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| P2SC-ROB-WR-016-20100628 Weekly report #016 | P2SC Weekly report |  |
| Period covered: Date: Written by: Released by: | Mon June 28 to Sun July 4 2010 Mon July 5 2010 Anik De Groof Carlos Cabanas | Royal Observatory of Belgium PROBA2 Science Center |
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1. Science

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| <p>Space weather events</p> <p><u>June 29, around 15:30:</u> flaring sequence in AR North-West on solar disk. A B1.3 flare was going off in the SWAP FOV which also produced a CME seen in LASCO. Link to solarsoft event.</p> <p>LYRA also sees an event around that time. Unfortunately we miss part of the event because of dark acquisitions.</p> <p><u>July 3:</u> Small-scale activity in SWAP. Small filament eruption at South-West (early morning) and little activity North-East. LYRA does not show any significant signal changes.</p> |
| <p>Scientific campaigns</p> <p>On 29-30 June, SWAP was performing a paving campaign to be able to reconstruct the inner corona up to 2 solar radii. For that purpose 2 times 2 orbits of 10 arcmin off-pointing acquisitions were performed, with an additional orbit of dark images for calibration purposes (see SWAP IOS and operations below). The acquisitions and data download was completely successful. Analysis of the data is ongoing.</p> |
| <p>Outreach, papers, presentations, etc.</p> <ul style="list-style-type: none"> - Dan Seaton participated in an ISSI meeting on prominence cavities in Bern, Switzerland. He spoke about SWAP data and observations of several quiescent cavities and one cavity eruption. He will continue collaboration using SWAP to observe cavities and model cavities appearance in SWAP images. - Marilena Mierla presented a talk on the 3D reconstruction of coronal mass ejections using SECCHI and SWAP data, at the Catania Observatory, Italy. - Joe Zender presented the case of the PROBA2 mission extension on Tue 29 June in ESOC. |

- A VRT journalist visited ROB on Wed 30 June for an interview with Anik De Groof and David Berghmans on the PROBA2 mission. The interview will be broadcasted on VRT radio later this summer.

To be explored

2. LYRA instrument status

Calibration

New high-level LYRA data products were produced:

- a quicklook image of 1-minute averaged, preliminary calibrated LYRA data over 3 consecutive days, temporarily available from <http://solwww.oma.be/users/dammasch/DailyImageCal.html>
- a FITS file of the 1-minute averaged, preliminary calibrated LYRA data of 1 day, temporarily available from <http://solwww.oma.be/users/dammasch/Level3.html>

The FITS files can be opened with the publicly available and free software FV (<http://heasarc.gsfc.nasa.gov/ftools/fv/>). Both quicklook and FITS files will be moved to the public directory of the P2SC website very soon.

Preliminary calibration means:

- instrumental dark currents are subtracted
 - the trend due to instrumental degradation is removed
 - the LYRA count rates were converted to physical units with the help of other instruments.
- TIMED-SEE observations are used for step 2 and 3. These are available (in lower temporal resolution) with a latency of 4 days and so an estimation model is used to calculate the recent LYRA measurements.

As this data product is up to now the most useful one to the scientific community, the old Daily image, advertised on the <http://PROBA2.sidc.be> website, will be replaced with these similar, but now calibrated, data.

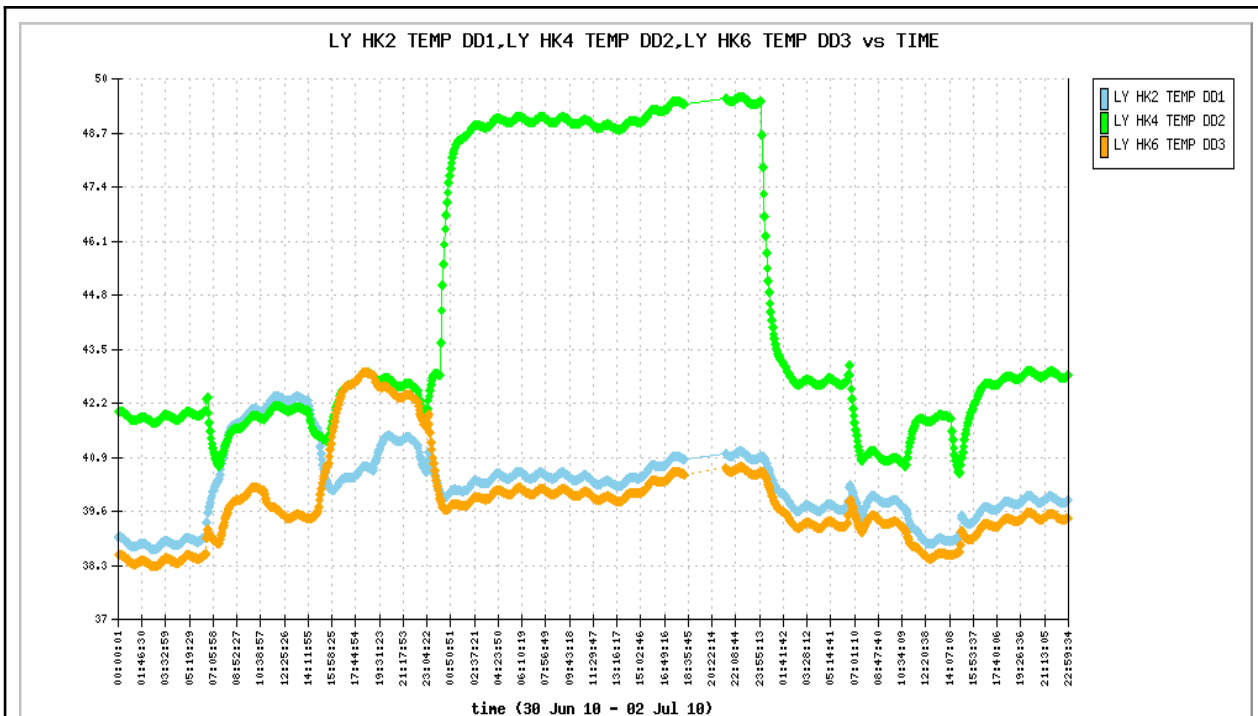
IOS & operations

LYRA's nominal operations over the week were acquisition with unit 2 at a 50ms cadence.

There were also some special calibration campaigns performed:

- Calibration 30 June (IOS00071)
- Bakeout 1 July (IOS00071)
- Calibration 2 July (IOS00071)

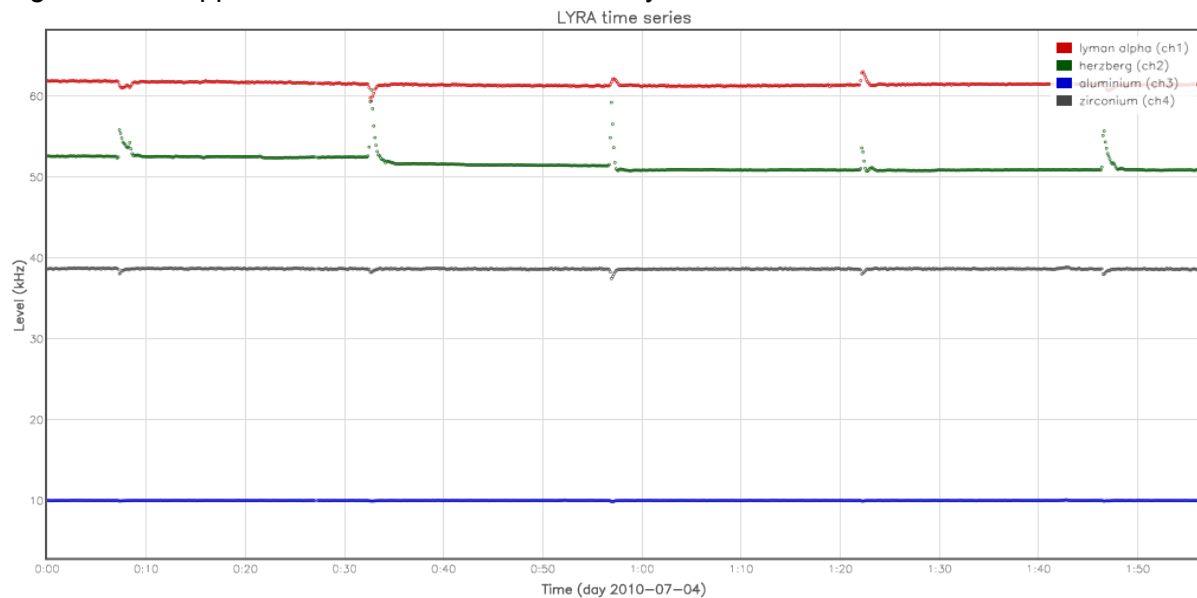
The bakeout of unit 2 was successful: LY HK4 TEMP DD2 increased up to 49 degrees. There was an additional increase of temperature on Thursday because of DSLP switching on. Some data were lost because of missing data associated with pass 1701 over Svalbard. Right before and 6 hours after the bakeout, a calibration campaign was done. The last calibration campaign only took unit 2 into account.



The data will be analysed asap to find any difference in data quality before and after the campaign.

To be explored

On July 4, between 00UT and 04UT, the Herzberg channel shows a stepwise decrease of the signal. As it happens at each LAR, it has definitely no solar nature.



Further investigation is going on.

3. SWAP instrument status

MCPM recoverable errors

increased from 186 to 189 on July 1 at 13:21.
The number of MCPM unrecoverable errors is still 0.

IOS & operations

SWAP was doing nominal operations most of the week, with 110s cadence at the beginning of the week. During last weekend and on Monday, the buffer was emptied regularly, so cadence could have been higher but as special campaigns were planned for Tuesday & Wednesday, the cadence was not increased.

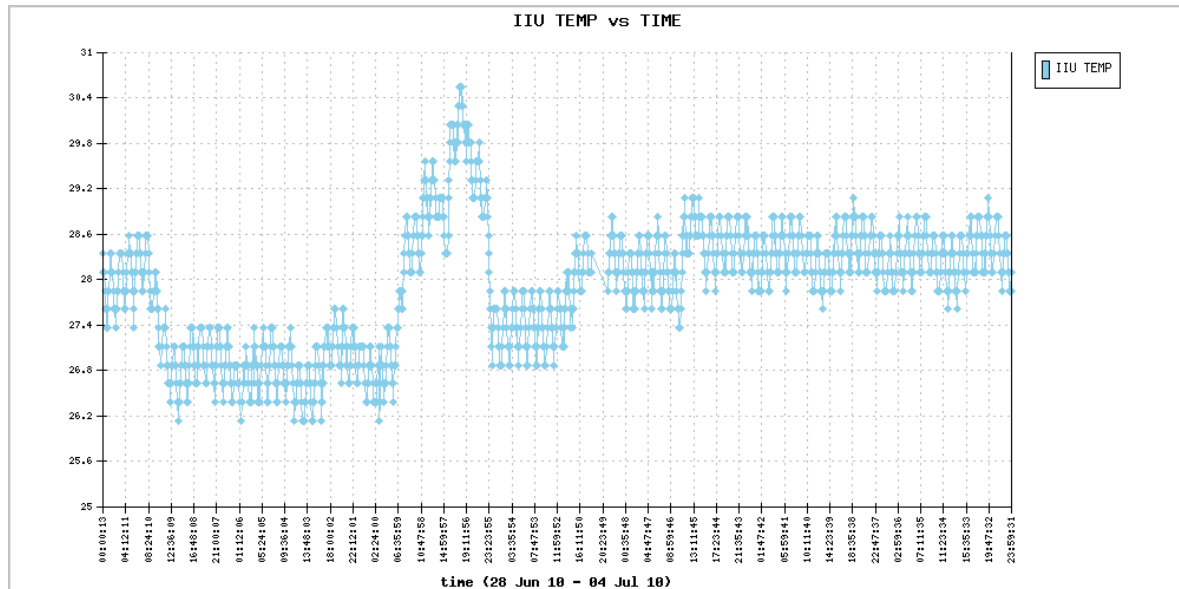
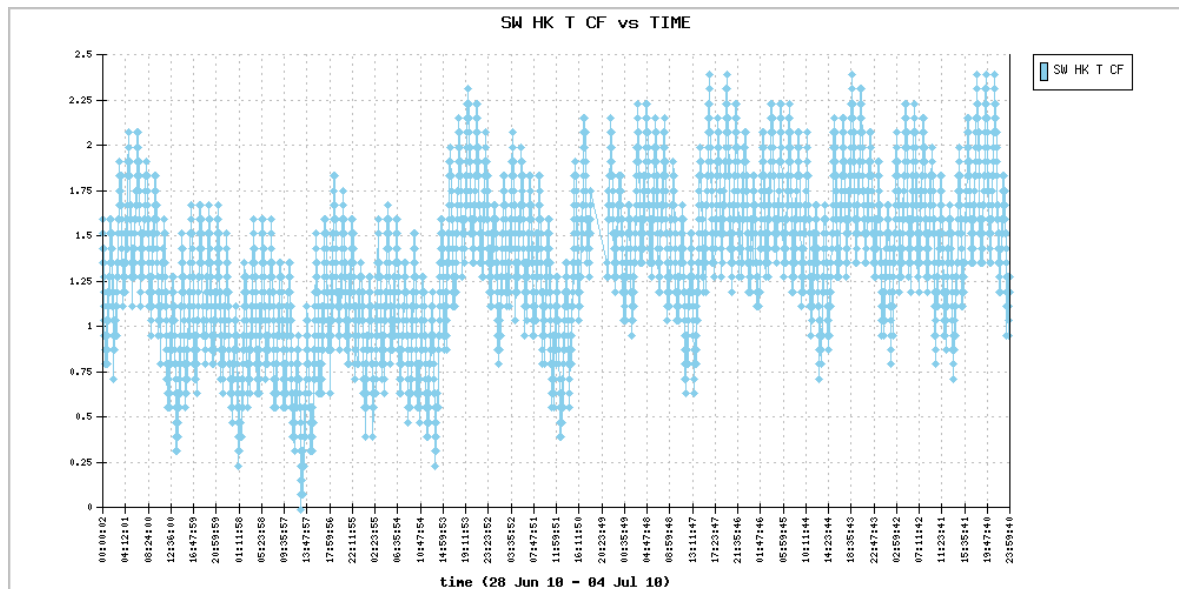
Campaigns:

- 29 June: Offpointing campaign during 2 orbits, 10 arcmin off to 4 corners of FOV (IOS00129)
- 29 June: dark acquisitions (3 degrees off-pointing) during 1 orbit (IOS00130)
- 30 June: Offpointing campaign during 2 orbits, 10 arcmin off to 4 corners of FOV (IOS00131)

Image number 100000 was received on Tuesday June 29.

SWAP detector and IIU temperature

The SWAP Cold Finger Temperature fluctuated between 0 and 2.4 degrees Celsius. Effects were seen of LYRA calibration and bakeout and of DSLP & TPMU acquisitions.



Issue on onboard image overwriting algorithm

Last week we reported that many SWAP images were lost of the offpointing campaign on June

21. As all passes were received and no images were overwritten in the raw buffer, it seemed that those high priority images were overwritten onboard. Further investigation however revealed that one of the BINSWAP tar files of that day was not complete. Only 42 images were delivered while 122 were downloaded.

This pass SVA 1609 was re-extracted by the MOC and resend on Monday July 5. It completely filled up the data gap in the off-pointing campaign.

4. PROBA2 Science Center Status

Anik De Groof was operator during this week.

The LYRA EDG was operated manually.

SWAP daily movies were also created manually. The removal of blurred images due to large angle rotations was not successful this week. The threshold which are implemented to detect the blurred images seem to be dependent on the solar activity. For this reason, no difference movies were produced. Towards the end of the week, the movie quality was better again. This is to be explored and to be improved.

The following tools were updated on the operational server:

| Software name | Update | Date | Comment |
|---------------|--------|---------|--|
| Report Parser | 3392 | June 30 | more digits taken into account when reading SWAP image numbers |
| IOS writer | 3388 | July 1 | adapted to use the same temporary directory as LMAT |
| global.ini | 3400 | July 2 | the directories that were deleted during the cleaning up process should not be recreated automatically |

SWAP data reprocessing

The SWAP data reprocessing, which happened last week, was completed by:

- moving all auxiliary files (quicklook barplots, event lists, etc) to the operational server
- More checks were done on the completeness of the SWAP scientific data.
- The server was cleaned by removing useless and old files and directories.
- LMAT databases were chopped on July 2. All logs older than June 24 were deleted. (Old databases were kept but copied out of the operational server)
- The statistics published in the last weekly report were refined to see the trend in the quality of data processing.

The statistics below are found by comparing the number of (uncalibrated) level0 files with the number of (calibrated) level1 files during the data reprocessing from Dec to June 2010. The numbers are given per 100 passes (roughly every 10-15 days). Differences can be due to

- gaps in the HK data as the SWAP image is not calibrated in case no recent detector temperature is available

- number of calibration files (dark images, LED images) as these are not calibrated at all.

To be clear: it does not give any statistics on the number of SWAP images received or missed!

Pass 80 -> 199 (20-11-2009 -> 15-12-2009)

Number of Level-0 FITS files: 1026
Number of Level-1 FITS files: 632 (61,6 %)
Number of files with insufficient temperature data: 170 (16,6%)
Number of files determined to be calib files: 224 (21,8%)

Pass 200 -> 299 (15-12-2009 -> 12-01-2010)

Number of Level-0 FITS files: 1085
Number of Level-1 FITS files: 1037 (95,6%)
Number of files with insufficient temperature data: 25 (2,3%)
Number of files determined to be calib files: 23 (2,1%)

Pass 300 -> 399 (12-01-2010 -> 29-01-2010)

Number of Level-0 FITS files: 3323
Number of Level-1 FITS files: 2676 (80,5%)
Number of files with insufficient temperature data: 311 (9,4%)
Number of files determined to be calib files: 336 (10,1%)

Pass 400 -> 499 (29-01-2010 -> 14-02-2010)

Number of Level-0 FITS files: 3549
Number of Level-1 FITS files: 3470 (97,8%)
Number of files with insufficient temperature data: 25 (0,7%)
Number of files determined to be calib files: 54 (1,5%)

Pass 500 -> 599 (14-02-2010 -> 03-03-2010)

Number of Level-0 FITS files: 6775
Number of Level-1 FITS files: 6419 (94,7%)
Number of files with insufficient temperature data: 336 (5%)
Number of files determined to be calib files: 20 (0,3%)

Pass 600 -> 699 (03-03-2010 -> 15-03-2010)

Number of Level-0 FITS files: 6783
Number of Level-1 FITS files: 5109 (75,3%)
Number of files with insufficient temperature data: 1637 (24,1%)
Number of files determined to be calib files: 37 (0,6%)

Pass 700 -> 799 (15-03-2010 -> 25-03-2010)

Number of Level-0 FITS files: 5845
Number of Level-1 FITS files: 5350 (91,5%)
Number of files with insufficient temperature data: 366 (6,3%)
Number of files determined to be calib files: 129 (2,2%)

Pass 800 -> 899 (25-03-2010 -> 05-04-2010)

Number of Level-0 FITS files: 7556
Number of Level-1 FITS files: 6952 (92,0%)
Number of files with insufficient temperature data: 566 (7,5%)
Number of files determined to be calib files: 38 (0,5%)

Pass 900 -> 999 (05-04-2010 -> 16-04-2010)

Number of Level-0 FITS files: 6830
Number of Level-1 FITS files: 6682 (97,8%)
Number of files with insufficient temperature data: 72 (1,1%)
Number of files determined to be calib files: 76 (1,1%)

Pass 1000 -> 1099 (16-04-2010 -> 27-04-2010)

Number of Level-0 FITS files: 7279
Number of Level-1 FITS files: 7183 (98,7%)
Number of files with insufficient temperature data: 25 (0,3%)
Number of files determined to be calib files: 71 (1,0%)

Pass 1100 -> 1199 (27-04-2010 -> 08-05-2010)

Number of Level-0 FITS files: 8016
Number of Level-1 FITS files: 8001 (99,8%)
Number of files with insufficient temperature data: 15 (0,2%)
Number of files determined to be calib files: 0(0,0%)

Pass 1200 -> 1299 (08-05-2010 -> 19-05-2010)

Number of Level-0 FITS files: 7922
Number of Level-1 FITS files: 7791 (98,3%)
Number of files with insufficient temperature data: 96 (1,2%)
Number of files determined to be calib files: 35 (0,5%)

Pass 1300 -> 1399 (19-05-2010 -> 30-05-2010)

Number of Level-0 FITS files: 8016
Number of Level-1 FITS files: 7947 (99,1%)
Number of files with insufficient temperature data: 31 (0,4%)
Number of files determined to be calib files: 38 (0,5%)

Pass 1400 -> 1499 (30-05-2010 -> 10-06-2010)

Number of Level-0 FITS files: 8299
Number of Level-1 FITS files: 8261 (99,5%)
Number of files with insufficient temperature data: 0 (0,0%)
Number of files determined to be calib files: 38 (0,5%)

Pass 1500 -> 1565 (10-06-2010 -> 21-06-2010)

Number of Level-0 FITS files: 8118
Number of Level-1 FITS files: 8002 (98,6%)
Number of files with insufficient temperature data: 116 (1,4%)
Number of files determined to be calib files: 0 (0,0%)

Pass 1600 -> 1632 (21-06-2010 -> 24-06-2010)

Number of Level-0 FITS files: 2805
Number of Level-1 FITS files: 2767 (98,6%)
Number of files with insufficient temperature data: 0 (0,0%)
Number of files determined to be calib files: 38(1,4%)

5. Data reception & discussions with MOC

Passes

On July 2 in the morning, we noticed that none of the passes since last night 18UT was received (pass 1701 up to pass 1704). The MOC was informed, we learned that there was a problem with the automated pass system, and all passes were re-extracted and resend. Data of pass 1701 were however lost because the session was not recorded on the BBE at Svalbard.

On the P2SC side this caused some effects:

- an HK packet for pass 1702 was received but it only contained empty log files. These caused a number of warnings and errors but these could all be dismissed.
- when the new and complete packets for pass 1702 were sent to use, the empty files were still within the packets so the same warnings and errors re-appeared. Again, all could be easily dismissed.
- the LYRA data of pass 1705 could not be read and processed by the LYTMR. These data will be manually processed (if possible) and the tool adapted.

Data coverage HK

3 hrs data gap from 18:20 to 21:20 due to lost data of pass 1701.
Rest of the week was fine.

Data coverage SWAP

This week, there were many data packets which showed (small) problems, like corrupt or truncated data and image numbers missing. The list below is quite long compared to the previous weeks:

- 4 images missing in **pass 1675** (this pass was resend after pass 1677 so probably re-extracted) & some truncated and corrupted images in pass 1675:
 BINSWAP201006282050550000100156PROCESSED - JPEG data truncated:
 327516 < 372067
 BINSWAP201006282101550000100158PROCESSED - Corrupted first packet
- 6 Image numbers are missing in **pass 1683** + corrupt and truncated images:
 BINSWAP201006290345170000100694PROCESSED - JPEG data truncated
 BINSWAP201006290350470000100695PROCESSED - Corrupted first packet
 BINSWAP201006290749210000100703PROCESSED - Corrupted first packet
 BINSWAP201006292002360000100704PROCESSED - JPEG data truncated:
 65436 < 637844
- 4 Image numbers are missing in **pass 1685** + 1 truncated image:
 BINSWAP201006292358360000100913PROCESSED - JPEG data truncated:
 393036 < 638638
- 5 Image numbers are missing in **pass 1694** & 1 corrupt image:
 BINSWAP201006302240160000101652PROCESSED - Corrupted first packet
- 2 image numbers are missing in **pass 1700**
- **pass 1701** completely missed -> **106 images lost**
- 1 Image number missing in **pass 1705** & 2 truncated images:
 BINSWAP201007020645190000102265PROCESSED - JPEG data truncated:
 393036 < 642053
 BINSWAP201007011809580000102335PROCESSED - JPEG data truncated:

261996 < 641026

- 1 Image number is missing in **pass 1711** & 1 truncated & 1 corrupted image:
BINSWAP201007022242190000103060PROCESSED - JPEG data truncated:
65436 < 648817
BINSWAP201007022253190000103062PROCESSED - Corrupted first packet
- 6 Image numbers are missing in **pass 1712**
- 1 image number is missing in **pass 1717**
- 8 Image numbers are missing in **pass 1726**

The overall data coverage was not that much affected by these missing images. Only towards the end of the week, several small gaps were formed. Apart from images lost during download, there were also images overwritten onboard due to a full processed buffer.

Statistics for complete week:

Total number of images between 2010062800 and 2010070500: 5252
Highest cadence in this period: 30 seconds
Average cadence in this period: 115.14 seconds
Number of image gaps larger than 300 seconds: 25
Number of image gaps larger than 200 seconds: 587
Largest data gap: 150.33 minutes - 2nd largest: 6 minutes

From June 30, 7:00 onwards (outside the campaigns):

Total number of images between 2010063007 and 2010070500: 3230
Highest cadence in this period: 110 seconds
Average cadence in this period: 125.91 seconds
Number of image gaps larger than 300 seconds: 14
Largest data gap: 150.33 minutes
Other 13 gaps are 330s long -> 1 out of 3 images missing

Data coverage LYRA

All LYRA data are complete, apart from 2 gaps:

- Data gap on July 1 from 18:15 and 21:20 due to missed pass 1701. This was during the bakeout.
- Data gap on July 2 from 00:38 to 03:50 due to non-processed pass 1705. This can hopefully still be filled by processing the data manually.

6. APPENDIX Frequently used acronyms

| | |
|-------|---|
| ADP | Ancillary Data Processor |
| ADPMS | Advanced Data and Power Management System |
| AOCS | Attitude and Orbit Control System |
| APS | Active Pixel image Sensor |
| ASIC | Application Specific Integrated Circuit |
| BBE | Base Band Equipment |
| CME | Coronal Mass Ejection |
| COGEX | Cool Gas Generator Experiment |
| CRC | Cyclic Redundancy Check |
| DR | Destructive Readout |
| DSLIP | Dual Segmented Langmuir Probe |

| | |
|--------|---|
| EIT | Extreme ultraviolet Imaging Telescope |
| FITS | Flexible Image Transport System |
| FOV | Field Of View FPA Focal Plane Assembly |
| FPGA | Field Programmable Gate Arrays |
| GPS | Global Positioning System |
| HAS | High Accuracy Star tracker |
| HK | Housekeeping |
| ICD | Interface Control Document |
| IIU | Instrument Interface Unit |
| IOS | Instrument Operations Sheet |
| LED | Light Emitting Diode |
| LEO | Low Earth Orbit |
| LYRA | LYman alpha RAdiometer |
| LYTMR | LYRA Telemetry Reformatter (software module of P2SC) |
| LYEDG | LYRA Engineering Data Generator (software module of P2SC) |
| MCPM | Mass Memory, Compression and Packetisation Module |
| MOC | Mission Operation Center |
| NDR | Non Destructive Readout |
| OBET | On board Elapsed Time |
| OBSW | On board Software |
| PE | Proximity Electronics |
| PGA | Programmable Gain Amplifier |
| PI | Principal Investigator |
| P2SC | PROBA2 Science Center |
| PPT | Pointing, Positioning and Time (software module of P2SC) |
| ROB | Royal Observatory of Belgium |
| SAA | South Atlantic Anomaly |
| SCOS | Spacecraft Operation System |
| SEU | Single Event Upset |
| SOHO | Solar and Heliospheric Observatory |
| SWAP | Sun Watcher using APS detector and image Processing |
| SWBSDG | SWAP Base Science Data Generator |
| SWEDG | SWAP Engineering Data Generator (software module of P2SC) |
| SWTMR | SWAP Telemetry Reformatter (software module of P2SC) |
| TBC | To Be Confirmed |
| TBD | To Be Defined |
| TBW | To Be Written TC Telecommand |
| TPMU | Thermal Plasma Measurement Unit |
| UTC | Coordinated Universal Time |
| UV | Ultraviolet |