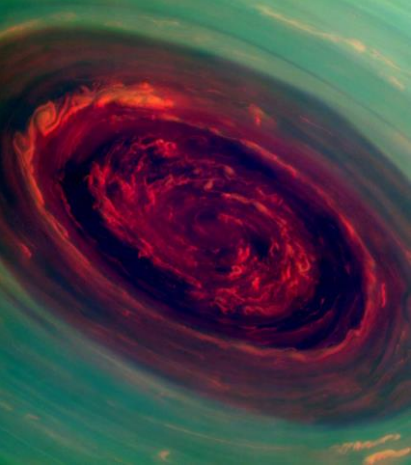
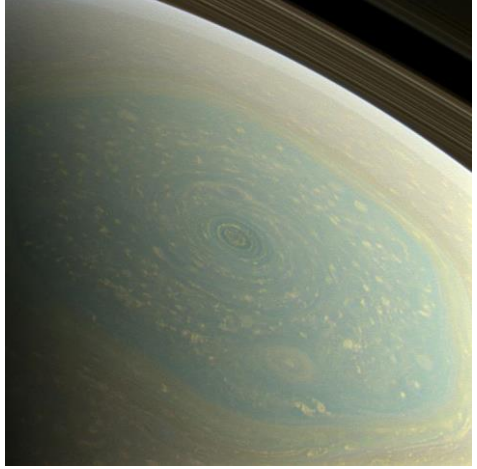
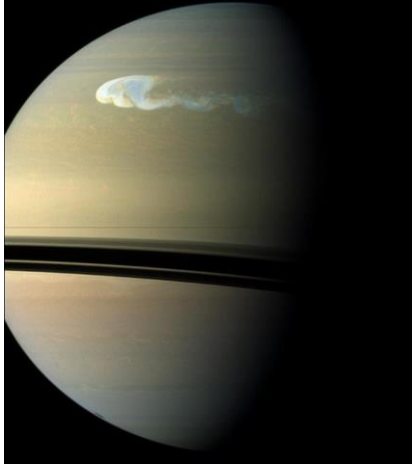


Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 121 Segment Legacy Package

Segment Boundary: November 13, 2009 – November 20, 2009
2009-317T19:21:00 – 2009-324T11:37:00 (SCET)

Integration Began 09/08/2008
Segment Delivered to S55 Sequence 05/11/2009
Lead Integrator was Shawn Boll

Legacy Package Assembled by Shawn Boll

Table of Contents

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

Segment Overview and Final Products

Segment Summary

- This segment was integrated simultaneously along with several others in Revs 119 – 122. They are all in an equatorial phase of the Equinox Mission. The inbound and outbound portions (days near periapse) of these orbits were Saturn discipline focused, while the apoapse periods, referred to as “pseudo-XD” (i.e., pseudo-cross-discipline), were of a multiple discipline flavor.

- The Rev 121 segment was over 6.5 days long. It began 2 days following Rev 121 apoapse, picking up where the Saturn_120_121 segment left off at the S54/S55 sequence boundary.

- Saturn science included ISS photopolarimetry and lightning searches, and as the spacecraft got closer to Saturn, VIMS performed observations focused on global dynamics and CIRS a NADIR occultation as part of a campaign to measure helium abundance.

- Notable out-of-discipline activities included several apoapse UVIS system mosaics, CAPS prime magnetosphere measurements, observations of icy satellites Rhea and Enceladus, and a look at the E and G-rings.

- Data volume negotiations were challenging for all the segments in this series, with a lot of data requested and limited DSN resources, especially at apoapse where 70-meter station requests were limited.

Final Sequenced SPASS

Saturn 121 Legacy

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S55, length = 39 days		2009-317T19:21:00		039T04:05:00	2009-356T23:26:00			
SATURN_121 Segment		2009-317T19:21:00		006T16:16:00	2009-324T11:37:00			
SP_121EA_S55IVP317_PRIME	M	2009-317T19:21:00		000T00:06:00	2009-317T19:27:00	XBAND to Earth	POS_X to 95.37/-63.17	S55 IVP Gap
SP_121SA_WAYPTTURN317_PRIME	M	2009-317T19:27:00		000T00:34:00	2009-317T20:01:00	ISS_NAC to Saturn	NEG_Z to NSP	~22 min. turn w/margin. Continue WP from previous sequence.
NEW WAYPOINT		**2009-317T20:01:00**		**005T06:16:00**	**2009-323T02:17:00**	**ISS_NAC to Saturn**	**NEG_Z to NSP**	
ISS_121TI_M90R2CLD317_PRIME	C, M, U	2009-317T20:01:00	E121_M90R2CLD317+000T00:00:00	000T01:15:00	2009-317T21:16:00	ISS_NAC to Titan (0.0,-6.0,0.0 deg. offset)	POS_X to 213.1/-83.2	
ISS_121SA_NALGTNG002_PRIME	M, V	2009-317T21:16:00		000T01:44:00	2009-317T23:00:00	ISS_NAC to Saturn	NEG_Z to NSP	
ISS_121TI_MUTUALEVE002_PRIME	M	2009-317T23:00:00		000T01:08:00	2009-318T00:08:00	ISS_NAC to Titan	NEG_Z to NSP	ISS_NAC to Titan control of secondary axis not required
UVIS_121SA_MOS120APO007_PRIME	M	2009-318T00:08:00		000T08:00:00	2009-318T08:08:00	ISS_NAC to Saturn	NEG_Z to NSP	
ISS_121SA_1X2WPXX003_PRIME	M	2009-318T08:08:00		000T01:00:00	2009-318T09:08:00	ISS_NAC to Saturn	NEG_X to Sun	
CAPS_121SU_SWAURPTG003_PRIME	M	2009-318T09:08:00		000T02:00:00	2009-318T11:08:00	POS_Y to COROT (0.0,0.0,40.0 deg. offset)	NEG_X to NSP	
ISS_121SA_NALGTNG003_PRIME	M, V	2009-318T11:08:00		000T05:03:00	2009-318T16:11:00	ISS_NAC to Saturn	NEG_Z to NSP	
SP_121EA_DLTURN318_PRIME	M	2009-318T16:11:00		000T00:40:00	2009-318T16:51:00	XBAND to Earth	POS_X to 94.85/-64.19	
SP_121EA_C70METNON318_PRIME	C, M	2009-318T16:51:00		000T09:00:00	2009-319T01:51:00	XBAND to Earth	Rolling/SRU	POS_X to NEP
SP_121SA_WAYPTTURN319_PRIME	M	2009-319T01:51:00		000T00:40:00	2009-319T02:31:00	ISS_NAC to Saturn	NEG_Z to NSP	
ISS_121TI_M90R3CLD319_PRIME	C, M, U	2009-319T02:31:00	E121_M90R3CLD319+000T00:00:00	000T01:15:00	2009-319T03:46:00	ISS_NAC to Titan (0.0,-4.0,0.0 deg. offset)	NEG_X to 40.7/84.1	
UVIS_121SA_MOS120APO008_PRIME	M	2009-319T03:46:00		000T08:00:00	2009-319T11:46:00	ISS_NAC to Saturn	NEG_Z to NSP	
ISS_121EN_MUTUALEVE001_PRIME	M	2009-319T11:46:00		000T01:05:00	2009-319T12:51:00	ISS_NAC to Enceladus	NEG_Z to NSP	ISS_NAC to Enceladus control of secondary axis not required
CAPS_121SU_SWAURPTG004_PRIME	M	2009-319T12:51:00		000T02:00:00	2009-319T14:51:00	POS_Y to COROT (0.0,0.0,40.0 deg. offset)	NEG_X to NSP	
ISS_121SA_1X2WPXX004_PRIME	M	2009-319T14:51:00		000T01:05:00	2009-319T15:56:00	ISS_NAC to Saturn	NEG_X to Sun	
SP_121EA_DLTURN319_PRIME	M	2009-319T15:56:00		000T00:40:00	2009-319T16:36:00	XBAND to Earth	POS_X to 94.85/-64.19	
SP_121EA_C34HEFNON419_PRIME	C, M	2009-319T16:36:00		000T09:00:00	2009-320T01:36:00	XBAND to Earth	Rolling/SRU	POS_X to NEP
SP_121SA_WAYPTTURN320_PRIME	M	2009-320T01:36:00		000T00:35:00	2009-320T02:11:00	ISS_NAC to Saturn (0.0,0.0,5.0 deg. offset)	NEG_Z to NSP	
SP_121SA_WAYPTTURN420_PRIME	M	2009-320T02:11:00		000T00:05:00	2009-320T02:16:00	ISS_NAC to Saturn	NEG_Z to NSP	Part 2 of 2-part turn to avoid 180 deg. turn ambiguity.
UVIS_121SA_MOS120APO009_PRIME	M	2009-320T02:16:00		000T08:00:00	2009-320T10:16:00	ISS_NAC to Saturn	NEG_Z to NSP	
ISS_121SA_NALGTNG004_PRIME	M, V	2009-320T10:16:00		000T02:40:00	2009-320T12:56:00	ISS_NAC to Saturn	NEG_Z to NSP	
ISS_121SA_1X2WPXX005_PRIME	M	2009-320T12:56:00		000T01:00:00	2009-320T13:56:00	ISS_NAC to Saturn	NEG_X to Sun	
CAPS_121SA_SURVEYPTG001_PRIME	M	2009-320T13:56:00		000T02:00:00	2009-320T15:56:00	POS_Y to COROT (0.0,0.0,40.0 deg. offset)	NEG_X to NSP	
SP_121EA_DLTURN320_PRIME	M	2009-320T15:56:00		000T00:40:00	2009-320T16:36:00	XBAND to Earth	POS_X to NEP	
SP_121EA_C34BWGNON320_PRIME	E, M, R	2009-320T16:36:00		000T09:00:00	2009-321T01:36:00	XBAND to Earth	Rolling/SRU	POS_X to NEP
SP_121SA_WAYPTTURN321_PRIME	M	2009-321T01:36:00		000T00:40:00	2009-321T02:16:00	ISS_NAC to Saturn	NEG_Z to NSP	
ISS_121ST_CHARGEXF001_PRIME	M	2009-321T02:16:00		000T07:30:00	2009-321T09:46:00	ISS_NAC to Star	NEG_Z to NSP	
ISS_121SA_1X2WPXX006_PRIME	M	2009-321T09:46:00		000T01:00:00	2009-321T10:46:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_121SA_NALGTNG005_PRIME	M, V	2009-321T10:46:00		000T01:11:00	2009-321T11:57:00	ISS_NAC to Saturn	NEG_Z to NSP	
UVIS_121EN_ICYATM001_PRIME	M	2009-321T11:57:00		000T04:00:00	2009-321T15:57:00	UVIS_FUV to Enceladus	NEG_Z to NSP	See observation description. Duration of 4 hours allows for 30 min slew to and from Enceladus, and 3 integration sites.
SP_121EA_DLTURN321_PRIME	M	2009-321T15:57:00		000T00:40:00	2009-321T16:37:00	XBAND to Earth	POS_X to 152.66/12.71	
SP_121EA_C34BWGOTP321_PRIME	C, M, N	2009-321T16:37:00		000T09:00:00	2009-322T01:37:00	XBAND to Earth	4_Hr_Rolling	POS_X to 152.66/12.71 for CAPS
SP_121SA_WAYPTTURN322_PRIME	M	2009-322T01:37:00		000T00:40:00	2009-322T02:17:00	ISS_NAC to Saturn	NEG_Z to NSP	
VIMS_121RI_EG130PHAS001_PRIME	I, M	2009-322T02:17:00		000T10:40:00	2009-322T12:57:00	VIMS_IR to Rings	NEG_Z to NSP	
ISS_121SA_1X2WPXX007_PRIME		2009-322T12:57:00		000T01:00:00	2009-322T13:57:00	ISS_NAC to Saturn	NEG_X to Sun	
CAPS_121SA_SURVEYPTG002_PRIME		2009-322T13:57:00		000T02:00:00	2009-322T15:57:00	POS_Y to COROT (0.0,0.0,40.0 deg. offset)	NEG_X to NSP	
SP_121EA_DLTURN322_PRIME		2009-322T15:57:00		000T00:40:00	2009-322T16:37:00	XBAND to Earth	POS_X to 152.66/12.71	
SP_121EA_C70METOTB322_PRIME	C, E, N	2009-322T16:37:00		000T09:00:00	2009-323T01:37:00	XBAND to Earth	6_Hr_Rolling	POS_X to 152.66/12.71 for CAPS
SP_121EA_WAYPTTURN323_PRIME		2009-323T01:37:00		000T00:40:00	2009-323T02:17:00	ISS_NAC to Saturn	NEG_X to Sun	
NEW WAYPOINT		**2009-323T02:17:00**		**001T10:05:00**	**2009-324T12:22:00**	**ISS_NAC to Saturn**	**NEG_X to Sun**	
ISS_121SA_1X2WPXX008_PRIME		2009-323T02:17:00		000T01:37:00	2009-323T03:54:00	ISS_NAC to Saturn	NEG_X to Sun	
ISS_121RH_MUTUALEVE001_PRIME		2009-323T03:54:00		000T01:03:00	2009-323T04:57:00	ISS_NAC to Rhea	NEG_X to Sun	ISS_NAC to Rhea control of secondary axis not required
ISS_121SA_NALGTNG007_PRIME		2009-323T04:57:00		000T04:40:00	2009-323T09:37:00	ISS_NAC to Saturn	NEG_X to Sun	
CAPS_121SA_SURVEYPTG004_PRIME		2009-323T09:37:00		000T02:00:00	2009-323T11:37:00	POS_Y to COROT (0.0,0.0,39.0 deg. offset)	NEG_X to NSP	
VIMS_121SA_GLOBDYN001_PRIME	I	2009-323T11:37:00		000T11:45:00	2009-323T23:22:00	ISS_NAC to Saturn	NEG_X to Sun	
CIRS_121SA_NADIROCC001_PRIME	M	2009-323T23:22:00		000T02:50:00	2009-324T02:12:00	CIRS_FP3 to Saturn	NEG_X to Sun	
SP_121EA_DLTURN324_PRIME	M	2009-324T02:12:00		000T00:25:00	2009-324T02:37:00	XBAND to Earth	POS_X to NEP	
SP_121EA_M70METNON324_PRIME	C, M, R	2009-324T02:37:00		000T09:00:00	2009-324T11:37:00	XBAND to Earth	POS_X to NEP	

Final Sequenced SMT and Data Volume

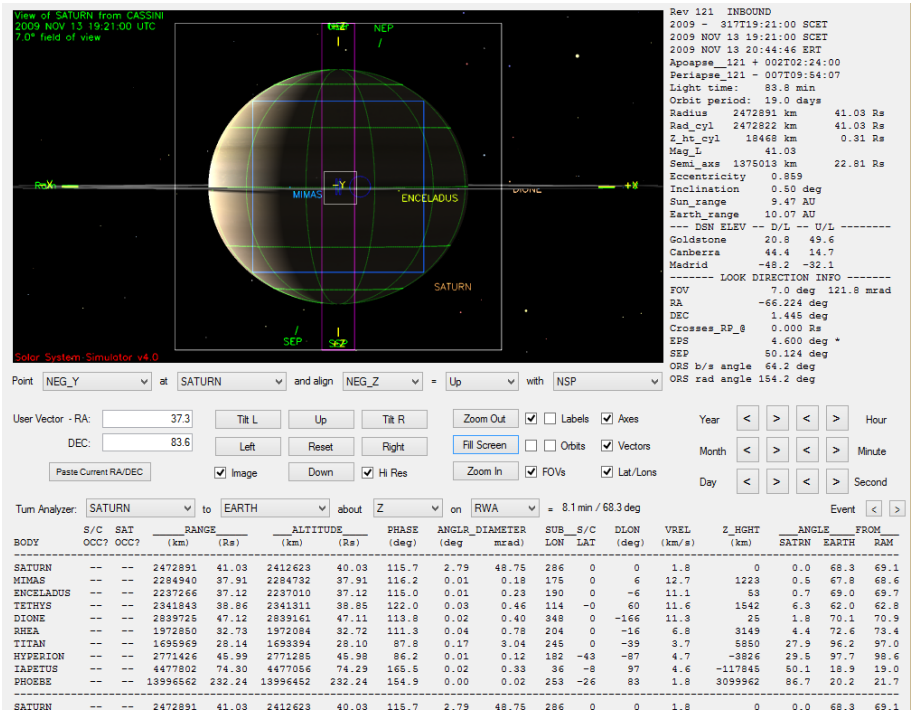
DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

			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_121EA_C70METNON318_PRIME	318 16:51	319 01:51	0	2258	91	2349	3539	1190	0	645	53	3047	3135	88	494	4%	0
SP_121EA_C34HEFNON419_PRIME	319 16:36	320 01:36	0	663	62	725	3539	2813	0	393	53	1171	730	-441	406	3%	441
SP_121EA_C34BWGNON320_PRIME	320 16:36	321 01:36	441	756	63	1260	3539	2279	0	172	53	1485	668	-817	406	3%	817
SP_121EA_C34BWGOTP321_PRIME	321 16:37	322 01:37	817	1063	63	1943	3539	1595	0	216	53	2213	559	-1654	406	3%	1653
SP_121EA_C70METOTB322_PRIME	322 16:37	323 01:37	1653	1123	63	2840	3539	699	0	247	53	3140	3156	16	406	3%	0
SP_121EA_M70METNON324_PRIME	324 02:37	324 11:37	0	1749	106	1855	3539	1683	0	739	53	2647	3102	455	390	3%	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	317 19:21	318 16:51	396.0	40.6	18.0	64.4	447.1	152.9	92.9	0.0	719.8	156.0	150.0	0.0	89.9	2327.5
SP_121EA_C70METNON318_PRIME	318 16:51	319 01:51	129.6	17.0	86.4	3.2	0.0	57.4	38.9	0.0	301.3	4.9	0.0	0.0	0.0	638.8
DAILY TOTAL SCIENCE	317 19:21	319 01:51	525.6	57.5	104.4	67.6	447.1	210.4	131.8	0.0	1021.1	160.9	150.0	0.0	89.9	
OBSERVATION_NOR	319 01:51	319 16:36	64.6	27.8	18.0	6.9	198.1	52.5	63.7	0.0	69.6	156.0	0.0	0.0	61.6	718.7
SP_121EA_C34HEFNON419_PRIME	319 16:36	320 01:36	209.0	17.0	43.2	1.7	0.0	32.0	38.9	0.0	42.4	4.9	0.0	0.0	0.0	389.1
DAILY TOTAL SCIENCE	319 01:51	320 01:36	273.6	44.8	61.2	8.5	198.1	84.5	102.6	0.0	112.0	160.9	0.0	0.0	61.6	
OBSERVATION_NOR	320 01:36	320 16:36	75.6	28.3	0.0	5.4	199.1	53.4	64.8	0.0	70.7	151.4	100.0	0.0	62.7	811.4
SP_121EA_C34BWGNON320_PRIME	320 16:36	321 01:36	32.4	17.0	0.0	3.2	0.0	32.0	38.9	0.0	42.4	4.9	0.0	0.0	0.0	170.9
DAILY TOTAL SCIENCE	320 01:36	321 01:36	108.0	45.3	0.0	8.6	199.1	85.4	103.7	0.0	113.2	156.4	100.0	0.0	62.7	
OBSERVATION_NOR	321 01:36	321 16:37	54.1	28.3	0.0	5.4	654.1	53.4	64.9	0.0	70.8	72.5	50.0	0.0	62.8	1116.2
SP_121EA_C34BWGOTP321_PRIME	321 16:37	322 01:37	32.4	17.0	43.2	3.2	0.0	32.0	38.9	0.0	42.4	4.9	0.0	0.0	0.0	214.1
DAILY TOTAL SCIENCE	321 01:36	322 01:37	86.5	45.3	43.2	8.6	654.1	85.4	103.8	0.0	113.3	77.4	50.0	0.0	62.8	
OBSERVATION_NOR	322 01:37	322 16:37	198.5	28.3	0.0	5.4	283.1	106.1	64.8	0.0	367.7	0.0	58.8	0.0	62.7	1175.3
SP_121EA_C70METOTB322_PRIME	322 16:37	323 01:37	32.4	17.0	86.4	3.2	0.0	19.4	38.9	0.0	42.4	4.9	0.0	0.0	0.0	244.7
DAILY TOTAL SCIENCE	322 01:37	323 01:37	230.9	45.3	86.4	8.6	283.1	125.6	103.7	0.0	410.1	4.9	58.8	0.0	62.7	
OBSERVATION_NOR	323 01:37	324 02:37	117.9	52.7	40.8	19.1	711.1	56.9	81.6	0.0	132.6	0.0	521.0	0.0	104.5	1838.1
SP_121EA_M70METNON324_PRIME	324 02:37	324 11:37	129.6	135.8	86.4	3.2	0.0	64.0	38.9	0.0	268.9	4.9	0.0	0.0	0.0	731.8
DAILY TOTAL SCIENCE	323 01:37	324 11:37	247.5	188.5	127.2	22.3	711.1	120.9	120.5	0.0	401.5	4.9	521.0	0.0	104.5	

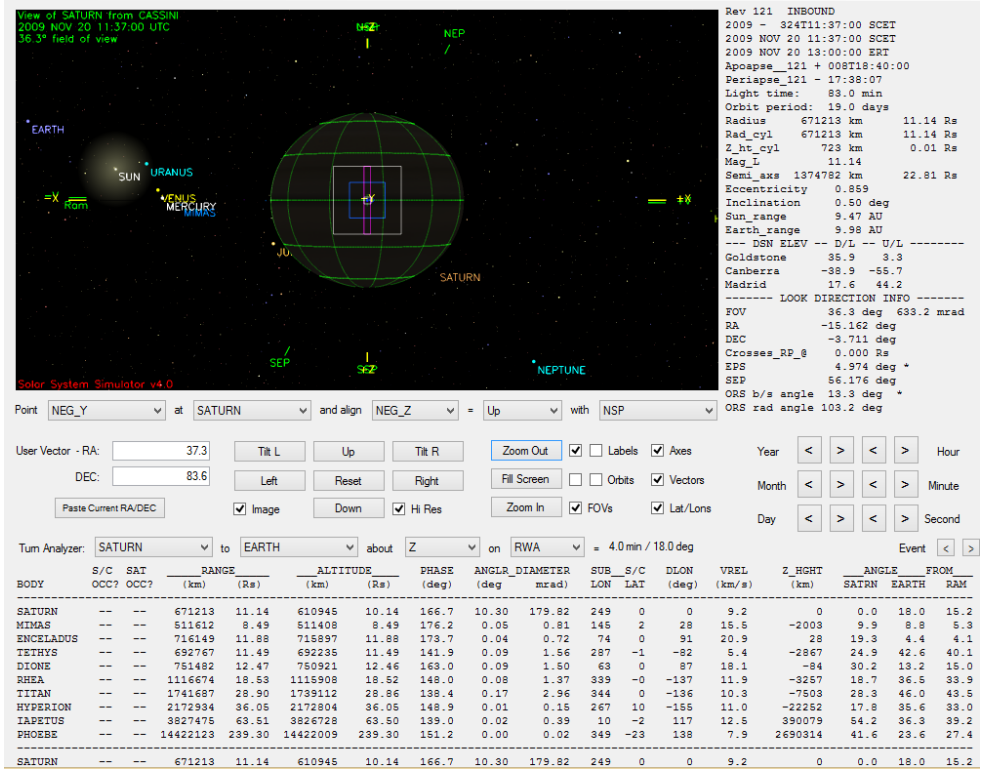
Segment Geometry



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	--	--	2472891	41.03	2412623	40.03	115.7	2.79	48.75	286	0	0	1.8	0	0.0	68.3	69.1
MIMAS	--	--	2284940	37.91	2284732	37.91	116.2	0.01	0.18	175	0	6	12.7	1223	0.5	67.8	68.6
ENCELADUS	--	--	2237266	37.12	2237010	37.12	115.0	0.01	0.23	190	0	-6	11.1	53	0.7	69.0	69.7
TETHYS	--	--	2341843	38.86	2341311	38.85	122.0	0.03	0.46	114	-0	60	11.6	1542	6.3	62.0	62.8
DIONE	--	--	2839726	47.12	2839161	47.11	113.8	0.02	0.40	348	0	-166	11.3	25	1.8	70.1	70.9
RHEA	--	--	1972850	32.73	1972084	32.72	111.3	0.04	0.78	204	0	-16	6.8	3149	4.4	72.6	73.4
TITAN	--	--	1695969	28.14	1693394	28.10	87.8	0.17	3.04	245	0	-39	3.7	5850	27.9	96.2	97.0
HYPERION	--	--	2771426	45.99	2771285	45.98	86.2	0.01	0.12	182	-43	-87	4.7	-3826	29.5	97.7	98.6
IAPETUS	--	--	4477802	74.30	4477056	74.29	165.5	0.02	0.33	36	-8	97	4.6	-117845	50.1	18.9	19.0
PHOEBE	--	--	13996562	232.24	13996452	232.24	154.9	0.00	0.02	253	-26	83	1.8	3099962	86.7	20.2	21.7
SATURN	--	--	2472891	41.03	2412623	40.03	115.7	2.79	48.75	286	0	0	1.8	0	0.0	68.3	69.1

Seg Start (Left)

Seg End (below)



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	--	--	671213	11.14	610945	10.14	166.7	10.30	179.82	249	0	0	9.2	0	0.0	18.0	15.2
MIMAS	--	--	511612	8.49	511408	8.49	176.2	0.05	0.81	145	2	28	15.5	-2003	9.9	8.8	5.3
ENCELADUS	--	--	716149	11.88	715897	11.88	173.7	0.04	0.72	74	0	91	20.9	28	19.3	4.4	4.1
TETHYS	--	--	692767	11.49	692235	11.49	141.9	0.09	1.56	287	-1	-82	5.4	-2867	24.9	42.6	40.1
DIONE	--	--	751482	12.47	750921	12.46	163.0	0.09	1.50	63	0	87	18.1	-84	30.2	13.2	15.0
RHEA	--	--	1116674	18.53	1115908	18.52	148.0	0.08	1.37	339	-0	-137	11.9	-3257	18.7	36.5	33.9
TITAN	--	--	1741687	28.90	1739112	28.86	138.4	0.17	2.96	344	0	-136	10.3	-7503	28.3	46.0	43.5
HYPERION	--	--	2172934	36.05	2172804	36.05	148.9	0.01	0.15	267	10	-155	11.0	-22252	17.8	35.6	33.0
IAPETUS	--	--	3827475	63.51	3826728	63.50	139.0	0.02	0.39	10	-2	117	12.5	390079	54.2	36.3	39.2
PHOEBE	--	--	14422123	239.30	14422009	239.30	151.2	0.00	0.02	349	-23	138	7.9	2690314	41.6	23.6	27.4
SATURN	--	--	671213	11.14	610945	10.14	166.7	10.30	179.82	249	0	0	9.2	0	0.0	18.0	15.2

	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	41.03	115.7	0
Segment End	11.14	166.7	0

Solar Geometry – ORS Boresight Concerns

No ORS Boresight Solar Constraints on Science Pointing.

Daily Science Highlights

DOY 317: The first day of the Saturn_121 segment and the S55 sequence began with an ORS Titan cloud monitoring campaign observation. ISS then observed the dark-side of Saturn in search of lightning before taking images of the transit of Titan across Hyperion for orbit determination purposes. Meanwhile, the MAPS instruments conducted a solar wind-aurora campaign.

DOY 318: UVIS performed an observation that was part of a large campaign to measure Saturn's magnetosphere at apoapse. ISS conducted a Saturn WAC photopolarimetry observation and another search for lightning while CAPS got some prime pointing for their solar wind-aurora campaign.

DOY 319: ISS led the ORS teams as they looked at Titan as part of the cloud monitoring campaign and UVIS performed another scan of Saturn's magnetosphere. ISS watched the transit of Enceladus across Rhea for orbit determination purposes and performed more Saturn WAC photopolarimetry, while CAPS took the reins with more "prime time" for the solar wind-aurora campaign.

DOY 320: ISS continued the search for lightning on Saturn and took more WAC photopolarimetry. The MAPS teams began a magnetospheric boundaries campaign with CAPS getting prime survey pointing.

DOY 321: ISS imaged a couple stars as part of a CCD charge transfer calibration. Following their calibration, ISS spent more time on WAC photopolarimetry and lightning searches. UVIS took a distant look at Enceladus to map volatiles in system in immediate neighborhood. These observations were to test the connection of volatile changes to plume eruptions. Meanwhile, the MAPS teams continued their magnetospheric boundaries campaign.

DOY 322: The bulk of the day was spent by VIMS leading a joint ORS E/G Ring phase observation. Additionally, ISS looked to acquire more Saturn WAC photopolarimetry and the MAPS teams continued their magnetospheric boundaries campaign with more "prime time" for CAPS.

DOY 323: ISS continued to take images of Saturn for photopolarimetry and lightning searches. While CAPS got more prime pointing, the MAPS teams began a campaign to examine interactions between the rings and the satellites. More specifically, they were observing the interaction between the magnetospheric hot ion and electron distributions, rings, and icy satellites. VIMS led a joint ORS mosaic of Saturn to look at global dynamics and CIRS performed a helium abundance measurement at the RSS egress or ingress occultation point.

Segment Integration Planning

Timeline Gaps and Suggested Observations

Rev 120-121/121 Statistics

- UVIS System Scan Flavor

Saturn Rev 120_121/121 (pseudo-xd portion) Strawman Statistics

2009-308T12:35:00 --> 2009-323T02:17:00

	Requested in CIMS				Allocated in Timeline						
Prime Pointing Request Type	Requests	Min. Duration	Max. Duration	Total Duration	Requests	Min. Duration	Max. Duration	Total Duration	% Alloc. Req.	% Alloc. Time	Notes
CAPS											
SA_MAGBNDPTG	2	000T02:00:00		000T04:00:00	2	000T02:00:00		000T04:00:00	100.00%	100.00%	
SU_SWAURPTG	2	002T15:31:00	006T20:24:00	009T11:55:00	6	000T01:43:00	000T02:00:00	000T11:43:00	300.00%	4.22%	2 hr. blocks in place of continuous coverage.
SA_SURVEYPTG	3	000T02:00:00		000T06:00:00	2	000T02:00:00		000T04:00:00	66.67%	66.67%	
CIRS											
OT_1STAROBS	1	000T06:00:00		000T06:00:00	0				0.00%	0.00%	UVIS focused segment
SA_COMPSIT	2	000T10:00:00	000T20:10:00	001T06:10:00	0				0.00%	0.00%	UVIS focused segment
SA_FIRMAP	1	000T12:00:00		000T12:00:00	1	000T11:55:00		000T11:55:00	100.00%	99.31%	
SA_MIRMAP	1	000T22:00:00		000T22:00:00	0				0.00%	0.00%	UVIS focused segment
OT_STRALTCAL	1	000T05:00:00		000T05:00:00	0				0.00%	0.00%	UVIS focused segment
ISS											
MUTUALEVE	20	000T00:40:00	000T01:45:00	000T17:23:00	7	000T00:44:00	000T01:08:00	000T05:46:00	35.00%	33.17%	Conflicts with each other and downlinks.
MI_PHOTOOP	1	000T01:10:00		000T01:10:00	0				0.00%	0.00%	Conflict with downlink.
TI_PHOTOOP	1	000T01:05:00		000T01:05:00	0				0.00%	0.00%	Cleared for TI mutual evt.
OT_OUTERSATS	2	000T03:00:00		000T06:00:00	1	000T03:00:00		000T03:00:00	50.00%	50.00%	
OT_SATELLORB	11	000T00:30:00		000T05:30:00	7	000T00:29:00	000T00:30:00	000T03:29:00	63.64%	63.33%	
RE_LRLEMP	2	000T17:30:00	000T17:48:00	001T11:18:00	2	000T04:54:00	000T12:52:00	000T17:46:00	100.00%	50.33%	
SA_1X2WPXX	14	000T01:00:00		000T14:00:00	14	000T01:00:00	000T01:18:00	000T14:18:00	100.00%	102.14%	
SA_NALGTNG	12	000T14:45:00	001T01:00:00	009T01:17:00	11	000T01:11:00	000T05:55:00	001T04:09:00	91.67%	12.96%	
SA_TITANSHAD	1	000T02:35:00		000T02:35:00	1	000T02:35:00		000T02:35:00	100.00%	100.00%	
ST_CHARGEXF	1	000T07:30:00		000T07:30:00	1	000T07:30:00		000T07:30:00	100.00%	100.00%	
TI_CLD_MONTIOR	3	000T01:15:00		000T03:45:00	3	000T01:15:00		000T03:45:00	100.00%	100.00%	
NAV											
SK_SFAD	1	000T01:36:00		000T01:36:00	1	000T01:36:00		000T01:36:00	100.00%	100.00%	
UVIS											
EN_ICYATM	2	000T04:00:00		000T08:00:00	2	000T04:00:00		000T08:00:00	100.00%	100.00%	
SA_MOS120APO	10	000T08:00:00		003T08:00:00	9	000T08:00:00		003T00:00:00	90.00%	90.00%	
IC_ALPVIR	1	000T03:00:00		000T03:00:00	1	000T03:00:00		000T03:00:00	100.00%	100.00%	
VIMS											
RI_EG130PHAS	1	000T12:00:00		000T12:00:00	1	000T11:40:00		000T11:40:00	100.00%	97.22%	

Saturn_121 Inbound

Notes	Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
	Sequence S55, length = 39 days		2009-317T19:21:00		039T04:05:00	2009-356T23:26:00			
	SATURN_121 Segment		2009-317T19:21:00		006T16:16:00	2009-324T11:37:00			
	SP_121EA_C34BWGOTB322_PRIME	C, E, N	2009-322T16:37:00		000T09:00:00	2009-323T01:37:00	XBAND to Earth	Rolling	POS_X to 94.96/-64.17; CAPS
	SP_121EA_WAYPTTURN323_PRIME		2009-323T01:37:00		000T00:40:00	2009-323T02:17:00	ISS_NAC to Saturn		
	ISS_121SA_1X2WPXX008_PRIME	C, E, N	2009-323T02:17:00		000T01:00:00	2009-323T03:17:00	ISS_NAC to Saturn	NEG_X to Sun	
Give gap time to one of the ISS requests?	GAP		2009-323T03:17:00		000T00:37:00	2009-323T03:54:00			
	ISS_121RH_MUTUALEVE001_PRIME		2009-323T03:54:00		000T01:03:00	2009-323T04:57:00	ISS_NAC to Rhea	POS_X to NSP	ISS_NAC to Rhea control of secondary axis not required
	ISS_121SA_NALGTNG007_PRIME		2009-323T04:57:00		000T04:40:00	2009-323T09:37:00	ISS_NAC to Saturn	NEG_X to NSP	
	CAPS_121SA_SURVEYPTG004_PRIME	I	2009-323T09:37:00		000T02:00:00	2009-323T11:37:00			
Priority of UVIS_EN_ICYATM (also requested on DOY 321)?	VIMS_121SA_GLOBDYN001_PRIME	I, M, R	2009-323T11:37:00		000T12:00:00	2009-323T23:07:00	ISS_NAC to Saturn	NEG_X to NSP	
Shortened duration by 10 min. Is this OK?	CIRS_121SA_NADIROCC001_PRIME	I, M	2009-323T23:07:00		000T02:50:00	2009-324T01:57:00	CIRS_FP3 to Saturn	POS_Z to NSP	
	SP_121EA_DLTURN324_PRIME		2009-324T01:57:00		000T00:40:00	2009-324T02:37:00	XBAND to Earth	POS_X to NEP	
	SP_121EA_M70METNON324_PRIME	C, M, R	2009-324T02:37:00		000T09:00:00	2009-324T11:37:00	XBAND to Earth	POS_X to NEP	

Initial SMT and Data Volume (1 of 2)

Integration (Following Timeline Completion):

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_121EA_C70METNON318_PRIME	318 16:51	319 01:51	0	1471	91	1562	3540	1978	0	325	53	1940	3135	1194	-364	-3%	0
SP_121EA_C34HEFNON327_PRIME	319 16:36	320 01:36	0	756	62	819	3540	2722	0	314	53	1186	730	-456	-1559	-26%	456
SP_121EA_C34BWGNON320_PRIME	320 16:36	321 01:36	456	1187	63	1706	3540	1835	0	368	53	2127	668	-1459	-1559	-30%	1459
SP_121EA_C34BWGOTP321_PRIME	321 16:37	322 01:37	1459	1407	63	2929	3540	611	0	412	53	3394	559	-2836	-1559	-35%	2835
SP_121EA_C34BWGOTB322_PRIME	322 16:37	323 01:37	2835	838	63	3736	3540	-195	0	194	53	3787	657	-3130	-1559	-40%	3130
SP_121EA_M70METNON324_PRIME	324 02:37	324 11:37	3130	1865	106	5100	3540	-1559	0	869	53	4463	3102	-1361	0	0%	1360

Cuts made so far:
RPWS – 2.7 Gbits
CIRS – 288 Mbits
CDA – 36 Mbits
MIMI – 738 Mbits (All 3 segments Combined)

Initial SMT and Data Volume (2 of 2)

Integration (Following Timeline Completion):

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	317 19:21	318 16:51	154.8	40.6	18.0	11.5	530.1	152.9	92.9	0.0	101.4	156.0	200.0	0.0	17.6	1475.6
SP_121EA_C70METNON318_PRIME	318 16:51	319 01:51	64.8	17.0	86.4	3.2	0.0	64.0	38.9	0.0	42.4	4.9	0.0	0.0	0.0	321.7
DAILY TOTAL SCIENCE	317 19:21	319 01:51	219.6	57.5	104.4	14.7	530.1	217.0	131.8	0.0	143.8	160.9	200.0	0.0		
OBSERVATION_NOR	319 01:51	319 16:36	106.2	27.8	18.0	5.3	198.1	104.9	63.7	0.0	69.6	156.0	0.0	0.0	12.1	761.6
SP_121EA_C34HEFNON327_PRIME	319 16:36	320 01:36	97.6	17.0	43.2	3.2	0.0	64.0	38.9	0.0	42.4	4.9	0.0	0.0	0.0	311.3
DAILY TOTAL SCIENCE	319 01:51	320 01:36	203.8	44.8	61.2	8.6	198.1	168.9	102.6	0.0	112.0	160.9	0.0	0.0		
OBSERVATION_NOR	320 01:36	320 16:36	264.2	28.3	0.0	5.4	231.1	106.7	64.8	0.0	174.0	151.4	150.0	0.0	12.3	1188.2
SP_121EA_C34BWGNON320_PRIME	320 16:36	321 01:36	32.4	17.0	0.0	3.2	0.0	64.0	38.9	0.0	204.5	4.9	0.0	0.0	0.0	365.0
DAILY TOTAL SCIENCE	320 01:36	321 01:36	296.6	45.3	0.0	8.6	231.1	170.7	103.7	0.0	378.5	156.4	150.0	0.0		
OBSERVATION_NOR	321 01:36	321 16:37	54.1	28.3	0.0	5.4	671.1	106.8	64.9	0.0	341.2	72.5	50.0	0.0	12.3	1406.5
SP_121EA_C34BWGOTP321_PRIME	321 16:37	322 01:37	32.4	17.0	43.2	3.2	0.0	64.0	38.9	0.0	204.5	4.9	0.0	0.0	0.0	408.2
DAILY TOTAL SCIENCE	321 01:36	322 01:37	86.5	45.3	43.2	8.6	671.1	170.8	103.8	0.0	545.8	77.4	50.0	0.0		
OBSERVATION_NOR	322 01:37	322 16:37	75.6	28.3	0.0	5.4	283.1	98.9	57.7	0.0	222.3	0.0	58.8	0.0	12.3	842.3
SP_121EA_C34BWGOTB322_PRIME	322 16:37	323 01:37	32.4	17.0	43.2	3.2	0.0	19.4	29.2	0.0	42.4	4.9	0.0	0.0	0.0	191.8
DAILY TOTAL SCIENCE	322 01:37	323 01:37	108.0	45.3	43.2	8.6	283.1	118.3	86.8	0.0	264.8	4.9	58.8	0.0		
OBSERVATION_NOR	323 01:37	324 02:37	126.3	52.7	40.8	19.1	767.1	56.9	81.6	0.0	132.6	0.0	571.0	0.0	20.4	1868.4
SP_121EA_M70METNON324_PRIME	324 02:37	324 11:37	259.2	135.8	86.4	3.2	0.0	64.0	38.9	0.0	268.9	4.9	0.0	0.0	0.0	861.4
DAILY TOTAL SCIENCE	323 01:37	324 11:37	385.5	188.5	127.2	22.3	767.1	120.9	120.5	0.0	401.5	4.9	571.0	0.0		

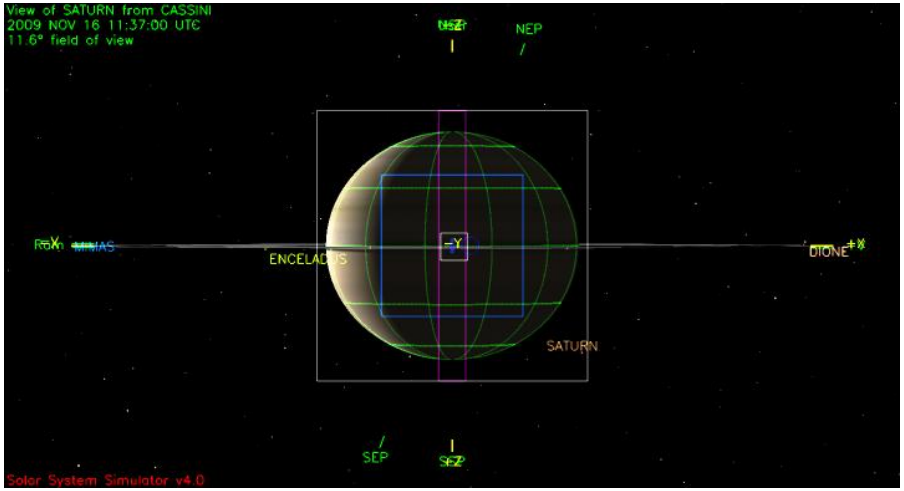
	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)
TOTAL RECORDED (OPNAV data not included)	1300.0	426.7	379.2	71.5	2680.4	966.7	649.2	0.0	1846.4	565.5	1029.8	0.0

Waypoint Selection

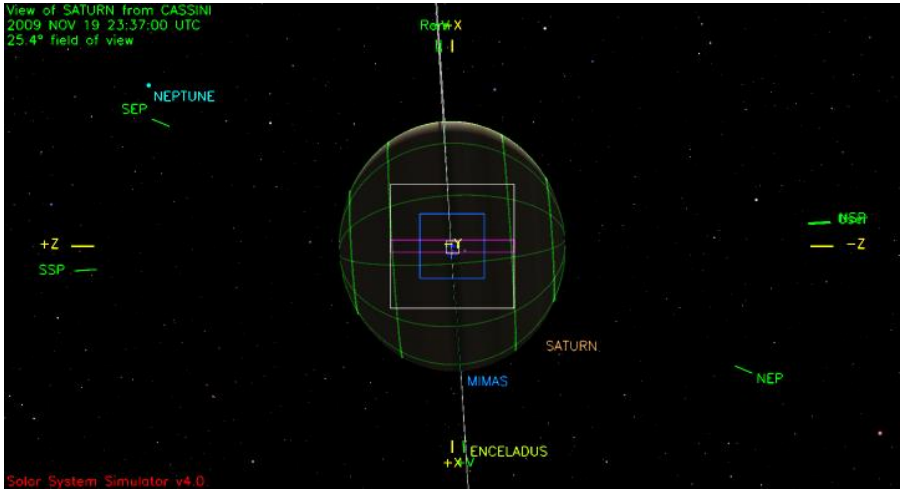
Request	Start (SCET)	Potential secondaries for ISS_NAC to Saturn waypoint						
Sequence S55, length = 39 days	2009-317T19:21:00							
SATURN_121 Segment	2009-317T19:21:00							
SP_121EA_C34BWGOTB322_PRIME	2009-322T16:37:00							
SP_121EA_WAYPTTURN323_PRIME	2009-323T01:37:00							
ISS_121SA_1X2WPXX008_PRIME	2009-323T02:17:00	posx2nep	negx2nsp	posx2nsp	negx2sun	negz2nsp	negz2nep	negz2earth
GAP	2009-323T03:17:00	OK	OK	OK	OK	OK	OK	OK
ISS_121RH_MUTUALEVE001_PRIME	2009-323T03:54:00	OK	OK	OK	OK	OK	OK	OK
ISS_121SA_NALGTNG007_PRIME	2009-323T04:57:00	OK	OK	OK	OK	OK	OK	OK
CAPS_121SA_SURVEYPTG004_PRIME	2009-323T09:37:00	OK	OK	OK	OK	OK	OK	OK
VIMS_121SA_GLOBDYN001_PRIME	2009-323T11:37:00	OK	OK	OK	OK	OK	OK	OK
CIRS_121SA_NADIROCC001_PRIME	2009-323T23:07:00	OK	OK	OK	OK	OK	OK	OK
SP_121EA_DLTURN324_PRIME	2009-324T01:57:00	OK	OK	OK	OK	OK	OK	OK
SP_121EA_M70METNON324_PRIME	2009-324T02:37:00	OK till 10:32	OK till 10:32	OK till 10:32	OK till 10:32	OK till 10:32	OK till 10:32	OK till 10:32

Waypoints Chosen

Waypoint 1 (2009-317T20:01:00 – 2009-323T02:17:00): ISS_NAC to Saturn; NEG_Z to NSP



Waypoint 2 (2009-323T02:17:00 – 2009-324T12:22:00): ISS_NAC to Saturn; NEG_X to Sun



Notes & Liens

Notes:

- Pointing:
  - Turn on DOY 320 was designed as “2-part” turns to avoid 180 degree ambiguity.
- Data Volume:
  - No issues.
- DSN:
  - No passes in maintenance.
- Opmodes:
  - Nothing extraordinary.
- Special Activities:
  - None, but that does not mean that the activities that are there are expendable! ;)

Sequence Liens:

- None