

## S-1 MPC

# S1-A N-Cyclic Performance Report - 2018-07 Cycles 153 to 156 (20-Oct-2018 to 07-Dec-2018)

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Context:	Sentinel-1 Mission Performance Centre
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Hyperlink:	

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ESA	Notification	N.Miranda

## Applicable documents

Nomenclature	Title	Edition Number	Revision Number
[S1-AD-14]	S1 RS-MDA-52-7441 Sentinel-1 Product Specification	3	5
[S1-AD-15]	S1-RS-MDA-57-7440 Sentinel-1 Product Definition	2	7

## Reference documents

Piantanida R., Recchia A., Franceschi N., Valentino A., Miranda N., Schubert A., Small D., *Accurate Geometric Calibration of Sentinel - 1 Data*, Proc. *EUSAR 2018*; Aachen, Germany, 2018, 6 p.



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## 1. Introduction

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### 1.1. Purpose of the document

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The purpose of this document is to provide a status on the S1-A sensor and product performance for orbit repeat cycle 153 from 20th October to 1st November 2018, cycle 154 from 1st November to 13th November 2018, cycle 155 from 13th November 2018 to 25th November 2018 and cycle 156 from 25th November to 7th December 2018.

### 1.2. Structure of the document

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- Chapter 1 : This introduction
- Chapter 2 : Executive Summary
- Chapter 3 : Instrument Status
- Chapter 4 : IPF and Auxiliary Data 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

There were no particular issues for S1-A during cycles 153 to 156 (20th October to 7th December 2018).

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
05/12/2018 23:45	06/12/2018 09:29	SOB-953	Sentinel-1A Unavailability between 05/12/2018 and 06/12/2018

**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 during the reporting period.

### 4.2. Auxiliary Data File Updates

There were no updates to S1-A Auxiliary Data Files (ADFs) during the reporting period.

#### Instrument ADF (AUX\_INS)

ADF	Update Reason

Table 3 AUX\_INS Updates

#### Calibration ADF (AUX\_CAL)

ADF	Update Reason

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<sup>1</sup>:

Start Date	Start Time	Stop Date	Stop Time	Comment
25/10/2018	00:50:24.148	25/10/2018	00:50:29.648	
08/11/2018	00:15:00.058	08/11/2018	00:15:04.808	
14/11/2018	22:33:49.312	14/11/2018	22:34:11.062	
15/11/2018	00:25:32.372	15/11/2018	00:28:39.497	
28/11/2018	22:12:32.106	28/11/2018	22:12:42.606	
05/12/2018	22:09:31.528	05/12/2018	22:09:41.778	
06/12/2018	00:01:00.555	06/12/2018	00:03:48.680	

**Table 8 S1-A Orbit Manoeuvres**

<sup>1</sup> 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):-

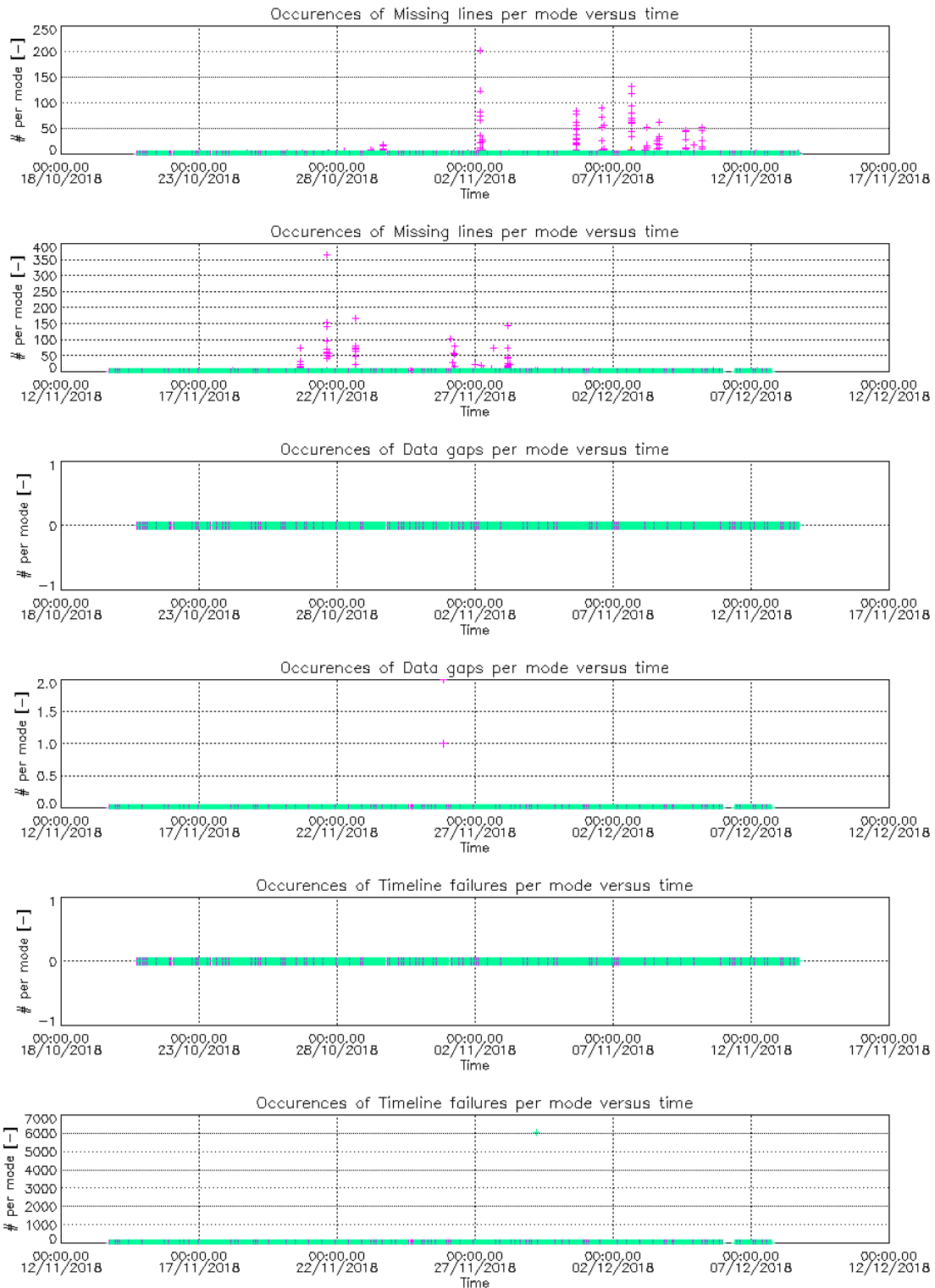


Figure 1 Missing Lines, Data Gaps and Timeline Failures.

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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:

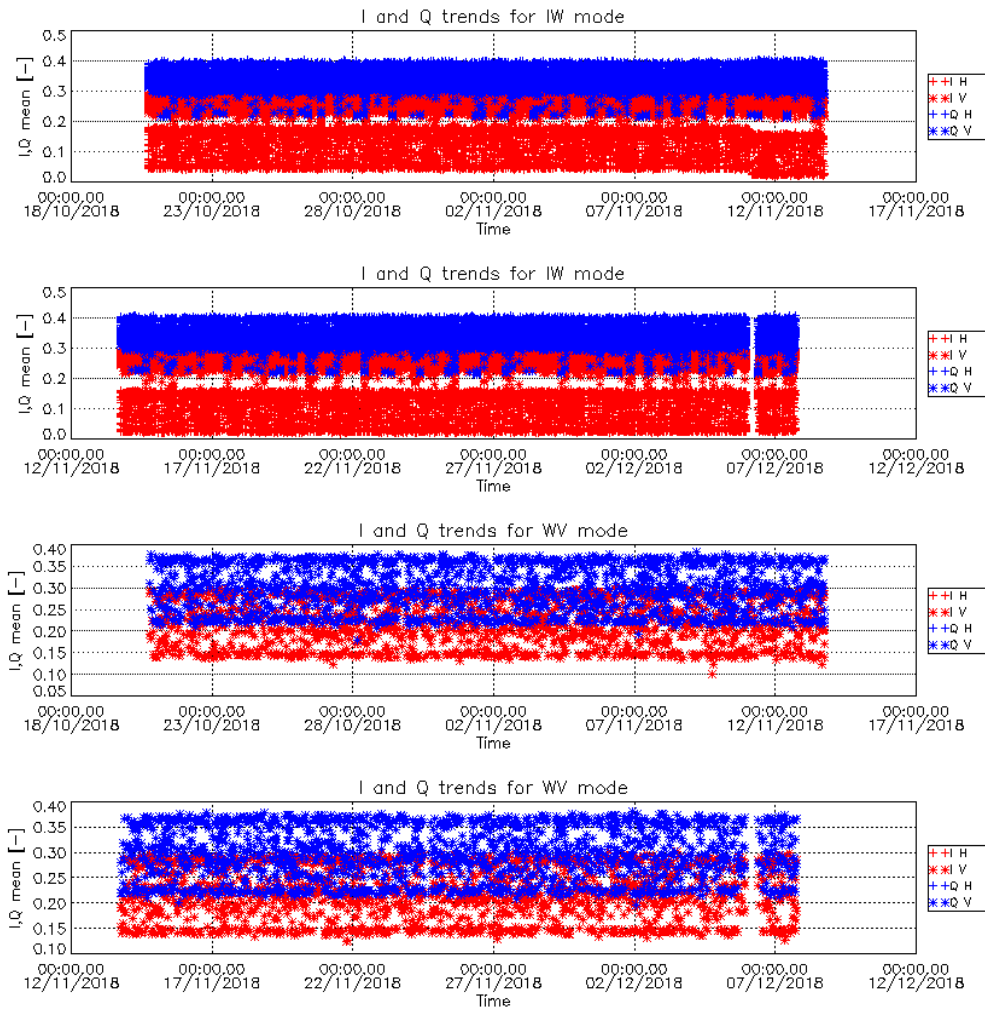
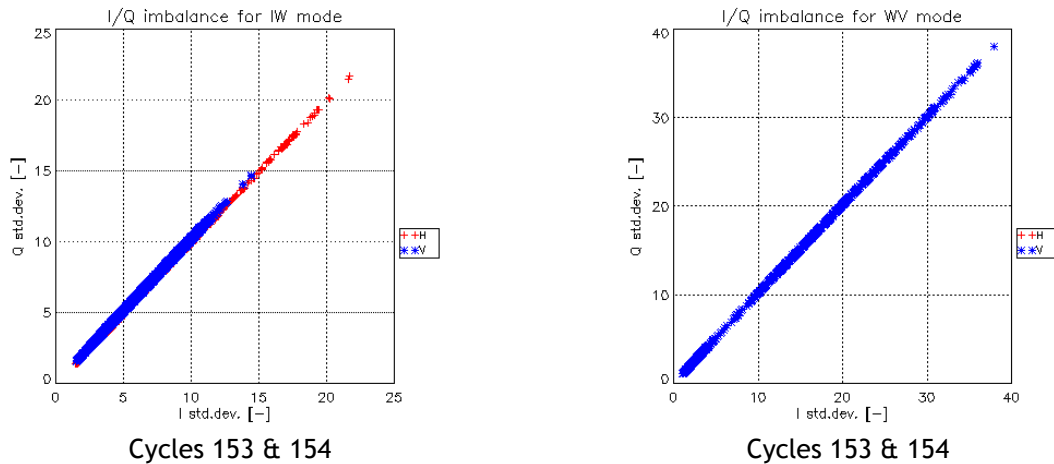


Figure 2 I&Q Channels

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.



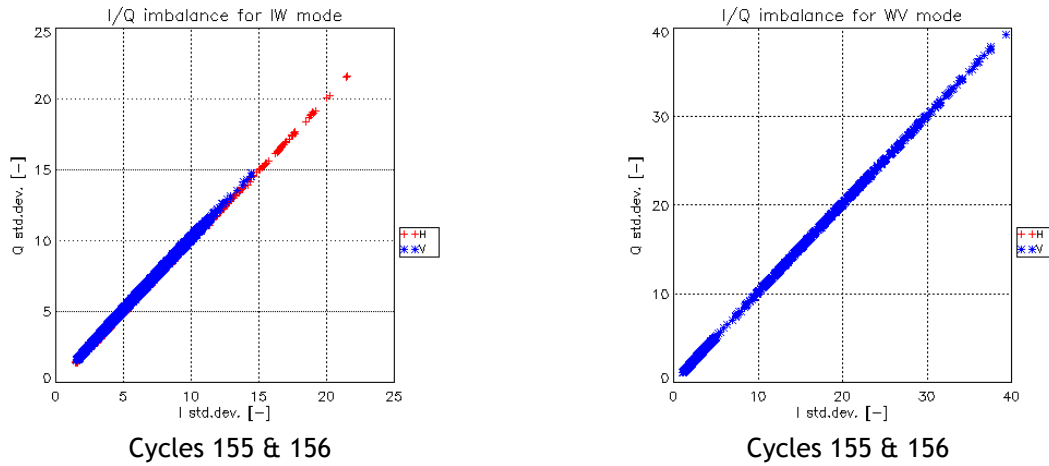


Figure 3 WV I&Q Channel Imbalance

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.

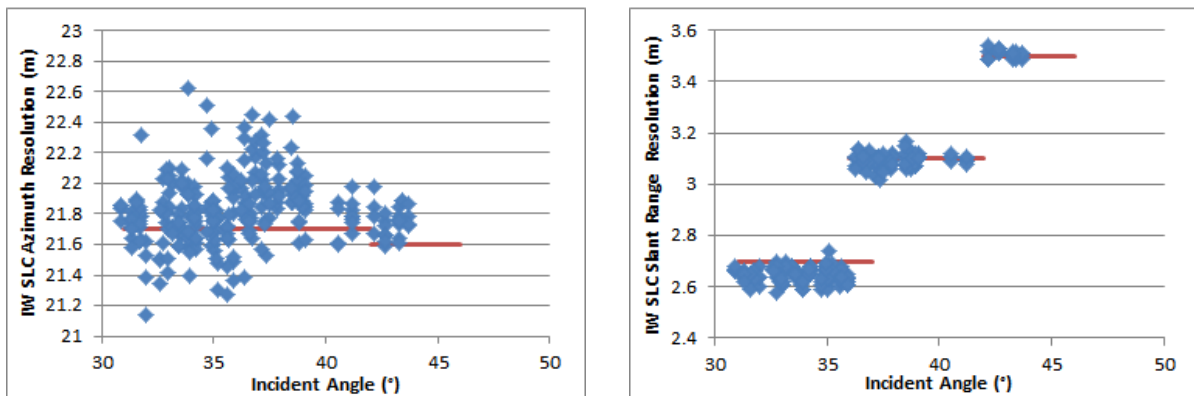


Figure 4 IW Azimuth and Slant Range Spatial Resolutions

Mode/Swath	Azimuth Spatial Resolution (m)	Slant Range Spatial Resolution (m)
IW1	21.77±0.21	2.65±0.03
IW2	21.92±0.20	3.09±0.02
IW3	21.75±0.10	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	-11.25±3.47	-19.41±1.33	-22.62±3.62

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).

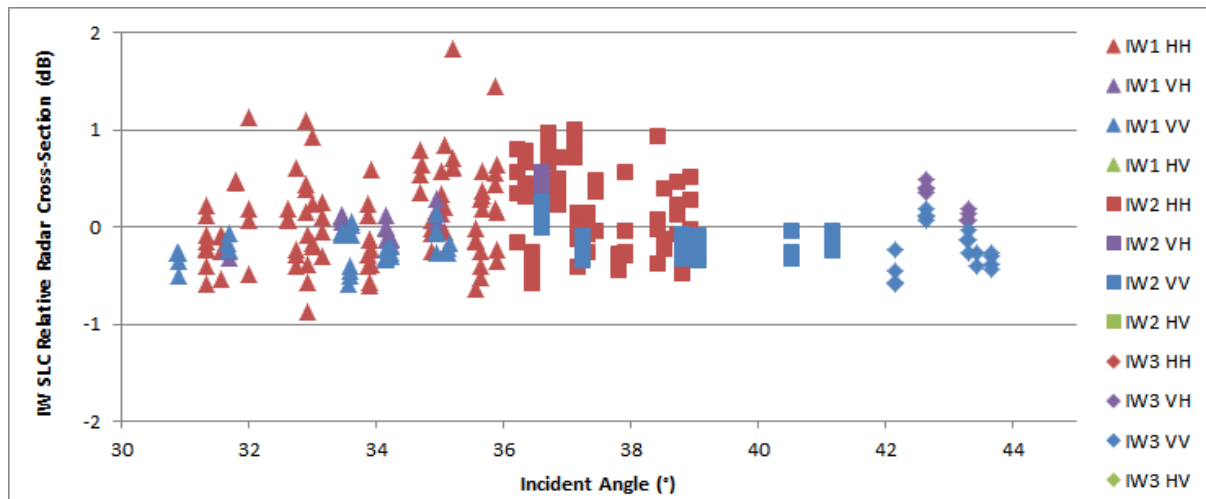


Figure 5 IW Relative Radar Cross-Section

Mode/Swath	Relative Radar Cross-Section (dB)				
	All	HH	VH	VV	HV
IW1	0.01±0.41	0.10±0.47	-0.04±0.17	-0.22±0.17	
IW2	0.06±0.40	0.15±0.45	0.15±0.31	-0.17±0.15	
IW3	-0.07±0.31		0.26±0.17	-0.22±0.24	

Table 11 IW Relative Radar Cross-Section

Figure 6 shows the IW long-term relative radar cross-section of the DLR transponders since March 2017 (the green triangles are the average radar cross-section per product) - the relative radar cross-section is  $-0.05 \pm 0.29$  dB. Also shown in the IW long-term relative radar cross-section of the BAE corner reflector since the start of the Sentinel-1A routine phase (October 2014) where the mean relative radar cross-section is  $-0.18 \pm 0.21$  dB (the majority of the measurements are for VV polarisation).

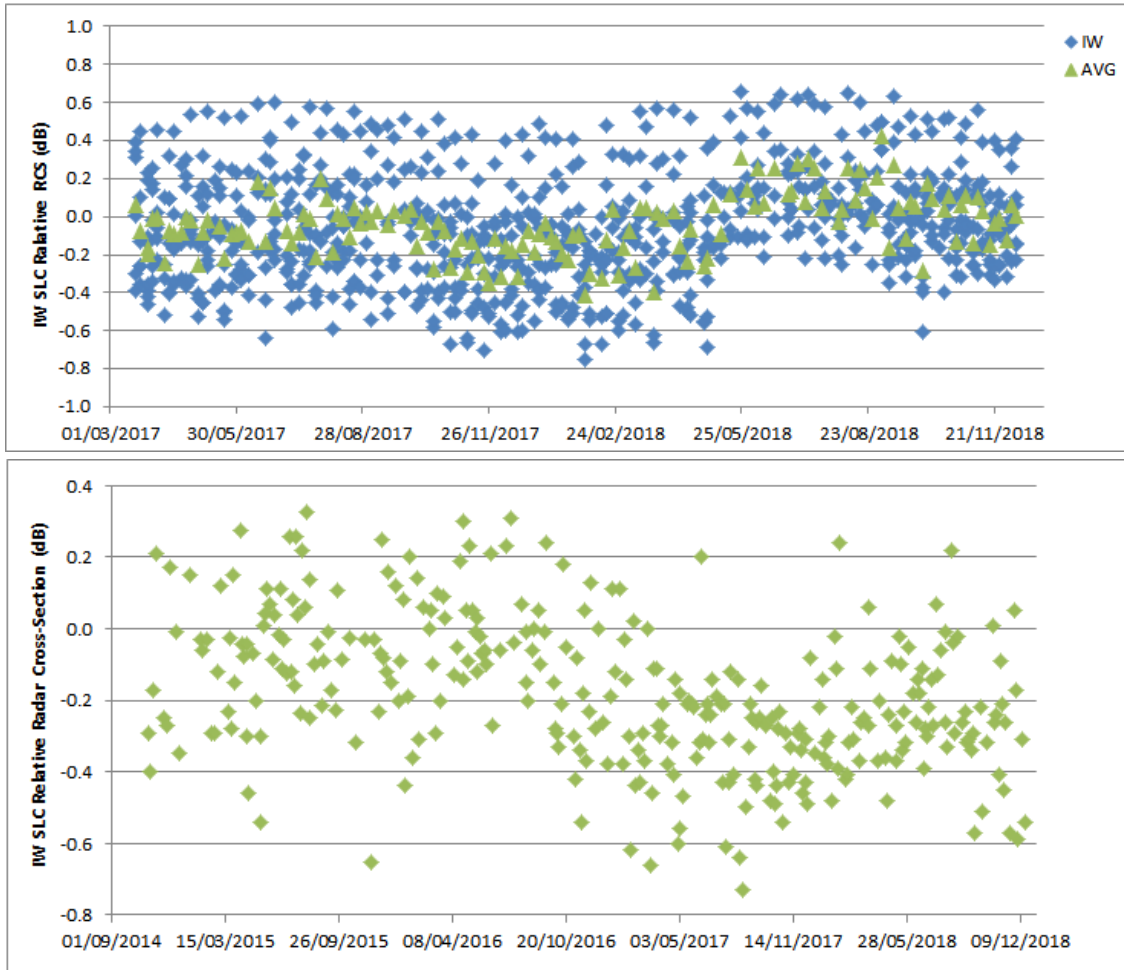


Figure 6 IW Long-Term Relative Radar Cross-Section

Figure 7 shows a recent IW VV Permanent Scatter Calibration series over Paris. The series covers almost 2 years from January 2016 to November 2017. The PSCAL results are consistent with the time series from the BAE corner reflector (Figure 6). In particular it can be noticed a small radiometric jump around March 2017 which could be related to the IPF 2.8.2 release.

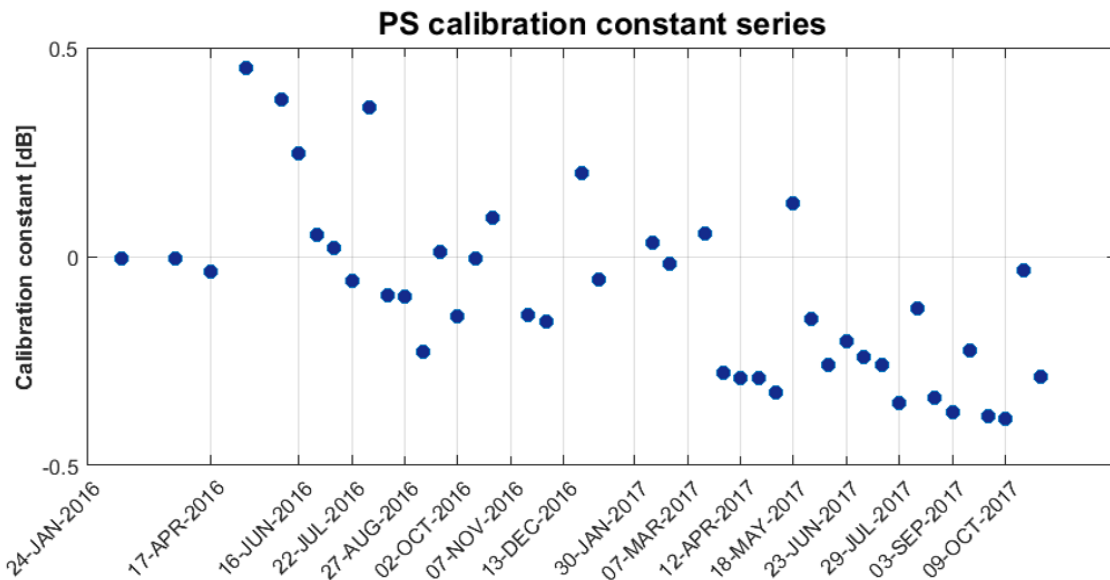


Figure 7 Permanent Scatter Calibration time series for TopSAR IW V/V over Paris.

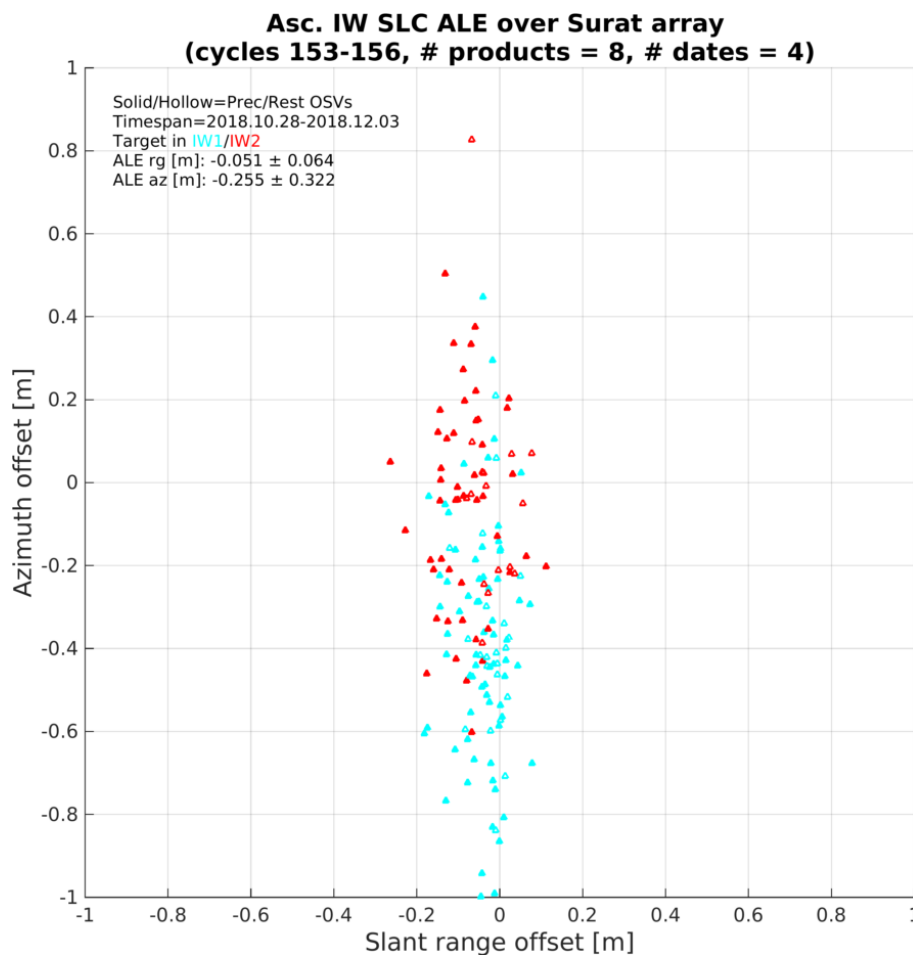


### 6.2.3. Geometric Calibration

Figure 8 shows the absolute location error (ALE) based on eight S-1A SLC products from the IW acquisition mode acquired during the current reporting period (four azimuth-adjacent product pairs acquired on four separate dates). The points have been colour-coded according to the subswath the targets were visible in. The products were analysed using both precise and near-real-time restituted orbit files, depending on their availability at the time of reporting. Corrections described in previous reports were made, including the atmospheric path delay (PD), the “intra-burst-dependent” range correction, “bulk bistatic” and “bistatic residual” corrections, an instrument timing correction, and a topography-dependent Doppler centroid correction (the azimuth corrections are briefly described e.g. in [Piantanida 2018]). Note that PD correction depends on the off-nadir angle, which is considered here for the individual corner reflectors spanning the over-100km wide array.

Figure 8 shows the ALE scatter after the effects listed above were corrected during post-processing. The range and azimuth ALE mean and standard deviations are annotated in the upper left corners of the figures. A possible residual separation of the ALE scatter “clouds” for the IW1/2 sub-swaths is apparent. The separation may represent an as-of-yet unidentified timing bias, or possibly a bias inherent in the measurement process. In any case, a physical explanation for such a separation has yet to be identified.

The IW mode ALE plots indicate a localisation performance well within the requirements. The ALE is within the specified 1-sigma 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 S-1A IW SLC products acquired over the test site during the current reporting period.**



### 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	0.01±0.05	0.15±0.49	

Table 12 Polarimetric Calibration Measurements

### 6.2.5. Elevation Antenna Patterns

No S1-A Elevation Antenna Patterns (EAPs) were updated during the reporting period.

### 6.2.6. Azimuth Antenna Patterns

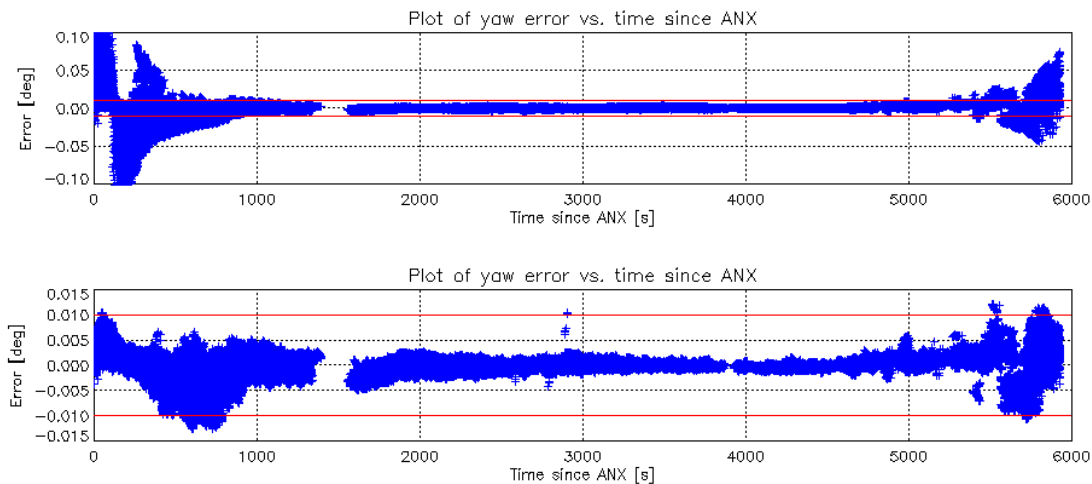
No Azimuth Antenna Patterns (AAPs) were updated during the reporting period.

### 6.2.7. Noise Equivalent Radar Cross-section

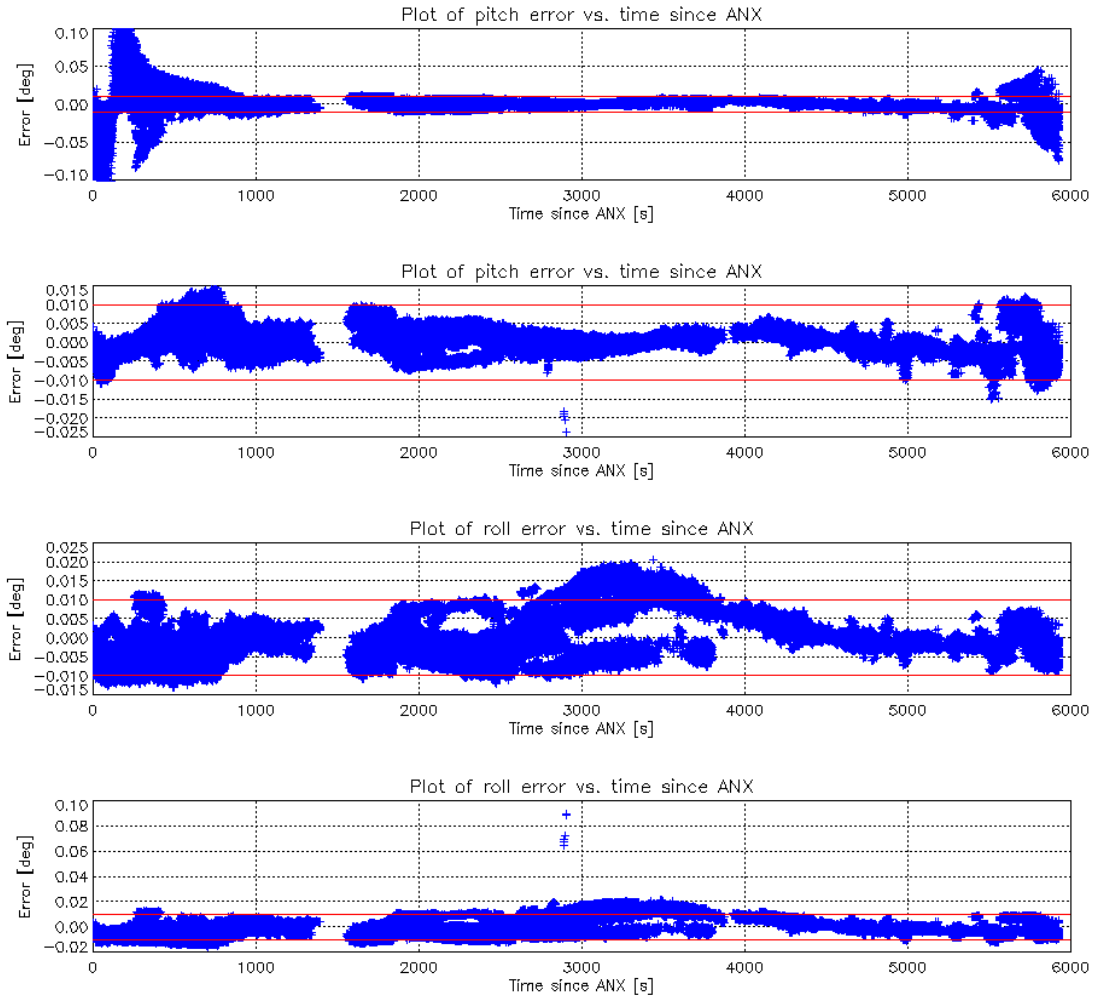
No NESZ measurements were made during the reporting period.

### 6.2.8. Antenna Pointing

Figure 9 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.

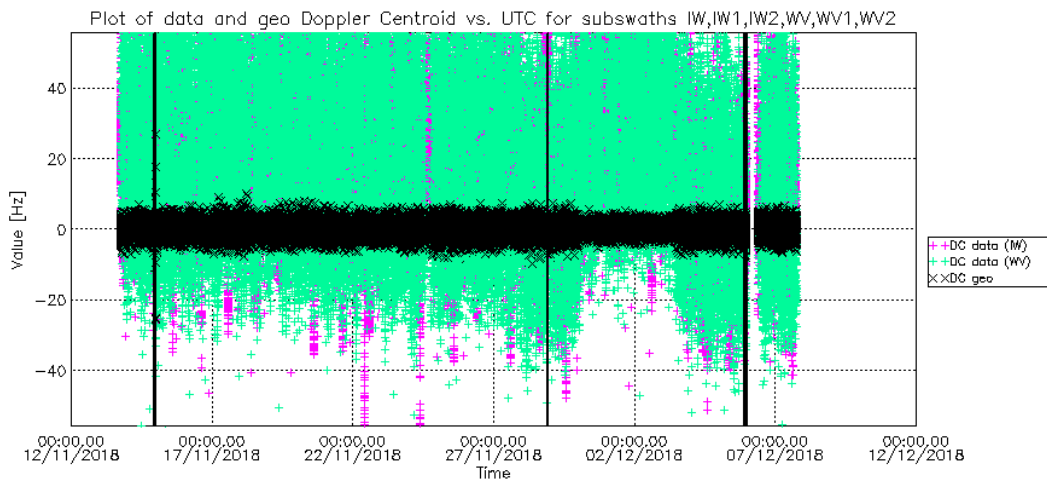
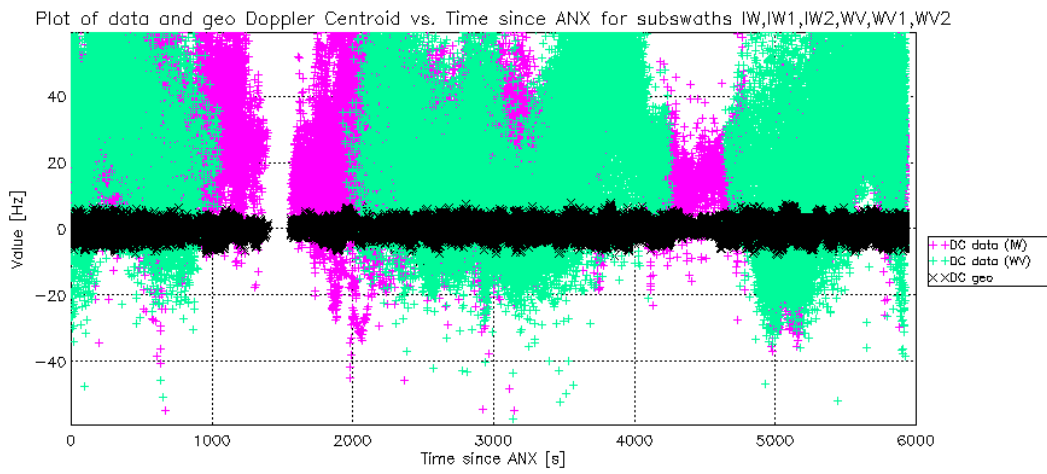
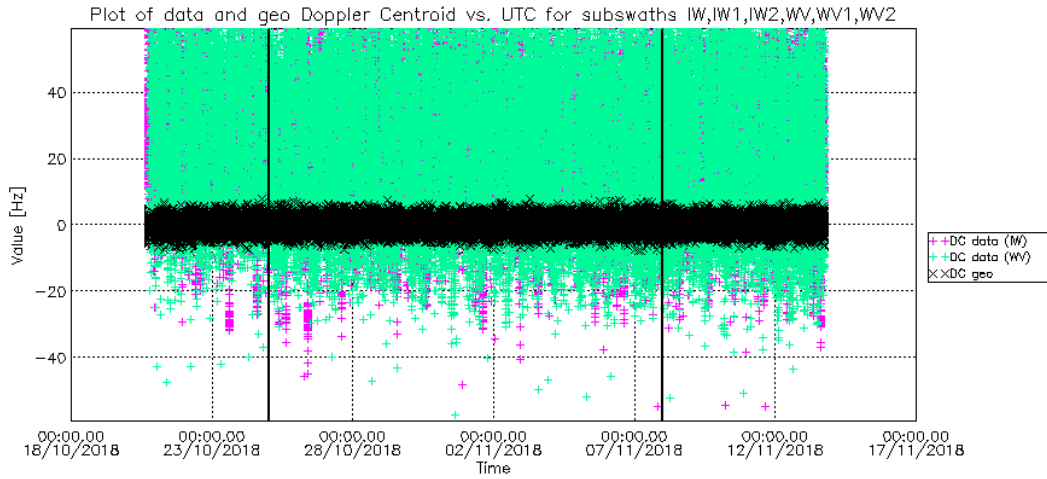






**Figure 9 S1-A Yaw, Pitch and Roll Errors**

Figure 10 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 11. A few DC jumps can be observed between end of November and begin of December. The jumps are related to changes in the Star Trackers (STTs) configuration and caused by a small mis-alignment between the on-board STTs. Operations are currently on going to correct the S-1A STTs inter-alignment in order to avoid such jumps in the future.



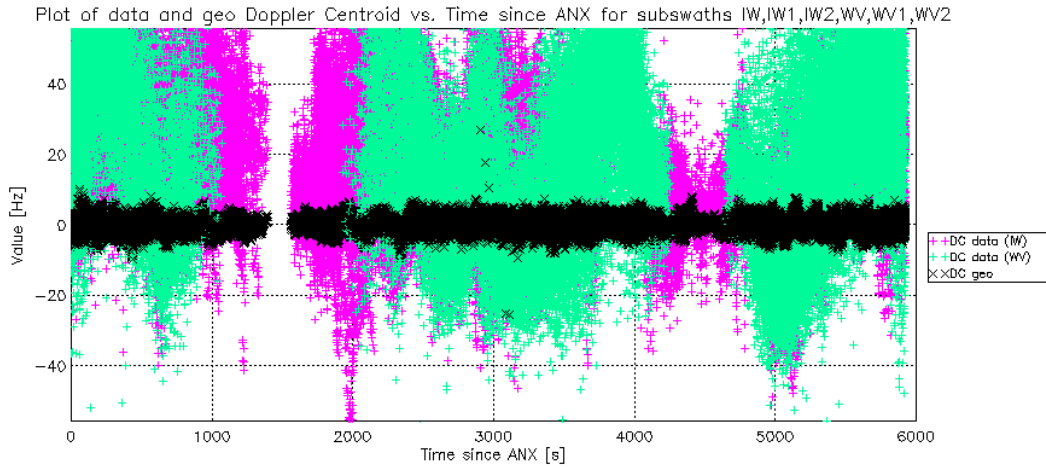


Figure 10 S1-A Doppler Centroid

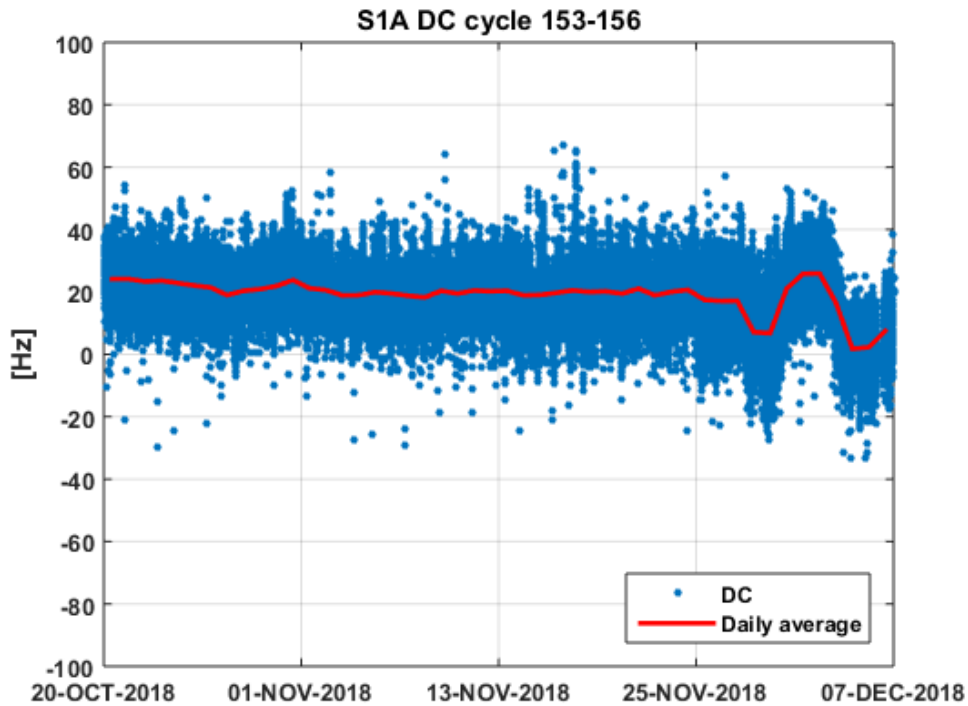


Figure 11 S1-A Doppler Centroid

	Min (Hz)	Mean (Hz)	Max (Hz)
Cycles 153 & 154	-403.15	24.20±13.75	240.63
Cycles 155 & 156	-242.71	20.68±16.04	256.51

Table 13 Doppler Centroid Statistics

### 6.2.9. Summary of Anomalies

There were no anomalies during the reporting period.

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## 6.2.10. Quality Disclaimers

No 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
Tile 11	See below	

On the 16<sup>th</sup> October 2017 the S-1A antenna was reconfigured to optimize the electronic operation after the tile 11 issue on June 2016. The new antenna configuration, only related to the tile 11, was



captured in RDB#6. From the SAR data point of view, the new antenna status is not much different from the previous one and the only observed effects are a slight increase of the PG (less than 0.1 dB) and a modification of the EAP from the S-1 AM (lower then  $\pm 0.1$  dB).



## 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	20/02/2015 10:15	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



Start Date/Time	End Date/Time	MPC Reference	Summary
07/07/2017 02:20	07/07/2017 10:29	SOB-758	Sentinel-1A Unavailability on 07/07/2017
03/08/2017 13:30	03/08/2017 14:07	SOB-776	Sentinel-1A Unavailability on 03/08/2017
01/10/2017 12:06	01/10/2017 20:01	SOB-796	Sentinel-1A Unavailability on 01/10/2017
25/10/2017 08:25	25/10/2017 10:15	SOB-817	Sentinel-1A planned Unavailability on 25/10/2017
02/02/2018 14:27	02/02/2018 16:13	SOB-854	Sentinel-1A Unavailability on 02/02/2018
15/03/2018 20:06	16/03/2018 10:25	SOB-888	Sentinel-1A Unavailability between 15/03/2018 and 16/03/2018
16/05/2018 07:51	16/05/2018 09:34	SOB-892	Sentinel-1A Unavailability on 16/05/2018
22/05/2018 16:52	22/05/2018 19:00	SOB-895	Sentinel-1A Unavailability on 22/05/2018
31/05/2018 06:37	31/05/2018 09:54	SOB-897	Sentinel-1A Unavailability on 31/05/2018
02/06/2018 01:23	02/06/2018 09:42	SOB-898	Sentinel-1A Unavailability on 02/06/2018
29/06/2018 16:27	29/06/2018 18:16	SOB-911	Sentinel-1A Unavailability on 29/06/2018
06/07/2018 11:30	06/07/2018 13:11	SOB-916	Sentinel-1A Unavailability on 06/07/2018
13/08/2018 07:59	13/08/2018 11:21	SOB-917	Sentinel-1A Unavailability on 13/08/2018
05/12/2018 23:45	06/12/2018 09:29	SOB-953	Sentinel-1A Unavailability between 05/12/2018 and 06/12/2018



## 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_G20180313T095009.SAFE	Update for usage with IPF V290: - schemaVersion updated to 3.3 - new fields (correctBistaticDelay Method, estimateNoiseEquivalent PowerFlag) added. Related to RDB#1.
S1A_AUX_INS_V20140616T133500_G20180313T100039.SAFE	As above but related to RDB#2.
S1A_AUX_INS_V20140908T000000_G20180313T100906.SAFE	As above but related to RDB#3.
S1A_AUX_INS_V20150519T120000_G20180313T101559.SAFE	As above but related to RDB#4.
S1A_AUX_INS_V20150722T120000_G20180313T102353.SAFE	As above but related to RDB#5.
S1A_AUX_INS_V20160627T000000_G20180313T103836.SAFE	As above but related to RDB#5.
S1A_AUX_INS_V20171017T080000_G20180313T104658.SAFE	As above but related to RDB#6.

### Calibration ADF (AUX\_CAL)

ADF	Update Reason
S1A_AUX_CAL_V20140406T133000_G20180622T075800	Revised SM Noise Calibration Factors. Related to RDB#1.
S1A_AUX_CAL_V20140616T133500_G20180622T075957	Revised SM Noise Calibration Factors. Related to RDB#2.
S1A_AUX_CAL_V20140908T000000_G20180622T081848	Revised SM Noise Calibration Factors. Related to RDB#3.
S1A_AUX_CAL_V20150519T120000_G20180622T082141	Revised SM Noise Calibration Factors. Related to RDB#4.
S1A_AUX_CAL_V20150722T120000_G20180622T082359	Revised SM Noise Calibration Factors. Related to RDB#5.
S1A_AUX_CAL_V20160627T000000_G20180622T082707	Revised SM Noise Calibration Factors. Related to RDB#5.
S1A_AUX_CAL_V20171017T080000_G20180622T082918	Revised SM Noise Calibration Factors. Related to RDB#6.

### L1 Processor Parameters ADF (AUX\_PP1)

ADF	Update Reason
S1A_AUX_PP1_V20140406T133000_G20180313T094731.SAFE	Update for usage with IPF V290: - schemaVersion updated to 3.3 - new fields (correctBistaticDelay Method, estimateNoiseEquivalent



	<p>PowerFlag) added</p> <ul style="list-style-type: none"> <li>- processing gains for SM and WV modes, L1 and L2 products, updated according to corresponding re-calibration activities</li> <li>- azimuth processing bandwidths for S1, S3 and S5 modes, SLC products, updated</li> <li>- azimuth hamming windows for SM modes, SLC and GRD products, updated.</li> </ul> <p>Related to RDB#1.</p>
S1A_AUX_PP1_V20140616T133500_G20180313T095922.SAFE	As above but related to RDB#2.
S1A_AUX_PP1_V20140908T000000_G20180313T100753.SAFE	As above but related to RDB#3.
S1A_AUX_PP1_V20150519T120000_G20180313T101449.SAFE	As above but related to RDB#4.
S1A_AUX_PP1_V20150722T120000_G20180313T102236.SAFE	As above but related to RDB#5.
S1A_AUX_PP1_V20171017T080000_G20180627T080350	<p>The parameter estimateNoise EquivalentPowerFlag is set to True for S1A IW/EW modes. The purpose is activating the use of additional noise information present in the LON products (equivalent noise rank echoes), in order to improve noise power estimation and final noise annotations in the L1/L2 products. Related to RDB#6.</p>

## 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.



S1A_AUX_PP2_V20171017T080000_G20171013T101254.SAFE	Update of ADF to be compliant with RDB#6.
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### Simulated Cross Spectra ADF (AUX\_SCS)

ADF	Update Reason
S1__AUX_SCS_V20140402T000000_G20160413T103855.SAFE	Introduction of AUX_SCS. Related to RDB#1.
S1__AUX_SCS_V20140616T133700_G20160413T104849.SAFE	Introduction of AUX_SCS. Related to RDB#2.
S1__AUX_SCS_V20140908T000000_G20160413T105124.SAFE	Introduction of AUX_SCS. Related to RDB#3.
S1__AUX_SCS_V20150519T120000_G20160413T105253.SAFE	Introduction of AUX_SCS. Related to RDB#4.
S1__AUX_SCS_V20150722T120000_G20160413T105410.SAFE	Introduction of AUX_SCS. Related to RDB#5.
S1__AUX_SCS_V20171017T080000_G20171016T150910.SAFE	Update of ADF to be compliant with RDB#6.



## 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	Denosing 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 SSPDU 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
26	S-1A products processed with invalid Restituted Orbit Files (AUX_RESORB) between 2017-09-06 and 2017-09-07	2017-09-06 18:57:47 UT	2017-09-07 08:07:45 UT	Issued
28	S-1A L2 OCN products provide reverse OSW wind direction respect to the specification	2015-11-24 12:03:51 UT	ongoing	Issued
30	Issue on the noise vector annotation of S-1A products generated from LON with updated content	2018-03-13 01:00:42 UT	2018-03-15 14:01:26 UT	Issued
32	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	Issued
33	S-1A products processed without Restituted Orbit Files (AUX_RESORB) between 2018-03-21 and 2018-03-22	2018-03-21 21:42:52 UT	2018-03-22 07:33:09 UT	Issued
35	S-1A products processed without Restituted Orbit Files (AUX_RESORB) between 2018-04-08 and 2018-04-11	2018-04-08 18:58:39 UT	2018-04-11 16:20:49 UT	Issued
37	S1A denoising vectors for Strip Map products were not properly calibrated after IPF 2.90 deployment	2018-03-13 11:54:53 UT	2018-06-21 18:53:32 UT	Issued
38	S-1A products processed without Restituted Orbit Files (AUX_RESORB) between 2018-07-07 and 2018-07-09	2018-07-07 11:49:47	2018-07-09 03:34:48	Issued
40	S-1A products processed without Restituted Orbit Files (AUX_RESORB) on 2018-09-20	2018-09-20 10:41:03	2018-09-20 16:15:34	Issued
	Phase artefacts for products acquired over region with strong variations of terrain height in range direction			In preparation