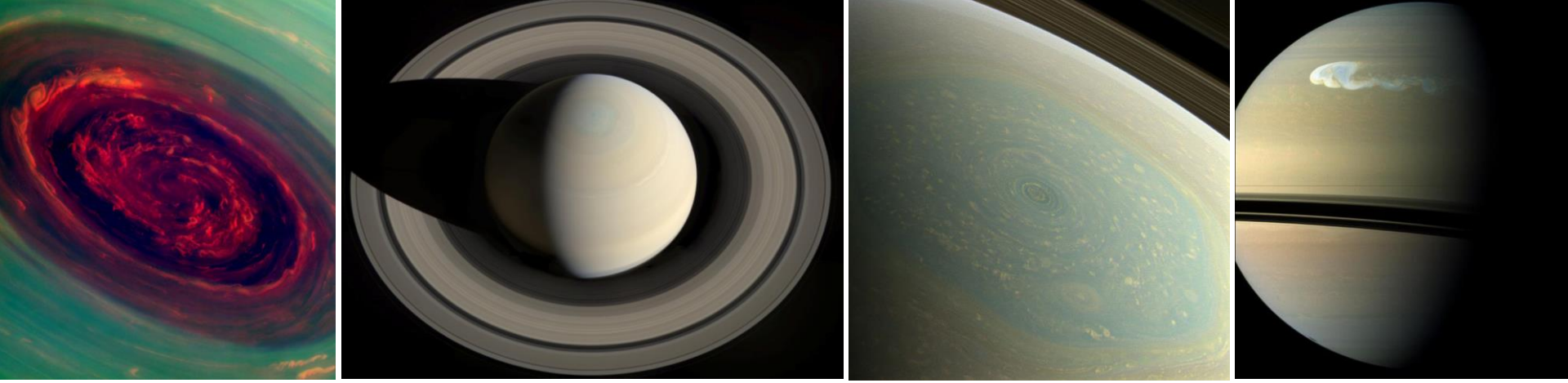

Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 59_60 Segment Legacy Package

Segment Boundary: February 24, 2008 – February 28, 2008
2008-055T11:21 – 2008-059T10:51 (SCET)

Integration Began 09/29/2003
Segment Delivered to S38 Sequence 08/23/2004
Lead Integrator was Scott Edgington

Legacy Package Assembled by Kyle Cloutier

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

Segment Overview and Final Products

Segment Summary

- Saturn 59/60 is an apoapse segment during the Prime Mission, with increasing phase angles and sub-spacecraft latitudes.
- Saturn science was limited to ISS photopolarimetry mosaics of Saturn.
- The timeline was dominated by out-of-discipline science, including a VIMS/ISS/CIRS F-ring rotation movie, ISS photopolarimetry mosaics of Titan, ISS satellite orbit determination campaign observations, a CIRS radial scan of the rings, a VIMS 3 star calibration of their instrument, and a UVIS stellar-ring occultation.
- An RSS Operations Readiness Test (ORT) was performed in order to demonstrate DSN and RSS preparedness to support the upcoming Rings Occultation experiment on DOY 062.

Final Sequenced SPASS

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End	Primary	Secondary	Comments
SATURN revs 59/60 Segment		2008-055T11:21:00		003T23:30:00	2008-059T10:51:00			
SP_059RI_WAYPTTURN055_PRIME	C, M	2008-055T11:21:00		000T00:25:00	2008-055T11:46:00	ISS_NAC to L_ANSA_F	POS_X to NEP	
SP_059RI_WAYPTTURN455_PRIME	M	2008-055T11:46:00		000T00:09:00	2008-055T11:55:00	ISS_NAC to L_ANSA_F	POS_X to NSP	Use 140223.7 km as ring radius
NEW WAYPOINT		2008-055T11:55:00		000T23:41:00	2008-056T11:36:00	ISS_NAC to L_ANSA_F	POS_X to NSP	
VIMS_059RF_FMOVIE002_PRIME	C, I, M, R	2008-055T11:55:00		000T16:41:00	2008-056T04:36:00	VIMS_IR to L_ANSA_F	POS_X to NSP	
SP_059EA_DLTURN056_PRIME	M, R	2008-056T04:36:00		000T00:30:00	2008-056T05:06:00	XBAND to Earth	POS_X to NEP	16.1 min. Turn
SP_059EA_G34BWGNON056_PRIME	C, M, R	2008-056T05:06:00		000T06:00:00	2008-056T11:06:00	XBAND to Earth	Rolling	
SP_059SA_WAYPTTURN056_PRIME	C, M	2008-056T11:06:00		000T00:30:00	2008-056T11:36:00	ISS_NAC to Saturn	NEG_Z to NSP	22.3 min. Turn
NEW WAYPOINT		2008-056T11:36:00		002T23:53:00	2008-059T11:29:00	ISS_NAC to Saturn	NEG_Z to NSP	
ISS_059TI_1X1PT60001_PRIME	M	2008-056T11:36:00		000T01:00:00	2008-056T12:36:00	ISS_NAC to Titan	POS_X to North_Pole_Dir	
ISS_059OT_SATELLORB018_PRIME	C, M	2008-056T12:36:00		000T00:30:00	2008-056T13:06:00	ISS_NAC to Satellites	NEG_Z to NSP	
ISS_059SA_1X2WPH25001_PRIME	M, R, U	2008-056T13:06:00		000T12:30:00	2008-057T01:36:00	ISS_NAC to Saturn	NEG_X to Sun	
Apoapse Per = 10.6 d, inc ...		2008-056T22:07:25		000T00:00:01	2008-056T22:07:26			
SP_060EA_DLTURN057_PRIME	C, M, R	2008-057T01:36:00		000T00:30:00	2008-057T02:06:00	XBAND to Earth	POS_X to NEP	22.5 min. Turn
SP_060EA_G34BWGNON057_PRIME	C, M, R	2008-057T02:06:00		000T09:00:00	2008-057T11:06:00	XBAND to Earth	Rolling	
SP_060SA_WAYPTTURN057_PRIME	C, M	2008-057T11:06:00		000T00:30:00	2008-057T11:36:00	ISS_NAC to Saturn	NEG_Z to NSP	22.5 min. Turn
ISS_060OT_SATELLORB001_PRIME	C, M	2008-057T11:36:00		000T00:30:00	2008-057T12:06:00	ISS_NAC to Satellites	NEG_Z to NSP	
ISS_060SA_1X2WPH25001_PRIME	M, R, U	2008-057T12:06:00		000T13:00:00	2008-058T01:06:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_060OT_SATELLORB002_PRIME	C, M, R	2008-058T01:06:00		000T00:30:00	2008-058T01:36:00	ISS_NAC to Satellites	NEG_Z to NSP	
SP_060EA_DLTURN058_PRIME	C, M, R	2008-058T01:36:00		000T00:30:00	2008-058T02:06:00	XBAND to Earth	POS_X to NEP	22.6 min. Turn
SP_060EA_G34BWGNON058_PRIME	C, M, R	2008-058T02:06:00		000T09:00:00	2008-058T11:06:00	XBAND to Earth	Rolling	
SP_060SA_WAYPTTURN058_PRIME	C, M	2008-058T11:06:00		000T00:25:00	2008-058T11:31:00	ISS_NAC to Saturn	NEG_Z to NSP	
CIRS_060RI_SUBMU30LP001_PRIME	C, M	2008-058T11:31:00		000T08:35:00	2008-058T20:06:00	CIRS_FP1 to Rings	NEG_Z to NSP	
VIMS_060ST_3STARCAL001_PRIME	M	2008-058T20:06:00		000T01:30:00	2008-058T21:36:00	VIMS_IR to 143.061/-62.789	PIC	
UVIS_060ST_URBETHYA001_PRIME	M	2008-058T21:36:00		000T03:45:00	2008-059T01:21:00	UVIS_FUV to 178.227/-33.908	NEG_X to Sun	
SP_060EA_DLTURN059_PRIME	C, M	2008-059T01:21:00		000T00:30:00	2008-059T01:51:00	XBAND to Earth	POS_X to NEP	22.6 min. Turn
SP_060EA_G70METNON059_PRIME	C, M, R	2008-059T01:51:00		000T09:00:00	2008-059T10:51:00	XBAND to Earth	Rolling	

Final Sequenced SMT and Data Volume

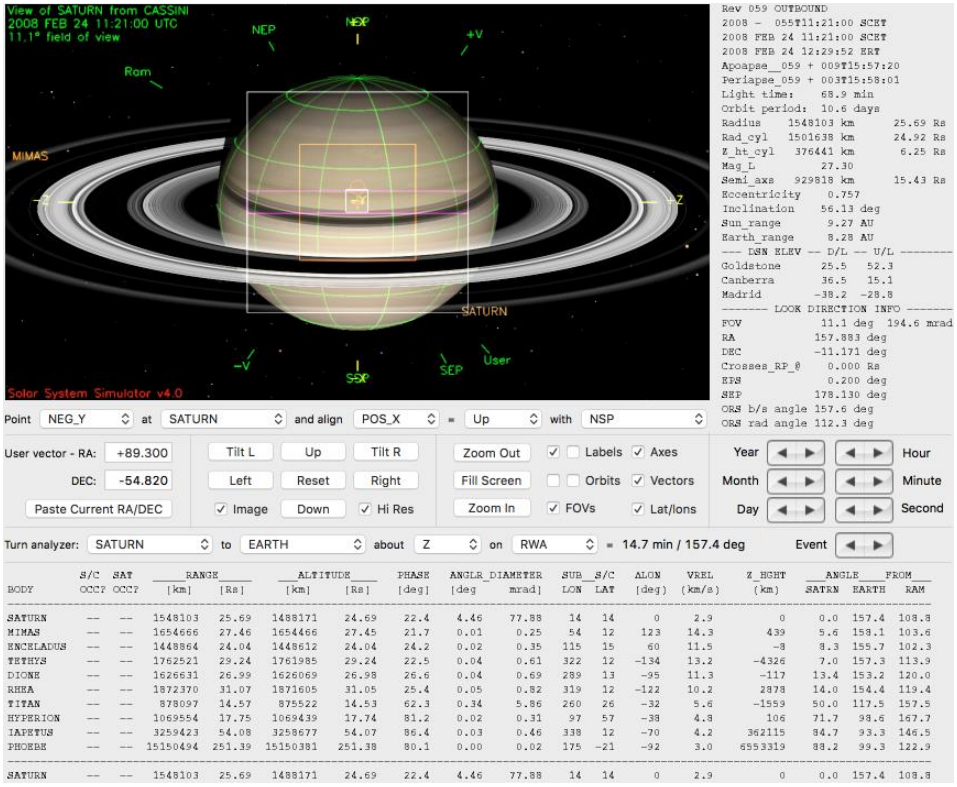
DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

			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 (Mb)	CAROVR (%) (Mb)
SP_059EA_G34BWGNON056_PRIME	056 05:06	056 11:06	0	1093	751	1845	3492	1648	0	172	35	2052	686	-1366	8	0% 1366
SP_060EA_G34BWGNON057_PRIME	057 02:06	057 11:06	1366	1390	63	2819	3492	673	0	236	53	3108	1006	-2103	8	0% 2102
SP_060EA_G34BWGNON058_PRIME	058 02:06	058 11:06	2102	1319	63	3485	3492	8	0	236	53	3773	1008	-2765	162	1% 2765
SP_060EA_G70METNON059_PRIME	059 01:51	059 10:51	2765	504	62	3331	3492	162	0	1042	53	4425	4535	109	186	1% 0

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

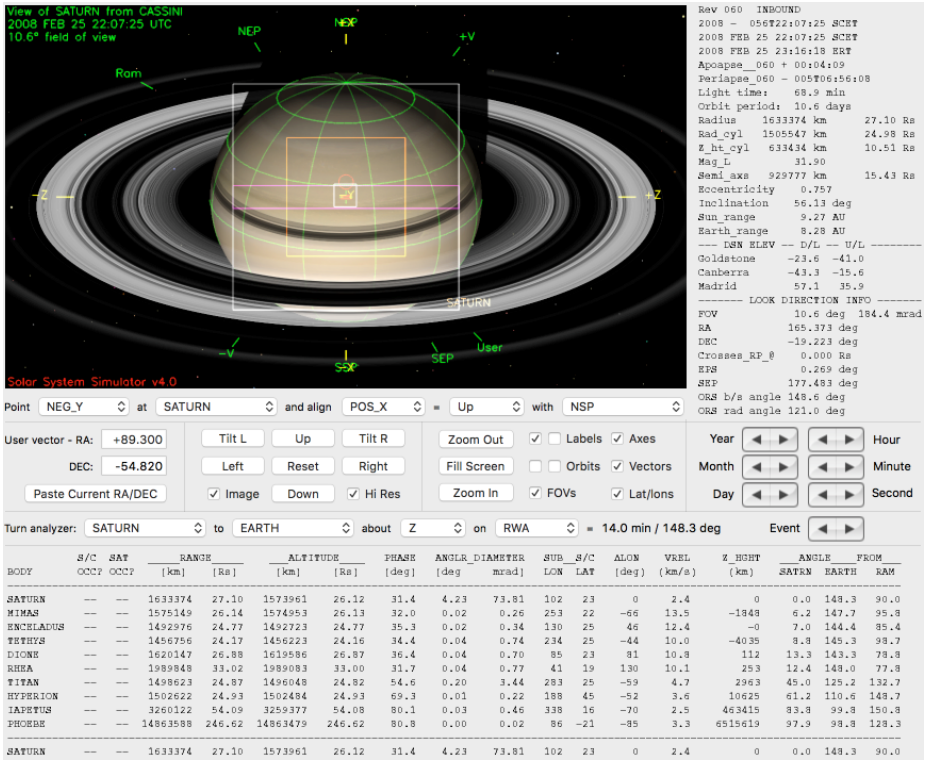
Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
OBSERVATION_NOR	055 11:21	056 05:06	63.9	19.2	246.2	3.2	372.0	38.3	76.7	0.0	83.7	0.0	180.0	0.0	691.0	1774.2
SP_059EA_G34BWGNON056_PRIME	056 05:06	056 11:06	21.6	6.5	72.0	1.1	0.0	13.0	25.9	0.0	28.3	1.6	0.0	0.0	0.0	170.0
DAILY TOTAL SCIENCE	055 11:21	056 11:06	85.5	25.6	318.2	4.3	372.0	51.3	102.6	0.0	112.0	1.6	180.0	0.0		
OBSERVATION_NOR	056 11:06	057 02:06	54.0	15.6	21.6	2.7	1070.5	32.4	64.8	0.0	70.7	45.1	0.0	0.0	12.3	1389.7
SP_060EA_G34BWGNON057_PRIME	057 02:06	057 11:06	32.4	9.7	86.4	1.6	0.0	19.4	38.9	0.0	42.4	2.5	0.0	0.0	0.0	233.4
DAILY TOTAL SCIENCE	056 11:06	057 11:06	86.4	25.4	108.0	4.3	1070.5	51.8	103.7	0.0	113.2	47.5	0.0	0.0		
OBSERVATION_NOR	057 11:06	058 02:06	54.0	16.2	28.8	2.7	990.3	32.4	64.8	0.0	70.7	46.9	0.0	0.0	12.3	1319.0
SP_060EA_G34BWGNON058_PRIME	058 02:06	058 11:06	32.4	9.7	86.4	1.6	0.0	19.4	38.9	0.0	42.4	2.5	0.0	0.0	0.0	233.4
DAILY TOTAL SCIENCE	057 11:06	058 11:06	86.4	25.9	115.2	4.3	990.3	51.8	103.7	0.0	113.2	49.3	0.0	0.0		
OBSERVATION_NOR	058 11:06	059 01:51	53.1	15.9	136.8	2.7	0.0	31.9	63.7	0.0	69.6	88.4	20.0	0.0	12.1	494.1
OBSERVATION_SI	058 11:06	059 01:51	0.0	0.0	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0
SP_060EA_G70METNON059_PRIME	059 01:51	059 10:51	320.8	17.0	86.4	1.6	0.0	64.0	38.9	0.0	501.2	2.5	0.0	0.0	0.0	1032.4
DAILY TOTAL SCIENCE	058 11:06	059 10:51	373.9	32.9	240.2	4.3	0.0	95.9	102.6	0.0	570.8	90.9	20.0	0.0		

Segment Geometry (1 of 2)



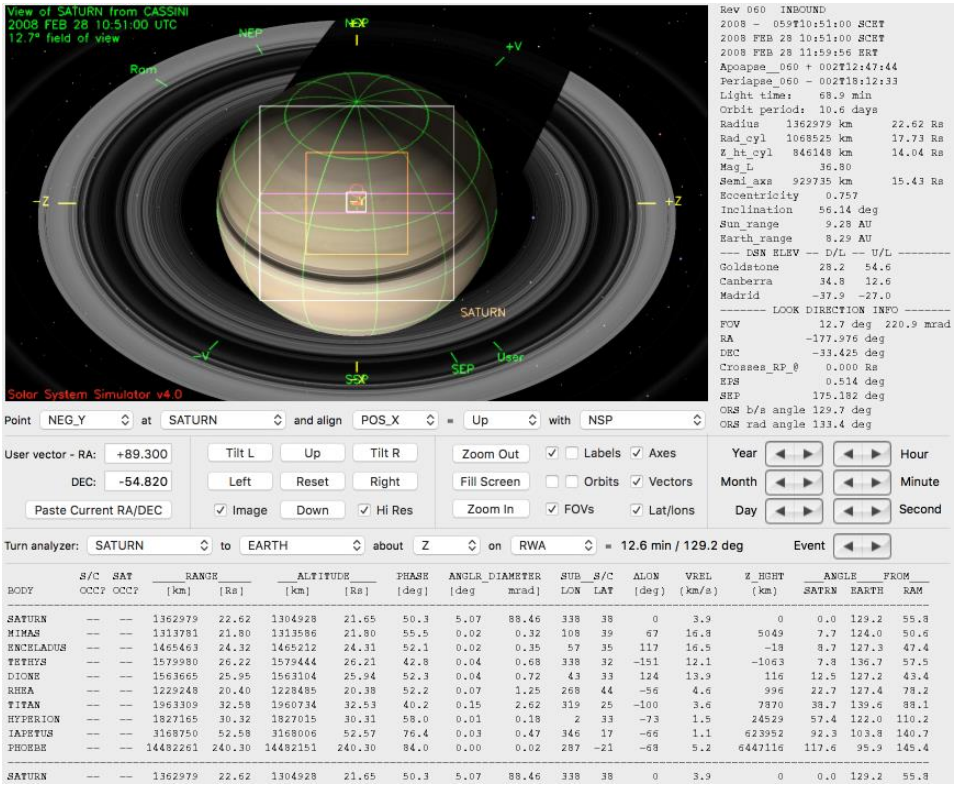
Segment Start: 2008-055T11:21

Apoapse: 2008-056T22:07:25



	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	25.69 Rs	22.4 deg	14
Apoapse	27.10 Rs	31.4 deg	23
Segment End	22.62 Rs	50.3 deg	38

Segment Geometry (2 of 2)

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Rev 060  INBOUND
2008 -  059T10:51:00 SCET
2008 FEB 28 10:51:00 SCET
2008 FEB 28 11:59:56 ERT
Apoapse__060 + 002T12:47:44
Periapse_060 - 002T18:12:33
Light time:    68.9 min
Orbit period:  10.6 days
Radius     1362979 km      22.62 Rs
Rad_cyl    1068525 km      17.73 Rs
Z_ht_cyl    846148 km      14.04 Rs
Mag_L         36.80
Semi_axs    929735 km      15.43 Rs
Eccentricity     0.757
Inclination     56.14 deg
Sun_range        9.28 AU
Earth_range      8.29 AU
--- DSN ELEV -- D/L -- U/L --------
Goldstone       28.2   54.6
Canberra        34.8   12.6
Madrid         -37.9  -27.0
------- LOOK DIRECTION INFO -------
FOV              12.7 deg  220.9 mrad
RA            -177.976 deg
DEC            -33.425 deg
Crosses_RP_0     0.000 Rs
EPS              0.514 deg
SEP            175.182 deg
ORS b/s angle 129.7 deg
ORS rad angle 133.4 deg
```

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	ALON [deg]	VREL (km/s)	Z_HGHT (km)	ANGLE_FROM SATRN	ANGLE_FROM EARTH	ANGLE_FROM RAM
SATURN	--	--	1362979	22.62	1304928	21.65	50.3	5.07	88.46	338	38	0	3.9	0	0.0	129.2	55.8
MIMAS	--	--	1313781	21.80	1313586	21.80	55.5	0.02	0.32	108	39	67	16.8	5049	7.7	124.0	50.6
ENCELADUS	--	--	1465463	24.32	1465212	24.31	52.1	0.02	0.35	57	35	117	16.5	-18	8.7	127.3	47.4
TETHYS	--	--	1579980	26.22	1579444	26.21	42.8	0.04	0.68	338	32	-151	12.1	-1063	7.8	136.7	57.5
DIONE	--	--	1563665	25.95	1563104	25.94	52.3	0.04	0.72	43	33	124	13.9	116	12.5	127.2	43.4
RHEA	--	--	1229248	20.40	1228485	20.38	52.2	0.07	1.25	268	44	-56	4.6	996	22.7	127.4	78.2
TITAN	--	--	1963309	32.58	1960734	32.53	40.2	0.15	2.62	319	25	-100	3.6	7870	38.7	139.6	88.1
HYPERION	--	--	1827165	30.32	1827015	30.31	58.0	0.01	0.18	2	33	-73	1.5	24529	57.4	122.0	110.2
IAPETUS	--	--	3168750	52.58	3168006	52.57	76.4	0.03	0.47	346	17	-66	1.1	623952	92.3	103.8	140.7
PHOEBE	--	--	14482261	240.30	14482151	240.30	84.0	0.00	0.02	287	-21	-68	5.2	6447116	117.6	95.9	145.4
SATURN	--	--	1362979	22.62	1304928	21.65	50.3	5.07	88.46	338	38	0	3.9	0	0.0	129.2	55.8

Segment End: 2008-059T10:51

	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	25.69 Rs	22.4 deg	14
Apoapse	27.10 Rs	31.4 deg	23
Segment End	22.62 Rs	50.3 deg	38

Solar Geometry – ORS Boresight Concerns

No ORS Boresight Solar Constraints on Science Pointing.

Daily Science Highlights

DOY 055 – MAPS instruments continued their low-rate magnetospheric study. VIMS stared at 1 ansa of the F ring and observed continuously for 1 orbital period to build up a 360 deg azimuthal map of the ring.

DOY 056 – UVIS continued their Interplanetary Hydrogen Survey. ISS targeted Titan for a NAC photopol at 60 deg phase then ISS targets several satellites in their ongoing satellite orbit determination campaign.

DOY 057 - RSS Operations Readiness Test (ORT), to demonstrate DSN and RSSG preparedness to support the Rings Occultation experiment on DOY 062. ISS targeted several satellites in their ongoing satellite orbit determination campaign then ISS targeted Saturn for WAC photopolarimetry at 25 degree phase.

DOY 058 – ISS targeted several satellites in their ongoing satellite orbit determination campaign. VIMS performed a 3 star calibration of their instrument. UVIS observed an occultation of star Bet Hya by the rings.

DOY 059 – UVIS started the day by finishing their observations of the occultation of star Bet Hya by Saturn's rings. MAPS continued their continuous low-rate magnetospheric survey.

Segment Integration Planning

Timeline Gaps and Suggested Observations

Activity	Start	Duration	Pointing	Notes	TLM
Segment Start	**2008-055T11:21:00**				
OPNAV and Turn to New Waypoint	2008-055T11:21:00	01:00:00			
New Waypoint	**2008-055T12:21:00**				
VIMS F-Movie	2008-055T12:21:00	15:15:00			
ISS Titan	2008-056T03:36:00	01:00:00			
SP Turn to Downlink	2008-056T04:36:00	00:30:00			
Downlink	2008-056T05:06:00	06:00:00	XBAND to Earth;	Goldstone 34 BWG	
SP Turn to Waypoint	2008-056T11:06:00	00:30:00			
OPEN	2008-056T11:36:00	14:00:00			
Rev 60 Apoapsis	**2008-056T22:23:37**				
SP Turn to Downlink	2008-057T01:36:00	00:30:00	XBAND to Earth;		
Downlink	2008-057T02:06:00	09:00:00	XBAND to Earth;	Goldstone 34 BWG	
SP Turn to Waypoint	2008-057T11:06:00	00:30:00			
OPEN	2008-057T11:36:00	06:00:00			
UVIS Ring Impact	2008-057T17:36:00	08:00:00			
SP Turn to Downlink	2008-058T01:36:00	00:30:00	XBAND to Earth;		
Downlink	2008-058T02:06:00	09:00:00	XBAND to Earth;	Goldstone 34 BWG	
OPNAV and Turn to Waypoint	2008-058T11:06:00	01:00:00			
CIRS Rings	2008-058T12:06:00	08:00:00			
UVIS Ring Impact	2008-058T20:06:00	05:15:00			
SP Turn to Downlink	2008-059T01:21:00	00:30:00			
Downlink	2008-059T01:51:00	09:00:00	XBAND to Earth;	Goldstone 34 BWG	

Time (2008)	Rs	Phase (deg.)	Sub S/C Lat
Rev 59/60			
055T00:00:00	24.58	19.6	11
056T00:00:00	26.55	25.7	17
057T00:00:00	27.13	32	23
058T00:00:00	26.37	38.6	29
059T00:00:00	24.2	46.2	35

Initial SMT and Data Volume

Beginning of Integration:

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)	(%)		OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGIN (Mb)	(%)	CAROVR (Mb)
SP_059EA_G34BWGNON056_PRIME	056 05:06	056 11:06	0	525	62	586	3534	2947	83%		17	170	35	809	690	-119	-17%	119
SP_060EA_G34BWGNON057_PRIME	057 02:06	057 11:06	119	1325	52	1496	3568	2073	58%		0	229	53	1777	1013	-764	-75%	764
SP_060EA_G34BWGNON058_PRIME	058 02:06	058 11:06	764	1252	52	2068	3568	1500	42%		0	229	53	2350	1013	-1337	-132%	1337
SP_060EA_G34BWGNON059_PRIME	059 01:51	059 10:51	1337	629	51	2017	3534	1517	43%		17	229	53	2316	1010	-1306	-129%	1306

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	055 11:21	056 05:06	63.9	9.6	248.4	3.2	0.0	38.3	76.7	0.0	83.7	0.8	0.0	0.0	0.0	524.6
OBSERVATION_OPN	055 11:21	056 05:06	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_059EA_G34BWGNON056_PRIME	056 05:06	056 11:06	21.6	3.2	75.6	1.1	0.0	13.0	25.9	0.0	28.3	1.6	0.0	0.0	0.0	170.3
DAILY TOTAL SCIENCE	055 11:21	056 11:06	85.5	12.8	324.0	4.3	0.0	51.3	102.6	0.0	112.0	2.5	0.0	0.0		
OBSERVATION_NOR	056 11:06	057 02:06	54.0	7.8	21.6	2.7	1070.5	32.4	64.8	0.0	70.7	0.0	0.0	0.0	0.0	1324.6
SP_060EA_G34BWGNON057_PRIME	057 02:06	057 11:06	32.4	4.9	86.4	1.6	0.0	19.4	38.9	0.0	42.4	2.5	0.0	0.0	0.0	228.5
DAILY TOTAL SCIENCE	056 11:06	057 11:06	86.4	12.7	108.0	4.3	1070.5	51.8	103.7	0.0	113.2	2.5	0.0	0.0		
OBSERVATION_NOR	057 11:06	058 02:06	54.0	8.1	28.8	2.7	990.3	32.4	64.8	0.0	70.7	0.0	0.0	0.0	0.0	1251.8
SP_060EA_G34BWGNON058_PRIME	058 02:06	058 11:06	32.4	4.9	86.4	1.6	0.0	19.4	38.9	0.0	42.4	2.5	0.0	0.0	0.0	228.5
DAILY TOTAL SCIENCE	057 11:06	058 11:06	86.4	12.9	115.2	4.3	990.3	51.8	103.7	0.0	113.2	2.5	0.0	0.0		
OBSERVATION_NOR	058 11:06	059 01:51	53.1	8.0	212.4	2.7	48.0	31.9	63.7	0.0	69.6	123.7	0.0	0.0	0.0	613.0
OBSERVATION_OPN	058 11:06	059 01:51	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
OBSERVATION_SI	058 11:06	059 01:51	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0
SP_060EA_G34BWGNON059_PRIME	059 01:51	059 10:51	32.4	4.9	86.4	1.6	0.0	19.4	38.9	0.0	42.4	2.5	0.0	0.0	0.0	228.5
DAILY TOTAL SCIENCE	058 11:06	059 10:51	85.5	12.8	314.8	4.3	48.0	51.3	102.6	0.0	112.0	126.2	0.0	0.0		

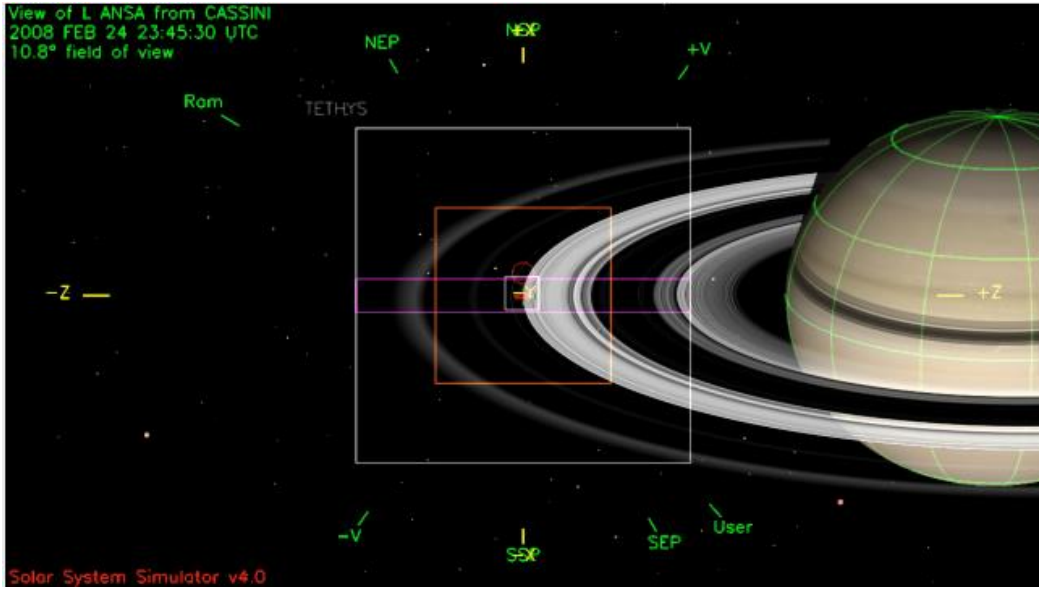
	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)
TOTAL RECORDED (OPNAV data not included)	343.8	51.3	862.0	17.2	2108.8	206.3	412.6	0.0	450.4	133.6	0.0	0.0

Waypoint Selection

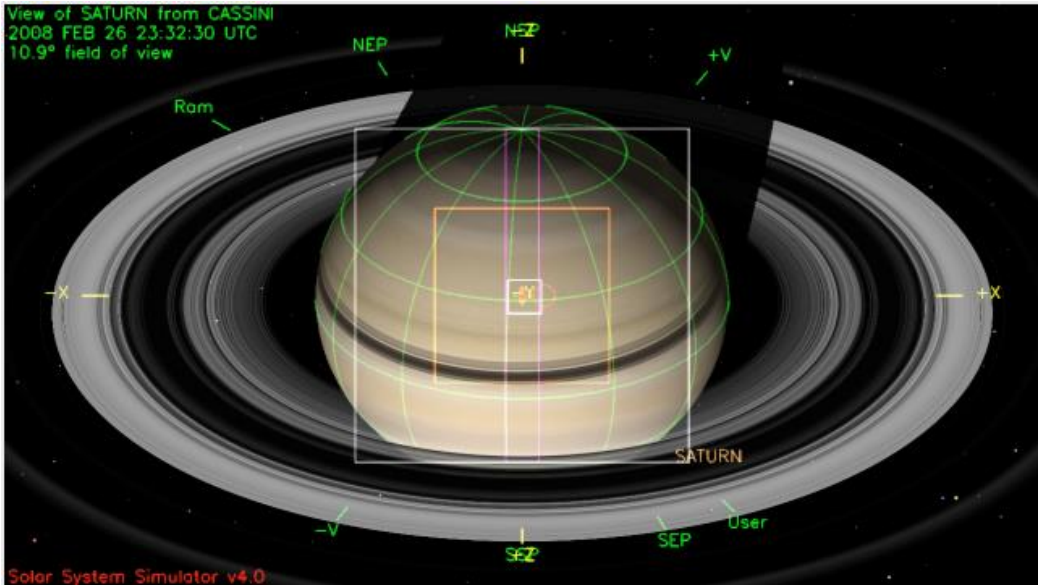
No Waypoint Selection Info Available.

Waypoints Chosen

Waypoint 1 (2005-055T11:55 – 056T11:36):
NAC to L_ANSA_F, POS_X to NSP



Waypoint 2 (2005-056T11:36 – 059T11:29):
NAC to Saturn, NEG_Z to NSP



Notes & Liens

- **Pointing Issues**
  - None
- **Data Volume Issues**
  - The version of SMT used does not apply the latest margin policy. We'll deal when implemented. The retrofitted segment uses the latest SMT version (MSS 10.2)
- **Telemetry Mode Issues**
  - None
- **CIMS Issues**
  - None
- **Power/OPMODE Issues**
  - None
- **Flight Rule/Mission Planning Guideline and Constraint Issues**
  - Not checked
- **Other Issues**
  - None