S-1 MPC

S1-A N-Cyclic Performance Report - 2017-04
Cycles 109 to 112 (10-May-2017 to 27-Jun-2017)

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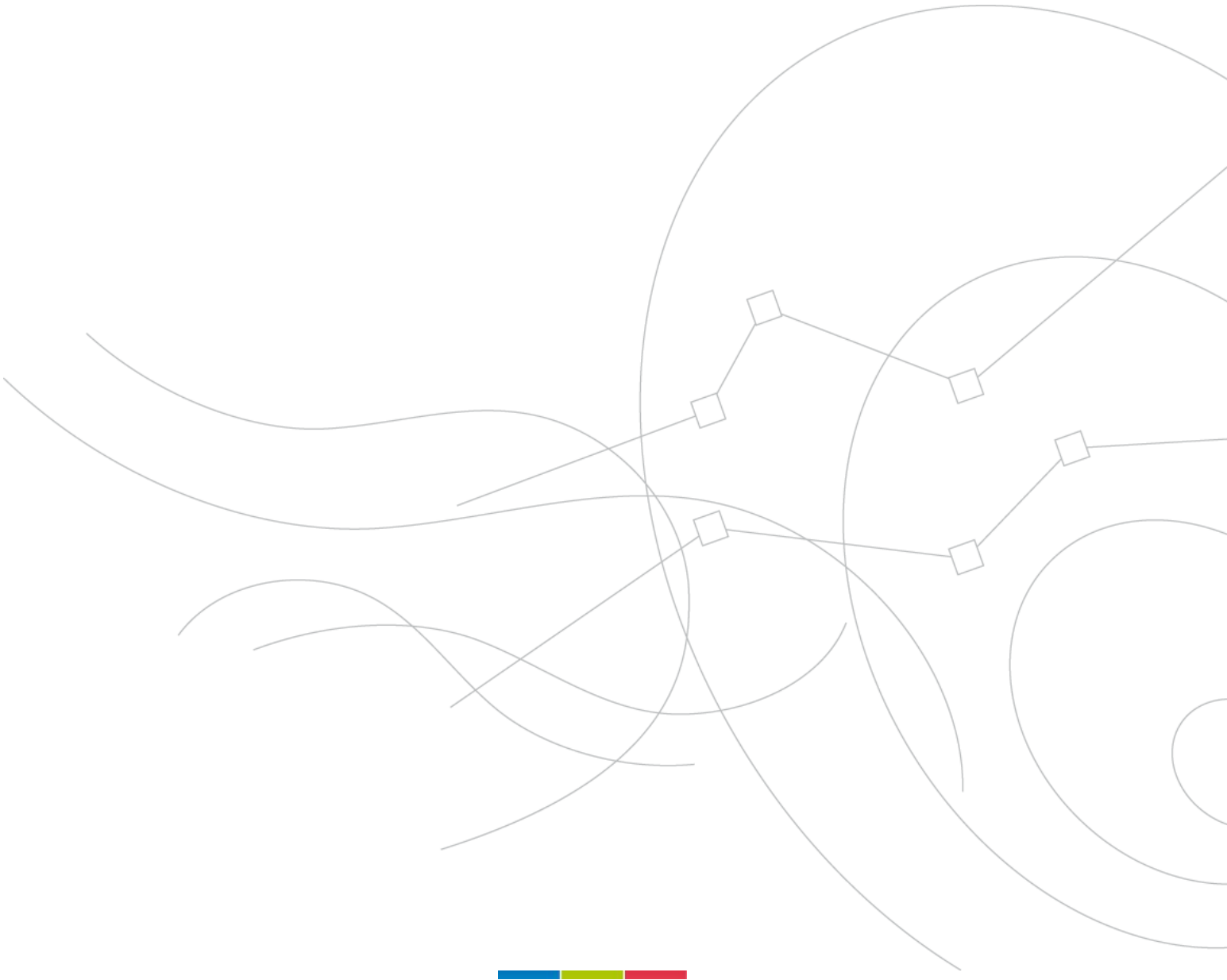
Applicable documents

Nomenclature	Title	Edition Number	Revision Number
[S1-AD-14]	S1 RS-MDA-52-7441 Sentinel-1 Product Specification	3	3
[S1-AD-15]	S1-RS-MDA-57-7440 Sentinel-1 Product Definition	2	7

Reference documents

None



List of Contents

1. Introduction

1.1. Purpose of the document

The purpose of this document is to provide a status on the S1-A sensor and product performance for orbit repeat cycle 109 from 10th May to 22nd May 2017, cycle 110 from 22nd May to 3rd June 2017, cycle 111 from 3rd June to 15th June 2017 and cycle 112 from 15th June to 27th June 2017.

1.2. Structure of the document

- Chapter 1 : This introduction
- Chapter 2 : Executive Summary
- Chapter 3 : Instrument Status
- Chapter 4 : IPF and Auxiliary Date File Status
- Chapter 5 : Manoeuvres
- Chapter 6 : Products Status

The following appendices are also provided:

- Appendix A : List of Acronyms
- Appendix B : S1-A Transmit Receive Module Failures
- Appendix C : S1-A Instrument Unavailability
- Appendix D : S1-A Auxiliary Data Files

2. Executive Summary

The main change during S1-A cycles 109 to 112 (10th May to 27th June 2017) was an update to the S1-A SM, IW and EW Elevation Antenna Patterns following the Tile 11 Anomaly in June 2016.

A summary of the instrument and product status is provided in following sections of the document.

The list of Quality Disclaimers on the Sentinel-1A products performances and the list of the IPF Auxiliary Data Files can be accessed on the QC Web Server at following address:

https://qc.sentinel1.eo.esa.int/

3. Instrument Status

Here the status of the S1-A instrument during the reporting period is provided.

3.1. Antenna Status

There were no new S1-A antenna transmit/receive module failures during the reporting period.

TRM	Description	Date of Failure

Table 1 S1-A Antenna Transmit/Receive Module Failures

A full list of all TRM failures since S1-A launch is given in Appendix B.

3.2. Instrument Unavailability

Table 2 gives when the S1-A instrument was unavailable during the reporting period:

Start Date/Time	End Date/Time	MPC Reference	Summary
16/06/2017 09:09	16/06/2017 12:31	SOB-751	Sentinel-1A Unavailability on 16/06/2017
17/06/2017 11:43	17/06/2017 14:43	SOB-752	Sentinel-1A Unavailability on 17/06/2017
21/06/2017 14:09	21/06/2017 17:35	SOB-753	Sentinel-1A Unavailability on 21/06/2017

Table 2 S1-A Instrument Unavailabilities

A full list of all instrument unavailabilities since the S1-A launch is given in Appendix C.

4. IPF and Auxiliary Date File Status

4.1. Level 1 Processor Issues

There were no updates to the Instrument Processing Facility (IPF) during the reporting period.

4.2. Auxiliary Data File Updates

There were the following updates to S1-A Auxiliary Data Files (ADFs) during the reporting period. A full list of currently applicable ADF files is given in Appendix D.

Instrument ADF (AUX_INS)

ADF	Update Reason

Table 3 AUX_INS Updates

Calibration ADF (AUX_CAL)

ADF	Update Reason
S1A_AUX_CAL_V20160627T000000_G20170522T132042.SAFE	Updated S1-A SM, IW and EW Elevation Antenna Patterns following the Tile 11 Anomaly in June 2016. Related to RDB#5.

Table 4 AUX_CAL Updates

L1 Processor Parameters ADF (AUX_PP1)

ADF	Update Reason

Table 5 AUX_PP1 Updates

L2 Processor Parameters ADF (AUX_PP2)

ADF	Update Reason

Table 6 AUX_PP2 Updates

Simulated Cross Spectra ADF (AUX_SCS)

ADF	Update Reason

Table 7 AUX_SCS Updates

5. Manoeuvres

Table 8 gives a list of the S1-A orbit manoeuvres that occurred during the reporting period[1]:

Start Date	Start Time	Stop Date	Stop Time	Comment
11/05/2017	00:40:19.251	11/05/2017	00:40:25.376	
24/05/2017	21:48:21.348	24/05/2017	21:52:37.973	
24/05/2017	22:49:59.397	24/05/2017	22:50:37.772	
01/06/2017	00:19:30.355	01/06/2017	00:19:35.605	
14/06/2017	23:59:45.006	14/06/2017	23:59:52.756	
21/06/2017	23:48:35.169	21/06/2017	23:49:05.919	
22/06/2017	00:38:23.615	22/06/2017	00:38:48.490	

Table 8 S1-A Orbit Manoeuvres

[1] This table is extracted from the DBL file of the SAFE product containing the list of thruster event by applying : awk 'NR>1 {if ($3=1) start=$1 ; getline; print start";"$1}'

6. Products Status

6.1. Level 0 Products

Figure 1 show missing lines, data gaps, and timeline failures derived from L1 annotation products (purple for IW, blue for EW and green for WV):-

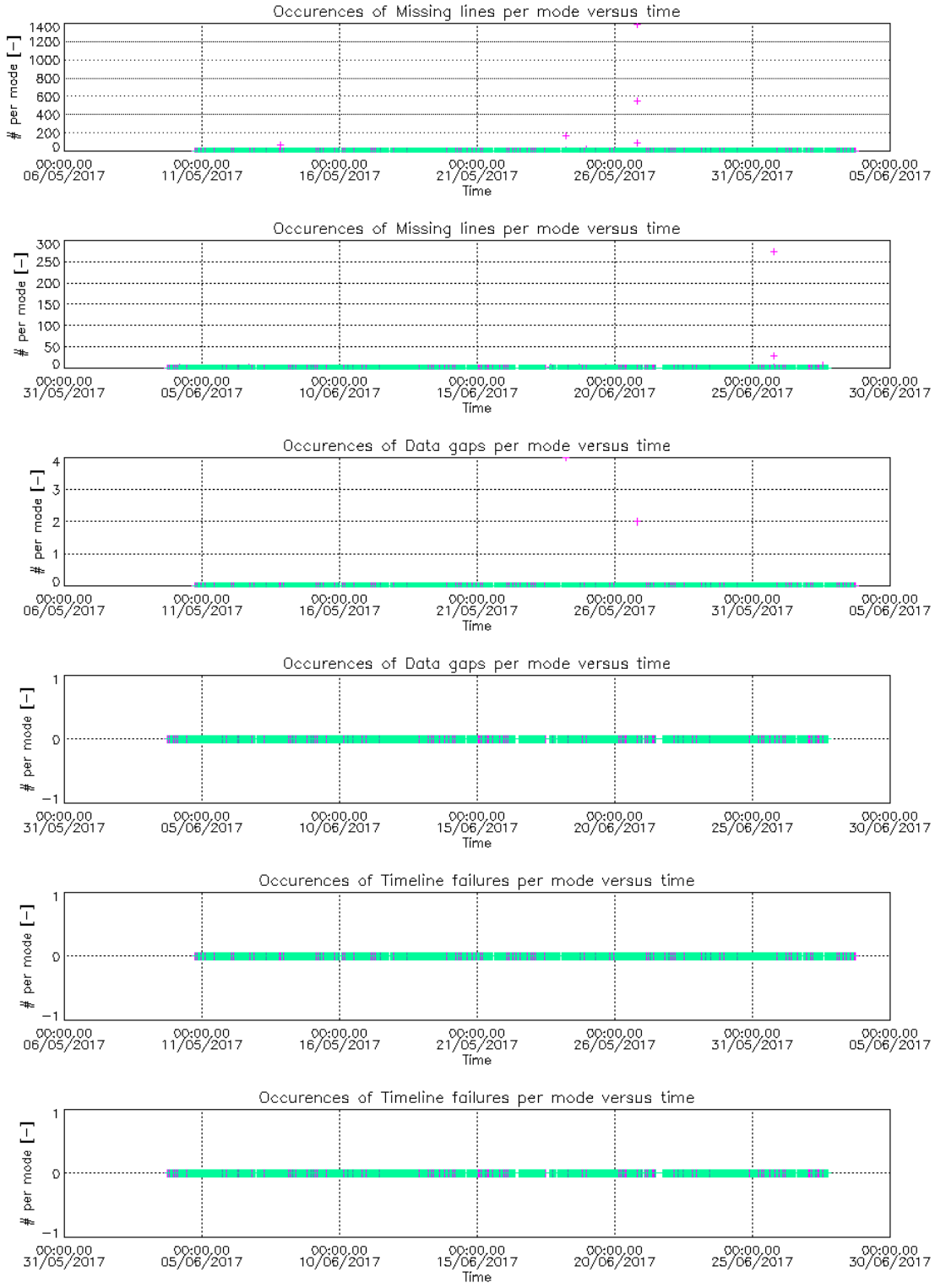


Figure 1 Missing Lines, Data Gaps and Timeline Failures.

The above plots indicate no problems with missing lines and data gaps plus a small number of timeline failures.

Figure 2 and Figure 3 show I and Q trends and imbalance for IW and WV modes:

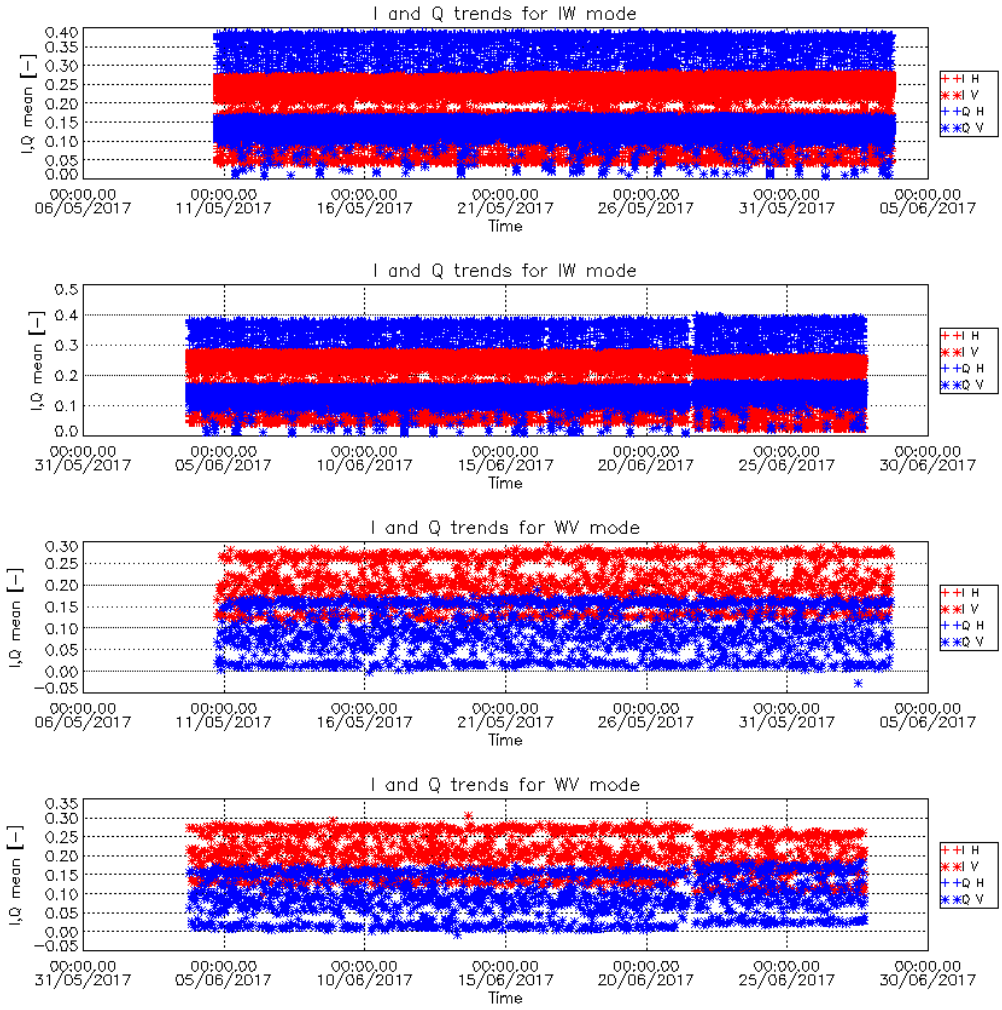
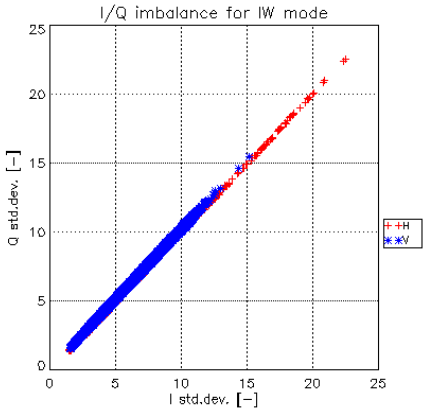
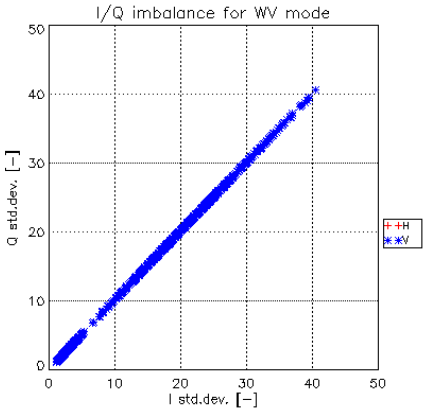


Figure 2 I&Q Channels

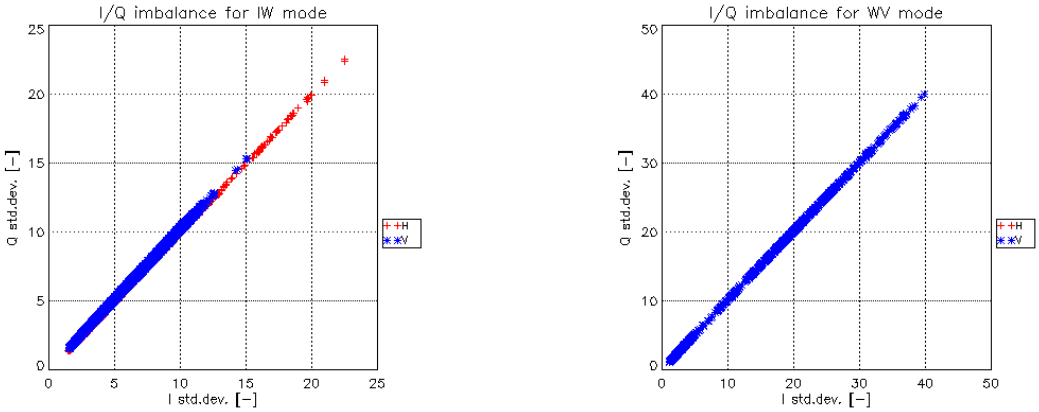
The jumps that may be noticed on the above time-series are related to instrument switch on/off, and correspond to a normal behaviour, that is compensated at processing level. It therefore has no impact on data quality.



Cycles 109 & 110



Cycles 109 & 110



Cycles 111 & 112 Cycles 111 & 112

Figure 3 WV I&Q Channel Imbalance

The I & Q imbalance plots in the figure above (*left*: IW mode, *right*: WV mode) indicate that the Rx I and Q channels are perfectly balanced.

6.2. Level 1 Products

6.2.1. Image Quality

Figure 4 and Table 9 give the azimuth and range spatial resolution using the Australian corner reflector array, the BAE corner reflector and the DLR transponders & corner reflectors derived from IW imagery acquired during the reporting period. The spatial resolution has been derived from SLC data. Table 10 gives the impulse response function (IRF) sidelobe ratios. These indicate a nominal IRF performance.

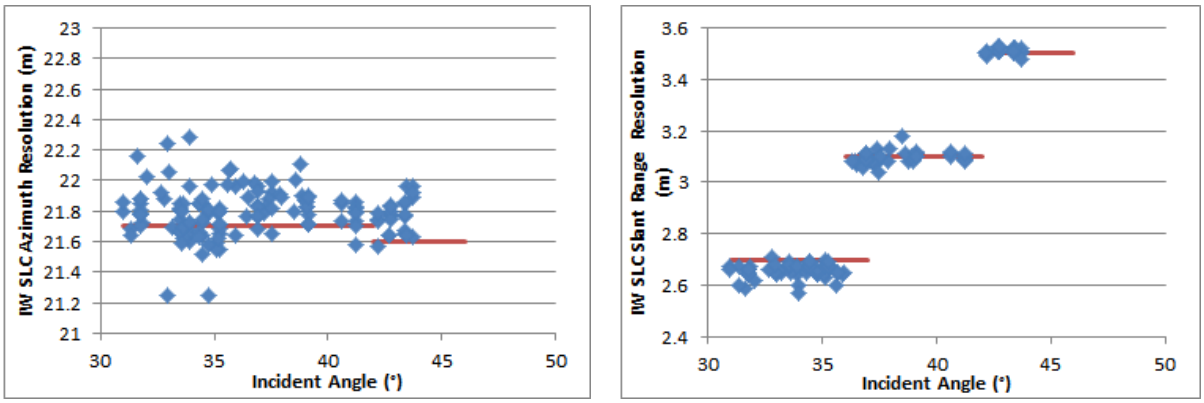


Figure 4 IW Azimuth and Slant Range Spatial Resolutions

Mode/Swath	Azimuth Spatial Resolution (m)	Slant Range Spatial Resolution (m)
IW1	21.78±0.18	2.66±0.03
IW2	21.84±0.10	3.10±0.02
IW3	21.77±0.11	3.51±0.01

Table 9 IW Azimuth and Slant Range Spatial Resolutions

Mode/Swath	Integrated Sidelobe Ratio (dB)	Peak Sidelobe Ratio (dB)	Spurious Sidelobe Ratio (dB)
IW	-12.46±2.83	-20.07±0.99	-24.67±3.17

Table 10 IW Sidelobe Ratios

No Equivalent Number of Looks/Radiometric Resolution and Ambiguity measurements were made during the reporting period.

6.2.2. Radiometric Calibration

Figure 5 and Figure 6 give the relative radar cross-section using the DLR transponders & corner reflectors, Australian corner reflector array and the BAE corner reflector derived from IW imagery acquired during the reporting period. The relative radar cross-section has been derived from SLC data. These indicate a nominal radiometric calibration performance (where there is sufficient number of measurements per sub-swath).

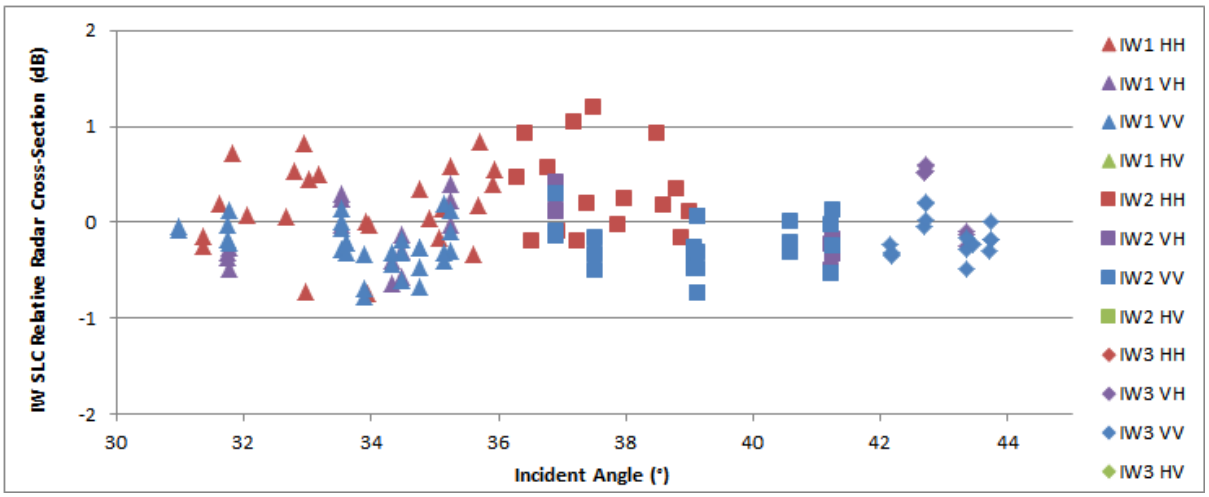


Figure 5 IW Relative Radar Cross-Section

Mode/Swath	Relative Radar Cross-Section (dB)				
	All	HH	VH	VV	HV
IW1	-0.08±0.38	0.17±0.43	-0.13±0.34	-0.24±0.25	
IW2	-0.01±0.44	0.35±0.47	-0.09±0.32	-0.25±0.27	
IW3	-0.05±0.32		0.25±0.39	-0.17±0.19	

Table 11 IW Relative Radar Cross-Section

Figure 6 shows the IW long-term relative radar cross-section of the BAE corner reflector since the start of the Sentinel-1A routine phase (October 2014). The mean relative radar cross-section is -0.12±0.21 dB (the majority of the measurements are for VV polarisation). There is an indication of a drift in the relative radar cross-section since mid-2016 – this is being investigated.

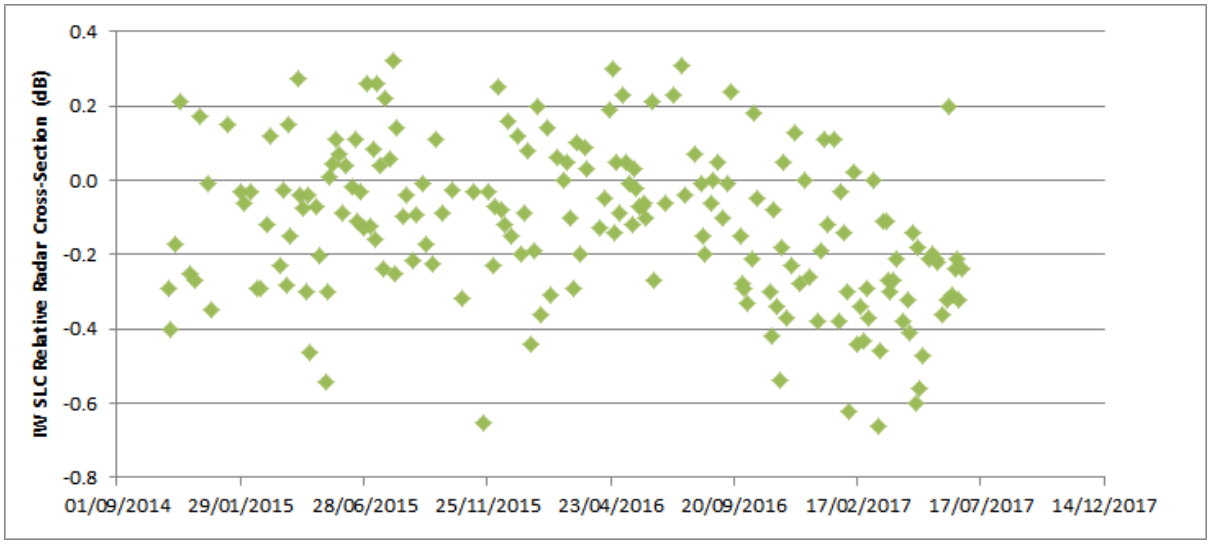


Figure 6 IW Long-Term Relative Radar Cross-Section

Figure 7 show a recent IW VV Permanent Scatter Calibration series over Paris. The series covers the whole of 2016 and includes the tile 11 issue (June 2016). after the issue only a small reduction of the calibration constant can be observed (about 0.1 dB), meaning that the TX power reduction for half tile 11 is mostly captured by the internal calibration PG product. Overall S1A shows a good radiometric stability.

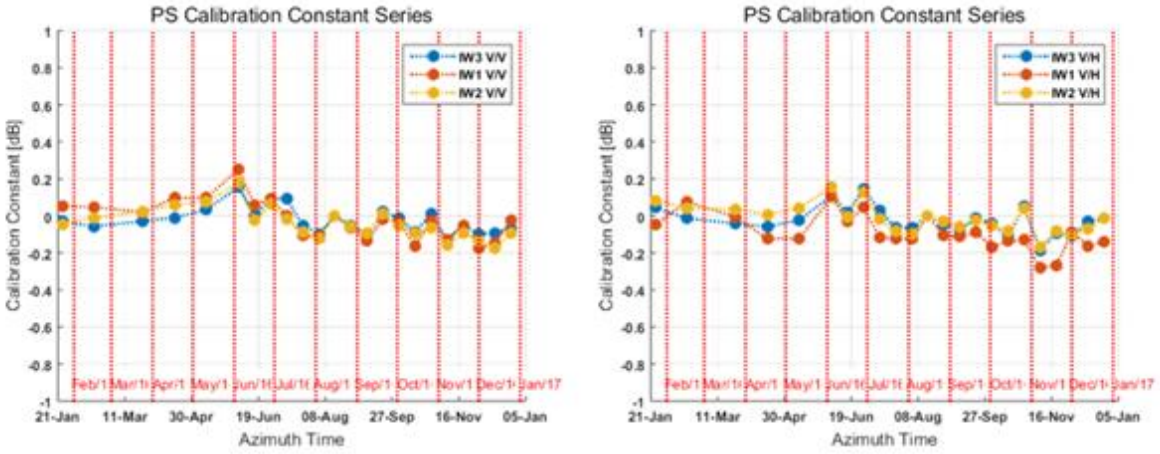


Figure 7 Permanent Scatter Calibration time series for TopSAR IW V/V (left) and V/H (right) over Paris.

6.2.3. Geometric Calibration

Figure 8 shows the absolute location error (ALE) based on the only two S1-A SLC products from the IW acquisition mode acquired during the current reporting period (an azimuth-adjacent product pair, both from the same date). The points have been colour-coded and labelled to reflect the numerical labels assigned to them by Geoscience Australia. The products were analysed using both precise and near-real-time restituted orbit files, depending on their availability at the time of reporting. Atmospheric path delay (PD) and azimuth timing errors (residual error from the bistatic correction made by the IPF) have also been mitigated. Note that PD correction depends on the local incident angle, which is considered here for the individual corner reflectors spanning the over-100km wide array.

A new range correction was applied for the first time here, with the improvement visible as the change from Figure 8 (a) to (b). In (a), only the path delay correction was made during range

geolocation; in (b), the new "intra-burst-dependent" range shift was applied as well. This correction takes into account a recently understood shift that is produced as a side-effect of TOPS processing. The azimuth beam steering, required to obtain data from the three IW (or 5 EW) subswaths, generates a Doppler frequency ramp. In combination with the "classical" azimuth FM rate, the total Doppler azimuth variation of the focused burst varies linearly along the length of a burst. As a result, a small additional range shift is introduced that is proportional to the distance from the burst centre. The origins of this effect are discussed in the context of TOPS product phase deramping in the ESA technical note: Miranda, N. 2015: "Definition of the TOPS SLC deramping function for products generated by the S-1 IPF," Ref. COPE-GSEG-EOPG-TN-14-0025, Iss. 1 Rev. 2. Future cyclic reports will include this correction without further detailed discussion. In (b), in can be observed that the mean offset moves closer to zero compared with (a), and the standard deviation also decreases.

The points can additionally be observed to cluster into two distinct groups corresponding to the subswaths IW1 and IW2, a feature of these analyses that has already been well-established for other test sites, for both S1-A and S1-B. It is the result of the way the data are processed, and has been under investigation for some time with currently only a partial explanation available. The effect will be corrected in a future version of the S-1 processor.

In spite of the known biases, the IW mode ALE plots indicate a nominal localisation performance; the range and azimuth ALE mean and standard deviations are annotated in the upper left corner of the figure subplot. The standard deviations are better than the specified 1-sigma ALE for IW mode products (3.33m, i.e. 10m at 3 sigma; see section 5.5.2.2 of the "GMES Sentinel-1 System Requirements Document," Ref. S1-RS-ESA-SY-0001, Iss. 3, Rev. 3).

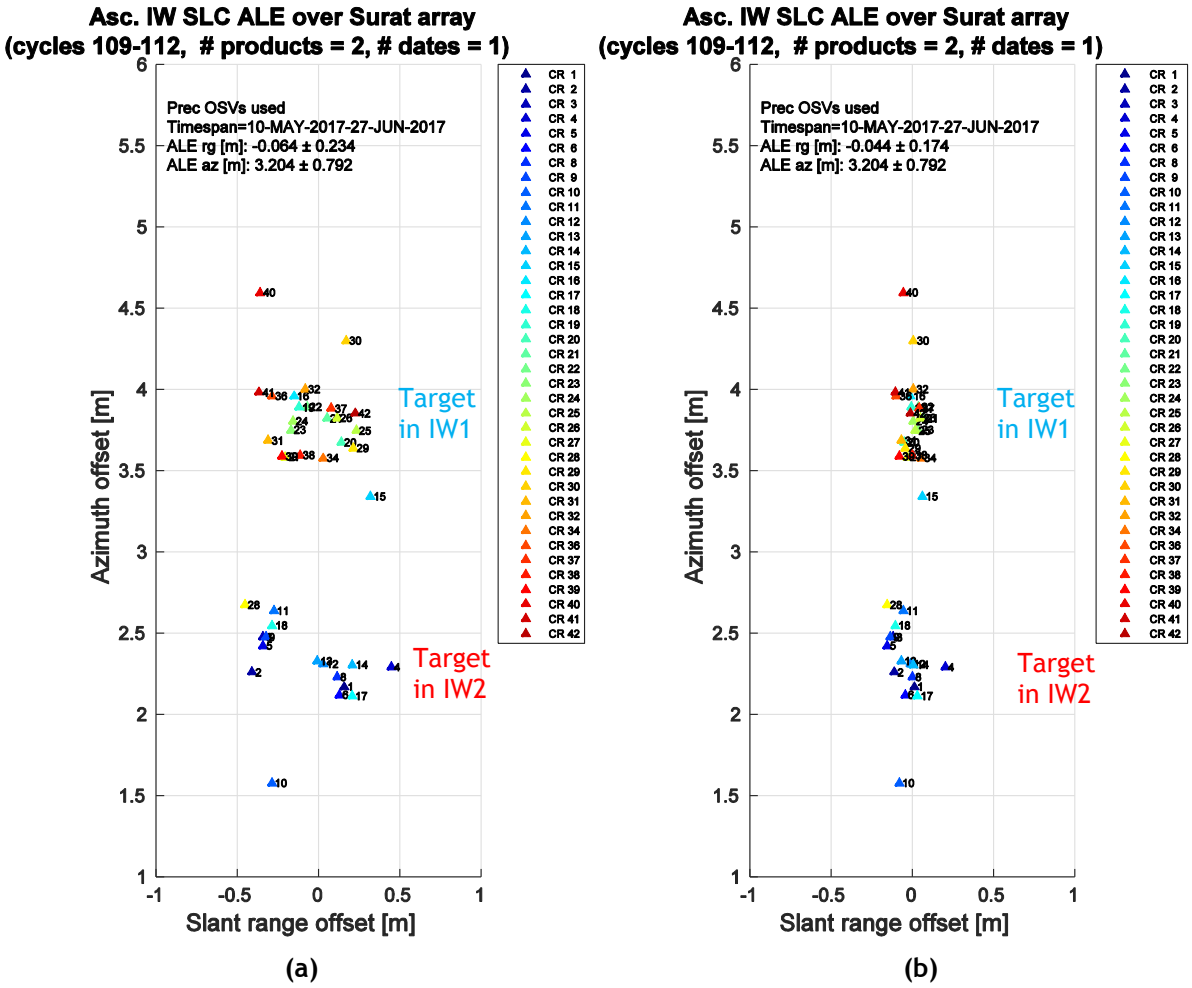


Figure 8 S1-A absolute localisation error based on the pair of azimuth-adjacent IW SLC S-1A products acquired over the test site during the current reporting period. Path delay and azimuth timing corrections have been made. The two labelled groups in each plot contain points from subswaths IW1 and IW2, a known effect observed over other targets as well. In (a), the standard range corrections were made (atmospheric path delay); in (b), an additional range correction was made ("intra-burst-dependent" delay).

6.2.4. Polarimetric Calibration

Table 12 gives the co-registration between the two polarisations of dual-polarisation products acquired during the reporting period (based in DLR transponder measurements). No channel distortion measurements were made during the reporting period.

Mode/Swath	Range Co-registration Accuracy (m)	Azimuth Co-registration Accuracy (m)	Channel Distortion (dB)
IW	0.03±0.09	0.12±0.44	

Table 12 Polarimetric Calibration Measurements

6.2.5. Elevation Antenna Patterns

The S1-A Elevation Antenna Patterns (EAPs) were updated during the reporting period following the Tile 11 Anomaly in June 2016 (as reflected in S1A_AUX_CAL_V20160627T000000_G20170522T132042.SAFE). This update only relates to RDB#5. Figure 9 and Figure 10 show the difference between the new and previous EAPs for IW and EW modes. Since the inverse of the EAP is applied in the SAR processor, the relative RCS of distributed and point targets will in general increase depending on their incident angle.

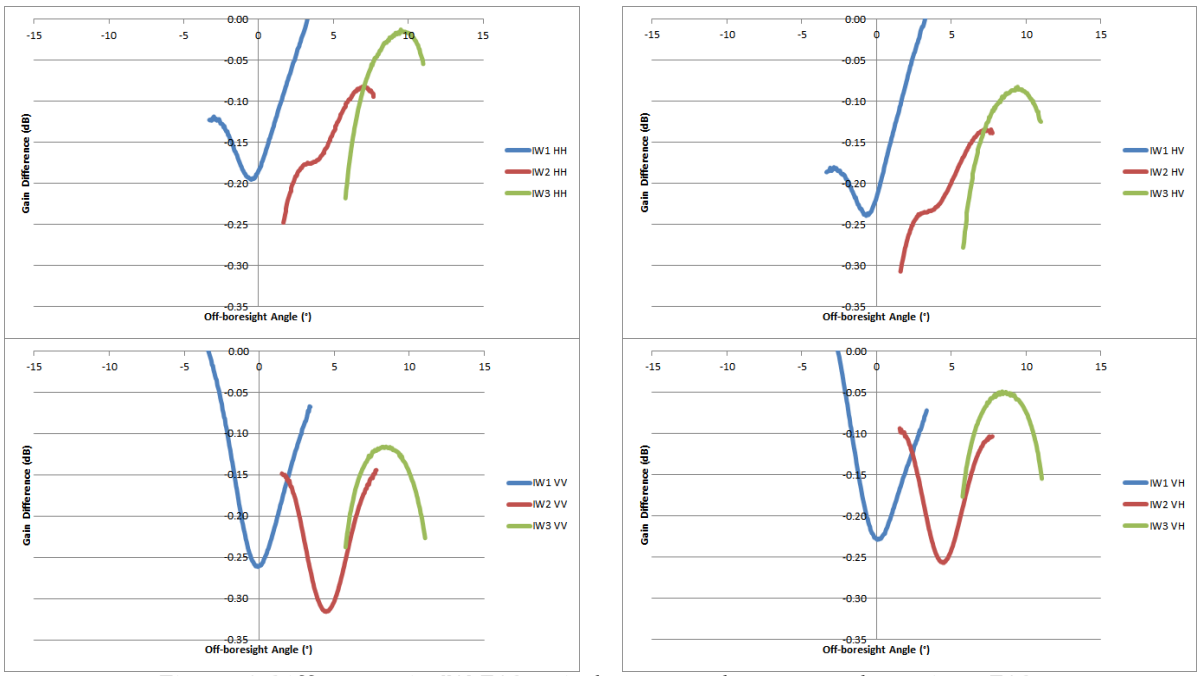


Figure 9 Difference in IW EAP gain between the new and previous EAPs.

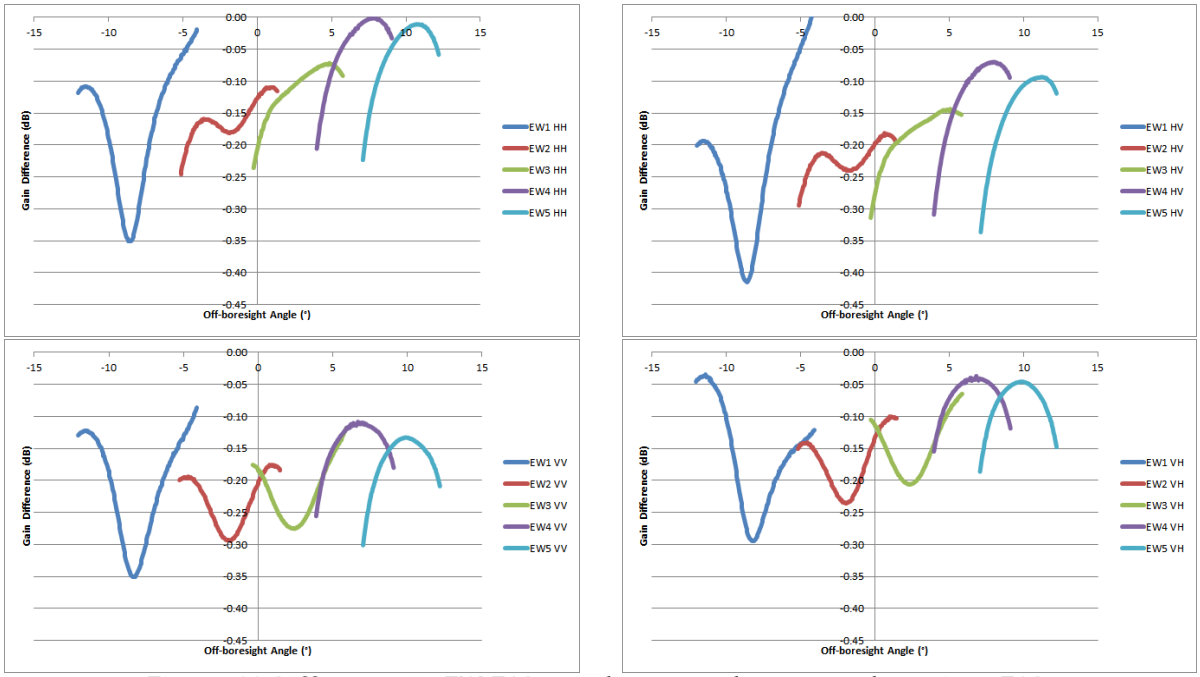


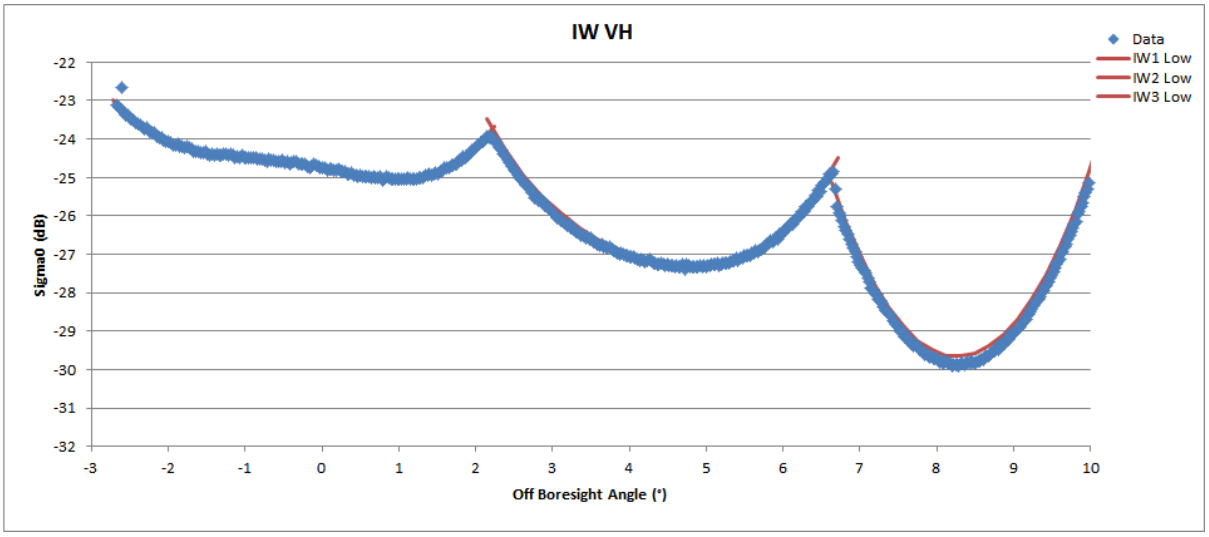
Figure 10 Difference in EW EAP gain between the new and previous EAPs.

6.2.6. Azimuth Antenna Patterns

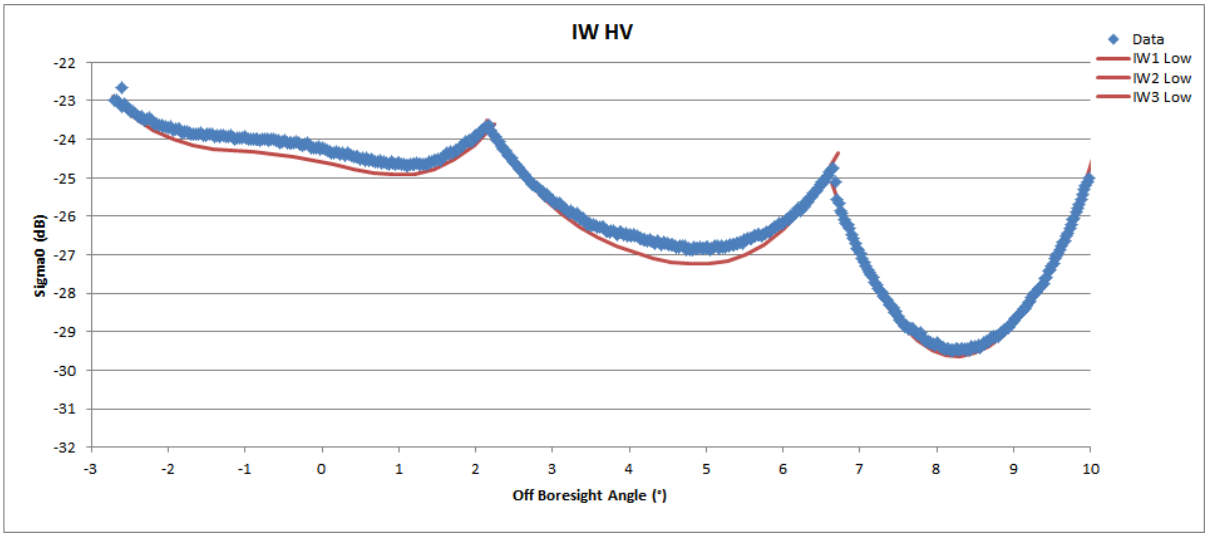
No Azimuth Antenna Patterns (AAPs) were updated during the reporting period.

6.2.7. Noise Equivalent Radar Cross-section

The following Noise Equivalent Sigma0 Zero (NESZ) measurements were made during the reporting period.

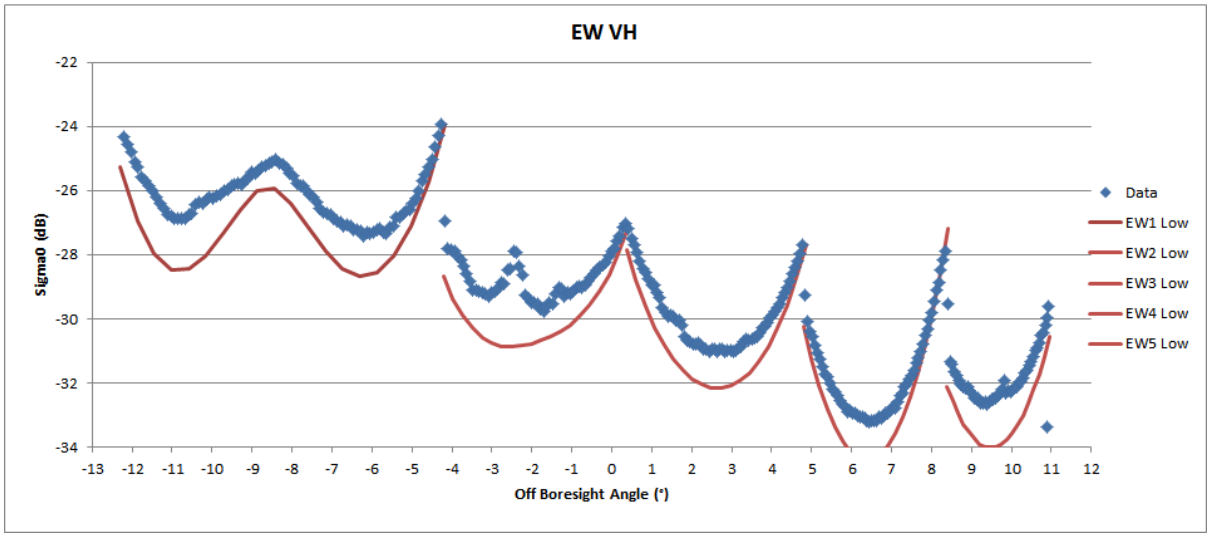


S1A_IW_GRDH_1SDV_20170515T122159_20170515T122227_016592_01B85F_BB84.SAFE



S1A_IW_GRDH_1SDH_20170603T121350_20170603T121418_016869_01C0E3_80AE.SAFE

Figure 11 NESZ measures for IW. Blue is the measured NESZ and the red lines are the predicted NESZ at minimum orbital altitude.

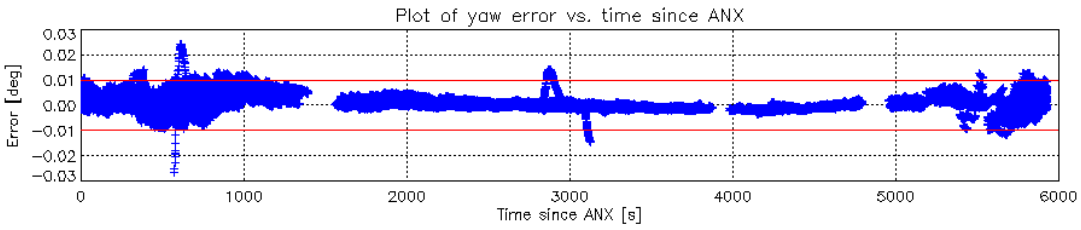


S1A_EW_GRDH_1SDV_20170608T122142_20170608T122229_016942_01C330_27F7.SAFE

Figure 12 NESZ measures for EW. Blue is the measured NESZ and the red lines are the predicted NESZ at minimum orbital altitude.

6.2.8. Antenna Pointing

Figure 13 shows yaw, pitch and roll errors calculated for the reporting period against ascending node crossing time (ANX). The red horizontal lines show the nominal ±0.01° bounds for these attitude errors – points outside these bounds are normally due to orbit manoeuvres.



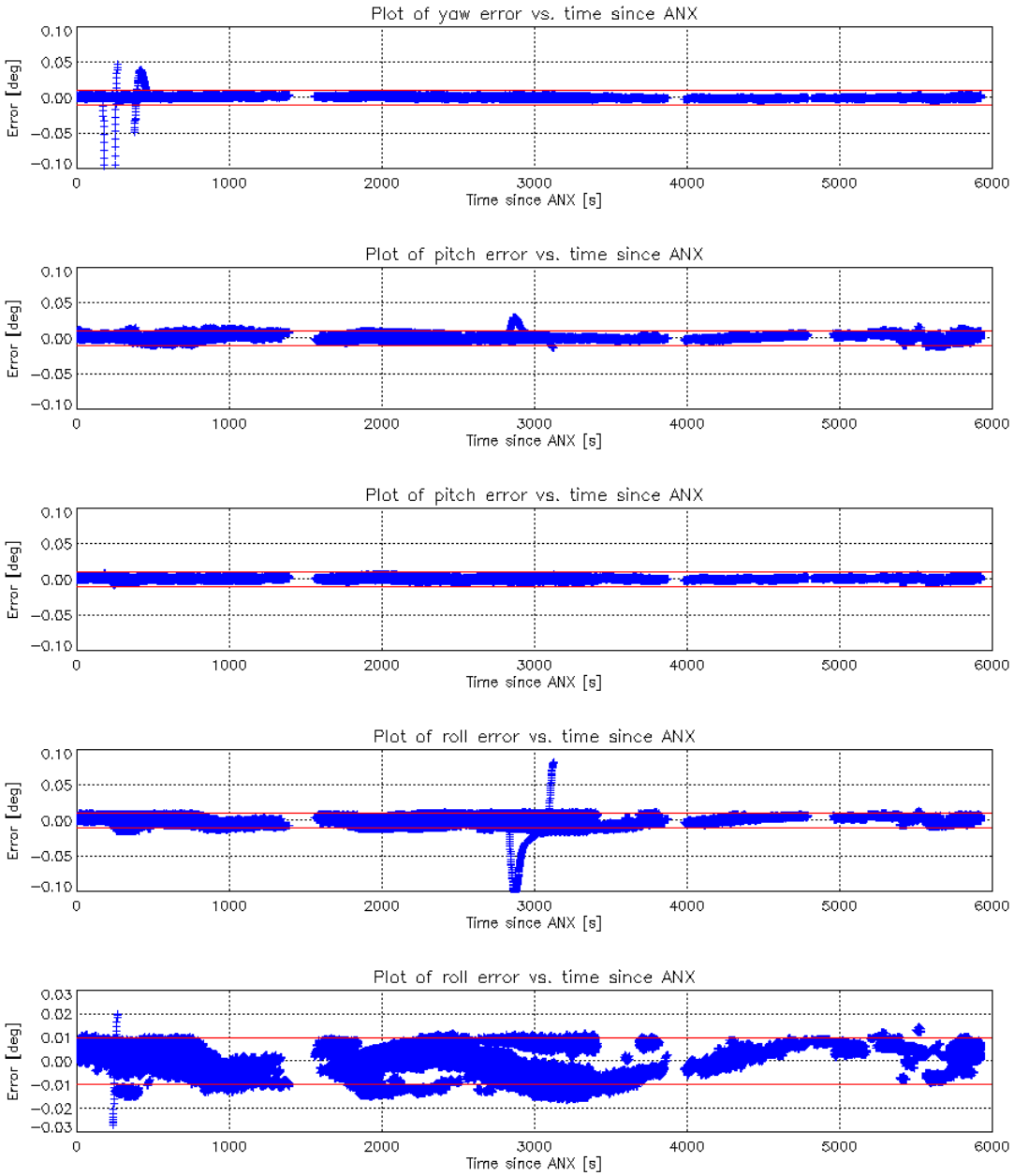
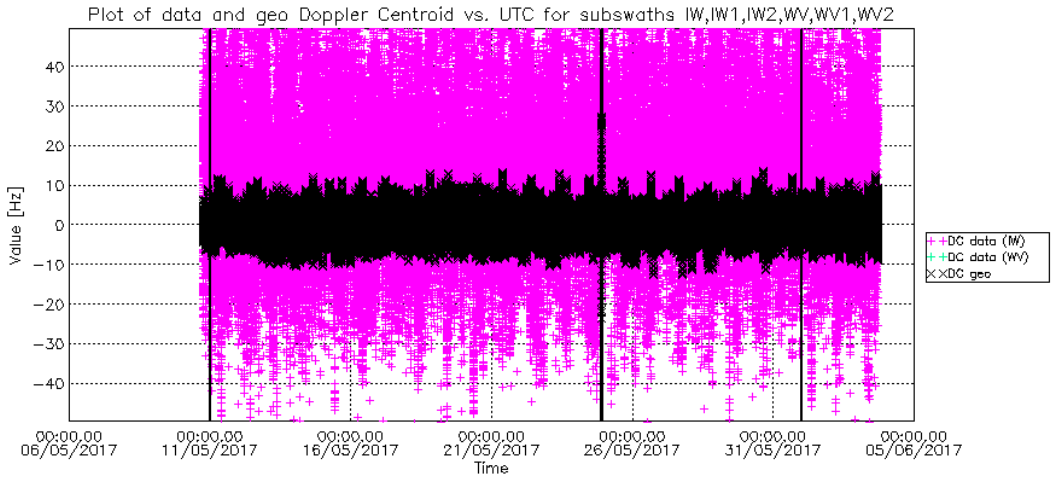
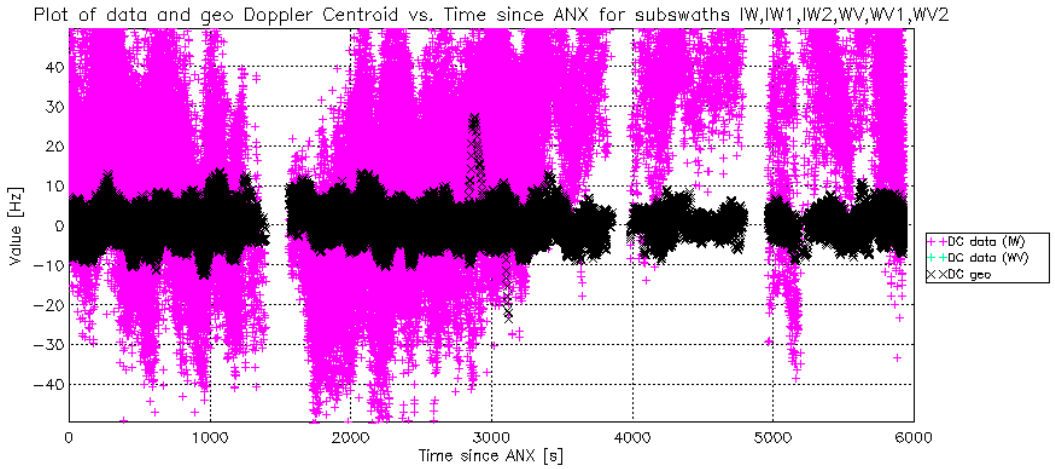
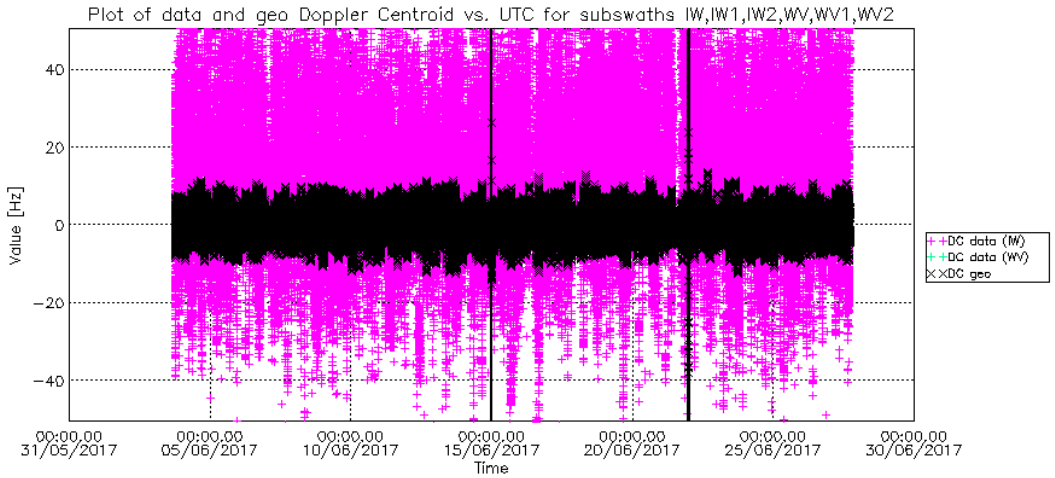


Figure 13 S1-A Yaw, Pitch and Roll Errors

Figure 14 shows the Doppler Centroid frequency as a function of date and ANX. The data has been derived from IW & WV data and from geometry. Note that it is expected that the Doppler estimation from WV mode data will have a higher standard deviation than from IW mode due to the Doppler estimation over the ocean will be noisier than over land. Table 13 gives the statistics based on Doppler Centroid derived from IW and WV data. A more detailed plot of Doppler Centroid frequency derived over land from SM, IW and EW products is shown in Figure 15.







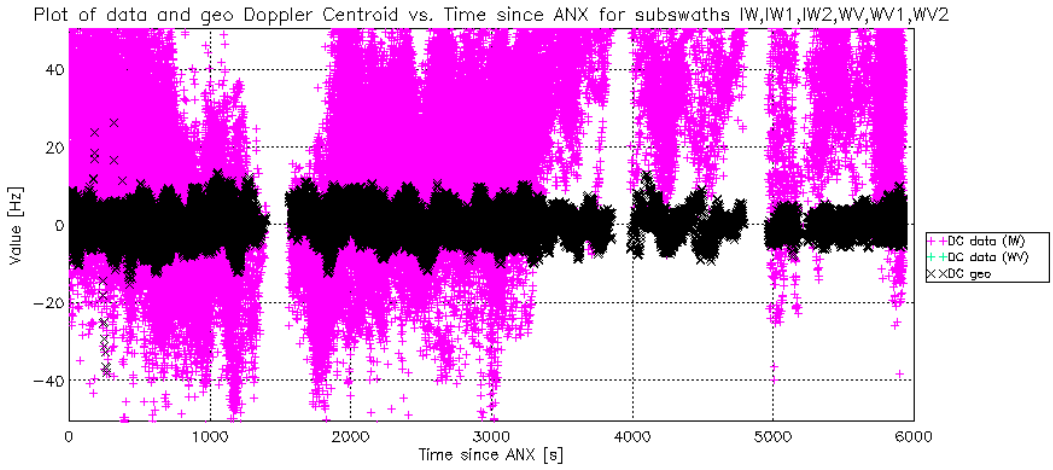


Figure 14 S1-A Doppler Centroid

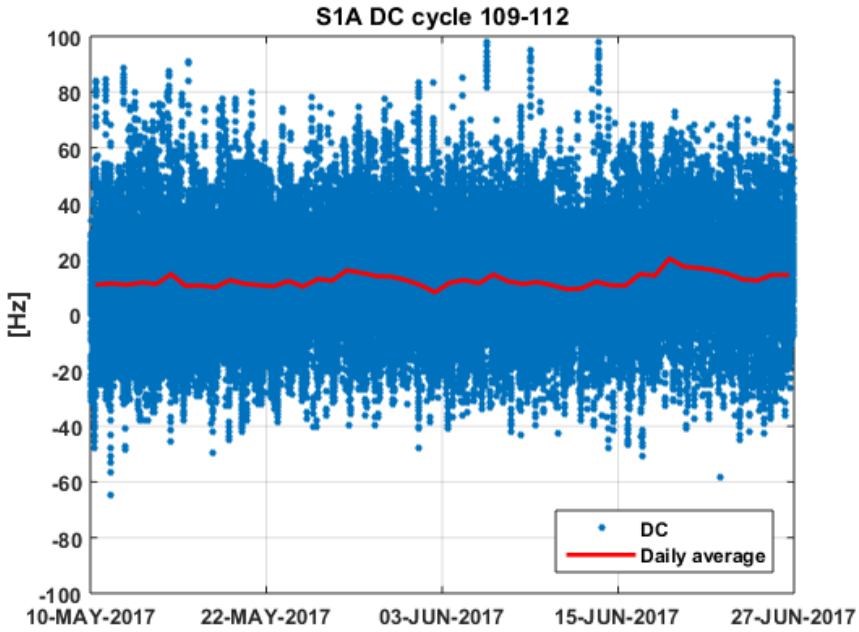


Figure 15 S1-A Doppler Centroid

	Min (Hz)	Mean (Hz)	Max (Hz)
Cycles 109 & 110	-107.49	12.65±19.38	131.25
Cycles 111 & 112	-97.06	13.59±19.25	145.11

Table 13 Doppler Centroid Statistics

6.2.9. Summary of Anomalies

There were no anomalies during the reporting period.

6.2.10. Quality Disclaimers

No L1 product quality disclaimers were issued during the reporting period (see Appendix E for a list of issued and prepared quality disclaimers). A full list of issued quality disclaimers can also be found on the QC Web site.

Appendix A - **List of Acronyms**

AAP	Azimuth Antenna Pattern
AD	Applicable Document
ADF	Auxiliary Data File
ALE	Absolute Localisation Accuracy Error
ANX	Ascending Node Crossing Time
EAP	Elevation Antenna Pattern
EW	Extra Wide Swath
IPF	Instrument Processing Facility
IRF	Impulse Response Function
IW	Interferometric Wide Swath
NESZ	Noise Equivalent Sigma0 Zero
PD	Path Delay
PSCAL	Permanent Scatter Calibration
RD	Reference Document
RDB	Radar Data Base
Rx	Receive
SM	Stripmap
TBC	To be confirmed
TBD	To be defined
TRM	Transmit Receive Module
Tx	Transmit
WV	Wave Mode

Appendix B - **S1-A Transmit Receive Module Failures**

The following S1-A antenna TRM have failed since the S1-A launch:

TRM	Description	Date of Failure
Tile 4, Row 11	Tx, H & V	05-May-2014
Tile 4, Row 12	Tx, H & V	05-May-2014
Tile 4, Row 11	Rx, V	05-May-2014
Tile 4, Row 12	Rx, V	05-May-2014
Tile 4, Row 12	Rx, H	09-June-2014
Tile 5, all TRM failures (intermittent)	Rx, H & V	Between 18-Oct-2014, 15:29:30 UT and 20-Jan-2015, 19:04:54 UT
Tile 5, all TRM failures (intermittent)	Rx, H & V	Between 18-Mar-2015, 04:09:00 UT and 20-Mar-2015, 11:46:30 UT
Tile 5, all TRM failures (intermittent)	Rx, H & V	Between 26-Mar-2015, 16:20:00 UT and 28-Mar-2015, 02:50:30 UT
Tile 12, Row 16 (intermittent)	Tx V & Rx V	Between 16-Apr-2015 and 18-Apr-2015
Tile 5, all TRM failures (intermittent)	Rx, H & V	Between 18-Apr-2015, 17:40:21 UT and 24-Apr-2015, 17:48:08 UT
Tile 12, Row 16 (intermittent)	Tx V & Rx V	Between 20-Apr-2015 and 28-Apr-2015
Tile 5, all TRM failures (intermittent)	Rx, H & V	Between 25-Apr-2015 17:37:37 UT and 30-Apr-2015, 23:01:11 UT
Tile 4, Row 11	Rx H	29-Apr-2015, 21:57:30 UT
Tile 12, Row 16 (intermittent)	Tx V & Rx V	Between 01-May-2015 and 04-May-2015
Tile 5, all TRM failures (intermittent)	Rx, H & V	Between 05-May-2015, 05:12:51 UT and 06-May-2015, 00:44:43 UT
Tile 12, Row 16	Tx V & Rx V	18-May-2015, 22:33:36 UT
Tile 5, all TRM failures	Rx, H & V	Between 26-May-2015, 19:06:00 UT and 27-May-2015, 06:07:00 UT
Tile 5, all TRM failures	Rx, H & V	Between 06-Jun-2015, 06:35:00 UT and 14-July-2015, 10:43:00 UT
Tile 5, all TRM failures	Rx, H & V	Between 17-July-2015, 19:07:00 UT and 21-July-2015, 11:58:00 UT
Tile 11, Rows 1 to 10	Tx H, Tx V	16 June -27 June 2016

Appendix C - **S1-A Instrument Unavailability**

The S1-A instrument has been unavailable during the following periods since S-1A launch:

Start Date/Time	End Date/Time	MPC Reference	Summary
26/04/2014 11:56	29/04/2014 12:13	SOB-23	Sentinel-1A Unavailability - Instrument Anomaly
29/05/2014 14:00	02/06/2014 17:00	SOB-27	Sentinel-1A Unavailability - Spacecraft Anomaly
06/07/2014 05:04	08/07/2014 15:22	SOB-39	Sentinel-1A Unavailability - Spacecraft Anomaly
21/07/2014 03:30	23/07/2014 08:35	SOB-40	Sentinel-1A Unavailability - Instrument Switch OFF for test
12/08/2014 09:37	12/08/2014 15:31	SOB-47	Sentinel-1A Unavailability - Onboard planned operation
21/08/2014 07:59	21/08/2014 15:29	SOB-49	Sentinel-1A Unavailability - Instrument Anomaly
25/08/2014 09:49	25/08/2014 17:50	SOB-50	Sentinel-1A Unavailability - SAR Instrument
03/09/2014 08:30	04/09/2014 15:11	SOB-53	Sentinel-1A Unavailability - SAR Instrument
20/09/2014 22:30	21/09/2014 12:06	SOB-62	SAR anomaly from 20/09 at 22:30 UTC to 21/09 12:06 UTC
23/09/2014 08:00	23/09/2014 20:00	SOB-60	S1PDGS - SAR & X-Band downlink unavailability on Tuesday 23rd from 08:00 CET to 20:00 CET
26/09/2014 21:40	27/09/2014 09:42	SOB-63	SAR instrument unavailable between 26/09/2014 21.40.48 UTC and 27/09/2014 09.42.38 UTC
29/09/2014 14:56	30/09/2014 15:17	SOB-64	SAR instrument unavailability from 29/09/2014 16.54 UTC to 30/09/2014 at 15.17 UTC.
06/10/2014 10:51	06/10/2014 14:05	SOB-70	Sentinel-1A Unavailability - SAR Anomaly
07/10/2014 06:30	07/10/2014 21:30	SOB-69	Sentinel-1A Unavailability - planned maintenance
10/10/2014 21:52	11/10/2014 11:03	SOB-73	Sentinel-1A Unavailability - SAR anomaly
13/10/2014 08:00	13/10/2014 12:48	SOB-71	Sentinel-1A Unavailability - Planned maintenance
19/11/2014 10:20	19/11/2014 14:50	SOB-91	Sentinel 1A unavailability
29/12/2014 20:45	30/12/2014 11:33	SOB-99	Sentinel-1A Unavailability
20/01/2015 07:30	20/01/2015 18:00	SOB-112	Sentinel-1A Unavailability - Planned maintenance

Start Date/Time	End Date/Time	MPC Reference	Summary
01/02/2015 07:50	02/02/2015 16:26	SOB-116	Sentinel-1A unavailability from 01/02/2015 7h50 to 02/02/2015 16h27
17/02/2015 19:56	18/02/2015 16:02	SOB-118	Sentinel-1A Unavailability - since 17/02/15 evening to 18/02/15 afternoon
19/02/2015 13:29	20/02/201510:15	SOB-121	Sentinel-1A unavailability from 19/02/2015 13h29 to 20/02/2015 10h15
14/04/2015 08:30	14/04/2015 17:00	SOB-147	Sentinel-1A unavailability planned on 14/04/2015 for maintenance
09/05/2015 23:19	10/05/2015 15:39	SOB-159	Sentinel-1A unavailability on 10/05/2015
19/05/2015 05:00	19/05/2015 12:00	SOB-168	Sentinel-1A planned unavailability on 19/05/2015 (RDB#4 uplink onboard)
28/05/2015 04:00	28/05/2015 14:30	SOB-170	Planned Sentinel-1A unavailability on 28/05/2015 for maintenance purpose
20/06/2015 15:30	21/06/2015 13:00	SOB-176	Sentinel-1A unavailability on 20 and 21/06/2015
22/07/2015 06:35	22/07/2015 08:21	SOB-206	Sentinel-1A Planned Unavailability (RDB#5)
03/08/2015 02:37	03/08/2015 18:33	SOB-207	Sentinel-1A Unavailability from orbit 7093 to 7101
04/08/2015 04:52	04/08/2015 13:47	SOB-208	Sentinel-1A Unavailability from orbit 7103 to 7114
04/08/2015 23:44	05/08/2015 11:20	SOB-209	Sentinel-1A Unavailability from orbit 7120 to 7128
09/08/2015 21:22	10/08/2015 16:14	SOB-210	Sentinel-1A Unavailability from orbit 7192 to 7204
04/09/2015 16:54	05/09/2015 11:08	SOB-214	Sentinel-1A Unavailability from 04/09 to 05/09/2015
23/09/2015 07:20	23/09/2015 11:56	SOB-222	Sentinel-1A Unavailability from orbit 7840 to 7842
19/10/2015 16:28	20/10/2015 07:27	SOB-226	Sentinel-1A Unavailability from 19/10 to 20/10/2015
21/10/2015 14:54	22/10/2015 07:12	SOB-227	Sentinel-1A Unavailability from 21/10 to 22/10/2015
05/11/2015 16:50	06/11/2015 12:20	SOB-229	Sentinel-1A Unavailability from 05/11 to 06/11/2015
07/11/2015 17:53	08/11/2015 12:10	SOB-230	Sentinel-1A Unavailability from 07/11 to 08/11/2015
18/11/2015 07:40	18/11/2015 12:28	SOB-233	Sentinel-1A Unavailability on 18/11/2015
29/11/2015 22:54	30/11/2015 11:10	SOB-251	Sentinel-1A Unavailability from 29/11 to 30/11/2015
10/12/2015 07:30	10/12/2015 13:00	SOB-252	Sentinel-1A Planned unavailability on 10/12/2015

Start Date/Time	End Date/Time	MPC Reference	Summary
11/12/2015 02:30	11/12/2015 16:00	SOB-253	Sentinel-1A Unavailability on 11/12/2015
02/01/2016 04:45	02/01/2016 15:14	SOB-255	Sentinel-1A Unavailability on 02/01/2016
16/01/2016 14:59	16/01/2016 19:57	SOB-257	Sentinel-1A Unavailability on 16/01/2016
21/02/2016 18:17	22/02/2016 10:51	SOB-310	Sentinel-1A Unavailability from 21/02/2016 to 22/02/2016
13/03/2016 08:23	13/03/2016 16:14	SOB-332	Sentinel-1A Unavailability on 13/03/2016
15/03/2016 07:46	15/03/2016 09:36	SOB-340	Sentinel-1A Planned Maintenance on 15/03/2016
06/05/2016 21:17	07/05/2016 14:27	SOB-389	Sentinel-1A Unavailability from 06/05/2016 to 07/05/2016
22/05/2016 14:51	22/05/2016 18:11	SOB-411	Sentinel-1A Unavailability on 22/05/2016
16/06/2016 05:59	16/06/2016 13:57	SOB-447	Sentinel-1A Unavailability on 16/06/2016
16/06/2016 16:45	17/06/2016 11:26	SOB-448	Sentinel-1A Unavailability between 16/06/2016 and 17/06/2016
17/06/2016 11:45	27/06/2016 16:32	SOB-467	Sentinel-1A Unavailability between 17/06/2016 and 27/06/2016
02/07/2016 04:52	02/07/2016 13:23	SOB-476	Sentinel-1A Unavailability on 02/07/2016
10/07/2016 06:39	10/07/2016 17:51	SOB-483	Sentinel-1A Unavailability on 10/07/2016
11/07/2016 21:32	12/07/2016 12:05	SOB-507	Sentinel-1A Unavailability on 11/07/2016
27/07/2016 07:49	27/07/2016 15:42	SOB-508	Sentinel-1A Unavailability on 27/07/2016
27/08/2016 23:58	28/08/2016 09:45	SOB-533	Sentinel-1A Unavailability from 27/08/2016 to 28/08/2016
24/11/2016 20:38	25/11/2016 11:34	SOB-614	Sentinel-1A Unavailability from 24/11/2016 to 25/11/2016
04/12/2016 06:52	04/12/2016 11:07	SOB-624	Sentinel-1A Unavailability on 04/12/2016
16/06/2017 09:09	16/06/2017 12:31	SOB-751	Sentinel-1A Unavailability on 16/06/2017
17/06/2017 11:43	17/06/2017 14:43	SOB-752	Sentinel-1A Unavailability on 17/06/2017
21/06/2017 14:09	21/06/2017 17:35	SOB-753	Sentinel-1A Unavailability on 21/06/2017

Appendix D - **S1-A Auxiliary Data Files**

The following is a full list of currently applicable ADF updates:

Instrument ADF (AUX_INS)

ADF	Update Reason
S1A_AUX_INS_V20140406T133000_G20160215T161024.SAFE	Updated PG model and default noise values related to RDB#1.
S1A_AUX_INS_V20140616T135500_G20160215T161549.SAFE	Updated PG model and default noise values related to RDB#2.
S1A_AUX_INS_V20140915T100000_G20160215T161938.SAFE	Updated PG model and default noise values related to RDB#3.
S1A_AUX_INS_V20150519T120000_G20160215T162440.SAFE	Updated PG model and default noise values related to RDB#4.
S1A_AUX_INS_V20150722T120000_G20160215T163523.SAFE	Updated PG model and default noise values related to RDB#5.

Calibration ADF (AUX_CAL)

ADF	Update Reason
S1A_AUX_PP1_V20140406T133000_G20170328T093347.SAFE	Updates of (a) noise calibration factors and (b) Elevation antenna pattern in S1A_AUX_CAL to implement the outcome of recalibration #2 activities performed in preparation to IPF V282 deployment. Related to RDB#1.
S1A_AUX_CAL_V20140616T133500_G20170328T093438.SAFE	Updates of (a) noise calibration factors and (b) Elevation antenna pattern in S1A_AUX_CAL to implement the outcome of recalibration #2 activities performed in preparation to IPF V282 deployment. Related to RDB#2.
S1A_AUX_CAL_V20140908T000000_G20170328T093643.SAFE	Updates of (a) noise calibration factors and (b) Elevation antenna pattern in S1A_AUX_CAL to implement the outcome of recalibration #2 activities performed in preparation to IPF V282 deployment. Related to RDB#3.
S1A_AUX_CAL_V20150519T120000_G20170328T093753.SAFE	Updates of (a) noise calibration factors and (b) Elevation antenna pattern in S1A_AUX_CAL to implement the outcome of recalibration #2 activities performed in preparation to IPF

	V282 deployment. Related to RDB#4.
S1A_AUX_CAL_V20160627T000000_G20170522T132042.SAFE	Updated S1-A SM, IW and EW Elevation Antenna Patterns following the Tile 11 Anomaly in June 2016. Related to RDB#5.

L1 Processor Parameters ADF (AUX_PP1)

ADF	Update Reason
S1A_AUX_PP1_V20150722T120000_G20160517T085710.SAFE	Update of the processing gains for IW and EW modes to implement the outcome of recalibration #2 activity performed in preparation to IPF V282 deployment. Related to RDB#1.
S1A_AUX_PP1_V20140616T133500_G20170328T093550.SAFE	Update of the processing gains for IW and EW modes to implement the outcome of recalibration #2 activity performed in preparation to IPF V282 deployment. Related to RDB#2.
S1A_AUX_PP1_V20140908T000000_G20170328T093714.SAFE	Update of the processing gains for IW and EW modes to implement the outcome of recalibration #2 activity performed in preparation to IPF V282 deployment. Related to RDB#3.
S1A_AUX_PP1_V20150519T120000_G20170328T093825.SAFE	Update of the processing gains for IW and EW modes to implement the outcome of recalibration #2 activity performed in preparation to IPF V282 deployment. Related to RDB#4.
S1A_AUX_PP1_V20150722T120000_G20170328T093954.SAFE	Update of the processing gains for IW and EW modes to implement the outcome of recalibration #2 activity performed in preparation to IPF V282 deployment. Related to RDB#5.

L2 Processor Parameters ADF (AUX_PP2)

ADF	Update Reason
S1A_AUX_PP2_V20140406T133000_G20151124T084156.SAFE	Update to handle long swell from WV (better resolution of long swell in OSW products). Related to RDB#1.
S1A_AUX_PP2_V20140616T135500_G20151124T084238.SAFE	Update to handle long swell from WV (better resolution of long swell in OSW products). Related to RDB#2.

S1A_AUX_PP2_V20140915T100000_G20151124T084308.SAFE	Update to handle long swell from WV (better resolution of long swell in OSW products). Related to RDB#3.
S1A_AUX_PP2_V20150519T120000_G20151124T084337.SAFE	Update to handle long swell from WV (better resolution of long swell in OSW products). Related to RDB#4.
S1A_AUX_PP2_V20150722T120000_G20151124T084401.SAFE	Update to handle long swell from WV (better resolution of long swell in OSW products). Related to RDB#5.

Simulated Cross Spectra ADF (AUX_SCS)

ADF	Update Reason
S1__AUX_SCS_V20150722T120000_G20160413T105410.SAFE	Introduction of AUX_SCS. Related to RDB#5.
S1__AUX_SCS_V20150519T120000_G20160413T105253.SAFE	Introduction of AUX_SCS. Related to RDB#4.
S1__AUX_SCS_V20140908T000000_G20160413T105124.SAFE	Introduction of AUX_SCS. Related to RDB#3.
S1__AUX_SCS_V20140616T133700_G20160413T104849.SAFE	Introduction of AUX_SCS. Related to RDB#2.
S1__AUX_SCS_V20140402T000000_G20160413T103855.SAFE	Introduction of AUX_SCS. Related to RDB#1.

Appendix E - **S-1A Quality Disclaimers**

The following Quality Disclaimers have been prepared since the S1-A launch:

Number	Description	Start Validity Date	End Validity Date	Issue Status
1	S1A_WV_SLC_1S products filled with zero (black products)	2014-09-30 15:17:26 UT	2014-10-03 03:34:01 UT	Issued
2	Failure on tile amplifier #5 of the receiving antenna	2014-10-18 15:29:30 UT	2015-01-20 19:04:54 UT	Issued
3	Level 1 products processed with incorrect gains	2014-09-30 15:17:26 UT	2014-10-03 04:07:54 UT	Issued
4	Incorrect Cycle Number and Relative orbit number in products processed in PAC2/DPA	2014-12-09 11:45:25 UT	2015-01-21 03:53:00 UT	Issued
5	Failure on Tile amplifier #5 of the receiving antenna from 18/03/2015 and 20/03/2015	2015-03-18 04:09:00 UT	2015-03-20 11:46:30 UT	Issued
6	Failure on Tile amplifier #5 of the receiving antenna from 26/03/2015 to 28/03/2015	2015-03-26 16:20:00 UT	2015-03-28 02:50:30 UT	Issued
7	Failure on Tile amplifier #5 of the receiving antenna from 18/04/2015 to 24/04/2015	2015-04-18 17:40:21 UT	2015-04-24 17:48:08 UT	Issued
8	Failure on Tile amplifier #5 of the receiving antenna from 25/04/2015 to 30/04/2015	2015-04-25 17:37:37 UT	2015-04-30 23:01:11 UT	Issued
9	Failure on Tile amplifier #5 of the receiving antenna from 05/05/2015 to 06/05/2015	2015-05-05 05:12:51 UT	2015-05-06 00:44:43 UT	Issued
10	Denoising vectors not qualified	2014-10-03 00:00:00 UT	2015-07-03 06:33:15 UT	Issued
11	S-1 L2 OCN product preliminary qualified	2015-07-02 00:31:03 UT	2030-01-01 00:00:00 UT	Issued
12	Failure of TRM #5 between 2015-05-26 and 2015-05-27.	2015-05-26 21:10:28 UT	2015-05-27 05:53:00 UT	Issued
13	Failure of TRM #5 between 2015-06-06 and 2015-07-14	2015-06-06 06:44:28 UT	2015-07-14 07:50:55 UT	Issued
14	Invalid radiometric calibration of WV L1 and L2 products	2015-03-19 02:29:22 UT	2015-07-03 08:09:02 UT	Issued
15	Failure of TRM #5 from 2015-07-17 to 2015-07-21	2015-07-17 18:58:56 UT	2015-07-21 12:04:57 UT	Issued
16	Invalid Orbit Number at UPA - before 2014-10-10	2014-10-03 00:00:00 UT	2014-10-10 06:28:50 UT	Issued
17	Incorrect Cycle Number in S1-A Products acquired between 26/01/2016 and 04/02/2016.	2016-01-26 21:17:42 UT	2016-02-04 16:29:59 UT	Issued
18	Invalid annotation of NSSDC identifier of Sentinel-1A between April 2014 and July 5th 2016	2014-09-30 15:17:26 UT	2016-07-05 10:16:00 UT	Issued
21	Issue on geolocation of Sentinel-1A SM SLC products with IPF v2.71	2016-05-11 21:02:59 UT	2016-08-22 21:35:50 UT	Issued

22	Invalid annotation of SSPPDU in the manifest of S-1A products	2014-09-30 15:17:26 UT	ongoing	Issued
24	Incorrect Cycle Number in S1-A Products acquired between 12/01/2017 and 24/01/2017	2017-01-12 00:18:59 UT	2017-01-24 06:52:28 UT	Issued
	S-1A mis synchronisation with impact on azimuth bandwidth synchronisation for InSAR applications	2015-05-17 00:03:40 UT	2015-05-18 23:14:45 UT	In preparation
	Phase artefacts for products acquired over region with strong variations of terrain height in range direction			In preparation