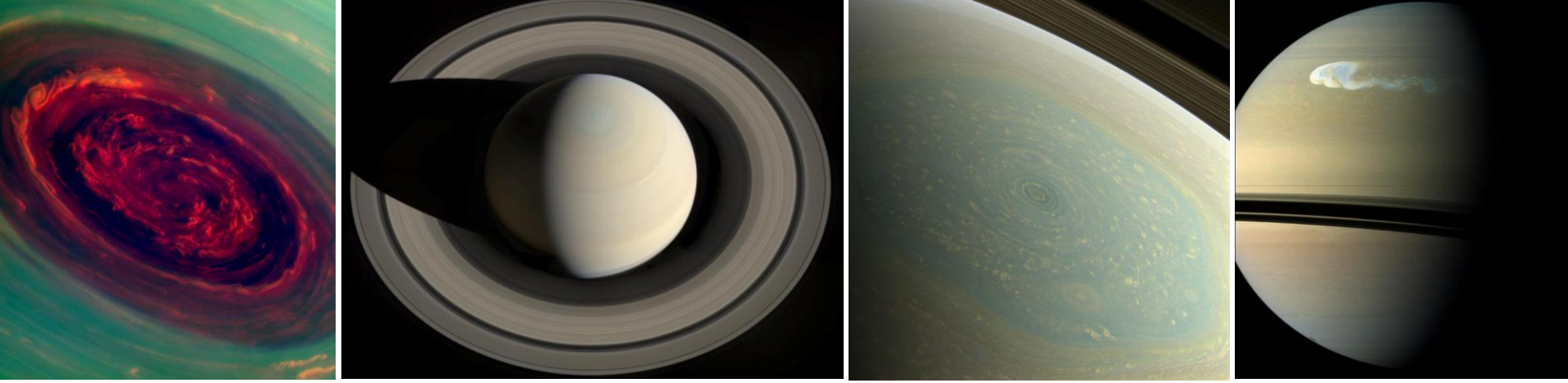


Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 12 Outbound Segment Legacy Package

Segment Boundary: Aug 3, 2005 – Aug 4, 2005
2005-215T14:50:00 – 2005-216T22:00:00 (SCET)

Integration Began 09/17/2001
Segment Delivered to S13 Sequence 02/08/2002
Lead Integrator was Jerod Gross

Legacy Package Assembled by Keven Uchida

Table of Contents

*** N.A. = Slide present but content not available.**

Segment Overview and Final Products

Segment Summary

- This is a very short (~1.5 day long) Prime Mission outbound segment. Periapse occurs ~1.4 days **prior** to the start of this segment. The S/C is in an inclined orbit. Phase angles were relatively high, ranging between 112 – 96 degrees.
- The initial science proposal included UVIS EUV-FUV observations of Saturn, followed by ISS observations (first of satellites, then of Saturn), and then concluding with OPNAV satellite observations (page 11). The final plan (page 5) had instead the UVIS and ISS observations entirely replaced by an ~21 hour long CIRS Far-IR mapping of Saturn (scanning N-S). The ~1 hour remaining in the segment went to OPNAV satellite imaging.
- Data volume was initially oversubscribed (page 12), but cuts were made come within the allocation/downlink capability.
- There were no Sun constraints/issues in planning this segment

Final Sequenced SPASS

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
SATURN rev 12 Segment		2005-215T14:50:00		001T07:30:00	2005-216T22:20:00			
SP_012SA_WAYPTTURN215_PRIME		2005-215T14:50:00		000T00:20:00	2005-215T15:10:00	ISS_NAC to 300.0/0.0	POS_X to NSP	SP Turn to Waypoint
SP_012SA_WAYPTTURN415_PRIME	U, V	2005-215T15:10:00		000T00:18:00	2005-215T15:28:00	ISS_NAC to Saturn	POS_X to NSP	SP Turn to Waypoint
NEW WAYPOINT		**2005-215T15:28:00**		**001T07:37:00**	**2005-216T23:05:0(**	**ISS_NAC to Saturn**	**POS_X to NSP**	
CIRS_012SA_FIRMAP008_PRIME	C, U, V	2005-215T15:28:00		000T20:52:00	2005-216T12:20:00	CIRS_FP1 to Saturn	POS_X to NSP	
NAV_012SK_OPNAV161_PRIME	N	2005-216T12:20:00		000T00:59:00	2005-216T13:19:00	ISS_NAC to Satellites	POS_X to NSP	Starts at waypoint, ends at Earth point
NAV_012EA_DLTURN161_PRIME		2005-216T13:19:00		000T00:01:00	2005-216T13:20:00	XBAND to Earth	POS_X to NEP	
SP_012EA_G34BWGOTB216_PRIME	N	2005-216T13:20:00		000T09:00:00	2005-216T22:20:00	XBAND to Earth	POS_X to NEP	

Final Sequenced SMT and Data Volume

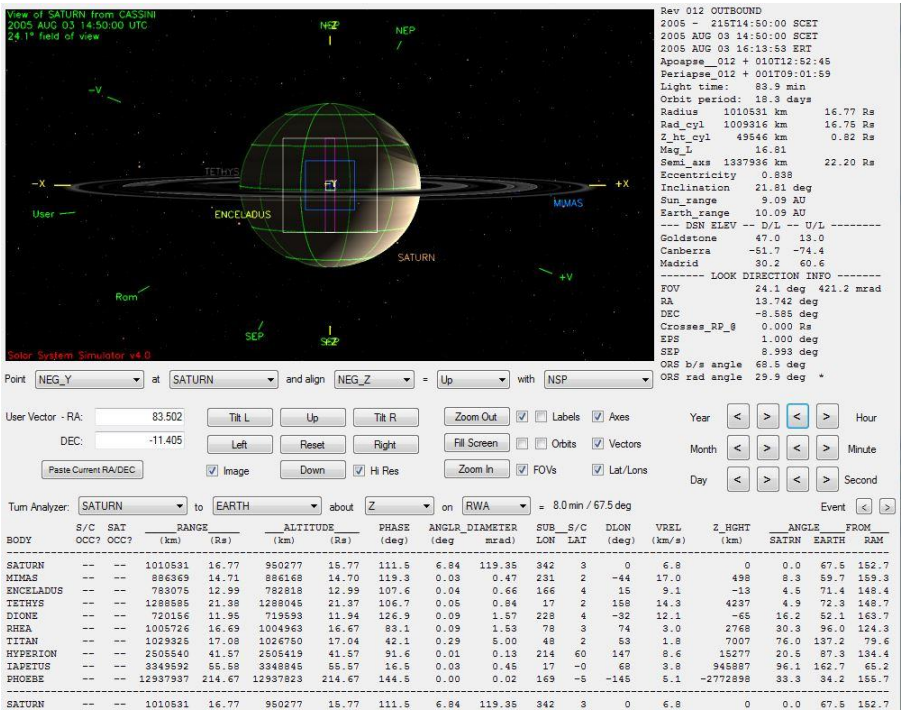
DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

			OBSERVATION_PERIOD							DOWNLINK_PASS							
			P4						P5	RECORDED		PLAYBACK					
DOWNLINK PASS NAME	Start doy hh:mm	End doy hh:mm	START (Mb)	SCI (Mb)	HK+E (Mb)	TOTAL (Mb)	CPACTY (Mb)	MRGN (Mb)	OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_MARGN (%)	CAROVR (Mb)
SP_012EA_G34BWGOTB216_PRIME	216 13:20	216 22:20	0	1440	77	1516	3468	1952	9	248	53	1826	668	-1158	72	1%	1158

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

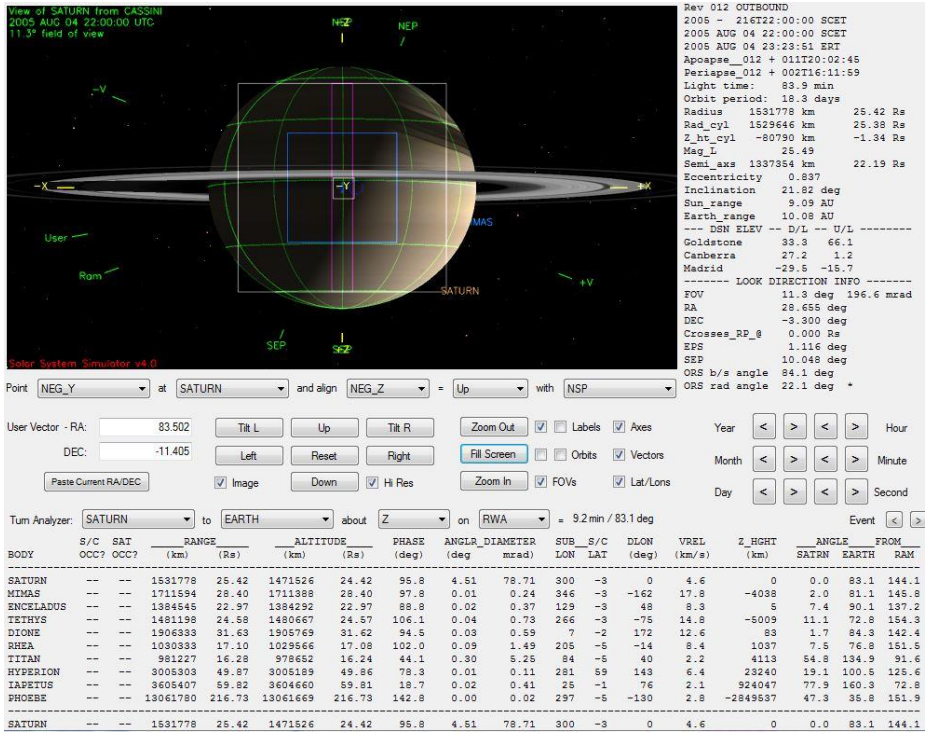
Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
OBSERVATION_NOR	215 14:50	216 13:20	81.0	104.9	300.5	4.1	0.0	80.0	97.2	0.0	703.2	32.8	10.0	0.0	0.0	1413.6
OBSERVATION_OPN	215 14:50	216 13:20	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
OBSERVATION_SI	215 14:50	216 13:20	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0
SP_012EA_G34BWGOTB216_PRIME	216 13:20	216 22:20	32.4	17.0	86.4	1.6	0.0	32.0	38.9	0.0	35.2	2.5	0.0	0.0	0.0	245.9
DAILY TOTAL SCIENCE	215 14:50	216 22:20	113.4	121.8	399.9	5.7	0.0	112.0	136.1	0.0	738.4	35.3	10.0	0.0		

Segment Geometry



Seg Start (Left)

Seg End (below)



	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	16.77	111.5	+3
Segment End	25.42	95.8	–3

Solar Geometry – ORS Boresight Concerns

No ORS Boresight Solar Constraints on Science Pointing.

Daily Science Highlights

- **Aug 3 (DOY 215):** The one observation period in this segment started at 2005-215T15:28:00 with an ~21 hour duration CIRS Far-IR mapping observation of Saturn (scanning N-S).
- **Aug 4 (DOY 216):** Following the CIRS Far-IR map, OPNAV satellite imaging was performed for the remaining one hour of this segment.

Segment Integration Planning

Rev 12 Outbound Strawman

- **Rev 12 outbound segment (215T14:00 to 216T22:00)**
  - Periapse is 2005-214T05:31:27.70, so this seg starts at Peri+1T08:30
  - Total data volume of all inputs: ~1920 Mb
  - Proposed DSN passes: 1 Goldstone 34-m HEF, ~840 Mb capability
- **Proposed Strawman:**
- UVIS moved 2:00 earlier
- ISS Pandora and Atlas events moved ~0:02 later
- ISS Photom moved 2:23 earlier
- OPNAV given 3:05 to do whatever they want
- 30 minutes to turn to Earth after OpNav
- 9.25-hour d/l assumed (13 hrs. pictured); no CIRS DS Cal due to OTM
- OTM window moved 7:00 later - OK?
- **Questions**
- Is SOST using Mad 70-m downlink?

Observation	Start Time	Dur	End Time
UVIS EUV-FUV	215T15:00	11:00	216T02:00
ISS Pandora Mutual Event	216T02:00	0:31	216T02:31
ISS Atlas Mutual Event	216T02:31	0:31	216T03:02
ISS Janus Mutual Event	216T03:02	0:31	216T03:33
ISS Saturn Photom 001	216T03:40	0:24	216T04:04
ISS Saturn Photom 002	216T04:40	0:24	216T05:04
ISS Saturn Photom 003	216T05:40	0:24	216T06:04
ISS Saturn Photom 004	216T06:40	0:24	216T07:04
ISS Saturn Photom 005	216T07:40	0:24	216T08:04
ISS Saturn Photom 006	216T08:40	0:24	216T09:04
OPNAV	216T09:10	3:05	216T12:15
Downlink & OTM-26 B/U	216T12:45	9:15	216T22:00

Initial SMT and Data Volume

Beginning of Integration:

Rev 12 Outbound

- We are oversubscribed by 725 Mb (more than a factor of 2!)
  - Science usage = 1423 Mb; ORS usage = 58% (821 Mb), MAPS usage = 42% (602 Mb)
  - One solution would be ORS cuts 0.58*725 = 421 Mb, MAPS cuts by 0.42*725 = 304
  - Other solutions?
  - We need to come up with a solution here today!
- Telem mode = S_N_ER_5 for OpNav, S_N_ER_3 elsewhere? OpMode = ORS_RWA?

Playback	Start doy hh:mm	End doy hh:mm	Volume (Mb)	5% (Mb)	ENG+HK (Mb)	SCIENCE (Mb)	TOTAL (Mb)	MARGIN (Mb)
Gold_27k**	216 13:05	216 22:35	877	44	134	1423	1558	-725

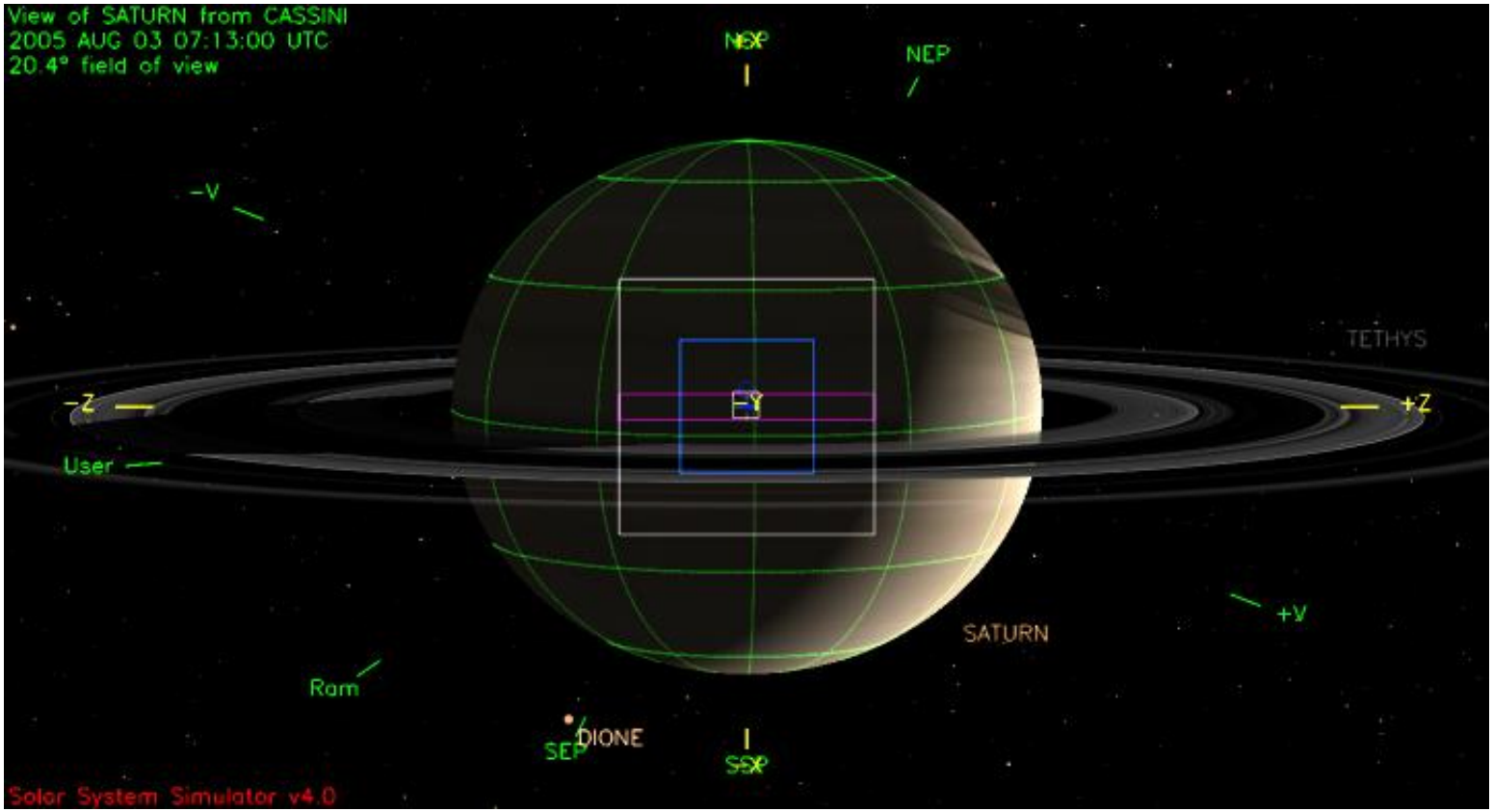
Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	ENG (Mb)	SCIENC (Mb)	TOTAL (Mb)
OBSERVATION	215 13:59	216 13:05	166.2	27.4	302.4	4.2	18.5	49.9	75.0	0.0	108.0	76.1	420.0	59.7	19.6	1326.9
Gold_27k**	216 13:05	216 22:35	68.4	5.1	0.0	1.7	1.5	20.5	30.8	0.0	44.5	2.5	0.0	55.0	0.1	230.7

Waypoint Selection

No Waypoint Selection Info Available

Waypoints Chosen

Waypoint 1 (2005-215T15:28:00 to – 216T23:05:00): NEG_Y to Saturn, POS_X to NSP.



Saturn Rev 12 Outbound Open Issues (as of 02/08/02)

- **Pointing Issues**
  - The waypoint is NAC to Saturn, +X to Saturn N. Pole.
- **Data Volume Issues**
  - 80 Mb of "extra" data volume available. The Saturn TWT agrees that the 80 Mb should be awarded to CIRS to help restore the Far-IR Map. Originally requesting 4000 bps, the Far-IR Map was cut back to 2000 bps to solve a data volume problem that was partly fictitious. The 80 Mb helps, but still does not restore 4000 bps.
  - There are OpNavs in the observation period.
- **CIMS Issues**
  - None
- **Power Issues**
  - None
- **Flight Rule / Mission Planning Guideline & Constraint Issues**
  - None
- **Other Issues**
  - None