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SCIAMACHY Bi-MONTHLY Report: July - August 2006

prepared by/*préparé par* Angelika Dehn

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TABLE OF CONTENTS

SCIAMACHY Bi-monthly Report July – August 2006

1 INTRODUCTION

The SCIAMACHY Bi-Monthly report documents the current status and recent changes to the SCIAMACHY instrument, its data processing chain, and its data products.
The Bi-Monthly Report (hereafter BMR) is composed of analysis results obtained by the DPQC, combined with inputs received from the different groups working on SCIAMACHY operation, calibration, product validation and data quality.
The first part of the report is dedicated to Instrument Configuration and Performance. It is composed of contributions from SOST-DLR and SOST-IFE.
The remainder of the report is dedicated to level 1 and level 2 performance assessment and is generated by ESA/ESRIN DPQC with contributions from ESA/ESTEC PLSO and DLR-IMF.

The structure of the report will be in constant evolution through the ENVISAT mission, as experience with SCIAMACHY data and quality control grows.

1.1 Scope

The main objective of the BMR is to give, on a regular basis, the status of SCIAMACHY instrument performance, data acquisition, results of anomaly investigations, calibration activities and validation campaigns. The BMR is composed of the following six sections:

- Summary;
- Instrument Configuration and Performance;
- Data Availability Statistics;
- Level 1 Product Quality Monitoring;
- Level 2 Product Quality Monitoring;
- Validation Activities and Results.

1.2 References

[1] ‘Instrument Operation Manual’, MA-SCIA-0000DO/01, Issue F R2, 16 Dec. 2004
[2] ‘ENVISAT-1 Products Specifications Volume 15: SCIAMACHY Products Specifications’, PO-RS-MDA-GS-2009, Issue 3, Rev: K, Gianni Sotis, 06 May 2006
[3] ‘SCIAMACHY cL0 Statistics, PO-TN-DLR-SH-0012, Issue 1, Rev. 1 14 April 2005’
[4] SCIAMACHY cL0 Statistics 2003, PO-TN-DLR-SH-0013, Issue 1, Rev. 0 14 April 2005
[5] ‘SCIAMACHY Consolidated Level 0: Statistics for the Year 2005’, PO-TN-DLR-SH-0014, Issue 1, Rev. 0 11 July 2006

1.3 Acronyms and Abbreviations

ADC	Analogue to Digital Converter
ADF	Auxiliary Data File
ANX	Ascending Node Crossing
AOCS	Attitude and Orbit Control System
APSM	Aperture Stop Mechanism
ASM	Azimuth Scan Mechanism
ATC	Active Thermal Control
BMR	Bi-Monthly Report
CA	Corrective Action
CCA	Communication Area
CTI	Configurable Transfer Item
DAC	Digital Analogue Converter
DLR-IMF	Deutsches Zentrum fuer Luft- und Raumfahrt
DPQC	Data Processing Quality Control
ESM	Elevation Scan Mechanism
FPN	Fixed Pattern Noise
HK	Housekeeping
ICE	Instrument Control Electronics
ICU	Instrument Control Unit
IECF	Instrument Engineering and Calibration Facilities
IOM	Instrument Operation Manual
LK1	Leakage Current Auxiliary File (SCI_LK1_AX)
LOS	Line of Sight
MCMD	Macro Command
MR	Monthly Report
NCWM	Nadir Calibration Window Mechanism
NDFM	Neutral Density Filter Mechanism
NNDEC	Non-nominal Decontamination
NRT	Near Real Time
OBM	Optical Bench Module
OCR	Operations Change Request
OSDF	Orbit Sequence Definition File
PCF	Product Control Facility
PDHS	Payload Data Handling Station (PDS)
PDHS-E	Payload Data Handling Station – ESRIN
PDHS-K	Payload Data Handling Station – Kiruna
PDS	Payload Data Segment
PE1	Pixel to Pixel/ Etalon Auxiliary File (SCI_PE1_AX)
PLSO	Payload Switch OFF
PMD	Polarization Measurement Device
QUADAS	Quality Analysis of Data from Atmospheric Sounders

SAA	South Atlantic Anomaly
SCIAMACHY	Scanning Imaging Absorption Spectrometer for Atmospheric Chartography
SCIAVALIG	SCIAMACHY Validation and Interpretation Group
SCICAL	SCIAMACHY Calibration tool
SEU	Single Event Upset
SLS	Spectral Line Source
SMR	Sun Mean Reference
SOST	SCIAMACHY Operations Support Team
SP1	Spectral Calibration Auxiliary File (SCI_SP1_AX)
SU1	Sun Reference Auxiliary File (SCI_SU1_AX)
SZA	Sun Zenith Angle
TC	Thermal Control
TCFoV	Total Clear Field of View
TOA	Top of Atmosphere
TRUE	Tangent height Retrieval by UV-B Exploitation
VCD	Vertical Column Density
WLS	White Light Source

2 SUMMARY

- During the reported period SCIAMACHY measurements were nominal with respect to planning. Two minor anomalies occurred, but measurements continued.
  - 22594 (03 Jul 2006) SEU
  - 23092 (31 Jul 2006) complementary failure

- Monthly Calibration was executed during Orbits:
  - 22798-22802 (10/11 Jul 2006)
  - 23213-23217 (08/09 Aug 2006)

- No occultations with the moon rising on the night side could be executed. The moon was in the limb TCFoV between orbits:
  - 22734-22821 (06 Jul 2006 until 12 Jul 2006)
  - 23158-23236 (04 Aug 2006 until 10 Aug 2006)

- One OCR (OCR_025) has been implemented, to execute nominal scanning measurements of the moon close to the top of the atmosphere and ending when the moon leaves the limb TCFoV.

- No TC adjustment was executed.

- Light Path monitoring results are as expected:
  - Channel 1&2: degradation in UV for all light paths involving ESM increases with a rate of 0.5-1 % per month. The average throughput loss in channel 1 is about 25%.
  - Channels 3 small throughput loss (about 2%)
  - Channel 4 small throughput loss continues
  - Channel 5 throughput remains stable
  - Channel 6 throughput remains stable
  - Channel 7 and 8: a small throughput decrease of about 0.5% per month is visible
  - Channel 8 throughput remains stable at about 75%

- PMD monitoring:
  - UV degradation visible in science channels is also visible in PMD 1 to 3

- PMD 4 and 7 show a large decrease in throughput which is currently unexplained. (possible explanation: specific detector material)
- PMD 6 results still under investigation

- The level 2 OL processor became operational on 08 August 2006. Products were processed in backlog starting with following orbit at D-PAC:

  - 21824 (03 May 2006)

- The Validation Data Set (level 1 processed with IPF 6.02, level 2 off-line processed with processor version 3.00) was uploaded to

  ftp://ftp-ops.de.envisat.esa.int

3 INSTRUMENT CONFIGURATION AND PERFORMANCE

3.1 In-Flight Status and Performance

Detailed operations, planning and instrument status information can be found on the website of the *SCIAMACHY Operations Support (SOST)* under http://atmos.caf.dlr.de/projects/scops/. These pages are maintained on a daily basis and show the history and actual progress of the SCIAMACHY mission.

3.1.1 Planned Operations and Measurements (SOST-DLR)

The reporting period covers the orbits 22659 (ANX = 01-Jul-2006, 00:54:48.992) to 23545 (ANX = 31-Aug-2006, 22:25:21.328). One OSDF specified the planning baseline.

Orbit		ANX		OSDF
Start	Stop	Start	Stop	
22659	23545	01-Jul-2006 00:54:48.992	31-Aug-2006 22:25:21.328	MPL_OSD_SHVSH_20060522_010101_00000000_33180001_20060701_005450_20060901_000555

Table 3-1: SCIAMACHY OSDF planning file from July – August 2006

All measurements were nominal, i.e. timelines executed on the dayside of the orbit limb/nadir sequences with wide swath settings except for lunar observations which had to reflect OCR_025 (see below). In-flight calibration and monitoring measurements occurred on daily, weekly and monthly timescales according to the mission scenarios. Monthly calibration was scheduled between orbits

- 22798-22802 (10/11-Jul-2006)
- 23213-23217 (08/09-Aug-2006)

The moon was in the limb TCFoV between orbits

- 22734-22821 (06-Jul-2006 until 12-Jul-2006)
- 23158-23236 (04-Aug-2006 until 10-Aug-2006)

No occultations with the moon rising on the nightside could be executed.

One OCR had to be implemented. This was OCR_025 which requested to execute nominal scanning measurements of the moon starting close to the top of the atmosphere and ending when the moon leaves the limb TCFoV. Such measurements were scheduled for the complete July and August monthly lunar visbility periods.

3.1.2 Instrument Measurement Status (SOST-DLR)

Final flight status for mission scenarios, states and timelines remained unchanged throughout the reporting period.

3.1.3 Executed Operations and Measurements (SOST-DLR)

Measurements

The OSDF planning file has been scheduled as requested.

Detector thermal adjustment

No TC adjustment was executed. Thus the TC settings remained unchanged at

- DAC1 = 0.53 W
- DAC2 = 0.70 W
- DAC3 = 0.00 W

APSM/NDFM health checks & PMD ADC cal

In the reporting period one APSM/NDFM health check and two PMD ADC calibrations were executed. All showed nominal results.

APSM/NDFM			PMD ADC	
Orbit	ANX	Result	Orbit	ANX
23019	26-Jul-2006 05:51:36	ok	23020	26-Jul-2006 07:28:06
n.a.	n.a.	n.a.	23535	31-Aug-2006 07:00:11

Table 3-2: APSM/NDFM health check and PMD ADC calibration

Anomalies

Only two minor anomalies had occurred. In both cases measurements continued.

- In orbit 22594 (03-Jul-2006, 12:49:25 UTC) a detector 3 ADC latchup was detected for 1 sec. This transient event is attributed to a Single Event Upset.
- In orbit 23092 (31-Jul-2006, 08:14:11 UTC) a complementary failure was reported (corrective action CA = 0).

Orbit	Date	Entry - UTC	Level	Entry Type	ID Content/Transition	Mode	Remark
22694	03-JUL-2004	2006.184.12.49.25.399	Instrument	HK PARAMETER LIMIT EXCEEDING	1 (I6000)	MEASUREMENT	DM3 ADC latchup (1 sec OOL), possible SEU
23092	31-Jul-2006	2006.212.08.14.11.545	Instrument	COMPLEMENTARY FAILURES	---	MEASUREMENT	SDPU Wrong UD Counter (fault indication 386)

Table 3-3: Instrument anomalies between July and August 2006

Instrument unavailability

The instrument was available during the complete reporting period.

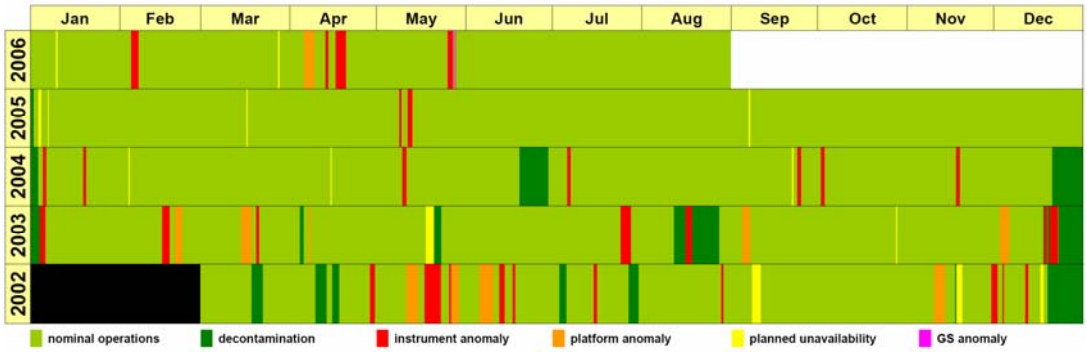


Fig. 3-1: Current instrument availability status including the reporting period

3.1.4 Performance Monitoring - System (SOST-DLR)

Detector temperatures

Detector temperatures are monitored according to the requirements of the IOM *[1]*. It requests to ensure that the average temperature per orbit remains within the specified limits. For each detector the average temperatures per orbit are determined from HK telemetry parameters. Fig. 3-2 displays the temperatures of all 8 detectors. Colour coding is as on the operational monitoring website, i.e. data from orbits with HK telemetry coverage > 90% are shown in red, for < 90% in green. Minimum/maximum values per orbit are indicated as vertical bars (not always visible). The temperature limits of each detector are shown as horizontal lines.

Detector temperatures remained within limits.

OBM temperatures

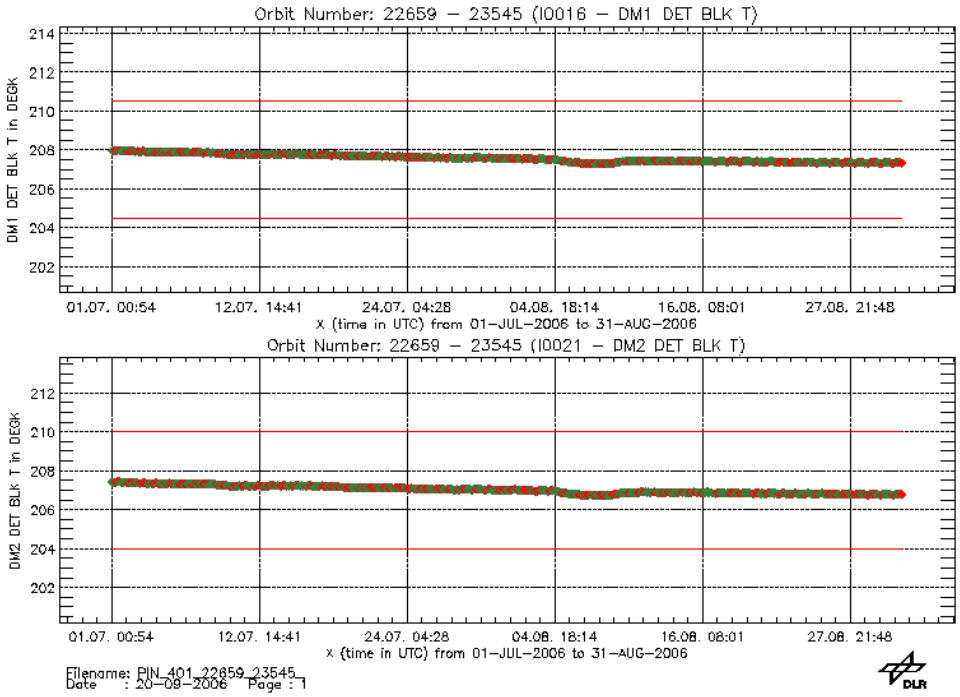
OBM temperatures are monitored according to the requirements of the IOM *[1]*. It requests to ensure that the average temperature per orbit remains within the specified limits. The average OBM temperature per orbit is determined from specific HK telemetry parameters. In addition power readings for the ATC heaters are monitored. Temperatures and ATC heater powers are given in Fig. 3-3 and 3-4. Colour coding is as in Fig. 3-2.

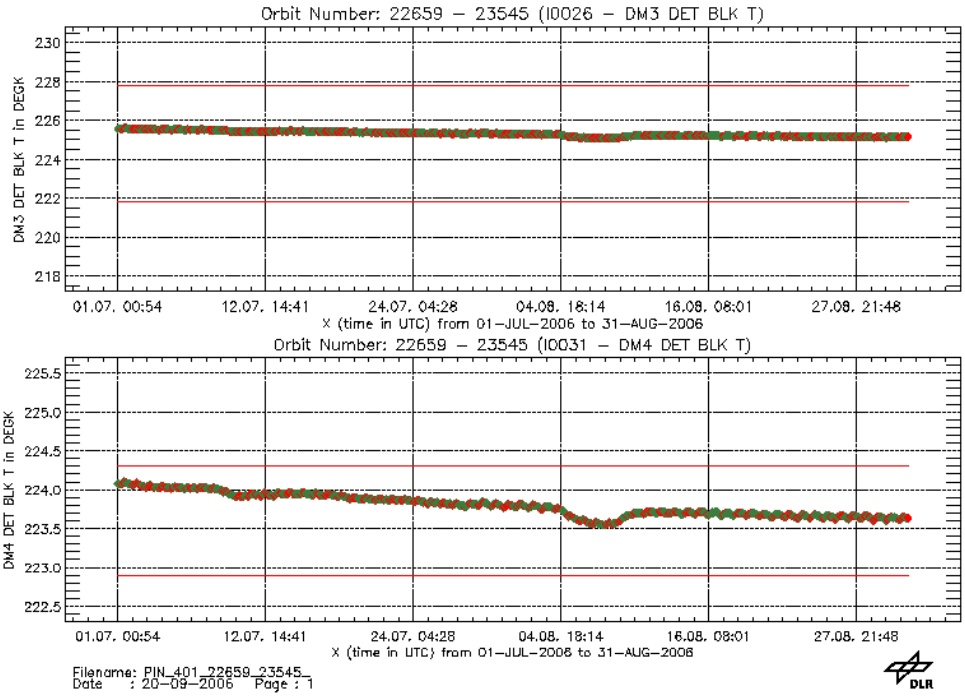
OBM temperatures and ATC heater powers remained within limits.

PMD ADC status

The status of the PMD ADC is monitored according to the requirements of the IOM *[1]*. It requests to ensure that no glitches occur caused by an SEU.

No PMD ADC glitches have been detected.


Orbit Number: 22659 – 23545 (I0016 – DM1 DET BLK T)
DM1 DET BLK T in DEGK
214
212
210
208
206
204
202
01.07. 00:54
12.07. 14:41
24.07. 04:28
04.08. 18:14
16.08. 08:01
27.08. 21:48
X (time in UTC) from 01–JUL–2006 to 31–AUG–2006
Orbit Number: 22659 – 23545 (I0021 – DM2 DET BLK T)
DM2 DET BLK T in DEGK
212
210
208
206
204
202
01.07. 00:54
12.07. 14:41
24.07. 04:28
04.08. 18:14
16.08. 08:01
27.08. 21:48
X (time in UTC) from 01–JUL–2006 to 31–AUG–2006
Filename: PIN_401_22659_23545
Date : 20–09–2006 Page : 1
DLR


Orbit Number: 22659 – 23545 (I0026 – DM3 DET BLK T)
DM3 DET BLK T in DEGK
230
228
226
224
222
220
218
01.07. 00:54
12.07. 14:41
24.07. 04:28
04.08. 18:14
16.08. 08:01
27.08. 21:48
X (time in UTC) from 01–JUL–2006 to 31–AUG–2006
Orbit Number: 22659 – 23545 (I0031 – DM4 DET BLK T)
DM4 DET BLK T in DEGK
225.5
225.0
224.5
224.0
223.5
223.0
222.5
01.07. 00:54
12.07. 14:41
24.07. 04:28
04.08. 18:14
16.08. 08:01
27.08. 21:48
X (time in UTC) from 01–JUL–2006 to 31–AUG–2006
Filename: PIN_401_22659_23545
Date : 20–09–2006 Page : 1
DLR

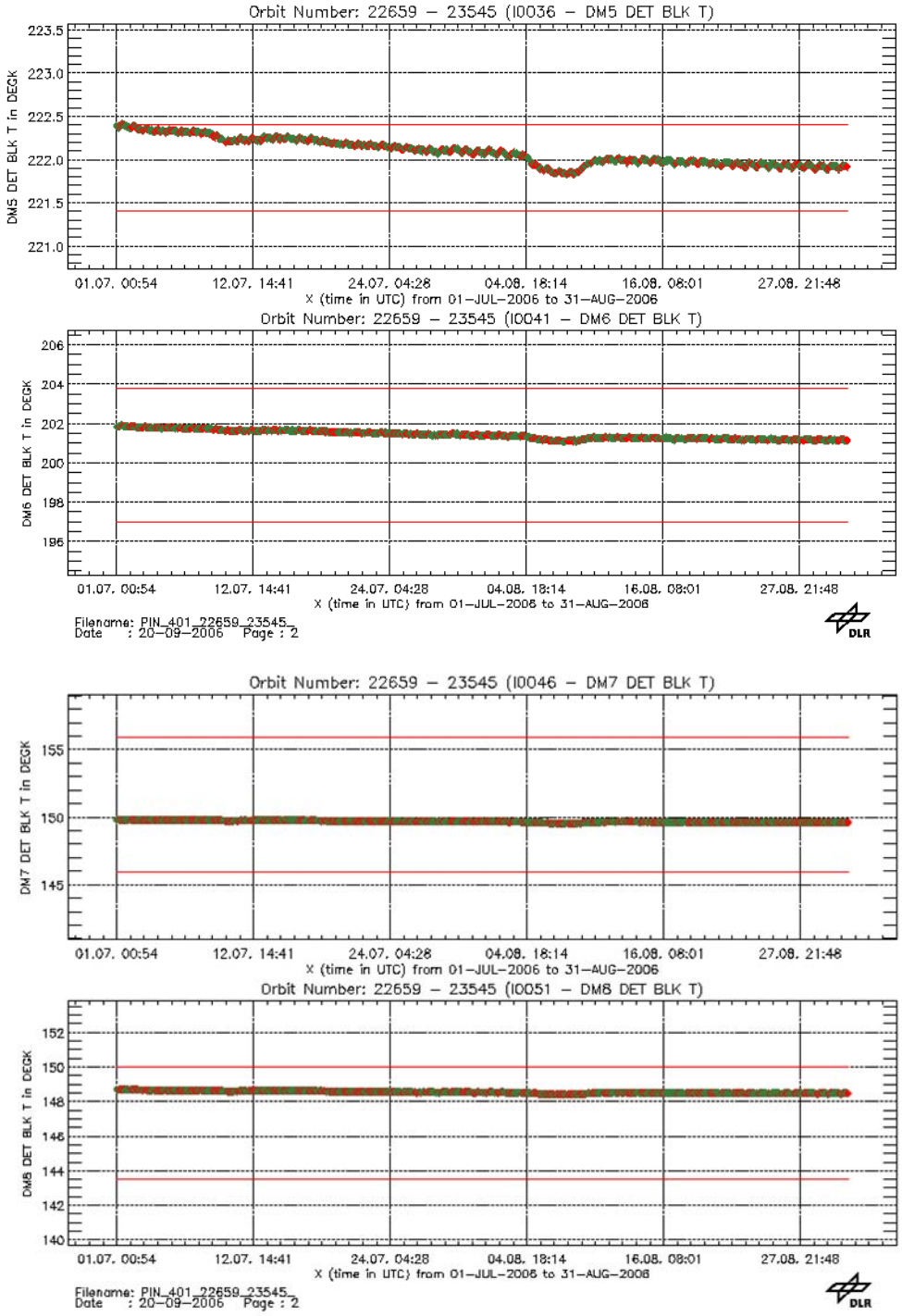


Fig. 3-2: Detector temperatures

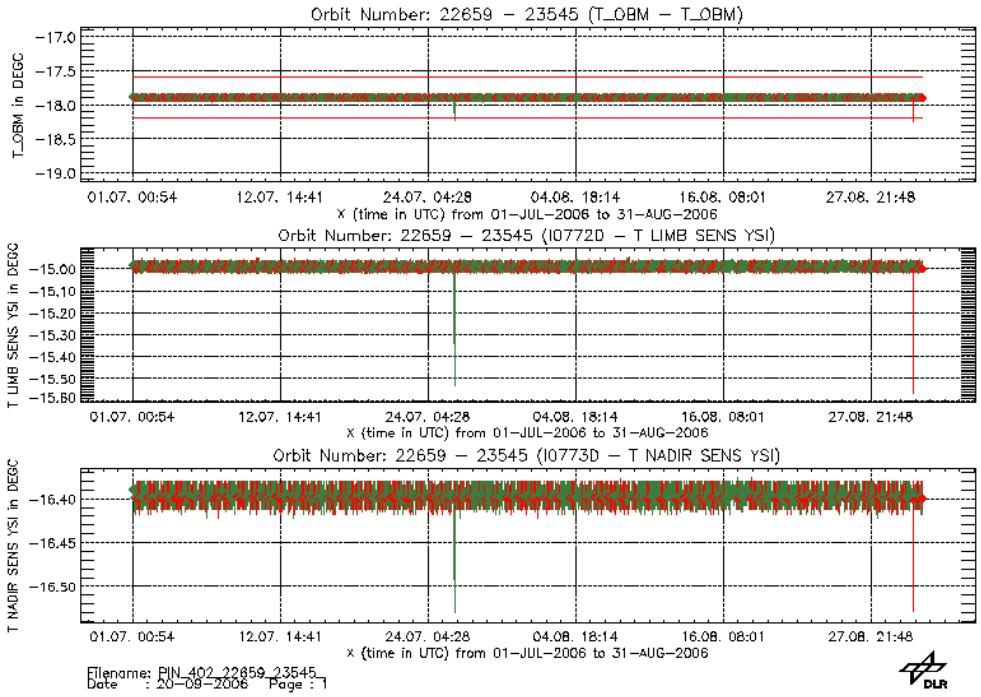


Fig. 3-3: OBM temperatures (top: derived OBM, middle: limb sensor, bottom: nadir sensor)

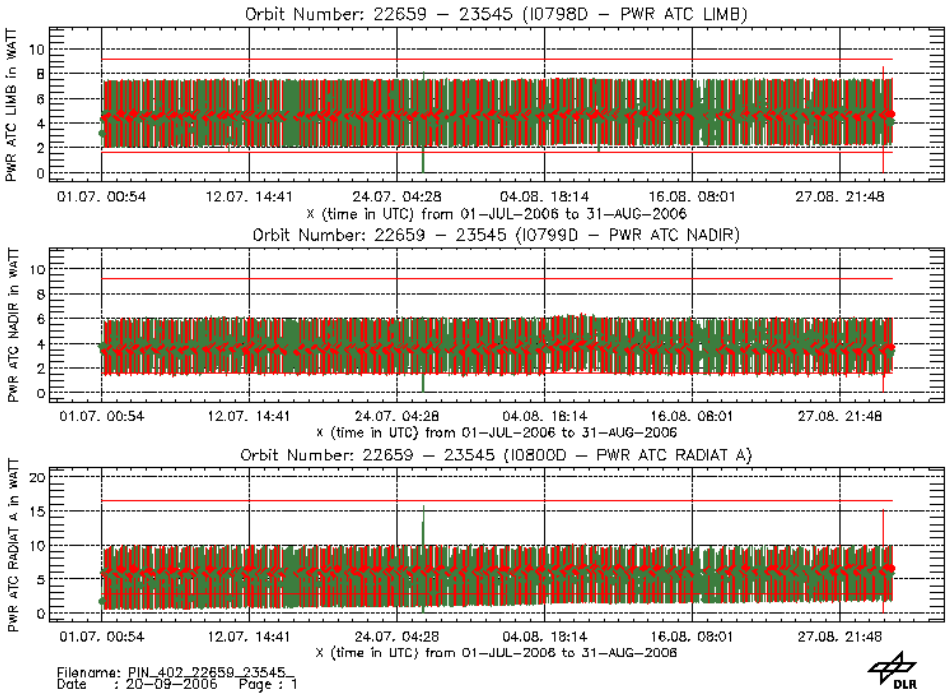


Fig. 3-4: ATC heater power (top: ATC limb, middle: ATC nadir, bottom: ATC Rad A)

LLI status

Life Limited Items are monitored based on analysis of the

- OSDF: This yields a predicted LLI usage.
- Report format: This counts the actual LLI switches or used LLI cycles. No WLS/SLS burning times can be derived thereof.

In addition, the in-flight usage of the cryogenic heat pipe is recorded. This subsystem has a limited number of cycles. Each decontamination increases the accumulated number of cycles by 1.

At the end of the reporting period the fractional usage of the LLI relative to the allowed in-flight budget was

- NDFM: 0.62
- APSM: 0.56
- NCWM (sub-solar port): 0.66
- WLS (switches): 0.12
- WLS (burning time): 0.23
- SLS (switches): 0.04
- SLS (burning time): 0.01

How the relative LLI usage has accumulated since launch can be seen in fig. 3-5. 'EOL' assumes a total mission lifetime of 0.5 years of Commissioning Phase and 4.5 years of routine operations.

Note: In order to prepare for the ENVISAT/SCIAMACHY mission extension it was decided to modify the mission scenarios slightly by reconsidering the usage of the most critical LLIs, i.e. NCWM, APSM and NDFM. As a result, sub-solar measurements will be executed only 2/week. Solar occultations remain at a rate of 1/orbit because it was found acceptable to exceed the currently specified in-flight budgets (based on a safety margin factor of 2) as long as the usage stays below the figures of the lifetests. However it will even take until April 2009 (NDFM) and November 2009 (APSM) that the in-flight budgets are exceeded. The envisaged reduction in sub-solar measurements will be implemented end of 2006.

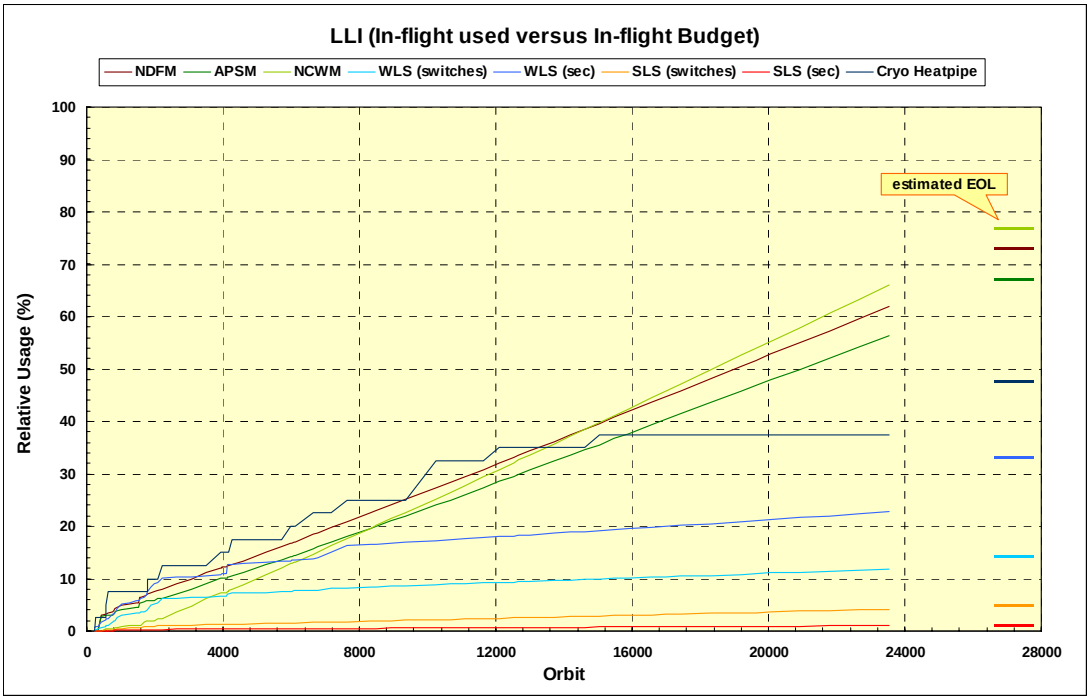


Fig. 3-5: Realtive usage of LLIs. 'EOL' is derived for the currently specified mission lifetime (not yet taking mission extension and modified subsolar measurements into account).

The number of cryogenic heatpipe cycles did not increase (no decontamination). The budget used remained at 38% of the allowed in-flight budget.

Time reference

The times quoted in all planning files refer to the reference orbit. Since the actual orbit differs from the reference orbit (e.g. orbit drift), the times given w.r.t. the reference orbit also do not reflect exactly the actual absolute times of events along the orbit (e.g. ANX, sunrise, sub-solar, moonrise, eclipse). The requirements for orbit maintenance may result in time differences of usually < ±10 sec. In some cases this value may even reach ±1 min, however.
SOST monitors how the reference time deviates from the actual time. This is done by using the predicted time which comes very close to the actual = restituted time. If the predicted times are delayed w.r.t. the reference orbit, then the difference *predicted – reference time* is > 0 sec; in the other case it is < 0 sec.

Fig. 3-6 displays the time difference *predicted – reference*. Orbit manouevres cause distinct discontinuities.

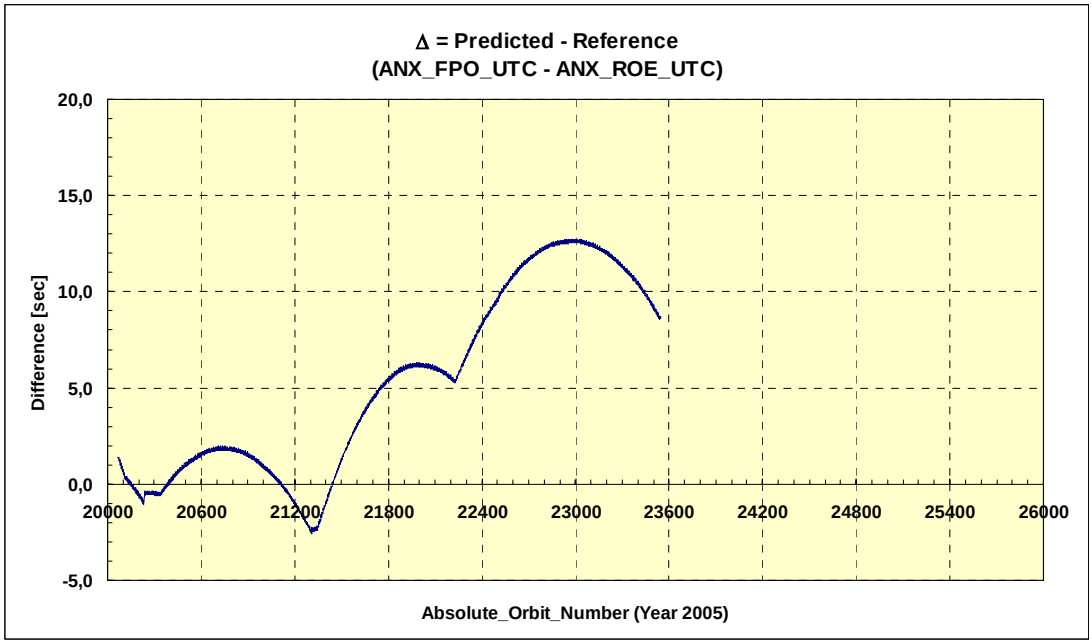


Fig. 3-6: Time difference between predicted and reference time.

3.1.5 Performance Monitoring - Light Path (SOST-IFE)

3.1.5.1 Science Channel Averages

One part of the SOST long-term monitoring activities is the trend analysis of measurements with the internal White Light Source (WLS) and of observations of the unobscured Sun above the atmosphere. In order to monitor the different SCIAMACHY light paths solar measurements are taken in various viewing geometries: In limb/occultation geometry (via ASM and ESM mirrors), in nadir geometry (via the ESM mirror through the subsolar port), and via the so-called calibration light path involving the ASM mirror and the ESM diffuser.
SCIAMACHY long-term monitoring comprises a regular analysis of these measurements.

The plots displayed in Fig. 3.7 show results of these monitoring activities for the time interval July to August 2006.
All measured signals have been averaged over the entire channel and then divided by the corresponding measurement at a reference time (currently 2 August 2002, at about orbit 2200), yielding an effective instrument throughput for the different light paths.
The timing of subsolar measurements before 30 November 2002 (about orbit 3922) did not consider the known yaw misalignment of SCIAMACHY on ENVISAT. Therefore all subsolar measurements after 30 November 2002 have been referred to orbit 4519 (10 March 2003, just after a long decontamination phase).

Note that measurements performed during times of reduced instrument performance (e.g. switch-offs or decontamination periods) have been omitted.

The results presented in Fig. 3.7 are based on the analysis of Level 0 data, which have been corrected for dead/bad pixels, dark current (fixed value from August 2002), scan angle dependencies, quantum efficiency changes, and the seasonally varying distance to the Sun. Additional calibration steps have not been performed, like for example a straylight correction. Therefore, variations smaller than about 1% require careful interpretation. Especially, small variations of the throughput signal may be caused by remaining seasonal effects due to the limited calibration of the data.
Furthermore, there exists a systematic offset between the throughput results for the subsolar light path and those for the other viewing geometries. This offset is most prominent in the IR and caused by the specific subsolar scan mode (fast sweep) analysed.

The light path monitoring results presented in this section may be regarded as a first step towards spectrally resolved monitoring factors (m-factors) which will be produced based on fully calibrated data.
Daily updated light path monitoring results can be found on the SOST or IUP web site (http://www.iup.uni-bremen.de/sciamachy/LTM/LTM.html).

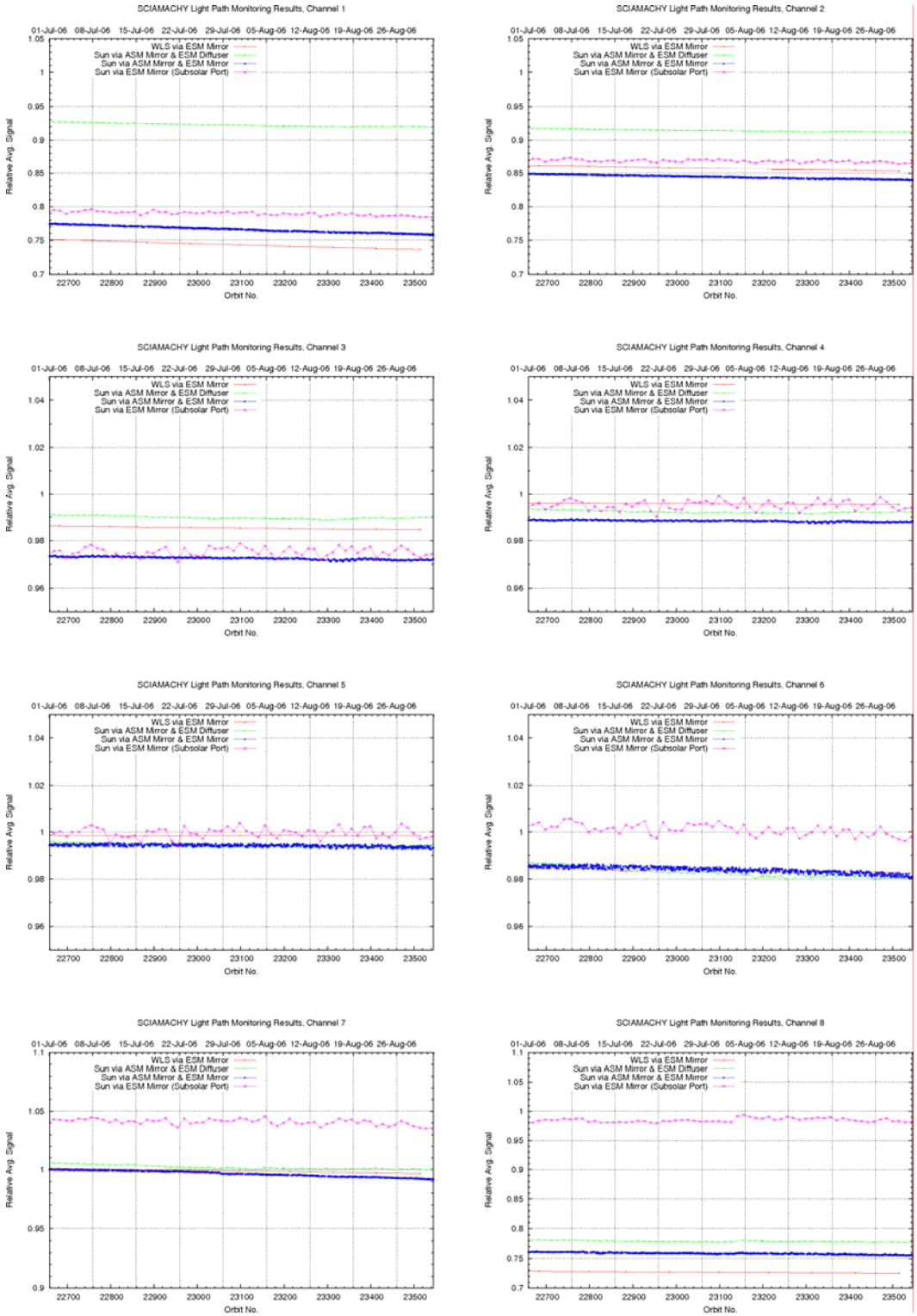


Fig. 3.7: Light path monitoring results July to August 2006.

The following specific features can be identified from the light path monitoring results during the time interval of this report:

- Overall, the instrument throughput changes were as expected.
- For all light paths involving the ESM mirror the degradation in the UV (channels 1 and 2) increases with a rate of about 0.5-1% per month, as observed during the previous time intervals. The average throughput loss in channel 1 lies currently around 25%. The throughput of the calibration light path which involves the ESM diffuser instead of the ESM mirror is currently at about 92% and decreased over the two months covered by this report by about 1%.
- The overall degradation of channel 3 is very small (about 2%) compared to channels 1 and 2, but is still slowly increasing.
- Channel 4 and 5 remain stable on a sub-percent level, although both channels seem to show a slight throughput decrease over the two months of this report.
- There is also a small throughput decrease of about 0.5%/month visible for channels 7 and 8.
- Channel 8 transmission still remains quite stable at about 75% (depending on light path; note that the subsolar results are not reliable here because of the scan mode analysed).

3.1.5.2 Spectral light path monitoring results

Fig. 3.8 – 3.11 show results of spectral throughput monitoring performed by SOST-IFE for the different light paths (nadir, limb, calibration, and WLS). These results have been derived from Level 0 data analysed in a similar way as for the channel averaged throughput data (but of course without spectral averaging).
Because the variation in spectral direction is very small within two month, Fig. 3.8 – 3.11 show the complete time series from 2 August 2002 to the end of August 2006.

Notes:

- Dates in the graphs refer to UTC noon (12:00).
- The data have been interpolated over dead/bad pixels (using the on-ground list).
- Data from times of reduced instrument performance (like decontaminations or instrument switch-offs) have not been considered. These times are masked out by grey vertical bars.
- All data have been transformed to a daily grid, involving averaging and interpolation.
- Ratios have been performed on a pixel axis without any spectral interpolations. The wavelength axis is just for illustration and gives only approximate values, assuming a linear relation between pixel number and wavelength.
- Depending on the availability of measurement data, features close to large data gaps (especially before and after a decontamination) may be caused by interpolation.
- WLS data have not been corrected for a potential degradation of the lamp. Only the intensity jump after the extended WLS usage in June 2003 has been removed.
- As mentioned before, the timing of subsolar measurements before 30 November 2002 did not consider the known yaw misalignment of SCIAMACHY on

ENVISAT. The timing has been corrected in the final flight settings. To take this change into account, all subsolar measurements have been referred to orbit 4519 (10 January 2003).
Therefore, subsolar results before 30 November 2002 are not reliable.

The underlying data for the spectral monitoring are available via the SOST-IFE web site (see http://www.iup.uni-bremen.de/sciamachy/LTM/LTM_spectral/LTM_spectral.html). As for the plotted results, these data are regularly updated one to two times per month.

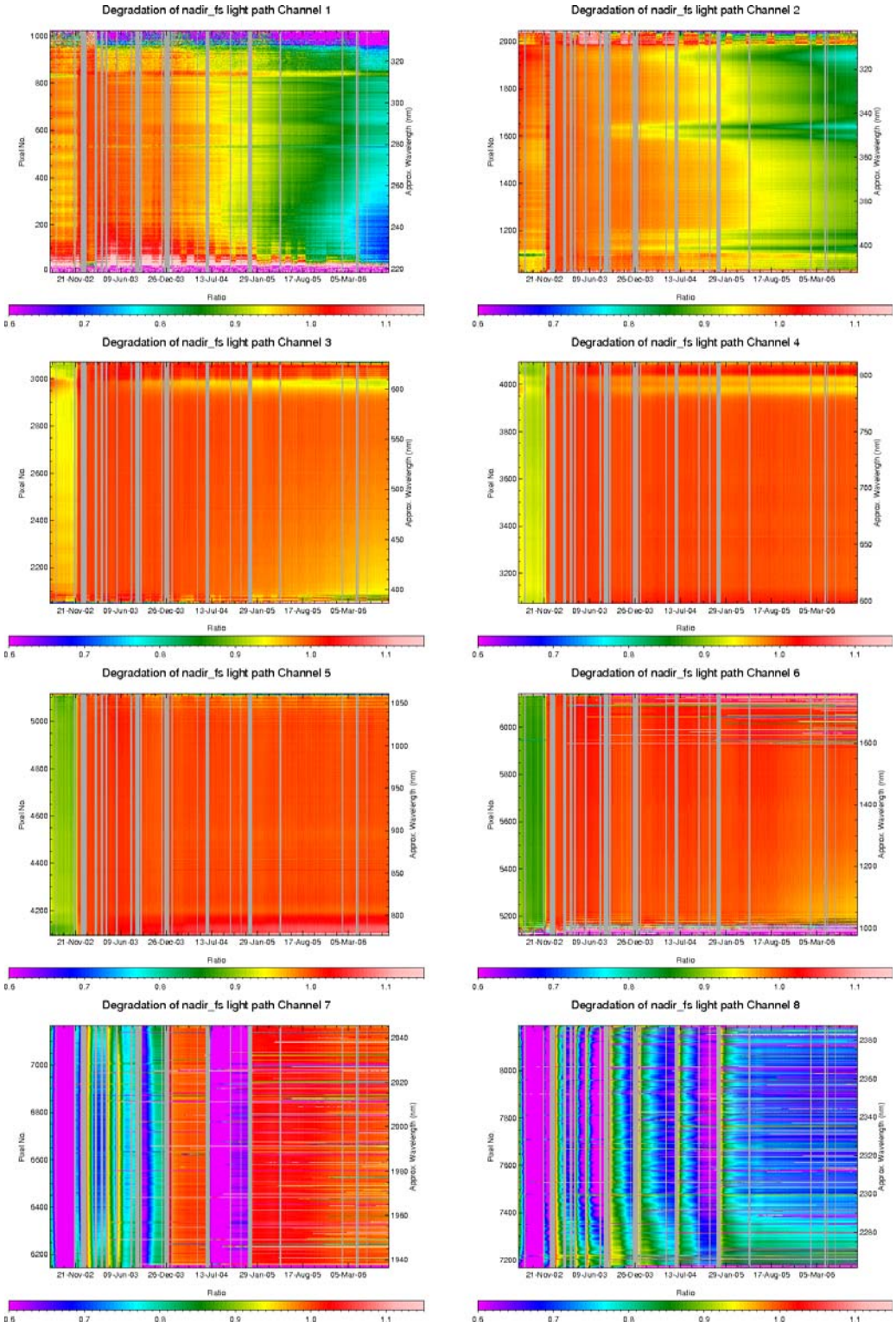


Fig. 3.8: Spectral light path monitoring results August 2002 to August 2006 (nadir light path)

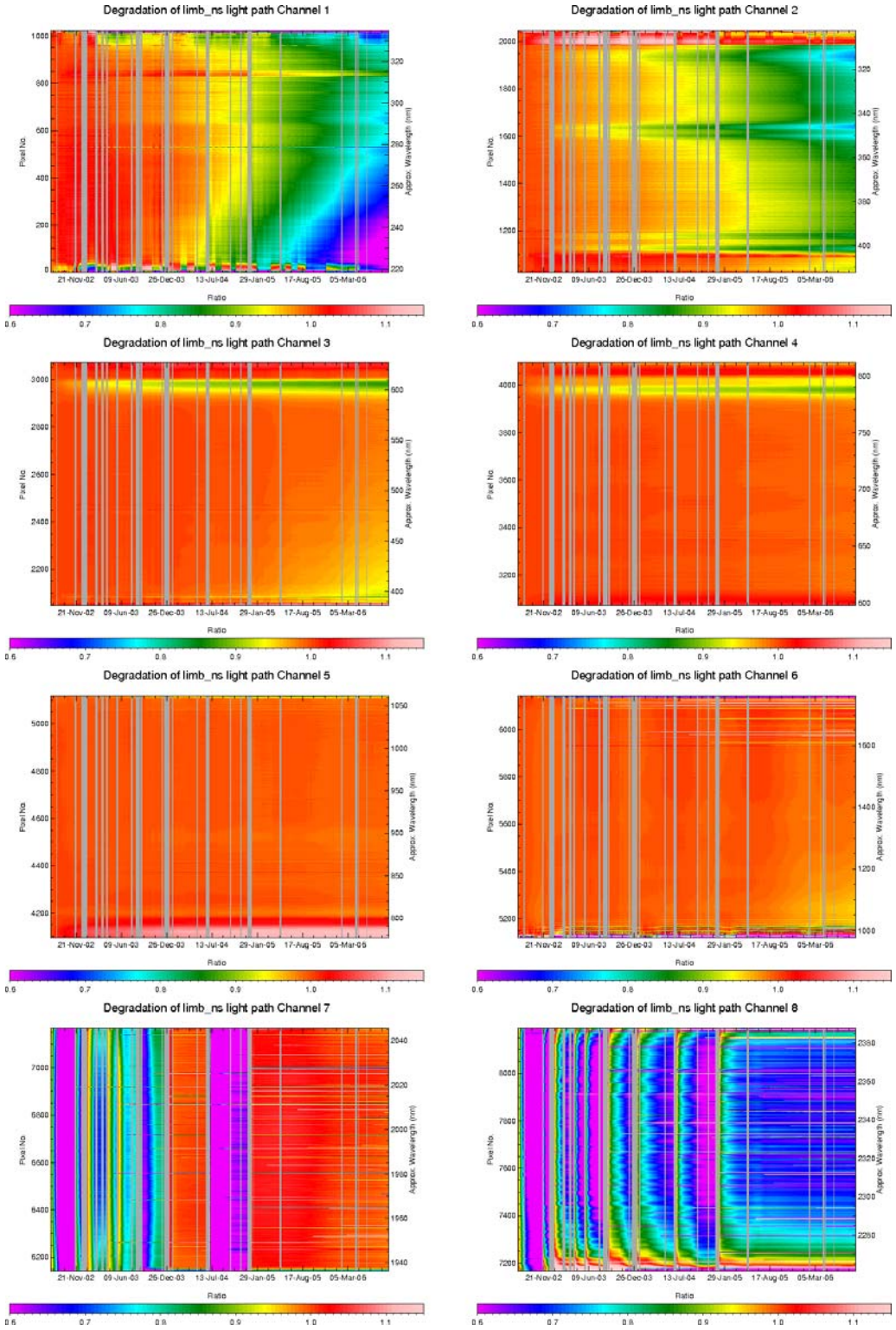


Fig. 3.9: Spectral light path monitoring results August 2002 to August 2006 (limb light path)

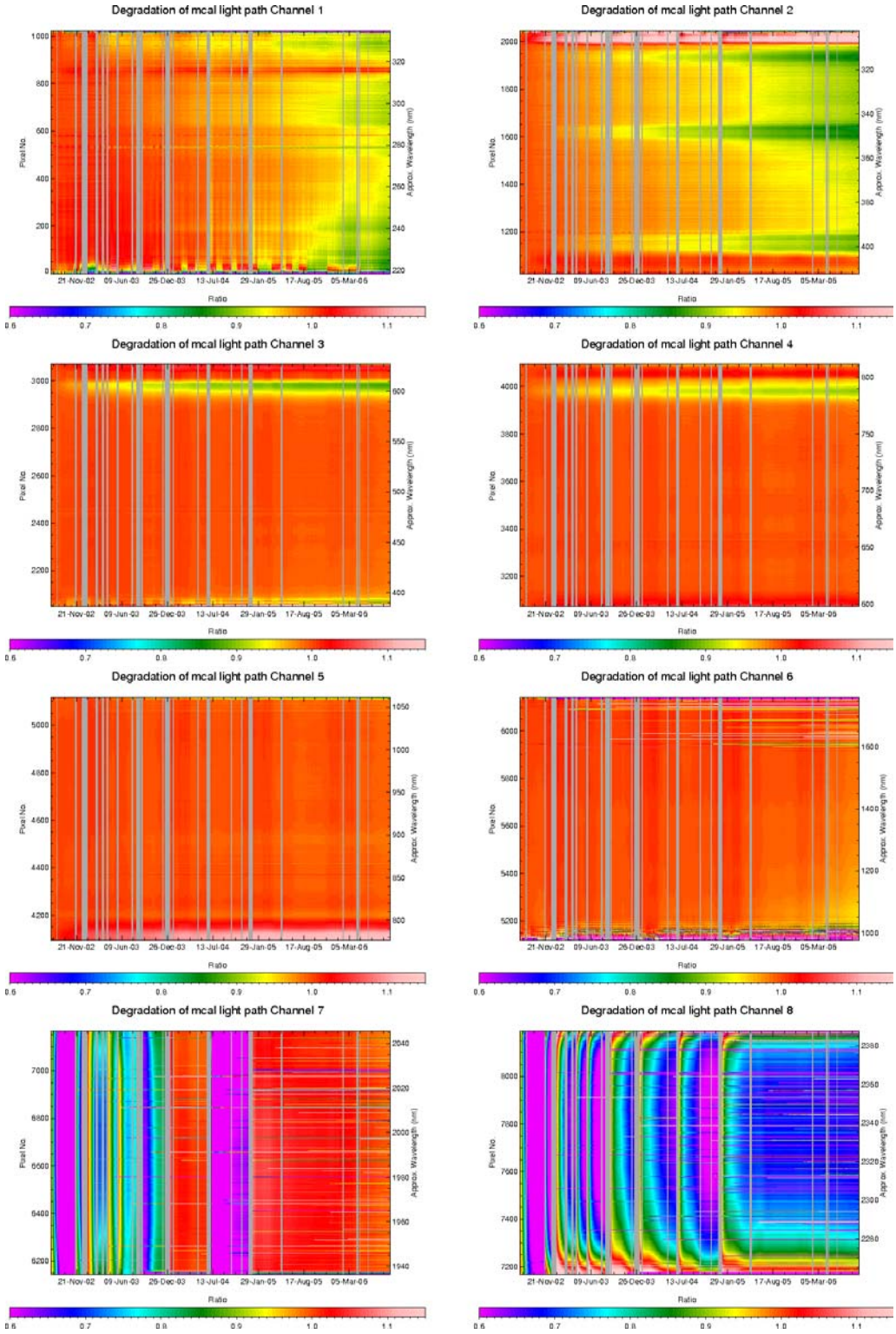


Fig. 3.10: Spectral light path monitoring results August 2002 to August 2006 (calibration light path)

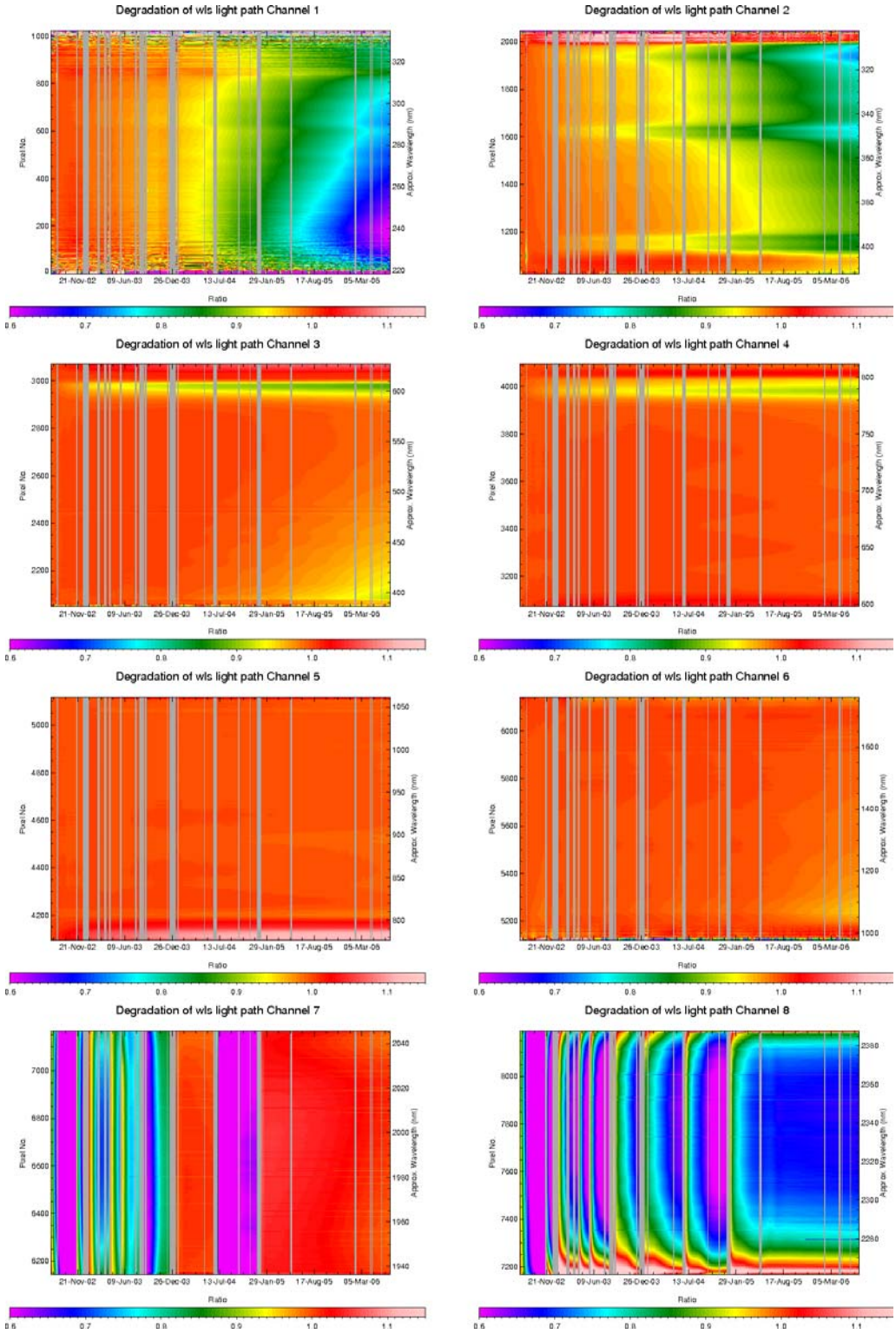


Fig. 3.11: Spectral light path monitoring results August 2002 to August 2006 (WLS light path)

The following main features can be identified in the spectral monitoring plots:

- As expected, the UV degradation generally decreases with increasing wavelength.
- The SCIAMACHY degradation strongly depends on wavelength and is largest at the channel edges. The prominent degradation peak around 350 nm in channel 2 coincides with a region of high polarisation sensitivity, although this is probably not directly related.
- The minimum throughput reaches about 60% for the limb and WLS (nadir) light paths at the short wavelength edge of channel 1.
- Also solar activity variation can be seen in the plots, e.g. the intensity change of the solar Mg II Fraunhofer line at about 280 nm.
- The degradation in channel 3 which was already indicated by the channel integrated results is much better visible in the spectrally resolved plots, where the propagation of this effect in time to higher wavelengths can be clearly identified.
- The difference in degradation between the diffuser light path and the other light paths is also visible in the plots; however, the spectral regions where degradation is strongest coincide quite well.
- The spectral plots also show that the relative stability for channels 4 and 5 observed in the integrated data is not present over the whole spectral range; also these channels show variations, but these are restricted to the overlap regions close to the channel edges.
- Channel 6 spectral results confirm the assumption of a slight degradation in this channel which is concentrated at the lower wavelength edge and independent of the overlaid remaining seasonal cycle.
- For channels 7 and 8 the spectral behaviour of the throughput loss is consistent with (broadband) ice absorption features. The effect of the decontaminations is of course also clearly visible in these channels.
- Especially channel 8 shows a large pixel dependence of the throughput variation caused by the different sensitivity of the pixels. This variation is much higher for light paths where the small aperture is involved (i.e. nadir (subsolar) and limb), indicating that the small aperture causes additional effects which need to be considered when applying these results to Earthshine data.
- In general, the WLS data are much smoother than the solar data.

3.1.5.3 PMD monitoring results

The SCIAMACHY PMDs are monitored in a similar way as the science channels, but of course no channel averaging is performed. However, the results presented here are based on the same measurements as the science channel results (but using the PMD low gain signal), and they have been normalized to the same reference times.
For the nadir light path it is not possible to use subsolar fast sweep measurements for PMD monitoring, because these show too large scatter. This is probably caused by a combination of the very time-sensitive measurement type and scan mode and the fact that the PMDs measure a sampled signal, not an integrated one. Therefore, subsolar pointing measurements are used for monitoring of the PMD nadir light path, because the pointing signal is much more stable. Unfortunately, subsolar pointing measurements are currently

only performed once per month, therefore the temporal sampling is much less than for the other light paths. For this reason it is planned to increase the number of subsolar pointing measurements (on the cost of subsolar fast sweep data).
This reduced temporal sampling is also the reason that Fig. 3.12 shows the PMD throughput variation for the whole time period between 2 August 2002 and 31 August 2006 (instead of only the two month time interval of this report). Note that a constant dark signal for each of the PMDs has been assumed. To verify this assumption, Fig. 3.12 also shows the variation of the PMD dark signal over time, which is usually quite low.
Note that PMD 7 results are most likely dominated by straylight and not reliable. They are only shown for completeness. Furthermore, WLS data are only available for PMD 1 to 3 because of saturation in the other PMD channels.

Considering the broadband character of the PMDs, the observed PMD throughput changes are (except for PMD 4 and 7) very similar to those of the science channels with the following features:

- The UV degradation apparent in the science channels is also visible in PMD 1 to 3.
- PMD 4 and 7 (which cover the same wavelength interval) show a considerably large decrease in throughput which is still unexplained (but may be related to the specific detector material).
- There are remaining seasonal variations in the data which could up to now not be corrected out. The amplitude of these seasonal variations increases with the wavelength range covered by the PMD. This issue is still unresolved.
- The PMD 6 dark signal shows a strange variation over time which is still under investigation.

A more detailed investigation of the open issues listed above requires a better calibration of the monitoring data which is currently (in the context of m-factor generation) under development.

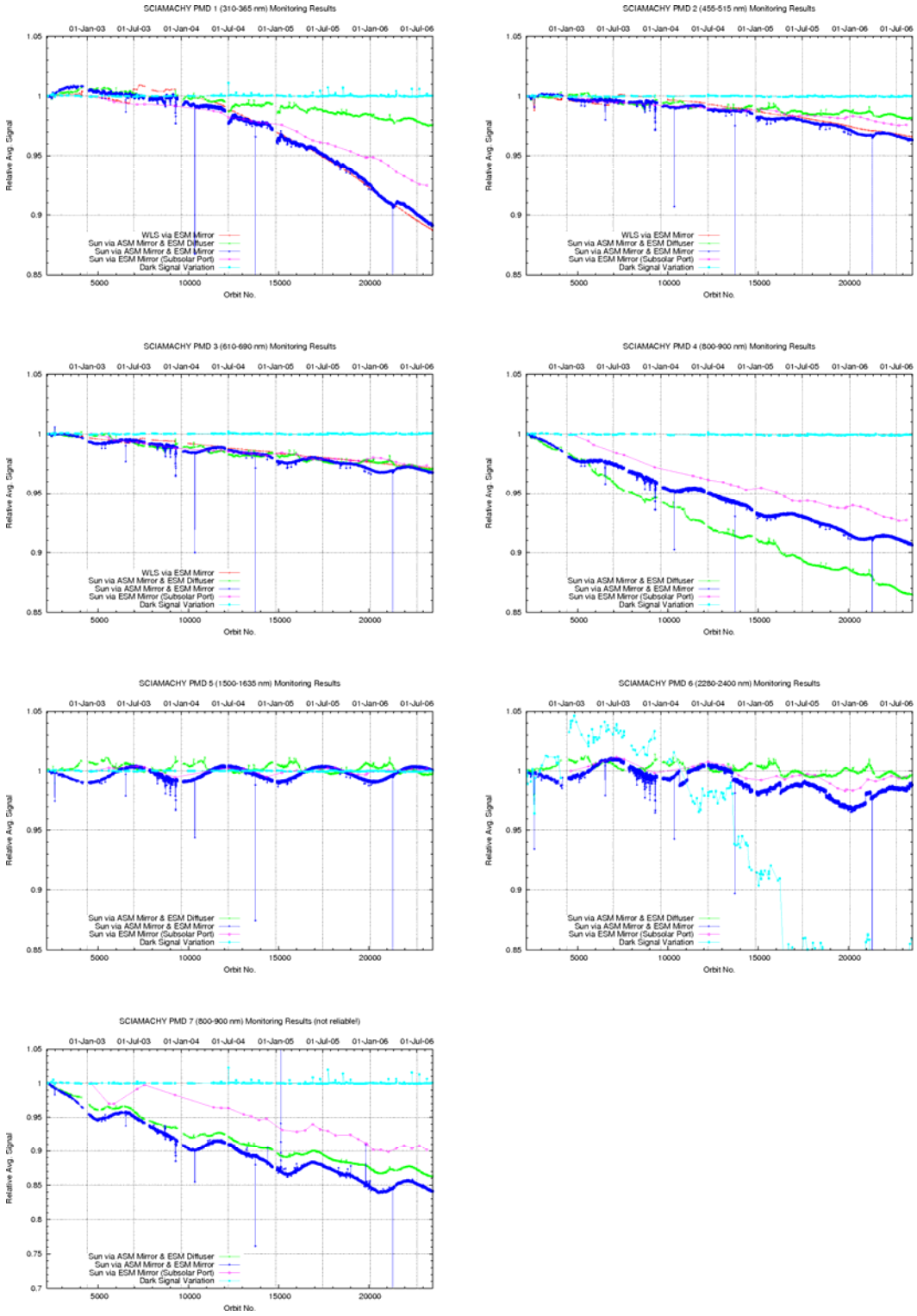


Fig. 3.12: PMD monitoring results August 2002 to August 2006

3.1.6 Problem Report Status (DLR-BO)

No updates on problem report statistics were reported. The last status is as from period July-August 2005:

- Total number of problem reports: 43
- Open problem reports: 5
- New problem reports during the reporting period: 0

4 DATA AVAILABILITY STATISTICS

4.1 Downlink/Acquisition Performance

Problems are known for the product listed in Tab. 4.1:

Product	Day	Filename	description
SCI_NL__0P	24-AUG-2006	SCI_NL__0PNPDK20060824_162134_000060302050_00341_23441_0519.N1	products have a high number of ISP Errors; the data format is not correct

These occurrences of data corruptions are currently under investigation.

4.2 Statistics on unconsolidated data (SCI_NL__0P, SCI_NL__1P)

This paragraph reports the availability of NRT data on a monthly basis. The statistics are based on level 0 data and level 1 data inventoried in the ground segment. Unavailability periods due to instrument anomalies or Satellite switch-offs are excluded. The gaps considered are only interfile gaps.

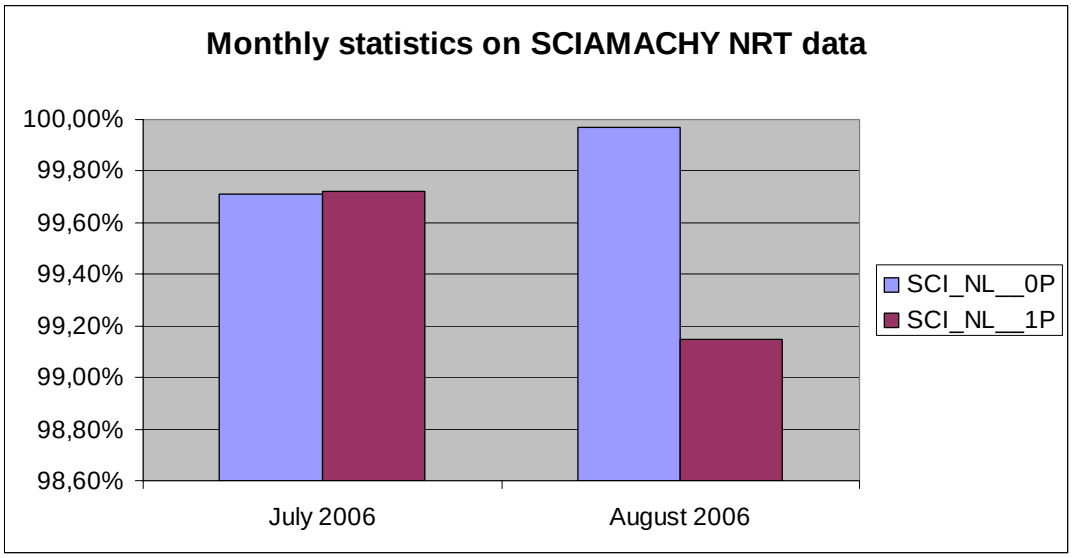


Fig. 4-1: Statistics on available unconsolidated level 0 and level 1 products

4.3 Statistics on consolidated data

Statistics on consolidated data products level 0 and level 1 are currently not available. They will be included again into the next reports.

4.3.1 Anomalies on level 0 consolidated data products

In the past it had been reported by SOST-DLR that the SCIAMACHY consolidated level 0 data contain errors and are not complete. Following specific problems have been identified and are reported in detail in the technical notes *[3]*, *[4]* for years 2003 and 2004 as well as for products of 2005 *[5]*:

- For one orbit there can be more than one consolidated level 0 product. These products may be identical or different in content (disregarding the product type file counter).
- Some orbits are not covered by consolidated level 0 products although SCIAMACHY was operational.
- Some orbits are covered by consolidated level 0 products but the product duration does not comply with the actually planned and executed instrument operations in that particular orbit.
- Some consolidated level 0 products exceed the Reed Solomon correction threshold and are flagged accordingly. The occurrence of Reed Solomon errors is non-uniform.
- Until late October / early November 2003 consolidated level 0 data are hampered by an incorrect orbit number.

More details on consolidated level 0 anomalies can be found on the SOST web page, which contains a catalogue of available level 0 consolidated data and description of errors.
http://atmos.caf.dlr.de/projects/scops/data_availability/availability.html

The errors contained in the consolidated level 0 data have been formally transferred into Observation Anomaly Reports (OAR) towards the ENVISAT ground segment.
As a consequence in the beginning of December 2005 a dedicated meeting was held at ESA to implement a strategy to improve the product quality of consolidated level 0 data and to reprocess erroneous products in the historic data set.
A recovery plan was initiated in order to reprocess erroneous data 2002 - 2004. This activity has been completed.
The reprocessing of anomalous data belonging to year 2005 is currently in progress.
Next step afterwards will be the flagging of duplicate level 0 products in the ENVISAT ground segment inventory.
The overall goal is to achieve a level 0 consolidated data ‘master set’ that will allow data reprocessing of improved data quality.

4.4 Statistics on reprocessed data

The reprocessing of products from the time interval July 2002 to May 2004 (corresponding to cycles 7 -26, each cycle consisting of 501 orbits) with IPF 5.04 has been completed. See also BMR September-October 2005 for details.

A second reprocessing cycle is foreseen with IPF 6.02 or higher for level 1b processing and the level 2 off-line processor 3.00 or higher starting in the first quarter of 2007. The reprocessing will follow after the recommendation of the 3rd ACVE workshop in December 2006 have been evaluated and possibly implemented into the processors.

5 LEVEL 1 PRODUCT QUALITY MONITORING

5.1 Processor Configuration

5.1.1 Version

The current IPF version used for processing of SCIAMACHY level 1 data is 6.02.
For an interim period, between 22 May 2006 and 07 June 2006, IPF 6.01 was activated. After identification of a major non compliancy in processor version IPF 6.01, corrective actions were undertaken and IPF 6.01 was replaced by IPF 6.02 on 07 June 2006. The recommendation is to not use level 1b products generated with IPF 6.01. Instead the Off-line level 1b products of IPF 6.02 for the period 22 May 2006 to 07 June 2006 should be used for scientific analysis.

The corresponding product specification has been updated. The actual version now is Volume 15 issue 3/k *[2]* available at
http://earth.esa.int/pub/ESA_DOC/ENVISAT/Vol15_Sciamachy_3k.pdf

The disclaimer at
http://envisat.esa.int/dataproducts/availability/disclaimers/SCI_NL__1P_Disclaimers.pdf
describes known artefacts as well as major improvements with respect to the previous IPF version.
During the period 13 to 18 May 2006 a number of level 1b IPF 6.02 off-line products were processed with outdated auxiliary files. These occurrences are described in more detail in the disclaimer mentioned above. Appendix B lists the product names of the level 1b data affected. These products were removed from the D-PAC ftp server and should not be used. The corresponding orbits were already reprocessed with the correct auxiliary files.

An IPF implementation error was detected which results in erroneous Leakage GADS in the off-line processing chain. In some cases level 1b products contain leakage values equal to 0 in channel 6-8 or the values are anomalous high. A patch of the IPF to version 6.03 is in preparation.

Table 5.1 gives a brief overview of changes implemented with processor versions IPF 6.02, 6.01, 5.04 and 5.01.

Following definition of the SZA for Limb/Occultation measurements are used in previous and actual IPFs:

- For IPF versions 4.02, 5.00, 5.01, 5.04, 6.01, 6.02 the SZA is defined with respect to Top of Atmosphere (TOA).
- For IPF versions 4.03, 4.01 and earlier versions the SZA is defined with respect to Tangent Height.

IPF versions 4.02 and 5.00 however were not used operationally but to generate the validation dataset for the ACVT workshop in 2004.

IPF Version	Description	Proc Centre	Date	Start Orbit
6.02	No algorithm specification changes were implemented, but following non compliances of version 6.01 have been corrected, to get • Polarisation correction factors different from 0 • Correct order of SMR spectra in Sun Reference ADS • Solar mean reference spectra in New Sun Reference Data set with positive sign (was negative in IPF 6.01)	D-PAC	05-MAY-2006	21843
		PDHS-E	07-JUN-2006	22327
		PDHS-K	07-JUN-2006	22318
6.01	• Improved parameterization of the Memory effect for channels 1 to 5 • New correction for the Non-Linearity effect in the infrared channels • Usage of improved key data for the radiometric calibration of all channels • Each solar spectrum is provided in a calibrated and un-calibrated manner for all channels • Orbital dependency of channel 6 to 8 leakage current now calculated for ADFs, though applied only to channel 8 • Consolidated Products: Leakage current re-calculation from orbit data itself for channel 6 to 8 • Improvement of the pointing accuracy through the usage of the ENVISAT Restituted Attitude auxiliary files for the off-line processing • decontamination flag added to the SPH	D-PAC	No operations activated	-
		PDHS-E	22-MAY-2006	22098
		PDHS-K	22-MAY-2006	22090
5.04	No algorithm specification changes were implemented, but two algorithm	PDHS-K	21-AUG-2004	12942
		LRAC	20-AUG-2004	12750
		PDHS-E	16-AUG-2004	12823

	implementation errors have been corrected. In addition, code adaptations have been performed to resolve performance problems encountered during reprocessing. The list of modifications is as follows: • An incorrect polarisation-ratio calculation has been corrected, to remove radiance discrepancies up to 1% between prototype and operational +++processor. • Memory leaks have been detected and eliminated • Two modifications have been performed to avoid level 1B processing crashes	DPAC	12-AUG-2004	12879
5.01		DPAC	31-MAR-2004	
		PDHS-E PDHS-K LRAC	24-MAR-2004	

Tab. 5-1: Processor Version and main changes

5.1.2 Auxiliary Data Files

For operation of the SCIAMACHY level 1 processor a set of auxiliary files as input is required.
One subset of these auxiliary files usually changes only in correspondence with a new IPF version, namely the Initialisation file (SCI_LI1_AX), the Key Data File (SCI_KD1_AX).
In addition there is the m-factor file (SCI_MF1_AX), which shall describe the degradation of the instrument during its stay in orbit. Note that the m-factor file has not been changed so far.

Another subset of auxiliary files are the In-flight calibration data files which are generated when calibration measurements are included in the set of level 0 data to be processed. Four types of In-flight calibration auxiliary files exist:

- Leakage Current Calibration (SCI_LK1_AX - updated on orbital basis)
- Solar Reference Spectrum (SCI_SU1_AX - updated on daily basis)
- Spectral Calibration Parameters (SCI_SP1_AX - updated on a weekly basis)
- Pixel-to-Pixel Gain and Etalon Parameters (SCI_PE1_AX - updated on a weekly basis)

With the activation of the new IPF 6.01 and IPF 6.02 the generation of in-flight auxiliary files is based on level 0 data, and a new calibration tool, SCICAL, was set in operation. SCICAL replaces the computation of ADFs that previously was performed by IECF, while IECF remains the interface for operational ADF dissemination, monitoring activities and database for the ADFs. SCICAL therefore can be considered integral part of the ENVISAT ground segment.
SCICAL provides the advantage that all auxiliary files are generated automatically, SCI_SP1_AX and SCI_PE1_AX files are now updated once per week, using the weekly calibration measurements as input. The fact that the calibration is now based on level 0 data as input further reduces the time effort of full mission re-calibration.

The table in Appendix A gives an overview about the in flight auxiliary files for the reporting period July - August 2006 generated with SCICAL. Note that all ADFs listed in Appendix A are compatible with IPF 6.02.

Table 5-2 lists the actual Key Data File and Initialisation File used with IPF 6.02.

Table 5-2

SCI_LI1_AXVIEC20060523_182643_20020701_000000_20991231_235959
SCI_KD1_AXVIEC20060523_182626_20020301_000000_20991231_235959

Fig. 5.1 shows statistics of the SU1 and LK1 ADFs generated operationally with the IECF. It has to be noted that unavailability periods are excluded from statistics. Generation of SU1 ADFs for July and August 2006 was 100%.
The LK1 ADF statistic is calculated by dividing the number of all LK1 ADFs by number of all available (to SCICAL) level 0 products. The statistics on available LK1 ADFs during July (79.8%) and August 2006 (68.7%) represent a nominal level of ADFs generated. The statistic does not take into account SAA and orbit phase constraints.

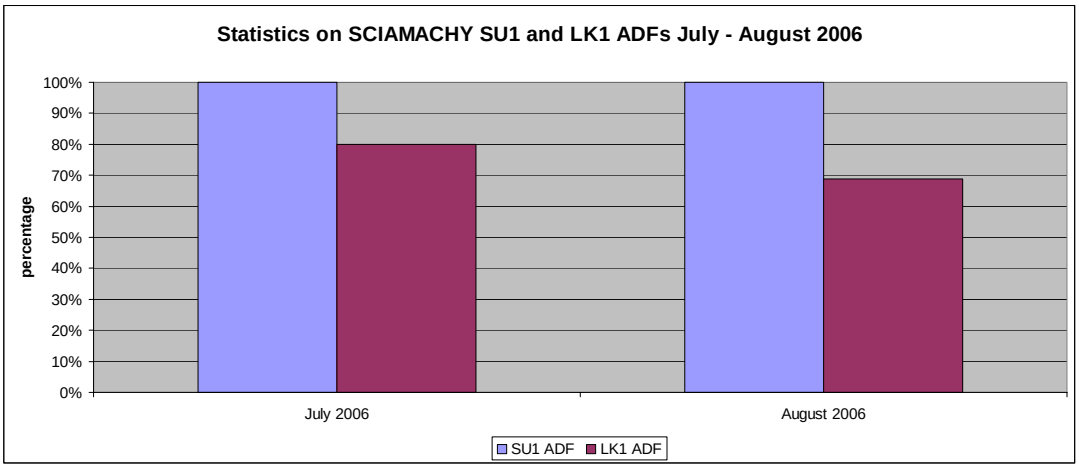


Fig. 5-1: Statistics on SU1 and LK1 processing

5.1.3 Spectral Performance

Future reports will contain analyses of spectral performance.

5.1.4 Radiometric Performance

Future reports will contain analyses of spectral performance.

5.1.5 Other Calibration Results

5.1.5.1 SMR analysis

SCICAL generates daily SU1 Auxiliary Files. Solar spectra obtained from ESM and ASM calibration measurements are provided in a calibrated and un-calibrated way.
The different types of spectra can be recognized by the so called identifier in the solar reference global annotation data set record.
In difference to previous versions, no solar reference spectra from occultation or sub-solar measurements are provided by the GADS, as they turned out to be of no use for trace gas retrievals.
Note the following recommendation:

- Use an un-calibrated ASM diffuser spectrum (A0) for DOAS type applications.
- All retrieval methods requiring absolute calibrated radiance and irradiance are obliged to use the calibrated ESM diffuser spectrum (D0) (see also disclaimer).

Fig. 5-2 to Fig. 5-5 show the ratios of SMR spectra derived from calibrated SMR/ESM (D0) during the months July - August 2006. The ratios were determined by dividing the spectra of the beginning of each month to a set of days during each month. All ratios are not corrected for variation of distance earth/sun.
In detail the spectra used for the ratios of each month are the following:

- **July 2006**
  Reference SMR - 01 July 2006
  SMR used for ratios: 02, 03, 04, 05, 06, 07, 14, 21, 28 July 2006
- **August 2006**
  Reference SMR - 01 August 2006
  SMR used for ratios: 02, 03, 04, 05, 09, 10, 14, 21, 28 August 2006

The overall changes lie at about 1 % during one month for all channels, which is at least partly caused by the increasing distance between sun and earth. In channel 1 around pixel 550 (at 282 nm) some strong features can be noticed, as well as in channel 2 near pixel 840 (near 393 nm). These strong features coincide with the Mg II and Ca Fraunhofer lines respectively. These lines are partially formed in the solar chromosphere and are known to change with solar variability.
The weaker spectral features in channel 2 (e.g. near pixels 550, 650,750), on the other hand, correlate with strong Fraunhofer lines, which are not chromospheric. These features probably arise from small wavelength shifts (order of 1/100 of a pixel).

Generally a spectral feature could have significant impact on the product quality, especially when the affected spectral parts are used for DOAS retrieval.

The large features in the end of channel 6 (channel 6+) and channels 7 and 8 are due to bad pixels.
Note that the bad pixel mask used is still from the on ground calibration.
A regular update of the bad pixel mask is implemented starting with IPF 6.02. However a bad pixel correction will not be applied to the SMR spectra, but only to PMD out-of-band factors, in order to enable the user to apply a different mask from the one provided by the ADF.

Fig. 5-6 and Fig. 5-7 show SMR ratios on a long term trend dividing the ESM spectra from days 24 July 2002 and 24 July 2006, respectively 31 August 2002 and 31 August 2006. The first spectrum available exists for 18-Jul-2002. However to consider sun/earth distance, the ratio was performed with spectra from same calendar days. All SCI_SU1_AX files used were generated with SCICAL.

What can be concluded is that for channels 1-2 an average degradation of about 7% is observed, channels 3 degrades by about 2% and channels 4-6 degrade by less than 1%. The signal in channels 7 and 8 has increased with respect to the SMR of year 2002. This is consistent with the Light Path monitoring at SOST-IFE.

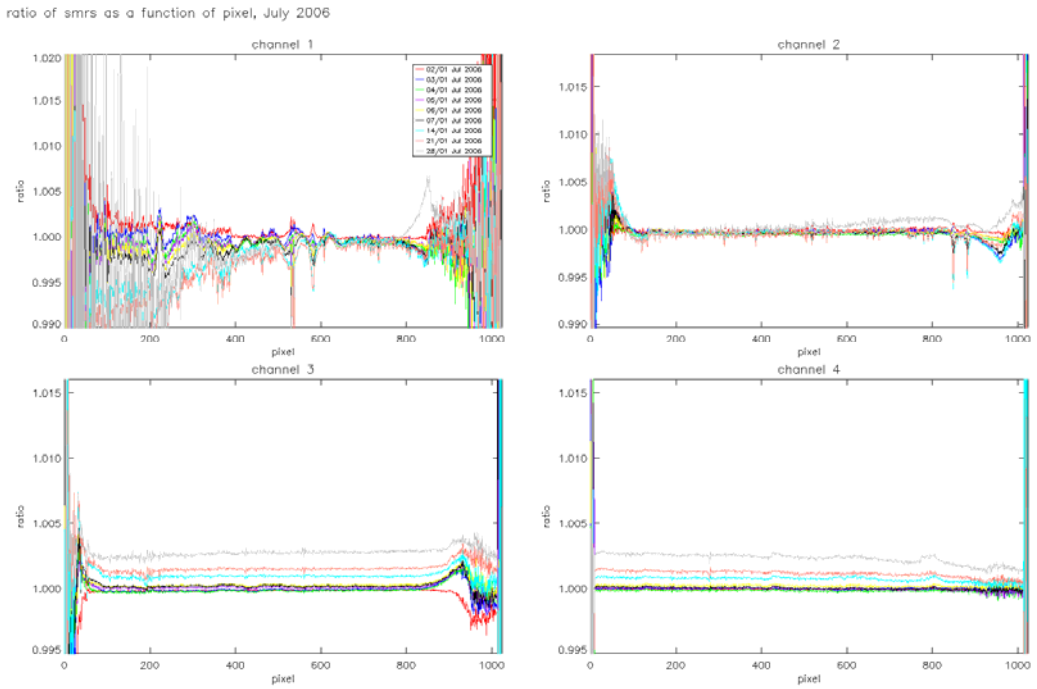


Fig. 5-2: SMR ratios per detector channel 1-4 (changes during July 2006)

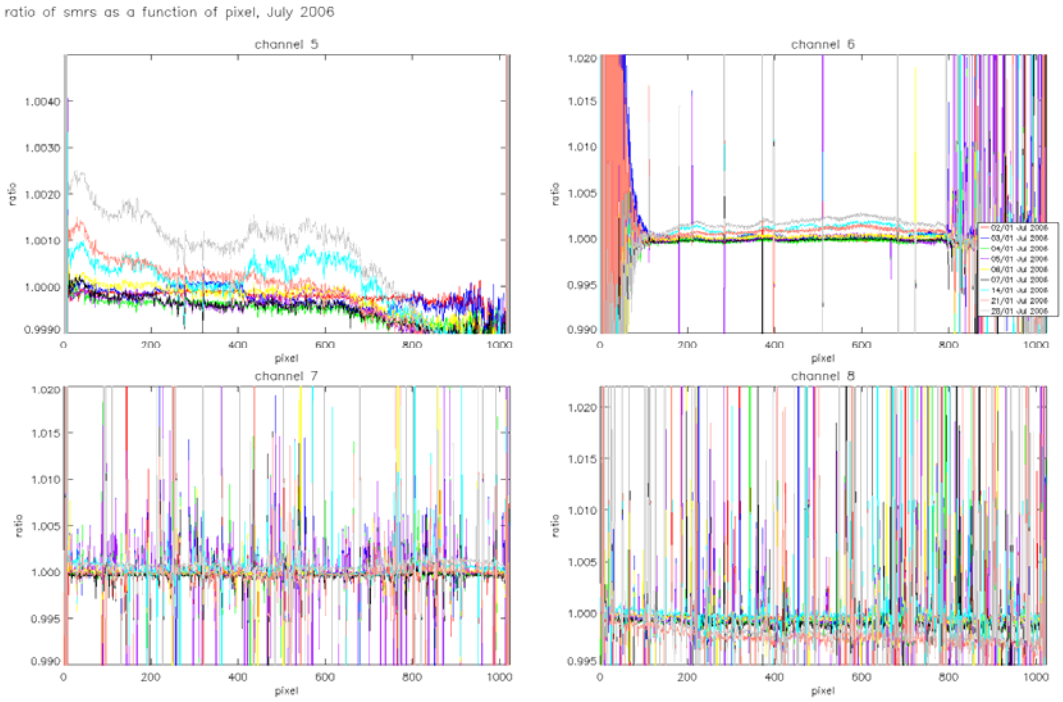


Fig. 5-3: SMR ratios per detector channel 5-8 (changes during July 2006)

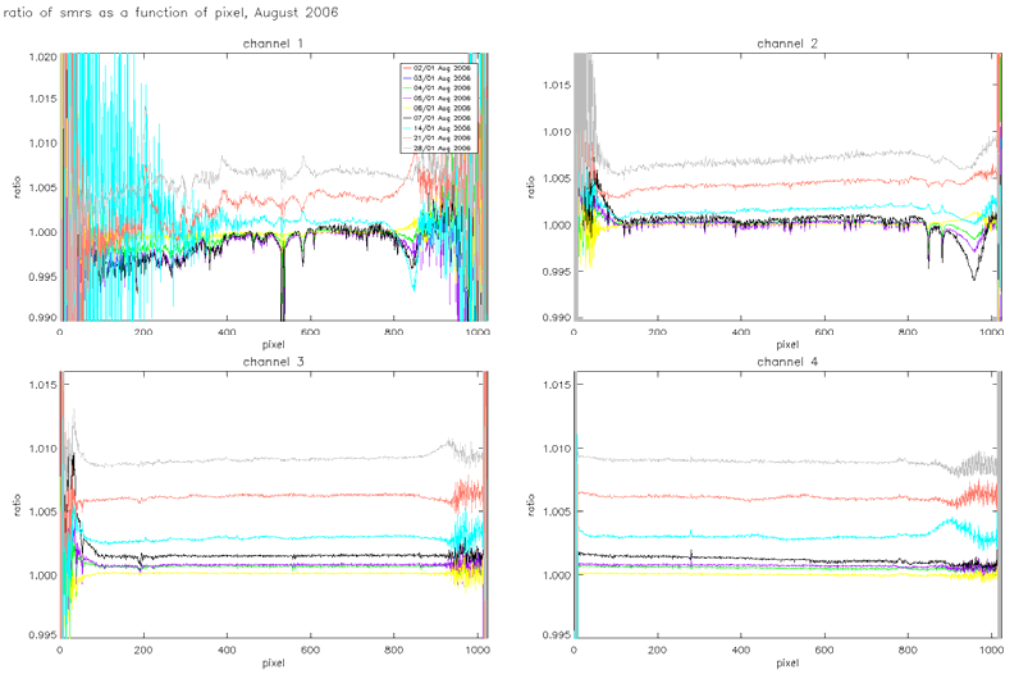


Fig. 5-4: SMR ratios per detector channel 1-4 (changes during August 2006)

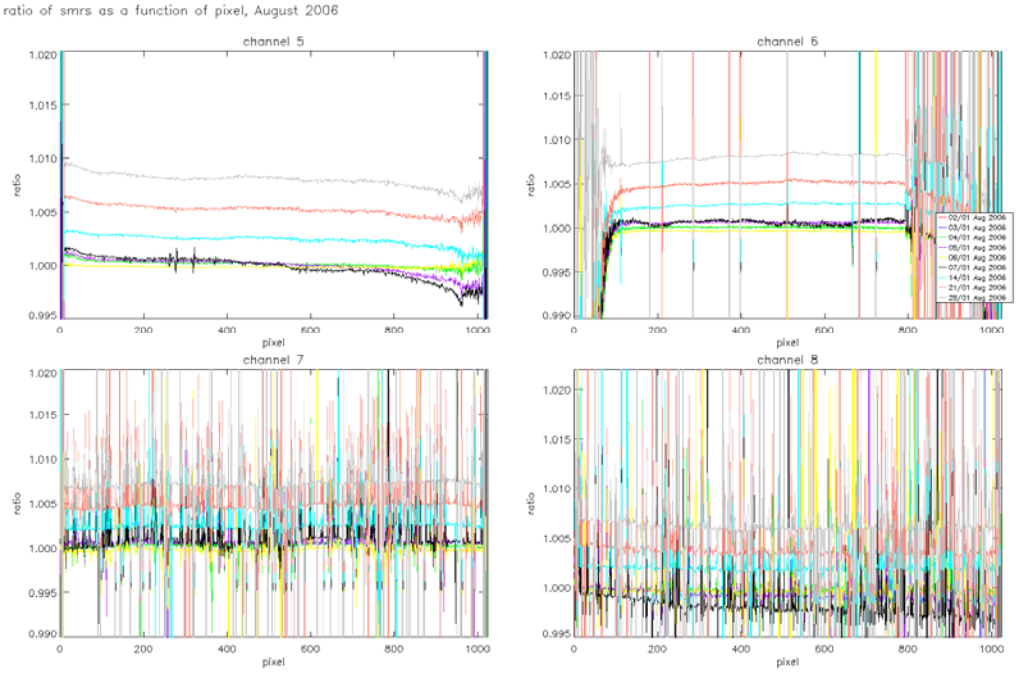


Fig. 5-5: SMR ratios per detector channel 5-8 (changes during August 2006)

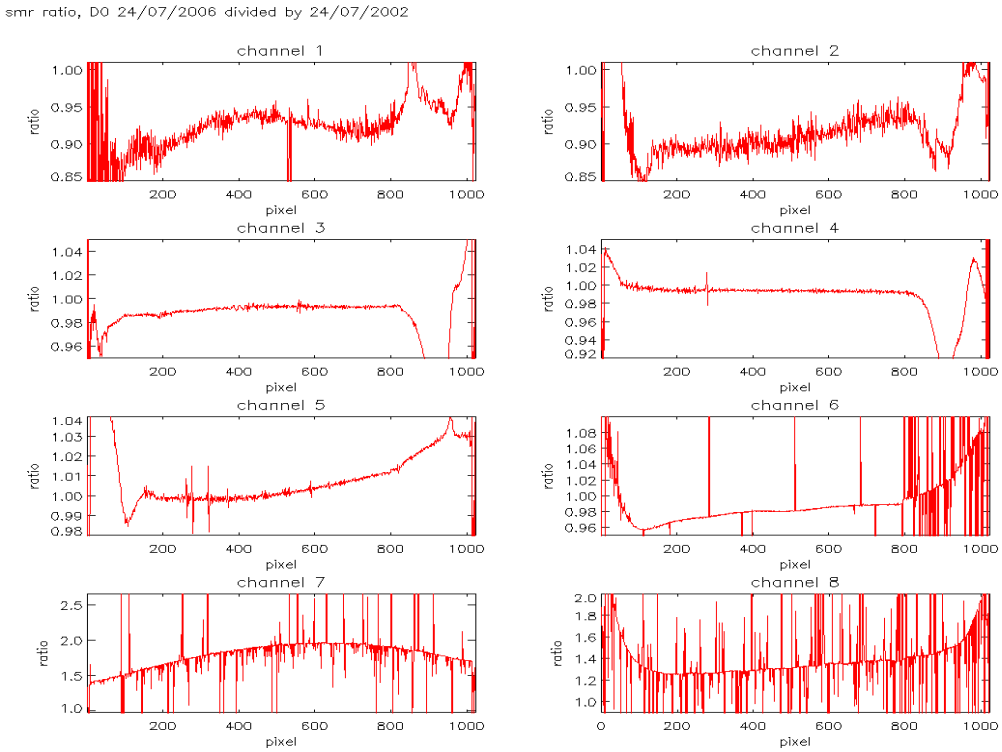


Fig. 5-6: SMR ratios per detector channel on Long Term Trend

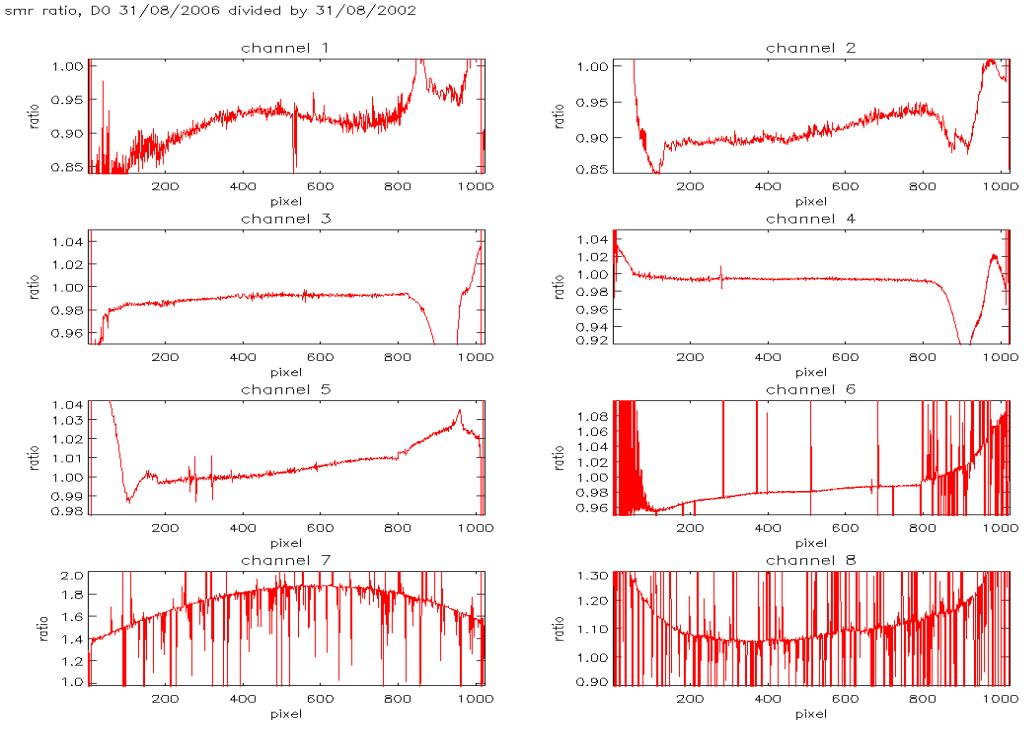


Fig. 5-7: SMR ratios per detector channel on Long Term Trend

5.1.5.2 LK1 analysis

5.1.5.2.1 Leakage Constant part

On an orbital basis a leakage current calibration is performed, if measurement data do not lie in the South Atlantic Anomaly region.
In Fig. 5-8 to Fig. 5-11 the leakage constant part FPN (fixed pattern noise) of the LK1 ADFs are analysed by determining the ratios of the FPN of each month with a time distance of one orbit, one day, one week, two weeks, three weeks and a month.
For channels 1-5 and the first part of channel 6, during up to three weeks nearly no changes can be noticed. Sudden jumps however between the different dark current ratios can be seen for channels 1, 2, 4 and 5 between 2 and 3 weeks. They are very small but above the noise level.
The IR channels show a lot of noise. Note that with the new processor version IPF 6.02, the time dependent part of the leakage current is considered (see 5.1.5.2.2).

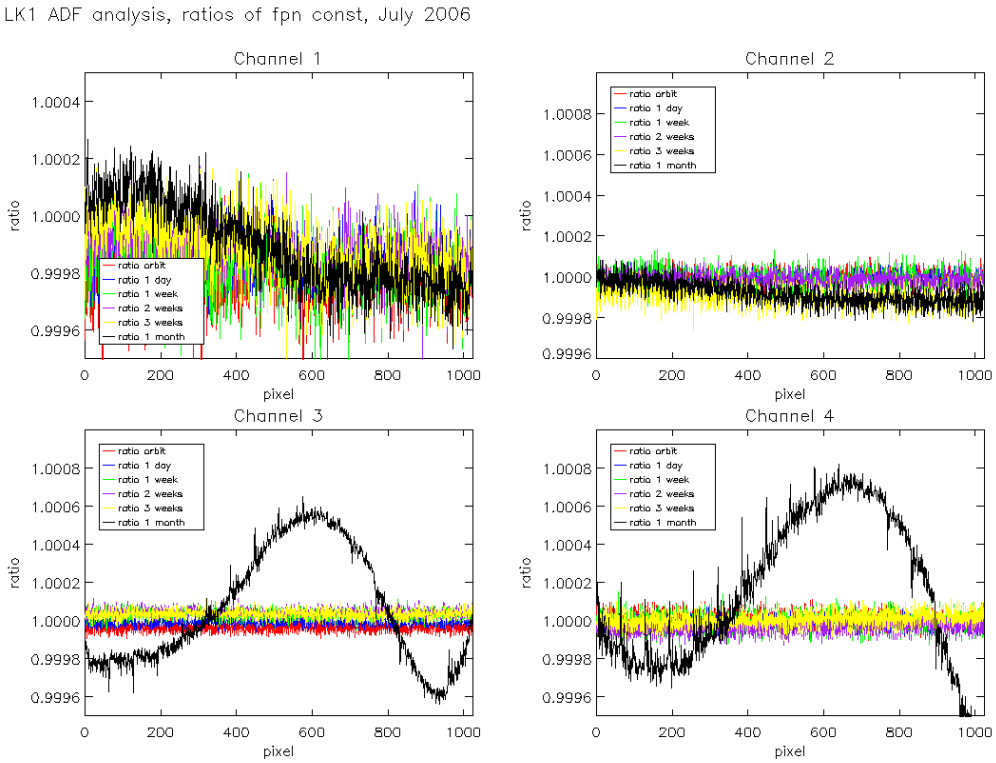


Fig. 5-7: dark current ratios (constant part) channel 1-4 during July 2006, Reference Spectrum used: Orbit 22663, 01-July-2006

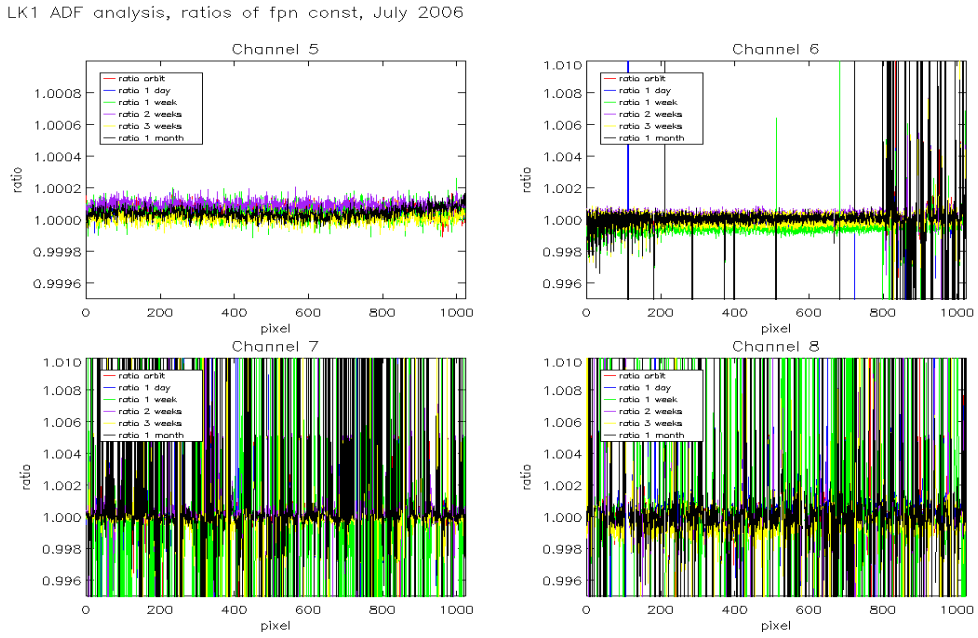


Fig. 5-8: dark current ratios (constant part) channel 5-8 during July 2006, Reference Spectrum used: Orbit 22663, 01-July-2006

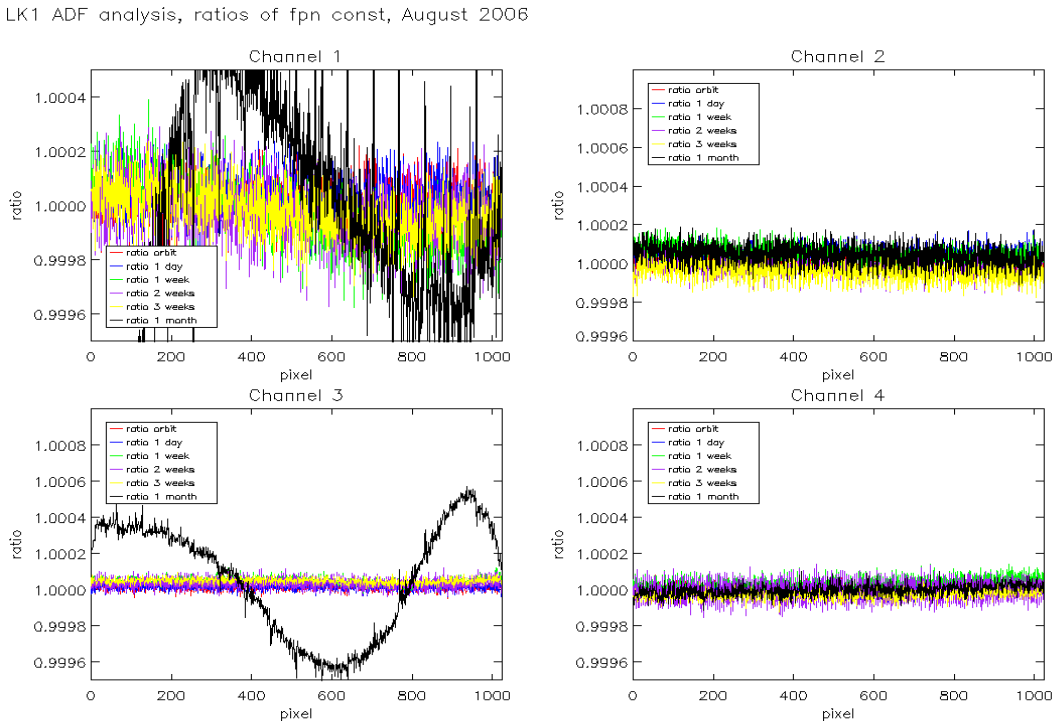


Fig. 5-9: dark current ratios (constant part) channel 1-4 during August 2006, Reference Spectrum used: Orbit 23107, 01-August 2006

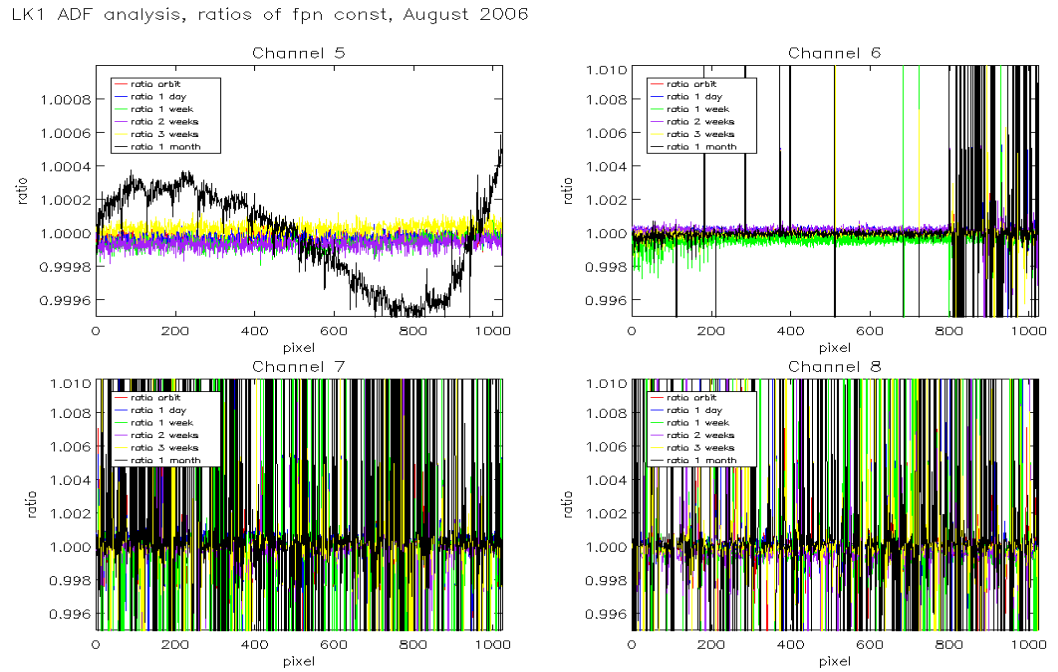


Fig. 5-10: dark current ratios (constant part) channel 5-8 during August 2006, Reference Spectrum used: Orbit 23107, 01-Aug-2006

5.1.5.2.2 Leakage Variable part

With the IPF 6.02 the orbital dependency of channel 6 to 8 leakage current is considered. SCIAMACHY detector channels 6 – 8 have a time dependent leakage dark signal that consists of two components, the leakage current of the detector pixel and second a component due to thermal background that varies along the orbit.

The implementation of the orbital variation of the leakage current is expected to improve retrieval especially in detector channel 8, e.g. for infrared products.

Figure 5-11 shows an example of the newly included leakage variable part into the SCI_LK1_ADF. The leakage variation for selected pixels in channels 6-8 in dependency of the orbit phase (12 values between 0 and 1) are shown.
As the orbital variation is different for each individual detector pixel, the lower picture shows a selected range of detector pixels and their orbital leakage variation, showing a typical sine curve. Differences between the detector pixels are due to the quality of the pixels. In case of bad pixels, strong outliers are expected.
Future reports will contain further details.

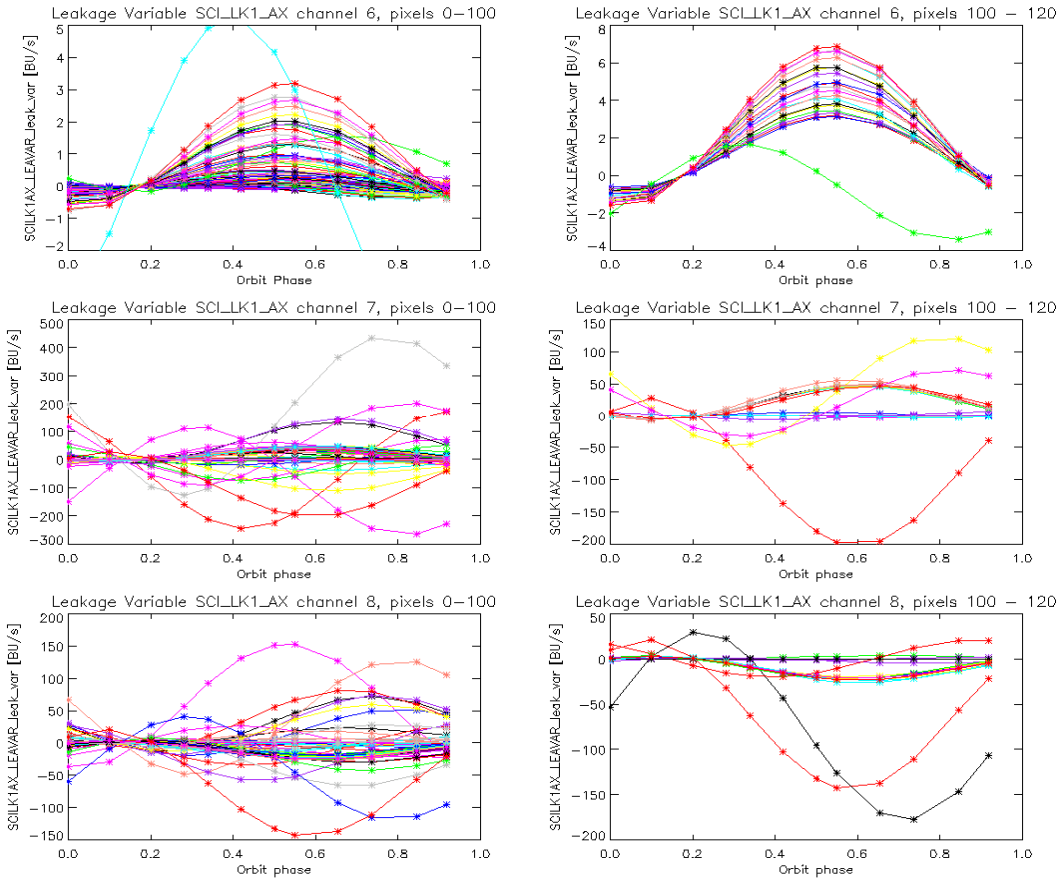


Figure 5-11: Example on leakage variation, SCI_LK1_AX 09 August 2006

5.1.6 Pointing Performance

The new SCIAMACHY processor IPF 6.02 contains the implementation of a limb pointing correction scheme. Results on first products analysed by IFE Bremen were summarised in the previous BMR.
Note, that the implementation of the pointing correction is twofold:

- a constant angle correction via the initialization file (SCI_LI1_AX) is included for the constant tangent height shift of around 1.1 km
- usage of the restituted attitude information from AUX_FRA auxiliary files for level 1b off-line processing

However the following operational problem was identified:
Due to a current shortcoming in the restituted attitude auxiliary file, no off-line consolidated Level 1b product for orbits crossing 00:00 UTC can be processed.
Therefore also no corresponding Level 2 Off-Line product can be provided.
Corrective actions are ongoing and the corresponding files, both Level 1b and Level 2, will be processed as soon as possible.
Investigation to improve the pointing also further is on-going and will be described in the upcoming Bi-Monthly reports.

5.2 SciaL1c tool

The SciaL1c tool is an application provided to the users of SCIAMACHY Level 1b products. This application allows the selection of specific calibrations for application to Level 1b data, which are in case of SCIAMACHY defined as not fully calibrated Level 0 channel information in combination with calculated calibration data. The generated Level 1c products are suitable for the user's particular applications. This tool had been available with EnviView for IPF version 5.04 (and previous).
SciaL1C Calibration and Extraction Software was upgraded to be compatible with IPF 6.02 data. The SciaL1c tool provided with Enviview is outdated and should not be used with the new IPF 6.02 products.
The tool of the current version 1.23 can be downloaded as Linux or Sun Solaris executable from

http://earth.esa.int/resources/softwaretools/

An upgrade of this version is in preparation in order to improve the performance of the tool. Additional executables are foreseen to be provided in the near future as well.

6 LEVEL 2 NRT PRODUCT QUALITY MONITORING

6.1 Processor Configuration

6.1.1 Version

Since 08 May 2006 the near real time processing of SCIAMACHY level 2 data has been suspended, evolution is currently restricted to the level 2 Off-line processor (see chapter 7).
The last IPF version used was 5.04. The corresponding product specification is *[2]*. The disclaimer at
http://envisat.esa.int/dataproducts/availability/disclaimers/SCI_NL__2P_Disclaimers.pdf
describes known artefacts.

Table 6.1 shows the implementation dates of the IPF at the different PDS processing centres and the main modifications implemented.

IPF Version	Description	Proc Centre	Date	Start Orbit
5.04	No algorithm specification changes were implemented, but two algorithm	PDHS-K	21-AUG-2004	12942
		LRAC	20-AUG-2004	12750
		PDHS-E	16-AUG-2004	12823

	implementation errors have been corrected. In addition, code adaptations have been performed to resolve performance problems encountered during reprocessing. The list of modifications is as follows: • The incorrect handling of the season index 4 has been corrected. • An incorrect polarisation-ratio calculation has been corrected, to remove radiance discrepancies up to 1% between prototype and operational processor. • Memory leaks have been detected and eliminated • An adaptation has been implemented to allow co-existence with the initialisation file used by the Off-Line processor	DPAC	12-AUG-2004	12879
5.01	• description for cloud MDS updated • minor changes in MPI and USA climatology description • latitude grids fixed • list of surface types fixed, note about vegetation index added • O_3 FM formula fixed sizes of SCIA FM spectra fixed latitude zones fixed • solar zenith angle grid fixed	DPAC PDHS-E PDHS-K LRAC	31-MAR-2004 24-MAR-2004	

Tab. 6-1: Level 2 Processor Configuration

6.1.2 Auxiliary Data Files

Auxiliary Files being used as input for SCI_NL__2P products are listed in table 6-2. These ADF files are generally not changed.

SCI_FM2_AXVIEC20040309_092553_19990101_000000_20991231_235959
SCI_BL2_AXVIEC20020220_093709_20020101_000000_20200101_000000
SCI_CC2_AXVIEC20020220_094004_20020101_000000_20200101_000000
SCI_CL2_AXVIEC20020220_094214_20020101_000000_20200101_000000
SCI_CS2_AXVIEC20020220_094417_20020101_000000_20200101_000000
SCI_MF2_AXVIEC20040309_093236_19990101_000000_20991231_235959
SCI_PF2_AXVIEC20020220_100450_20020101_000000_20200101_000000
SCI_PR2_AXVIEC20020220_100642_20020101_000000_20200101_000000
SCI_RC2_AXVIEC20020220_100912_20020101_000000_20200101_000000
SCI_UC2_AXVIEC20040309_092027_19990101_000000_20991231_235959
SCI_SF2_AXVIEC20020220_101039_20020101_000000_20200101_000000
SCI_LI2_AXVIEC20040308_170000_20020101_000000_20200101_000000

Tab. 6-2: Level 2 Auxiliary Files

7 LEVEL 2 OFF-LINE PRODUCT QUALITY MONITORING

7.1 Processor Configuration

7.1.1 Version

A major upgrade of the level 2 Off-line processor to version 3.00 took place during this reporting period.
Level 2 Off-line processing with version 2.5 was stopped with orbit 21803, 02 May 2006. After the official release 08 August 2006 of the level 2 Off-line processor version 3.00 level 2 data were processed in backlog starting with orbit 21824, 03 May 2006.
The product specification corresponding to the level 2 off-line processor 3.00 is Volume 15, issue 3/k *[2]* and can be found at
http://earth.esa.int/pub/ESA_DOC/ENVISAT/Vol15_Sciamachy_3k.pdf

The disclaimer at
http://envisat.esa.int/dataproducts/availability/disclaimers/SCI_OL__2P_Disclaimers.pdf
describes known artefacts.
SCI_OL__2P products contain geo-located vertical column amounts of O_3, NO_2 Nadir measurements, as well as stratospheric Limb profiles of O_3, NO_2. Additionally the fractional cloud coverage is derived and provided as product to the user. The major upgrades are summarised in table 7.1.

Processor Version	Description	Proc Centre	Date	Start Orbit
3.00	• Nadir UV/Visible algorithm for ozone and NO2 is based on the GDP (GOME Data Processor) Version 4.0 • Nadir UV/Visible algorithm for cloud-top height and cloud optical thickness based on the SACURA algorithm in contrast to GDP Version 4.0 • Limb UV/Visible products: Stratospheric Ozone and NO2 profiles are now deduced applying retrieval	D-PAC	03-MAY-2006	21824

	package DRACULA instead of former optimal estimation approach. Retrieval scheme is now Tikhonov regularization. Ozone profiles are now deduced from the Chappuis band in contrast to Version's 2.5 derivation from Huggins band. • Improved pointing performance through the use of the Envisat Restituted Attitude information in the consolidated Level 1b product			
2.5	• First operational version of processor	D-PAC	January 2005	-

Table 7-1: Level 2 off-line Proceesor Configuration

7.1.2 Auxiliary Data Files

Input for level 2 Off-line processing version 3.00 is the Initialization File SCI_IN__AXNPDE20060608_111400_20060615_000000_20991231_235959, that usually is changed only in case of a processor upgrade.

7.2 Monitoring results

7.2.1 NADIR: NO_2 consistency checking

The NO_2 consistency check in previous reports was performed on the SCI_NL__2P products. The near real time product generation was suspended in May 2006.
The world map plots of NADIR NO_2 vertical column density (VCD) values averaged over one month are therefore generated now from the SCI_OL__2P NADIR products. The products starting from 05 May 2006 were available starting from 08 August. For this reason this BMR contains the monthly world map plots from May – August 2006 see Fig. 7.1 to 7.4.

Generally, high concentration of NO_2 is expected over industrial regions, as over North America, especially the East coast, over central Europe, China and South Africa.

Values at high SZA are currently not filtered, which results in unphysical values in the monthly average plots.

The data gap over the Pacific and Australia results from the missing AUX_FRA coverage crossing midnight. Orbits covering this period will be processed in off-line mode at a later state.

7.2.1.1 NADIR: VCD NO2 map May 2006

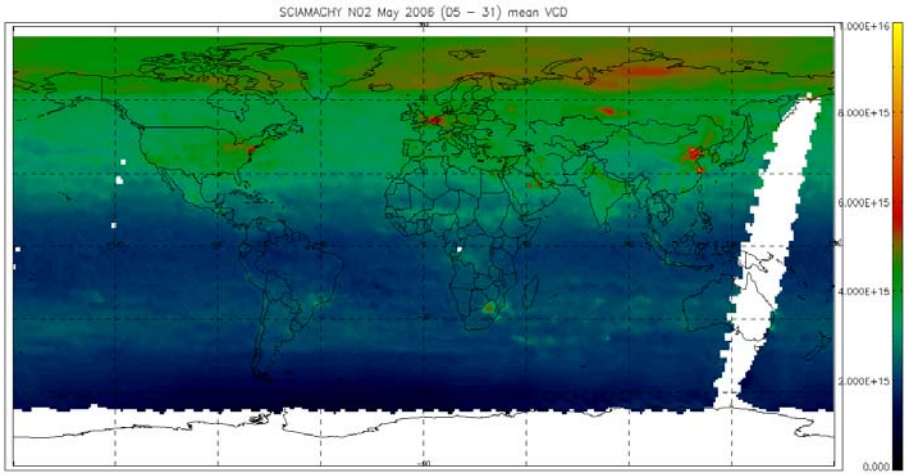


Figure 7-1: NO2 VCD world map 05-31 May 2006 – monthly average

7.2.1.2 NADIR: VCD NO2 map June 2006

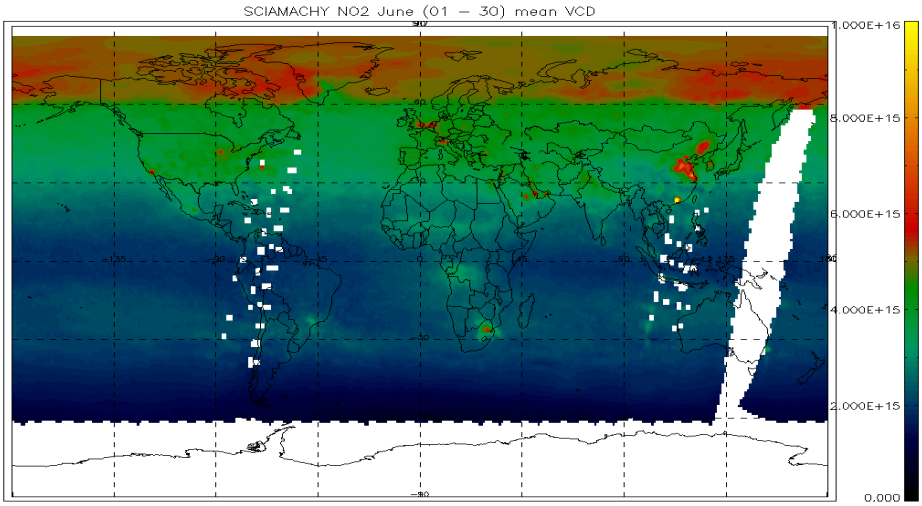


Figure 7-2: NO2 VCD world map 01-30 June 2006 – monthly average

7.2.1.3 NADIR: VCD NO2 map July 2006

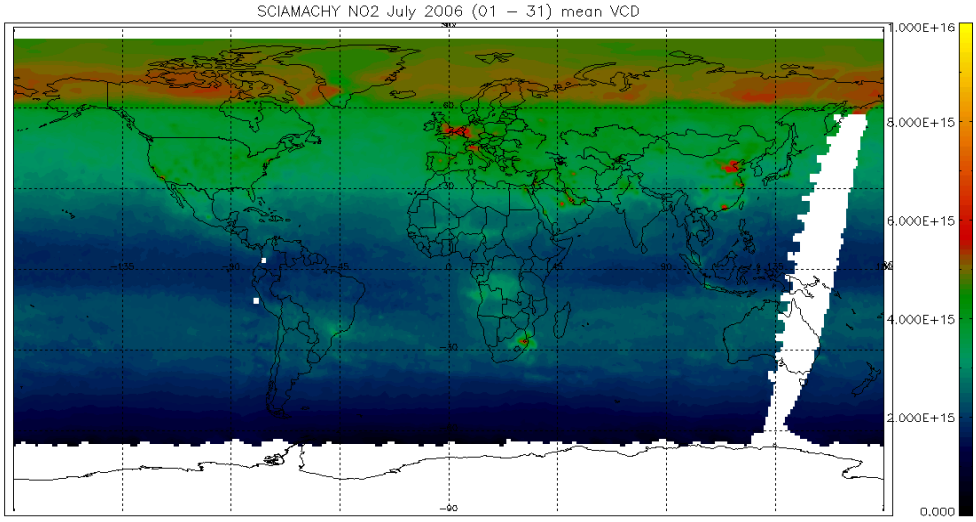


Figure 7-3: NO2 VCD world map 01-31 July 2006 – monthly average

7.2.1.4 NADIR: VCD NO2 map August 2006

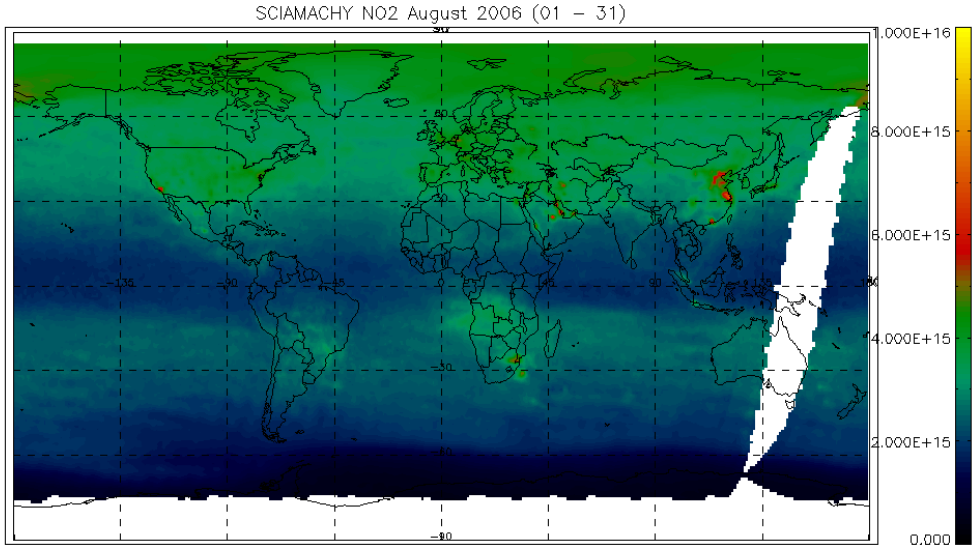


Figure 7-4: NO2 VCD world map 01-31 August 2006 – monthly average

7.2.2 LIMB

Future reports will contain information on this issue.

8 VALIDATION ACTIVITIES AND RESULTS

8.1 Validation Approach

The new Level 1b processor IPF 6.02 and Level 2 off-line processor Version 3.00 are assessed with respect to the quality of the data products.
The scientific validation is performed on behalf of the agencies by a wide group of scientists SCIAVALIG, representing the specialists for the different data products.
Detailed information about SCIAVALIG activities and results can be found at:

http://www.sciamachy.org/validation/

The validation of the new SCIAMACHY products shall result in

- Error estimates
- Recommendations for algorithm improvement
- Recommendations on reprocessing activity

These results will be discussed in the preliminary validation meeting at KNMI on 20 September 2006 and the ACVE-3 in the beginning of December 2006 in ESRIN.

8.2 Validation Data set

A set of SCIAMACHY measurement states was defined by SCIAVALIG to be processed to level 1b and level 2 off-line products. These measurement states correspond to validation campaigns from ground based measurements, balloon measurements, aircraft or satellite inter-comparison measurements.

Table 8.1 summarises the data set requested.

Table 8-1

Year	States requested	Number of orbits
2002	742	316
2003	1349	760
2004	1608	1095
2005	186	175
Total	3885	2346

Level 1b data IPF 6.02 (by 07 July 2006) and level 2 off-line data 3.00 (by 01 August 2006) were uploaded to the following ftp server at D-PAC:

ftp://ftp-ops.de.envisat.esa.int

APPENDIX A LIST OF OPERATIONAL ADFS FOR THE PERIOD JULY – AUGUST 2006

Type	ADF Name
PE1_AX	SCI_PE1_AXVIEC20060628_101039_20060625_174308_20990101_000000
	SCI_PE1_AXVIEC20060705_041035_20060702_172509_20990101_000000
	SCI_PE1_AXVIEC20060714_224506_20060710_181233_20990101_000000
	SCI_PE1_AXVIEC20060727_101023_20060716_182351_20990101_000000
	SCI_PE1_AXVIEC20060728_101025_20060723_180500_20990101_000000
	SCI_PE1_AXVIEC20060804_064028_20060731_171154_20990101_000000
	SCI_PE1_AXVIEC20060811_064058_20060808_180052_20990101_000000
	SCI_PE1_AXVIEC20060820_065431_20060815_174000_20990101_000000
	SCI_PE1_AXVIEC20060825_043209_20060822_172526_20990101_000000
SP1_AX	SCI_SP1_AXVIEC20060628_102036_20060625_160802_20060923_192520
	SCI_SP1_AXVIEC20060705_042048_20060702_155002_20060930_190613
	SCI_SP1_AXVIEC20060714_224518_20060710_163700_20061008_195509
	SCI_SP1_AXVIEC20060727_042040_20060716_164637_20061014_200710
	SCI_SP1_AXVIEC20060728_102024_20060723_162649_20061021_194410
	SCI_SP1_AXVIEC20060803_185101_20060731_153847_20061029_185404
	SCI_SP1_AXVIEC20060812_044030_20060808_162148_20061106_205051
	SCI_SP1_AXVIEC20060820_071122_20060815_160230_20061113_192253
	SCI_SP1_AXVIEC20060825_043302_20060822_154712_20061120_190436
SU1_AX	SCI_SU1_AXVIEC20060706_103254_20060627_164633_20060712_200351
	SCI_SU1_AXVIEC20060705_043211_20060701_161934_20060716_193749
	SCI_SU1_AXVIEC20060705_043315_20060702_155002_20060717_190613
	SCI_SU1_AXVIEC20060706_043202_20060703_165658_20060718_201417
	SCI_SU1_AXVIEC20060707_043202_20060704_162630_20060719_194445
	SCI_SU1_AXVIEC20060708_043409_20060705_155550_20060720_191105
	SCI_SU1_AXVIEC20060709_043210_20060706_170246_20060721_202209
	SCI_SU1_AXVIEC20060712_083643_20060708_155934_20060723_191654
	SCI_SU1_AXVIEC20060712_083652_20060707_163110_20060722_194925
	SCI_SU1_AXVIEC20060714_225026_20060710_163700_20060725_195509
	SCI_SU1_AXVIEC20060717_083116_20060709_153059_20060724_184518
	SCI_SU1_AXVIEC20060724_103306_20060712_153702_20060727_185313
	SCI_SU1_AXVIEC20060724_103349_20060713_164346_20060728_200214
	SCI_SU1_AXVIEC20060726_163206_20060714_161211_20060729_192931
	SCI_SU1_AXVIEC20060727_043146_20060715_154145_20060730_185552
	SCI_SU1_AXVIEC20060727_043238_20060716_164637_20060731_200710
	SCI_SU1_AXVIEC20060727_103130_20060720_162300_20060804_180122
	SCI_SU1_AXVIEC20060727_103230_20060721_155222_20060805_190738
	SCI_SU1_AXVIEC20060727_103330_20060717_161611_20060801_193427
	SCI_SU1_AXVIEC20060727_103435_20060718_154328_20060802_190157
	SCI_SU1_AXVIEC20060727_103546_20060719_165230_20060803_201155
	SCI_SU1_AXVIEC20060728_043202_20060722_165823_20060806_201652
	SCI_SU1_AXVIEC20060728_103135_20060723_162649_20060807_194410
	SCI_SU1_AXVIEC20060729_043322_20060724_155624_20060808_191441
	SCI_SU1_AXVIEC20060729_043432_20060725_170214_20060809_202235

	SCI_SU1_AXVIEC20060731_103326_20060727_160411_20060811_191928 SCI_SU1_AXVIEC20060731_103449_20060726_163040_20060810_195306 SCI_SU1_AXVIEC20060731_103519_20060728_153238_20060812_184754 SCI_SU1_AXVIEC20060803_183805_20060730_160911_20060814_192537 SCI_SU1_AXVIEC20060803_183806_20060729_163636_20060813_195710 SCI_SU1_AXVIEC20060803_183900_20060731_153847_20060815_185404 SCI_SU1_AXVIEC20060804_063217_20060801_164329_20060816_200403 SCI_SU1_AXVIEC20060804_150228_20060802_161400_20060817_193122 SCI_SU1_AXVIEC20060807_030207_20060803_172052_20060818_185949 SCI_SU1_AXVIEC20060810_040053_20060806_172446_20060821_190452 SCI_SU1_AXVIEC20060810_103122_20060807_165429_20060822_212558 SCI_SU1_AXVIEC20060812_035439_20060808_162148_20060823_194238 SCI_SU1_AXVIEC20060812_063309_20060806_154417_20060821_172542 SCI_SU1_AXVIEC20060813_035243_20060809_155221_20060824_191051 SCI_SU1_AXVIEC20060817_103032_20060804_164626_20060819_200905 SCI_SU1_AXVIEC20060817_103043_20060805_161453_20060820_193432 SCI_SU1_AXVIEC20060817_103116_20060810_170233_20060825_202051 SCI_SU1_AXVIEC20060817_103227_20060811_162748_20060826_194824 SCI_SU1_AXVIEC20060817_103346_20060812_155616_20060827_191748 SCI_SU1_AXVIEC20060817_103453_20060813_153058_20060828_184616 SCI_SU1_AXVIEC20060820_053353_20060814_163402_20060829_195425 SCI_SU1_AXVIEC20060820_054013_20060815_160230_20060830_192253 SCI_SU1_AXVIEC20060820_055107_20060816_153507_20060831_185230 SCI_SU1_AXVIEC20060821_032448_20060817_163855_20060901_200122 SCI_SU1_AXVIEC20060822_033446_20060818_160723_20060902_192759 SCI_SU1_AXVIEC20060822_063141_20060819_153757_20060903_185724 SCI_SU1_AXVIEC20060823_035215_20060820_164702_20060904_200629 SCI_SU1_AXVIEC20060824_033520_20060821_161435_20060905_193306 SCI_SU1_AXVIEC20060825_031019_20060822_154712_20060906_190436 SCI_SU1_AXVIEC20060826_063153_20060823_165401_20060907_201041 SCI_SU1_AXVIEC20060827_063147_20060824_162134_20060908_194101 SCI_SU1_AXVIEC20060829_031953_20060825_172925_20060909_190835 SCI_SU1_AXVIEC20060829_033656_20060826_165813_20060910_201836 SCI_SU1_AXVIEC20060831_044147_20060827_162533_20060911_194514 SCI_SU1_AXVIEC20060831_044510_20060828_155511_20060912_191439 SCI_SU1_AXVIEC20060901_065154_20060829_170404_20060913_202441 SCI_SU1_AXVIEC20060902_063223_20060830_163234_20060914_195214 SCI_SU1_AXVIEC20060904_063218_20060831_160212_20060915_192140
LK1_AX	SCI_LK1_AXVIEC20060703_070332_20060630_230041_20060830_004209 SCI_LK1_AXVIEC20060703_190251_20060701_004041_20060830_021825 SCI_LK1_AXVIEC20060704_070225_20060701_065727_20060830_080452 SCI_LK1_AXVIEC20060704_070335_20060701_080452_20060830_094624 SCI_LK1_AXVIEC20060704_070440_20060701_094528_20060830_112604 SCI_LK1_AXVIEC20060704_070656_20060701_112604_20060830_130531 SCI_LK1_AXVIEC20060705_025124_20060701_130435_20060830_144415 SCI_LK1_AXVIEC20060705_025406_20060701_144307_20060830_162030 SCI_LK1_AXVIEC20060705_025636_20060701_161934_20060830_175850 SCI_LK1_AXVIEC20060705_025855_20060701_175754_20060830_193749 SCI_LK1_AXVIEC20060704_070549_20060701_193544_20060830_204541 SCI_LK1_AXVIEC20060704_190106_20060701_204413_20060830_223029 SCI_LK1_AXVIEC20060704_190212_20060701_222906_20060831_001033

	SCI_LK1_AXVIEC20060704_190315_20060702_000905_20060831_014944
	SCI_LK1_AXVIEC20060705_030121_20060702_062551_20060831_073316
	SCI_LK1_AXVIEC20060705_030354_20060702_073316_20060831_091448
	SCI_LK1_AXVIEC20060705_030533_20060702_091352_20060831_105428
	SCI_LK1_AXVIEC20060705_030549_20060702_105332_20060831_123355
	SCI_LK1_AXVIEC20060705_030746_20060702_123259_20060831_141239
	SCI_LK1_AXVIEC20060705_070121_20060702_141239_20060831_155058
	SCI_LK1_AXVIEC20060705_070221_20060702_155002_20060831_172714
	SCI_LK1_AXVIEC20060705_070328_20060702_172509_20060831_190613
	SCI_LK1_AXVIEC20060705_070436_20060702_190517_20060831_204537
	SCI_LK1_AXVIEC20060706_010533_20060702_233942_20060901_011842
	SCI_LK1_AXVIEC20060706_010615_20060703_023154_20060901_041242
	SCI_LK1_AXVIEC20060706_010717_20060703_041242_20060901_055414
	SCI_LK1_AXVIEC20060706_010907_20060703_055306_20060901_070248
	SCI_LK1_AXVIEC20060706_011000_20060703_070140_20060901_084420
	SCI_LK1_AXVIEC20060706_011116_20060703_084311_20060901_102400
	SCI_LK1_AXVIEC20060706_011240_20060703_102400_20060901_120219
	SCI_LK1_AXVIEC20060706_083335_20060703_120219_20060901_134103
	SCI_LK1_AXVIEC20060706_011511_20060703_134103_20060901_152030
	SCI_LK1_AXVIEC20060706_070119_20060703_151922_20060901_165806
	SCI_LK1_AXVIEC20060706_070228_20060703_165658_20060901_183505
	SCI_LK1_AXVIEC20060706_070318_20060703_183301_20060901_201417
	SCI_LK1_AXVIEC20060706_190119_20060703_201212_20060901_212554
	SCI_LK1_AXVIEC20060706_190224_20060703_212554_20060901_230806
	SCI_LK1_AXVIEC20060707_030826_20060704_004706_20060902_022454
	SCI_LK1_AXVIEC20060707_031153_20060704_033958_20060902_052334
	SCI_LK1_AXVIEC20060707_031452_20060704_052238_20060902_070314
	SCI_LK1_AXVIEC20060707_031732_20060704_070314_20060902_081135
	SCI_LK1_AXVIEC20060707_031805_20060704_081039_20060902_095224
	SCI_LK1_AXVIEC20060707_032021_20060704_095224_20060902_113151
	SCI_LK1_AXVIEC20060707_032116_20060704_113151_20060902_131131
	SCI_LK1_AXVIEC20060707_032410_20060704_131131_20060902_144950
	SCI_LK1_AXVIEC20060707_070128_20060704_144854_20060902_162726
	SCI_LK1_AXVIEC20060707_070230_20060704_162630_20060902_180329
	SCI_LK1_AXVIEC20060707_070334_20060704_180329_20060902_194445
	SCI_LK1_AXVIEC20060707_070441_20060704_194349_20060902_205215
	SCI_LK1_AXVIEC20060707_070547_20060704_205051_20060902_223715
	SCI_LK1_AXVIEC20060708_034449_20060705_030822_20060903_045102
	SCI_LK1_AXVIEC20060708_034728_20060705_045102_20060903_063138
	SCI_LK1_AXVIEC20060708_035049_20060705_063138_20060903_073959
	SCI_LK1_AXVIEC20060708_035353_20060705_073903_20060903_092252
	SCI_LK1_AXVIEC20060708_035629_20060705_092144_20060903_110015
	SCI_LK1_AXVIEC20060708_040008_20060705_105907_20060903_123955
	SCI_LK1_AXVIEC20060708_040101_20060705_123955_20060903_141923
	SCI_LK1_AXVIEC20060708_040349_20060705_141923_20060903_155550
	SCI_LK1_AXVIEC20060708_040724_20060705_155550_20060903_173302
	SCI_LK1_AXVIEC20060708_040829_20060705_173302_20060903_191105
	SCI_LK1_AXVIEC20060708_041005_20060705_191009_20060903_205221
	SCI_LK1_AXVIEC20060708_070133_20060705_205016_20060903_220456
	SCI_LK1_AXVIEC20060708_070240_20060705_220412_20060903_234647
	SCI_LK1_AXVIEC20060708_070345_20060705_234519_20060904_012524

	SCI_LK1_AXVIEC20060709_010727_20060706_060002_20060904_070823
	SCI_LK1_AXVIEC20060709_010953_20060706_070728_20060904_085008
	SCI_LK1_AXVIEC20060709_011242_20060706_084859_20060904_102935
	SCI_LK1_AXVIEC20060709_011544_20060706_102840_20060904_120915
	SCI_LK1_AXVIEC20060709_012146_20060706_120915_20060904_134638
	SCI_LK1_AXVIEC20060709_012150_20060706_134638_20060904_152619
	SCI_LK1_AXVIEC20060709_012154_20060706_152510_20060904_170342
	SCI_LK1_AXVIEC20060710_091926_20060706_170246_20060904_184202
	SCI_LK1_AXVIEC20060709_012408_20060706_184054_20060904_202209
	SCI_LK1_AXVIEC20060709_070118_20060706_202101_20060904_213153
	SCI_LK1_AXVIEC20060709_070332_20060706_213025_20060904_231344
	SCI_LK1_AXVIEC20060709_070218_20060706_231221_20060905_005516
	SCI_LK1_AXVIEC20060709_190131_20060707_020510_20060905_034646
	SCI_LK1_AXVIEC20060710_034129_20060707_034646_20060905_052722
	SCI_LK1_AXVIEC20060710_035052_20060707_052722_20060905_070141
	SCI_LK1_AXVIEC20060710_034319_20060707_070658_20060905_081519
	SCI_LK1_AXVIEC20060710_034353_20060707_081423_20060905_095800
	SCI_LK1_AXVIEC20060710_034509_20060707_095704_20060905_113740
	SCI_LK1_AXVIEC20060710_034543_20060707_113631_20060905_131611
	SCI_LK1_AXVIEC20060710_034720_20060707_131611_20060905_145334
	SCI_LK1_AXVIEC20060710_034733_20060707_145334_20060905_163206
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	SCI_LK1_AXVIEC20060902_081009_20060830_163234_20061029_181305
	SCI_LK1_AXVIEC20060902_081123_20060830_181209_20061029_195214
	SCI_LK1_AXVIEC20060903_054144_20060831_064002_20061030_074728
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	SCI_LK1_AXVIEC20060903_054342_20060831_093008_20061030_110840
	SCI_LK1_AXVIEC20060903_054451_20060831_110840_20061030_124917
	SCI_LK1_AXVIEC20060903_054609_20060831_124917_20061030_142749
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APPENDIX B LEVEL 1B OFF-LINE PRODUCTS PROCESSED WITH OUTDATED AUXILIARY FILES

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