CASSINI SOST SEGMENT

Rev 158 (D3) Handoff Package

Segment Boundary 2011-344T11:50:00 – 2011-347T04:05:00

27 May 2011

Nora Alonge

SMT report and SPASS

Science Highlights

Notes & Liens

Integration Checklist

https://cassini.jpl.nasa.gov/sp/icy/rev158/SOST_158_D3_110524.rpt
(no issues)

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DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)
-----------------------------------------------------------------------------------------------------------|
                                     |                OBSERVATION_PERIOD              |       DOWNLINK_PASS                |
                                     |                                                |                                   |
                                     |------------------------------------------------|-----------------------------------|
                                     |                   P4                 |   P5    | RECORDED |          PLAYBACK       |
                                     |                                      |         |          |                         |
                                     |--------------------------------------|---------|----------|-------------------------|
                      Start    End   | START  SCI  HK+E  TOTAL CPACTY  MRGN | OPNAV   | SCI  ENGR| TOTAL CPACTY MARGN  NET_MARGN  CAROVR|
    DOWNLINK PASS NAME doy hh:mm doy hh:mm| (Mb)  (Mb) (Mb)  (Mb)   (Mb)   (Mb) | (Mb)   | (Mb) (Mb)| (Mb)  (Mb)   (Mb)  (Mb)  (%)  (Mb) |
-----------------------------------------------------------------------------------------------------------|
SP_158EA_M34BWGNON345_PRIME 345 02:35 345 11:35    0   698   62    761   3322  2561 |   0    | 236   53 | 1049   503  -547     1   0%   547 |
SP_158EA_C34BWGRSS346_PRIME 346 01:09 346 02:35  547   625   57   1229   3322  2093 |   0    |  30    8 | 1268    65 -1203     1   0%  1203 |
SP_158EA_M34BWGRSS346_PRIME 346 02:35 346 04:09 1203     0    0   1203   3322  2119 |   0    |  34    9 | 1246    66 -1180     1   0%  1180 |
SP_158EA_G34BWGRSS346_PRIME 346 14:39 346 17:39 1180  1493   62   2735   3322   587 |   0    |  49   18 | 2802   183 -2620     1   0%  2620 |
SP_158EA_C70METNON346_PRIME 346 17:40 347 02:35 2620     0    0   2620   3322   702 |   0    | 236   53 | 2909  2910     1     1   0%     0 |
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No warnings

SPASS

SOST 158 (D3)

https://cassini.jpl.nasa.gov/sp/icy/rev158/SPASS_SOST_158_D3_110524.pdf
https://cassini.jpl.nasa.gov/sp/icy/rev158/SPASS_SOST_158_D3_110524.xls
https://cassini.jpl.nasa.gov/sp/icy/rev158/SPASS_SOST_158_D3_110524.txt

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S71, length = 70 days		2011-320T03:02:00		069T19:53:00	2012-024T22:55:00			
Dione Flyby D3 Segment		2011-344T11:50:00		002T16:15:00	2011-347T04:05:00			
SP_158EA_WAYPTTURN344_PRIME		2011-344T11:50:00		000T00:10:00	2011-344T12:00:00	XBAND to Earth	POS_X to NSP	
NEW WAYPOINT		**2011-344T12:00:00**		**000T07:00:00**	**2011-344T19:00:00**	**XBAND to Earth**	**POS_X to NSP**	
UVIS_158IC_ALPVIR001_PRIME	V	2011-344T12:00:00		000T03:00:00	2011-344T15:00:00	UVIS_FUV to Star	POS_X to 200.0/79.0	
SP_158TI_WAYPTTURN344_PRIME		2011-344T18:30:00		000T00:30:00	2011-344T19:00:00	ISS_NAC to Titan	NEG_X to Sun	
NEW WAYPOINT		**2011-344T19:00:00**		**000T06:05:00**	**2011-345T01:05:00**	**ISS_NAC to Titan**	**NEG_X to Sun**	
ISS_158TI_MUTUALEVE001_PRIME	V	2011-344T19:00:00		000T03:00:00	2011-344T22:00:00	ISS_NAC to Titan	NEG_X to Sun	
ISS_158TI_M150R2HZ345_PRIME	C, V	2011-344T22:00:00	E158_M150R2HZ344+000T00:00:00	000T02:00:00	2011-345T00:00:00	ISS_NAC to Titan	NEG_X to Sun	No Preference to secondary pointing
SP_158EA_DLTURN345_PRIME		2011-345T00:00:00		000T01:05:00	2011-345T01:05:00	XBAND to Earth	POS_X to 193.0/81.0	POS_X to NSP as RA/Dec
NEW WAYPOINT		**2011-345T01:05:00**		**002T03:00:00**	**2011-347T04:05:00**	**XBAND to Earth**	**POS_X to 193.0/81.0**	
SP_158EA_YBIAS345_PRIME	E	2011-345T01:05:00		000T01:30:00	2011-345T02:35:00	XBAND to Earth	POS_X to 193.0/81.0	POS_X to NSP as RA/Dec
SP_158EA_M34BWGNON345_PRIME	C, R	2011-345T02:35:00		000T09:00:00	2011-345T11:35:00	XBAND to Earth	Rolling/SRU	POS_X to NEP or NSP, CAPS
UVIS_158SA_ENAURFOOT001_PIE	M, V	2011-345T11:35:00		000T10:10:00	2011-345T21:45:00	UVIS_FUV to Saturn	NEG_X to 95.992/67.159	
CDA_158OT_RINGSHAD001_PIE	R	2011-345T21:45:00		000T03:15:00	2011-346T01:00:00	NEG_Z to Earth (-100.0,0.0,-80.0 deg. offset)	POS_X to NSP	
SP_158EA_DEADTIME346_PRIME	R	2011-346T01:00:00		000T00:09:22	2011-346T01:09:22	XBAND to Earth	POS_X to 193.0/81.0	
Begin Custom		2011-346T01:09:22	GMB_E158_DIONE_D3-000T08:30:00	000T00:00:01	2011-346T01:09:23	XBAND to Earth	POS_X to 193.0/81.0	
SP_158EA_C34BWGRSS346_PRIME	R	2011-346T01:09:22	GMB_E158_DIONE_D3-000T08:30:00	000T01:25:38	2011-346T02:35:00	XBAND to Earth	POS_X to 193.0/81.0	Pick up at XBAND to Earth, POS_X to 193.0/81.0; Hand off at XBAND to Earth, POS_X to 193.0/81.0. POS_X to NSP as RA/Dec
Periapse R = 3.241 Rs, lat ...		2011-346T02:00:19		000T00:00:01	2011-346T02:00:20			
SP_158EA_M34BWGRSS346_PRIME	R	2011-346T02:35:00	GMB_E158_DIONE_D3-000T07:04:22	000T01:34:22	2011-346T04:09:22	XBAND to Earth	POS_X to 193.0/81.0	Pick up at XBAND to Earth, POS_X to 193.0/81.0; Hand off at XBAND to Earth, POS_X to 193.0/81.0.
ISS_158EN_ENCEL001_PRIME	C, U, V	2011-346T04:09:22	GMB_E158_DIONE_D3-000T05:30:00	000T02:30:00	2011-346T06:39:22	ISS_NAC to Enceladus (0.0,-45.835,0.0 deg. offset)	NEG_X to Sun	Collaborative Rider(s): CIRS, UVIS. Pick up at XBAND to Earth, POS_X to 193.0/81.0; Hand off at CIRS_FP1 to Dione, NEG_X to Sun. Collaborative Rider(s): CIRS, UVIS
CIRS_158DI_DIONE001_PRIME	I, U, V	2011-346T06:39:22	GMB_E158_DIONE_D3-000T03:00:00	000T01:30:00	2011-346T08:09:22	CIRS_FP1 to Dione	NEG_X to Sun	Pick up at CIRS_FP1 to Dione, NEG_X to Sun; Hand off at XBAND to Earth, NEG_X to 337.38/-2.71.
RSS_158DI_GRAVITY002_PIE	M	2011-346T08:09:22	GMB_E158_DIONE_D3-000T01:30:00	000T03:00:00	2011-346T11:09:22	XBAND to Earth	NEG_X to 337.38/-2.71	Pick up at XBAND to Earth, NEG_X to 337.38/-2.71; Hand off at XBAND to Earth, NEG_X to 337.38/-2.71.
158DI (t) D3 DIONE Outbou...		2011-346T09:39:22		000T00:00:01	2011-346T09:39:23			
ISS_158DI_REGMAP001_PRIME	C, M, U, V	2011-346T11:09:22	GMB_E158_DIONE_D3+000T01:30:00	000T03:30:00	2011-346T14:39:22	ISS_NAC to Dione	NEG_Z to Earth	Collaborative Rider(s): UVIS. Pick up at XBAND to Earth, NEG_X to 337.38/-2.71; Hand off at XBAND to Earth, POS_X to 193.0/81.0. Collaborative Rider(s): UVIS
SP_158EA_G34BWGRSS346_PRIME	R	2011-346T14:39:22	GMB_E158_DIONE_D3+000T05:00:00	000T03:00:00	2011-346T17:39:22	XBAND to Earth	POS_X to 193.0/81.0	Pick up at XBAND to Earth, POS_X to 193.0/81.0; Hand off at XBAND to Earth, POS_X to 193.0/81.0.
End Custom		2011-346T17:39:22	GMB_E158_DIONE_D3+000T08:00:00	000T00:00:01	2011-346T17:39:23	XBAND to Earth	POS_X to 193.0/81.0	
SP_158EA_DEADTIME446_PRIME	R	2011-346T17:39:22	GMB_E158_DIONE_D3+000T08:00:00	000T00:00:38	2011-346T17:40:00	XBAND to Earth	POS_X to 193.0/81.0	
SP_158EA_C70METNON346_PRIME	C, E, R	2011-346T17:40:00		000T08:55:00	2011-347T02:35:00	XBAND to Earth	POS_X to 193.0/81.0	CAPS, POS_X to NSP as RA/Dec
SP_158EA_YBIAS347_PRIME	E	2011-347T02:35:00		000T01:30:00	2011-347T04:05:00	XBAND to Earth	POS_X to 193.0/81.0	

N.K.Alonge   Cassini SP   **CassiniXXM**   EXTENDED EXTENDED MISSION   **3**   **27 May 11**

Overview: RSS flyby with INMS/MAPS secondary at C/A (Greg Fletcher did C/A design). Otherwise, ORS Enceladus and Dione inbound, and ORS Dione outbound. UVIS auroral footprint PIE and CDA ring shadow PIE plus a couple Titan monitors and a UVIS star occ calibration at beginning of segment.

DOY 344 (of 2011):

This segment starts with a UVIS star occ calibration (most likely of Spica) before turning ORS to Titan for a mutual event opportunity (transit of Titan across Tethys followed by transit of Rhea across Titan) and a Titan haze observation as part of the Titan Monitoring Campaign.

DOY 345:

This day begins with a turn toward Earth to downlink data to Madrid, Spain before beginning two high-priority PIE (pre-integrated event) observations. First, UVIS takes control to point FUV to Saturn to do slow repeated slews across Saturn's auroral zone, emphasizing Enceladus-related auroras. This search may add to evidence of the Enceladus-Saturn auroral footprint. VIMS and MAPS instruments will ride along. Next, CDA points their boresight to prograde dust ram to observe the ring shadow crossing at 4 Rs.

DOY 346:

We fly by Dione at ~99 km today for a prime radio science gravity measurement. RSS will take data on inbound and outbound "wings" and also at closest-approach. Collaborating with INMS, the C/A attitude design will allow good INMS and MAPS data, as well. Before closest-approach there is also time for ORS instruments to observe Enceladus, and with CIRS leading, turn back to observe Dione fractures. On the outbound leg, ISS will lead for ORS instruments to map Dione with a mosaic, plus a scan for CIRS and a sit'n'stare for VIMS.

DOY 347:

The Dione flyby segment ends today with an 8-hour 55-minute downlink of all the data to the large 70-meter DSN antenna in Canberra, Australia.

Thruster firing/**bias keep-out zone**:

From beginning of inbound GSE until the end of the outbound GSE, with the most critical period being the prime gravity observation: beginning of inbound wing (RSS GRAVITY001) until the end of the outbound wing (RSS GRAVITY003).

In SCET:
2011-345T02:35:00 – 2011-347T02:35:00
(Most critical period: 2011-346T01:09:22 – 2011-346T17:39:22)

FROM PACKAGE TEMPLATE:

No Biases during (overlapping) the RSS science observations.

For gravity observations, the requirement is no biases (thruster firing) in arcs devoted to gravity observations. A gravity arc is defined as the time between the start of the first tracking pass and the end of the last pass, so if there's a gap in between the tracking passes, there should be no biases there as well. Any firing in this arc would destroy the coherence of the trajectory and would lead to an unpredictable result.

Gravity Science Enhancements. Placing the Y-Bias during the first 90 minutes of the downlink is OK for inbound GSEs. Impact to outbound GSEs should be looked at on a case-by-case basis (contact Aseel), and the ones following a prime gravity observation would likely be more impacted by a Y-Bias than the ones following an occultation.

Dual playbacks

- No dual playback, BUT ---

There is a RSS Level 3 DSN request:

Rev 158 D3 Dione Gravity Observation:
Level 3 requested from 2011-345/2130 to 2011/346-1910*
Stations: DSS-34, DSS-55, DSS-25

*Even though the DSS-25 tracks ends at 346/2110, the gravity observation ends ~346/1910. The track continues to support part of the GSE that follows the prime gravity observation, and that doesn't require Level 3 support.

- Pointing:
  - Collaborative prime/riders (3): INMS design for 2ry at C/A (2011-346T08:09:22), ISS ENCEL001 at 2011-346T04:09:22 is collab w/ UVIS and CIRS for FP3 raster scan, ISS REGMAP001 at 2011-346T11:09:22 is collab with UVIS, CIRS for scans, and VIMS for sit'n'stare.
  - Teams have validated custom handoffs and turn times
  - No >3 hr observations with >60 degrees target motion
  - Acceptable CIRS heating during waypoints
  - Final Ybias window is *after* final DL to accommodate RSS bias keepout zone (see p.5)
  - Earth-pointed WP for majority of segment for RSS flyby
  - C/A attitude: primary for RSS, secondary for INMS (G. Fletcher designed) (see lien section below)
- Data Volume:
  - No carryover. No dual PB.
- DSN:
  - Push back on weekly maintenance overlap for RSS Dione flyby support (partial SP_158EA_M34BWGNON345_PRIME) (partial SP_158EA_C70METNON346_PRIME). Level 3 requests! (see previous page)
- Opmodes:
  - No unique opmodes. RSSK (RSSK-RWAF) for RSS, and no CDA articulation during RSS C/A and wings.
- Hydrazine:
  - N/A
- Special Activities:
  - None (besides unique RSS flyby of Dione ☺)

Sequence Liens:

- May need SID suspend during CIRS DIONE001 at 2011-346T06:39:22, and could have CIRS, VIMS heating during RSS GRAVITY002 at 2011-346T08:09:22 (C/A). ISWG priority was RSS and INMS (2ry) at C/A, so was willing to incur heating (though need to see that it is acceptable extent at sequence-level).

- Potential very short SRU violation flagged at final custom turn back to Earth during ISS REGMAP001. PDT flagged 90 sec issue at 2011-346T14:27:37. We are quiescent on either side of this observation though, if need to suspend SID.

Item SOST 158 (D3)	Disposition notes, or X if complete
1. Disposition all requests in CIMS - approve all pending requests, no outstanding revisions/new requests	x
2. No rocking downlinks. No AZSCANS (IGAPIMAGE). No arrayed downlinks.	x
3. Examine SPASS, ensure SP turns correctly designated PRIME or NEW WAYPOINT. Prime RSS observations require the Xband to Earth attitude be a waypoint, use DLTURN with spass type New Waypoint (also for DLTURN before Ybiases)	x
4. Waypoints and downlinks are violation free (per CTV). NOTE ON ISSUES PAGE if periods of no valid waypoint	x
5. SP turns have been checked and are violation free- use ctv_batch or PDT. Fix any issues found. First turn of segment has been checked using correct final attitude of previous segment. All turns use the slower XM slew rates and include 2 minutes turn margin. Allow extra turn time whenever possible to aid possible RBOT changes.	x
6. YBIAS windows have been included as required, guidelines met per https://cassini.jpl.nasa.gov/sp/xxmdev/ybias_mpforum.pdf	x
7. There are no more than 3 waypoint changes in a 24 hour period (DLTURN waypoints for YBIAS do not count)	x
8. The minimum prime instrument request duration outside ±5 hours from a targeted satellite flyby is 30 minutes	x
9. Custom handoffs are limited to ±3 hours around a targeted Titan flyby or an asymmetric 10 hour window for Icy Satellite flybys. Custom periods 1) designated properly with SPASS notes 2) requests have "pick up at" and "hand off at" information filled in correctly 3) turn times and handoff attitudes have been verified – early PDT work recommended! Best strategy was to include all C/A obs, which is > 10 hrs.	Custom for 16:30 but at WP attitude inside 10:30 (could adjust spass)
10. PIEs are properly identified via _PIE naming convention. All agreed to PIEs have been integrated.	All except RSS wing PIEs are SP DLs, too, so not _PIE
11. Prime/rider coordination: secondaries have all been reviewed and agreed to, collaborative observations are so designated, pre-designed in PDT, prime instrument agrees to work with riders for collaborate designs. All collaborators marked in SPASS except INMS who is doing C/A secondary design for RSS. Will collaborate by necessity, but also have query out to INMS to see if they want to be SPASS rider (currently non-SPASS). If updated, will inform S71 leads.	x: but see text to left
12. Use rolling_sru if required. Follow rolling guidelines per SCO, see the ScoRules wiki page (linked to integration procedure)	x
13. The secondary axis for downlinks that contain prime and backup OTMs is the same, and inertially fixed	n/a
14. Downlinks that contain OTPs only roll for the first 4 hours of the downlink pass max. OTB: Full rolling OK, unless SRU issues, then 4_Hr_Rolling max (NO split rolls)	n/a
15. There is one downlink pass block per OTM prime or backup window (one wedding cake for a split pass). Exception - if first split downlink pass is ≤4 hours can use 2 cakes, put playback_gap in 2nd pass, put OTP/OTB in name of BOTH passes (for CDA). MUST have a full length 9 hour station requested for NAV tracking data	n/a

Segment Checklist p2

Item	Disposition notes, or X if complete
16. Moving any downlink pass to a different view period requires coordination with Navigation. Changes to the DSN strawman plan require SPST manager approval.	n/a
17. Any observation >3 hours in which the target body travels > 60 degrees must have a SPLAT item stating that the design must include quiescent periods approximately every 3 hours for 20 minutes	X (none >60 deg)
18. Live moveable blocks (LMBs) include the appropriate time margin specified as a DEADTIME request in CIMS at the beginning and end of the moveable block. TLM modes in separate OBSMOV request (n/a for RSS). Waypoint same entering as leaving, and is valid throughout. Avoid skeet shoots in LMBs. If CMT management required, contain within LMB. Live moveable blocks use an LMB epoch and use the appropriate epoch naming conventions. Live Update Blocks use a LUB epoch (RSS only).	n/a
19. Pointing is not altered for science during any SCO/MP activity that has pointing requirements (e.g., dust hazards). [Note that science turns are allowed for all but the first minute of an inbound thruster transition during a Titan or icy satellite flyby. No science turns are allowed during any portion of the outbound transition]	n/a
20. All stellar occultation observations include an additional +/-20 minutes of time (40 minutes total) when they occur within -1 day to +2 days of Saturn periapse	x
21. All Ground and Live Moveable blocks associated with non-targeted geometric events (e.g., solar and earth occultations) include an additional +/-20 minutes of time margin (40 minutes total) to account for reference trajectory changes.	n/a
22. Check your GMB, LMB, LUB, Occ times against current reference trajectory (Tour Atlas)	x
23. Dual playback of high value data is performed within this segment and does not affect downstream segments. CIMS entries are correct and SPASS type Note. SSR-A is emptied after the first downlink. Open a SPLAT item (tied to the ENGR request that resets the pointers, ie the DUALPB_CDS request) which says, "During DSN negotiations ensure that SSR-A is emptied before the pointers are reset. This item cannot be closed until the DSN negotiations are complete for both downlink passes, or the dual playback is deleted."	n/a
24. Run the resource checker in CIMS and fix errors found. Remaining notes disposition here or on notes page: Gap in SPASS at 2011-344T12:00:00 is intentional. VIMS "rider mismatch" error is false- ignore (2011-346T11:09:22). 4 INMS errors (2011-345 and 346) about using epoch outside GMB are OK. (INMS prefers this to avoid data gaps.)	x
25. SMT: note if SSR not empty at end of segment, have approval from following segment. No carryover across sequence boundaries. Aim for empty SSR every 4 days. No negative SSR margin during integration. List discrepancies on notes page.	x
26. Examine SMT warnings report, include dispositions here or on notes page of any items	x. none

Segment Checklist p3

Item	Disposition notes, or X if complete
27. Examine "ap_downlink report check" output, include dispositions here or on notes page of any items (see next two items). 2 weekly maintenance push-backs.	See Notes page.
28. List any DSN stations requested during maintenance periods, AND JUSTIFICATION. **AVOID!!!!!** (partial weekly only)	See Notes page.
29. Avoid requesting two overlapping stations (except for RSS science) whenever possible – use RSS station for downlink too	Yes: RSS & science playback together
30. Compare RSS requests to DSN requests, make sure they jive (ORT, occ, etc), ORTs are integrated.	x
31. RSS boresight: one _SP pass, two _PRIME downlink passes, one hour observation block in SNER_3	n/a
32. Apoapse segments only: Follow Integration Guideline & Constaint #15c regarding "two out of three" types of science per RBOT segment. ME OTM's split an RBOT segment.	n/a
33. Apoapse segments only: List your percent 70M stations requested - avoid >35%.	n/a
34. Support images use _XXM or _XXM3 activity type	n/a
35. In CIMS check for "start before", "end before", "start after", "end after" requests - fix if any problems found	x
36. Verify OPNAVs are in SNER5 and are support_image class, sanity check rest of tlm modes (RADAR 15 min in 5A/activity in 5A or 8, etc)	x
37. If sequence boundary at START of segment, ensure IVPGAP info correct, NO "start before" MAPS requests, OpNav is not first thing in segment	n/a
38. If sequence boundary at END of segment (ie in the next segment), ensure 6 "SEQ" upload DSN passes - will probably ripple into preceding segment(s), notify them. Last pass has Ybias window in front, no bonus science. NO "end after" MAPS requests	n/a
39. Verify opmodes correct (RSS and RADAR especially), teams going to sleep have agreed? MIMI: not in sleep during RPX? Use table at https://cassini.jpl.nasa.gov/wiki/bin/view/Cassini/XXMOpModes	x. (see Notes page)
40. If conjunction is in your segment, see Conjunction page on SP Wiki	n/a
41. RAMAVOID: new waypoint, NOT in custom period	n/a
42. If on thrusters, confirm deadbands	n/a
43. Segment products linked to XXM deliveries page, & this package when you are done	x