

Project	Solar Orbiter Spacecraft Anomalies	Project ID	SOL_SC	Report Type	SC
Observation	[RPW] Antenna#3 reported lost	State	Open	ID	SOL_SC-153
Originator	Serenella Di Betta	Criticality	Low	Created	2024-01-15 10:25 UTC
Urgency	Low	Reproducibility	Unknown	Detection Date	2024-01-08 00:00
Classification	[Not Specified] [Not Specified] [Not Specified]			Occurrence Date	2023-11-13 23:35

Description	
Description	<p>On 08/01/2024 the PIs informed SOC and MOC that the RPW antenna#3 is most probably lost due to unknown reasons.</p> <p>The antenna is apparently showing a short circuit since 13/11/2023 at 23:35z, and the antenna is most likely not floating anymore and now electrically connected to the S/C body. The details of the observables are reported in the attached presentation "SoLO RPW Antenna 3 Issue.pdf"</p> <p>The first investigations on the MOC side could not detect anything anomalous /in the instrument or spacecraft TM around the time of the anomaly. The times around the anomaly, of the sweep on 12/10/2023 (normal sweep behavior reported from PI) and of the sweep on 08/10/2023 (that the PIs reported as unusual) were checked for unexpected/unusual spacecraft attitude, but nothing was detected outside of the ordinary.</p> <p>More in details the CALIB_OFFPOI_5x5 on the 12/10/2023 was showing attitude errors below 0.7mdeg per axis and the RW offloading on the 08/10/2023 starting at 23:00z with duration of 25min had a maximum error in the attitude of 18mdeg per axis, during the same period, S/C rates were between +- 6mdeg/s per axis.</p> <p>The first investigations on TM performed by SOC raised the following points:</p> <ol style="list-style-type: none"> 1) I see that the sweep occurred during an offpointing sequence, actually a CALIB_OFFPOI_5x5 or "full disk mosaic". It is speculative but I could imagine a couple of ways that slewing could plausibly interact unfavourably with sweeping. One of the component slews starts at 23:36 so this may align with the failure. Further, even if the timing is off wrt this specific slew, maybe the sequence as a whole may excite some sort of mechanical resonance in the antennas that persists beyond the individual slews(?), and maybe this can give rise to trouble. I don't know what the RPW team would think about this, but I would think that a precautionary avoidance of sweeps close to any sort of attitude disturbance may be a desirable move, at least until we understand better what happened. 2) I see a change in the behaviour of RPW parameter NIW00119 PDU_BIAS_M5V_CURRENT mA at the anomaly. Is it plausible that a short on the antenna would influence this parameter? Does this tell us anything useful? Unfortunately the change is at the level of single TM quantisation steps so as a measurement it is not particularly precise. It may be interesting to understand this because, e.g., with the single failure occurrence it can be hard to establish if correlations are meaningful or not, but if we can also look at earlier "blips" on this current parameter as possible transitory "pre-failure events" then we may perhaps get better statistics. 3) I did not see any evidence of a micrometeorite hit in TM. But I think this is not surprising. Without proper analysis my expectation is that "smaller" hits can still be damaging without e.g. imparting enough momentum at the level of the overall body to be detectable on attitude. And indeed we never saw any attitude signature in TM from the SA discrete events, where we are fairly sure the micrometeorites hits are involved. It is the case that on 13 Nov we were in a part of the orbit where we expect higher micrometeorite hit probability. (This arises from the relative velocity of Solar Orbiter wrt a crude theoretical circularly-rotating zodiacal dust cloud population. It is not considering directional exposure geometry of any particular antenna). <p>An ARB will be organized during CW 3 to discuss the issue and agree on a way forward</p>
Item Configuration	[Not Specified]
Environment	[Not Specified]
Impacted Services	[Not Specified]
Recommendation	[Not Specified]
Affected Requirement	[Not Specified]
External Reference	[Not Specified]

Processing	
History	<p>2024-01-15 10:25 UTC State set to ["Open"] (By Serenella Di Betta)</p> <p>2024-01-15 10:25 UTC 7 notification(s) sent for event 'Report Creation'. Recipients: ["alfio.mantineo@esa.int", "stefano.scaglioni@esa.int", "ricardo.de-botton@serco-eu.com", "Thierry.Bernardi@ext.esa.int", "Shanmugapriya.Chandrasekar@ext.esa.int", "Paolo.DeMeo@esa.int", "Federica.Pireddu@ext.esa.int"]</p> <p>2024-01-15 10:25 UTC Attachment [SoIO_RPW_Antenna_3_Issue.pdf] added by Serenella Di Betta</p> <p>2024-01-15 10:26 UTC Attachment [RPW_current_parameter.png] added by Serenella Di Betta</p> <p>2024-01-15 10:26 UTC Attachment [slewing.png] added by Serenella Di Betta</p> <p>2024-01-15 10:26 UTC Updated (By Serenella Di Betta)</p>
Identified Cause	[Not Specified]
Space Weather Event	No
Date of last ARB	[Not Specified]
Risk of Re-occurrence	No
Resolution	[Not Specified]
Link Report	[Not Specified]
Relevant to	none
To be notified	NO
Permanent Failure	No
Recovery Completed	[Not Specified]
Recommended Change for the Future	There is nothing to be learned from this anomaly.

Related Files					
Reference	Filename	Revision	Comment	Size	Status
SOL_SC-DOC-0378	SoIO_RPW_Antenna_3_Issue.pdf	1.1	Original filename: SoIO RPW Antenna 3 Issue.pdf	462 KB	Available
SOL_SC-DOC-0379	RPW_current_parameter.png	1.1	Original filename: RPW current parameter.png	60.5 KB	Available
SOL_SC-DOC-0380	slewing.png			86.3 KB	Available

Actions
<i>There are no Actions related to this Report.</i>

Related Reports
<i>There are no Relations for this Report.</i>

Effectiveness Indicators	
Time to raise	7.4 days
Time or delay to analyse	17.2 days
Delay to solve	Undefined
Time to close a SC AR	Undefined