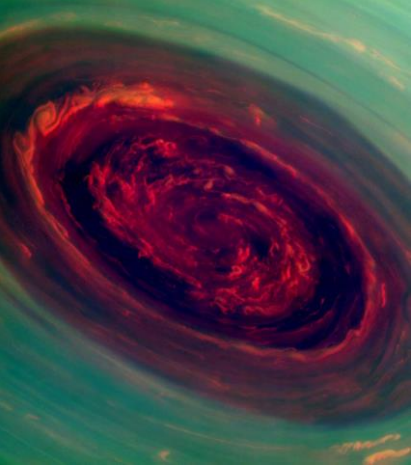

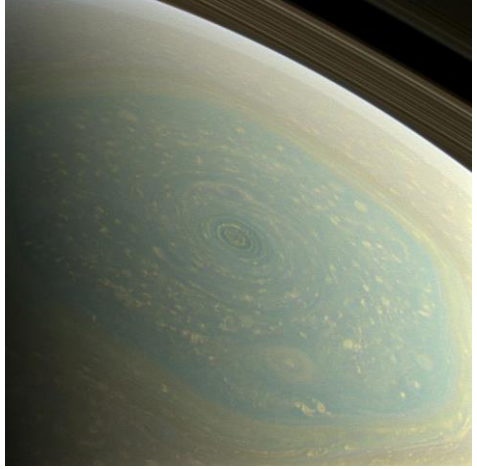
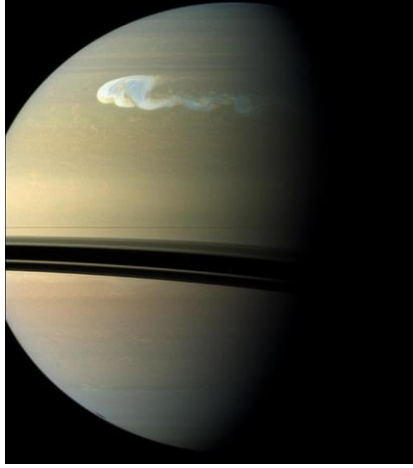

Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 215_216 Segment Legacy Package

Segment Boundary: May 11, 2015 – May 31, 2015
2015-131T18:00:00 – 2015-151T02:30:00 (SCET)

Integration Began 08/11/2014
Segment Delivered to S89 Sequence 11/07/2014
Lead Integrator was Shawn Brooks
Legacy Package Assembled by Keven Uchida

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Segment Overview and Final Products

Segment Summary

- Saturn_215_216 was a ~19.5 day segment in the second equatorial phase (EQ-2) of the Solstice Mission, encompassing both apoapse and periapse. For the majority of the segment, Saturn was observed at high phase angles.
- This segment was noteworthy in that on DOY 274 it contained the final planned suite of three joint VIMS and RADAR observations which comprised the Saturn Working Group's Deep Atmospheric Campaign. The observations were meant to reveal the meteorological role that ammonia plays in Saturn's atmosphere and how the atmosphere has changed in the aftermath the Great Storm of 2011/2012 (See Science Highlights, pages 14-15, and "Notes on the Deep Atmosphere Campaign", page 16). The high value data acquired warranted a "dual playback" of those data (See page 26), one of only a few such playbacks performed a Saturn TWT segment, over the entire course of the mission,.
- The segment was otherwise dominated by standard ORS templated mapping activities. UVIS led in the activity count, with multiple auroral slew/stare and EUV/FUV mapping observations. CIRS led a number of Far-IR, Mid-IR and compositional (COMPSIT) mapping activities. ISS performed a Saturn "feature track" observation, but otherwise concentrated on out-of-discipline activities – two Titan Monitoring Campaigns and an observation of the irregular moon Paaliaq. The other out-of- discipline activities included a MAG Cal Roll and an engineering OPNAV.
- There were a number of DSN/changes/upgrades made to accommodate science data volume, including those to facilitate the Deep Atmosphere dual playback.
- There were no ORS boresight to Sun constraints/issues in this segment.

Final Sequenced SPASS (1 of 3)

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
SATURN_215_216 Segment		2015-131T18:00:00		019T08:30:00	2015-151T02:30:00			
SP_215SA_WAYPTTURN131_PRIME		2015-131T18:00:00		000T00:30:00	2015-131T18:30:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2015-131T18:30:00**		**000T14:30:00**	**2015-132T09:00:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
MAG_215SU_CALROLL001_PRIME		2015-131T18:30:00		000T08:00:00	2015-132T02:30:00	NEG_X to Earth (0.0,0.0,-30.0 deg. offset)	Rolling	
UVIS_215SA_AURSTARE004_PRIME	I, V	2015-132T02:30:00		000T06:00:00	2015-132T08:30:00	UVIS_FUV to Saturn	NEG_X to 37.5/83.7	
SP_215EA_DLTURN132_PRIME		2015-132T08:30:00		000T00:30:00	2015-132T09:00:00	XBAND to Earth	NEG_Y to 161.81/3.35	
NEW WAYPOINT		**2015-132T09:00:00**		**000T09:40:00**	**2015-132T18:40:00**	**XBAND to Earth**	**NEG_Y to 161.81/3.35**	
SP_215EA_C34HEFOTB132_PRIME	C, N	2015-132T09:00:00		000T08:45:00	2015-132T17:45:00	XBAND to Earth	NEG_Y to 161.81/3.35	
SP_215SA_WAYPTTURN132_PRIME		2015-132T18:00:00		000T00:40:00	2015-132T18:40:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2015-132T18:40:00**		**001T12:50:00**	**2015-134T07:30:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
UVIS_215SA_EUVFUV001_PRIME	C, I	2015-132T18:40:00		000T14:15:00	2015-133T08:55:00	UVIS_FUV to Saturn	NEG_X to NSP	
CIRS_215SA_FIRMAP001_PRIME	V	2015-133T08:55:00		000T22:00:00	2015-134T06:55:00	CIRS_FP1 to Saturn	NEG_X to NSP	
SP_215EA_DLTURN134_PRIME		2015-134T06:55:00		000T00:35:00	2015-134T07:30:00	XBAND to Earth	NEG_X to 319.0/30.0	
NEW WAYPOINT		**2015-134T07:30:00**		**000T11:10:00**	**2015-134T18:40:00**	**XBAND to Earth**	**NEG_X to 319.0/30.0**	
ENGR_215SC_KPTYBIAS134_PRIME		2015-134T07:30:00		000T01:30:00	2015-134T09:00:00	POS_Z to DELTA_H (0.0,0.0,-47.999 deg. offset)	NEG_X to Sun	
SP_215EA_C70METNON134_PRIME	C	2015-134T09:00:00		000T05:45:00	2015-134T14:45:00	XBAND to Earth	NEG_X to 319.0/30.0	CDA.NEG_X to 319/30.
SP_215SA_WAYPTTURN134_PRIME		2015-134T18:00:00		000T00:40:00	2015-134T18:40:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2015-134T18:40:00**		**000T12:35:00**	**2015-135T07:15:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
VIMS_215SA_AURSTARE001_PRIME	C, I, U	2015-134T18:40:00		000T06:00:00	2015-135T00:40:00	ISS_NAC to Saturn	POS_Z to NSP	
UVIS_215SA_AURSLEW001_PRIME	C, V	2015-135T00:40:00		000T06:00:00	2015-135T06:40:00	UVIS_FUV to Saturn	POS_Z to NSP	Must point within 15 deg of Saturn Center
SP_215EA_DLTURN135_PRIME		2015-135T06:40:00		000T00:35:00	2015-135T07:15:00	XBAND to Earth	NEG_X to 319.0/30.0	
NEW WAYPOINT		**2015-135T07:15:00**		**000T11:10:00**	**2015-135T18:25:00**	**XBAND to Earth**	**NEG_X to 319.0/30.0**	
SP_215EA_YGAP135_PRIME		2015-135T07:15:00		000T01:30:00	2015-135T08:45:00	XBAND to Earth	NEG_X to 319.0/30.0	
SP_215EA_C34HEFNON135_PRIME	C	2015-135T08:45:00		000T09:00:00	2015-135T17:45:00	XBAND to Earth	NEG_X to 319.0/30.0	CDA.NEG_X to 319/30.
SP_215SA_WAYPTTURN135_PRIME		2015-135T17:45:00		000T00:40:00	2015-135T18:25:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2015-135T18:25:00**		**000T12:50:00**	**2015-136T07:15:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
CIRS_215SA_COMPSIT007_PRIME	I, M, U, V	2015-135T18:25:00		000T12:15:00	2015-136T06:40:00	CIRS_FP3 to Saturn	POS_Z to NSP	
SP_215EA_DLTURN136_PRIME	M	2015-136T06:40:00		000T00:35:00	2015-136T07:15:00	XBAND to Earth	NEG_X to 319.0/30.0	
NEW WAYPOINT		**2015-136T07:15:00**		**000T11:10:00**	**2015-136T18:25:00**	**XBAND to Earth**	**NEG_X to 319.0/30.0**	
SP_215EA_YGAP136_PRIME	M	2015-136T07:15:00		000T01:30:00	2015-136T08:45:00	XBAND to Earth	NEG_X to 319.0/30.0	
SP_215EA_C34BWGNON136_PRIME	C, M	2015-136T08:45:00		000T09:00:00	2015-136T17:45:00	XBAND to Earth	NEG_X to 319.0/30.0	CDA.NEG_X to 319/30.
SP_215SA_WAYPTTURN136_PRIME	M	2015-136T17:45:00		000T00:40:00	2015-136T18:25:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2015-136T18:25:00**		**001T12:35:00**	**2015-138T07:00:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
UVIS_215SA_EUVFUV002_PRIME	C, I, M, V	2015-136T18:25:00		000T14:00:00	2015-137T08:25:00	UVIS_FUV to Saturn	POS_Z to NSP	
CIRS_215SA_MIRMAP003_PRIME	I, M, V	2015-137T08:25:00		000T22:00:00	2015-138T06:25:00	CIRS_FP3 to Saturn	POS_Z to NSP	
SP_215EA_DLTURN138_PRIME	M	2015-138T06:25:00		000T00:35:00	2015-138T07:00:00	XBAND to Earth	NEG_X to 319.0/30.0	
NEW WAYPOINT		**2015-138T07:00:00**		**000T11:10:00**	**2015-138T18:10:00**	**XBAND to Earth**	**NEG_X to 319.0/30.0**	
ENGR_215SC_KPTYBIAS138_PRIME	M	2015-138T07:00:00		000T01:30:00	2015-138T08:30:00	NEG_Z to DELTA_H (0.0,0.0,-14.002 deg. offset)	NEG_X to Sun	
SP_215EA_C70METNON138_PRIME	C, M	2015-138T08:30:00		000T04:45:00	2015-138T13:15:00	XBAND to Earth	NEG_X to 319.0/30.0	CDA.NEG_X to 319/30.
SP_215EA_C34BWGNON138_PRIME	C, M	2015-138T13:15:00		000T04:15:00	2015-138T17:30:00	XBAND to Earth	NEG_X to 319.0/30.0	CDA.NEG_X to 319/30.
SP_215SA_WAYPTTURN138_PRIME	M	2015-138T17:30:00		000T00:40:00	2015-138T18:10:00	ISS_NAC to Saturn	POS_Z to NSP	

Gap 1

Final Sequenced SPASS (2 of 3)

NEW WAYPOINT		**2015-138T18:10:00**		**001T12:50:00**	**2015-140T07:00:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
ISS_215OT_PAAPOL063_PRIME	M	2015-138T18:10:00		001T00:00:00	2015-139T18:10:00	UVIS_FUV to Rocks (-0.082,0.0,0.0 deg. offset)	NEG_Z to Sun	
Apoapse Per = 18.9 d, inc ...		2015-139T04:31:05		000T00:00:01	2015-139T04:31:06			
VIMS_216SA_AURSTARE001_PRIME	C, I, M, U	2015-139T18:10:00		000T06:00:00	2015-140T00:10:00	ISS_NAC to Saturn	POS_Z to NSP	
UVIS_216SA_AURSLEW001_PRIME	C, M, V	2015-140T00:10:00		000T06:15:00	2015-140T06:25:00	UVIS_FUV to Saturn	POS_Z to NSP	Must point within 15 deg of Saturn Center
SP_216EA_DLTURN140_PRIME	M	2015-140T06:25:00		000T00:35:00	2015-140T07:00:00	XBAND to Earth	NEG_X to 314.0/30.0	
NEW WAYPOINT		**2015-140T07:00:00**		**000T11:10:00**	**2015-140T18:10:00**	**XBAND to Earth**	**NEG_X to 314.0/30.0**	
SP_216EA_YGAP140_PRIME	M	2015-140T07:00:00		000T01:30:00	2015-140T08:30:00	XBAND to Earth	NEG_X to 314.0/30.0	
SP_216EA_C34BWGNON140_PRIME	C, M	2015-140T08:30:00		000T09:00:00	2015-140T17:30:00	XBAND to Earth	Rolling/SRU	CDA.NEG_X to 314/40.SRU.
SP_216SA_WAYPTTURN140_PRIME		2015-140T17:30:00		000T00:40:00	2015-140T18:10:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2015-140T18:10:00**		**001T12:35:00**	**2015-142T06:45:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
ISS_216TI_M120R2HZ140_PRIME	C, V	2015-140T18:10:00	E216_M120R2HZ140+000T00:00:00	000T01:30:00	2015-140T19:40:00	ISS_NAC to Titan	POS_Z to NSP	No Preference to secondary pointing
UVIS_216SA_EUVFUV001_PRIME	C, I, M, V	2015-140T19:40:00		000T16:00:00	2015-141T11:40:00	UVIS_FUV to Saturn	POS_Z to NSP	
CIRS_216SA_COMPSIT004_PRIME	I, M, U, V	2015-141T11:40:00		000T17:00:00	2015-142T04:40:00	CIRS_FP3 to Saturn	POS_Z to NSP	
NAV_216SK_OPNAV421_PRIME		2015-142T04:40:00		000T01:30:00	2015-142T06:10:00	ISS_NAC to Satellites	POS_Z to NSP	No Preference to secondary pointing. Starts at waypoint, ends at same waypoint
SP_216EA_DLTURN142_PRIME		2015-142T06:10:00		000T00:35:00	2015-142T06:45:00	XBAND to Earth	NEG_X to 314.0/30.0	
NEW WAYPOINT		**2015-142T06:45:00**		**000T11:10:00**	**2015-142T17:55:00**	**XBAND to Earth**	**NEG_X to 314.0/30.0**	
SP_216EA_YGAP142_PRIME		2015-142T06:45:00		000T01:30:00	2015-142T08:15:00	XBAND to Earth	NEG_X to 314.0/30.0	
SP_216EA_C70METNON142_PRIME	C	2015-142T08:15:00		000T05:00:00	2015-142T13:15:00	XBAND to Earth	Rolling/SRU	CDA.NEG_X to 314/40.SRU.
SP_216EA_C34HEFNON142_PRIME	C	2015-142T13:15:00		000T03:35:00	2015-142T16:50:00	XBAND to Earth	Rolling/SRU	CDA.NEG_X to 314/40.SRU.
SP_216SA_WAYPTTURN142_PRIME		2015-142T17:15:00		000T00:40:00	2015-142T17:55:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2015-142T17:55:00**		**001T12:50:00**	**2015-144T06:45:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
CIRS_216SA_MIRMAP002_PRIME	I, V	2015-142T17:55:00		000T22:00:00	2015-143T15:55:00	CIRS_FP3 to Saturn	POS_Z to NSP	Coadd to save data volume
UVIS_216SA_AURSLEW002_PRIME	C, V	2015-143T15:55:00		000T07:00:00	2015-143T22:55:00	UVIS_FUV to Saturn	POS_Z to NSP	Must point within 15 deg of Saturn Center
VIMS_216SA_AURSTARE002_PRIME	C, I, U	2015-143T22:55:00		000T07:10:00	2015-144T06:05:00	ISS_NAC to Saturn	POS_Z to NSP	
SP_216EA_DLTURN144_PRIME		2015-144T06:05:00		000T00:40:00	2015-144T06:45:00	XBAND to Earth	POS_X to 135.8/-36.1	
NEW WAYPOINT		**2015-144T06:45:00**		**000T11:10:00**	**2015-144T17:55:00**	**XBAND to Earth**	**POS_X to 135.8/-36.1**	
SP_216EA_YGAP144_PRIME		2015-144T06:45:00		000T01:30:00	2015-144T08:15:00	XBAND to Earth	POS_X to 135.8/-36.1	
SP_216EA_C70METNON144_PRIME	C, E	2015-144T08:15:00		000T09:00:00	2015-144T17:15:00	XBAND to Earth	Rolling/SRU	CDA.NEG_X to 314/40.SRU.
SP_216SA_WAYPTTURN144_PRIME		2015-144T17:15:00		000T00:40:00	2015-144T17:55:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2015-144T17:55:00**		**001T06:35:00**	**2015-146T00:30:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
UVIS_216SA_EUVFUV002_PRIME	C, I, V	2015-144T17:55:00		000T14:00:00	2015-145T07:55:00	UVIS_FUV to Saturn	POS_Z to NSP	
ISS_216SA_FEAT16H001_PRIME	C, U, V	2015-145T07:55:00		000T16:00:00	2015-145T23:55:00	ISS_NAC to Saturn	POS_Z to NSP	
SP_216EA_DLTURN145_PRIME		2015-145T23:55:00		000T00:35:00	2015-146T00:30:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
NEW WAYPOINT		**2015-146T00:30:00**		**000T10:30:00**	**2015-146T11:00:00**	**XBAND to Earth (0.0,0.0,-9.5 deg. offset)**	**NEG_Y to Saturn**	
SP_216EA_YGAP146_PRIME		2015-146T00:30:00		000T01:30:00	2015-146T02:00:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
SP_216EA_G70METNON146_PRIME	C	2015-146T02:15:00		000T01:55:00	2015-146T04:10:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	Rolling/SRU	MIMI.NEG_Y to Saturn (0,0,-9.5).SRU.
SP_216EA_G34BWGNON146_PRIME	C	2015-146T04:10:00		000T02:30:00	2015-146T06:40:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	Rolling/SRU	MIMI.NEG_Y to Saturn (0,0,-9.5).SRU.
SP_216EA_C70METNON146_PRIME	C	2015-146T06:40:00		000T01:25:00	2015-146T08:05:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	Rolling/SRU	MIMI.NEG_Y to Saturn (0,0,-9.5).SRU.
SP_216EA_C34BWGNON146_PRIME	C	2015-146T08:05:00		000T02:40:00	2015-146T10:45:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	Rolling/SRU	MIMI.NEG_Y to Saturn (0,0,-9.5).SRU.
SP_216SA_WAYPTTURN146_PRIME		2015-146T10:45:00		000T00:15:00	2015-146T11:00:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2015-146T11:00:00**		**000T19:41:00**	**2015-147T06:41:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
VIMS_216SA_GLOBALMAP001_PRIME	C, I	2015-146T11:00:00		000T19:00:00	2015-147T06:00:00	ISS_NAC to Saturn	NEG_X to NSP	
SP_216EA_DLTURN147_PRIME		2015-147T06:11:00		000T00:30:00	2015-147T06:41:00	XBAND to Earth	POS_X to NSP	

Gap 2

Gap 3

Gap 4

Final Sequenced SPASS (3 of 3)

NEW WAYPOINT		**2015-147T06:41:00**		**000T10:49:00**	**2015-147T17:30:00**	**XBAND to Earth**	**POS_X to NSP**	
ENGR_216SC_KPTYBIAS147_PRIME		2015-147T06:41:00		000T01:19:00	2015-147T08:00:00	NEG_Z to DELTA_H (0.0,0.0,42.001 deg. offset)	NEG_X to Sun	
SP_216EA_C70METNON147_PRIME	C	2015-147T08:00:00		000T08:45:00	2015-147T16:45:00	XBAND to Earth	POS_X to NSP	CAPS.POS_X to 40.6/83.5 (NSP) or NEP.SRU.
SP_216SA_WAYPTTURN147_PRIME		2015-147T17:00:00		000T00:30:00	2015-147T17:30:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2015-147T17:30:00**		**001T14:45:00**	**2015-149T08:15:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
Begin Dual Playback Science		2015-147T17:29:59		000T00:00:01	2015-147T17:30:00			
VIMS_216SA_DEEPDYN001_PIE		2015-147T17:30:00		000T11:40:00	2015-148T05:10:00	ISS_NAC to Saturn	NEG_X to NSP	PIE
RADAR_216SA_GLOBALMAP003_PIE	E, M	2015-148T05:40:00		000T15:30:00	2015-148T21:10:00	NEG_Z to Saturn	NEG_X to NSP	
Periapse R = 4.125 Rs, lat ...		2015-148T14:53:30		000T00:00:01	2015-148T14:53:31			
VIMS_216SA_DEEPDYN002_PIE	M	2015-148T21:40:00		000T10:00:00	2015-149T07:40:00	ISS_NAC to Saturn	NEG_X to NSP	PIE
End Dual Playback Science		2015-149T01:00:00		000T00:00:01	2015-149T01:00:01			
SP_216EA_DLTURN149_PRIME		2015-149T07:40:00		000T00:35:00	2015-149T08:15:00	XBAND to Earth	NEG_X to NSP	
NEW WAYPOINT		**2015-149T08:15:00**		**000T11:00:00**	**2015-149T19:15:00**	**XBAND to Earth**	**NEG_X to NSP**	
SP_216EA_C70METNON149_PRIME	C	2015-149T08:15:00		000T06:40:00	2015-149T14:55:00	XBAND to Earth	Rolling	CAPS.NEG_X to 40.6/83.5 (NSP) or NEP.
SP_216EA_C34BWGNON149_PRIME	C	2015-149T14:55:00		000T02:20:00	2015-149T17:15:00	XBAND to Earth	Rolling	CAPS.NEG_X to 40.6/83.5 (NSP) or NEP.
Pointer Reset in preparatio...		2015-149T17:15:00		000T00:00:01	2015-149T17:15:01			
ENGR_216SC_RWABIAS149_PRIME		2015-149T17:15:00		000T01:30:00	2015-149T18:45:00	XBAND to Earth	NEG_X to NSP	
SP_216SA_WAYPTTURN149_PRIME		2015-149T18:45:00		000T00:30:00	2015-149T19:15:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2015-149T19:15:00**		**000T08:45:00**	**2015-150T04:00:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
ISS_216TI_M150R2HZ149_PRIME	C, V	2015-149T19:15:00	E216_M150R2HZ149+000T00:00:00	000T01:30:00	2015-149T20:45:00	ISS_NAC to Titan	NEG_X to NSP	No Preference to secondary pointing. No Preference to secondary pointing
UVIS_216SA_AURSLEW003_PRIME	C, V	2015-149T20:45:00		000T06:50:00	2015-150T03:35:00	UVIS_FUV to Saturn	NEG_X to NSP	Must point within 15 deg of Saturn Center
SP_216EA_DLTURN150_PRIME		2015-150T03:35:00		000T00:25:00	2015-150T04:00:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
NEW WAYPOINT		**2015-150T04:00:00**		**000T04:25:00**	**2015-150T08:25:00**	**XBAND to Earth (0.0,0.0,-9.5 deg. offset)**	**NEG_Y to Saturn**	
SP_216EA_G70METNON150_PRIME		2015-150T04:00:00		000T04:00:00	2015-150T08:00:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	Rolling/SRU	MIMI.NEG_Y to Saturn (0,0,-9.5).SRU.
SP_216SA_WAYPTTURN150_PRIME		2015-150T08:00:00		000T00:25:00	2015-150T08:25:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2015-150T08:25:00**		**000T08:20:00**	**2015-150T16:45:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
VIMS_216SA_AURSTARE003_PRIME	C, I, U	2015-150T08:25:00		000T07:50:00	2015-150T16:15:00	ISS_NAC to Saturn	NEG_X to NSP	Collaborative Rider(s): ISS
SP_216EA_DLTURN450_PRIME	R	2015-150T16:15:00		000T00:30:00	2015-150T16:45:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
NEW WAYPOINT		**2015-150T16:45:00**		**000T10:15:00**	**2015-151T03:00:00**	**XBAND to Earth (0.0,0.0,-9.5 deg. offset)**	**NEG_Y to Saturn**	
SP_216EA_YGAP150_PRIME	R	2015-150T16:45:00		000T01:30:00	2015-150T18:15:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	NEG_Y to Saturn	
SP_216EA_M70METNON150_PRIME	C, R	2015-150T18:15:00		000T08:15:00	2015-151T02:30:00	XBAND to Earth (0.0,0.0,-9.5 deg. offset)	Rolling	MIMI.NEG_Y to Saturn (0,0,-9.5).

Gap 5

Final Sequenced SMT and Data Volume (1 of 3)

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_215EA_C34HEFOTB132_PRIME	132 09:00	132 17:45	33	1003	63	1100	3322	2223	0	484	52	1635	904	-731	0	0%	731
SP_215EA_C70METNON134_PRIME	134 09:00	134 14:45	731	1442	166	2339	3322	983	0	123	34	2496	2486	-11	0	0%	10
SP_215EA_C34HEFNON135_PRIME	135 08:45	135 17:45	10	737	76	823	3322	2499	0	199	53	1075	982	-94	415	4%	93
SP_215EA_C34BWGNON136_PRIME	136 08:45	136 17:45	93	782	63	938	3322	2384	0	199	53	1191	919	-272	415	4%	271
SP_215EA_C70METNON138_PRIME	138 08:30	138 13:15	271	1958	164	2393	3322	929	0	100	28	2521	2031	-490	415	4%	490
SP_215EA_C34BWGNON138_PRIME	138 13:15	138 17:30	490	0	0	490	3322	2832	0	99	25	614	438	-177	415	5%	176
SP_216EA_C34BWGNON140_PRIME	140 08:30	140 17:30	176	1566	165	1907	3322	1415	0	199	53	2159	919	-1240	415	5%	1240
SP_216EA_C70METNON142_PRIME	142 08:15	142 13:15	1240	1504	164	2907	3322	415	0	106	29	3043	2141	-902	913	8%	902
SP_216EA_C34HEFNON142_PRIME	142 13:15	142 16:50	902	0	0	902	3322	2420	0	84	21	1007	395	-613	913	7%	612
SP_216EA_C70METNON144_PRIME	144 08:15	144 17:15	612	1631	167	2409	3322	913	0	178	53	2641	3876	1234	2002	16%	0
SP_216EA_G70METNON146_PRIME	146 02:15	146 04:10	0	1939	139	2079	3322	1243	0	37	11	2127	672	-1456	767	8%	1455
SP_216EA_G34BWGNON146_PRIME	146 04:10	146 06:40	1455	0	0	1455	3322	1867	0	58	15	1528	234	-1294	767	6%	1294
SP_216EA_C70METNON146_PRIME	146 06:40	146 08:05	1294	0	0	1294	3322	2028	0	33	8	1335	431	-905	767	6%	904
SP_216EA_C34BWGNON146_PRIME	146 08:05	146 10:45	904	0	0	904	3322	2418	0	62	16	982	271	-712	767	6%	712
SP_216EA_C70METNON147_PRIME	147 08:00	147 16:45	712	1754	90	2555	3322	767	0	245	52	2851	3786	934	1878	14%	0
SP_216EA_C70METNON149_PRIME	149 08:15	149 14:55	0	2210	169	2379	3322	943	0	145	39	2563	2889	325	1195	12%	0
SP_216EA_C34BWGNON149_PRIME	149 14:55	149 17:15	0	0	0	0	3322	3322	0	54	14	68	222	153	869	12%	0
SP_216EA_G70METNON150_PRIME	150 04:00	150 08:00	0	2175	45	2221	3322	1101	0	180	24	2425	1719	-707	716	10%	706
SP_216EA_M70METNON150_PRIME	150 18:15	151 02:30	706	778	43	1528	3322	1794	0	340	49	1916	2632	716	716	11%	0

Final Sequenced SMT and Data Volume (2 of 3)

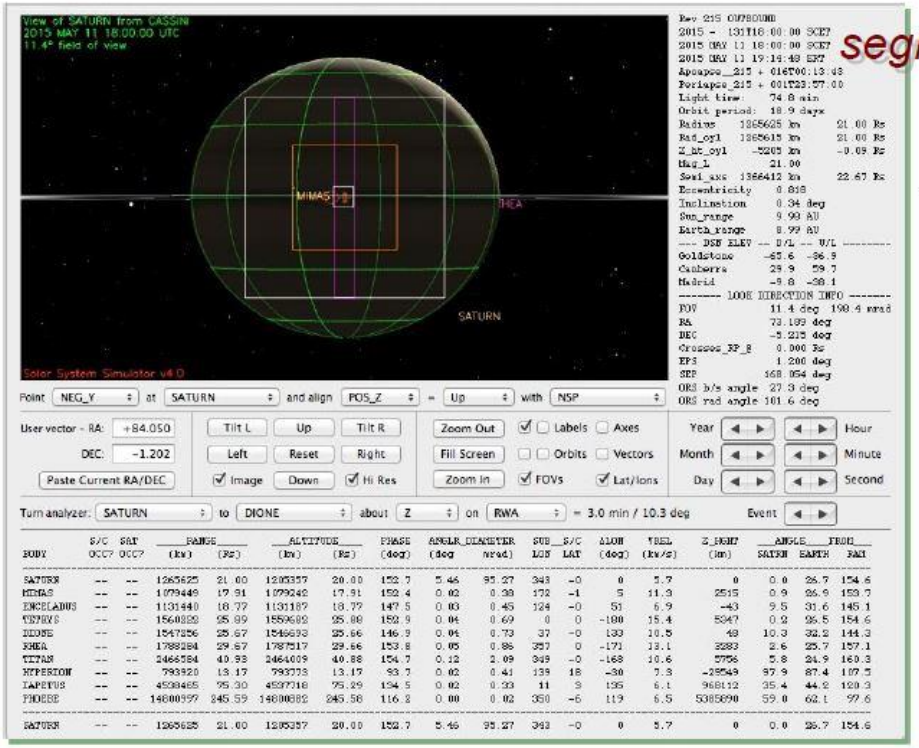
DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

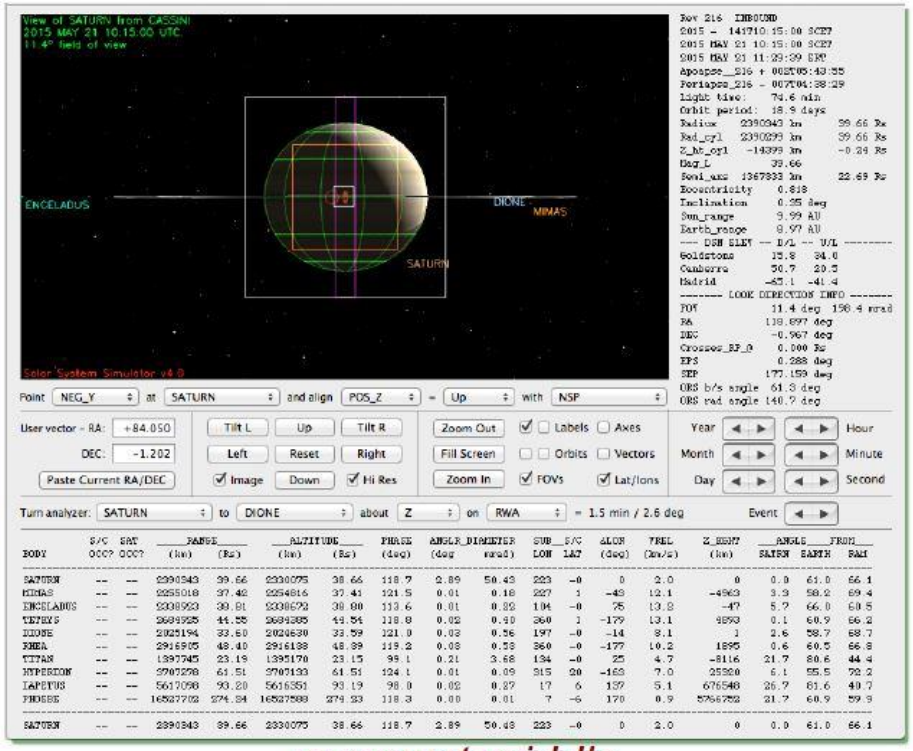
Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
OBSERVATION_NOR	131 18:00	132 09:00	0.0	28.3	0.0	5.4	60.0	69.4	45.9	0.0	564.3	113.1	108.0	0.0	62.7	1057.0
SP_215EA_C34HEFOTB132_PRIME	132 09:00	132 17:45	0.0	16.5	83.7	3.2	0.0	15.6	26.8	0.0	329.2	4.8	0.0	0.0	0.0	479.6
DAILY TOTAL SCIENCE	131 18:00	132 17:45	0.0	44.8	83.7	8.6	60.0	84.9	72.7	0.0	893.4	117.9	108.0	0.0	62.7	
OBSERVATION_NOR	132 17:45	134 09:00	0.0	74.0	422.1	14.1	50.0	69.8	120.1	0.0	390.7	258.3	30.0	0.0	164.0	1593.2
SP_215EA_C70METNON134_PRIME	134 09:00	134 14:45	0.0	10.8	51.3	2.1	0.0	10.2	17.6	0.0	27.1	3.2	0.0	0.0	0.0	122.3
DAILY TOTAL SCIENCE	132 17:45	134 14:45	0.0	84.9	473.4	16.2	50.0	80.0	137.7	0.0	417.9	261.4	30.0	0.0	164.0	
OBSERVATION_NOR	134 14:45	135 08:45	0.0	34.0	121.5	6.5	120.0	32.0	55.1	0.0	84.9	132.2	144.0	0.0	75.2	805.4
SP_215EA_C34HEFNON135_PRIME	135 08:45	135 17:45	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	134 14:45	135 17:45	0.0	50.9	207.9	9.7	120.0	48.0	82.6	0.0	127.3	137.2	144.0	0.0	75.2	
OBSERVATION_NOR	135 17:45	136 08:45	0.0	28.3	176.4	5.4	10.0	26.7	45.9	0.0	70.7	44.4	367.0	0.0	62.7	837.5
SP_215EA_C34BWGNON136_PRIME	136 08:45	136 17:45	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	135 17:45	136 17:45	0.0	45.3	262.8	8.6	10.0	42.7	73.4	0.0	113.2	49.3	367.0	0.0	62.7	
OBSERVATION_NOR	136 17:45	138 08:30	0.0	73.1	417.6	14.0	101.5	68.9	118.6	0.0	182.7	253.6	710.0	0.0	162.0	2101.9
SP_215EA_C70METNON138_PRIME	138 08:30	138 13:15	0.0	9.0	40.5	1.7	0.0	8.4	14.5	0.0	22.4	2.6	0.0	0.0	0.0	99.2
SP_215EA_C34BWGNON138_PRIME	138 13:15	138 17:30	0.0	8.0	45.9	1.5	0.0	7.6	13.0	0.0	20.0	2.3	0.0	0.0	0.0	98.4
DAILY TOTAL SCIENCE	136 17:45	138 17:30	0.0	90.1	504.0	17.2	101.5	84.9	146.1	0.0	225.2	258.6	710.0	0.0	162.0	
OBSERVATION_NOR	138 17:30	140 08:30	0.0	73.6	88.2	14.0	720.0	69.4	119.3	0.0	183.9	135.0	148.0	0.0	163.0	1714.4
SP_216EA_C34BWGNON140_PRIME	140 08:30	140 17:30	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	138 17:30	140 17:30	0.0	90.5	174.6	17.3	720.0	85.4	146.9	0.0	226.4	139.9	148.0	0.0	163.0	
OBSERVATION_NOR	140 17:30	142 08:15	0.0	73.1	381.6	14.0	95.0	68.9	118.6	0.0	182.7	351.4	196.0	0.0	162.0	1643.3
OBSERVATION_SI	140 17:30	142 08:15	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
SP_216EA_C70METNON142_PRIME	142 08:15	142 13:15	0.0	9.4	43.2	1.8	0.0	8.9	15.3	0.0	23.6	2.7	0.0	0.0	0.0	104.9
SP_216EA_C34HEFNON142_PRIME	142 13:15	142 16:50	0.0	6.8	38.7	1.3	0.0	6.4	11.0	0.0	16.9	2.0	0.0	0.0	0.0	83.0
DAILY TOTAL SCIENCE	140 17:30	142 16:50	0.0	89.3	463.5	17.0	103.7	84.2	144.8	0.0	223.2	356.1	196.0	0.0	162.0	

Final Sequenced SMT and Data Volume (3 of 3)

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	142 16:50	144 08:15	0.0	74.4	264.9	14.2	194.8	35.4	120.6	0.0	129.7	153.0	629.0	0.0	164.7	1780.7
SP_216EA_C70METNON144_PRIME	144 08:15	144 17:15	0.0	17.0	86.4	3.2	0.0	8.0	27.5	0.0	29.5	4.9	0.0	0.0	0.0	176.6
DAILY TOTAL SCIENCE	142 16:50	144 17:15	0.0	91.3	351.3	17.4	194.8	43.4	148.2	0.0	159.2	157.9	629.0	0.0	164.7	
OBSERVATION_NOR	144 17:15	146 02:15	0.0	62.3	216.0	11.9	663.9	29.6	101.0	0.0	108.5	398.7	330.0	0.0	137.9	2059.6
SP_216EA_G70METNON146_PRIME	146 02:15	146 04:10	0.0	3.6	12.6	0.7	0.0	3.4	5.9	0.0	9.0	1.1	0.0	0.0	0.0	36.3
SP_216EA_G34BWGNON146_PRIME	146 04:10	146 06:40	0.0	4.7	27.0	0.9	0.0	4.4	7.6	0.0	11.8	1.4	0.0	0.0	0.0	57.9
SP_216EA_C70METNON146_PRIME	146 06:40	146 08:05	0.0	2.7	15.3	0.5	0.0	2.5	4.3	0.0	6.7	0.8	0.0	0.0	0.0	32.8
SP_216EA_C34BWGNON146_PRIME	146 08:05	146 10:45	0.0	5.0	28.8	1.0	0.0	4.7	8.2	0.0	12.6	1.5	0.0	0.0	0.0	61.7
DAILY TOTAL SCIENCE	144 17:15	146 10:45	0.0	78.3	299.7	14.9	663.9	44.7	127.0	0.0	148.5	403.3	330.0	0.0	137.9	
OBSERVATION_NOR	146 10:45	147 08:00	0.0	40.1	136.8	7.7	500.0	37.8	65.0	0.0	100.2	0.0	850.0	0.0	88.8	1826.4
SP_216EA_C70METNON147_PRIME	147 08:00	147 16:45	0.0	67.6	83.7	3.2	0.0	15.6	26.8	0.0	41.0	4.8	0.0	0.0	0.0	242.6
DAILY TOTAL SCIENCE	146 10:45	147 16:45	0.0	107.7	220.5	10.8	500.0	53.4	91.8	0.0	141.2	4.8	850.0	0.0	88.8	
OBSERVATION_NOR	147 16:45	149 08:15	0.0	230.8	2.7	25.1	0.0	92.0	120.9	65.7	452.5	0.1	1200.0	0.0	165.1	2354.9
SP_216EA_C70METNON149_PRIME	149 08:15	149 14:55	0.0	12.6	61.2	2.4	0.0	11.9	20.4	0.0	31.2	3.7	0.0	0.0	0.0	143.3
SP_216EA_C34BWGNON149_PRIME	149 14:55	149 17:15	0.0	4.4	25.2	0.8	0.0	4.1	7.1	0.0	10.9	1.3	0.0	0.0	0.0	53.9
DAILY TOTAL SCIENCE	147 16:45	149 17:15	0.0	247.7	89.1	28.4	0.0	108.0	148.4	65.7	494.6	5.1	1200.0	0.0	165.1	
OBSERVATION_NOR	149 17:15	150 04:00	0.0	20.3	70.8	3.9	35.0	19.1	32.9	0.0	338.5	123.8	119.0	0.0	1437.4	2200.7
SP_216EA_G70METNON150_PRIME	150 04:00	150 08:00	0.0	7.5	0.0	1.4	0.0	7.1	12.2	0.0	150.5	0.0	0.0	0.0	0.0	178.8
DAILY TOTAL SCIENCE	149 17:15	150 08:00	0.0	27.8	70.8	5.3	35.0	26.2	45.1	0.0	489.0	123.8	119.0	0.0	1437.4	
OBSERVATION_NOR	150 08:00	150 18:15	0.0	19.3	56.4	13.8	156.2	18.2	31.4	0.0	385.6	28.4	62.0	0.0	42.8	814.1
SP_216EA_M70METNON150_PRIME	150 18:15	151 02:30	0.0	15.6	78.3	3.0	0.0	14.7	25.2	0.0	195.2	4.5	0.0	0.0	0.0	336.5
DAILY TOTAL SCIENCE	150 08:00	151 02:30	0.0	34.9	134.7	16.7	156.2	32.9	56.6	0.0	580.8	32.9	62.0	0.0	42.8	

Segment Geometry (1 of 2)

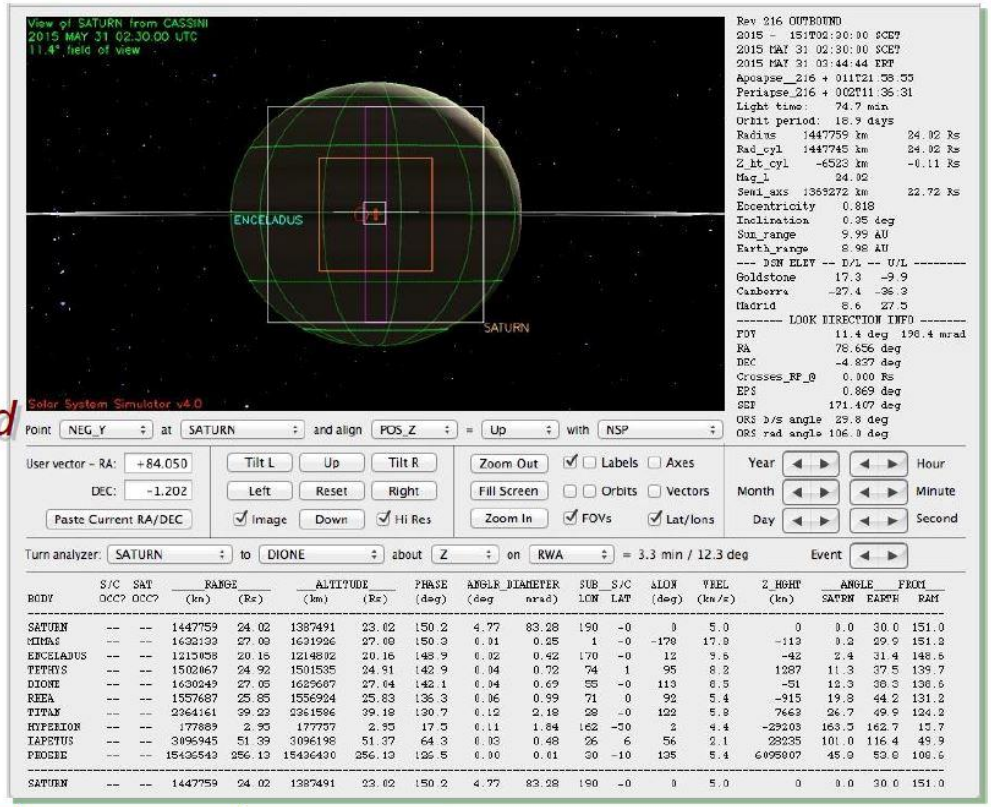




	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	21.0 R_{Sat}	152.7°	0°
Apoapse	41.2 R_{Sat}	125.3°	0°
Periapse	4.1 R_{Sat}	54.5°	0°
Segment End	24.0 R_{Sat}	150.2°	0°

Segment Geometry (2 of 2)

segment end



	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	21.0 R_{Sat}	152.7°	0°
Apoapse	41.2 R_{Sat}	125.3°	0°
Periapse	4.1 R_{Sat}	54.5°	0°
Segment End	24.0 R_{Sat}	150.2°	0°

Solar Geometry – ORS Boresight Concerns

No ORS Boresight Solar Constraints on Science Pointing

Daily Science Highlights (1 of 4)

DOY 131 (11 May 2015): The `Saturn_215_216` segment began on this day. In addition to the MAPS instruments setting up their instruments to survey the outer magnetosphere, MAG executed a calibration roll. UVIS rode along, mapping out the distribution of interplanetary hydrogen across the sky.

DOY 132 (12 May 2015): UVIS began the day's science activities with a coordinated observation of Saturn's aurora. Following a nine-hour downlink, UVIS turned back to Saturn to map out the planet's disk in the ultraviolet. ISS simultaneously imaged the planet with its wide angle camera through its polarization filters while CIRS acquires mid- and far infrared spectra at moderate spectral resolution.

DOY 133 (13 May 2015): After UVIS' EUVFUV observation of Saturn, CIRS trained its far infrared detector on Saturn and continuously scans across the planet's disk for twenty-two hours to map out temperatures in Saturn's upper troposphere and tropopause.

DOY 134 (14 May 2015): DOY 134 began with a downlink to relay the previous' days observations. VIMS then trained its telescope at Saturn to observe the aurora at Saturn's southern polar regions. CIRS, ISS and UVIS took auroral data at the same time.

DOY 135 (15 May 2015): Following VIMS' stare at Saturn's southern aurorae, UVIS took a turn imaging the aurorae in own fashion, repeatedly slewing across the entire auroral oval. Following a downlink, CIRS stared at Saturn to derive atmospheric composition.

DOY 136 (16 May 2015): As the day began, CIRS completed the previous day's COMPSIT observation before the spacecraft was commanded to turn its high gain antenna back to Earth to relay data. At the end of DOY 136 UVIS executed another EUVFUV observation, producing spectral images of the planet.

DOY 137 (17 May 2015): Following the end of the UVIS observation CIRS executed a dedicated stare at a particular latitude on Saturn to derive temperatures using its mid-infrared sensors. This observation rounded out the day's science activities.

DOY 138 (18 May 2015): Most of DOY 138 was taken up with the continuation of the CIRS MIRMAP and a downlink. The day ended with the start of a day-long ISS observation of Paaliaq, one of Saturn's distant irregular moons. This observation will help determine Paaliaq's rotation rate and shape.

DOY 139 (19 May 2015): At the conclusion of ISS' Paaliaq observation, VIMS turned towards Saturn's poles to observe the southern aurora at high spatial resolution.

Daily Science Highlights (2 of 4)

DOY 140 (20 May 2015): After VIMS completed its auroral imaging UVIS slewed repeatedly across Saturn's auroral oval in an observation intended to complement the VIMS auroral imaging. After the previously recorded data are relayed to Earth Cassini turned towards Titan to monitor that moon for changes in its dynamic atmosphere. The day concluded with UVIS imaging Saturn in the ultraviolet.

DOY 141 (21 May 2015): DOY 141 saw the conclusion of the UVIS ultraviolet imaging started the previous day and a CIRS stare at a determined location to derive compositional information in the infrared.

DOY 142 (22 May 2015): Following CIRS' compositional stare Cassini's cameras took images of distant objects intended to help determine the spacecraft's precise location in orbit around Saturn. After a downlink CIRS then pursued a nearly day-long observation staring at a chosen latitude to derive more compositional information.

DOY 143 (23 May 2015): Following the completion of the CIRS MIRMAP which began the day before UVIS and then VIMS took turns observing Saturn's southern aurorae.

DOY 144 (24 May 2015): At the conclusion of VIMS' auroral stare the spacecraft turned to Earth to downlink the bounty of data collected during the previous two days. Science activities resumed with UVIS imaging Saturn in the ultraviolet. These repeated ultraviolet mappings are meant to determine how the planet's appearance changes with observing geometry so that scientists can use it to study Saturn's atmospheric make-up.

DOY 145 (25 May 2015): The next science observation after the UVIS EUVFUV was a sixteen-hour ISS observation intended to image a variety of latitudes on Saturn at a range of zenith, or emission, angles. The other optical remote sensing instruments came along for the ride.

DOY 146 (26 May 2015): As the day began, the spacecraft was relaying data to Earth. Following this downlink VIMS began taking repeated mosaics of Saturn through 1.5 rotations of the planet over the course of 19 hours.

DOY 147 (27 May 2015): DOY 147 saw the first in a set of three joint VIMS and RADAR observations which comprised the Saturn Working Group's Deep Atmosphere campaign. This observation campaign was intended to reveal the meteorological role that ammonia plays in Saturn's atmosphere and how the atmosphere has changed in the aftermath of the Great Storm of 2010/2011. VIMS's role in this study is to detect NH_3 condensates (*i.e.* clouds) and determine wind conditions as it takes mosaics of the planet every 90 minutes. This suite of observations, which represented one of the highest value science goals for the Saturn Working Group, was protected via a dual playback, which was a first for the SWG. It was the third and final such observation suite planned for the remainder of the Cassini mission.

Daily Science Highlights (3 of 4)

DOY 148 (28 May 2015): The next observation in the Deep Atmospheres campaign, a global radar map, started on this day. RADAR mapped out the ammonia concentrations as the planet rotated beneath the spacecraft.

DOY 149 (29 May 2015): VIMS finished off the Deep Atmospheres campaign set of observations, bracketing the RADAR measurements in order to document any changes in wind conditions over the course of the observation suite. After the Deep Atmosphere campaign data were sent back to Earth Cassini turned towards Titan to look for any recent changes in its atmosphere. The day was rounded out by UVIS focusing again on Saturn's aurorae.

DOY 150 (30 May 2015): A short downlink initiated the second playback the first 31.5 hours of the Deep Atmospheres campaign. It was the largest dual playback ever attempted by the Cassini project. Following this downlink, VIMS performed a mosaic of the planet's northern auroral region, as CIRS, ISS and UVIS simultaneously took data as well. During the final downlink of the `Saturn_215_216` segment RSS executed an operational readiness test over Madrid's DSS-55 station in anticipation of their D4 Dione gravity experiment on DOY 167.

Notes on the Deep Atmosphere Campaign

Some salient points about the Deep Atmosphere Campaign (taken from K. Baines and M. Janssen):

•(1) The Deep Atmosphere Campaign was the highest-priority science for Saturn for the Extended and Solstice Missions, as evidenced by the very large number of PIE hours spent to secure it. Thirty percent of the Saturn PIE budget was spent on this, with ~10% of the budget spent on each of the 3 observations comprising the total Campaign.

•(2) This, the third observation set, is the "last and final" opportunity. There are no others scheduled, and it is really unthinkable that another one could be scheduled, as these require equatorial orbits with back-to-back observations centered on Saturn periapse that span nearly two days.

•(3) Saturn cooperated tremendously by producing the most powerful storm ever seen on Saturn just as this campaign began. (As one piece of evidence of this statement: the thunderstorm lofted water more than 200 km from the depths where it freely exists to the very upper atmosphere where it showed up as condensed ice.) Deep Campaign #1 actually was able to observe the storm in the act. A surprising behavior of the storm discovered by RADAR is that the storm dried out the atmosphere of nearly all ammonia vapor as it progressed westward. The atmosphere lost virtually all of its clouds as well. A follow-up set of ammonia vapor observations in Campaign #2 was collected by RADAR in January 2012, showing how the atmosphere looked just after the storm stopped. However, that data was lost, as thunderstorms over Spain disrupted the signal. The Saturn Working Group was dismayed by the loss of 13% of its PIE science; the aftermath of the Great Storm is of paramount interest, and it was a disaster to lose the entire map.

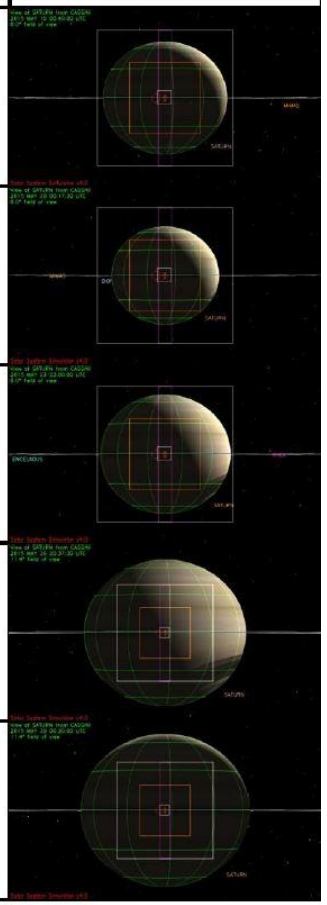
This final campaign #3 was a chance to once again investigate the storm's aftermath and observe the extent to which the dried-out atmosphere has recovered. Has "Saturn's desert" created by the storm 4 years ago recovered? Ancillary VIMS observations of "Storm Alley" indicate it probably has not: it is still remarkably clear of aerosols and clouds. Other than the 2010-2011 storm the remainder of the atmosphere has remained remarkably stable throughout the 2005-2011 time period. Yet, this stability appears to contradict Earth-based measurements obtained in the 1990s, and we have a chance in the upcoming mapping campaign to significantly extend our base for stability or to discover a transition to a new regime.

•(4) The campaign was comprised of two VIMS full-rotation maps bracketing a RADAR full-rotation observation that is centered at periapse. This gave RADAR the highest possible spatial resolution it could get, which only is comparable to the other remote sensing instruments near periapse. RADAR – passively observing Saturn's 2-cm radiation – was very sensitive to absorption by ammonia vapor, a key component of Saturn's meteorology and a prime constituent of several different cloud layers (*e.g.* ammonia hydrosulfide, ammonia-water solution clouds, and condensed ammonia clouds itself). However, RADAR can not see the clouds themselves. Complementary VIMS observations allow scientists to determine the cloud content.

Working together RADAR and VIMS could get both the gaseous component and the non-gaseous (liquid or ice) components of ammonia within and around the clouds, information which can provide unique insights into Saturn's meteorology and vertical circulation. But to do this correctly, the two data sets needed to be co-aligned by taking the winds into account. The two sets of VIMS images - taken before and after the RADAR observation – allow us to interpolate and tell exactly what the cloud content was over every spot that RADAR gets ammonia humidity for.

Segment Integration Planning

Timeline Gaps and Suggested Observations

Gap	Start	End	Duration	Phase angle	Range	Sub-S/C Lat.	Snapshot (mid-gap)
1	2015-134T18:40:00	2015-135T06:40:00	000T12:00:00	138.7° – 136.9°	34.9 – 36.3 R_s	0° - 0°	
	Suggested Observation: UVIS/VIMS-ISS Auroral Stare/Slew						
2	2015-139T18:10:00	2015-140T06:25:00	000T12:15:00	123.6° – 122.2°	41.4 – 40.8 R_s	0° - 0°	
	Suggested Observation: UVIS/VIMS-ISS Auroral Stare/Slew						
3	2015-143T15:55:00	2015-144T06:05:00	000T14:10:00	110.7 – 108.1	34.7 – 32.7	0° - 0°	
	Suggested Observation: UVIS/VIMS-ISS Auroral Stare/Slew						
4	2015-146T11:25:00	2015-147T05:50:00	000T18:25:00	92.9° - 82.1°	22.0-16.5 R_s	0° - 0°	
	Suggested Observation: VIMS Global Map, VIMS Auroral Stare						
5	2015-149T20:55:00	2015-150T16:05:00	000T19:10:00	155.5° - 152.6°	15.4-21.3 R_s	0° - 0°	
	Suggested Observation: VIMS Auroral Stare						

Initial SMT and Data Volume (1 of 3)

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_215EA_C34HEFOTB132_PRIME	132 09:00	132 18:00	0	274	63	338	3322	2984	0	159	53	550	927	377	1783	11%	0
SP_215EA_C70METNON134_PRIME	134 09:00	134 18:00	0	1751	165	1916	3322	1406	0	159	53	2128	3892	1764	4062	22%	0
SP_215EA_C34HEFNON135_PRIME	135 08:45	135 17:45	0	113	62	175	3322	3147	0	159	53	387	982	595	2297	15%	0
SP_215EA_C34BWGNON136_PRIME	136 08:45	136 17:45	0	358	63	421	3322	2901	0	159	53	633	919	286	1702	9%	0
SP_215EA_C70METNON138_PRIME	138 08:30	138 17:30	0	1743	164	1907	3322	1415	0	159	53	2118	3896	1777	3411	17%	0
SP_216EA_C34BWGNON140_PRIME	140 08:30	140 17:30	0	904	165	1069	3322	2253	0	159	53	1281	919	-362	1633	10%	361
SP_216EA_C70METNON142_PRIME	142 08:15	142 17:15	361	1164	164	1689	3322	1633	0	159	53	1900	3896	1995	3040	20%	0
SP_216EA_C34HEFNON144_PRIME	144 08:15	144 17:15	0	1337	165	1502	3322	1821	0	159	53	1713	991	-723	1044	9%	722
SP_216EA_G70METNON146_PRIME	146 02:00	146 10:45	722	1417	138	2278	3322	1044	0	154	52	2483	3278	794	2550	24%	0
SP_216EA_C34HEFNON147_PRIME	147 08:00	147 17:00	0	182	90	271	3322	3051	0	183	53	508	927	419	1755	24%	0
SP_216EA_C70METNON149_PRIME	149 08:15	149 17:15	0	1818	168	1986	3322	1336	0	208	53	2247	3850	1603	3067	47%	0
SP_216EA_M70METNON150_PRIME	150 18:15	151 02:30	0	832	106	938	3322	2384	0	182	49	1168	2632	1464	1464	56%	0

Initial SMT and Data Volume (2 of 3)

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	131 18:00	132 09:00	0.0	14.1	0.0	5.4	0.0	62.7	32.4	0.0	48.6	108.7	0.0	0.0	62.7	334.6
SP_215EA_C34HEFOTB132_PRIME	132 09:00	132 18:00	0.0	8.5	86.4	3.2	0.0	8.0	19.4	0.0	29.2	2.5	0.0	0.0	0.0	157.2
DAILY TOTAL SCIENCE	131 18:00	132 18:00	0.0	22.6	86.4	8.6	0.0	70.7	51.8	0.0	77.8	111.2	0.0	0.0	62.7	
OBSERVATION_NOR	132 18:00	134 09:00	0.0	36.8	419.4	14.0	101.7	34.7	84.2	0.0	126.4	258.1	660.0	0.0	163.0	1898.3
SP_215EA_C70METNON134_PRIME	134 09:00	134 18:00	0.0	8.5	86.4	3.2	0.0	8.0	19.4	0.0	29.2	2.5	0.0	0.0	0.0	157.2
DAILY TOTAL SCIENCE	132 18:00	134 18:00	0.0	45.3	505.8	17.3	101.7	42.7	103.7	0.0	155.5	260.6	660.0	0.0	163.0	
OBSERVATION_NOR	134 18:00	135 08:45	0.0	13.9	0.0	5.3	0.0	13.1	31.9	0.0	47.8	0.0	0.0	0.0	61.6	173.6
SP_215EA_C34HEFNON135_PRIME	135 08:45	135 17:45	0.0	8.5	86.4	3.2	0.0	8.0	19.4	0.0	29.2	2.5	0.0	0.0	0.0	157.2
DAILY TOTAL SCIENCE	134 18:00	135 17:45	0.0	22.4	86.4	8.6	0.0	21.1	51.3	0.0	77.0	2.5	0.0	0.0	61.6	
OBSERVATION_NOR	135 17:45	136 08:45	0.0	14.1	88.2	5.4	10.0	13.3	32.4	0.0	48.6	44.4	98.0	0.0	62.7	417.2
SP_215EA_C34BWGNON136_PRIME	136 08:45	136 17:45	0.0	8.5	86.4	3.2	0.0	8.0	19.4	0.0	29.2	2.5	0.0	0.0	0.0	157.2
DAILY TOTAL SCIENCE	135 17:45	136 17:45	0.0	22.6	174.6	8.6	10.0	21.3	51.8	0.0	77.8	46.9	98.0	0.0	62.7	
OBSERVATION_NOR	136 17:45	138 08:30	0.0	36.5	417.6	14.0	101.7	34.5	83.7	0.0	125.6	253.6	660.0	0.0	162.0	1889.1
SP_215EA_C70METNON138_PRIME	138 08:30	138 17:30	0.0	8.5	86.4	3.2	0.0	8.0	19.4	0.0	29.2	2.5	0.0	0.0	0.0	157.2
DAILY TOTAL SCIENCE	136 17:45	138 17:30	0.0	45.0	504.0	17.2	101.7	42.5	103.1	0.0	154.7	256.1	660.0	0.0	162.0	
OBSERVATION_NOR	138 17:30	140 08:30	0.0	36.8	0.0	14.0	600.0	34.7	84.2	0.0	126.4	0.0	0.0	0.0	163.0	1059.1
SP_216EA_C34BWGNON140_PRIME	140 08:30	140 17:30	0.0	8.5	86.4	3.2	0.0	8.0	19.4	0.0	29.2	2.5	0.0	0.0	0.0	157.2
DAILY TOTAL SCIENCE	138 17:30	140 17:30	0.0	45.3	86.4	17.3	600.0	42.7	103.7	0.0	155.5	2.5	0.0	0.0	163.0	
OBSERVATION_NOR	140 17:30	142 08:15	0.0	36.5	258.6	14.0	95.0	34.5	83.7	0.0	125.6	351.1	145.3	0.0	162.0	1306.2
OBSERVATION_SI	140 17:30	142 08:15	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
SP_216EA_C70METNON142_PRIME	142 08:15	142 17:15	0.0	8.5	86.4	3.2	0.0	8.0	19.4	0.0	29.2	2.5	0.0	0.0	0.0	157.2
DAILY TOTAL SCIENCE	140 17:30	142 17:15	0.0	45.0	345.0	17.2	103.7	42.5	103.1	0.0	154.7	353.6	145.3	0.0	162.0	

Initial SMT and Data Volume (3 of 3)

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	142 17:15	144 08:15	0.0	36.8	316.8	14.0	51.7	34.7	84.2	0.0	126.4	0.0	660.0	0.0	163.0	1487.6
SP_216EA_C34HEFNON144_PRIME	144 08:15	144 17:15	0.0	8.5	86.4	3.2	0.0	8.0	19.4	0.0	29.2	2.5	0.0	0.0	0.0	157.2
DAILY TOTAL SCIENCE	142 17:15	144 17:15	0.0	45.3	403.2	17.3	51.7	42.7	103.7	0.0	155.5	2.5	660.0	0.0	163.0	
OBSERVATION_NOR	144 17:15	146 02:00	0.0	30.9	144.0	11.8	500.0	29.1	70.7	0.0	106.1	311.6	200.0	0.0	136.9	1541.1
SP_216EA_G70METNON146_PRIME	146 02:00	146 10:45	0.0	8.3	83.7	3.2	0.0	7.8	18.9	0.0	28.4	2.4	0.0	0.0	0.0	152.5
DAILY TOTAL SCIENCE	144 17:15	146 10:45	0.0	39.1	227.7	14.9	500.0	36.9	89.6	0.0	134.5	314.0	200.0	0.0	136.9	
OBSERVATION_NOR	146 10:45	147 08:00	0.0	20.0	0.0	7.7	0.0	18.9	64.4	0.0	68.9	0.0	0.0	0.0	88.8	268.7
SP_216EA_C34HEFNON147_PRIME	147 08:00	147 17:00	0.0	12.4	86.4	3.2	0.0	8.0	27.5	0.0	39.1	4.9	0.0	0.0	0.0	181.6
DAILY TOTAL SCIENCE	146 10:45	147 17:00	0.0	32.4	86.4	10.9	0.0	26.9	92.0	0.0	107.9	4.9	0.0	0.0	88.8	
OBSERVATION_NOR	147 17:00	149 08:15	0.0	74.0	0.0	25.0	0.0	73.9	120.1	61.2	183.7	0.3	1263.6	0.0	164.0	1965.9
SP_216EA_C70METNON149_PRIME	149 08:15	149 17:15	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	42.1	13.7	0.0	0.0	0.0	206.0
DAILY TOTAL SCIENCE	147 17:00	149 17:15	0.0	91.0	86.4	28.3	0.0	89.9	147.6	61.2	225.8	14.0	1263.6	0.0	164.0	
OBSERVATION_NOR	149 17:15	150 18:15	0.0	47.2	21.6	19.1	35.0	44.5	76.5	0.0	117.8	452.9	10.0	0.0	104.5	929.0
SP_216EA_M70METNON150_PRIME	150 18:15	151 02:30	0.0	15.6	78.3	3.0	0.0	14.7	25.2	0.0	38.9	4.5	0.0	0.0	0.0	180.2
DAILY TOTAL SCIENCE	149 17:15	151 02:30	0.0	62.7	99.9	22.0	35.0	59.1	101.7	0.0	156.7	457.4	10.0	0.0	104.5	

	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	518.9	2692.2	188.2	1503.8	538.9	1103.3	61.2	1633.4	1826.0	3697.0	0.0

Waypoint Selection

Standard

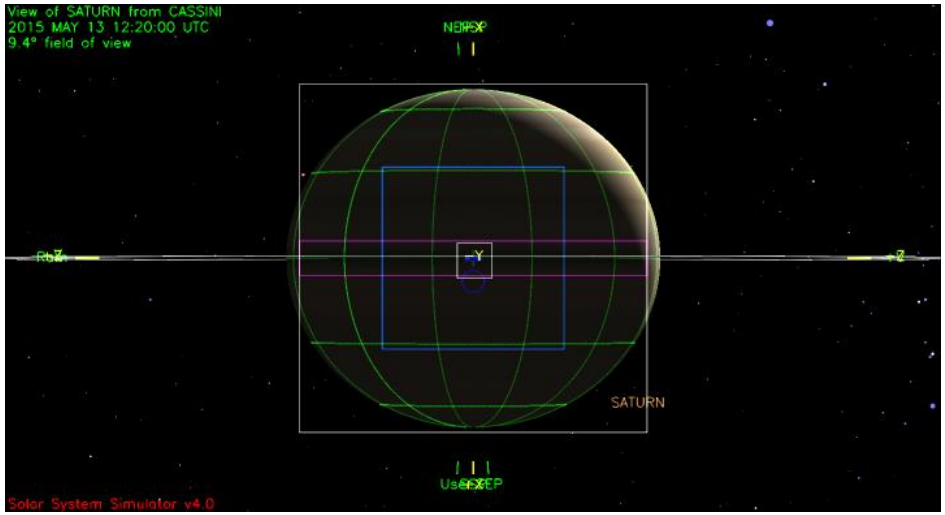
OBS_NAME	START	END	POS_X_2_NSP	POS_X_2_NEP	NEG_X_2_NSP	NEG_X_2_NEP	POS_Z_2_NSP	POS_Z_2_NEP	NEG_Z_2_NSP	NEG_Z_2_NEP	NEG_X_2_SUN	NEG_Z_2_EARTH
SP_215NA_OBSERV131_NA	2015-131T18:00:00	2015-132T09:00:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK
SP_215NA_OBSERV132_NA	2015-132T18:00:00	2015-134T09:00:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK
SP_215NA_OBSERV134_NA	2015-134T18:00:00	2015-135T08:45:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK
SP_215NA_OBSERV135_NA	2015-135T17:45:00	2015-136T08:45:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK
SP_215NA_OBSERV136_NA	2015-136T17:45:00	2015-138T08:30:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK
SP_215NA_OBSERV138_NA	2015-138T17:30:00	2015-140T08:30:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK
SP_216NA_OBSERV140_NA	2015-140T17:30:00	2015-142T08:15:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK
SP_216NA_OBSERV142_NA	2015-142T17:15:00	2015-144T08:15:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK
SP_216NA_OBSERV144_NA	2015-144T17:15:00	2015-146T02:00:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	OK
SP_216NA_OBSERV146_NA	2015-146T10:45:00	2015-147T08:00:00	**BAD**	OK	OK	**BAD**	OK	OK	**BAD**	**BAD**	OK	OK
SP_216NA_OBSERV147_NA	2015-147T17:00:00	2015-149T07:45:00	**BAD**	**BAD**	OK	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	OK	OK
SP_216NA_OBSERV149_NA	2015-149T16:45:00	2015-150T18:15:00	**BAD**	**BAD**	OK	OK	**BAD**	**BAD**	**BAD**	**BAD**	OK	OK

RBOT - Friendly

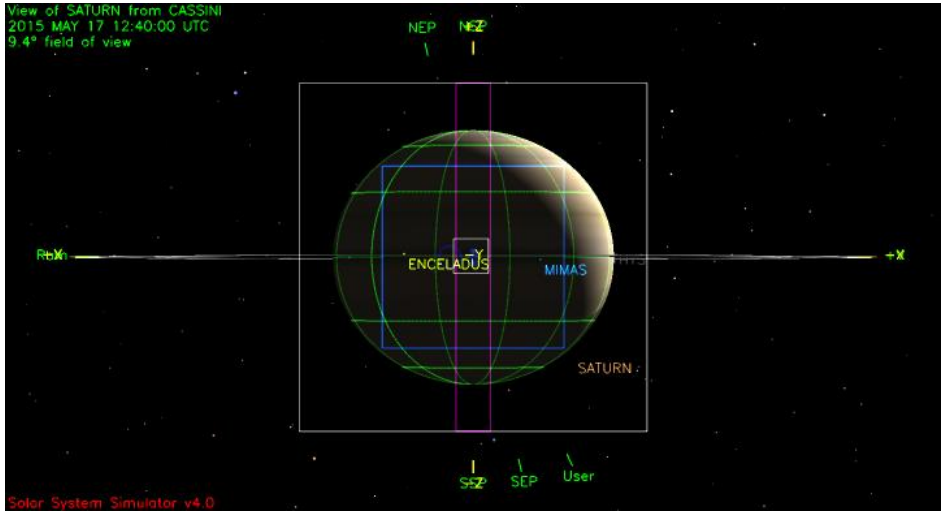
OBSERVATION PERIOD	START	END	POS_X	NEG_X	POS_Z	NEG_Z
SP_215NA_OBSERV131_NA	2015-131T18:00:00	2015-132T09:00:00	-----	37.6/ 83.6	37.6/ 83.6	-----
SP_215NA_OBSERV132_NA	2015-132T18:00:00	2015-134T09:00:00	-----	37.6/ 83.6	37.6/ 83.6	-----
SP_215NA_OBSERV134_NA	2015-134T18:00:00	2015-135T08:45:00	-----	37.6/ 83.6	37.6/ 83.6	-----
SP_215NA_OBSERV135_NA	2015-135T17:45:00	2015-136T08:45:00	-----	37.6/ 83.6	37.6/ 83.6	-----
SP_215NA_OBSERV136_NA	2015-136T17:45:00	2015-138T08:30:00	-----	37.6/ 83.6	37.6/ 83.6	-----
SP_215NA_OBSERV138_NA	2015-138T17:30:00	2015-140T08:30:00	-----	37.6/ 83.6	37.6/ 83.6	-----
SP_216NA_OBSERV140_NA	2015-140T17:30:00	2015-142T08:15:00	-----	37.5/ 83.6	37.5/ 83.6	-----
SP_216NA_OBSERV142_NA	2015-142T17:15:00	2015-144T08:15:00	-----	37.5/ 83.6	37.5/ 83.6	-----
SP_216NA_OBSERV144_NA	2015-144T17:15:00	2015-146T02:00:00	-----	37.5/ 83.6	37.5/ 83.6	-----
SP_216NA_OBSERV146_NA	2015-146T10:45:00	2015-147T08:00:00	-----	37.5/ 83.6	37.5/ 83.6	-----
SP_216NA_OBSERV147_NA	2015-147T17:00:00	2015-149T07:45:00	-----	37.5/ 83.6	-----	-----
SP_216NA_OBSERV149_NA	2015-149T16:45:00	2015-150T18:15:00	-----	37.5/ 83.6	-----	-----

Waypoints Chosen

Waypoint 1-2 (2015-131T18:30 – 134T07:30): NEG_Y to Saturn, NEG_X to NSP

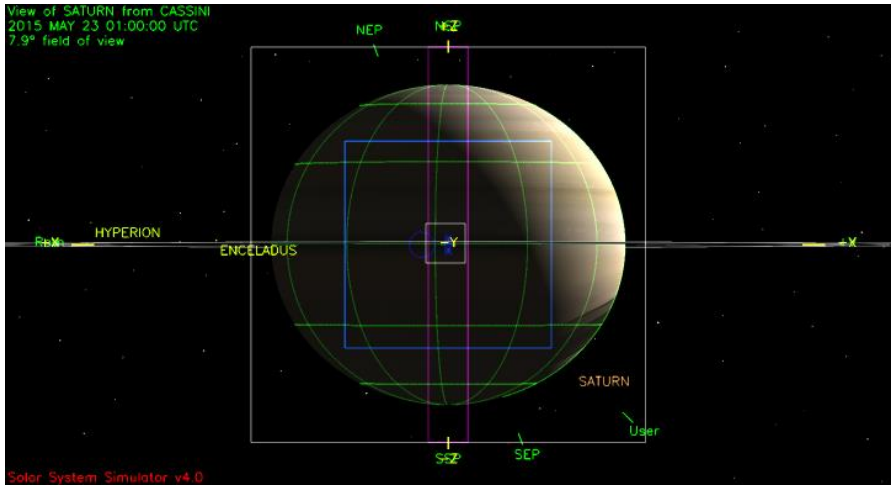


Waypoint 3-6 (2015-134T18:40 – 140T07:07): NEG_Y to Saturn, POS_Z to NSP

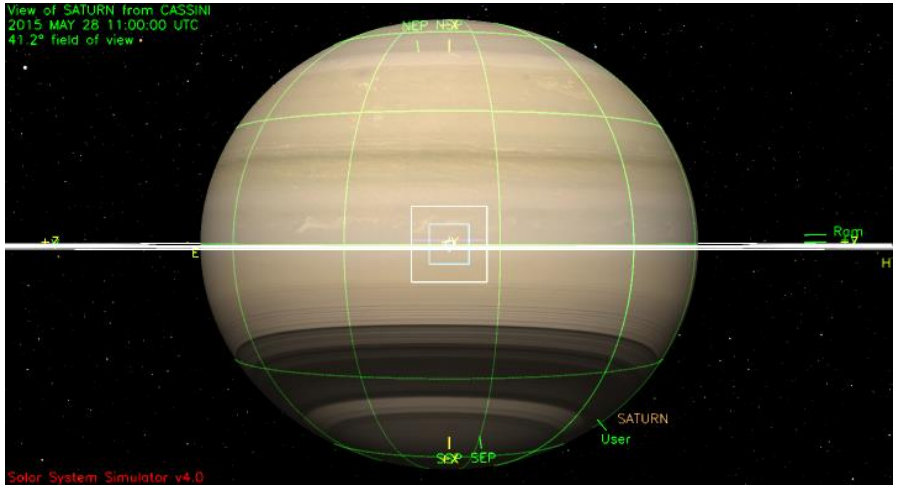


Waypoints Chosen

Waypoint 6-9 (2015-140T07:00 – 146T00:30): NEG_Y to Saturn, POS_Z to NSP



Waypoint 10-13 (2015-146T11:00 – 150T16:45): NEG_Y to Saturn, NEG_X to NSP



Notes (1/2)

- Pointing:
  - The DOY 149 YGAP was placed after the DOY 149 downlink. This was done in order to avoid impacting VIMS_216SA_DEEPDYN002_PIE. SCO and NAV were consulted regarding this change and have approved it.
  - RBOT-friendly waypoints point close enough to NSP that the TWT elected to use those science-friendly attitudes instead.
  - VIMS has requested five collaborative riders of UVIS. VIMS and UVIS will verify that this can be supported.

- Data Volume:
  - There is a dual playback of 1390 Mb scheduled for DOY 149. There are no other known data volume issues.
  - Disposition all SMT warnings:
    - 2015-149T08:15:00 SP_216EA_C70METNON149_PRIME Priority List conflicts with selected SSR. (SSR_B)
      - This is OK; the priority playback list has been set to support the DOY 149 dual playback. Ignore.
    - 2015-150T04:00:00 SP_216EA_G70METNON150_PRIME Priority List conflicts with selected SSR. (SSR_B)
      - This is OK; the priority playback list has been set to support the DOY 149 dual playback. Ignore.
    - 2015-147T12:52:51 CDA_216OT_RATE080A002_RIDER Found an activity whose average data rate of 4192 bps exceeds the maximum CDS pickup rate of 524 bps in "S_N_ER_5A" commanded at 2015-147T17:30:00.000.
      - This is likely not a real problem. CDA drops to 524 bps precisely as S_N_ER_5A is commanded. Ignore.

- DSN:
  - ap_downlink report check warnings:
    - Warning: SP_216EA_C70METNON149_PRIME has an unusual priority playback list
      - This is OK; the priority playback list has been set to support the DOY 149 dual playback.
    - Warning: SP_216EA_G70METNON150_PRIME has an unusual priority playback list
      - This is OK; the priority playback list has been set to support the DOY 149 dual playback.
    - Warning: 70m usage for sequence exceeds project commitment of <= 35%; is at 57%
      - The heavy reliance on 70M DSN stations is needed to support the DOY 149 dual playback. There is margin to accommodate DSN negotiation losses. The SPST manager has approved this DSN strategy.

continued on next page

Notes (2/2)

- DSN (cont'd):
  - Warning: number of sequence upload passes is 0; should be 5 or more
    - This segment is in the middle of the sequence; the warning is irrelevant.
  - Changes to strawman DSN plan:
    - DOY 132 – downgraded from DSS-43 to DSS-45
    - DOY 134 – upgraded from DSS-45 to DSS-43
    - DOY 144 – upgraded DSS-34 to DSS-45
    - DOY 146 – upgraded from DSS-15 to DSS-14
    - DOY 149 – started DSS-43 30 minutes later to accommodate VIMS_216SA_DEEPDYN002_PIE
    - DOY 150 – added four-hour DSN pass (DSS-14)
    - DOY 150 – added DSS-55 shadow pass for RSS ORT

- Resource checker:
  - `SP_216EA_C70METNON149_PRIME` First_Part value of SSRAP4 does not match default of SSRBP4 Second_Part value of SSRBP4 does not match default of SSRAP4
    - This is OK; the priority playback list has been set to support the DOY 149 dual playback. Ignore.
  - `SP_216EA_G70METNON150_PRIME` First_Part value of SSRAP4 does not match default of SSRBP4 Second_Part value of SSRBP4 does not match default of SSRAP4
    - This is OK; the priority playback list has been set to support the DOY 149 dual playback. Ignore.
  - `VIMS_216SA_DEEPDYN001_PIE` Gap in Prime SPASS requests between `VIMS_216SA_DEEPDYN001_PIE` and `RADAR_216SA_GLOBALMAP003_PIE`. Gap of 000T00:30:00 is greater than or equal to 60 seconds.
    - This gap is intentional. Ignore.
  - `RADAR_216SA_GLOBALMAP003_PIE` Gap in Prime SPASS requests between `RADAR_216SA_GLOBALMAP003_PIE` and `VIMS_216SA_DEEPDYN002_PIE`. Gap of 000T00:30:00 is greater than or equal to 60 seconds.
    - This gap is intentional. Ignore.

Liens

- Opmodes:
  - RADWU @2015-148T02:40:07 – added in support of DOY 148 RADAR PIE; no impact to other science
  - RSSPRWAF @2015-150T16:15:00 – added in support of DOY 150 RSS ORT; no impact to other science
  - RSSKRWAF @2015-150T18:15:00 – added in support of DOY 150 RSS ORT; no impact to other science

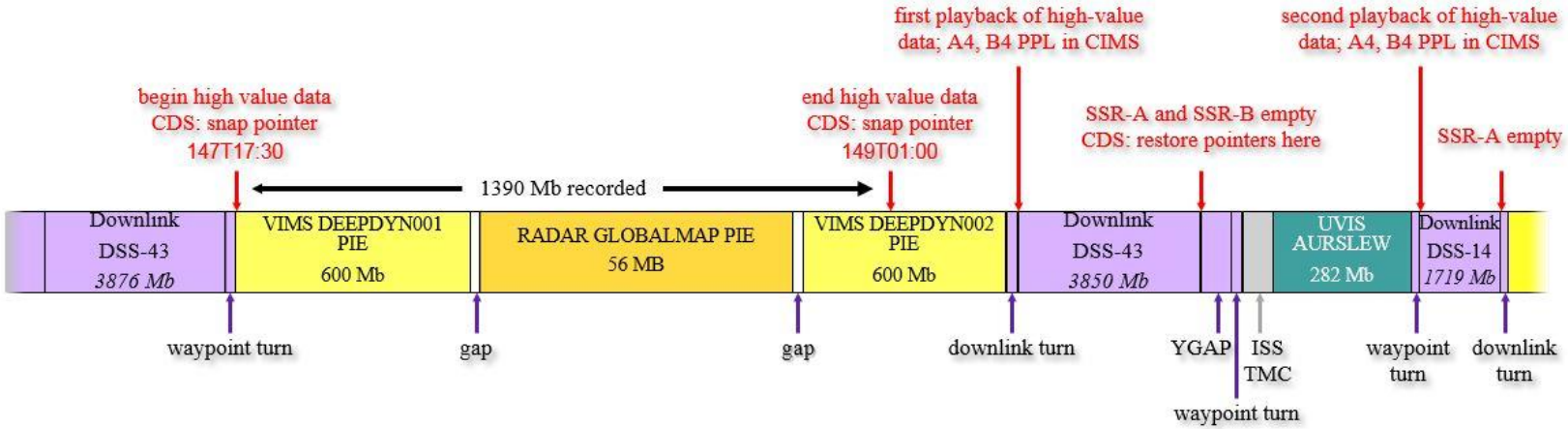
- Hydrazine:
  - none

- Special Activities:
  - none

- Sequence Liens:
  - S89000023 `ENGR_216NA_DUALPB148_CDS` During DSN negotiations ensure that SSR-A is emptied before the pointers are reset. This item cannot be closed until the DSN negotiations are complete for both downlink passes, or the dual playback is deleted.
    - Resolve during DSN negotiations; remove pointer reset commands if required DSN passes are not negotiated prior to FSIV.
  - S89000024 `RADAR_216SA_GLOBALMAP003_PIE` This RADAR request will track Saturn across 152 degrees of sky. Such observations have the potential to put stress on the reaction wheels and complicate attempts to converge on an acceptable RBOT solution.
    - Per RBOT constraints, this observation will need to include quiescent gaps of twenty minutes duration every three hours for possible bias placement. RADAR may iterate with AACS during the RBOT process to reduce the number of gaps incorporated in the final observation design.

Dual Playback (Saturn 215_216)

Flyby	Driving Instruments	BEGHIVAL	ENDHIVAL	P4 Dual Playback	SSR empty before hi-value observation period?	SSR-A empty after first playback?	PPL set to A4, B4 for both playbacks?	SSRs empty after second playback?
Rev 216 periapse	VIMS/RADAR	147T18:40	149T01:00	1390 Mb	Yes	Yes	Yes	Yes



- The dual playback data volume limit was calculated assuming:
  - SSR-A has a capacity of 1660 Mb,
  - **all** data recorded during the downlink goes to SSR-A
  - and an additional margin should be maintained.