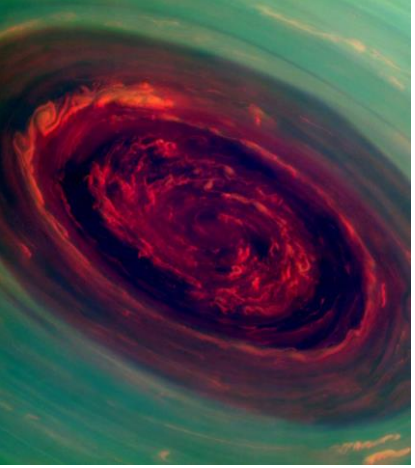

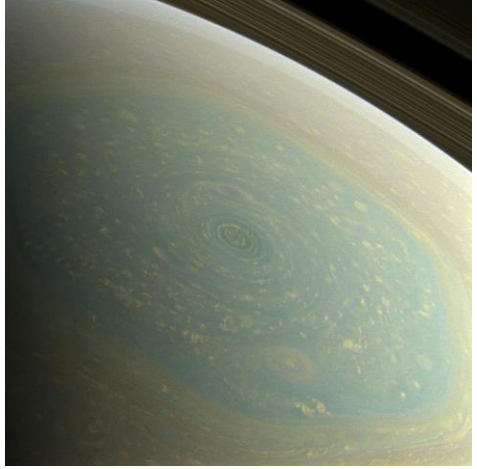
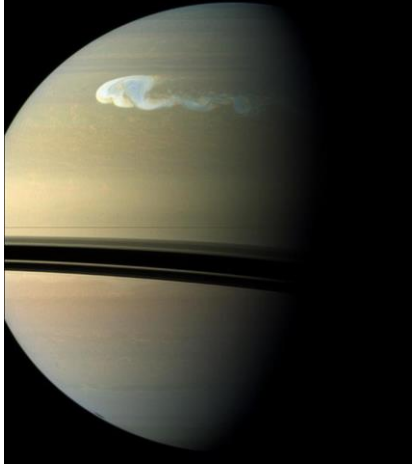

Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 11a Segment Legacy Package

Segment Boundary: July 11, 2005 – July 12, 2005
2005-192T23:30:00 – 2005-194T00:00:00 (SCET)

Integration Began 09/17/2001
Segment Delivered to S12 Sequence 03/01/2002
Lead Integrator was S. Edgington

Legacy Package Assembled by Keven Uchida

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

Segment Overview and Final Products

Segment Summary

- This is a short, one day long Prime Mission inbound segment (periapse occurs ~two days after segment end)
- The S/C was in an inclined orbit. The view was of the southern hemisphere of Saturn from distances which ranged between 27 - 21 R_S. Phase angles were between a relatively narrow range of 41 - 32 degrees.
- There was only one observation period in this segment, with a duration of ~13 hours.
- There were no ORS boresight constraints/issues in this segment

Final Sequenced SPASS (1 of 1)

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
SATURN rev 11 Segment		2005-192T23:30:00		000T23:30:00	2005-193T23:00:00			
SP_011SA_WAYPTTURN192_PRIME	M, R	2005-192T23:30:00		000T00:30:00	2005-193T00:00:00	ISS_NAC to Saturn	NEG_X to Sun	
NEW WAYPOINT		**2005-193T00:00:00**		**001T00:00:00**	**2005-194T00:00:00**	**ISS_NAC to Saturn**	**NEG_X to Sun**	
UVIS_011RI_IMPACT003_PRIME	I, M, R, V	2005-193T00:00:00		000T02:45:00	2005-193T02:45:00	UVIS_HSP to Rings	NEG_X to Sun	Point HSP at rings entirely in Saturn's shadow. CHECK WITH CAPS/MAPS before making changes to pointing.
RADAR_011TI_SOUTH4CAL001_PRIME	M	2005-193T02:45:00		000T01:00:00	2005-193T03:45:00	NEG_Z to Titan	NEG_X to SC_RAM	RADAR must control primary and secondary axes to obtain correct polarization. CHECK WITH CAPS/MAPS before making changes to pointing.
VIMS_011RI_FOLLOWUP002_PRIME	M	2005-193T03:45:00		000T00:15:00	2005-193T04:00:00	VIMS_IR to Rings	NEG_X to Sun	CHECK WITH CAPS/MAPS before making changes to pointing.
ISS_011SA_1X2WPH40001_PRIME	M, V	2005-193T04:00:00		000T00:50:00	2005-193T04:50:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_011SA_1X2WPH40002_PRIME	M, V	2005-193T05:00:00		000T00:50:00	2005-193T05:50:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_011SA_1X2WPH40003_PRIME	M, V	2005-193T06:00:00		000T00:50:00	2005-193T06:50:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_011SA_1X2WPH40004_PRIME	M, V	2005-193T07:00:00		000T00:50:00	2005-193T07:50:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_011SA_1X2WPH40005_PRIME	M, V	2005-193T08:00:00		000T00:50:00	2005-193T08:50:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_011SA_1X2WPH40006_PRIME	M, V	2005-193T09:00:00		000T00:50:00	2005-193T09:50:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_011SA_1X2WPH40007_PRIME	M, V	2005-193T10:00:00		000T00:50:00	2005-193T10:50:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_011SA_1X2WPH40008_PRIME	M, V	2005-193T11:00:00		000T00:50:00	2005-193T11:50:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_011OT_SATELLORB020_PRIME	M	2005-193T11:50:00		000T01:00:00	2005-193T12:50:00	ISS_NAC to Satellites	NEG_X to Sun	
NAV_011SK_OPNAV931_PRIME	M	2005-193T12:50:00		000T01:49:00	2005-193T14:39:00	ISS_NAC to Satellites	NEG_X to Sun	Starts at waypoint, ends at Earth point
NAV_011EA_DLTURN931_PRIME		2005-193T14:39:00		000T00:01:00	2005-193T14:40:00	XBAND to Earth	NEG_X to Sun	
SP_011EA_G70METNON193_PRIME	C, R	2005-193T14:40:00		000T08:50:00	2005-193T23:30:00	XBAND to Earth	Rolling	

Final Sequenced SMT and Data Volume

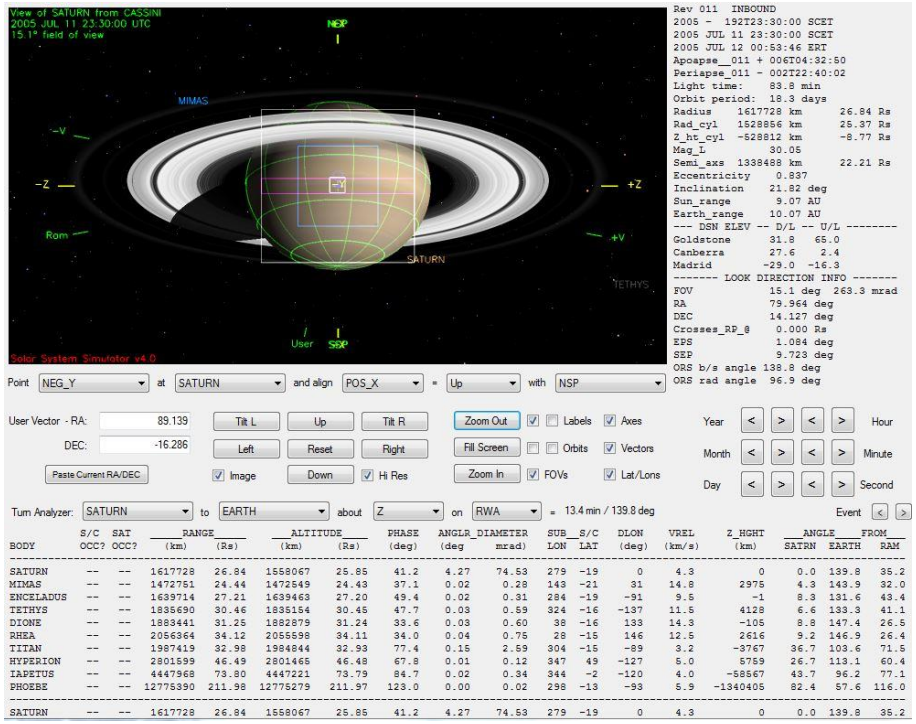
DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

			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_011EA_G70METNON193_PRIME	193 14:40	193 23:30	161	2267	53	2481	3460	979	35	287	52	2855	3286	432	541	4%	0

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	192 23:30	193 14:40	327.7	5.4	0.0	2.7	887.8	53.9	65.5	4.0	324.2	64.8	510.0	0.0	0.0	2246.1
OBSERVATION_OPN	192 23:30	193 14:40	0.0	0.0	0.0	0.0	34.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.8
SP_011EA_G70METNON193_PRIME	193 14:40	193 23:30	31.8	3.2	86.4	1.6	0.0	31.4	38.2	0.0	89.0	2.4	0.0	0.0	0.0	284.0
DAILY TOTAL SCIENCE	192 23:30	193 23:30	359.5	8.6	86.4	4.3	887.8	85.4	103.7	4.0	413.2	67.2	510.0	0.0		

Segment Geometry




```
Rev 011   INBOUND
2005 -  192T23:30:00 SCET
2005 JUL 11 23:30:00 SCET
2005 JUL 12 00:53:46 ERT
Apoapse__011 + 006T04:32:50
Periapse__011 - 002T22:40:02
Light time:    83.8 min
Orbit period:  18.3 days
Radius      1617728 km      26.84 Rs
Rad_cyl     1528856 km      25.37 Rs
Z_ht_cyl    -528812 km      -8.77 Rs
Mag_L          30.05
Semi_axs    1338488 km      22.21 Rs
Eccentricity    0.837
Inclination    21.82 deg
Sun_range       9.07 AU
Earth_range    10.07 AU
--- DSN ELEV -- D/L -- U/L --------
Goldstone      31.8    65.0
Canberra       27.6     2.4
Madrid        -29.0   -16.3
------- LOOK DIRECTION INFO -------
FOV                15.1 deg  263.3 mrad
RA                 79.964 deg
DEC                14.127 deg
Crosses_RP_@        0.000 Rs
EPS                 1.084 deg
SEP                 9.723 deg
ORS b/s angle 138.8 deg
ORS rad angle  96.9 deg
```

Point NEG_Y at SATURN and align POS_X = Up with NSP

User Vector - RA: 89.139 DEC: -16.286 Paste Current RA/DEC

Tilt L | Up | Tilt R | Left | Reset | Right | Down | Image | Hi Res

Zoom Out | Fill Screen | Zoom In | Labels | Orbits | FOVs | Axes | Vectors | Lat/Lons

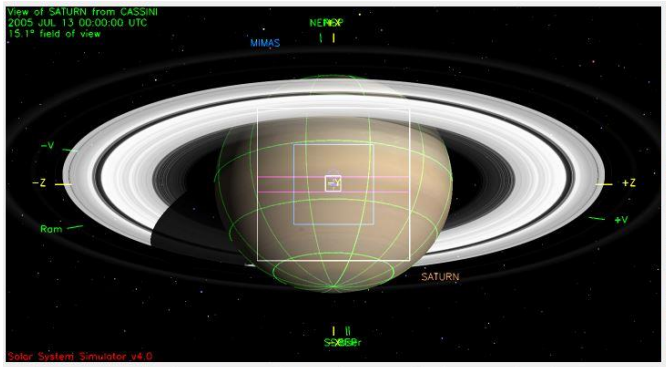
Year / Month / Day / Hour / Minute / Second

Turn Analyzer: SATURN to EARTH about Z on RWA = 13.4 min / 139.8 deg Event

BODY	S/C OCC?	SAT OCC?	RANGE (km)	RANGE (Rs)	ALTITUDE (km)	ALTITUDE (Rs)	PHASE (deg)	ANGLR_DIAMETER (deg)	ANGLR_DIAMETER (mrad)	SUB_S/C LON	SUB_S/C LAT	DLON (deg)	VREL (km/s)	Z_HGHT (km)	ANGLE FROM SATRN	ANGLE FROM EARTH	ANGLE FROM RAM
SATURN	--	--	1617728	26.84	1558067	25.85	41.2	4.27	74.53	279	-19	0	4.3	0	0.0	139.8	35.2
MIMAS	--	--	1472751	24.44	1472549	24.43	37.1	0.02	0.28	143	-21	31	14.8	2975	4.3	143.9	32.0
ENCELADUS	--	--	1639714	27.21	1639463	27.20	49.4	0.02	0.31	284	-19	-91	9.5	-1	8.3	131.6	43.4
TETHYS	--	--	1835690	30.46	1835154	30.45	47.7	0.03	0.59	324	-16	-137	11.5	4128	6.6	133.3	41.1
DIONE	--	--	1883441	31.25	1882879	31.24	33.6	0.03	0.60	38	-16	133	14.3	-105	8.8	147.4	26.5
RHEA	--	--	2056364	34.12	2055598	34.11	34.0	0.04	0.75	28	-15	146	12.5	2616	9.2	146.9	26.4
TITAN	--	--	1987419	32.98	1984844	32.93	77.4	0.15	2.59	304	-15	-89	3.2	-3767	36.7	103.6	71.5
HYPERION	--	--	2801599	46.49	2801465	46.48	67.8	0.01	0.12	347	49	-127	5.0	5759	26.7	113.1	60.4
IAPETUS	--	--	4447968	73.80	4447221	73.79	84.7	0.02	0.34	344	-2	-120	4.0	-58567	43.7	96.2	77.1
PHOEBE	--	--	12775390	211.98	12775279	211.97	123.0	0.00	0.02	298	-13	-93	5.9	-1340405	82.4	57.6	116.0
SATURN	--	--	1617728	26.84	1558067	25.85	41.2	4.27	74.53	279	-19	0	4.3	0	0.0	139.8	35.2

Seg Start (2005-192T23:30:00)

Seg End (2005-194T00:00)




```
Rev 011   INBOUND
2005 -  194T00:00:00 SCET
2005 JUL 13 00:00:00 SCET
2005 JUL 13 01:23:48 EDT
Apoapse__011 + 007T05:02:50
Periapse__011 - 001T22:10:02
Light time:    83.8 min
Orbit period:  18.3 days
Radius      1254663 km      20.82 Rs
Rad_cyl     1174475 km      19.49 Rs
Z_ht_cyl    -441347 km      -7.32 Rs
Mag_L          23.76
Semi_axs    1338488 km      22.21 Rs
Eccentricity    0.837
Inclination    21.82 deg
Sun_range       9.07 AU
Earth_range    10.08 AU
--- DSN ELEV -- D/L -- U/L --------
Goldstone      25.0    58.8
Canberra       30.7     8.3
Madrid        -28.8   -20.4
------- LOOK DIRECTION INFO -------
FOV                15.1 deg  263.3 mrad
RA                 89.613 deg
DEC                16.426 deg
Crosses_RP_@        0.000 Rs
EPS                 0.989 deg
SEP                 8.865 deg
ORS b/s angle 148.4 deg
ORS rad angle  93.7 deg
```

Point NEG_Y at SATURN and align POS_X = Up with NSP

User Vector - RA: 89.139 DEC: -16.286 Paste Current RA/DEC

Tilt L | Up | Tilt R | Left | Reset | Right | Down | Image | Hi Res

Zoom Out | Fill Screen | Zoom In | Labels | Orbits | FOVs | Axes | Vectors | Lat/Lons

Year / Month / Day / Hour / Minute / Second

Turn Analyzer: SATURN to EARTH about Z on RWA = 14.1 min / 149.3 deg Event

BODY	S/C OCC?	SAT OCC?	RANGE (km)	RANGE (Rs)	ALTITUDE (km)	ALTITUDE (Rs)	PHASE (deg)	ANGLR_DIAMETER (deg)	ANGLR_DIAMETER mrad	SUB_S/C LON	SUB_S/C LAT	DLON (deg)	VREL (km/s)	Z_HGHT (km)	ANGLE FROM SATRN	ANGLE FROM EARTH	ANGLE FROM RAM
SATURN	--	--	1254663	20.82	1195099	19.83	31.6	5.51	96.11	17	-21	0	5.7	0	0.0	149.3	27.3
MIMAS	--	--	1085610	18.01	1085406	18.01	29.4	0.02	0.38	164	-24	12	13.3	477	4.0	151.6	26.2
ENCELADUS	--	--	1041373	17.28	1041118	17.27	28.8	0.03	0.49	170	-25	11	11.8	-56	5.2	152.2	26.0
TETHYS	--	--	1064505	17.50	1063971	17.49	21.4	0.06	1.02	131	-23	38	13.1	-4970	10.8	159.5	19.0
DIONE	--	--	916434	15.21	915871	15.20	28.1	0.07	1.23	167	-29	9	9.2	12	9.0	152.9	26.5
RHEA	--	--	1233805	20.47	1233042	20.46	7.2	0.07	1.24	82	-21	74	12.8	2317	24.5	173.7	7.2
TITAN	--	--	1905642	31.62	1903067	31.58	69.3	0.15	2.70	318	-13	-103	4.6	-589	37.7	111.6	64.5
HYPERION	--	--	2571970	42.68	2571843	42.67	59.6	0.01	0.13	48	47	-133	6.1	13545	28.3	121.3	54.0
IAPETUS	--	--	4116387	68.30	4115639	68.29	82.3	0.02	0.36	347	-2	-114	4.7	20765	50.9	98.5	77.2
PHOEBE	--	--	12483056	207.13	12482942	207.12	125.3	0.00	0.02	171	-12	-82	7.4	-1407970	94.2	55.2	120.8
SATURN	--	--	1254663	20.82	1195099	19.83	31.6	5.51	96.11	17	-21	0	5.7	0	0.0	149.3	27.3

	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	26.8	41.2	-19
Segment End	20.8	31.6	-21

Solar Geometry – ORS Boresight Concerns

No ORS Boresight Solar Constraints on Science Pointing

Daily Science Highlights

Monday, July 11 (DOY 192):

The RADAR instrument was powered on to obtain distant full-disk radiometry of Titan. The next RADAR observation will be to participate in the Rhea non-targeted flyby on July 14.

Real-time commands were sent to the spacecraft for a modification to the CDA Enceladus flyby activities, and to send a trigger command for the RADAR scatterometry to be performed at Rhea.

Segment Integration Planning

Timeline Gaps and Suggested Observations

Rev 11 Inbound Strawman

- **Rev 11 inbound segment (193T00:00 to 194T00:00)**
  - Periapse is 2005-195T22:13:45.16, so this seg starts at Peri-2T22:13
  - Total data volume of all inputs: ~1630 Mb
  - Proposed DSN passes: 1 Goldstone 34-m HEF, ~840 Mb capability

- **Proposed Strawman:**
- ISS observations moved earlier ~14:45
- OPNAV given 2:30 to do whatever they need
- 40 minutes to turn to Earth after OpNav
- 9-hour d/l assumed (13 hrs. pictured)
- **Questions**
- What is the nature of the RADAR obs?
- What is the nature of the

Observation	Start Time	Dur	End Time
UVIS Ring Impact	193T00:00	6:00	193T06:00
ISS Saturn Photom 001	193T06:00	0:24	193T06:24
ISS Saturn Photom 002	193T07:00	0:24	193T07:24
ISS Saturn Photom 003	193T08:00	0:24	193T08:24
ISS Saturn Photom 004	193T09:00	0:24	193T09:24
ISS Saturn Photom 005	193T10:00	0:24	193T10:24
ISS Saturn Photom 006	193T11:00	0:24	193T11:24
OPNAV	193T11:30	2:30	193T14:00
Downlink & CIRS Cal	193T14:40	9:00	193T23:40

Legacy Note: This is an early/first proposal for observations in Rev 011. Several iterations were made before achieving the final timeline.

Initial SMT and Data Volume

Beginning of Integration:

Rev 11 Inbound Data Volume Analysis

(Based on CIMS inputs as of 01/04/02)

- Current Data Volumes

Playback	Start doy hh:mm	End doy hh:mm	Volume (Mb)	5% (Mb)	ENG+HK (Mb)	SCIENCE (Mb)	TOTAL (Mb)	MARGIN (Mb)
PLAYBACK**	193 14:28	193 23:43	3383	169	103	1811	1914	1300

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)	RSS (Mb)	ENG (Mb)	SCIENC (Mb)	TOTAL (Mb)
OBSERVATION	192 23:43	193 14:28	138.9	5.3	0.0	5.5	905.8	71.2	73.7	6.1	289.1	64.9	30.0	0.0	38.1	11.6	1640.2
PLAYBACK**	193 14:28	193 23:43	33.3	3.3	86.4	1.7	0.0	20.0	30.0	0.0	43.3	2.5	0.0	0.0	53.2	0.0	273.6

- We have a margin of 1300 Mb. The available data volume for science data is 3111 Mb. Do we wish to increase data collection, e.g. MAPS or CIRS riders?

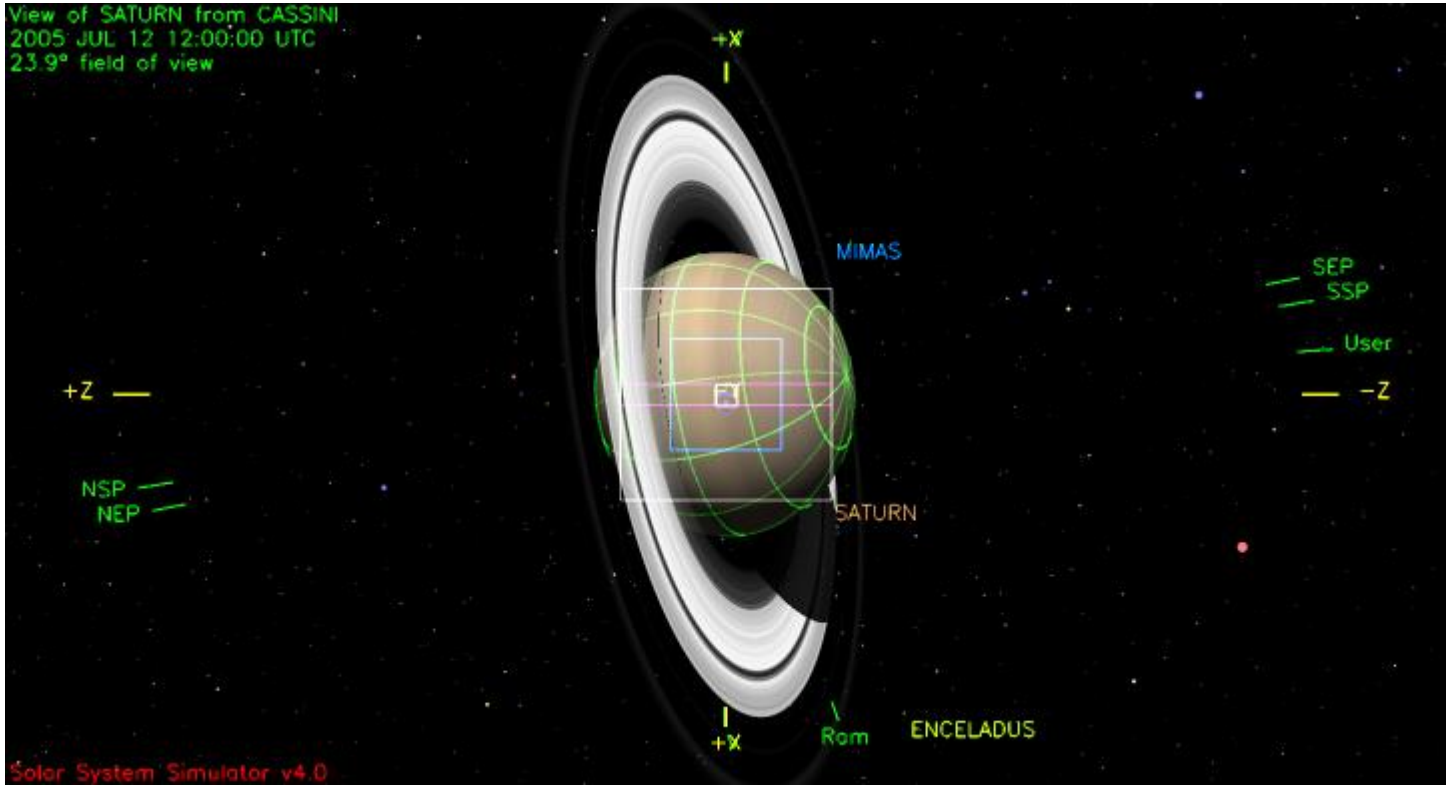
Legacy Note: The margin was reduced from 1300 Mb to 413 Mb, by the time of segment delivery. No details were provided on how this was accomplished.

Waypoint Selection

No Waypoint Selection Info Available

Waypoints Chosen

Waypoint 1 (2005-193T00:00:00 – 193T23:30:00): ISS_NAC to Saturn; NEG_X to Sun



Saturn Rev 11 Inbound Open Issues

- **Pointing Issues**
  - -X to Sun may not be consistent with OPNAV primary axis pointing
- **Data Volume Issues**
  - None
- **CIMS Issues**
  - None
- **Power Issues**
  - OpMode transition RADAR_RWA -> ORS takes 00:05:28 and cuts into VIMS Rings Follow-up (40% of their time).
- **Flight Rule/Mission Planning Guideline and Constraint Issues**
  - None known at this time
- **Other Issues**
  - None