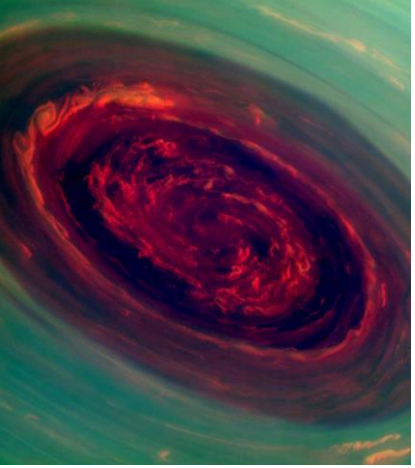

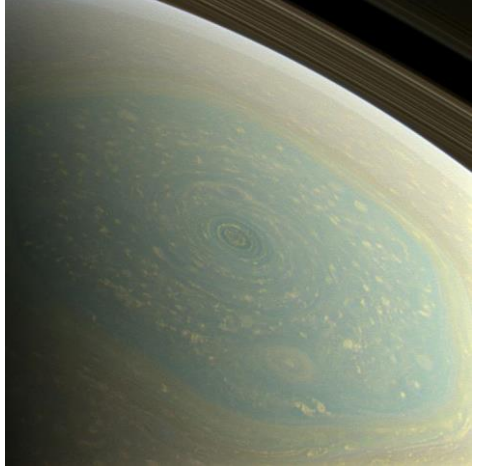
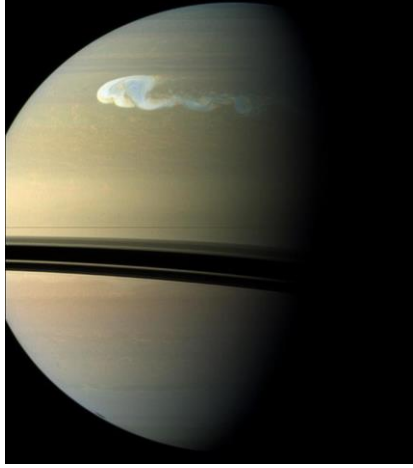

Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 24 Segment Legacy Package

Segment Boundary: May 21, 2006 – May 23, 2006
2006-141T19:56:00 – 2006-143T19:41:00 (SCET)

Integration Began 09/23/2002
Segment Delivered to S20 Sequence 11/19/2002
Lead Integrator was Jerod Gross

Legacy Package Assembled by Shawn Boll

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

Segment Overview and Final Products

Segment Summary

- This was a two day long periapse segment in the Prime Mission, during an equatorial orbit. The segment immediately followed the T14 Titan flyby. Periapse was roughly in the middle of the segment at 5.46 Rs.

- The views were of Saturn at mid to low phase angles for much of the segment, but ending at much higher phase as the spacecraft moved outbound from periapse. Being an equatorial orbit, the rings were seen “edge-on”, however at this time in Saturn’s year there was extensive ring shadowing of the northern hemisphere.

- Inbound to periapse, Saturn science focused on UVIS stellar occultations. VIMS and CIRS also spent some time looking at Rhea.

- At periapse, CIRS performed Saturn feature tracking and ISS took imaged the tiny moon, Polydeuces.

- Outbound from periapse, VIMS performed Saturn thermal cylindrical mapping and UVIS targeted a stellar occultation of Tethys.

Final Sequenced SPASS

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S020, length = 42 ...		2006-112T05:15:00	E023_SEQUENCE_020 +000T00:00:00	041T21:24:00	2006-154T02:39:00			
SATURN rev 24 Segment		2006-141T19:56:00		001T23:45:00	2006-143T19:41:00			
NAV_024SK_OPNAV411_PRIME	N	2006-141T19:56:00		000T00:53:00	2006-141T20:49:00	ISS_NAC to Satellites	POS_X to NSP	Starts at Earth point, ends at NEW waypoint
NAV_024SA_WAYPTURN411_PRIME	N	2006-141T20:49:00		000T00:01:00	2006-141T20:50:00	ISS_NAC to Saturn	POS_X to NSP	
NEW WAYPOINT		**2006-141T20:50:00**		**001T05:21:00**	**2006-143T02:11:00**	**ISS_NAC to Saturn**	**POS_X to NSP**	
UVIS_024ST_BETORI002_PRIME	I	2006-141T20:50:00		000T00:50:00	2006-141T21:40:00	UVIS_FUV to 78.63/-8.2	POS_X to NSP	
UVIS_024ST_EPSORI002_PRIME		2006-141T21:40:00		000T01:10:00	2006-141T22:50:00	UVIS_FUV to 84.05/-1.2	POS_X to NSP	
UVIS_024ST_BETORI003_PRIME	I, M	2006-142T00:00:00		000T01:00:00	2006-142T01:00:00	UVIS_FUV to 78.63/-8.2	POS_X to NSP	
UVIS_024ST_EPSORI003_PRIME	I, M	2006-142T01:00:00		000T00:40:00	2006-142T01:40:00	UVIS_FUV to 84.05/-1.2	POS_X to NSP	
UVIS_024ST_ZETAORI001_PRIME	I, M	2006-142T01:40:00		000T00:50:00	2006-142T02:30:00	UVIS_FUV to 85.19/-1.94 (0.082,0.0,0.0 deg. offset)	POS_X to NSP	
VIMS_024RH_RHEA001_PRIME	C, I, M, U	2006-142T02:30:00		000T01:10:00	2006-142T03:40:00	VIMS_IR to Rhea	POS_X to NSP	
VIMS_024SA_ALPCMIOCC001_PRIME	I, M	2006-142T03:40:00		000T01:00:00	2006-142T04:40:00	ISS_NAC to 114.825/5.225	POS_X to NSP	
CIRS_024RH_FP1FP3MAP001_PRIME	M	2006-142T04:40:00		000T02:15:00	2006-142T06:55:00	CIRS_FP1 to Rhea	POS_X to NSP	Includes some FP3 time for ISS, VIMS.
CIRS_024SA_FTRACK006_PRIME	I, M, V	2006-142T06:55:00		000T06:00:00	2006-142T12:55:00	CIRS_FPB to Saturn	POS_X to NSP	
Periapse per = 39.4 d, inc ...		2006-142T09:00:49		000T00:00:01	2006-142T09:00:50			
ISS_024OT_RETHIEQPL011_PRIME	M	2006-142T12:55:00		000T03:15:00	2006-142T16:10:00	ISS_NAC to Retargetable	POS_X to NSP	CDA requires -Y to Saturn (+/- 2Rs) between 14:00-14:33 and 15:13-15:35
SP_024EA_DLTURN142_PRIME	M	2006-142T16:10:00		000T00:10:00	2006-142T16:20:00	ISS_NAC to Saturn	POS_X to NSP	Sit at the current waypoint for 10 minutes; because the following turn has SRU warnings.
SP_024EA_DLTURN442_PRIME	M	2006-142T16:20:00		000T00:21:00	2006-142T16:41:00	XBAND to Earth	NEG_X to NSP	Turn now; turn will have SRU warnings
SP_024EA_G34HEFOPN142_PRIME	C, M	2006-142T16:41:00		000T03:00:00	2006-142T19:41:00	XBAND to Earth	NEG_X to NSP	2nd Axis for CDA
SP_024EA_G34HEFOPN442_PRIME	C	2006-142T19:41:00		000T06:00:00	2006-143T01:41:00	XBAND to Earth	Rolling/SRU	Rolling for CDA. This should incur < 2.4K of CIRS heating. CIRS is fine with this.
SP_024SA_WAYPTURN143_PRIME		2006-143T01:41:00		000T00:30:00	2006-143T02:11:00	ISS_NAC to Saturn	NEG_Z to NSP	20 min. turn
NEW WAYPOINT		**2006-143T02:11:00**		**000T18:00:00**	**2006-143T20:11:00**	**ISS_NAC to Saturn**	**NEG_Z to NSP**	
VIMS_024SA_THRCYLMAP001_PRIME		2006-143T02:11:00		000T02:21:00	2006-143T04:32:00	VIMS_IR to Saturn	NEG_Z to NSP	
UVIS_024TE_ICYOCC041_PRIME	C, I, V	2006-143T04:32:00		000T01:30:00	2006-143T06:02:00	UVIS_FUV to 270.065/4.369	NEG_Z to NSP	
VIMS_024SA_THRCYLMAP002_PRIME		2006-143T06:02:00		000T04:09:00	2006-143T10:11:00	VIMS_IR to Saturn	NEG_Z to NSP	
SP_024EA_DLTURN143_PRIME		2006-143T10:11:00		000T00:30:00	2006-143T10:41:00	XBAND to Earth	NEG_X to 50.6/-30.0	21 min. turn
SP_024EA_M34BWGOTP143_PRIME	N	2006-143T10:41:00		000T09:00:00	2006-143T19:41:00	XBAND to Earth	NEG_X to 50.6/-30.0	OTM-62 Prime; 2nd Axis for CDA.

Final Sequenced SMT and Data Volume

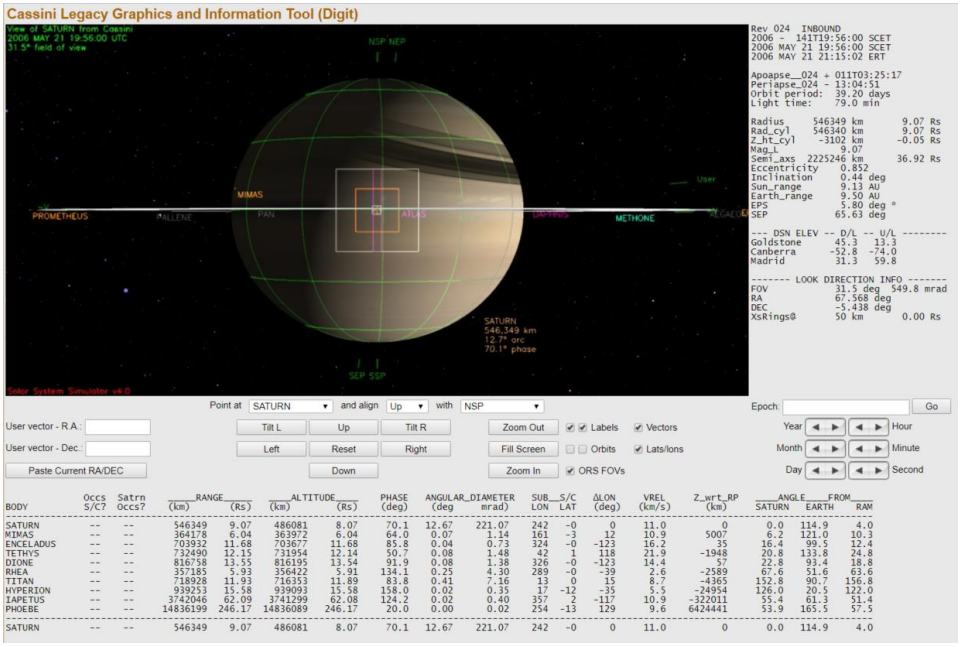
DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

			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_024EA_G34HEFOPN142_PRIME	142 16:41	142 19:41	0	2418	71	2488	3491	1003	18	91	18	2614	237	-2377	198	2%	2377
SP_024EA_G34HEFOPN442_PRIME	142 19:41	143 01:41	2377	0	0	2377	3491	1114	0	152	35	2565	626	-1938	198	2%	1938
SP_024EA_M34BWGOTP143_PRIME	143 10:41	143 19:41	1938	714	31	2683	3491	808	0	146	53	2882	599	-2282	198	2%	2283

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

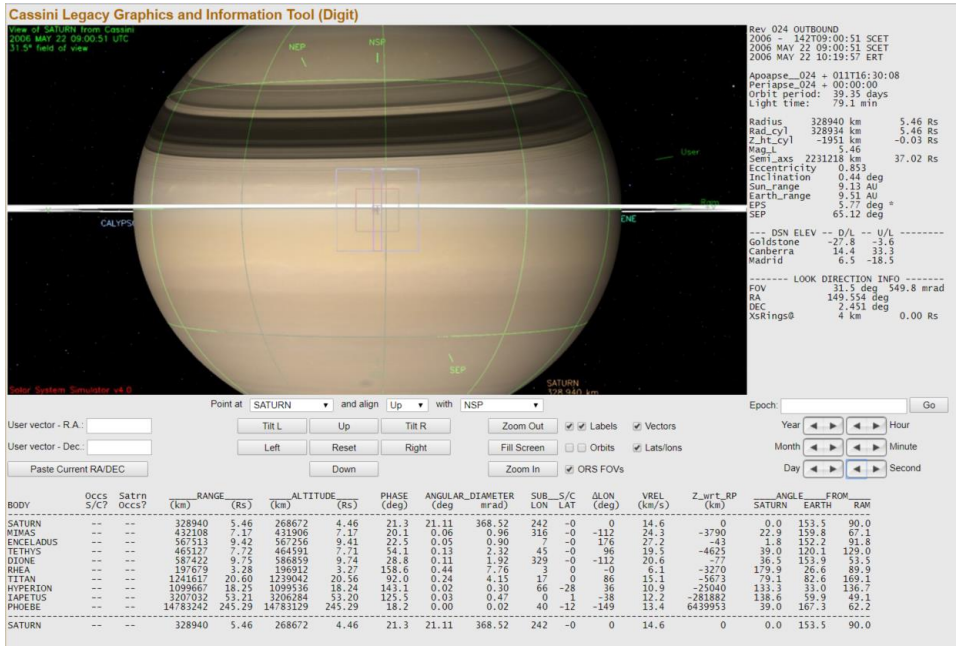
Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
OBSERVATION_NOR	141 19:56	142 16:41	74.7	167.1	135.6	3.7	695.6	44.8	124.8	0.0	328.6	442.7	377.9	0.0	0.0	2395.6
OBSERVATION_OPN	141 19:56	142 16:41	0.0	0.0	0.0	0.0	17.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.4
SP_024EA_G34HEFOPN142_PRIME	142 16:41	142 19:41	10.8	5.6	32.4	0.5	0.0	6.5	19.1	0.0	14.1	0.8	0.0	0.0	0.0	89.9
SP_024EA_G34HEFOPN442_PRIME	142 19:41	143 01:41	21.6	11.2	54.0	1.1	0.0	13.0	19.8	0.0	28.3	1.6	0.0	0.0	0.0	150.5
DAILY TOTAL SCIENCE	141 19:56	143 01:41	107.1	183.9	222.0	5.4	695.6	64.3	163.7	0.0	371.0	445.2	377.9	0.0		
OBSERVATION_NOR	143 01:41	143 10:41	32.4	16.9	21.6	1.6	20.0	19.4	29.7	0.0	42.4	143.3	380.0	0.0	0.0	707.4
SP_024EA_M34BWGOTP143_PRIME	143 10:41	143 19:41	32.4	16.9	0.0	1.6	0.0	19.4	29.7	0.0	42.4	2.5	0.0	0.0	0.0	144.9
DAILY TOTAL SCIENCE	143 01:41	143 19:41	64.8	33.7	21.6	3.2	20.0	38.9	59.4	0.0	84.9	145.8	380.0	0.0		

Segment Geometry (1 of 2)



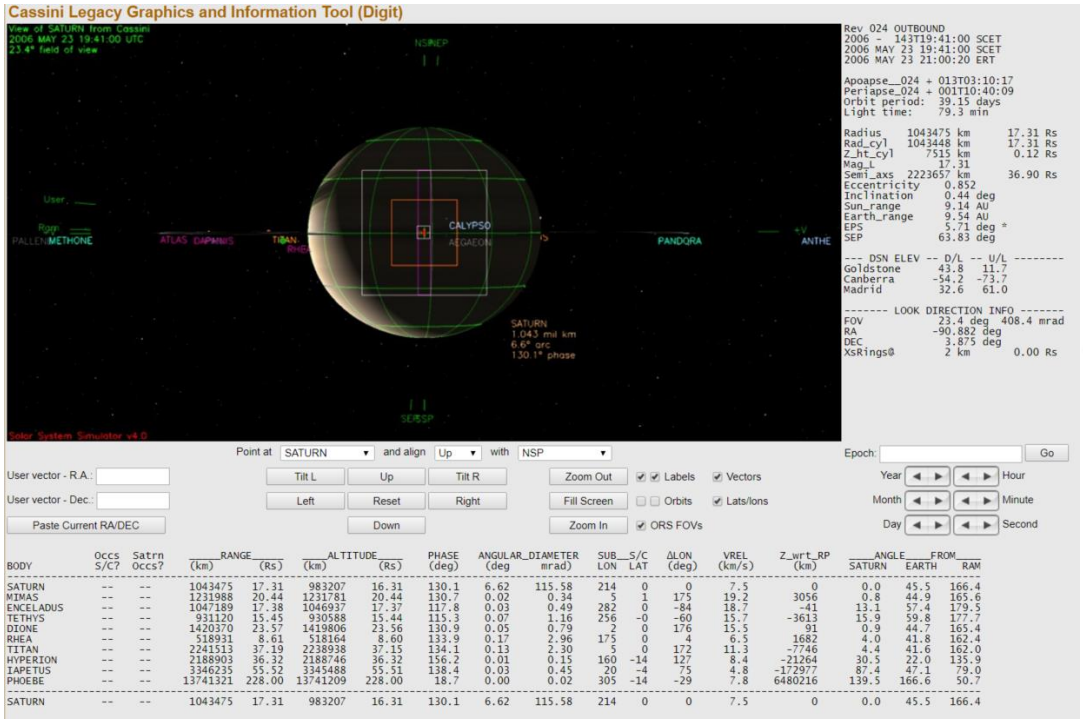
← Seg Start (Left)

↓ Seg End (below)



	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	9.07 Rs	70.1	0
Periapse	5.46 Rs	21.3	0
Segment End	17.13 Rs	130.1	0

Segment Geometry (2 of 2)



BODY	Occs S/C?	Satrn Occs?	RANGE (km)	RANGE (Rs)	ALTITUDE (km)	ALTITUDE (Rs)	PHASE (deg)	ANGULAR_DIAMETER (deg	ANGULAR_DIAMETER mrad)	SUB_S/C LON	SUB_S/C LAT	ΔLON (deg)	VREL (km/s)	Z_wrt_RP (km)	ANGLE_FROM SATURN	ANGLE_FROM EARTH	ANGLE_FROM RAM
SATURN	--	--	1043475	17.31	983207	16.31	130.1	6.62	115.58	214	0	0	7.5	0	0.0	45.5	166.4
MIMAS	--	--	1231988	20.44	1231781	20.44	130.7	0.02	0.34	5	1	175	19.2	3056	0.8	44.9	165.6
ENCELADUS	--	--	1047189	17.38	1046937	17.37	117.8	0.03	0.49	282	0	-84	18.7	-41	13.1	57.4	179.5
TETHYS	--	--	931120	15.45	930588	15.44	115.3	0.07	1.16	256	-0	-60	15.7	-3613	15.9	59.8	177.7
DIONE	--	--	1420370	23.57	1419806	23.56	130.9	0.05	0.79	2	0	176	15.5	91	0.9	44.7	165.4
RHEA	--	--	518931	8.61	518164	8.60	133.9	0.17	2.96	175	0	4	6.5	1682	4.0	41.8	162.4
TITAN	--	--	2241513	37.19	2238938	37.15	134.1	0.13	2.30	5	0	172	11.3	-7746	4.4	41.6	162.0
HYPERION	--	--	2188903	36.32	2188746	36.32	156.2	0.01	0.15	160	-14	127	8.4	-21264	30.5	22.0	135.9
IAPETUS	--	--	3346235	55.52	3345488	55.51	138.4	0.03	0.45	20	-4	75	4.8	-172977	87.4	47.1	79.0
PHOEBE	--	--	13741321	228.00	13741209	228.00	18.7	0.00	0.02	305	-14	-29	7.8	6480216	139.5	166.6	50.7
SATURN	--	--	1043475	17.31	983207	16.31	130.1	6.62	115.58	214	0	0	7.5	0	0.0	45.5	166.4

Seg End

Solar Geometry – ORS Boresight Concerns

No ORS Boresight Solar Constraints on Science Pointing.

Sunday, May 21 (DOY 141):
On Sunday and Monday, UVIS performed some Saturn occultation observations using the stars Beta Orionis, Epsilon Orionis, and Zeta Orionis. These observations were designed to yield the temperature of Saturn's high atmosphere and vertical profiles of H, H2, and hydrocarbons. The Visual and Infrared Mapping Spectrometer (VIMS) performed a couple of Saturn thermal cylindrical mappings as well.

Monday, May 22 (DOY 142):
A non-targeted flyby of the Saturnian satellite Polydeuces occurred on this day at an altitude of 64057 kilometers.

Segment Integration Planning

Timeline Gaps and Suggested Observations

- Issues with the strawman
  - Can we shorten CIRS F-ring Movie by 3 hours to accommodate beginning of inbound VIMS Feature Track?
  - Can we skip planned Gold 34HEF at end of DOY 142/start of DOY 143?
  - We will interrupt VIMS ThrCylMap to perform the UVIS Tethys Occ and the ISS Janus observations.

Proposed Order For Rev 24 Strawman
CIRS F-Movie
VIMS Feature Track
UVIS Stellar Occ
ISS Retarg
VIMS Stellar Occ
ORS Feature Track
ISS Retarg
VIMS Feature Track
VIMS Thermal Cyl Map
UVIS Tethys Occ
ISS Janus Mutual Eve
Mad 70-m w/ OTM-62 prime

Initial SMT and Data Volume

First Look During Integration:

Data Volume For Rev 24

- We are currently oversubscribed by 300 Mb, in order to leave 5% margin on last pass
- Data volume totals for the segment are shown in bold at the bottom of the page
  - Total volume requested = 4038 Mb
  - 3 biggest users: VIMS = 1202 Mb, ISS = 780 Mb, UVIS = 638 Mb; total I/U/V = 2620 Mb [65% of total]

DATA VOLUME SUMMARY

			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)	MARGIN (Mb)	MARGIN (%)	OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGIN (Mb)	CAROVR (%)	CAROVR (Mb)
SP_024EA_G34HEFOPN142_PRIME	142 16:41	143 01:41	0	2773	70	2843	3534	690	20%	17	260	53	3173	871	-2302	-264%	2302
SP_024EA_M70ARROTP143_PRIME	143 10:41	143 19:41	2302	843	30	3175	3569	394	11%	0	145	53	3373	3248	-125	-4%	125

DATA VOLUME REPORT

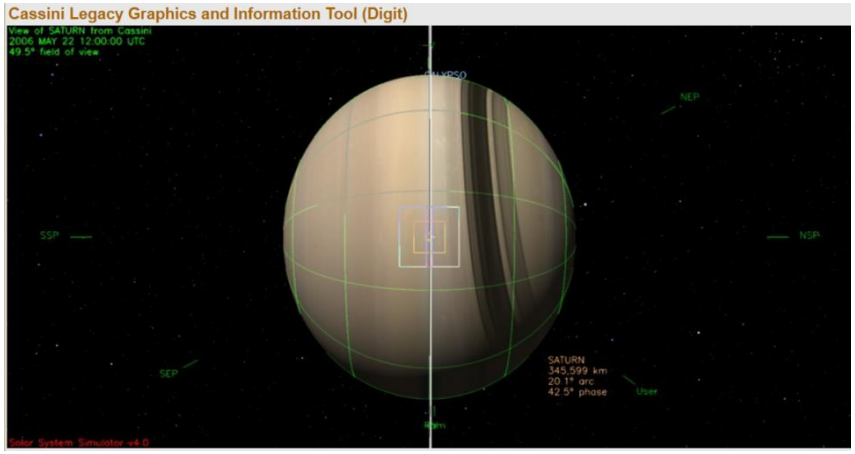
Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
OBSERVATION_NOR	141 19:56	142 16:41	74.7	170.4	118.8	3.7	742.6	44.8	124.8	0.0	328.6	462.2	702.8	0.0	0.0	2773.4
OBSERVATION_OPN	141 19:56	142 16:41	0.0	0.0	0.0	0.0	17.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.4
SP_024EA_G34HEFOPN142_PRIME	142 16:41	143 01:41	32.4	38.8	86.4	1.6	0.0	19.4	38.9	0.0	42.4	0.0	0.0	0.0	0.0	260.0
OBSERVATION_NOR	143 01:41	143 10:41	32.4	16.9	7.2	1.6	20.0	19.4	29.7	0.0	42.4	173.3	500.0	0.0	0.0	843.0
SP_024EA_M70ARROTP143_PRIME	143 10:41	143 19:41	32.4	16.9	0.0	1.6	0.0	19.4	29.7	0.0	42.4	2.5	0.0	0.0	0.0	144.9
SEGMENT TOTAL	**141 19:56**	**143 19:41**	**171.9**	**243.0**	**212.4**	**8.5**	**780.0**	**103.0**	**223.1**	**0.0**	**455.8**	**638.0**	**1202.8**			**4038.7**

Waypoint Selection

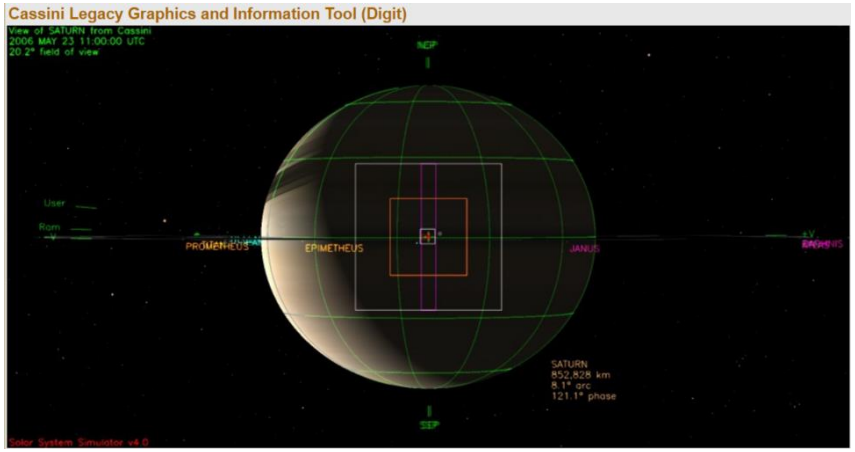
No Waypoint Selection Info Available.

Waypoints Chosen

Waypoint 1 (2006-141T20:50:00 – 2006-143T02:11:00): ISS_NAC to Saturn; POS_X to NSP



Waypoint 2 (2006-143T02:11:00 – 2006-143T19:41:00): ISS_NAC to Saturn; NEG_Z to NSP



Saturn Rev 24 Periapse Notes & Open Issues (as of 11/19/02)

- **Pointing**
  - All waypoints have been verified as being Flight Rule-safe.
  - All downlink attitudes have been verified as being Flight-Rule safe.
  - All SP turns have been allocated enough time and are Flight Rule-safe.
- **Data Volume**
  - No issues. We carry data over for the first day, then empty the SSRs with 6% margin at the end of the second and final pass.
- **CIMS**
  - All of the expected requests for this delivery are approved in CIMS.
  - There is one deleted request, ISS_024ST_EPSORI002_UVIS. This request was deleted due to data volume cuts.
- **OpModes**
  - All OpMode transitions are in the CIMS delivery. No issues at this time.
- **Flight Rule / Mission Planning Guideline & Constraint Issues**
  - None known at this time.
- **DSN**
  - Nav has approved of the DSN plan.
- **Other Notes & Issues**
  - The entire period from 141T20:50 to 142T02:30 is given to UVIS for occultations. The preceding segment contains the Titan-14 encounter, which may shift the trajectory and therefore the timing of the occultations. By providing the entire window for UVIS, it is expected that any timing changes to the occs would still fall within the UVIS window. This is not a moveable block because the start/end time of the UVIS period is fixed. But UVIS is expected to change the timing of their requests as necessary, due to any trajectory changes.