CassiniXXM
EXTENDED EXTENDED MISSION

CASSINI SOST SEGMENT

Rev 156 E16 Handoff Package

Segment Boundary 2011-309T21:17:00 to 2011-312T03:32:00

18 March 2011

Nancy Vandermey

SMT report and SPASS

Science Highlights

Notes & Liens

Integration Checklist

SMT report

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_156EA_C70METSEQ310_PRIME	310 19:47	311 04:47	0	2904	95	2999	3322	323	0	242	53	3294	2755	-539	0	0%	539
SP_156EA_M70METNON311_PRIME	311 04:47	311 07:47	539	0	0	539	3322	2784	0	461	18	1017	806	-211	0	0%	211
SP_156EA_C34HEFSEQ311_PRIME	311 18:32	312 03:32	211	379	45	635	3322	2687	0	232	53	920	664	-257	0	0%	256

Was 100 Mb carryover to MAG before DSN predict updates and RADAR redesigns. Still acceptable. Will fix during negotiations if necessary (this is after the GRAIL launch period)

SPASS

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S70, length = 70 days		2011-250T00:48:00		070T02:14:00	2011-320T03:02:00			
Enceladus Flyby E16 Segment		2011-309T21:17:00		002T06:15:00	2011-312T03:32:00			
SP_156EN_WAYPTTURN309_PRIME		2011-309T21:17:00		000T00:30:00	2011-309T21:47:00	ISS_NAC to Enceladus	POS_X to NEP	pt 1 of 2
SP_156EN_WAYPTTURN409_PRIME		2011-309T21:47:00		000T00:23:00	2011-309T22:10:00	ISS_NAC to Enceladus	NEG_X to 90.0/17.0	pt 2 of 2
NEW WAYPOINT		2011-309T22:10:00		000T21:37:00	2011-310T19:47:00	ISS_NAC to Enceladus	NEG_X to 90.0/17.0	
SP_156EN_DEADTIME309_PRIME		2011-309T22:10:00		000T00:05:00	2011-309T22:15:00	ISS_NAC to Enceladus	NEG_X to 90.0/17.0	
Begin Custom		2011-309T22:15:00	GMB_E156_ENCELADUS_E16-000T06:43:53	000T00:00:01	2011-309T22:15:01			
ISS_156EN_PLMHPHR001_PIE	C, U, V	2011-309T22:15:00	GMB_E156_ENCELADUS_E16-000T06:43:53	000T02:00:00	2011-310T00:15:00	ISS_NAC to Enceladus	NEG_X to NSP	Pick up at ISS_NAC to Enceladus, NEG_X to 90.0/17.0; Hand off at ISS_NAC to Enceladus, NEG_X to NSP. SOST PIE
CIRS_156EN_ENCELADUS001_PRIME	I, V	2011-310T00:15:00	GMB_E156_ENCELADUS_E16-000T04:43:53	000T02:42:00	2011-310T02:57:00	CIRS_FP1 to Enceladus	NEG_X to NSP	Pick up at ISS_NAC to Enceladus, NEG_X to NSP; Hand off at NEG_Z to Enceladus, NEG_X to 90.0/17.0.
RADAR_156EN_ENCELINB001_PIE	M	2011-310T02:57:00	GMB_E156_ENCELADUS_E16-000T02:01:53	000T01:22:10	2011-310T04:19:10	NEG_Z to Enceladus	POS_Y to North_Pole_Dir	Pick up at NEG_Z to Enceladus, NEG_X to 90.0/17.0; Hand off at NEG_Z to Enceladus, POS_Y to North_Pole_Dir.
RADAR_156EN_ENCELINB002_PIE	M	2011-310T04:19:10	GMB_E156_ENCELADUS_E16-000T00:39:43	000T00:31:19	2011-310T04:50:29	NEG_Z to Enceladus	POS_Y to North_Pole_Dir	Pick up at NEG_Z to Enceladus, POS_Y to North_Pole_Dir; Hand off at NEG_Z to Enceladus, POS_Y to North_Pole_Dir.
ENGR_156SC_RADRCS310_PRIME	M	2011-310T04:50:29	GMB_E156_ENCELADUS_E16-000T00:08:24	000T00:01:00	2011-310T04:51:29	NEG_Z to Enceladus	POS_Y to North_Pole_Dir	Pick up at NEG_Z to Enceladus, POS_Y to North_Pole_Dir; Hand off at NEG_Z to Enceladus, POS_Y to North_Pole_Dir. deadband =(2,2,20)
Begin Dual Playback Science...		2011-310T04:51:29	GMB_E156_ENCELADUS_E16-000T00:07:24	000T00:00:01	2011-310T04:51:30			
RADAR_156EN_ENCELCA001_PIE	M	2011-310T04:51:29	GMB_E156_ENCELADUS_E16-000T00:07:24	000T00:44:24	2011-310T05:35:53	NEG_Z to Enceladus	NEG_X to SC_RAM	Pick up at NEG_Z to Enceladus, POS_Y to North_Pole_Dir; Hand off at NEG_Z to Enceladus, NEG_X to North_Pole_Dir.
156EN (t) E16 ENCELADUS In...		2011-310T04:58:53		000T00:00:01	2011-310T04:58:54			
End Dual Playback Science f...		2011-310T05:35:53	GMB_E156_ENCELADUS_E16+000T00:37:00	000T00:00:01	2011-310T05:35:54			
ENGR_156SC_DFPWBIAS310_PPS	M	2011-310T05:35:53	GMB_E156_ENCELADUS_E16+000T00:37:00	000T00:21:05	2011-310T05:56:58	NEG_Z to Enceladus	NEG_X to North_Pole_Dir	Pick up at NEG_Z to Enceladus, NEG_X to North_Pole_Dir; Hand off at NEG_Z to Enceladus, NEG_X to North_Pole_Dir. Deadband=(2, 2, 2)
RADAR_156EN_ENCELOUTB001_PIE	M	2011-310T05:56:58	GMB_E156_ENCELADUS_E16+000T00:58:05	000T01:24:07	2011-310T07:21:05	NEG_Z to Enceladus	NEG_X to North_Pole_Dir	Pick up at NEG_Z to Enceladus, NEG_X to North_Pole_Dir; Hand off at NEG_Z to Enceladus, NEG_X to 90.0/17.0.
ISS_156EN_ENCEL001_PRIME	C, U, V	2011-310T07:21:09	GMB_E156_ENCELADUS_E16+000T02:22:16	000T03:29:56	2011-310T10:51:05	ISS_NAC to Enceladus	NEG_X to 90.0/17.0	No Preference to secondary pointing. Pick up at NEG_Z to Enceladus, NEG_X to 90.0/17.0; Hand off at ISS_NAC to Enceladus, NEG_X to 90.0/17.0. No Preference to secondary pointing
Periapse R = 3.260 Rs, lat ...		2011-310T07:58:12		000T00:00:01	2011-310T07:58:13			
End Custom		2011-310T10:51:05	GMB_E156_ENCELADUS_E16+000T05:52:12	000T00:00:01	2011-310T10:51:06			
SP_156EN_DEADTIME310_PRIME		2011-310T10:51:06	GMB_E156_ENCELADUS_E16+000T05:52:13	000T00:01:54	2011-310T10:53:00	ISS_NAC to Enceladus	NEG_X to 90.0/17.0	
UVIS_156DI_ICYSTARE001_PRIME	C, I, V	2011-310T10:53:00		000T05:14:00	2011-310T16:07:00	ISS_NAC to Dione	PIC	Target to center of illuminated crescent
UVIS_156IC_ALPVIR002_PRIME	V	2011-310T16:07:00		000T03:00:00	2011-310T19:07:00	UVIS_FUV to Star	PIC	
SP_156EA_DLTURN310_PRIME		2011-310T19:07:00		000T00:30:00	2011-310T19:37:00	XBAND to Earth (0.0,0.0,-40.0 deg. offset)	POS_X to NEP	pt 1 of 2
SP_156EA_DLTURN410_PRIME		2011-310T19:37:00		000T00:10:00	2011-310T19:47:00	XBAND to Earth	POS_X to NEP	pt 2 of 2
NEW WAYPOINT		2011-310T19:47:00		001T07:45:00	2011-312T03:32:00	XBAND to Earth	POS_X to NEP	
SP_156EA_C70METSEQ310_PRIME	C, E	2011-310T19:47:00		000T09:00:00	2011-311T04:47:00	XBAND to Earth	Rolling	POS_X to NEP or NSP, CAPS
Pointer Reset in preparatio...		2011-311T04:47:00		000T00:00:01	2011-311T04:47:01			
SP_156EA_M70METNON311_PRIME	C	2011-311T04:47:00		000T03:00:00	2011-311T07:47:00	XBAND to Earth	Rolling	POS_X to NEP, CAPS
ISS_156OT_L5ENCE311_PRIME	V	2011-311T07:47:00		000T04:23:00	2011-311T12:10:00	ISS_NAC to Rocks	NEG_Z to Earth	No return to WP (ISS-internal hand-off). No science preference for secondary axis.
ISS_156OT_L5RHEA311_PRIME	V	2011-311T12:10:00		000T04:52:00	2011-311T17:02:00	ISS_NAC to Rocks	NEG_Z to Earth	Pick-up at Enceladus L5 point (ISS-internal hand-off). No science preference for secondary axis.
SP_156EA_YBIAS311_PRIME	E	2011-311T17:02:00		000T01:30:00	2011-311T18:32:00	XBAND to Earth	POS_X to NEP	
SP_156EA_C34HEFSEQ311_PRIME	C	2011-311T18:32:00		000T09:00:00	2011-312T03:32:00	XBAND to Earth	Rolling	POS_X to NEP or NSP, CAPS

CassiniXXM EXTENDED EXTENDED MISSION

Science Highlights

Rev 156 periapse is the targeted E16 flyby. This is a 500 km flyby on RCS control for RADAR. The goal of this measurement is to perform the first close SAR measurement on an icy satellite to understand the structure and composition of the regolith directly below the surface, and to compare this result with similar measurements of Titan.

The only other SOST PIE is an Enceladus plume observation to aid in understanding their structure and morphology, temporal variability, and relationship to geological features and hot spots on the surface. There are no out of discipline PIEs.

Other SOST science includes inbound CIRS FP3 global scans of Enceladus to map thermal anomalies on the moon and to search for variability, ORS observations of Enceladus post-flyby, UVIS ICYSTARE of Dione to measure its UV spectral albedo and search for an exosphere, UVIS ALPVIR stellar calibration, and (in a caboose period) L5 rock searches for both Enceladus and Rhea to look for small moons and particles trapped in gravitationally stable regions.

Dual Playback

- A Dual Playback for High Value Science has been planned

- Based on DSN requests, SMT results indicate it will fit within this segment (some carryover to next downlink)

- A SPLAT item has been opened until the DSN negotiations for this time period are complete

Flyby	Driving Instrument	BEGHIVAL	ENDHIVAL	P4 Dual Playback	SSR-A empty after first playback?	Anything nonstandard?
E16	RADAR	E16-7:24	E16+37:00	394 Mb	Yes	First playback does not empty SSR, MUST do A4 first

Notes and Liens

- Pointing:
    - No collaborative prime/rider coordination designs
    - Teams have validated custom handoffs and turn times
    - No Ybias window for first downlink due to it being an RCS flyby
    - Sitting at Enceladus waypoint would cause 2.6° CIRS heating, but RADAR turns will negate that
- Data Volume:
    - Carryover to following MAGTWT segment has been approved by them (me). Dual playback strategy has been validated.
- DSN:
    - No issues
- Opmodes:
    - Standard RCS, RADAR opmodes
- Hydrazine:
    - RADAR worked closely with Todd Brown/AACS to tweak the timing of the RCS & RWA transitions to minimize hydrazine usage. Current estimate is ≈175 grams, less than the 200 grams MP was bookkeeping
- Special Activities:
    - None

Sequence Liens:

- SPLAT item opened for dual playback

Segment Checklist p1

Item	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	Cirs heating, see issues page
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!	13 hour custom period
10. PIEs are properly identified via _PIE naming convention. All agreed to PIEs have been integrated.	x
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	x
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	x
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)	x
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	x

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.	x
17. Multi-revolution turns about the X-axis have an offset greater than or equal to 30 degrees	x
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).	-
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]	x
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.	x
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."	x
24. Run the resource checker in CIMS and fix errors found. Remaining notes disposition here or on notes page2 related to opmodes: OK, 1 for PPL being A4/B4, 1 for INMS using GMB epoch, 1 for Radar warmup tlm mode switch during ISS	All OK
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.	Carryover OK per magtwt
26. Examine SMT warnings report, include dispositions here or on notes page of any items. Standard RADAR complaints	All OK
27. RSS boresight: one _SP pass, two _PRIME downlink passes, one hour observation block in SNER_3	-

Segment Checklist p3

Item	Disposition notes, or X if complete
28. Examine "ap_downlink report check" output, include dispositions here or on notes page of any items (see next two items).	x
29. List any DSN stations requested during maintenance periods, AND JUSTIFICATION. **AVOID!!!!!**	x
30. Avoid requesting two overlapping stations (except for RSS science) whenever possible – use RSS station for downlink too	x
31. Compare RSS requests to DSN requests, make sure they jive (ORT, occ, etc), ORTs are integrated.	x
32. Apoapse segments only: List your percent 70M stations requested - avoid >35%.	x
33. 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.	x
34. Periapse segments: >3 hr observations with >60 degree target motion are broken up by a 20 min inertial period (lien if not explicit in SPASS)	x
35. Support images use _XXM or _XXM3 activity type	x
36. In CIMS check for "start before", "end before", "start after", "end after" requests - fix if any problems found	x
37. 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
38. If sequence boundary at START of segment, ensure IVPGAP info correct, NO "start before" MAPS requests, OpNav is not first thing in segment	x
39. 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	x
40. 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
41. If conjunction is in your segment, see Conjunction page on SP Wiki	x
42. RAMAVOID: new waypoint, NOT in custom period	x
43. If on thrusters, confirm deadbands	x
44. Segment products linked to XXM deliveries page, & this package when you are done	x