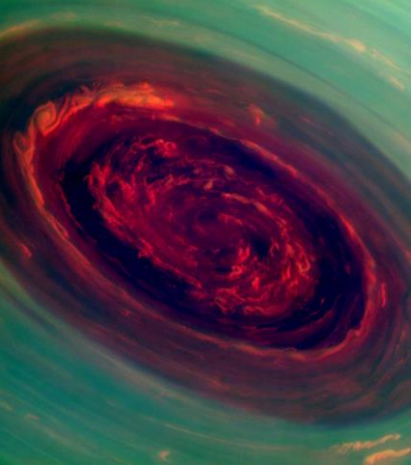

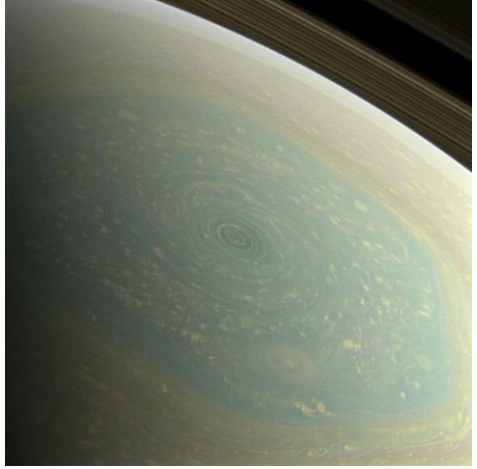
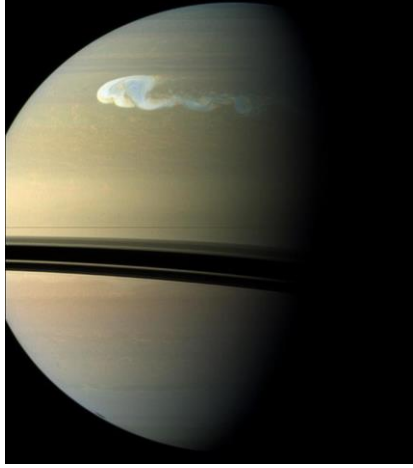

Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 21 Segment Legacy Package

Segment Boundary: Feb 24, 2006 – Feb 26, 2006
2006-055T09:22:00 – 2006-057T09:06:30 (SCET)

Integration Began 01/27/2002
Segment Delivered to S18 Sequence 01/20/2004
Lead Integrator was Scott Edgington
Revised Segment Delivered to S18 Sequence 09/13/2005
By Barbara Larsen

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 an ~2 day long Prime Mission Periapse Segment, with periapse situated approximately half way through the segment. The S/C was in an equatorial orbit. Saturn phase angles ranged between 41 and 72 degrees.
- VIMS led Saturn thermal cycle mapping and lightning observations, and CIRS led a limb mapping observation.
- Notably, this segment contained a higher than normal amount of out-of-discipline activities: CIRS led ring movies, CIRS led observations of the icy satellites (Rhea, Tethys). RADAR performed scatterometry on Tethys and CDA measurements during E-Ring plane crossing. Additionally, very late in the process, CDA requested and was granted time for a CDA eccentricity scan (see page 10).
- There were no ORS boresight constraints/issues in this segment.

Final Sequenced SPASS

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
SATURN rev 21 Segment		2006-055T09:22:00		001T23:44:00	2006-057T09:06:00			
SP_021RH_WAYPTTURN055_PRIME		2006-055T09:22:00		000T00:30:00	2006-055T09:52:00	ISS_NAC to Rhea	POS_X to North_Pole_Dir	
NEW WAYPOINT		**2006-055T09:52:00**		**000T15:38:00**	**2006-056T01:30:00**	**ISS_NAC to Rhea**	**POS_X to North_Pole_Dir**	
CIRS_021RH_FP3GLOBAL001_PRIME	U	2006-055T09:52:00		000T00:20:00	2006-055T10:12:00	CIRS_FP3 to Rhea	POS_X to North_Pole_Dir	
CIRS_021RF_FMOVIEB001_PRIME	C, I	2006-055T10:12:00		000T04:53:00	2006-055T15:05:00	CIRS_FP1 to Rings	POS_X to North_Pole_Dir	
CIRS_021RH_FP3REGION001_PRIME	U	2006-055T15:05:00		000T00:20:00	2006-055T15:25:00	CIRS_FP3 to Rhea	POS_X to North_Pole_Dir	
ISS_021RH_GLOCOL001_PRIME	U	2006-055T15:25:00		000T00:20:00	2006-055T15:45:00	ISS_NAC to Rhea	POS_X to North_Pole_Dir	
SP_021EA_DLTURN055_PRIME		2006-055T15:45:00		000T00:20:00	2006-055T16:05:00	XBAND to Earth	POS_X to NEP	
SP_021EA_M34HEFOTB055_PRIME	C, M, N	2006-055T16:05:00		000T09:00:00	2006-056T01:05:00	XBAND to Earth	POS_X to NEP	
SP_021SA_WAYPTTURN056_PRIME	M	2006-056T01:05:00		000T00:25:00	2006-056T01:30:00	ISS_NAC to Saturn	POS_X to North_Pole_Dir	
NEW WAYPOINT		**2006-056T01:30:00**		**000T17:30:00**	**2006-056T19:00:00**	**ISS_NAC to Saturn**	**POS_X to North_Pole_Dir**	
VIMS_021SA_THRCYLMAP001_PRIME	M	2006-056T01:30:00		000T03:15:00	2006-056T04:45:00	ISS_NAC to Saturn	POS_X to North_Pole_Dir	
ISS_021HE_COLORF001_PRIME	M, U	2006-056T04:45:00		000T00:50:00	2006-056T05:35:00	ISS_NAC to Helene	POS_X to North_Pole_Dir	
CIRS_021TE_FP3REGION001_PRIME	I, M, U	2006-056T05:35:00		000T01:10:00	2006-056T06:45:00	CIRS_FP3 to Tethys	POS_X to North_Pole_Dir	
CIRS_021SA_LIMBMAPA006_PRIME	C, M, V	2006-056T06:45:00		000T02:05:00	2006-056T08:50:00	CIRS_FPB to Saturn	POS_X to NSP	
CIRS_021TE_FP1FAZ0P5370_PRIME	I, M, U	2006-056T08:50:00		000T00:40:00	2006-056T09:30:00	CIRS_FP1 to Tethys	POS_X to North_Pole_Dir	
CDA_021RE_0500ERNGX017_PRIME	M	2006-056T09:30:00		000T01:10:00	2006-056T10:40:00	NEG_Z to Earth	POS_X to 14.1/48.9	
CIRS_021SA_LIMBMAPB006_PRIME	C, M, V	2006-056T10:40:00		000T04:20:00	2006-056T15:00:00	CIRS_FPB to Saturn	POS_X to NSP	
Periapse per = 39.3 d, inc ...		2006-056T10:55:42		000T00:00:01	2006-056T10:55:43			
CIRS_021TE_FP1FAZ0P5371_PRIME	I, M, U	2006-056T15:00:00		000T01:00:00	2006-056T16:00:00	CIRS_FP3 to Tethys	POS_X to North_Pole_Dir	
VIMS_021SA_LIGHTNING001_PRIME	M, R, U	2006-056T16:00:00		000T02:45:00	2006-056T18:45:00	ISS_NAC to Saturn	POS_X to North_Pole_Dir	
SP_021TE_WAYPTTURN056_PRIME	M, R	2006-056T18:45:00		000T00:15:00	2006-056T19:00:00	ISS_NAC to Tethys	POS_X to North_Pole_Dir	
NEW WAYPOINT		**2006-056T19:00:00**		**000T01:54:00**	**2006-056T20:54:00**	**ISS_NAC to Tethys**	**POS_X to North_Pole_Dir**	
RADAR_021TE_SCATTRADL001_PRIME	M	2006-056T19:00:00		000T01:15:00	2006-056T20:15:00	NEG_Z to Tethys	POS_X to North_Pole_Dir	RADAR must control primary and secondary axes to obtain correct polarization.
CIRS_021TE_FP1REGTMP001_PRIME	M, U	2006-056T20:15:00		000T00:20:00	2006-056T20:35:00	CIRS_FP1 to Tethys	POS_X to North_Pole_Dir	
SP_021OT_WAYPTTURN456_PRIME	M	2006-056T20:35:00		000T00:19:00	2006-056T20:54:00	NEG_Z to NSP	NEG_X to 5.3/-5.3	
NEW WAYPOINT		**2006-056T20:54:00**		**000T12:42:00**	**2006-057T09:36:00**	**NEG_Z to NSP**	**NEG_X to 5.3/-5.3**	
CDA_021OT_ECCSCAN006_PRIME	M	2006-056T20:54:00		000T05:12:00	2006-057T02:06:00	NEG_Z to NSP	NEG_X to 5.3/-5.3	
SP_021EA_DLTURN057_PRIME		2006-057T02:06:00		000T00:24:00	2006-057T02:30:00	XBAND to Earth	NEG_X to 40.478/55.0	
SP_021EA_DLTURN457_PRIME		2006-057T02:30:00		000T00:06:00	2006-057T02:36:00	XBAND to Earth	NEG_X to NSP	
SP_021EA_G70METNON057_PRIME	C	2006-057T02:36:00		000T06:30:00	2006-057T09:06:00	XBAND to Earth	NEG_X to NSP	

Final Sequenced SMT and Data Volume

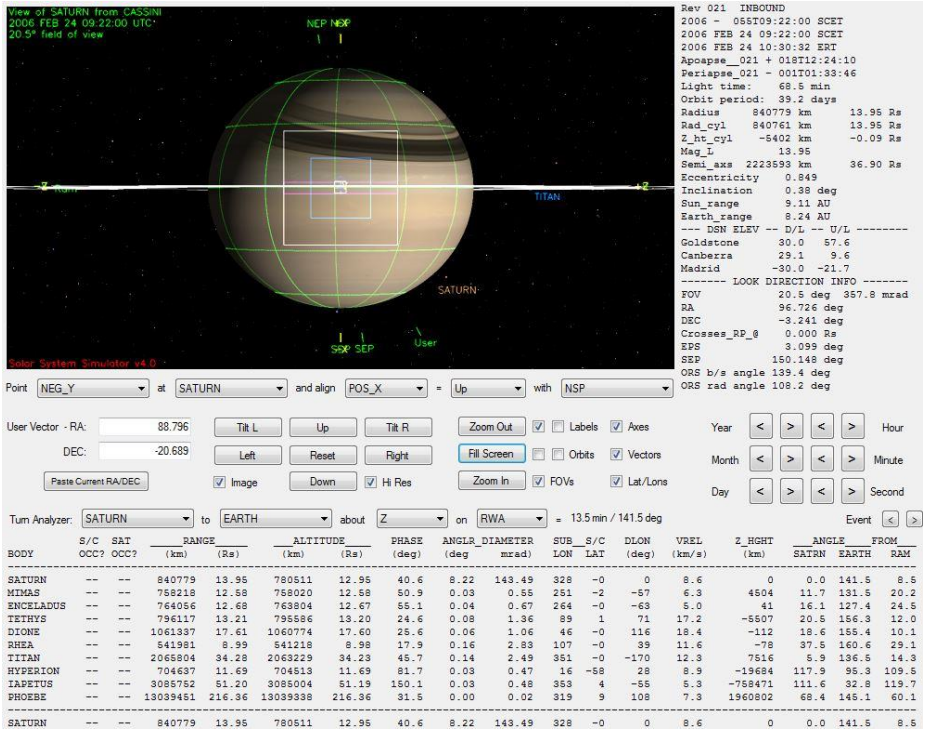
DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

			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 (Mb)	(%)	CAROVR (Mb)
SP_021EA_M34HEFOTB055_PRIME	055 16:05	056 01:05	247	727	23	997	3531	2534	0	399	53	1449	1145	-304	68	0%	305
SP_021EA_G70METNON057_PRIME	057 02:36	057 09:06	305	2586	88	2980	3531	552	0	218	38	3236	3292	57	68	0%	0

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

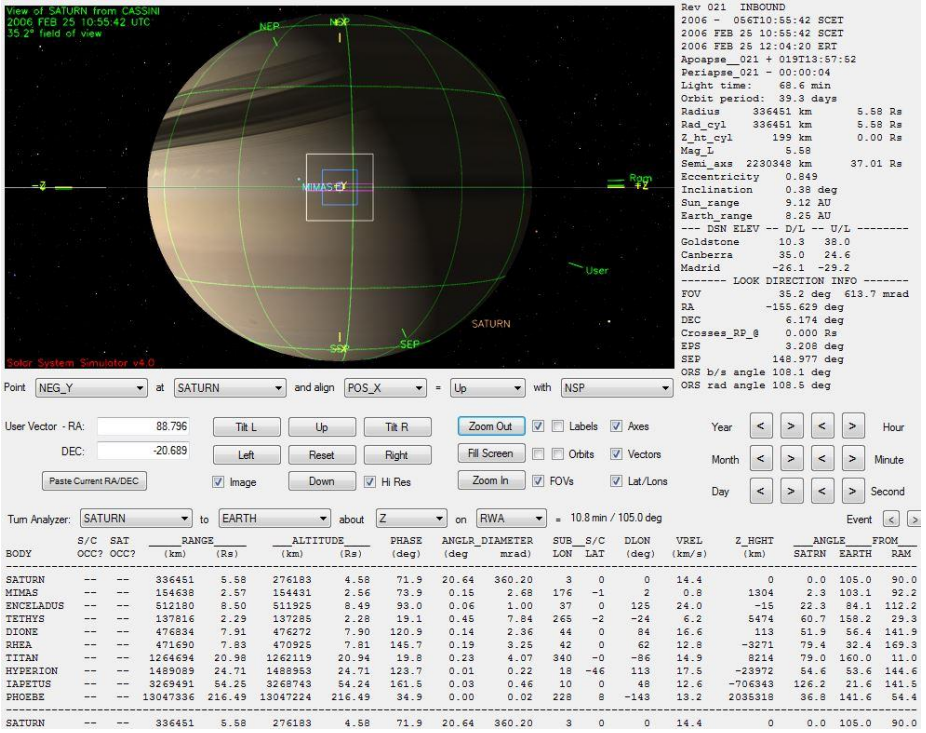
Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
OBSERVATION_NOR	055 09:22	055 16:05	23.9	92.5	79.9	1.2	353.0	23.9	42.6	0.0	80.7	18.1	0.0	0.0	0.0	715.8
OBSERVATION_SI	055 09:22	055 16:05	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
SP_021EA_M34HEFOTB055_PRIME	055 16:05	056 01:05	155.3	16.8	86.4	1.6	0.0	32.0	58.3	0.0	42.4	2.5	0.0	0.0	0.0	395.3
DAILY TOTAL SCIENCE	055 09:22	056 01:05	179.2	109.3	171.3	2.8	353.0	55.9	100.9	0.0	123.2	20.6	0.0	0.0		
OBSERVATION_NOR	056 01:05	057 02:36	91.9	357.3	138.0	48.0	151.0	90.8	165.3	291.1	739.6	74.9	410.0	0.0	1.2	2559.1
OBSERVATION_SI	056 01:05	057 02:36	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
SP_021EA_G70METNON057_PRIME	057 02:36	057 09:06	23.4	12.2	82.8	1.2	0.0	23.1	40.8	0.0	30.7	1.8	0.0	0.0	0.0	215.9
DAILY TOTAL SCIENCE	056 01:05	057 09:06	115.3	369.4	225.8	49.2	151.0	113.9	206.1	291.1	770.3	76.7	410.0	0.0		

Segment Geometry



Seg Start (Left)

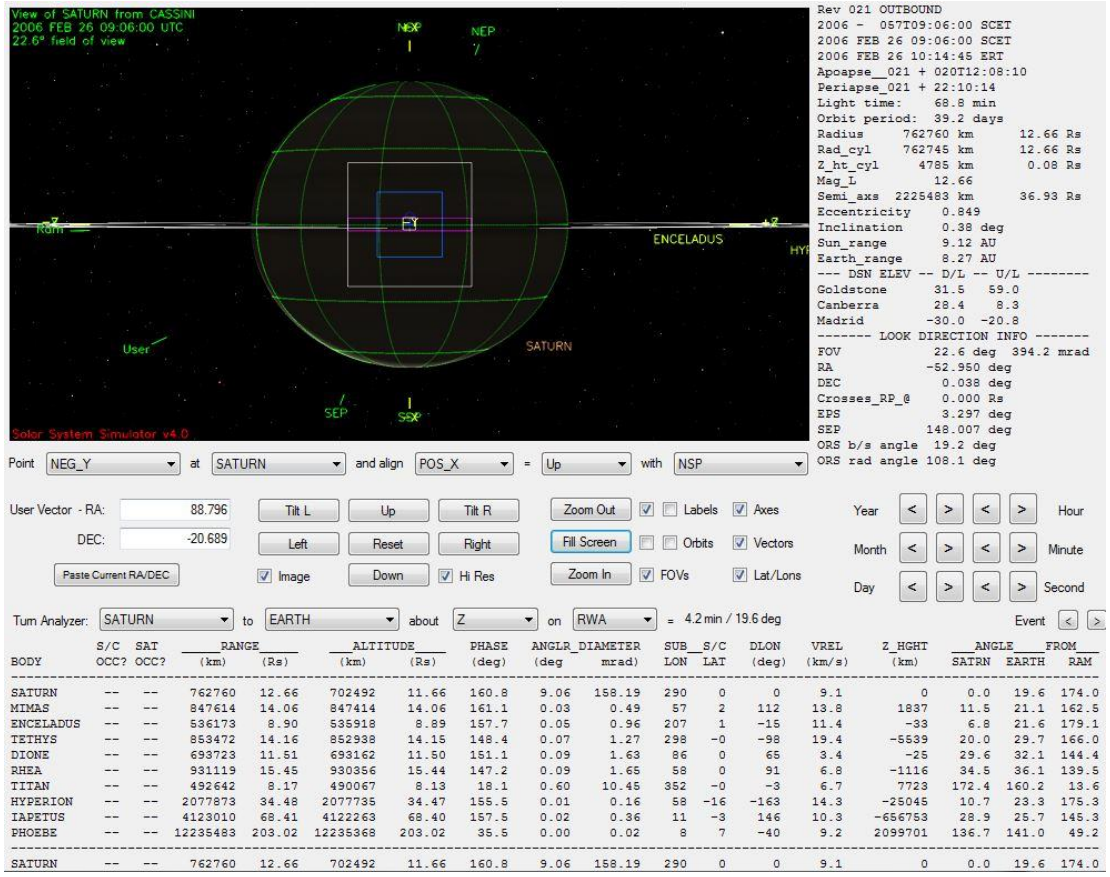
Periapse (below)



	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	13.95	40.6	0
Periapse	5.58	71.9	0
Segment End	12.66	160.8	0

Segment Geometry

Seg End (below)



BODY	S/C OCC?	SAT OCC?	RANGE (km)	RANGE (Rs)	ALTITUDE (km)	ALTITUDE (Rs)	PHASE (deg)	ANGLR DIAMETER (deg	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	--	--	762760	12.66	702492	11.66	160.8	9.06	158.19	290	0	0	9.1	0	0.0	19.6	174.0
MIMAS	--	--	847614	14.06	847414	14.06	161.1	0.03	0.49	57	2	112	13.8	1837	11.5	21.1	162.5
ENCELADUS	--	--	536173	8.90	535918	8.89	157.7	0.05	0.96	207	1	-15	11.4	-33	6.8	21.6	179.1
TETHYS	--	--	853472	14.16	852938	14.15	148.4	0.07	1.27	298	-0	-98	19.4	-5539	20.0	29.7	166.0
DIONE	--	--	693723	11.51	693162	11.50	151.1	0.09	1.63	86	0	65	3.4	-25	29.6	32.1	144.4
RHEA	--	--	931119	15.45	930356	15.44	147.2	0.09	1.65	58	0	91	6.8	-1116	34.5	36.1	139.5
TITAN	--	--	492642	8.17	490067	8.13	18.1	0.60	10.45	352	-0	-3	6.7	7723	172.4	160.2	13.6
HYPERION	--	--	2077873	34.48	2077735	34.47	155.5	0.01	0.16	58	-16	-163	14.3	-25045	10.7	23.3	175.3
IAPETUS	--	--	4123010	68.41	4122263	68.40	157.5	0.02	0.36	11	-3	146	10.3	-656753	28.9	25.7	145.3
PHOEBE	--	--	12235483	203.02	12235368	203.02	35.5	0.00	0.02	8	7	-40	9.2	2099701	136.7	141.0	49.2
SATURN	--	--	762760	12.66	702492	11.66	160.8	9.06	158.19	290	0	0	9.1	0	0.0	19.6	174.0

Solar Geometry – ORS Boresight Concerns

No ORS Boresight Solar Constraints on Science Pointing.

Daily Science Highlights

25 Feb 2017 (DOY 056):

CDA eccentricity scan: An observation scenario which allows the separation of orbital elements to the greatest degree possible is required. Particle inclinations can be determined having a rolling S/C with a rotation axis parallel to the ring plane (equatorial orbits). However in order to determine particle eccentricities the CDA boresight must rotate in the ring plane. This observation mode requires a CDA prime observation and cannot easily be combined with ORS, RADAR or D/L observations. During the proposed observation CDA will perform a rock about the x axis which will be aligned perpendicular to the ring plane. This allows scan through the dust RAM direction without violating flight rules.

Legacy Note: The above CDA eccentricity scan highlight was the only highlight available/found for this segment.

Segment Integration Planning

Rev 21 Strawman

- start of segment ~55T10:00
  - 10:00-10:17 turn to Rhea (waypoint; 17 min turn with +X to NSP; this is a safe waypoint until 16:00)
  - 10:17-10:50 CIRS/ORS Rhea
  - 10:50- 15:15 F-ring movie (10 min turns to Saturn)
  - 15:15-15:45 Rhea
  - 15:45-16:00 turn to Earth
- [OR:
  - 10:00-10:23 turn to Saturn (waypoint; this is a safe waypoint until 16:00 with +X to NSP as secondary)
  - 10:23-11:00 Rhea (10 min turns)
  - 11:00-16:00 F-ring movie]
- 055T16:00-056T01:00 OTM/downlink (Madrid)
  - 056T01:00-01:20 turn to waypoint (20 min turn with +X to NSP as secondary)

Rev 21 Strawman

Continued

- WAYPOINT: NAC to Tethys, +X to NSP (this is a safe waypoint at least until 07:00)
  - 01:20-01:45 Tethys
  - 01:45-02:45 Rhea (23 min turns)
  - 02:45-03:15 Tethys
  - 03:15-04:20 Rhea (25 min turns)
  - 04:20-05:10 Helene (assume 10 min turn times; C/A at 04:43)
  - 05:10-05:40 ring retarg
  - 05:40-06:45 Tethys
  - 06:45-07:00 turn to new waypoint (12 min turn)
- WAYPOINT: NAC to Saturn, +X to NSP (this is a safe waypoint until the downlink at ~00:00)
  - 07:00-08:50 CIRS Saturn
  - 08:50-09:30 Tethys (13.4 min turns)
  - 09:30-10:40 CDA (-Z to Earth; 7.1-8.4 min turns to/from Saturn using +X to NSP as secondary)
  - 10:40-15:00 CIRS Saturn
  - 15:00-16:00 Tethys (12 min turns)
  - 16:00 -?? VIMS Saturn Lightening
  - ?? - 00:06 VIMS Cylindrical Map
- 057T00:06 Downlink (Goldstone)

Initial SMT and Data Volume

Beginning of Integration:

Rev 21 Data Volume Analysis

DATA VOLUME SUMMARY

Playback	Start doy hh:mm	End doy hh:mm	PLAYBACK CAPACITY (Mb)	OBSERVATION_PERIOD NORM_SCI (Mb)	OPNV_HVS (Mb)	SCI_HK (Mb)	ENGR (Mb)	DOWNLINK_PASS NORM_SCI (Mb)	ENGR (Mb)	TOTAL DATA (Mb)	PLAYBK MARGIN (%)	CARRIED OVER (MB)
SP_021EA_G70METNON055_PRIME	055 00:22	055 09:22	4454	0	0	0	0	71	53	124	97	0
SP_021EA_M34HEFOTB055_PRIME	055 16:00	056 01:00	1159	408	0	5	17	156	53	639	45	0
SP_021EA_G70METNON057_PRIME	057 00:06	057 09:06	4435	3302	0	18	60	227	53	3659	17	0

DATA VOLUME REPORT

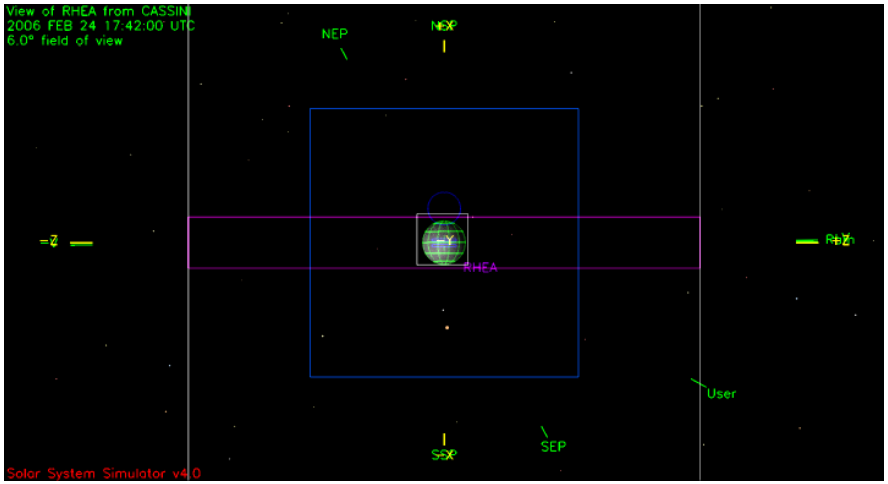
Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
SP_021EA_G70METNON055_PRIME	055 00:22	055 09:22	22.7	0.3	0.0	1.3	0.0	10.5	24.3	0.0	9.8	2.5	0.0	0.0	0.0	71.5
OBSERVATION_NOR	055 09:22	055 16:00	23.6	12.4	84.7	1.2	200.0	14.1	21.4	0.0	31.1	19.1	0.0	0.0	0.0	407.6
SP_021EA_M34HEFOTB055_PRIME	055 16:00	056 01:00	32.4	27.8	0.0	1.6	0.0	19.4	29.2	3.5	42.4	0.0	0.0	0.0	0.0	156.4
OBSERVATION_NOR	056 01:00	057 00:06	83.2	128.9	134.6	4.2	157.7	49.9	141.0	542.7	627.7	57.4	1375.0	0.0	0.0	3302.2
SP_021EA_G70METNON057_PRIME	057 00:06	057 09:06	32.4	16.8	85.0	1.6	0.0	19.4	29.2	0.0	42.4	0.0	0.0	0.0	0.0	226.8

Waypoint Selection

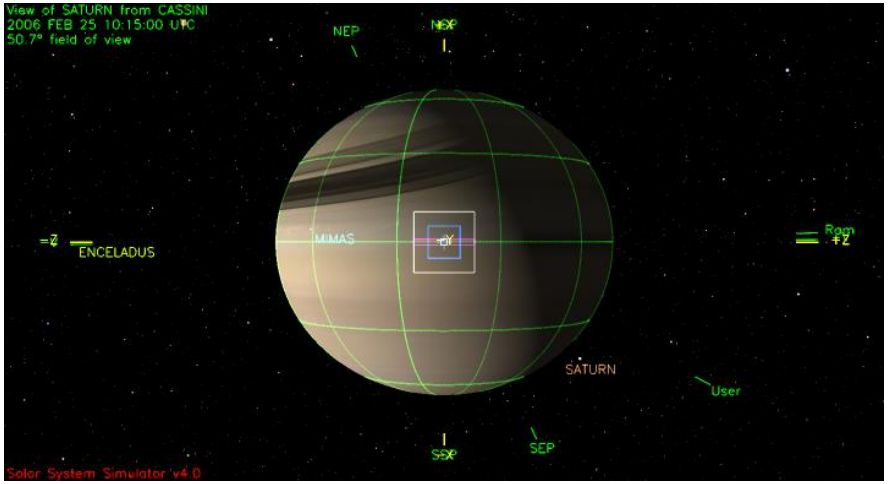
No Waypoint Selection Info Available

Waypoints Chosen

Waypoint 1 (2006-055T09:52:00 –056T01:30:00): Neg_Y to Rhea, Pos_X to North_Pole_Dir

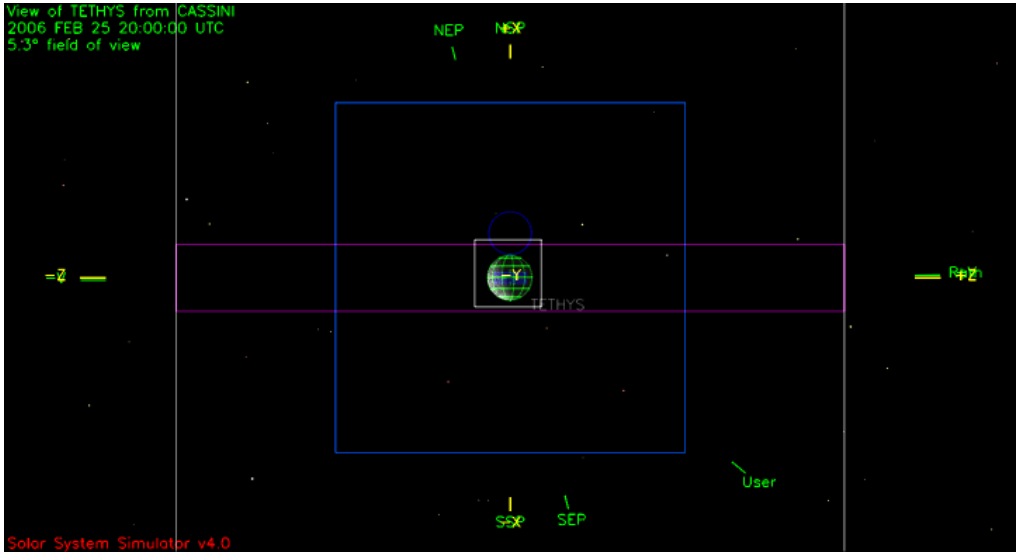


Waypoint 2 (2006-056T01:30:00 – 056T19:00:00): NEG_Y to Saturn, Pos_X to North_Pole_Dir



Waypoints Chosen

Waypoint 3 (2006-056T19:00:00 – 056T20:54:00): NEG_Y to Tethys, Pos_X to North_Pole_Dir



Waypoint 4 (2006-056T20:54:00 – 057T09:36:00): NEG_Z to NSP, Neg_X to 5.3/5/3

Not shown here since ORS is not pointed toward any particular object.

Notes and Liens

No “Notes & Liens” Available