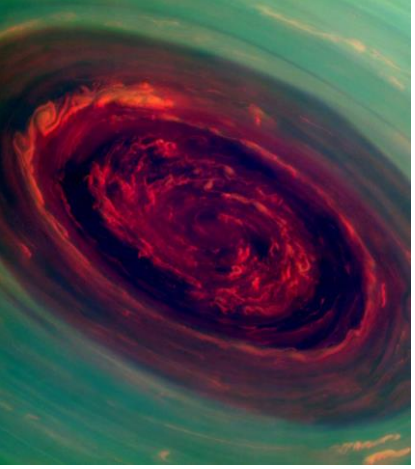

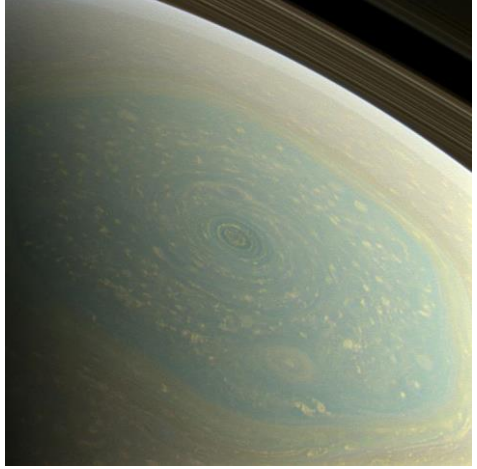
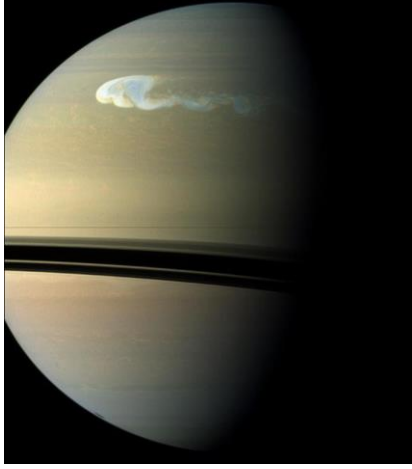

Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 267 Segment Legacy Package

Segment Boundary: March 25, 2017 – April 3, 2017
2017-084T22:45 – 2017-093T15:39 (SCET)

Integration Began 05/16/2016
Segment Delivered to S98 Sequence 08/08/2016
Lead Integrator was Kyle Cloutier

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

- Rev 267 was an F-ring periapse segment. Key science included:
  - Multiple Enceladus observations, including UVIS' **last plume occultation**, and thus the **last chance to measure column density,** the **penultimate observation** of a CIRS campaign to look for temporal variations in Enceladus' heat, and an ISS plume monitoring observation to observe brightness variations
  - INMS measurements of both neutrals and ions at different L-shells to provide composition data on ring material and information on the ionosphere
  - Multiple VIMS mosaic maps of Saturn, as well as a solar ring occultation
- Periapse science required a custom period. ORS solar viewing constraints impacted science placement and CMT constraint management was required during the occulted period.
- This segment contained a "jumpstart" period. Due to the challenging geometry and unique science of this phase of the mission, the timeline for the days around periapse was decided in advance of full segment integration. Detailed pointing analysis, constraint checking, and reaction-wheel bias optimization (RBOT) was performed on the periapse period. Changes were required to protect the wheels, see RBOT summary on page 29.

Final Sequenced SPASS (1 of 2)

Gap 1

Gap 2

Gap 3

Rev 267 Jumpstart

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End	Primary	Secondary	Comments
SATURN_267 Segment		2017-084T22:45:00		008T16:54:00	2017-093T15:39:00			
SP_267SA_WAYPTTURN084_PRIME		2017-084T22:45:00		000T00:40:00	2017-084T23:25:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2017-084T23:25:00**		**000T12:50:00**	**2017-085T12:15:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
ISS_267TI_M150R2HZ084_PRIME	C, V	2017-084T23:25:00	E267_M150R2HZ084+ 000T00:00:00	000T01:30:00	2017-085T00:55:00	ISS_NAC to Titan	NEG_X to NSP	No Preference to secondary pointing
CIRS_267SA_COMPSIT001_PRIME	U, V	2017-085T00:55:00		000T10:40:00	2017-085T11:35:00	CIRS_FP1 to Saturn	POS_Z to NSP	left unlit limb
SP_267EA_DLTURN085_PRIME		2017-085T11:35:00		000T00:40:00	2017-085T12:15:00	XBAND to Earth	POS_X to NEP	
NEW WAYPOINT		**2017-085T12:15:00**		**000T11:10:00**	**2017-085T23:25:00**	**XBAND to Earth**	**POS_X to NEP**	
SP_267EA_YGAP085_PRIME		2017-085T12:15:00		000T01:30:00	2017-085T13:45:00	XBAND to Earth	POS_X to NEP	
SP_267EA_C34BWGNON085_PRIME	C	2017-085T13:45:00		000T09:00:00	2017-085T22:45:00	XBAND to Earth	Rolling	Possible CIRS heating depending on secondary used (update in integration)
SP_267SA_WAYPTTURN085_PRIME		2017-085T22:45:00		000T00:40:00	2017-085T23:25:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2017-085T23:25:00**		**001T06:43:00**	**2017-087T06:08:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
VIMS_267SU_SOLARPORT001_PRIME		2017-085T23:25:00		000T04:00:00	2017-086T03:25:00	VIMS_IR_SOL to Sun	NEG_X to NSP	
CIRS_267SA_COMPSIT002_PRIME	U, V	2017-086T03:25:00		000T08:00:00	2017-086T11:25:00	CIRS_FP3 to Saturn	NEG_X to NSP	
ISS_267SA_LIMBINT001_PRIME	U, V	2017-086T11:25:00		000T02:33:00	2017-086T13:58:00	ISS_NAC to Saturn	NEG_X to NSP	
UVIS_267EN_ICYEXO001_PIE	C, I, V	2017-086T13:58:00		000T01:24:00	2017-086T15:22:00	UVIS_FUV to 104.656/-28.972	NEG_X to NSP	Collaborative Rider(s): ISS. Duration requested includes possible turn time. Actual occ is from 14:39:02 to 14:40:18. Secondary orientation is flexible.
VIMS_267SA_NHEMMAP001_PRIME	C, I	2017-086T15:22:00		000T06:00:00	2017-086T21:22:00	ISS_NAC to Saturn	NEG_X to NSP	
UVIS_267SA_AURDSTARE001_PRIME	C, I, V	2017-086T21:22:00		000T04:00:00	2017-087T01:22:00	UVIS_FUV to Saturn_North_Pole	NEG_X to NSP	Collaborative Rider(s): VIMS. collaborate with VIMS
UVIS_267SA_AURSLEW001_PRIME	C, V	2017-087T01:22:00		000T04:06:00	2017-087T05:28:00	UVIS_FUV to Saturn	NEG_X to NSP	Collaborative Rider(s): VIMS
SP_267EA_DLTURN087_PRIME		2017-087T05:28:00		000T00:40:00	2017-087T06:08:00	XBAND to Earth	POS_X to NEP	
NEW WAYPOINT		**2017-087T06:08:00**		**000T13:44:00**	**2017-087T19:52:00**	**XBAND to Earth**	**POS_X to NEP**	
ENGR_267SC_KPTYBIAS087_PRIME		2017-087T06:08:00		000T01:30:00	2017-087T07:38:00	POS_Z to DELTA_H (0.0,0.0,-88.0 deg. offset)	NEG_X to Sun	
SP_267EA_G34B26NON087_PRIME	M, R	2017-087T07:38:00		000T04:20:00	2017-087T11:58:00	XBAND to Earth	Rolling/SRU	MAG Range 1 - Roll Requested
SP_267EA_C70METNON087_PRIME	C, M, R	2017-087T11:58:00		000T07:14:00	2017-087T19:12:00	XBAND to Earth	Rolling/SRU	MAG Range 1 - Roll Requested. SRU.
SP_267SA_WAYPTTURN087_PRIME		2017-087T19:12:00		000T00:40:00	2017-087T19:52:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2017-087T19:52:00**		**001T01:33:00**	**2017-088T21:25:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
VIMS_267SA_NPOLMAP001_PRIME	C, I, U	2017-087T19:52:00		000T01:25:00	2017-087T21:17:00	ISS_NAC to Saturn	POS_Z to NSP	
UVIS_267ST_BETCRU001_PIE		2017-087T21:17:00		000T01:10:00	2017-087T22:27:00	UVIS_HSP to 191.929/-59.678	POS_Z to NSP	No Preference to secondary pointing. PIE
VIMS_267SA_NPOLMAP002_PRIME	C, E, I, M	2017-087T22:27:00		000T06:21:00	2017-088T04:48:00	ISS_NAC to Saturn	POS_Z to NSP	
Begin Custom		2017-088T04:48:00		000T00:00:01	2017-088T04:48:01	ISS_NAC to Saturn	POS_Z to NSP	
INMS_267RI_FRINGATMO001_PIE	M	2017-088T04:48:00		000T02:00:00	2017-088T06:48:00	POS_X to COROT (0.0,-5.0,15.0 deg. offset)	POS_Z to Saturn	Collaborative Rider(s): CDA. Pick up at ISS_NAC to Saturn, POS_Z to NSP; Hand off at POS_X to 195.0/50.0 (0.0,-7.0,-7.0 deg. offset), NEG_Z to Sun. Collaborative Rider(s): CDA
Periapse R = 2.435 Rs, lat ...		2017-088T06:09:25		000T00:00:01	2017-088T06:09:26			
CIRS_267EN_SP006_PIE	I, M, U, V	2017-088T06:48:00		000T06:42:00	2017-088T13:30:00	CIRS_FP3 to Enceladus	POS_X to NSP	Collaborative Rider(s): ISS. Pick up at POS_X to 195.0/50.0 (0.0,-7.0,-7.0 deg. offset), NEG_Z to Sun; Hand off at CIRS_FP3 to Enceladus, POS_X to NSP. Collaborative Rider(s): ISS
VIMS_267SA_SPOLMAP001_PRIME	C, U	2017-088T14:10:00		000T02:50:00	2017-088T17:00:00	ISS_NAC to Saturn	NEG_Z to NSP	Pick up at CIRS_FP3 to Enceladus, POS_X to NSP; Hand off at ISS_NAC to Saturn, NEG_Z to NSP.
VIMS_267SA_SSTRMLAT001_PRIME	C, U	2017-088T17:00:00		000T01:24:00	2017-088T18:24:00	ISS_NAC to Saturn	NEG_Z to NSP	Pick up at ISS_NAC to Saturn, NEG_Z to NSP; Hand off at ISS_NAC to Saturn, NEG_Z to NSP.
VIMS_267SA_SEQREGMAP001_PRIME	C, U	2017-088T18:24:00		000T02:21:00	2017-088T20:45:00	ISS_NAC to Saturn	NEG_Z to NSP	Pick up at ISS_NAC to Saturn, NEG_Z to NSP; Hand off at ISS_NAC to Saturn (10.0,5.0,0.0 deg. offset), NEG_Z to NSP.
SP_267SU_WAYPTTURN088_PRIME		2017-088T20:45:00		000T00:40:00	2017-088T21:25:00	UVIS_SOL_OFF to Sun	POS_Z to NSP	Pick up at ISS_NAC to Saturn (10.0,5.0,0.0 deg. offset), NEG_Z to NSP; Hand off at UVIS_SOL_OFF to Sun, POS_Z to NSP.
NEW WAYPOINT		**2017-088T21:25:00**		**000T12:27:00**	**2017-089T09:52:00**	**UVIS_SOL_OFF to Sun**	**POS_Z to NSP**	
End Custom		2017-088T21:25:00		000T00:00:01	2017-088T21:25:01	UVIS_SOL_OFF to Sun	POS_Z to NSP	

Final Sequenced SPASS (2 of 2)

Rev 267 Jumpstart

Gap 4

Gap 5

Gap 6

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End	Primary	Secondary	Comments
VIMS_267SA_SREGMAP001_PRIME	C, U	2017-088T21:25:00		000T06:13:00	2017-089T03:38:00	ISS_NAC to Saturn	POS_Z to NSP	
VIMS_267RI_SOLAROCC001_PRIME	U	2017-089T03:38:00		000T01:50:00	2017-089T05:28:00	UVIS_SOL_OFF to Sun	POS_Z to 258.1/48.052	Collaborative Rider(s): UVIS
CIRS_267RA_COMPUNLA3001_PRIME	I	2017-089T05:28:00		000T04:00:00	2017-089T09:28:00	CIRS_FP1 to Rings (0.055,-9.998,0.0 deg. offset)	NEG_X to NSP	
SP_267EA_DLTURN089_PRIME		2017-089T09:28:00		000T00:24:00	2017-089T09:52:00	XBAND to Earth	NEG_X to NEP	
NEW WAYPOINT		**2017-089T09:52:00**		**000T13:18:00**	**2017-089T23:10:00**	**XBAND to Earth**	**NEG_X to NEP**	
ENGR_267SC_KPTYBIAS089_PRIME		2017-089T09:52:00		000T01:30:00	2017-089T11:22:00	NEG_Z to DELTA_H (0.0,0.0,90.0 deg. offset)	NEG_X to Sun	
SP_267EA_C70METNON089_PRIME	C	2017-089T13:30:00		000T06:23:00	2017-089T19:53:00	XBAND to Earth	Rolling	
SP_267SA_WAYPTTURN089_PRIME		2017-089T22:30:00		000T00:40:00	2017-089T23:10:00	ISS_NAC to Saturn	POS_Z to 187.8/31.9	
NEW WAYPOINT		**2017-089T23:10:00**		**000T15:35:00**	**2017-090T14:45:00**	**ISS_NAC to Saturn**	**POS_Z to 187.8/31.9**	
VIMS_267SA_SHEMMAP001_PRIME	C	2017-089T23:10:00		000T04:00:00	2017-090T03:10:00	ISS_NAC to Saturn	NEG_X to NSP	
ISS_267SA_LIMBINT002_PRIME	U, V	2017-090T03:10:00		000T04:00:00	2017-090T07:10:00	ISS_NAC to Saturn	POS_Z to 187.8/31.9	
ISS_267EN_PLUME001_PIE	C, U, V	2017-090T07:10:00		000T06:55:00	2017-090T14:05:00	ISS_NAC to Enceladus	NEG_X to NSP	SOST PIE
SP_267EA_DLTURN090_PRIME		2017-090T14:05:00		000T00:40:00	2017-090T14:45:00	XBAND to Earth	NEG_X to NSP	
NEW WAYPOINT		**2017-090T14:45:00**		**000T10:10:00**	**2017-091T00:55:00**	**XBAND to Earth**	**NEG_X to NSP**	
ENGR_267SC_KPTYBIAS090_PRIME		2017-090T14:45:00		000T01:30:00	2017-090T16:15:00	POS_Z to DELTA_H (0.0,0.0,40.0 deg. offset)	NEG_X to Sun	
SP_267EA_C70METNON090_PRIME	C	2017-090T16:15:00		000T08:00:00	2017-091T00:15:00	XBAND to Earth	Rolling	Possible CIRS heating depending on secondary used (update in integration)
SP_267SA_WAYPTTURN091_PRIME		2017-091T00:15:00		000T00:40:00	2017-091T00:55:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2017-091T00:55:00**		**000T10:59:00**	**2017-091T11:54:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
CIRS_267SA_COMPSIT003_PRIME	U, V	2017-091T00:55:00		000T10:19:00	2017-091T11:14:00	CIRS_FP3 to Saturn	POS_Z to NSP	dayside northern hemisphere
SP_267EA_DLTURN091_PRIME		2017-091T11:14:00		000T00:40:00	2017-091T11:54:00	XBAND to Earth	NEG_X to NSP	
NEW WAYPOINT		**2017-091T11:54:00**		**000T11:10:00**	**2017-091T23:04:00**	**XBAND to Earth**	**NEG_X to NSP**	
ENGR_267SC_KPTYBIAS091_PRIME		2017-091T11:54:00		000T01:30:00	2017-091T13:24:00	POS_Z to DELTA_H (0.0,0.0,38.0 deg. offset)	NEG_X to Sun	
SP_267EA_C34BWGNON091_PRIME	C	2017-091T13:24:00		000T09:00:00	2017-091T22:24:00	XBAND to Earth	Rolling	Possible CIRS heating depending on secondary used (update in integration)
Apoapse Per = 7.2 d, inc =...		2017-091T20:05:00		000T00:00:01	2017-091T20:05:01			
SP_268SA_WAYPTTURN091_PRIME		2017-091T22:24:00		000T00:40:00	2017-091T23:04:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2017-091T23:04:00**		**000T23:35:00**	**2017-092T22:39:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
ISS_268TI_M120R2HZ091_PRIME	C, V	2017-091T23:04:00	E268_M120R2HZ091+ 000T00:00:00	000T01:30:00	2017-092T00:34:00	ISS_NAC to Titan	NEG_X to NSP	No Preference to secondary pointing
MAG_268SU_LFCALROLL001_PRIME	U	2017-092T00:34:00		000T09:00:00	2017-092T09:34:00	NEG_X to Earth (0.0,0.0,-30.0 deg. offset)	Rolling	
UVIS_268SA_AURDSTARE001_PRIME	C, V	2017-092T09:34:00		000T06:12:00	2017-092T15:46:00	UVIS_FUV to Saturn_North_Pole	NEG_X to NSP	Collaborative Rider(s): VIMS. collaborate with VIMS
UVIS_268SA_AURSLEW001_PRIME	C, V	2017-092T15:46:00		000T06:13:00	2017-092T21:59:00	UVIS_FUV to Saturn	NEG_X to NSP	Collaborative Rider(s): VIMS
SP_268EA_DLTURN092_PRIME		2017-092T21:59:00		000T00:40:00	2017-092T22:39:00	XBAND to Earth	POS_X to NEP	
NEW WAYPOINT		**2017-092T22:39:00**		**000T17:40:00**	**2017-093T16:19:00**	**XBAND to Earth**	**POS_X to NEP**	
ENGR_268SC_KPTYBIAS093_PRIME		2017-092T22:39:00		000T01:30:00	2017-093T00:09:00	POS_Z to DELTA_H (0.0,0.0,46.0 deg. offset)	NEG_X to Sun	
SP_268EA_M70METNON093_PRIME	C, R	2017-093T00:09:00		000T07:45:00	2017-093T07:54:00	XBAND to Earth	Rolling/SRU	
SP_268EA_G34B26NON093_PRIME	R	2017-093T07:54:00		000T06:30:00	2017-093T14:24:00	XBAND to Earth	3_Hr_Delayed_Rolling	

Final Sequenced SMT and Data Volume

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

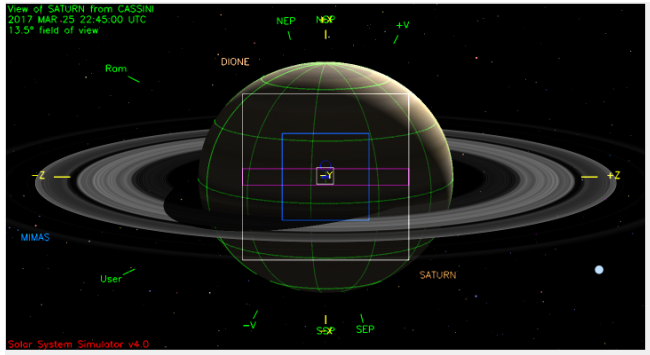
			OBSERVATION_PERIOD							DOWNLINK_PASS						
			P4						P5	RECORDED		PLAYBACK				
DOWNLINK PASS NAME	Start doy hh:mm	End doy hh:mm	START (Mb)	SCI (Mb)	HK+E (Mb)	TOTAL (Mb)	CPACTY (Mb)	MRGN (Mb)	OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_MARGN (Mb)	NET_MARGN (%)	CAROVR (Mb)
SP_267EA_C34BWGNON085_PRIME	085 13:45	085 22:45	0	447	63	511	3322	2811	0	199	53	763	731	-32	55	0%	32
SP_267EA_G34B26NON087_PRIME	087 07:38	087 11:58	32	1919	139	2090	3322	1232	0	102	26	2218	288	-1931	55	0%	1930
SP_267EA_C70METNON087_PRIME	087 11:58	087 19:12	1930	0	0	1930	3322	1392	0	248	43	2221	2554	333	55	0%	0
SP_267EA_C70METNON089_PRIME	089 13:30	089 19:53	0	3122	179	3300	3322	22	0	201	38	3539	2383	-1156	-277	-1%	1155
SP_267EA_C70METNON090_PRIME	090 16:15	091 00:15	1155	2359	86	3600	3322	-277	0	254	47	3623	2776	-848	-39	0%	848
SP_267EA_C34BWGNON091_PRIME	091 13:24	091 22:24	848	495	56	1399	3322	1923	0	284	53	1736	788	-949	-39	0%	949
SP_268EA_M70METNON093_PRIME	093 00:09	093 07:54	949	1071	109	2128	3322	1194	0	239	46	2413	2070	-343	-39	0%	343
SP_268EA_G34B26NON093_PRIME	093 07:54	093 14:24	343	0	0	343	3322	2979	0	138	38	519	486	-34	-39	0%	34

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	084 22:45	085 13:45	0.0	28.3	98.4	5.4	38.5	26.7	45.9	0.0	70.7	14.5	115.0	0.0	62.7	506.1
SP_267EA_C34BWGNON085_PRIME	085 13:45	085 22:45	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	42.4	4.9	0.0	0.0	0.0	197.5
DAILY TOTAL SCIENCE	084 22:45	085 22:45	0.0	45.3	184.8	8.6	38.5	42.7	73.4	0.0	113.2	19.4	115.0	0.0	62.7	
OBSERVATION_NOR	085 22:45	087 07:38	0.0	62.0	179.3	11.8	399.8	58.5	100.6	0.0	254.9	183.0	652.0	0.0	137.4	2039.4
SP_267EA_G34B26NON087_PRIME	087 07:38	087 11:58	0.0	8.2	0.0	1.6	0.0	7.7	13.3	0.0	67.8	2.4	0.0	0.0	0.0	100.9
SP_267EA_C70METNON087_PRIME	087 11:58	087 19:12	0.0	13.6	67.3	12.7	0.0	12.9	22.1	0.0	113.2	4.0	0.0	0.0	0.0	245.8
DAILY TOTAL SCIENCE	085 22:45	087 19:12	0.0	83.9	246.6	26.1	399.8	79.0	136.0	0.0	435.9	189.4	652.0	0.0	137.4	
OBSERVATION_NOR	087 19:12	089 13:30	0.0	106.2	276.2	25.3	520.7	97.8	154.6	0.0	561.3	383.2	968.0	0.0	176.8	3270.2
SP_267EA_C70METNON089_PRIME	089 13:30	089 19:53	0.0	12.0	58.1	2.3	0.0	11.4	19.5	0.0	91.9	3.5	0.0	0.0	0.0	198.8
DAILY TOTAL SCIENCE	087 19:12	089 19:53	0.0	118.2	334.4	27.6	520.7	109.1	174.2	0.0	653.2	386.8	968.0	0.0	176.8	
OBSERVATION_NOR	089 19:53	090 16:15	0.0	38.4	156.7	7.3	1199.5	36.2	62.3	0.0	293.3	176.8	367.0	0.0	85.1	2422.6
SP_267EA_C70METNON090_PRIME	090 16:15	091 00:15	0.0	15.1	75.6	2.9	0.0	14.2	24.5	0.0	115.2	4.4	0.0	0.0	0.0	251.9
DAILY TOTAL SCIENCE	089 19:53	091 00:15	0.0	53.5	232.3	10.2	1199.5	50.4	86.8	0.0	408.5	181.2	367.0	0.0	85.1	
OBSERVATION_NOR	091 00:15	091 13:24	0.0	24.8	74.3	4.7	0.0	23.4	40.2	0.0	189.4	14.0	120.0	0.0	55.0	545.8
SP_267EA_C34BWGNON091_PRIME	091 13:24	091 22:24	0.0	14.8	86.4	3.2	0.0	16.0	27.5	0.0	128.9	4.9	0.0	0.0	0.0	281.8
DAILY TOTAL SCIENCE	091 00:15	091 22:24	0.0	39.6	160.7	8.0	0.0	39.4	67.8	0.0	318.2	19.0	120.0	0.0	55.0	
OBSERVATION_NOR	091 22:24	093 00:09	0.0	24.3	111.0	9.3	38.5	93.8	78.8	0.0	370.8	229.9	105.0	0.0	107.6	1168.9
SP_268EA_M70METNON093_PRIME	093 00:09	093 07:54	0.0	7.3	72.9	2.8	0.0	13.8	23.7	0.0	111.6	4.3	0.0	0.0	0.0	236.3
SP_268EA_G34B26NON093_PRIME	093 07:54	093 14:24	0.0	6.1	0.0	2.3	0.0	11.6	19.9	0.0	93.6	3.6	0.0	0.0	0.0	137.1
DAILY TOTAL SCIENCE	091 22:24	093 14:24	0.0	37.7	183.9	14.4	38.5	119.2	122.4	0.0	576.0	237.7	105.0	0.0	107.6	

* NOTE: Negative SSR (P4) Margins did not result in data loss due to compression/under-utilization.

Segment Geometry (1 of 2)




```
Rev 267  INBOUND
2017 -  084T22:45:00 SCET
2017 MAR 25 22:45:00 SCET
2017 MAR 26 00:07:08 ERT
Apoapse__267 + 06:31:22
Periapse_267 - 003T07:24:26
Light time:    82.1 min
Orbit period:  7.2 days
Radius     1281059 km      21.26 Rs
Rad_cyl    1254980 km      20.82 Rs
Z_ht_cyl    257174 km       4.27 Rs
Mag_L         22.15
Semi_axs    716493 km      11.89 Rs
Eccentricity    0.795
Inclination    63.57 deg
Sun_range      10.06 AU
Earth_range     9.88 AU
--- DSN ELEV -- D/L -- U/L --------
Goldstone     -68.7  -36.3
Canberra       31.0   64.0
Madrid        -11.5  -42.4
------- LOOK DIRECTION INFO -------
FOV            13.5 deg  235.1 mrad
RA            107.057 deg
DEC           -14.232 deg
Crosses_RP_@    0.000 Rs
EPS             5.638 deg *
SEP            97.765 deg
ORS b/s angle  44.1 deg
ORS rad angle  52.7 deg  *
```

Point NEG_Y at SATURN and align POS_X = Up with NSP

User Vector - RA: 148.947 DEC: -23.550 Paste Current RA/DEC

Tilt L | Up | Tilt R | Left | Reset | Right | Down

Zoom Out | Fill Screen | Zoom In

Labels | Axes | Orbits | Vectors | FOVs | Lat/Lons | Image | Hi Res

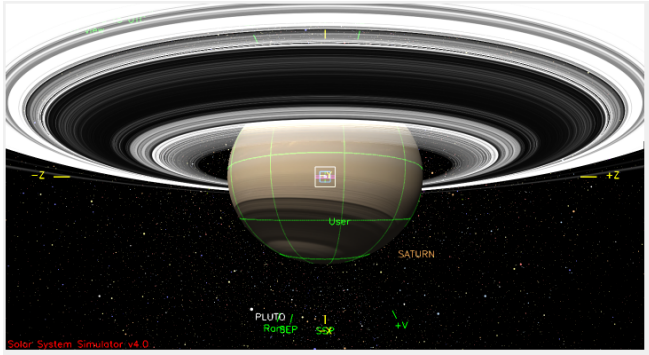
Year Month Day Hour Minute Second

Turn Analyzer: SATURN to EARTH about Z on RWA = 6.0 min / 41.1 deg Event

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	--	--	1281059	21.26	1221020	20.26	135.9	5.39	94.13	294	12	0	2.5	0	0.0	41.1	84.9
MIMAS	--	--	1154966	19.15	1154165	19.15	131.5	0.02	0.36	128	12	44	14.1	4892	6.6	44.9	79.7
ENCELADUS	--	--	1105892	18.35	1105639	18.35	137.3	0.03	0.46	229	13	-37	11.4	-9	7.7	40.7	92.5
TETHYS	--	--	1153960	19.15	1153418	19.14	127.6	0.05	0.94	110	12	58	11.7	265	12.6	48.4	74.6
DIONE	--	--	1647612	27.34	1647049	27.33	136.9	0.04	0.68	8	9	170	11.5	-64	3.4	39.7	81.7
RHEA	--	--	1102625	18.30	1101862	18.28	118.9	0.08	1.39	100	14	58	9.0	-3207	24.1	56.4	65.5
TITAN	--	--	1918775	31.84	1916200	31.79	142.5	0.15	2.68	315	8	-102	5.6	1216	37.7	40.1	117.4
HYPERION	--	--	1255584	20.83	1255471	20.83	122.4	0.01	0.26	20	73	-56	4.7	-8740	64.7	62.1	144.6
IAPETUS	--	--	2997829	49.74	2997083	49.73	87.5	0.03	0.50	347	11	-53	2.4	-679211	101.1	97.7	171.8
PHOEBE	--	--	15470759	256.70	15470650	256.70	160.7	0.00	0.01	277	-22	-134	3.1	5794609	53.0	24.6	106.6
SATURN	--	--	1281059	21.26	1221020	20.26	135.9	5.39	94.13	294	12	0	2.5	0	0.0	41.1	84.9

Start: 2017-084T22:45:00

Periapse: 2017-088T06:09:25




```
Rev 267  INBOUND
2017 -  088T06:09:25 SCET
2017 MAR 29 06:09:25 SCET
2017 MAR 29 07:31:02 ERT
Apoapse__267 + 003T13:55:47
Periapse_267 - 00:00:01
Light time:    81.6 min
Orbit period:  7.3 days
Radius     146926 km       2.44 Rs
Rad_cyl    144991 km       2.41 Rs
Z_ht_cyl   -23762 km      -0.39 Rs
Mag_L          2.50
Semi_axs   725422 km      12.04 Rs
Eccentricity    0.797
Inclination    63.61 deg
Sun_range      10.05 AU
Earth_range     9.81 AU
--- DSN ELEV -- D/L -- U/L --------
Goldstone      -8.6  -41.3
Canberra      -32.5  -21.2
Madrid         22.4   26.3
------- LOOK DIRECTION INFO -------
FOV            111.5 deg 1946.3 mrad
RA            -74.458 deg
DEC            12.101 deg
Crosses_RP_@    0.000 Rs
EPS             5.595 deg *
SEP           101.005 deg
ORS b/s angle 138.5 deg
ORS rad angle  54.7 deg  *
```

Point NEG_Y at SATURN and align POS_X = Up with NSP

User Vector - RA: -79.368 DEC: 0.509 Paste Current RA/DEC

Tilt L | Up | Tilt R | Left | Reset | Right | Down

Zoom Out | Fill Screen | Zoom In

Labels | Axes | Orbits | Vectors | FOVs | Lat/Lons | Image | Hi Res

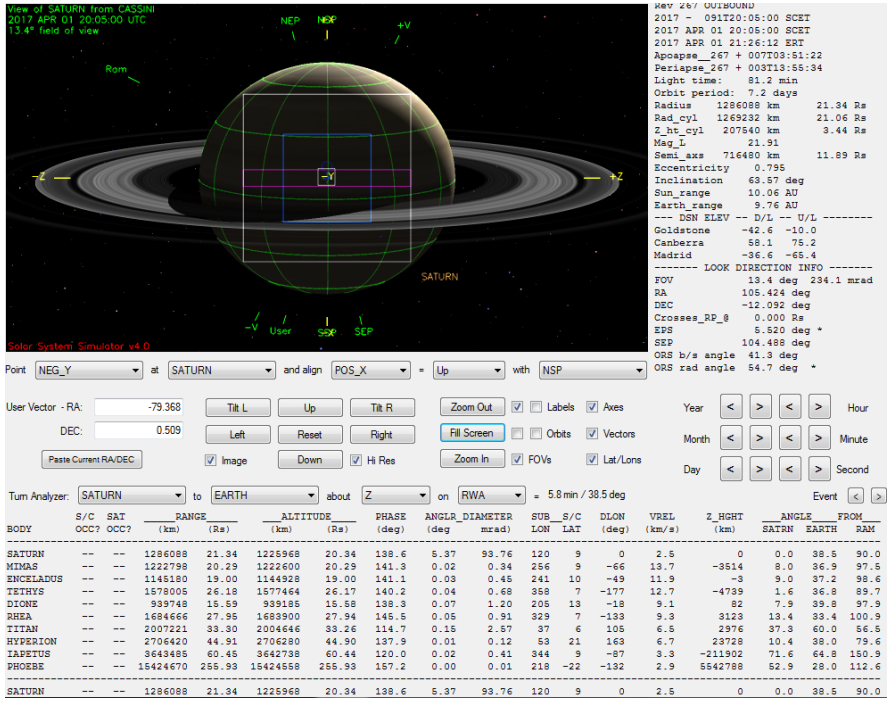
Year Month Day Hour Minute Second

Turn Analyzer: SATURN to EARTH about Z on RWA = 13.5 min / 141.4 deg Event

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	--	--	146926	2.44	86816	1.44	41.5	48.43	845.33	277	-9	0	21.5	0	0.0	141.4	90.0
MIMAS	--	--	122052	2.03	121852	2.02	109.7	0.19	3.40	54	-10	41	22.9	-4597	85.0	75.9	80.1
ENCELADUS	--	--	99760	1.66	99504	1.65	141.4	0.29	5.14	354	-14	-7	19.2	20	150.9	33.1	117.3
TETHYS	--	--	194500	3.23	193961	3.22	100.4	0.32	5.56	335	-6	-35	19.3	-5586	118.7	74.0	115.8
DIONE	--	--	396627	6.58	396064	6.57	57.4	0.16	2.84	339	-3	-87	22.2	-166	71.5	117.5	107.8
RHEA	--	--	404741	6.72	403974	6.70	120.0	0.22	3.79	353	-3	-27	19.1	101	141.3	54.5	111.5
TITAN	--	--	1093751	18.15	1091176	18.11	148.8	0.27	4.71	355	-2	2	19.7	8758	168.8	27.7	99.8
HYPERION	--	--	1236024	20.51	1235907	20.51	136.6	0.02	0.27	236	59	53	21.6	18682	120.7	48.3	81.1
IAPETUS	--	--	3514524	58.31	3513777	58.30	85.9	0.02	0.43	6	-1	110	23.4	-473439	69.8	99.5	62.2
PHOEBE	--	--	14629193	242.74	14629083	242.73	156.1	0.00	0.02	124	-26	47	21.5	5676632	123.8	29.3	104.5
SATURN	--	--	146926	2.44	86816	1.44	41.5	48.43	845.33	277	-9	0	21.5	0	0.0	141.4	90.0

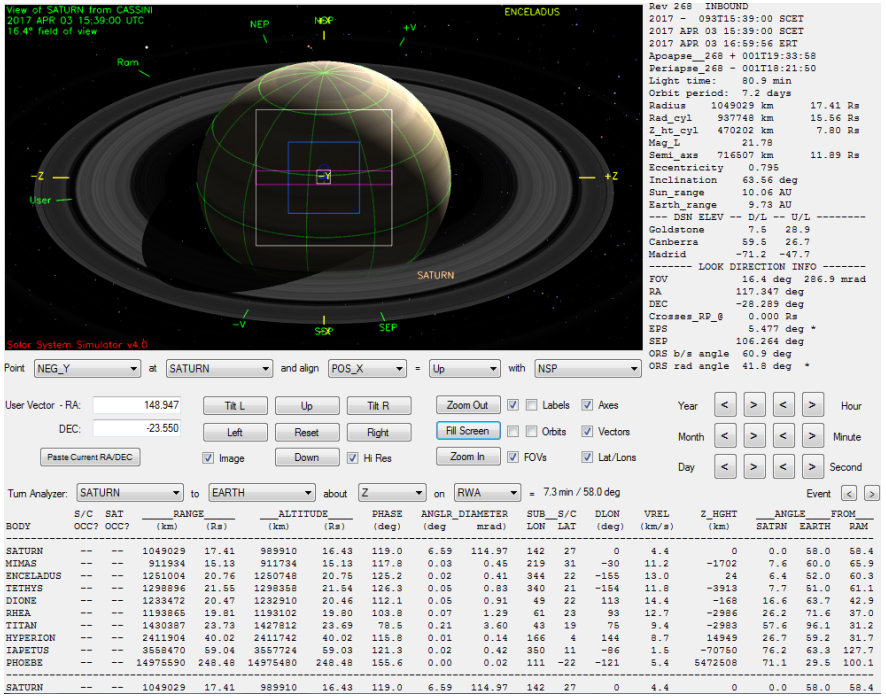
	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	21.26 Rs	135.9 deg	12
Periapse	2.44 Rs	41.5 deg	-9
Apoapse	21.34 Rs	138.6 deg	9
Segment End	17.41 Rs	119.0 deg	27

Segment Geometry (2 of 2)



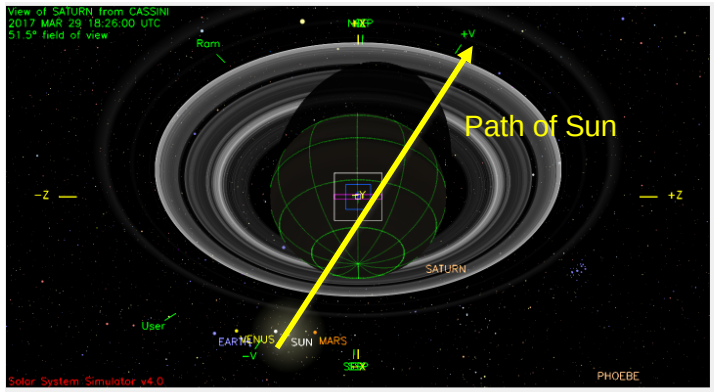
Apoapse: 2017-091T20:05:00

End: 2017-093T15:39:00



	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	21.26 Rs	135.9 deg	12
Periapse	2.44 Rs	41.5 deg	-9
Apoapse	21.34 Rs	138.6 deg	9
Segment End	17.41 Rs	119.0 deg	27

Solar Geometry – ORS Boresight Concerns



Rev 267 OUTBOUND
2017 - 088T18:26:00 SCET
2017 MAR 29 18:26:00 SCET
2017 MAR 29 19:47:35 ERT
Apoapse__267 + 004T02:12:22
Periapse_267 + 12:16:34
Light time: 81.6 min
Orbit period: 7.2 days

Radius	502470 km	8.34 Rs
Rad_cyl	398347 km	6.61 Rs
Z_ht_cyl	-306261 km	-5.08 Rs
Mag_L	13.27	
Semi_axs	716379 km	11.89 Rs
Eccentricity	0.795	
Inclination	63.58 deg	
Sun_range	10.06 AU	
Earth_range	9.81 AU	

--- DSN ELEV -- D/L -- U/L --------

Goldstone	-20.2	9.9
Canberra	75.8	56.6
Madrid	-57.1	-70.3

------- LOOK DIRECTION INFO -------

FOV	51.5 deg	899.6 mrad
RA	74.597 deg	
DEC	32.278 deg	
Crosses_RP_@	0.000 Rs	
EPS	5.584 deg	*
SEP	101.506 deg	
ORS b/s angle	12.0 deg	*
ORS rad angle	100.7 deg	

Point NEG_Y at SATURN and align POS_X = Up with NSP

User Vector - RA: 148.947 DEC: -23.550 Paste Current RA/DEC

Tilt L | Up | Tilt R | Left | Reset | Right | Down | Image | Hi Res

Zoom Out | Fill Screen | Zoom In | Labels | Axes | Orbits | Vectors | FOVs | Lat/Lons

Year / Month / Day < > Hour / Minute / Second

Turn Analyzer: SATURN to EARTH about Z on RWA = 3.7 min / 15.2 deg Event < >

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	--	--	502470	8.34	444357	7.37	168.0	13.78	240.47	179	-38	0	9.9	0	0.0	15.2	136.2
MIMAS	--	--	374612	6.22	374416	6.21	150.1	0.06	1.11	184	-57	-3	14.5	3903	18.5	31.5	123.0
ENCELADUS	--	--	351366	5.83	351116	5.83	145.5	0.08	1.46	158	-61	11	11.2	-26	25.1	34.3	113.0
TETHYS	--	--	346833	5.75	346304	5.75	137.8	0.18	3.12	121	-63	21	8.8	1161	34.9	40.5	101.9
DIONE	--	--	307059	5.09	306498	5.09	120.4	0.21	3.67	204	-86	-1	11.5	-43	48.6	60.1	97.1
RHEA	--	--	701127	11.63	700362	11.62	135.2	0.13	2.19	42	-26	85	2.9	-2021	48.6	39.3	95.3
TITAN	--	--	1612266	26.75	1609691	26.71	154.1	0.18	3.19	4	-11	143	10.0	8825	36.4	21.3	122.6
HYPERION	--	--	1747202	28.99	1747080	28.99	157.0	0.01	0.19	245	46	-165	14.1	21507	28.7	27.4	160.8
IAPETUS	--	--	3530361	58.58	3529614	58.57	98.1	0.02	0.42	357	-3	-100	13.2	-438088	78.5	87.3	135.2
PHOEBE	--	--	15173067	251.76	15172957	251.76	156.8	0.00	0.02	240	-26	-160	9.1	5657901	21.8	28.6	157.5
SATURN	--	--	502470	8.34	444357	7.37	168.0	13.78	240.47	179	-38	0	9.9	0	0.0	15.2	136.2

- Pointing to NEG_Y to Saturn (center) would lead to a CMT violation between ~2017-088T18:26:00 and ~2017-089T10:50:00.
- Minimum NEG_Y to Sun angle is ~1.49˚ from 2017-089T00:24 to 00:31.
- Pointing equatorial until 20:15, the moving north equatorial until 20:35 brings one out of the 12˚ cone, but not the 15˚ cone. *A waiver will be required.*
- The sun is occulted by Saturn from 088T21:21 to 089T03:39
- The sun is occulted by the rings from 089T03:39 to 089T05:01
- Pointing towards -30 to -60 deg latitude (left limb) at 07:30 brings one out of the 12˚ cone, but not the 15˚ cone. *A waiver will be required.*

088T17:20 -Y to Sat. center <15˚

088T18:26 -Y to Saturn Center <12 degrees

089T10:50 -Y to Sat. center <15˚

089T14:28

Eq. then N. Eq. OK | Obs Saturn OK (Sun Occulted) | Can't Look at Sat./ Rings OK (Sun Occulted) | -30/-60 lat, left OK

20:35 | 21:21:25 | 089T03:38:18 | 05:00:01 | 07:30

VIMS S. Eq. Region Maps | SP | VIMS S. Reg Maps | VIMS Solar Ring Occ | CIRS Composition of Unlit A Ring

18:24 | 20:45 | 21:25 | 03:38 | 05:28 | →19:28

Periapse Quicklooks

Rev 267

VIMS_267SA_NPOLMAP001_PRIME
UVIS_267ST_BETCRU001_PIE
VIMS_267SA_NPOLMAP002_PRIME
Begin Custom
INMS_267RI_FRINGATMO001_PIE
Periapse R = 2.435 Rs, lat ...
CIRS_267EN_SP006_PIE
VIMS_267SA_SPOLMAP001_PRIME
VIMS_267SA_SSTRMLAT001_PRIME
VIMS_267SA_SEQREGMAP001_PRIME
SP_267SU_WAYPTTURN088_PRIME
NEW WAYPOINT
End Custom
VIMS_267SA_SREGMAP001_PRIME
VIMS_267RI_SOLAROCC001_PRIME
CIRS_267RA_COMPUNLA3001_PRIME

- VIMS created a mosaic map of Saturn's North Pole. UVIS observed the ring and atmospheric occultation of the star Beta Cru, providing detailed vertical profiles of several hydrocarbon species and aerosols in Saturn's thermosphere and high stratosphere. VIMS created a mosaic map at Saturn's North Pole and at 35deg N. lat.
- INMS then took the lead to observe ions and neutrals within 1 Saturn radius of the equatorial plane. INMS measured both neutrals and ions at different L-shells as Cassini passed through them above and below the equatorial plane. Neutrals observed are expected to provide composition data on the ring material. Ions observed will provide information on Saturn's ionosphere and the coupling between the rings and the ionosphere.
- CIRS led an Enceladus observation that was the penultimate observation in a long campaign during Cassini's XXM to look for temporal variations in Enceladus' heat, on both short time-scales and with orbital location (as its plumes are known to).
- VIMS began a series of mapping observations of Saturn's southern latitudes, moving northward over time, beginning with a map of the South Pole, then mosaics of the South Storm Alley region, centered at 35 deg S. latitude, then mosaics of the South Equatorial region, centered at 5 deg S. latitude. VIMS then returned to center the mosaic map at 30 deg S. lat for a southern regional map.
- VIMS observed a solar ring occultation studying the size and spatial distributions of the smallest ring particles.
- CIRS led an observation that acquired moderate wavelength resolution spectra of the narrow trans-Encke region in Saturn's A ring.

Daily Science Highlights (1 of 3)

DOY 085 (26 March 2017): Saturn_267 was a ~8.5 day periapse segment beginning at the end of DOY084. Science started with a turn to Titan, where ISS preformed a haze observation of Titan's atmosphere as part of the Titan Monitoring Campaign (phase 142.5 deg. and range 1.9 Mkm) with CIRS and VIMS as riders. CIRS then led an observation to study the composition of Saturn's atmosphere; UVIS and VIMS rode, for almost 11hr.

DOY 086 (27 March 2017): VIMS observed the Sun for four hours to calibrate it's solar port. The solar port was used to observe solar occultations of Saturn, Titan and the rings, as well as to provide periodic calibration data for the instrument's IR channel. The latter were used to monitor the slowly-changing wavelength calibration, while also providing a check on the photometric stability of the instrument. The solar flux and spectrum both depend on the position of the sun in the VIMS field of view, so maps of the FOV were obtained periodically by moving the sun across it in a raster scan pattern. This was the **final such Solar Port calibration of the mission**, previous ones having been acquired on revs 225 (2015-318), 234 (2016-098) and 241 (2016-245), at roughly 6-month intervals. CIRS led another observation to study the composition of the Saturn's atmosphere. ISS imaged along the bright limb of Saturn, working with VIMS and UVIS to study the composition of the high atmosphere. UVIS then collaborated with ISS, with CIRS and VIMS riding, for an Enceladus plume occultation of the star Eps CMa. This occultation made a horizontal cut through Enceladus' plume, yielding one last look at the water vapor column density, and the opportunity to detect any long-term temporal change possibly associated with the seasons or the ellipticity of Enceladus' orbit. This was **the last time in the mission** when Cassini was to view a star passing behind the plume, so this was **the last chance to measure column density**. VIMS then led a 6hr observation, with CIRS and ISS riding, creating a North Hemisphere map and mosaics from the pole and extending to ~30 deg N Lat. UVIS and VIMS collaborated to observe the illuminated northern auroral oval, first staring for 4hr, then performing repeated slew observations for 4hr.

DOY 087 (28 March 2017): VIMS created a mosaic map of Saturn's North Pole. UVIS observed the ring and atmospheric occultation of the star Beta Cru. The Saturn UV stellar occultations provide detailed vertical profiles of several hydrocarbon species and aerosols in Saturn's thermosphere and high stratosphere. The detailed vertical profile information is critical for studies of photochemical processes and circulation in Saturn's upper atmosphere.

Daily Science Highlights (2 of 3)

DOY 087 (28 March 2017) continued: These measurements probed higher altitudes than could be sensed with the CIRS information and it is in this regime that the photochemical processes are active. Each occultation, however, samples only one latitude (in this case, Beta Cru ingress latitude will be -5.5deg) and many of them are needed to build up a global picture of Saturn's high atmosphere and the circulation in that part of the atmosphere. Occultations that occured near the latitude where INMS samples the atmosphere directly, in situ, near the end of the mission are additionally valuable because they provide information on the density of the atmosphere where the spacecraft experienced some atmospheric drag. Previous UV stellar occultation measurements showed that the atmosphere was expanding until about 2010 and has since contracted to some extent. This is a spacecraft health and safety issue.

DOY 088 (29 March 2017): VIMS created a mosaic map of Saturn's North Pole and Hexagon, and of the 35deg N. latitude region, examining the remnants of the Great Storm of 2010-2011. INMS then took the lead to observe ions and neutrals within 1 Saturn radii of the equatorial plane. INMS measured both neutrals and ions at different L-shells as Cassini passed through them above and below the equatorial plane. Neutrals observed were expected to provide compositional information on the ring material. Ions observed provide information on Saturn's ionosphere and the coupling between the rings and the ionosphere. These observations also informed the generation of INMS' science operations tables for future F-Ring and Proximal observations to ensure the most interesting and useful data are obtained out of the limited observations in the FPROX phase of the mission. CIRS then led an Enceladus observation that was **the penultimate observation** in a long campaign during Cassini's XXM to look for temporal variations in Enceladus' heat, on both short time-scales and with orbital location (as its plumes are known to). It was a 6 hr 42 min observation of Enceladus, which was used to make many slow CIRS FP3 scans of Enceladus' active south polar terrain region. Differences between these scans, and those from other observations in the campaign, will be examined to determine the temporal variability of Enceladus' thermal activity. VIMS then began a series of mapping observations of Saturn's southern latitudes, moving northward over time, beginning with a map of the South Pole, then conducting mosaics of the South Storm Alley region, centered at 35deg S. latitude, then adding mosaics of the South Equatorial region, centered at 5deg S. latitude. VIMS then returned to center the mosaic map at 30deg S. lat for a southern regional map. CIRS and UVIS rode on all 4 of these VIMS observations.

Daily Science Highlights (3 of 3)

DOY 089 (30 March 2017): VIMS and UVIS used their solar ports to collaboratively observe a solar ring occultation. As the sun egressed, passing behind the B through F rings of Saturn, the instruments could study the size and spatial distributions of the smallest particles in the rings. CIRS then led an observation to acquire moderate wavelength resolution spectra of the narrow trans-Encke region in Saturn's A ring. The spectra taken during this observation of the unlit side of the rings will be combined to study the composition and structure of this unique region in Saturn's rings.

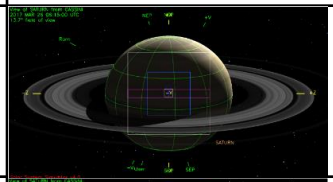
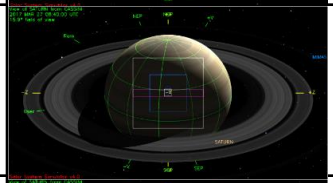
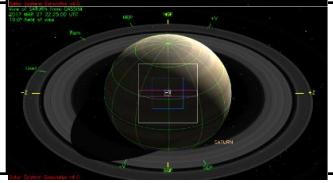
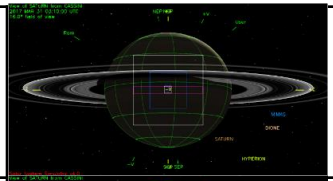
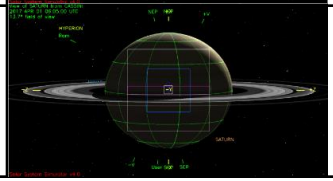
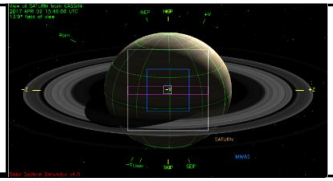
DOY 090 (31 March 2017): VIMS mapped Saturn's south hemisphere from the equator down to about 60deg S. latitude, with the mosaic centered on the central meridian near 30deg S. latitude. ISS imaged along the bright limb of Saturn to study the composition of the high atmosphere. ISS observed Enceladus as part of their plume monitoring campaign. This allowed them to observe brightness variations in the plume on short timescales, which is excellent for testing theories of plume production. More data covering this region will help to characterize these variations, which will lead to better understanding of the long term plume behavior.

DOY 091 (1 April 2017): CIRS, with UVIS and VIMS riding, studied the composition of the Saturn's atmosphere. ISS then preformed haze observations of Titan's atmosphere as part of the Titan Monitoring Campaign (phase 112.8 deg. and range 2 Mkm) with CIRS and VIMS as riders.

DOY 092 (2 April 2017): The spacecraft rolled for 9hr in support of a routine calibration of the Magnetometer instrument. UVIS and VIMS collaborated to observe the illuminated northern auroral oval, first staring for 6hr, then performing repeated slews for 6hr. Saturn_267 ended with a downlink of all data to Earth via a 34M antenna in Goldstone, California.

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	2017-085T00:55:00	2017-085T11:35:00	000T10:40:00	135.0 to 130.6	21.2 to 20.6	12 to 16	
	Suggested observations: CIRS Map/Compsit						
2	2017-086T03:25:00	2017-086T13:58:00	000T10:33:00	123.4 to 117.5	18.8 to 17.0	23 to 28	
	Suggested observations: ISS Imaging or VIMS mapping						
3	2017-086T15:22:00	2017-087T05:28:00	000T14:06:00	116.6 to 105.2	16.7 to 13.0	29 to 38	
	Suggested observations: VIMS Npolar Img, UVIS Aurora						
Periapse (2017-088T06:09:25) Periapse phase = 42 deg, R = 2.435 Rs, lat = -9 deg,							
4	2017-089T23:10:00	2017-090T07:10:00	000T08:00:00	159.0 to 154.6	17.1 to 18.6	-9 to -5	
	Suggested observations: ISS Limb, VIMS South Hemisphere Img						
5	2017-091T00:55:00	2017-091T11:14:00	000T10:19:00	146.3 to 142.1	20.6 to 21.2	2 to 6	
	Suggested observations: CIRS full rotation map or Compsit						
Apoapse (2017-091T20:05:00) Apoapse Per = 7.2 d, inc = 63.6 deg, phase = 139 deg, R = 21.318 Rs							
6	2017-092T09:34:00	2017-092T21:59:00	000T12:25:00	133.3 to 128.0	21.0 to 20.0	14 to 19	
	Suggested observations: UVIS Aurora or CIRS						

Initial SMT and Data Volume (1 of 2)

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 (%)	CAROVR (Mb)
SP_267EA_C34BWGNON085_PRIME	085 13:45	085 22:45	0	244	63	308	3322	3014	0	199	53	560	731	171	-1079	-7%	0
SP_267EA_G34BWGNON087_PRIME	087 07:38	087 11:58	0	1165	139	1304	3322	2018	0	211	26	1541	255	-1286	-1250	-9%	1286
SP_267EA_C70METNON087_PRIME	087 11:58	087 19:12	1286	0	0	1286	3322	2036	0	431	43	1759	2554	794	-1250	-9%	0
SP_267EA_C70METNON089_PRIME	089 13:30	089 22:30	0	5189	179	5368	3322	-2045	0	189	53	3564	3364	-200	1874	20%	200
SP_267EA_C70METNON090_PRIME	090 16:15	091 00:15	200	1173	75	1448	3322	1874	0	176	47	1671	2776	1104	3148	51%	0
SP_267EA_C34BWGNON091_PRIME	091 13:24	091 22:24	0	157	56	212	3322	3110	0	197	53	462	788	325	2043	61%	0
SP_268EA_M70METNON093_PRIME	093 00:09	093 07:54	0	401	109	510	3322	2812	0	163	46	718	2070	1351	1718	67%	0
SP_268EA_G34BWGNON093_PRIME	093 07:54	093 15:39	0	0	0	0	3322	3322	0	89	46	135	501	366	367	73%	0

Initial SMT and Data Volume (2 of 2)

Beginning of Integration:

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	084 22:45	085 13:45	0.0	28.3	21.6	5.4	38.5	26.7	45.9	0.0	70.7	0.0	5.0	0.0	62.7	304.8
SP_267EA_C34BWGNON085_PRIME	085 13:45	085 22:45	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	42.4	4.9	0.0	0.0	0.0	197.5
DAILY TOTAL SCIENCE	084 22:45	085 22:45	0.0	45.3	108.0	8.6	38.5	42.7	73.4	0.0	113.2	4.9	5.0	0.0	62.7	
OBSERVATION_NOR	085 22:45	087 07:38	0.0	62.0	20.2	11.8	120.0	58.5	100.6	0.0	483.6	16.2	282.0	0.0	137.4	1292.3
SP_267EA_G34BWGNON087_PRIME	087 07:38	087 11:58	0.0	8.2	0.0	1.6	0.0	7.7	13.3	0.0	176.3	2.4	0.0	0.0	0.0	209.4
SP_267EA_C70METNON087_PRIME	087 11:58	087 19:12	0.0	13.6	67.3	12.7	0.0	12.9	22.1	0.0	294.3	4.0	0.0	0.0	0.0	426.9
DAILY TOTAL SCIENCE	085 22:45	087 19:12	0.0	83.9	87.5	26.1	120.0	79.0	136.0	0.0	954.1	22.5	282.0	0.0	137.4	
OBSERVATION_NOR	087 19:12	089 13:30	0.0	106.2	311.5	25.3	520.0	142.8	154.6	0.0	2156.4	567.2	1158.0	0.0	176.8	5318.8
SP_267EA_C70METNON089_PRIME	089 13:30	089 22:30	0.0	17.0	77.0	3.2	0.0	16.0	27.5	0.0	42.4	3.9	0.0	0.0	0.0	187.2
DAILY TOTAL SCIENCE	087 19:12	089 22:30	0.0	123.2	388.6	28.5	520.0	158.8	182.2	0.0	2198.8	571.1	1158.0	0.0	176.8	
OBSERVATION_NOR	089 22:30	090 16:15	0.0	33.5	99.6	6.4	700.0	31.6	54.3	0.0	83.7	106.5	47.0	0.0	74.2	1236.8
SP_267EA_C70METNON090_PRIME	090 16:15	091 00:15	0.0	15.1	75.6	2.9	0.0	14.2	24.5	0.0	37.7	4.4	0.0	0.0	0.0	174.4
DAILY TOTAL SCIENCE	089 22:30	091 00:15	0.0	48.6	175.2	9.3	700.0	45.8	78.8	0.0	121.4	110.9	47.0	0.0	74.2	
OBSERVATION_NOR	091 00:15	091 13:24	0.0	24.8	0.0	4.7	0.0	23.4	40.2	0.0	62.0	0.0	0.0	0.0	55.0	210.1
SP_267EA_C34BWGNON091_PRIME	091 13:24	091 22:24	0.0	14.8	86.4	3.2	0.0	16.1	27.5	0.0	42.2	4.9	0.0	0.0	0.0	195.2
DAILY TOTAL SCIENCE	091 00:15	091 22:24	0.0	39.6	86.4	8.0	0.0	39.5	67.8	0.0	104.2	4.9	0.0	0.0	55.0	
OBSERVATION_NOR	091 22:24	093 00:09	0.0	24.3	21.6	9.3	38.5	93.7	78.8	0.0	121.4	4.9	5.0	0.0	107.6	505.2
SP_268EA_M70METNON093_PRIME	093 00:09	093 07:54	0.0	7.3	72.9	2.8	0.0	13.8	23.7	0.0	36.5	4.3	0.0	0.0	0.0	161.3
SP_268EA_G34BWGNON093_PRIME	093 07:54	093 15:39	0.0	7.3	0.0	2.8	0.0	13.8	23.7	0.0	36.5	4.3	0.0	0.0	0.0	88.4
DAILY TOTAL SCIENCE	091 22:24	093 15:39	0.0	38.9	94.5	14.9	38.5	121.3	126.2	0.0	194.5	13.4	5.0	0.0	107.6	

	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	379.4	940.1	95.3	1417.0	487.1	664.4	0.0	3686.3	727.9	1497.0	0.0

Waypoint Selection (1 of 2)

RBOT - Friendly

OBSERVATION PERIOD	START	END	POS_X	NEG_X	POS_Z	NEG_Z
SP_267NA_OBSERV084_NA	2017-084T22:45:00	2017-085T13:45:00	188.0/ 31.9	------	188.0/ 31.9	------
SP_267NA_OBSERV085_NA	2017-085T22:45:00	2017-087T07:38:00	188.0/ 31.9	------	188.0/ 31.9	------
SP_267NA_OBSERV087_NA	2017-087T19:12:00	2017-089T07:38:00	------	------	------	------
SP_267NA_OBSERV089_NA	2017-089T13:38:00	2017-090T16:15:00	------	------	------	------
SP_267NA_OBSERV090_NA	2017-091T00:15:00	2017-091T13:24:00	187.8/ 31.9	187.8/ 31.9	187.8/ 31.9	------
SP_268NA_OBSERV091_NA	2017-091T22:24:00	2017-093T07:24:00	187.8/ 31.9	187.8/ 31.9	187.8/ 31.9	------

Standard

OBS_NAME	START	END	POS_X_2_NSP	POS_X_2_NEP	NEG_X_2_NSP	NEG_X_2_NEP	POS_Z_2_NSP	POS_Z_2_NEP	NEG_Z_2_NSP	NEG_Z_2_NEP	NEG_X_2_SUN	NEG_Z_2_EARTH
SP_267NA_OBSERV084_NA	2017-084T22:45:00	2017-085T13:45:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	**BAD**
SP_267NA_OBSERV085_NA	2017-085T22:45:00	2017-087T07:38:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	**BAD**
SP_267NA_OBSERV087_NA	2017-087T19:12:00	2017-089T07:38:00	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**
SP_267NA_OBSERV089_NA	2017-089T13:38:00	2017-090T16:15:00	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**
SP_267NA_OBSERV090_NA	2017-091T00:15:00	2017-091T13:24:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	**BAD**
SP_268NA_OBSERV091_NA	2017-091T22:24:00	2017-093T07:24:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	**BAD**

*** NEG_Y to Saturn not safe from 2017-088T17:20 to 089T14:28 (ORS to Sun < 15 deg.).**
- Minimum ORS to SUN angle is appx. 1.49 deg (CIRS Operational FR Zone).

Waypoint Selection (2 of 2)

FPROX DOWNLINK

DOWNLINK	START	END	POS_X_2_NSP	POS_X_2_NEP	NEG_X_2_NSP	NEG_X_2_NEP	POS_Y_2_NSP	POS_Y_2_NEP	NEG_Y_2_NSP	NEG_Y_2_NEP	ROLL_FLAG
SP_267EA_C34BWGNON085_PRIME	2017-085T13:45:00	2017-085T22:45:00	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK	OK
SP_267EA_G70METNON087_PRIME	2017-087T07:38:00	2017-087T16:08:00	OK	OK	**BAD**	**BAD**	**BAD**	**BAD**	OK	OK	0
SP_267EA_C70METNON087_PRIME	2017-087T16:08:00	2017-087T19:12:00	OK	OK	**BAD**	**BAD**	**BAD**	**BAD**	OK	OK	0
SP_267EA_G70METNON089_PRIME	2017-089T07:38:00	2017-089T13:38:00	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK	OK
SP_267EA_C70METNON090_PRIME	2017-090T16:15:00	2017-091T00:15:00	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK	OK
SP_267EA_C34BWGNON091_PRIME	2017-091T13:24:00	2017-091T22:24:00	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK	OK
SP_268EA_G70METNON093_PRIME	2017-093T07:24:00	2017-093T15:39:00	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK	0

FPROX Periapse waypoint search

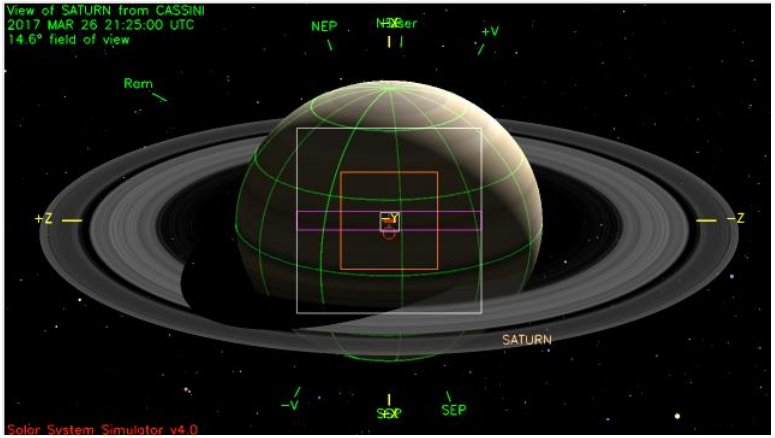
Each WAYPOINT "block" looks at the OBSERVING PERIOD that spans Periapsis
The OBSERVATION PERIOD is split into PRE PERI and a POST PERI blocks
Then each block is set up as a series of shorter time blocks that either END or START further from the actual time of periapsis

PERI 267

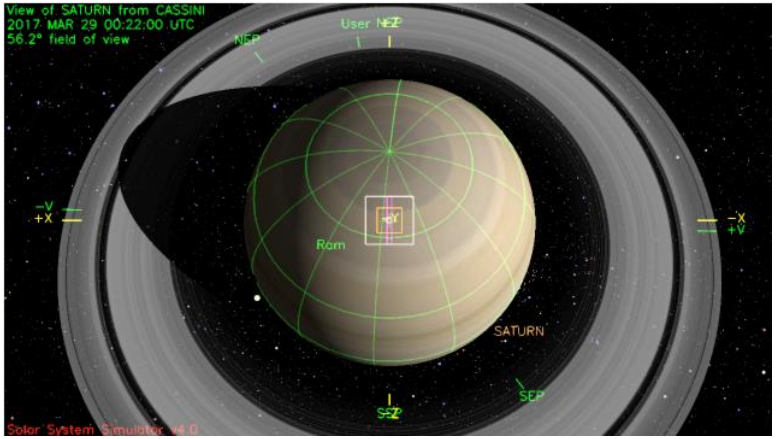
OBSERVATION PERIOD	START	END	POS_X	NEG_X	POS_Z	NEG_Z
SP_267NA_OBSERV000_NA	2017-087T19:12:00	2017-088T05:39:25	187.9/ 31.9	------	------	------
SP_267NA_OBSERV000_NA	2017-087T19:12:00	2017-088T05:09:25	187.9/ 31.9	------	------	------
SP_267NA_OBSERV000_NA	2017-087T19:12:00	2017-088T04:09:25	187.9/ 31.9	------	187.9/ 31.9	------
SP_267NA_OBSERV000_NA	2017-087T19:12:00	2017-088T03:09:25	187.9/ 31.9	------	187.9/ 31.9	------
SP_267NA_OBSERV000_NA	2017-087T19:12:00	2017-088T02:09:25	187.9/ 31.9	------	187.9/ 31.9	------
SP_267NA_OBSERV000_NA	2017-087T19:12:00	2017-088T01:09:25	187.9/ 31.9	------	187.9/ 31.9	------
SP_267NA_OBSERV000_NA	2017-088T06:39:25	2017-089T07:38:00	------	------	------	------
SP_267NA_OBSERV000_NA	2017-088T07:09:25	2017-089T07:38:00	------	------	------	------
SP_267NA_OBSERV000_NA	2017-088T08:09:25	2017-089T07:38:00	------	------	------	------
SP_267NA_OBSERV000_NA	2017-088T09:09:25	2017-089T07:38:00	------	------	------	------
SP_267NA_OBSERV000_NA	2017-088T10:09:25	2017-089T07:38:00	------	------	------	------
SP_267NA_OBSERV000_NA	2017-088T11:09:25	2017-089T07:38:00	------	------	------	------

Waypoints Chosen

Waypoint 1 (2017-084T23:25 – 087T19:52):
NAC to Saturn, NEG_X to NSP

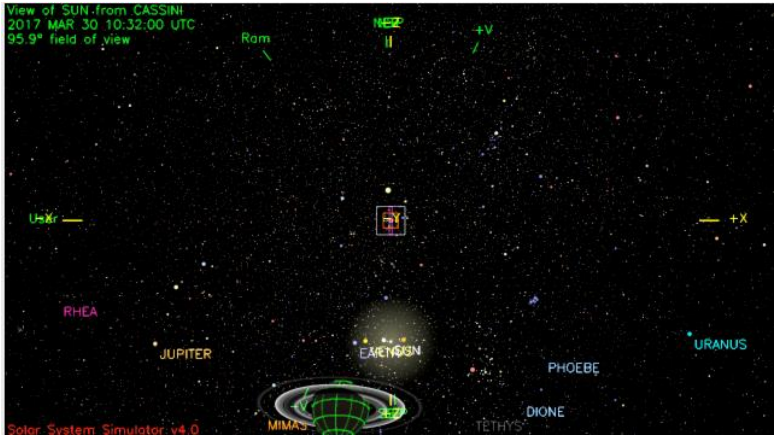


Waypoint 2 (2017-087T19:52 – 088T04:48):
NAC to Saturn, POS_Z to NSP



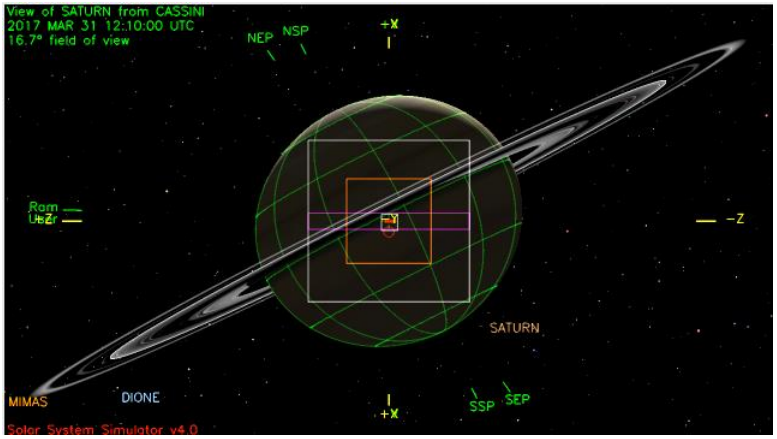
Waypoint 3 (2017-088T04:48 – 088T21:25):
No acceptable valid waypoint, custom period used.

Waypoint 4 (2017-088T21:25 – 089T23:10):
UVIS_SOL_OFF to Sun, POS_Z to NSP

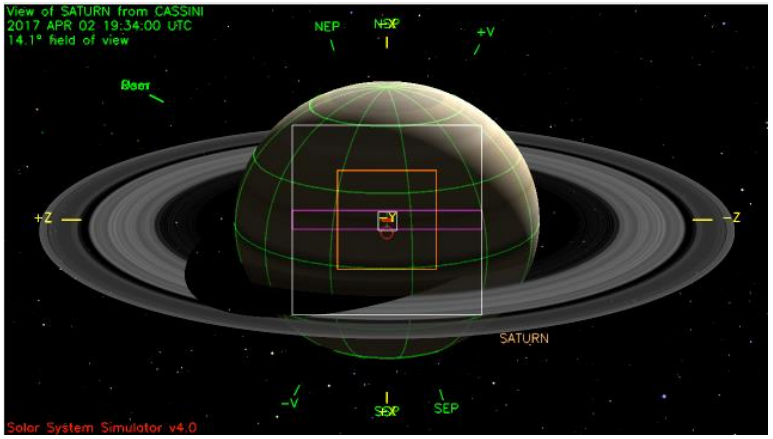


Waypoints Chosen

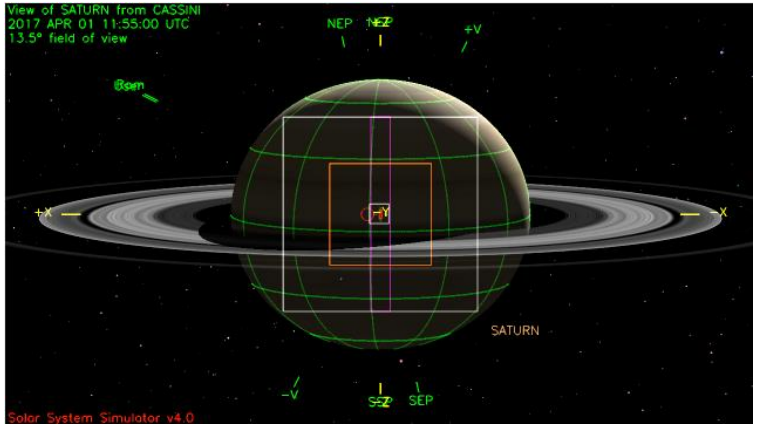
Waypoint 5 (2017-089T23:10 – 091T00:55):
NAC to Saturn, POS_Z to 187.8/31.9



Waypoint 7 (2017-091T23:04 – 093T16:19):
NAC to Saturn, NEG_X to NSP



Waypoint 6 (2017-091T00:55 – 091T23:04):
NAC to Saturn, POS_Z to NSP



Notes (1/4)

- Pointing:
  - Waypoints:
    - RBOT friendly waypoints used when compatible with science
    - No valid waypoint for Periapse Period (2017-087T19:52 – 088T21:25 SCET; Duration 001T01:33): Used custom period
  - Custom Period (2017-088T04:48 – 088T21:25 SCET)
  - CIRS and VIMS temperature/ boresight violations:
    - CIRS Max Temp = 82.37K (ΔT = 7.77K) @ 088T07:51 SCET (During CIRS SP006 PIE – Mostly due to INMS FRING PIE)
      - CIRS provided approval via email (Paul Romani 7/20)
      - **Consumable FR Waiver will be required (See SPLAT item)**
    - VIMS Max Temp = 65.24K (ΔT = 5.58K) @ 088T10:55 SCET (During CIRS SP006 PIE – Mostly due to INMS FRING PIE)
      - VIMS provided approval via email (Ed Audi 7/27)
      - **Consumable FR Waiver will be required (See SPLAT item)**
    - CIRS Boresight to Sun < 15° during DOY 088 - 089 (During VIMS SPOL / SSTRMLAT / SEQREG / SREG Maps)
      - CIRS Boresight to Sun < 12° occur only during Solar Occultation
      - KPT complaints (from Dave Bates):
        - The CIRS Boresight is within 15 Deg from Edge of Sun within 16 hours of CIRS Science during the CIRS_267RA_COMPUNLA3001 observation
      - CIRS provided approval via email (Paul Romani 7/20)
      - **Operational FR Waiver will be required (see SPLAT item)**

Notes (2/4)

- Pointing (continued):
  - **CMT Management & FR waivers required during the following periods:**
    - -Y to Sun < 12˚ CMT Management from 2017-088T21:27:50 – 089T03:31:05 SCET **(See SPLAT item)**
      - During VIMS_267SA_SREGMAP001_PRIME
      - KPT complaints (from Dave Bates):
        - The –Y to Sun angle drops to zero degrees during the VIMS_267SA_SREGMAP001_PRIME observation
        - (Sun will be occulted at this time)
      - Sun occulted between 088T21:21:26 - 089T03:38:17 (from Tour Atlas)
    - +X to Sun < 83˚ CMT Management from 2017-088T04:50:05 – 06:43:05 SCET **(See SPLAT item)**
      - During INMS_267RI_FRINGATMO001_PIE
      - This is a cause of the CIRS/VIMS heating
      - KPT complaints (from Dave Bates):
        - The +X to Sun angle drops to 45˚ during the INMS_267RI_FRINGATMO001_PIE observation, which causes CIRS and VIMS temperature increases above 5 and 2 deg, respectively.
      - INMS design has been approved by CIRS, VIMS, & CDA (via email Ralf Srama 7/15)

- Periapse Jumpstart of Merged PDT & AACS analysis for teams early PDT deliveries during 2017-087T05:28 – 089T20:38 **(See SPLAT item)**
- Rate violations on DOY 088 @ 05:05 during INMS FRING PIE. This is okay inside +/- 3hr of periapse per FRPO G&Cs.
- There is a 20 min quiescent period carved out at the beginning of the VIMS NPOLMAP002 (088T03:22:50 – 03:42:50) for a bias **(See SPLAT item)**
- Quiescent periods for a SID Suspend are required during CIRS_267EN_SP006_PIE and possibly VIMS NPOLMAP002 **(See SPLAT item)**
  - Per Dave Bates KPT runs
  - See RBOT notes
- **SIP SP_TURN PDT SASF Hand Edits required!**
  - Hand edit for downlink **SP_268EA_G34BWGNON093_PRIME**
    - SP turn script combines M70METNON093 and G34BWGNON093 into one request. The script properly handles rolling/SRU for M70 but does not start G34 3hr delayed roll at correct time. Change 7PROFILE start time from 02:59:30 to 10:44:30. Change 7DELTA_BODY_LONG start time from 03:00:00 to 10:45:00. This fixes the duration math, accounting for the 7hr45 duration of the M70 pass properly.

Notes (3/4)

- Data Volume
  - No SMT warnings
  - SSR cleared before periapse observation period and at the end of segment
- DSN
  - ap_downlink report check warnings can be ignored:
    - Ignore “Warning: 70m usage for sequence exceeds project commitment <=35%; is at 50%”
    - Ignore “Warning: number of sequence upload passes is 0; should be 5 or more” ---not the last segment in sequence
  - No Level 3 requests, no OTMs
- Resource Checker
  - All gaps (2) can be ignored
    - Gap on 2017-088T13:30 – 14:10 SCET (dur = 40 min) expected
    - Gap on 2017-089T11:38 – 13:30 SCET (dur = 1hr52min) expected
- RSS
  - RSS_267SA_OCCORT001_RSS from 2017-087T07:38 – 13:38 SCET
  - RSS_268EA_AUXPIM001_RSS from 2017-093T03:34 – 15:39 SCET
    - No rolling for first 3 hrs of G34 DL (2017-093T07:54:00 - 2017-093T10:54:00)
- Opmodes
  - RSSKRWAF on DOY 087 for RSS OCCORT
  - RSSPRWAF and RSSKRWAF on DOY 093 for RSS AUXPIM
- Hydrazine
  - N/A

Notes (4/4)

- Special Activities:
  - -Y to Sun CMT management and flight rule waivers required (mentioned in pointing area)
  - +X to Sun CMT management and flight rule waivers required (mentioned in pointing area)

  - MAG Cal Roll from 2017-092T00:34 – 09:34 SCET

  - RSS_268EA_AUXPIM001_RSS from 2017-093T03:34 – 15:39 SCET

  - Collaborative PRIME/RIDER activities:
    - UVIS_267EN_ICYEXO001_PIE - Collab w/ ISS
    - UVIS_267SA_AURDSTARE001_PRIME - Collab w/ VIMS
    - UVIS_267SA_AURSLEW001_PRIME - Collab w/ VIMS
    - INMS_267RI_FRINGATMO001_PIE - Collab w/ CDA
    - CIRS_267EN_SP006_PIE - Collab w/ ISS
    - VIMS_267RI_SOLAROCC001_PRIME - Collab w/ UVIS
    - UVIS_268SA_AURDSTARE001_PRIME - Collab w/ VIMS
    - UVIS_268SA_AURSLEW001_PRIME - Collab w/ VIMS
  - PIES:
    - UVIS_267EN_ICYEXO001_PIE (086T13:58)
    - UVIS_267ST_BETCRU001_PIE (087T21:17)
    - INMS_267RI_FRINGATMO001_PIE (088T04:48)
    - CIRS_267EN_SP006_PIE (088T06:48)
    - ISS_267EN_PLUME001_PIE (090T07:10)

Liens (1/2)

Sequence Liens (should all be SPLAT items):

- Target Motion Violations:
  - VIMS_267SA_NPOLMAP002_PRIME (2017-087T22:27 – 088T04:48 SCET) has 70.77 deg angular motion over a 6hr21min activity period (>3 hr observations with >60 degrees target motion). Requires a 20 min quiescent period for AACS within 3 hours of the violation per AACS rule.
  - The required quiescent period is **already implemented** by team from 088T03:22:50 – 03:42:50 in the periapse jumpstart.

- SRU violation between INMS_267RI_FRINGATM_001_PIE and CIRS_267EN_SP006_PIE (2017T088T06:35:44.530 to 2017-088T11:21:39.890)
  - Quiescent periods for a SID Suspend are required during CIRS_267EN_SP006_PIE and possibly VIMS NPOLMAP002

- **-Y to Sun < 12˚ CMT Management + FR waiver** required during the period 2017-088T21:27:50 – 089T03:31:05 SCET
  - CMT Management required during VIMS_267SA_SREGMAP001_PRIME
  - Sun occulted between 088T21:21:26 - 089T03:38:17 (from Tour Atlas)
- **+X to Sun < 83˚ CMT Management + FR waiver** required during the period 2017-088T04:50:05 – 06:43:05 SCET
  - CMT Management required during INMS_267RI_FRINGATMO001_PIE
  - This is the cause for the CIRS/VIMS heating
  - INMS design has been approved by CIRS, VIMS, & CDA (via email Ralf Srama 7/15)

- CIRS heating violation **Consumable FR waiver** required during CIRS SP006 PIE - Caused by INMS FRING PIE
  - CIRS Max Temp = 82.37K (ΔT = 7.77K) @ 088T07:51 SCET
  - CIRS provided approval via email (Paul Romani 7/20)
- VIMS heating violation **Consumable FR waiver** required during CIRS SP006 PIE – Caused by INMS FRING PIE
  - VIMS Max Temp = 65.24K (ΔT = 5.58K) @ 088T10:55 SCET
  - VIMS provided approval via email (Ed Audi 7/27)

- CIRS Boresight to Sun < 15˚ **Operational FR waiver** required during DOY 088 - 089 during VIMS SPOL / SSTRMLAT / SEQREG / SREG Maps
  - CIRS Boresight to Sun < 12˚ occur only during Solar Occultation
  - CIRS provided approval via email (Paul Romani 7/20)

Liens (2/2)

Sequence Liens (should all be SPLAT items):

- The following science request from 2017-087T05:28 – 089T20:38 in Saturn_267 have been designed in PDT during integration. Teams identified shall deliver these designs as part of the Port 1 delivery; SIP leads to monitor.

VIMS_267SA_NPOLMAP001_PRIME

UVIS_267ST_BETCRU001_PIE

VIMS_267SA_NPOLMAP002_PRIME

INMS_267RI_FRINGATMO001_PIE

CIRS_267EN_SP006_PIE

VIMS_267SA_SPOLMAP001_PRIME

VIMS_267SA_SSTRMLAT001_PRIME

VIMS_267SA_SEQREGMAP001_PRIME

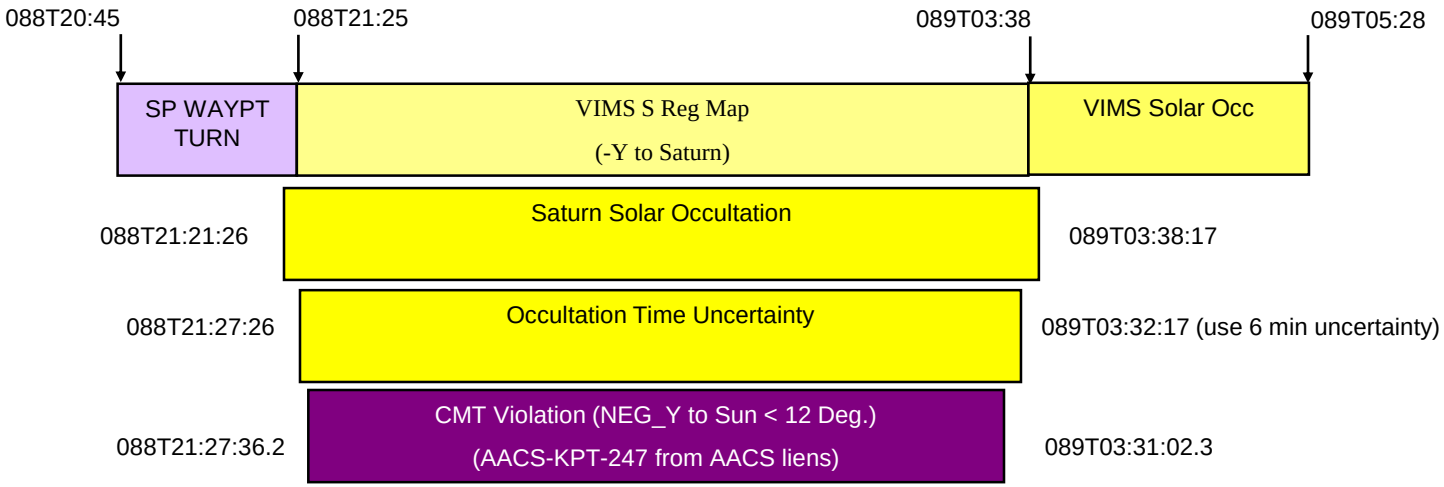
VIMS_267SA_SREGMAP001_PRIME

VIMS_267RI_SOLAROCC001_PRIME

CIRS_267RA_COMPUNLA3001_PRIME

CMT Management: -Y to Sun violation

- -Y to Sun CMT Management and flight rule waivers will be needed for the VIMS S. Regional Map on DOY 088/089 during the solar occultation
  - Time of Saturn Solar Occultation is from the tour atlas.
  - Timing uncertainty is ± 0.7 minutes as determined using Brad Wallis' "ask_carnac.pro" with a total of ± 6 minutes pad recommended



Rev 267 Periapse RBOT Assessment

AACS evaluation of Saturn_267 Jumpstart by David Bates

It is messy for RBOT, but it can be fixed if we:

1. Insert a bias during the VIMS_267SA_NPOLMAP002 observation, 088T03:22:50 – 03:42:50
   - VIMS has said that this should be doable per email from Ed Audi/Kevin Baines 8/03
2. Do something about the downlink rolls
   - The beginning of segment bias should occur after the first two downlink rolls, at 2017-087T17:00.
   - The short roll at 2017-087T17:32 should be killed (pending MAG approval—"MAG range 1").
   - The end of segment bias should occur before the downlink roll on DOY 89 starts. The bias could occur at 2017-089T10:50 (during YGAP).

If we do these suggestions, the RBOT picture looks good.