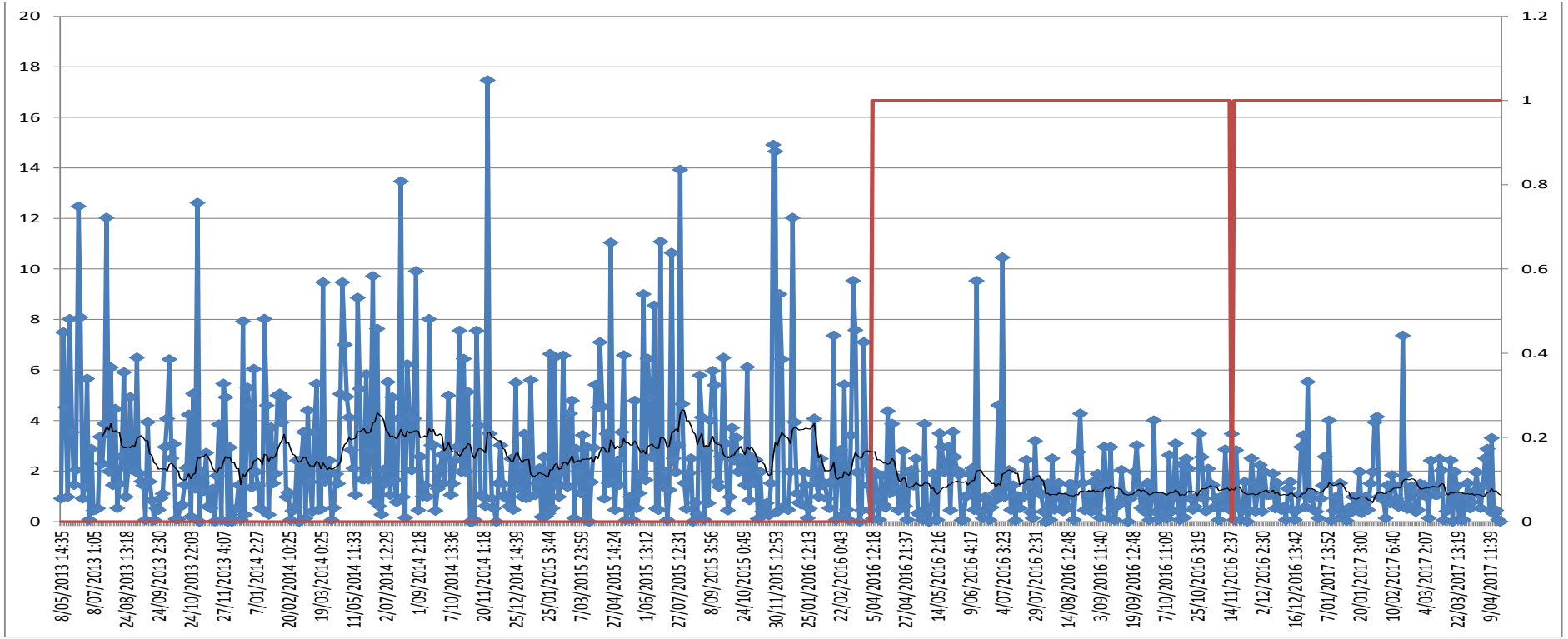
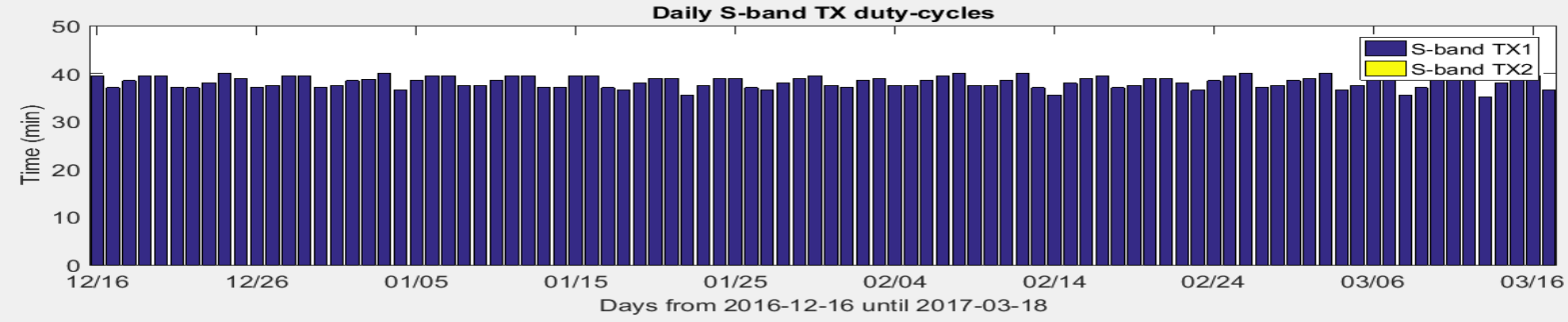


Figure 6-19: MMM SRAM latchup event interval + moving average over last 20 occurrences [days]. The red line shows the ADPMS lane (0 is primary, 1 is redundant)

RF S and X band duty cycle

- At the request of Project, since March 15 2017, the experimental X-band transmitter is used for each X-band pass.



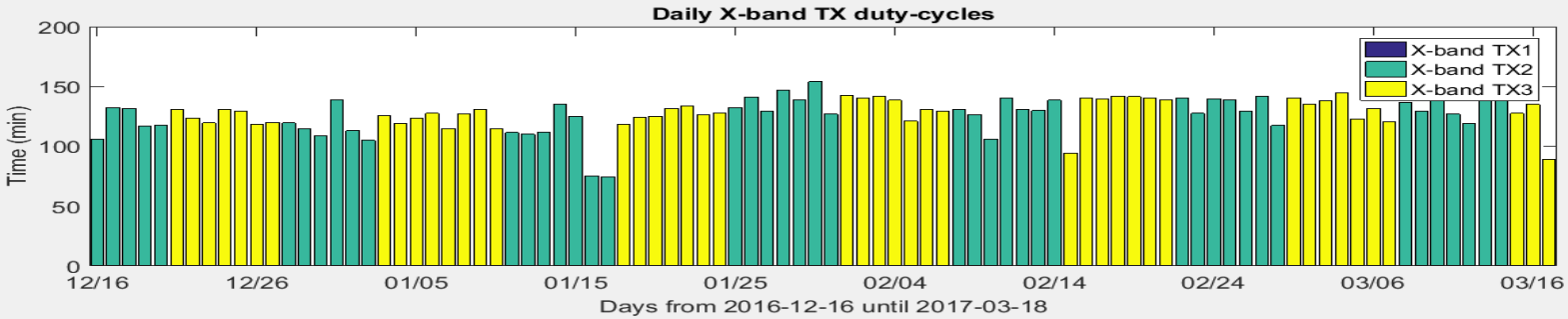


Figure 4-8: Duty cycle for S- and X-band transmissions over the last quarter

Instrument status

Instrument Status

- Fully functional
- All calibration requests were correctly executed.

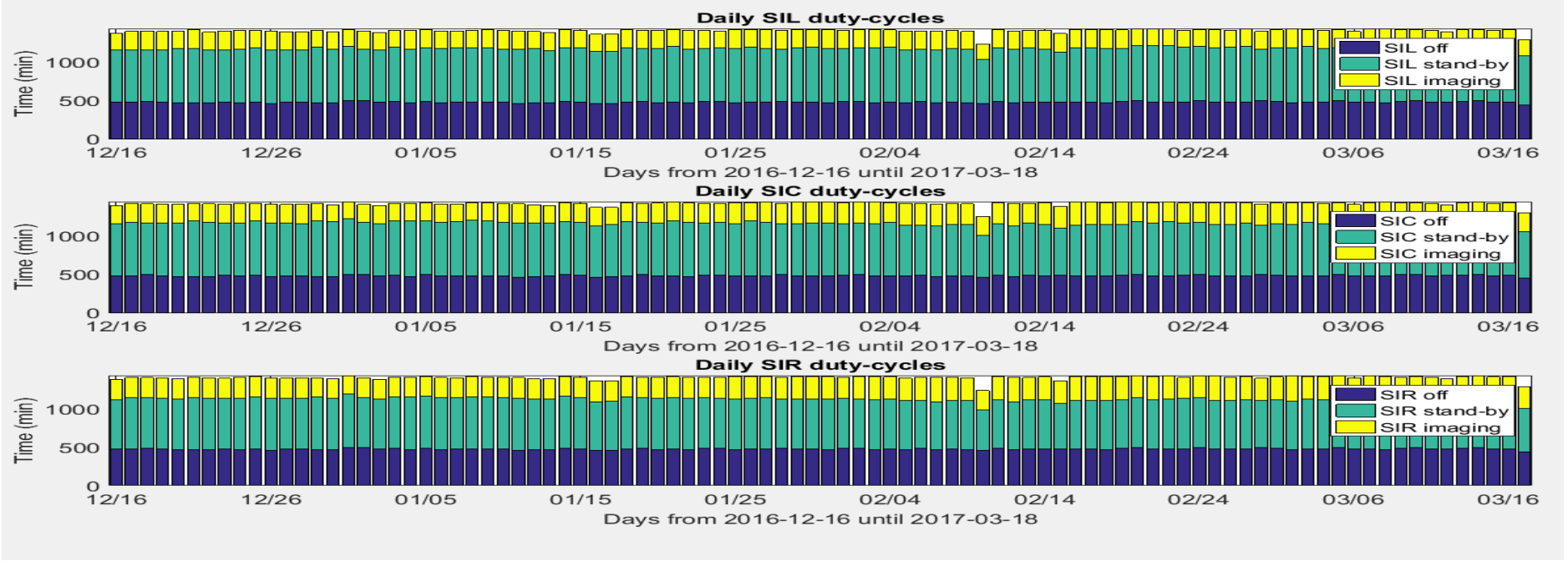
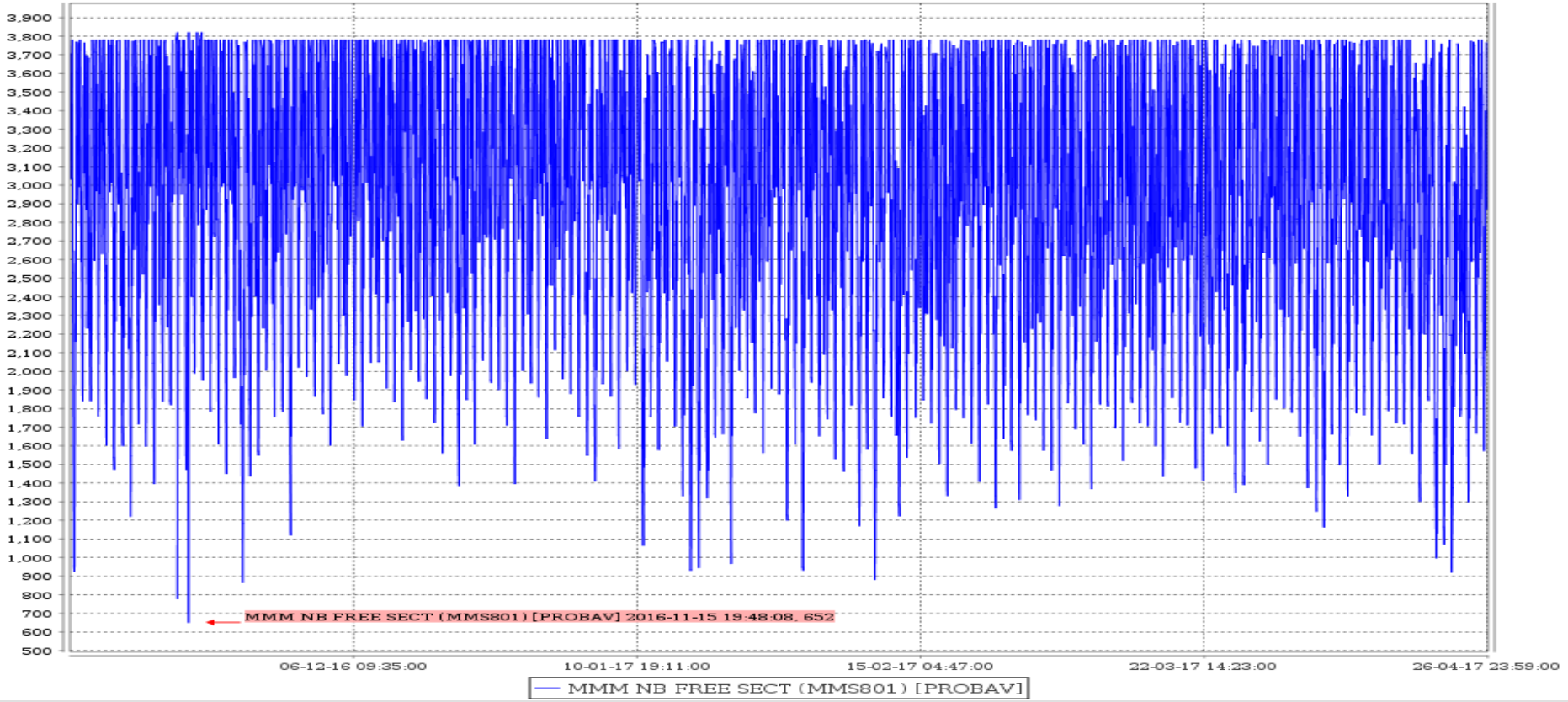


Figure 4-60: Daily SI duty cycles over the last quarter

MMM usage

MMM NB FREE SECT always > 237



Instrument Thermal

Optical bench thermal variation

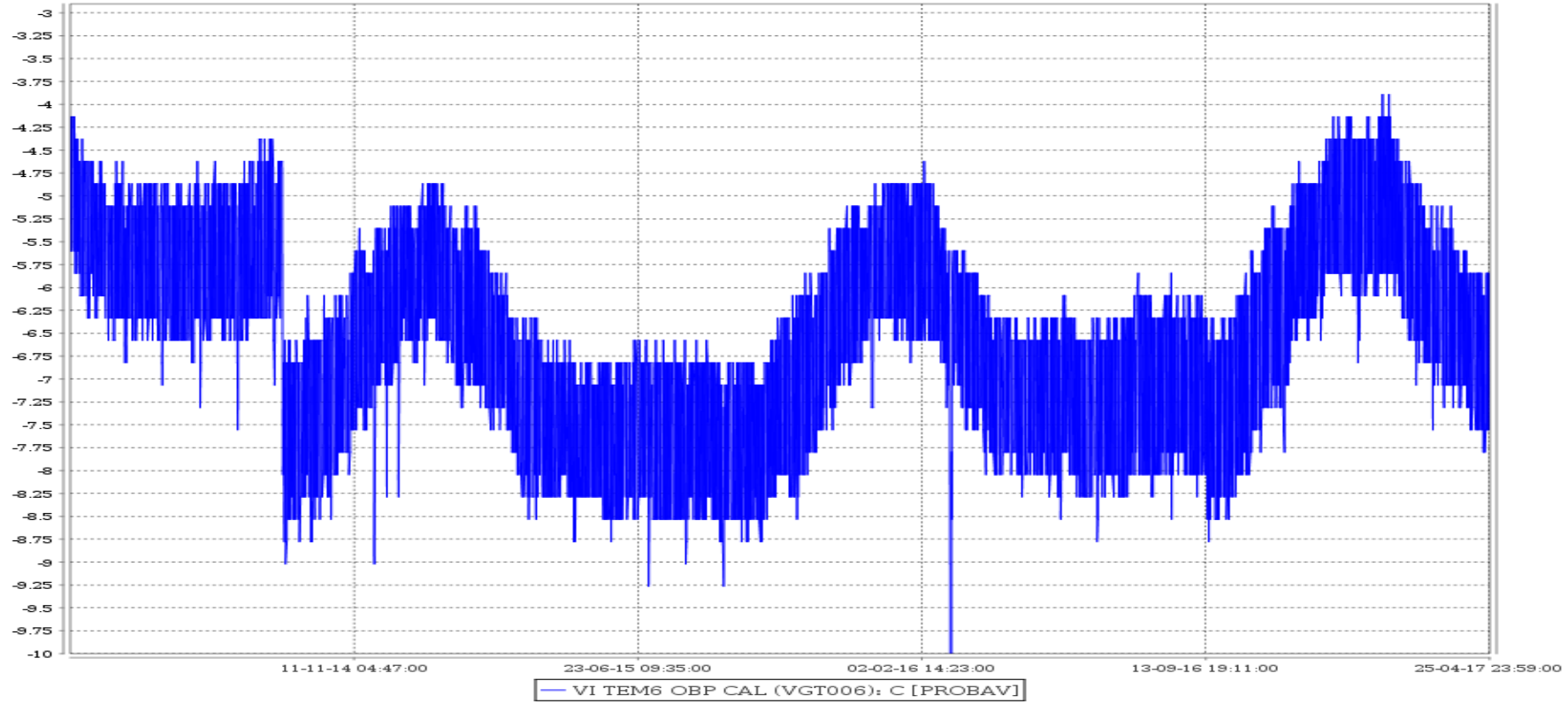
~ 1°C variation per orbit

~ 1.5°C variation per day

→**Confirming excellent thermal performances of radiator and bench**

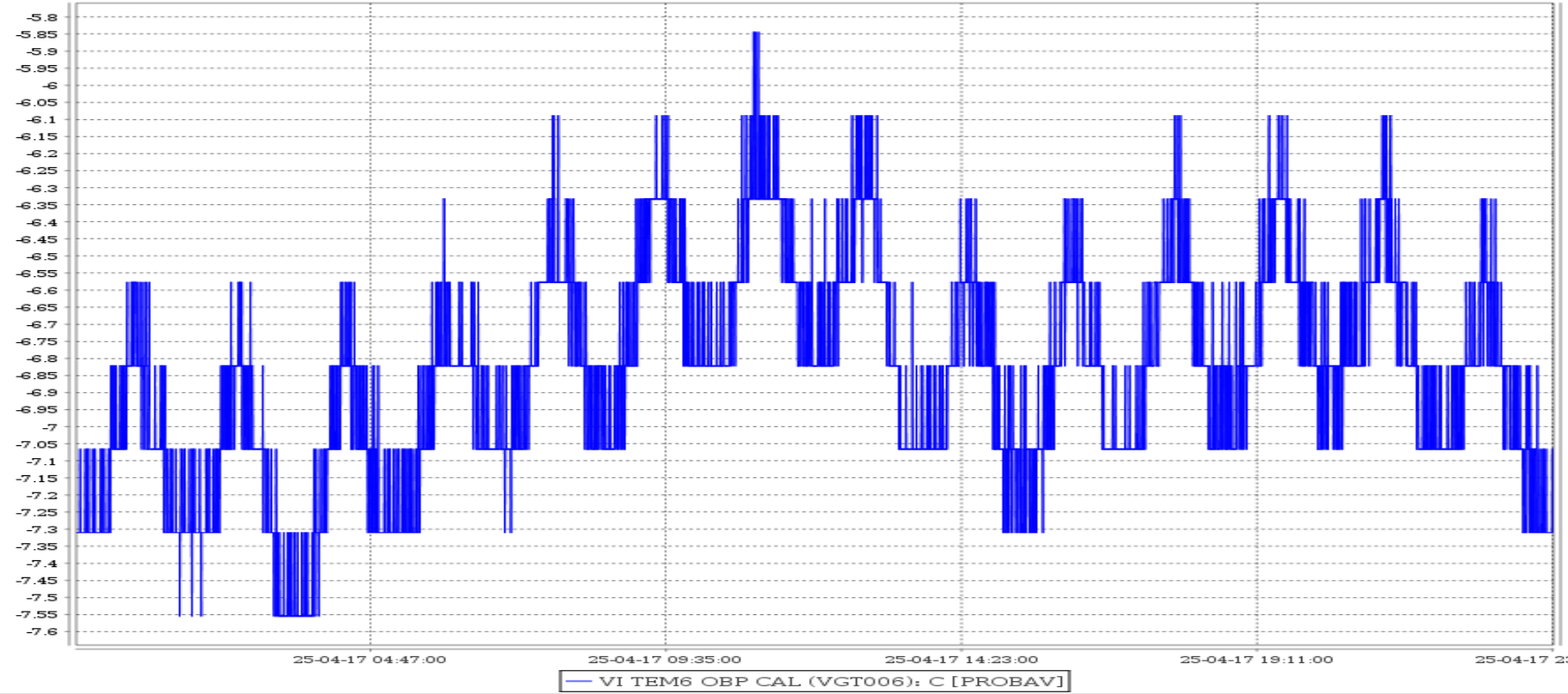
Instrument Thermal

Optical bench thermal variation since beginning of exploitation phase



Instrument Thermal

Optical bench thermal variation 26 April 2017



Report on anomalies

Report on anomalies

- Continuation of the decompression errors investigation.
- There were 3 anomaly reports opened in this reporting period:

PROBAV SAT 12_03/20170103:

Incorrect behaviour of the FID_MMM_STOP_DOWNLINK TC - MMM TOC corruption after an autonomous on-board reconfiguration

PROBAV SAT 16/20170408

Drop of number of satellites acquired by GPS2 for 24h

PROBAV SAT 17/20170422

2 MMM unavailability events 117 EVT_MMM_PW_BUSY after SRAM reconfiguration.

Report on anomalies:

Decompression error

- Double erase of full MMM on the primary lane done non Nov 14, 15 and 16 at a time when the MMM was fully dumped.

  A certain effect is seen but no dramatic improvement.

  More detailed analysis will be performed by QS on the TFF's acquired.

  Investigation on-going. Not finalized.

- OBCP to erase the empty MMM sector prior to writing to them (for tests on the primary lane to see if this has any effect and to collect new data) uploaded on May 4. Erasing of 800 sectors empty commanded at each S-band pass for long term validation of the OBCP.

  Primary lane switch to be planned for a test period.

Report on anomalies:

PROBAV SAT 12_03/20170103:
Incorrect behaviour of the FID_MMM_STOP_DOWNLINK TC - MMM TOC corruption after an autonomous on-board reconfiguration .

After analysis, the root cause was identified as a MMM TOC corruption after an autonomous on-board reconfiguration

OBCP to erase the last written sector of the MMM after boot to ensure incorrect data is erased (mainly important if the timestamp is incorrect, leading to significant loss of data) uploaded on May 4. Future optimization of the erase condition can be done if required. Validated on board but need to be changed to work correctly after a reconfiguration. Under correction.

Report on anomalies:

PROBAV SAT 16/20170408

Drop of number of satellites acquired by GPS2 for 24h

On 2017-04-08 at 10:18:17z, the number of satellites acquired by the GPS2 dropped from 12 to 4 and remained low until the next autonomous reconfiguration 2017/04/09 11:41:50z. As a result, the GPS navigation status toggled between 0, 1 and 2.

Analysis done by the unit provider shows frequent observations marked as invalid. The power cycle cleared the problem could indicate a radiation induced « hick-up ». No other action taken.

Report on anomalies:

PROBAV SAT 17/20170422:

MMM unavailability (event 117 EVT_MMM_PW_BUSY) after SRAM reconfiguration

Following a SRAM autonomous reconfiguration, the event 117 indicating a blockage status of the MMM packet-wire channel was triggered and commanded thus a new reconfiguration. The same behaviour repeated a second time. In total 3 reconfigurations in a row as follows:

2017-04-22T13:33:06.98 First normal reconfiguration.

2017-04-22T13:38:05.65 1 minute after the end of the reconfiguration, event 117 indicating a MMM blockage and commanding a new reconfiguration

2017-04-22T13:43:04.26 1 minute after the end of the reconfiguration, event 117 indicating a MMM blockage and commanding a new reconfiguration

2 other re-occurrences observed recently on 2017-05-04. Under analysis.

Flight Segment A.I.

AI4.2 To perform an assessment from satellite view point of the impact on the acquisition of Antarctica

AI4.6 To investigate feasibility for further manoeuvre roll + yaw for the two cameras

AI4.7 To check the possibility to repeat for checking the evolution.

Flight Segment A.I.

AI4.2 To perform an assessment from satellite view point of the impact on the acquisition of Antarctica

Email QS 2016/11/28:

- Antarctica occasionally as a normal calibration request is allowed.

- Antartica as a permanent area requires:
  - Disable sun mode (from Redu)
  - Change land-sea mask (from VITO)
  - Possible change the amount of X-band passes

Adding Antarctica permanently would generate huge overlap of data.

Flight Segment A.I.

AI4.6 To investigate feasibility for further manoeuvre roll (pitch) + yaw for the two cameras

AI4.7 To check the possibility to repeat for checking the evolution.

Additional rotation possible and exact requirement agreed.

QS contacted to update TN to compute the required BOF_REF parameters and timings and to check the constraints for a possible acquisition (set of 3 manoeuvres) in June.

Approach OK to be repeated every 6 months.

Ground Segment status

Overall Ground Segment & Operations status: Nominal.

- The satellite and ground segment operations, including its Vegetation Instrument acquisition and calibration requests, are running nominally.
- The Mission Operations Centre is fully operational. ESA/Redu centre supports all planned passes (3 S-band passes per day).
- The data downlink is shared between the SSC stations located in Kiruna, Alaska and Inuvik with 10 X-band passes per day.

X-band status:

	Total	Successful	Failed	Degraded Signal/data delay	Cancelled
November	298	293	0	5/0	0
December	310	297	1	7/5	0
January 2017	310	298	1	7/3	1
February	280	271	1	3/0	5
March	310	299	0	3/4	4
April	300	290	5	2/2	1

X-band status:

- Acquisition performance is very stable with only very few frame gaps.
- 8 missed and 11 cancelled passes since November.
- 8 missed: 1 due to config problems in Alaska, 1 late AOS in Alaska and 1 RT LEOP support in Alaska, 1 due to downconverter incorrect setting in Alaska, 1 config error in Inuvik, 1 other in Alaska and 2 due verification script problem in Kiruna.
- 11 cancelled: 9 due to strong winds at Kiruna and 2 due LEOP support in Alaska.
- The passes classified as degraded:
  - due to signal degraded: signal drop during the pass above 5 deg., RF I/F, wind
  - or due to data file transfer delay.
- Discussion took place with SSC in March to try to limit as much as possible the cancellation due to strong winds by moving in a short delay (the day before during the week) the support to an other station.

Close approach notifications from ESA Space Debris Office

March 28 at 20:39z., close approach warning with “FENGYUN 1C DEB” was issued with an overall miss distance of 223 m.

Ground Segment anomalies:
3 new REDU GS AR open. None blocking.

AR0681 : script mail not allowed by ISP (IP blacklisted):
On Tue. 07 February afternoon following new rules implemented by ISP, the sending of e-mail by operational machine in PROBA LAN was no more allowed. The situation was resolved on Wed. afternoon after e-mails exchange with ISP. ISP will be contacted to take preventive action. Open.

AR0687: PROBA webserver disk full
On Sat. 25 February, the PROBA webserver disk was full without operational impact on the mission. The problem was solved on Mon. 27 after removal of old PROBA-2 and PROBA-V data. Automatic purge script installed. Open.

AR0694: RED-3 RF uplink failure
Wednesday 19 April: Degraded RED-3 antenna uplink performance. No impact on the mission with the exception of the scheduling of the techno demo Energetic Particle Telescope. Use of RED-4 antenna from Thursday 20 to Monday 24 until RED-3 uplink is back fully operational and repaired with spare parts. Open.

Managed via Redu Anomaly/Ticketing system (TANOR) and reported through Weekly Report.

Thank you!

proba-v

9 - 10 May 2017
Turino

proba VEGETATION