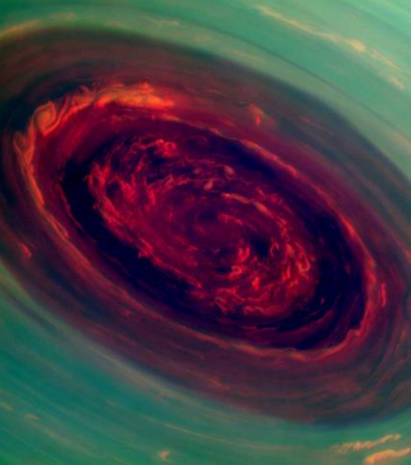

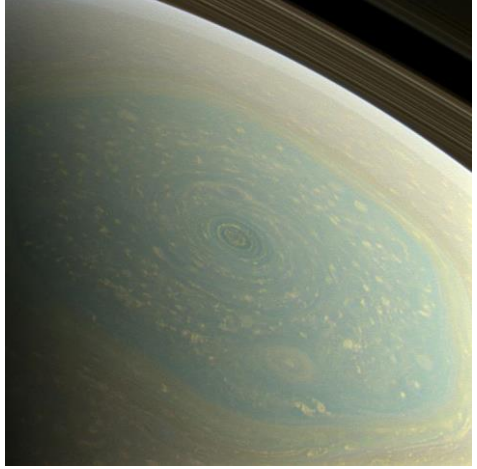
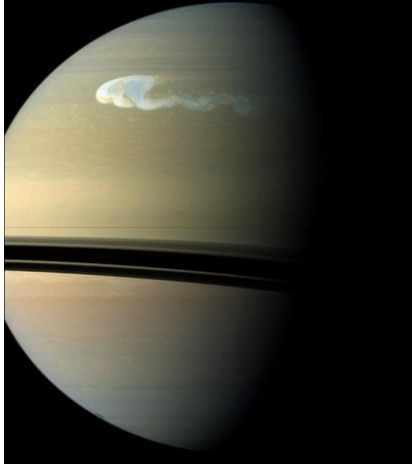

Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 209 Segment Legacy Package

Segment Boundary: October 20, 2014 – October 23, 2014
2014-293T06:30:00 – 2014-296T06:15:00 (SCET)

Integration Began 02/03/2014
Segment Delivered to S86 Sequence 04/17/2014
Lead Integrator was Shawn Boll

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

- 3 day segment centered on Rev 209 periapse (11.4 Rs), in the first inclined phase (IN-1) of the Solstice Mission.
- Began integration with a very open timeline, with no PIEs (Pre-Integrated Events) or significant out-of-discipline requests.
- Focused on Saturn atmospheric science
  - ORS Limb movies and southern regional mapping and movies, led by VIMS.
  - UVIS and VIMS led Aurora and CIRS Compositional Sit & Stare.
  - UVIS-led stellar occultation of Alpha Lyra and Saturn.
- Waypoints chosen for science compatibility and turn time mitigation.
- Data volume negotiations were not especially contentious.

Final Sequenced SPASS

Gap 1

Gap 2a & b

Gap 3

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S86, length = 72 days		2014-279T01:01:00		072T02:14:00	2014-351T03:15:00			
SATURN_209 Segment		2014-293T06:30:00		002T23:45:00	2014-296T06:15:00			
SP_209SA_WAYPTTURN293_PRIME		2014-293T06:30:00		000T00:40:00	2014-293T07:10:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2014-293T07:10:00**		**000T14:20:00**	**2014-293T21:30:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
ISS_209TI_M60R2CLD293_PRIME	C, V	2014-293T07:10:00	E209_M60R2CLD293+000T00:00:00	000T01:30:00	2014-293T08:40:00	ISS_NAC to Titan	NEG_X to 19.973/58.592	Pickup and Handoff at ISS_NAC to Saturn / NEG_X to 19.973/58.592
VIMS_209SA_LIMBMOV001_PRIME	C, I, U	2014-293T08:40:00		000T12:10:00	2014-293T20:50:00	ISS_NAC to Saturn (0.0,0.0,-2.752 deg. offset)	NEG_X to NSP	Collaborative Rider(s): ISS. Actual pickup/handoff attitudes due to RBOT changes: pickup: ISS_NAC to SATURN, NEG_X to RA/DEC = [19.973 58.592] handoff: ISS_NAC to SATURN, NEG_X to RA/DEC = [19.973 58.592]
SP_209EA_DLTURN293_PRIME		2014-293T20:50:00		000T00:40:00	2014-293T21:30:00	XBAND to Earth	NEG_Y to 306.91/38.61	Pickup from NAC to Saturn, Neg_X 19.7/58.59
NEW WAYPOINT		**2014-293T21:30:00**		**000T09:40:00**	**2014-294T07:10:00**	**XBAND to Earth**	**NEG_Y to 306.91/38.61**	
SP_209EA_C34HEFOTP293_PRIME	C, N	2014-293T21:30:00		000T09:00:00	2014-294T06:30:00	XBAND to Earth	4_Hr_Rolling	MIMI. NEG_Y to Saturn. OTP.
SP_209SA_WAYPTTURN294_PRIME		2014-294T06:30:00		000T00:40:00	2014-294T07:10:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2014-294T07:10:00**		**000T14:20:00**	**2014-294T21:30:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
VIMS_209SA_SREGMAP001_PRIME	C, I, U	2014-294T07:10:00		000T05:45:00	2014-294T12:55:00	ISS_NAC to Saturn	NEG_X to NSP	
UVIS_209ST_ALPLYR001_PRIME	V	2014-294T12:55:00		000T01:20:00	2014-294T14:15:00	UVIS_FUV to 279.234/38.784 (0.258,0.0,0.0 deg. offset)	NEG_X to NSP	
UVIS_209SA_AURSLEW002_PRIME		2014-294T14:15:00		000T02:00:00	2014-294T16:15:00	UVIS_FUV to Saturn	NEG_X to NSP	
VIMS_209SA_AURSTARE001_PRIME	C, I, U	2014-294T16:15:00		000T04:35:00	2014-294T20:50:00	ISS_NAC to Saturn	NEG_X to NSP	
SP_209EA_DLTURN294_PRIME		2014-294T20:50:00		000T00:40:00	2014-294T21:30:00	XBAND to Earth	NEG_Y to 306.91/38.61	
NEW WAYPOINT		**2014-294T21:30:00**		**000T09:40:00**	**2014-295T07:10:00**	**XBAND to Earth**	**NEG_Y to 306.91/38.61**	
Periapse R = 11.387 Rs, lat...		2014-294T21:22:13		000T00:00:01	2014-294T21:22:14			
SP_209EA_C70METOTB294_PRIME	C, N	2014-294T21:30:00		000T09:00:00	2014-295T06:30:00	XBAND to Earth	4_Hr_Rolling	MIMI. same as OTP pass. OTB. Custom handoff to NAC to Saturn, NEG_X to 71.98/2.04
SP_209SA_WAYPTTURN295_PRIME		2014-295T06:30:00		000T00:40:00	2014-295T07:10:00	ISS_NAC to Saturn	NEG_X to Sun	
NEW WAYPOINT		**2014-295T07:10:00**		**000T12:35:00**	**2014-295T19:45:00**	**ISS_NAC to Saturn**	**NEG_X to Sun**	
VIMS_209SA_SPOLMAP001_PRIME		2014-295T07:10:00		000T01:00:00	2014-295T08:10:00	ISS_NAC to Saturn (2.752,0.0,-0.857 deg. offset)	NEG_X to Sun	Actual pickup/handoff attitudes due to RBOT changes: pickup: ISS_NAC to SATURN, NEG_X to RA/DEC = [71.980 2.041] handoff: ISS_NAC to SATURN, NEG_X to RA/DEC = [71.980 2.041]
CIRS_209SA_COMPSIT008_PRIME	I, U, V	2014-295T08:10:00		000T10:00:00	2014-295T18:10:00	CIRS_FP3 to Saturn	NEG_X to Sun	50 deg. South Lat.; left (illuminated) limb change custom pickup to NAC to Saturn NEG_X to 71.98, 2.041
VIMS_209SA_SPOLMAP002_PRIME		2014-295T18:10:00		000T00:55:00	2014-295T19:05:00	ISS_NAC to Saturn (2.521,0.0,-0.8 deg. offset)	NEG_X to Sun	
SP_209EA_DLTURN295_PRIME		2014-295T19:05:00		000T00:40:00	2014-295T19:45:00	XBAND to Earth	NEG_Y to 115.6/-0.4	
NEW WAYPOINT		**2014-295T19:45:00**		**000T11:10:00**	**2014-296T06:55:00**	**XBAND to Earth**	**NEG_Y to 115.6/-0.4**	
SP_209EA_C70METNON295_PRIME	C, R	2014-295T22:35:00		000T07:40:00	2014-296T06:15:00	XBAND to Earth	NEG_Y to 115.6/-0.4	MIMI. NEG_Y to 115.6/-0.40. pre-TOST flyby

Final Sequenced SMT and Data Volume

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

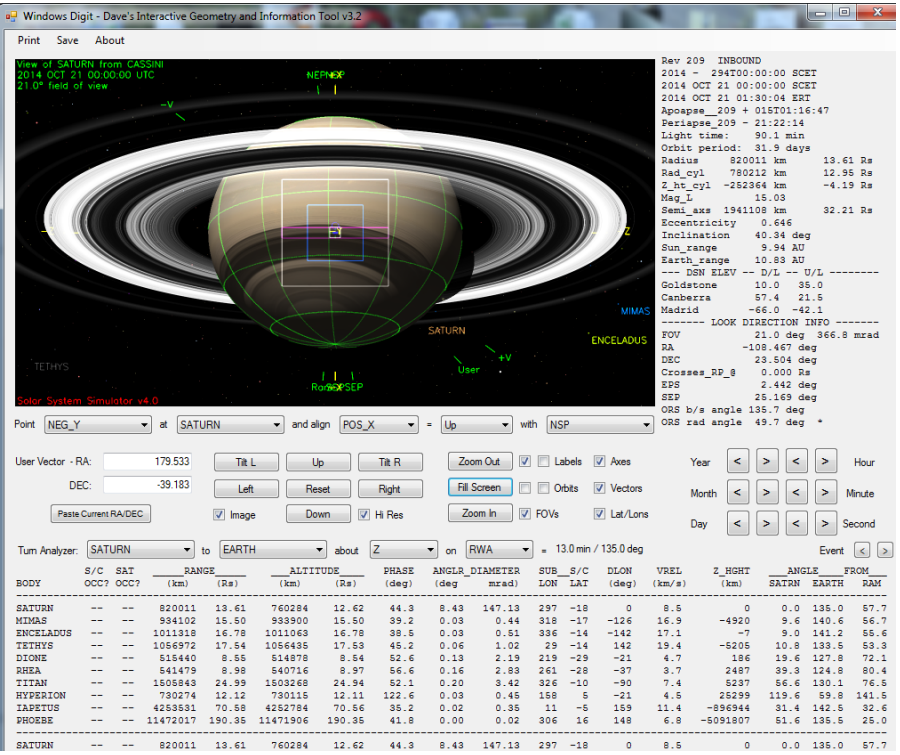
			OBSERVATION_PERIOD							DOWNLINK_PASS							
			P4						P5	RECORDED		PLAYBACK					
DOWNLINK PASS NAME	Start doy hh:mm	End doy hh:mm	START (Mb)	SCI (Mb)	HK+E (Mb)	TOTAL (Mb)	CPACTY (Mb)	MRGN (Mb)	OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_MARGN (Mb)	(%)	CAROVR (Mb)
SP_209EA_C34HEFOTP293_PRIME	293 21:30	294 06:30	917	1453	68	2438	3322	884	0	199	53	2690	550	-2140	4	0%	2140
SP_209EA_C70METOTB294_PRIME	294 21:30	295 06:30	2140	1115	63	3318	3322	4	0	199	53	3570	2944	-626	883	7%	626
SP_209EA_C70METNON295_PRIME	295 22:35	296 06:15	626	971	68	1664	3322	1658	0	179	45	1888	2537	648	883	8%	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	293 05:25	293 21:30	0.0	30.3	109.2	5.8	538.5	28.6	48.8	0.0	74.1	44.7	560.0	0.0	67.2	1507.3
SP_209EA_C34HEFOTP293_PRIME	293 21:30	294 06:30	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	42.1	4.9	0.0	0.0	0.0	197.2
DAILY TOTAL SCIENCE	293 05:25	294 06:30	0.0	47.3	195.6	9.0	538.5	44.6	76.4	0.0	116.2	49.6	560.0	0.0	67.2	
OBSERVATION_NOR	294 06:30	294 21:30	0.0	28.3	74.4	5.4	340.0	26.7	45.9	0.0	70.2	138.7	375.0	0.0	62.7	1167.2
SP_209EA_C70METOTB294_PRIME	294 21:30	295 06:30	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	42.1	4.9	0.0	0.0	0.0	197.2
DAILY TOTAL SCIENCE	294 06:30	295 06:30	0.0	45.3	160.8	8.6	340.0	42.7	73.4	0.0	112.3	143.6	375.0	0.0	62.7	
OBSERVATION_NOR	295 06:30	295 22:35	0.0	30.3	147.6	5.8	50.0	28.6	49.2	0.0	75.3	37.0	538.0	0.0	67.2	1029.0
SP_209EA_C70METNON295_PRIME	295 22:35	296 06:15	0.0	14.5	82.8	2.8	0.0	13.6	23.5	0.0	36.0	4.2	0.0	0.0	0.0	177.4
DAILY TOTAL SCIENCE	295 06:30	296 06:15	0.0	44.8	230.4	8.6	50.0	42.2	72.7	0.0	111.3	41.2	538.0	0.0	67.2	

Segment Geometry

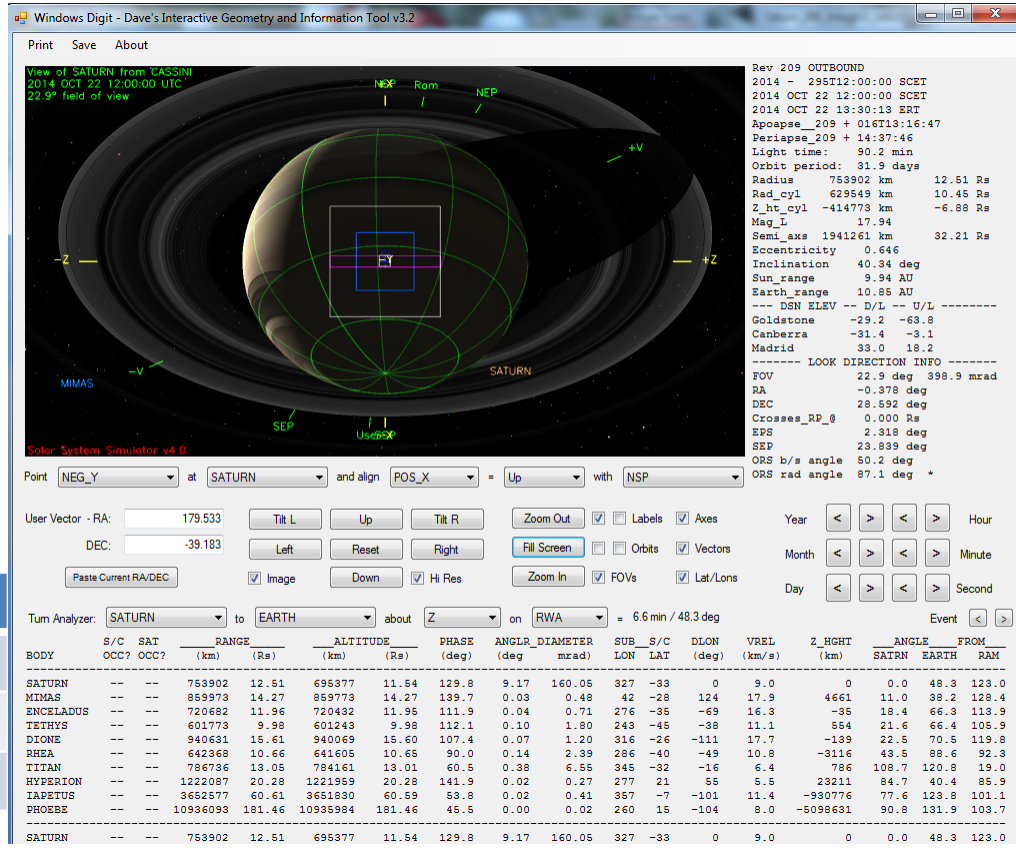
Inbound



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	--	--	820011	13.61	760284	12.62	44.3	8.43	147.13	297	-18	0	8.5	0	0.0	135.0	57.7
MIMAS	--	--	934102	15.50	933900	15.50	39.2	0.03	0.44	318	-17	-126	16.9	-4920	9.6	140.6	56.7
ENCELADUS	--	--	1011318	16.78	1011063	16.78	38.5	0.03	0.51	336	-14	-142	17.1	-7	9.0	141.2	55.6
TETHYS	--	--	1056972	17.54	1056435	17.53	45.2	0.06	1.02	29	-14	142	19.4	-5205	10.8	133.5	53.3
DIONE	--	--	516440	8.55	514878	8.54	52.6	0.13	2.19	219	-29	-21	4.7	186	19.6	127.8	72.1
RHEA	--	--	541479	8.98	540716	8.97	56.6	0.16	2.83	261	-28	-37	3.7	2487	39.3	124.8	80.4
TITAN	--	--	1505843	24.99	1503268	24.94	52.1	0.20	3.42	326	-10	-90	7.4	5237	56.6	130.1	76.5
HYPERION	--	--	730274	12.12	730115	12.11	122.6	0.03	0.45	158	5	-21	4.5	25239	119.6	59.8	141.5
IAPETUS	--	--	4253831	70.58	4252784	70.56	35.2	0.02	0.35	11	-5	159	11.4	-896944	31.4	142.5	32.6
PHOEBE	--	--	11472017	190.35	11471906	190.35	41.8	0.00	0.02	306	16	148	6.8	-5091807	51.6	135.5	25.0
SATURN	--	--	820011	13.61	760284	12.62	44.3	8.43	147.13	297	-18	0	8.5	0	0.0	135.0	57.7

	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	17.23	24	0
Periapse	11.4	93.7	-40
Segment End	15.92	155.8	-15

Outbound



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	--	--	753902	12.51	695377	11.54	129.8	9.17	160.05	327	-33	0	9.0	0	0.0	48.3	123.0
MIMAS	--	--	859973	14.27	859773	14.27	139.7	0.03	0.48	42	-28	124	17.9	4661	11.0	38.2	128.4
ENCELADUS	--	--	720682	11.96	720432	11.95	111.9	0.04	0.71	276	-35	-69	16.3	-35	18.4	66.3	113.9
TETHYS	--	--	601773	9.98	601243	9.98	112.1	0.10	1.80	243	-45	-38	11.1	554	21.6	66.4	105.9
DIONE	--	--	940631	15.61	940069	15.60	107.4	0.07	1.20	316	-26	-111	17.7	-139	22.5	70.5	119.8
RHEA	--	--	642368	10.66	641605	10.65	90.0	0.14	2.39	286	-40	-49	10.8	-3116	43.5	88.6	92.3
TITAN	--	--	786736	13.05	784161	13.01	60.5	0.38	6.55	345	-32	-16	6.4	786	108.7	120.8	19.0
HYPERION	--	--	1222087	20.28	1221959	20.28	141.9	0.02	0.27	277	21	55	5.5	23211	84.7	40.4	85.9
IAPETUS	--	--	3652577	60.61	3651830	60.59	53.8	0.02	0.41	357	-7	-101	11.4	-930776	77.6	123.8	101.1
PHOEBE	--	--	10936093	181.46	10935984	181.46	45.5	0.00	0.02	260	15	-104	8.0	-5098631	90.8	131.9	103.7
SATURN	--	--	753902	12.51	695377	11.54	129.8	9.17	160.05	327	-33	0	9.0	0	0.0	48.3	123.0

Solar Geometry – ORS Boresight Concerns

No ORS Boresight Solar Constraints on Science Pointing Noted.

Daily Science Highlights

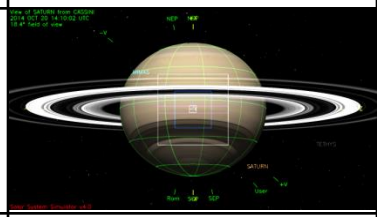
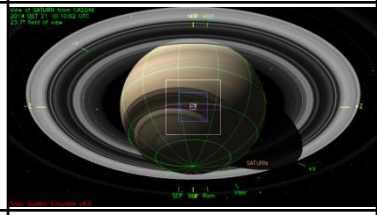
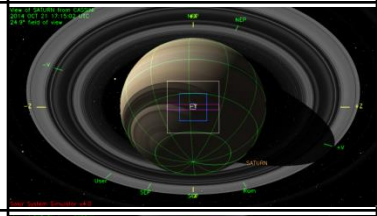
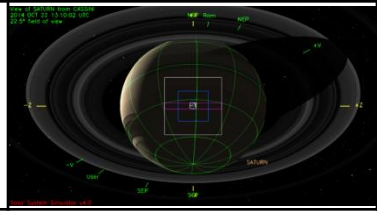
Oct 20 (DOY 293): MAPS instruments continued their ongoing campaigns to determine atmospheric and ionospheric thermal structure, and to study the magnetosphere. ORS teams conducted a joint observation of Titan as part of the ongoing Titan Monitoring Campaign. VIMS targeted Saturn to compose a movie of images along the bright limb of the planet, with the other ORS instruments riding along.

Oct 21 (DOY 294): VIMS performed regional mapping mosaics of Saturn's southern hemisphere. CIRS rode along focusing on the limb and UVIS looked for aurora. ISS performed WAC imagery during the VIMS activity. UVIS observed a stellar occultation of Alpha Lyra and Saturn, with VIMS riding along. Auroral observations were conducted by UVIS with repeated slews across the auroral oval. VIMS led a joint ORS auroral stare observation of the southern polar region. Cassini passed through Saturn periapse at a range of 11.4 Rs. MAPS instruments continued their ongoing campaigns to determine atmospheric and ionospheric thermal structure, and to study the magnetosphere.

Oct 22 (DOY 295): VIMS targeted Saturn's south pole to construct a map of the region. CIRS performed a COMPSIT, where they will sit and stare at one location to derive composition. The other ORS teams rode along. MAPS instruments continued their ongoing campaigns to determine atmospheric and ionospheric thermal structure, and to study the magnetosphere. During the downlink, RSS conducted an Operations Readiness Test to demonstrate DSN and RSSG preparedness to support upcoming Titan occultations.

Segment Integration Planning

Timeline Gaps and Suggested Observations

Gap	Start	End	Duration	Phase angle (range)	Rs range	Sub-S/C Lat.	Snapshot (mid-gap)
1	2014-293T07:10:00 ISS S. REGMAP or MOV	2014-293T20:50:00	000T13:40:00	24.5 to 39.1	17.08 to 14.2	-1 to -14	
2a	2014-294T07:10:00 VIMS S. REGMAP	2014-294T12:55:00	000T05:45:00	58.3 to 71.7	12.45 to 11.79	-27 to -34	
2b	2014-294T14:15:00 Aurora:4.5hr VIMS Stare, 2hr UVIS Slew	2014-294T20:50:00	000T06:35:00	75.0 to 92.3	11.68 to 11.40	-35 to -40	
		Periapse (11.39 Rs) @ 294T21:22:13					
3	2014-295T07:10:00 3hr ISS Limb, 4.5hr VIMS POLMAP, 4.5hr CIRS MAP	2014-295T19:05:00	000T11:55:00	118.9 to 142.9	11.92 to 13.67	-38 to -26	

Initial SMT and Data Volume

Beginning of Integration:

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_209EA_C34BWGOTP293_PRIME	293 21:30	294 06:30	0	374	63	437	3322	2885	0	199	53	689	472	-217	2864	45%	217
SP_209EA_C70METOTB294_PRIME	294 21:30	295 06:30	217	178	63	458	3322	2864	0	199	53	710	2944	2233	4674	80%	0
SP_209EA_C70METNON295_PRIME	295 21:15	296 06:15	0	175	62	237	3322	3085	0	199	53	490	2930	2440	2440	83%	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	293 06:30	293 21:30	0.0	28.3	0.0	5.4	0.0	26.7	45.9	0.0	70.6	193.6	0.0	0.0	62.7	433.1
SP_209EA_C34BWGOTP293_PRIME	293 21:30	294 06:30	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	42.1	4.9	0.0	0.0	0.0	197.2
DAILY TOTAL SCIENCE	293 06:30	294 06:30	0.0	45.3	86.4	8.6	0.0	42.7	73.4	0.0	112.7	198.5	0.0	0.0	62.7	
OBSERVATION_NOR	294 06:30	294 21:30	0.0	28.3	0.0	5.4	0.0	26.7	45.9	0.0	70.2	0.0	0.0	0.0	62.7	239.2
SP_209EA_C70METOTB294_PRIME	294 21:30	295 06:30	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	42.1	4.9	0.0	0.0	0.0	197.2
DAILY TOTAL SCIENCE	294 06:30	295 06:30	0.0	45.3	86.4	8.6	0.0	42.7	73.4	0.0	112.3	4.9	0.0	0.0	62.7	
OBSERVATION_NOR	295 06:30	295 21:15	0.0	27.8	0.0	5.3	0.0	26.2	45.1	0.0	69.0	0.0	0.0	0.0	61.6	235.2
SP_209EA_C70METNON295_PRIME	295 21:15	296 06:15	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	42.3	4.9	0.0	0.0	0.0	197.4
DAILY TOTAL SCIENCE	295 06:30	296 06:15	0.0	44.8	86.4	8.6	0.0	42.2	72.7	0.0	111.3	4.9	0.0	0.0	61.6	

	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)	0.0	135.3	259.2	25.8	0.0	127.6	219.6	0.0	336.3	208.4	0.0	0.0

Waypoint Selection

IN-1 RBOT WAYPOINTS

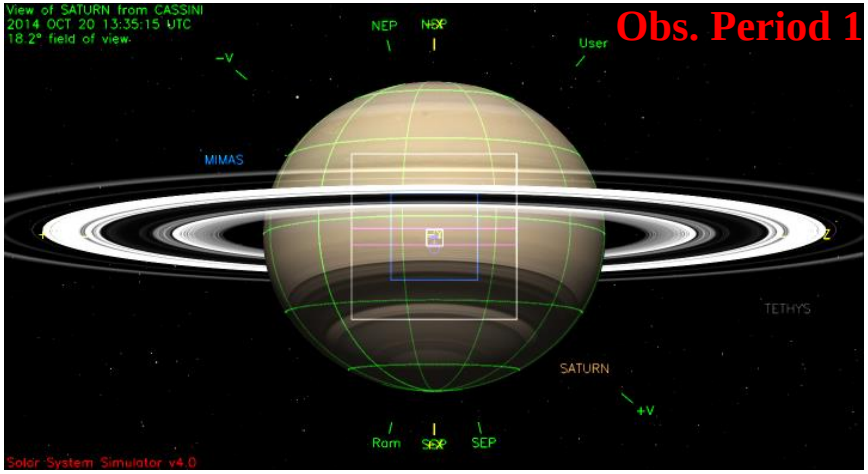
PRIMARY AXIS IS **NEG_Y to SATURN**

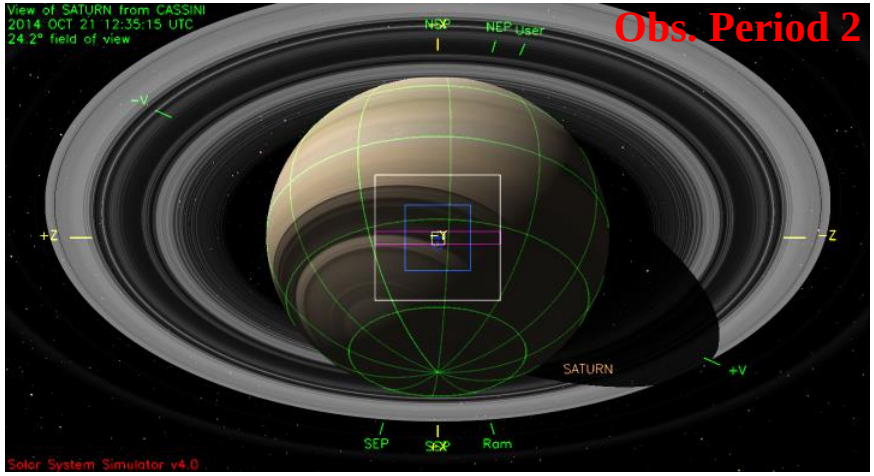
OBSERVATION PERIOD	START	END	POS_X	NEG_X	POS_Z	NEG_Z
SP_209NA_OBSERV293_NA	2014-293T06:30:00	2014-293T21:30:00	------	130.2/ 50.1	------	130.2/ 50.1
SP_209NA_OBSERV294_NA	2014-294T06:30:00	2014-294T21:30:00	------	130.2/ 50.1	------	130.2/ 50.1
SP_209NA_OBSERV295_NA	2014-295T06:30:00	2014-295T21:15:00	------	130.2/ 50.1	------	130.2/ 50.1

Gap/Obs. Period	X to NSP	Z to NSP	NEG_X to Sun	POS_Z to Sun
1	NEG_X only	NEG_Z after 10:45, POS_Z before	Safe	Safe
2a/2b	NEG_X only	NEG_Z only	Safe	Safe
3	NEG_X only	NEG_Z only	Safe	Safe

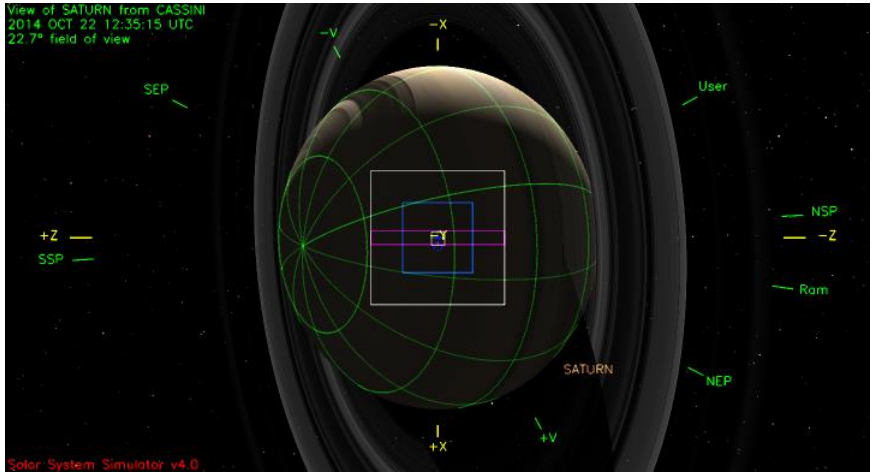
Waypoints Chosen

Waypoint 1 (2014-293T07:10:00 – 2014-295T07:10:00): ISS_NAC to Saturn; NEG_X to NSP





Waypoint 2 (2014-295T07:10:00 – 2014-296T06:15:00): ISS_NAC to Saturn, NEG_X to Sun



Notes & Liens

- Pointing:
  - VIMS_209SA_LIMBMOV001_PRIME has an ISS collaborative rider.
  - Waypoints were chosen for science. “RBOT-friendly” attitudes were not compatible with the observations in the timeline.
- Data Volume:
  - No SMT warnings
- DSN:
  - No ap_downlink report check warnings (70M % and SEQ passes ignored).
- Resource checker:
  - No resource checker items
- Opmodes:
  - No RWA-slow and/or unique opmodes, No special requirements
- Hydrazine:
  - N/A
- Special Activities:
  - None

Sequence Liens (should all be SPLAT items):

- List any Liens to be worked in SIP
  - None