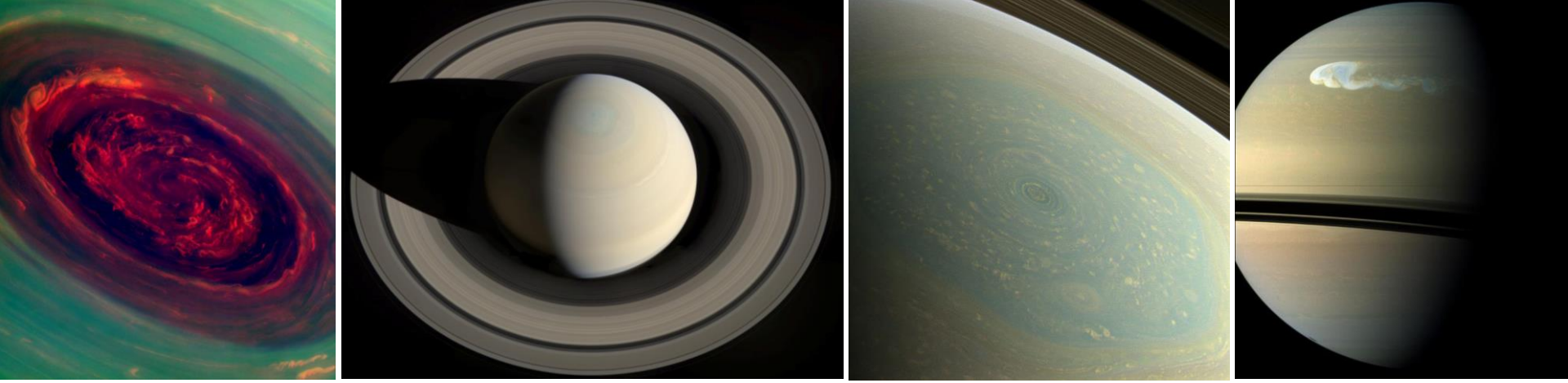


Science Planning & Sequence Team
CASSINI

SATURN TARGET WORKING TEAM

Rev 275 Segment Legacy Package

Segment Boundary: May 18, 2017 – May 23, 2017
2017-138T19:21 – 2017-143T12:41 (SCET)

Integration Began 07/18/2016
Segment Delivered to S99 Sequence 10/26/16
Lead Integrator was Kyle Cloutier

Legacy Package Assembled by Kyle Cloutier

Table of Contents

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

Segment Overview and Final Products

Segment Summary

- Cassini's 5th proximal periapse. Periapse science focused on the Radio Science Subsystem and CDA.
  - This was among the **best opportunities** in the Cassini Mission lifetime to conduct radio occultations of Saturn's ring system and run a gravity experiment to characterize Saturn's gravitational field with unprecedented detail.
  - During ring plane crossing, CDA measured large particles close to the ring plane, detecting the flux and composition of the large grains.
- ORS solar viewing constraints impacted science placement, but no CMT constraint management was required during the occulted period since Radio Science was prime at that time.
- 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. No changes were required following this analysis, due to relaxed constraints.

Final Sequenced SPASS

Gap 1

Gap 2

Rev 275 Jumpstart

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End	Primary	Secondary	Comments
SATURN_275 Segment		2017-138T19:21:00		004T16:53:00	2017-143T12:14:00			
SP_274SA_WAYPTTURN138_PRIME		2017-138T19:21:00		000T00:40:00	2017-138T20:01:00	ISS_NAC to Saturn	NEG_X to NSP	
NEW WAYPOINT		**2017-138T20:01:00**		**000T12:50:00**	**2017-139T08:51:00**	**ISS_NAC to Saturn**	**NEG_X to NSP**	
ISS_274SA_LIMBINT001_PRIME	U, V	2017-138T20:01:00		000T01:40:00	2017-138T21:41:00	ISS_NAC to Saturn	NEG_X to NSP	
VIMS_274SA_GLOBMAP001_PRIME	C, U	2017-138T21:41:00		000T10:30:00	2017-139T08:11:00	ISS_NAC to Saturn	NEG_X to NSP	
Apoapse Per = 6.4 d, inc =...		2017-138T21:59:51		000T00:00:01	2017-138T21:59:52			
SP_275EA_DLTURN139_PRIME		2017-139T08:11:00		000T00:40:00	2017-139T08:51:00	XBAND to Earth	NEG_X to NSP	
NEW WAYPOINT		**2017-139T08:51:00**		**000T11:04:00**	**2017-139T19:55:00**	**XBAND to Earth**	**NEG_X to NSP**	
ENGR_275SC_KPTYBIAS139_PRIME		2017-139T08:51:00		000T01:30:00	2017-139T10:21:00	POS_Z to DELTA_H (0.0,0.0,-64.0 deg. offset)	NEG_X to Sun	
SP_275EA_C34BWGSEQ139_PRIME	C, R	2017-139T10:21:00		000T09:00:00	2017-139T19:21:00	XBAND to Earth	Rolling	
SP_275SA_WAYPTTURN139_PRIME		2017-139T19:21:00		000T00:34:00	2017-139T19:55:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2017-139T19:55:00**		**000T12:56:00**	**2017-140T08:51:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
VIMS_275SA_ALPCMAOCC001_PIE	U	2017-139T19:55:00		000T01:05:00	2017-139T21:00:00	UVIS_FUV to 101.287/-16.716 (0.258,0.0,0.0 deg. offset)	POS_Z to NSP	
CIRS_275SA_MIRTMAP001_PRIME	V	2017-139T21:00:00		000T11:11:00	2017-140T08:11:00	CIRS_FP3 to Saturn	POS_Z to NSP	
SP_275EA_DLTURN140_PRIME		2017-140T08:11:00		000T00:40:00	2017-140T08:51:00	XBAND to Earth	POS_X to 10.23/-33.96	
NEW WAYPOINT		**2017-140T08:51:00**		**000T11:10:00**	**2017-140T20:01:00**	**XBAND to Earth**	**POS_X to 10.23/-33.96**	
SP_275EA_YGAP140_PRIME		2017-140T08:51:00		000T01:30:00	2017-140T10:21:00	XBAND to Earth	POS_X to 10.23/-33.96	
SP_275EA_C70METSEQ140_PRIME	C	2017-140T10:21:00		000T09:00:00	2017-140T19:21:00	XBAND to Earth	POS_X to 10.23/-33.96	MIMI. NEG_Y to Saturn (0,0,-9.5)
SP_275SA_WAYPTTURN140_PRIME		2017-140T19:21:00		000T00:40:00	2017-140T20:01:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		**2017-140T20:01:00**		**000T17:56:00**	**2017-141T13:57:00**	**ISS_NAC to Saturn**	**POS_Z to NSP**	
CIRS_275SA_MIRMAP001_PRIME	U, V	2017-140T20:01:00		000T12:00:00	2017-141T08:01:00	CIRS_FP3 to Saturn	POS_Z to NSP	
VIMS_275SA_NHEMMAP001_PRIME	C, I, U	2017-141T08:01:00		000T05:03:00	2017-141T13:04:00	ISS_NAC to Saturn	POS_Z to NSP	
SP_275EA_DLTURN141_PRIME	R	2017-141T13:04:00		000T00:40:00	2017-141T13:44:00	XBAND to Earth	NEG_Y to NSP	
SP_275EA_DLTURN441_PRIME	R	2017-141T13:44:00		000T00:13:00	2017-141T13:57:00	XBAND to Earth	POS_X to 230.3/63.6	
NEW WAYPOINT		**2017-141T13:57:00**		**001T03:47:00**	**2017-142T17:44:00**	**XBAND to Earth**	**POS_X to 230.3/63.6**	
SP_275EA_YGAP141_PRIME	R	2017-141T13:57:00		000T01:17:00	2017-141T15:14:00	XBAND to Earth	POS_X to 230.3/63.6	
SP_275EA_C34BWGRSS141_PRIME	C, M, R	2017-141T15:14:00		000T05:45:00	2017-141T20:59:00	XBAND to Earth	POS_X to 230.3/63.6	Collaborative Rider(s): CDA. RSS Gravity
SP_275EA_M34BWGRSS141_PRIME	M, R	2017-141T20:59:00		000T05:23:00	2017-142T02:22:00	XBAND to Earth	POS_X to 230.3/63.6	Collaborative Rider(s): CDA. RSS Gravity
RSS_275RI_PERIOCC001_PRIME	M, R	2017-142T02:22:00		000T02:07:00	2017-142T04:29:00	XBAND to Earth	POS_X to 230.3/63.6	Collaborative Rider(s): CDA
Periapse R = 1.043 Rs, lat ...		2017-142T03:14:27		000T00:00:01	2017-142T03:14:28			
SP_275EA_G70METRSS142_PRIME	C, M, R	2017-142T04:29:00		000T02:18:00	2017-142T06:47:00	XBAND to Earth	POS_X to 230.3/63.6	Collaborative Rider(s): CDA. RSS Gravity
RSS_275RI_INGOCC001_PRIME	M, R	2017-142T06:47:00		000T04:35:00	2017-142T11:22:00	XBAND to Earth	POS_X to 230.3/63.6	Collaborative Rider(s): CDA
RSS_275RI_EGROCC001_PRIME	M, R	2017-142T11:22:00		000T05:57:00	2017-142T17:19:00	XBAND to Earth	POS_X to 230.3/63.6	Collaborative Rider(s): CDA
SP_275SA_WAYPTTURN142_PRIME		2017-142T17:19:00		000T00:25:00	2017-142T17:44:00	ISS_NAC to Saturn (-10.0,-8.0,0.0 deg. offset)	NEG_Z to NSP	
NEW WAYPOINT		**2017-142T17:44:00**		**000T08:47:00**	**2017-143T02:31:00**	**ISS_NAC to Saturn (-10.0,-8.0,0.0 deg. offset)**	**NEG_Z to NSP**	
UVIS_275SA_AURSLEW001_PRIME		2017-142T17:44:00		000T03:54:00	2017-142T21:38:00	UVIS_FUV to Saturn	NEG_Z to NSP	
VIMS_275SA_ALPORIOCC002_PRIME		2017-142T21:38:00		000T01:10:00	2017-142T22:48:00	VIMS_IR to 88.793/7.407	POS_X to 1.899/-21.897	
UVIS_275SA_AURNSTARE001_PRIME	I	2017-142T22:48:00		000T03:16:00	2017-143T02:04:00	UVIS_FUV to Saturn	NEG_Z to NSP	
SP_275EA_DLTURN143_PRIME		2017-143T02:04:00		000T00:27:00	2017-143T02:31:00	XBAND to Earth	POS_X to 190.83/33.128	
NEW WAYPOINT		**2017-143T02:31:00**		**000T10:23:00**	**2017-143T12:54:00**	**XBAND to Earth**	**POS_X to 190.83/33.128**	
ENGR_275SC_KPTYBIAS143_PRIME		2017-143T02:31:00		000T01:28:00	2017-143T03:59:00	POS_Z to DELTA_H (0.0,0.0,-56.0 deg. offset)	NEG_X to Sun	
SP_275EA_G70METSEQ143_PRIME	C	2017-143T07:14:00		000T05:00:00	2017-143T12:14:00	XBAND to Earth	Rolling	

Final Sequenced SMT and Data Volume

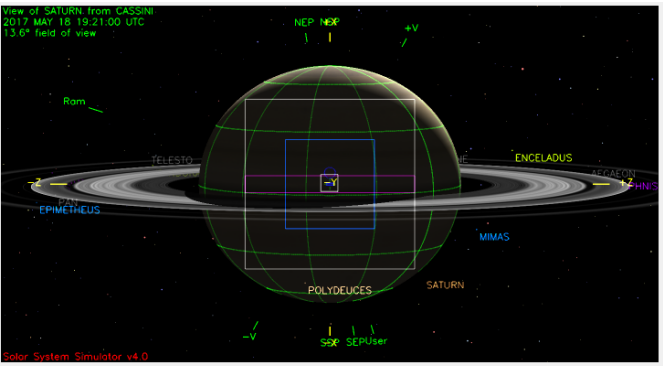
DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

			OBSERVATION_PERIOD							DOWNLINK_PASS							
			P4						P5	RECORDED		PLAYBACK					
DOWNLINK PASS NAME	Start doy hh:mm	End doy hh:mm	START (Mb)	SCI (Mb)	HK+E (Mb)	TOTAL (Mb)	CPACTY (Mb)	MRGN (Mb)	OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_MARGN (Mb)	NET_MARGN (%)	CAROVR (Mb)
SP_275EA_C34BWGSEQ139_PRIME	139 10:21	139 19:21	0	1792	64	1856	3322	1467	0	497	53	2405	904	-1501	432	4%	1501
SP_275EA_C70METSEQ140_PRIME	140 10:21	140 19:21	1501	1326	63	2890	3322	432	0	497	53	3440	3855	415	617	5%	0
SP_275EA_C34BWGRSS141_PRIME	141 15:14	141 20:59	0	917	84	1001	3322	2321	0	210	34	1245	500	-746	202	3%	745
SP_275EA_M34BWGRSS141_PRIME	141 20:59	142 02:22	745	0	0	745	3322	2577	0	636	32	1413	378	-1035	202	3%	1034
SP_275EA_G70METRSS142_PRIME	142 04:29	142 06:47	1034	507	9	1550	3322	1772	0	249	14	1812	750	-1063	202	3%	1063
SP_275EA_G70METSEQ143_PRIME	143 07:14	143 12:14	1063	844	103	2010	3322	1312	0	126	29	2166	1801	-365	202	3%	365

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	138 19:16	139 10:21	0.0	28.5	76.5	5.4	250.0	26.8	46.2	0.0	562.0	220.1	560.0	0.0	63.0	1838.6
SP_275EA_C34BWGSEQ139_PRIME	139 10:21	139 19:21	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	337.0	4.9	0.0	0.0	0.0	492.1
DAILY TOTAL SCIENCE	138 19:16	139 19:21	0.0	45.4	162.9	8.7	250.0	42.8	73.7	0.0	899.0	225.1	560.0	0.0	63.0	
OBSERVATION_NOR	139 19:21	140 10:21	0.0	28.3	161.0	5.4	0.0	26.7	45.9	0.0	561.6	125.2	360.0	0.0	62.7	1376.8
SP_275EA_C70METSEQ140_PRIME	140 10:21	140 19:21	0.0	17.0	86.4	3.2	0.0	16.0	27.5	0.0	337.0	4.9	0.0	0.0	0.0	492.1
DAILY TOTAL SCIENCE	139 19:21	140 19:21	0.0	45.3	247.4	8.6	0.0	42.7	73.4	0.0	898.6	130.1	360.0	0.0	62.7	
OBSERVATION_NOR	140 19:21	141 15:14	0.0	37.5	122.8	7.2	50.0	35.4	60.8	0.0	93.2	61.8	440.0	0.0	83.1	991.7
SP_275EA_C34BWGRSS141_PRIME	141 15:14	141 20:59	0.0	21.7	51.3	2.1	0.0	10.2	22.3	0.0	97.7	3.2	0.0	0.0	0.0	208.5
SP_275EA_M34BWGRSS141_PRIME	141 20:59	142 02:22	0.0	28.2	0.0	2.6	0.0	32.0	23.5	0.0	540.5	3.0	0.0	0.0	0.0	629.8
DAILY TOTAL SCIENCE	140 19:21	142 02:22	0.0	87.4	174.1	11.9	50.0	77.6	106.7	0.0	731.4	67.9	440.0	0.0	83.1	
OBSERVATION_NOR	142 02:22	142 04:29	0.0	31.9	0.0	10.2	0.0	15.1	13.2	0.0	432.0	0.0	0.0	0.0	8.8	511.2
SP_275EA_G70METRSS142_PRIME	142 04:29	142 06:47	0.0	9.7	14.0	0.8	0.0	16.4	9.9	0.0	194.5	1.3	0.0	0.0	0.0	246.5
DAILY TOTAL SCIENCE	142 02:22	142 06:47	0.0	41.6	14.0	11.0	0.0	31.4	23.1	0.0	626.5	1.3	0.0	0.0	8.8	
OBSERVATION_NOR	142 06:47	143 07:14	0.0	104.1	24.3	8.8	32.5	50.4	83.0	0.0	281.7	131.6	120.0	0.0	102.2	938.6
SP_275EA_G70METSEQ143_PRIME	143 07:14	143 12:14	0.0	18.9	54.0	1.8	0.0	8.9	15.3	0.0	23.6	2.7	0.0	0.0	0.0	125.2
DAILY TOTAL SCIENCE	142 06:47	143 12:14	0.0	123.0	78.3	10.6	32.5	59.3	98.3	0.0	305.2	134.4	120.0	0.0	102.2	

Segment Geometry




```
Rev 274 OUTBOUND
2017 -  138T19:21:00 SCET
2017 MAY 18 19:21:00 SCET
2017 MAY 18 20:37:12 ERT
Apoapse__274 + 006T07:49:50
Periapse_274 + 003T02:35:13
Light time:    76.2 min
Orbit period:  6.4 days
Radius     1271090 km      21.09 Rs
Rad_cyl    1266691 km      21.02 Rs
Z_ht_cyl    105662 km       1.75 Rs
Mag_L         21.24
Semi_axs    667349 km      11.07 Rs
Eccentricity    0.906
Inclination    62.36 deg
Sun_range      10.06 AU
Earth_range     9.16 AU
--- DSN ELEV -- D/L -- U/L --------
Goldstone     -69.9  -40.3
Canberra       29.4   60.2
Madrid        -10.1  -38.6
-------- LOOK DIRECTION INFO -------
FOV            13.6 deg  236.9 mrad
RA             97.934 deg
DEC            -8.287 deg
Crosses_RP_0    0.000 Rs
EPS             2.742 deg
SEP           151.580 deg
ORS b/s angle  33.7 deg
ORS rad angle  58.6 deg  *
```

Point NEG_Y at SATURN and align POS_X = Up with NSP

User Vector - RA: -80.249 DEC: -1.224 Paste Current RA/DEC

Tilt L | Up | Tilt R | Left | Reset | Right | Image | Down | 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 = 5.4 min / 32.5 deg Event

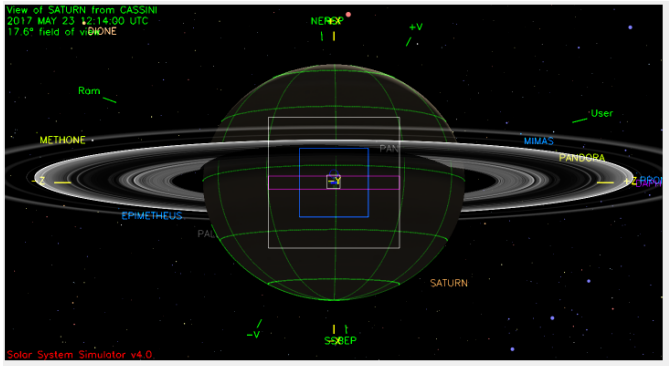
BODY	S/C OCC?	SAT OCC?	RANGE (km)	RANGE (Rs)	ALTITUDE (km)	ALTITUDE (Rs)	PHASE (deg)	ANGLR_DIAMETER (deg	mrad)	SUB_S/C LON	SUB_S/C LAT	DLON (deg)	VREL (km/s)	Z_HGHT (km)	ANGLE FROM SATRN	ANGLE FROM EARTH	ANGLE FROM RAM
SATURN	--	--	1271090	21.09	1210861	20.09	146.3	5.44	94.86	50	5	0	1.7	0	0.0	32.5	92.4
MIMAS	--	--	1094268	18.16	1094062	18.15	146.3	0.02	0.38	199	6	-18	13.5	-3002	3.2	32.7	95.5
ENCELADUS	--	--	1491571	24.75	1491314	24.74	148.1	0.02	0.34	343	4	-156	13.4	26	3.8	31.0	95.8
TETHYS	--	--	1512290	25.09	1511752	25.08	148.7	0.04	0.71	329	4	-141	12.1	-2285	7.0	30.6	98.8
DIONE	--	--	1279545	21.23	1278984	21.22	148.2	0.05	0.88	280	5	-83	10.1	166	17.0	32.1	108.6
RHEA	--	--	1266285	21.01	1265523	21.00	132.6	0.07	1.21	81	5	77	8.4	-2971	24.0	45.1	69.7
TITAN	--	--	2142759	35.55	2140184	35.51	128.1	0.14	2.40	30	3	116	5.9	5521	31.8	49.3	61.7
HYPERION	--	--	2031727	33.71	2031565	33.71	109.6	0.01	0.16	177	-12	88	4.8	-4133	53.6	67.6	42.2
IAPETUS	--	--	3122323	51.81	3121576	51.79	62.0	0.03	0.48	23	8	55	3.5	-317266	104.2	115.2	29.0
PHOEBE	--	--	14665458	243.34	14665349	243.34	132.2	0.00	0.02	82	-21	-115	2.5	3255205	62.7	50.1	138.9
SATURN	--	--	1271090	21.09	1210861	20.09	146.3	5.44	94.86	50	5	0	1.7	0	0.0	32.5	92.4

Segment Start: 2017-138T19:21

Apoapse: 2017-138T21:59:51 (not pictured)

Periapse: 2017-142T03:14:27 (not pictured)

Segment End: 2017-143T12:14




```
Rev 275 OUTBOUND
2017 -  143T12:14:00 SCET
2017 MAY 23 12:14:00 SCET
2017 MAY 23 13:29:54 ERT
Apoapse__275 + 004T14:13:35
Periapse_275 + 001T08:58:52
Light time:    75.9 min
Orbit period:  6.4 days
Radius     981100 km      16.28 Rs
Rad_cyl    973466 km      16.15 Rs
Z_ht_cyl  -122153 km      -2.03 Rs
Mag_L         16.54
Semi_axs    667728 km      11.08 Rs
Eccentricity    0.906
Inclination    62.39 deg
Sun_range      10.06 AU
Earth_range     9.13 AU
--- DSN ELEV -- D/L -- U/L --------
Goldstone      8.5   28.6
Canberra      58.2   27.5
Madrid       -70.8  -48.4
-------- LOOK DIRECTION INFO -------
FOV            17.6 deg  306.8 mrad
RA             89.571 deg
DEC             2.927 deg
Crosses_RP_0    0.000 Rs
EPS             2.309 deg
SEP           156.399 deg
ORS b/s angle  20.1 deg
ORS rad angle  70.4 deg  *
```

Point NEG_Y at SATURN and align POS_X = Up with NSP

User Vector - RA: -80.249 DEC: -1.224 Paste Current RA/DEC

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

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

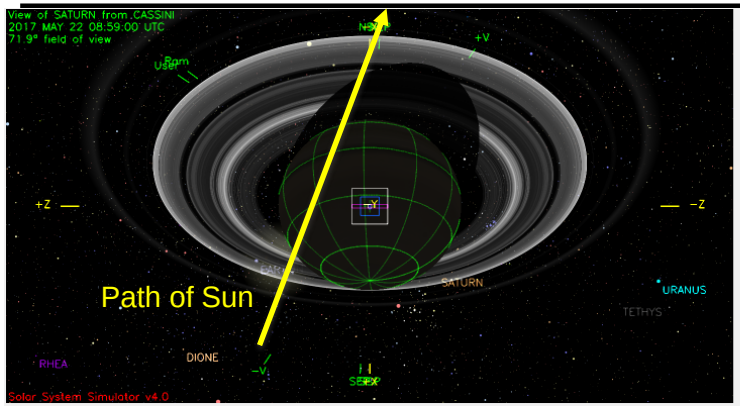
Year Month Day Hour Minute Second

Turn Analyzer: SATURN to EARTH about Z on RWA = 4.1 min / 19.5 deg Event

BODY	S/C OCC?	SAT OCC?	RANGE (km)	RANGE (Rs)	ALTITUDE (km)	ALTITUDE (Rs)	PHASE (deg)	ANGLR_DIAMETER (deg	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	--	--	981100	16.28	920920	15.28	159.9	7.04	122.94	271	-7	0	4.5	0	0.0	19.5	125.6
MIMAS	--	--	811087	13.46	810882	13.45	161.7	0.03	0.51	205	-8	-22	15.4	-3115	5.2	18.2	129.8
ENCELADUS	--	--	821690	13.63	821436	13.63	156.2	0.04	0.62	131	-9	42	9.5	-28	11.2	22.1	114.6
TETHYS	--	--	758860	12.59	758325	12.58	155.9	0.08	1.42	134	-10	34	8.7	2093	12.9	22.3	112.9
DIONE	--	--	619337	10.28	618773	10.27	161.1	0.10	1.82	162	-11	11	9.2	-30	7.9	17.4	117.9
RHEA	--	--	809684	13.43	808922	13.42	139.9	0.11	1.90	95	-8	55	4.9	-3183	32.5	37.8	94.1
TITAN	--	--	289072	4.80	286497	4.75	54.7	1.02	17.82	23	-23	6	6.1	-7834	139.1	124.4	24.9
HYPERION	--	--	709155	11.77	709043	11.76	46.6	0.03	0.46	57	-68	16	5.1	-28220	139.8	131.8	14.2
IAPETUS	--	--	2794017	46.36	2793270	46.35	34.8	0.03	0.54	15	3	28	4.0	-621085	142.8	143.1	26.0
PHOEBE	--	--	14573602	241.81	14573489	241.81	128.8	0.00	0.02	148	-22	-120	3.6	2979696	56.3	53.0	155.1
SATURN	--	--	981100	16.28	920920	15.28	159.9	7.04	122.94	271	-7	0	4.5	0	0.0	19.5	125.6

	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	21.09	146.3	5
Apoapse	21.11	145.6	5
Periapse	1.04	34.3	-6
Segment End	16.28	159.9	-7

Solar Geometry – ORS Boresight Concerns



Rev 275 OUTBOUND
2017 - 142T08:59:00 SCET
2017 MAY 22 08:59:00 SCET
2017 MAY 22 10:14:56 ERT
Apoapse__275 + 003T10:58:35
Periapse_275 + 05:43:52
Light time: 75.9 min
Orbit period: 6.4 days

Radius	336203 km	5.58 Rs
Rad_cyl	280568 km	4.66 Rs
Z_ht_cyl	-185240 km	-3.07 Rs
Mag_L	8.01	
Semi_axs	667492 km	11.08 Rs
Eccentricity	0.906	
Inclination	62.33 deg	
Sun_range	10.06 AU	
Earth_range	9.13 AU	

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

Goldstone	31.6	27.1
Canberra	18.0	-10.0
Madrid	-39.4	-10.9

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

FOV	71.9 deg 1254.2 mrad
RA	71.498 deg
DEC	27.947 deg
Crosses_RP_@	0.000 Rs
EPS	2.415 deg
SEP	155.243 deg
ORS b/s angle	12.0 deg *
ORS rad angle	83.9 deg *

Point NEG_Y at SATURN and align NEG_X = Up with NSP

User Vector - RA: 182.5 DEC: 32.8 Paste Current RA/DEC

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

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

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

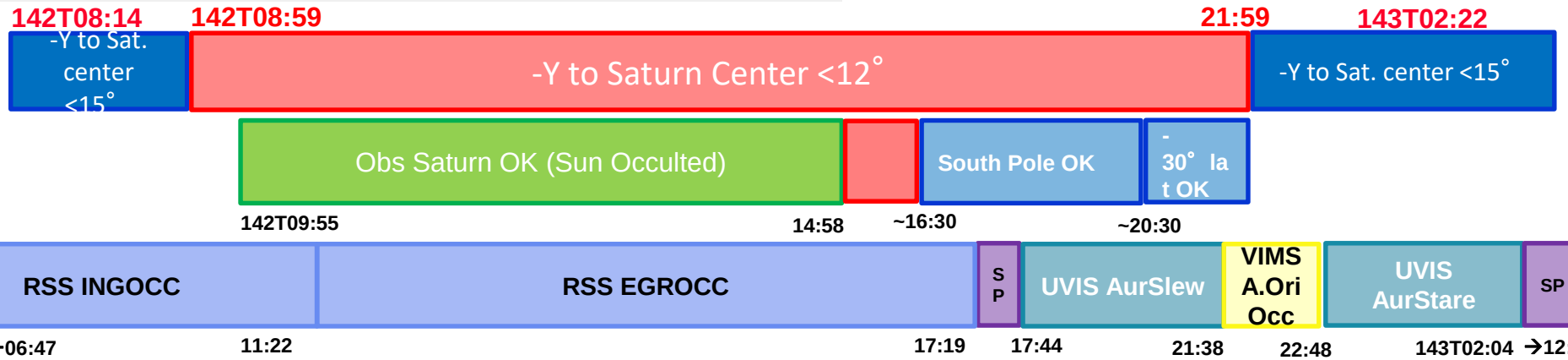
Tum Analyzer: SATURN to EARTH about Z on RWA = 3.5 min / 14.1 deg Event < >

BODY	S/C OCC?	SAT OCC?	RANGE (km)	RANGE (Rs)	ALTITUDE (km)	ALTITUDE (Rs)	PHASE (deg)	ANGLR_DIAMETER (deg	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	--	--	336203	5.58	277707	4.61	168.0	20.65	360.47	87	-33	0	13.0	0	0.0	14.1	142.1
MIMAS	--	--	250973	4.16	250780	4.16	149.5	0.09	1.65	103	-48	35	9.3	3036	32.6	29.3	109.5
ENCELADUS	--	--	250122	4.15	249873	4.15	123.3	0.12	2.05	278	-48	-37	21.1	-13	44.7	58.6	133.4
TETHYS	--	--	544854	9.04	544316	9.03	143.4	0.11	1.98	334	-19	-126	23.9	1430	28.1	39.0	167.3
DIONE	--	--	653337	10.84	652773	10.83	166.7	0.10	1.73	15	-16	144	13.5	-56	25.1	11.6	130.0
RHEA	--	--	760491	12.62	759725	12.61	155.8	0.12	2.02	20	-14	129	10.8	432	36.1	22.0	117.4
TITAN	--	--	978368	16.23	975793	16.19	47.8	0.30	5.26	5	-11	15	11.4	-5540	132.3	130.6	20.9
HYPERION	--	--	1365796	22.66	1365680	22.66	44.2	0.01	0.24	330	-66	15	11.6	-25208	136.2	134.1	18.2
IAPETUS	--	--	3340837	55.43	3340089	55.42	34.4	0.03	0.45	7	-2	16	11.7	-553737	148.3	143.5	12.1
PHOEBE	--	--	14312573	237.48	14312460	237.48	127.3	0.00	0.02	172	-24	-137	11.7	3046834	43.7	54.6	166.3
SATURN	--	--	336203	5.58	277707	4.61	168.0	20.65	360.47	87	-33	0	13.0	0	0.0	14.1	142.1

- Pointing to NEG_Y to Saturn (center) would lead to a CMT violation between ~2017-142T08:59 and ~2017-143T21:59.
- Minimum NEG_Y to Sun angle is ~5.09° from 2017-142T13:00-13:10.
- Pointing at the south pole after ~142T16:30 then at -30deg lat at ~20:30 brings one out of the 12° cone, but not the 15° cone. *A waiver will be required.*

The sun is occulted by Saturn from 142T09:55 to 14:58

The RSS occultation observations take place from 142T02:22 to 143T17:19. During this period, the spacecraft is Earth-pointed.



Periapse Quicklook

Rev 275

SP_275EA_C34BWGRSS141_PRIME	C, M, R
SP_275EA_M34BWGRSS141_PRIME	M, R
RSS_275RI_PERIOCC001_PRIME	M, R
Periapse R = 1.043 Rs, lat ...	
SP_275EA_G70METRSS142_PRIME	C, M, R
RSS_275RI_INGOCC001_PRIME	M, R
RSS_275RI_EGROCC001_PRIME	M, R
SP_275SA_WAYPTTURN142_PRIME	
NEW WAYPOINT	
UVIS_275SA_AURSLEW001_PRIME	
VIMS_275SA_ALPORIOCC002_PRIME	
UVIS_275SA_AURNSTARE001_PRIME	I
SP_275EA_DLTURN143_PRIME	
NEW WAYPOINT	
SP_275EA_YGAP143_PRIME	E
SP_275EA_G70METSEQ143_PRIME	C

The Radio Science Subsystem took advantage of one of the best opportunities in the Cassini Mission to conduct radio occultations of Saturn's ring system and to run a gravity experiment to characterize Saturn's gravitational field with unprecedented detail.

RSS determines Saturn's gravity by very precisely tracking the orbit of Cassini relative to the Earth as the spacecraft plunges at about 30 km/s into the deepest recesses of the planet's gravity field, just skimming the atmosphere. RSS searches for deviations of gravity from spherical symmetry. While passing close to the planet, Cassini also feels the gravitational pull from the rings (the B-ring in particular), whose mass can therefore be determined very accurately, aiding in determining the age of the ring system.

During ring plane crossing, CDA measured large particles close to the ring plane, detecting the flux and composition of large grains. CDA attempted to measure enough mass spectra to derive the particle composition. The compositional measurement of these grains is related to the degree of pollution of the icy particles and thus the age of Saturn's main ring system.

Almost immediately after the S/C crossed the ring plane, RSS captured a near-peripase occultation observing the rings from a distance < ~1 Saturnian radius staring. These periapse occultations were short in duration (< 30 minutes) but cover the full ring system. As the spacecraft headed out towards apoapse, RSS observed a much slower set of ingress and egress occultations.

Periapse day ended with UVIS auroral observations and a VIMS observation of the occultation of the star alpha Orionis, better known as Betelgeuse, by Saturn's atmosphere.

Daily Science Highlights (1 of 3)

DOY 138 (18 May 2017): Saturn_275 was a ~5 day periapse segment. Science started with an ISS observation of Saturn's lit limb, working with VIMS and UVIS to study the composition of the high atmosphere. VIMS then began a 10.5h global map of the planet, including 7 2x4 mosaics pole-to-pole and a 2x3 mosaic covering the northern hemisphere and a bit of the southern hemisphere.

DOY 139 (19 May 2017): VIMS finished its global map. After Cassini downlinked data to Earth, VIMS took charge of spacecraft pointing again to observe the occultation of the star Alpha Canis Majoris, better known as Sirius, by Saturn's atmosphere. This occultation provides a better understanding of Saturn's upper atmosphere. CIRS then began an 11h temperature mapping observation in the mid-IR (MIRTMAP) of the northern hemisphere to determine upper troposphere and tropopause temperatures over multiple latitudes. CIRS observed the Central Meridian Longitude as Saturn rotated for 1.5-2 hrs, then moved to another latitude and repeated. This is repeated for 6 or so latitudes. CIRS could average over longitudes to yield spectra to retrieve temperature and compositions at these different latitudes.

DOY 140 (20 May 2017): Cassini downlinked data to Earth. CIRS performed another temperature mapping observation in the mid-IR (MIRMAP), this time only sitting at one latitude on the Central Meridian Longitude as Saturn rotated for 12hr. This obtained upper troposphere and tropopause temperatures at all longitudes at this specific latitude. CIRS used this data to look for waves.

DOY 141 (21 May 2017): VIMS led a 5h observation, with CIRS, UVIS and ISS riding, creating a north hemisphere map centered at 35deg N Lat. Following the VIMS mapping observation, the high-gain antenna pointed towards the Earth during Cassini's **fifth proximal periapse passage**. Multiple DSN and ESA antennae monitored Cassini's signal. The Radio Science Subsystem took advantage of **one of the best opportunities** of the Cassini Mission to conduct radio occultations of Saturn's ring system and to run a gravity experiment to characterize Saturn's gravitational field with **unprecedented** detail.

Radio Science began the gravity experiment (**the 3rd of 6 during the Grand Finale**) during periapse to determine Saturn's gravity field and infer constraints on its internal structure, helping to answer some of the key questions about what is inside Saturn, how the planet is layered, what it's temperature profile is, and how deep the winds are. RSS determines Saturn's gravity by very precisely tracking the orbit of Cassini relative to the Earth as the spacecraft plunges at about 30 km/s into the deepest recesses of the planet's gravity field, just skimming the atmosphere. RSS searches for deviations of gravity from spherical symmetry. These deviations reveal how density varies with depth and the depth to which the strong winds seen at the surface extend. While passing close to the planet, Cassini also feels the gravitational pull from the rings (the B-ring in particular), therefore allowing an accurate determination of their mass. The mass bears special relevance because it is a strong indicator of the age of the ring system.

Daily Science Highlights (2 of 3)

DOY 141 (21 May 2017) continued: The orbit of Cassini could be inferred from radio tracking by the antennas of the DSN and the ESA network, which provided measurements of the spacecraft radial velocity as accurate as 0.01 mm/s after 60 s of averaging. This was about three billion times smaller than the spacecraft velocity. Cassini was tracked continuously for 24 hours around the pericenter during six of the 22 Grand Finale orbits. The favorable orbital geometry and the proximity to the planet allowed Cassini to measure surface gravity accelerations as small as 0.1 mGal (or 10 million times smaller than the acceleration of gravity on the Earth).

As Cassini flew through periapse, CDA (Cosmic Dust Analyzer) gathered it's own unique data. In this particular orbit, CDA's primary science targets were large ring plane particles (>50nm). Smaller particles can leave the ring plane and be found at higher latitudes while larger particles (big population) are grains with lower charge-to-mass ratio and they therefore stay closer to the ring plane. These particles are primarily also debris particles from the main ring moving inwards. CDA detected the flux and composition of the large grains during an extremely short time window during ring plane crossing, making such measurements challenging. CDA attempted to measure enough mass spectra to derive the particle composition. The compositional measurement of these grains is related to the degree of pollution of the icy particles and thus the age of Saturn's main ring system.

DOY 142 (22 May 2017): RSS and CDA continued their observations. RSS then began to conduct radio occultations of Saturn's ring system. Almost immediately after the S/C crossed the ring plane, RSS captured a near-periapse occultation by observing the rings from a distance < ~1 Saturnian radii. These never-before-attempted occultations were short in duration (< 30 min) but cover the full ring system. High resolution of both the scattered and direct signals was expected because of the smaller HGA footprint and the smaller Fresnel scale of diffraction. As the spacecraft headed out towards apoapse, RSS observed a much slower set of ingress and egress occultations.

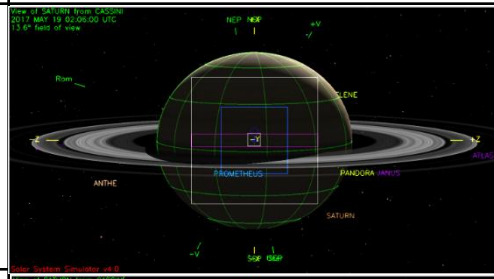
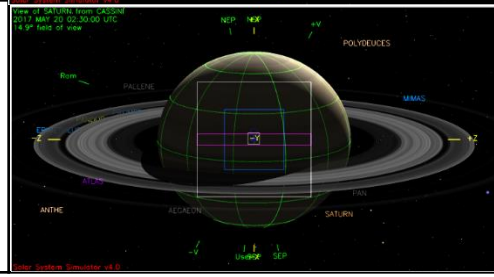
Uniquely, the campaign captured the rings when they were close to their maximum opening angle (B~26-27°) as seen from the Earth, possible only close to the 2017 epoch of the proximal orbits. The large B-angle allowed maximum possible radio-signal penetration of optically thick features of the B Ring and its 4 regions of distinct morphology, where most of the ring mass resides. The same is true for regions of optical depth enhancements within the many density and bending waves known to populate the A Ring and some in the B Ring, allowing reliable profiling not only of wave frequencies but also of wave amplitudes, crucial for characterization of wave damping and hence ring viscosity, as well as standard inference of rings surface mass density, particularly of the massive B-Ring. The deep penetration is also crucial for reliable profiling of confined and optically thick ringlets across the ring system, in particular the plateau regions of the C Ring where puzzling behavior has been reported. The use of three coherent radio frequencies during these observations also help constrain the physical properties of the rings' structures. The collective RSS Proximal occultations "campaign" was unprecedented in the Cassini Mission.

DOY 142 (22 May 2017) continued: UVIS then took the lead for auroral imaging, repeatedly slewing across the southern polar auroral zone, for 4h. VIMS then observed the occultation of the star alpha Orionis, better known as Betelgeuse, by Saturn's atmosphere. This occultation provides a better understanding of Saturn's upper atmosphere.

DOY 143 (23 May 2017): UVIS continued to observe the aurora by staring at the south polar auroral zone for 3h. Saturn_275 ended with a downlink of all data to Earth via the 70M 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	2017-138T20:01:00	2017-139T08:11:00	000T12:10:00	146.1 to 142.8	21.1 to 20.9	5 to 8	
	Suggested observations: ISS Limb/VIMS N Hem Map						
2	2016-139T21:00:00	2017-140T08:11:00	000T11:11:00	139.2 to 135.5	19.9 to 18.3	11 to 14	
	Suggested observations: CIRS Map						

Initial SMT and Data Volume

Beginning of Integration:

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

			OBSERVATION_PERIOD							DOWNLINK_PASS							
			P4						P5	RECORDED		PLAYBACK					
DOWNLINK PASS NAME	Start doy hh:mm	End doy hh:mm	START (Mb)	SCI (Mb)	HK+E (Mb)	TOTAL (Mb)	CPACTY (Mb)	MRGN (Mb)	OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_MARGN (Mb)	(%)	CAROVR (Mb)
SP_275EA_C34BWGSEQ139_PRIME	139 10:21	139 19:21	0	179	63	242	3322	3080	0	199	53	494	904	409	3218	38%	0
SP_275EA_C70METSEQ140_PRIME	140 10:21	140 19:21	0	436	63	499	3322	2823	0	199	53	752	3855	3103	2808	37%	0
SP_275EA_C34BWGRSS141_PRIME	141 15:14	141 20:59	0	1501	84	1585	3322	1737	0	348	34	1966	500	-1467	-295	-7%	1466
SP_275EA_M34BWGRSS141_PRIME	141 20:59	142 02:22	1466	0	0	1466	3322	1856	0	471	32	1970	376	-1594	-295	-8%	1594
SP_275EA_G34BWGRSS142_PRIME	142 04:29	142 06:47	1594	507	9	2110	3322	1212	0	212	14	2335	160	-2175	-295	-9%	2175
SP_275EA_G70METSEQ143_PRIME	143 03:59	143 12:14	2175	1353	90	3618	3322	-295	0	319	49	3690	2766	-924	0	0%	924

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	138 19:21	139 10:21	0.0	28.3	0.0	5.4	0.0	26.7	45.9	0.0	70.7	0.0	0.0	0.0	62.7	239.7
SP_275EA_C34BWGSEQ139_PRIME	139 10:21	139 19:21	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 19:21	139 19:21	0.0	45.3	86.4	8.6	0.0	42.7	73.4	0.0	113.2	4.9	0.0	0.0	62.7	
OBSERVATION_NOR	139 19:21	140 10:21	0.0	28.3	21.6	5.4	38.5	26.7	45.9	0.0	70.7	134.8	60.0	0.0	62.7	494.6
SP_275EA_C70METSEQ140_PRIME	140 10:21	140 19:21	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	139 19:21	140 19:21	0.0	45.3	108.0	8.6	38.5	42.7	73.4	0.0	113.2	139.7	60.0	0.0	62.7	
OBSERVATION_NOR	140 19:21	141 15:14	0.0	37.5	122.8	7.2	50.0	35.4	60.8	0.0	671.6	61.8	440.0	0.0	83.1	1570.1
SP_275EA_C34BWGRSS141_PRIME	141 15:14	141 20:59	0.0	21.7	51.3	2.1	0.0	10.2	22.3	0.0	233.9	3.2	0.0	0.0	0.0	344.7
SP_275EA_M34BWGRSS141_PRIME	141 20:59	142 02:22	0.0	28.2	0.0	2.6	0.0	32.0	23.5	0.0	377.9	3.0	0.0	0.0	0.0	467.2
DAILY TOTAL SCIENCE	140 19:21	142 02:22	0.0	87.4	174.1	11.8	50.0	77.6	106.7	0.0	1283.4	67.9	440.0	0.0	83.1	
OBSERVATION_NOR	142 02:22	142 04:29	0.0	31.9	0.0	10.2	0.0	15.1	13.2	0.0	432.0	0.0	0.0	0.0	8.8	511.2
SP_275EA_G34BWGRSS142_PRIME	142 04:29	142 06:47	0.0	9.7	14.0	0.8	0.0	16.4	9.9	0.0	157.7	1.3	0.0	0.0	0.0	209.8
DAILY TOTAL SCIENCE	142 02:22	142 06:47	0.0	41.6	14.0	11.0	0.0	31.4	23.1	0.0	589.7	1.3	0.0	0.0	8.8	
OBSERVATION_NOR	142 06:47	143 03:59	0.0	55.9	0.0	7.6	32.5	44.6	73.0	0.0	862.4	144.9	120.0	0.0	88.6	1429.7
SP_275EA_G70METSEQ143_PRIME	143 03:59	143 12:14	0.0	15.6	78.3	3.0	0.0	14.7	25.2	0.0	174.9	4.5	0.0	0.0	0.0	316.2
DAILY TOTAL SCIENCE	142 06:47	143 12:14	0.0	71.5	78.3	10.6	32.5	59.3	98.3	0.0	1037.3	149.4	120.0	0.0	88.6	

	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	291.1	460.8	50.7	121.0	253.7	374.9	0.0	3136.8	363.3	620.0	0.0

Waypoint Selection

RBOT – Friendly (Primary is NEG_Y to Saturn Center)

OBSERVATION PERIOD	START	END	POS_X	NEG_X	POS_Z	NEG_Z
SP_274NA_OBSERV138_NA	2017-138T19:21:00	2017-139T10:21:00	------	182.5/ 32.8	182.5/ 32.8	------
SP_275NA_OBSERV139_NA	2017-139T19:21:00	2017-140T10:21:00	------	182.5/ 32.8	182.5/ 32.8	------
SP_275NA_OBSERV141_NA	2017-140T19:21:00	2017-141T15:14:00	------	182.5/ 32.8	182.5/ 32.8	------
SP_275NA_OBSERV542_NA	2017-142T03:09:00	2017-142T03:44:00	------	------	------	------
SP_275NA_OBSERV142_NA	2017-142T08:14:00	2017-143T03:59:00	------	------	------	------
SP_275NA_OBSERV143_NA	2017-143T12:14:00	2017-144T20:44:00	------	181.4/ 32.8	181.4/ 32.8	------

Standard (Primary is NEG_Y to Saturn Center)

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_274NA_OBSERV138_NA	2017-138T19:21:00	2017-139T10:21:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	**BAD**
SP_275NA_OBSERV139_NA	2017-139T19:21:00	2017-140T10:21:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	**BAD**
SP_275NA_OBSERV141_NA	2017-140T19:21:00	2017-141T15:14:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	**BAD**
SP_275NA_OBSERV542_NA	2017-142T03:09:00	2017-142T03:44:00	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**
SP_275NA_OBSERV142_NA	2017-142T08:14:00	2017-143T03:59:00	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**
SP_275NA_OBSERV143_NA	2017-143T12:14:00	2017-144T20:44:00	**BAD**	**BAD**	OK	OK	OK	OK	**BAD**	**BAD**	OK	**BAD**

Downlinks

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_275EA_C34BWGSEQ139_PRIME	2017-139T10:21:00	2017-139T19:21:00	OK	OK	OK	OK	OK	OK	OK	OK	OK
SP_275EA_C70METSEQ140_PRIME	2017-140T10:21:00	2017-140T19:21:00	OK	OK	OK	OK	OK	OK	OK	OK	OK
SP_275EA_C34BWGRSS141_PRIME	2017-141T15:14:00	2017-141T20:59:00	OK	OK	**BAD**	**BAD**	OK	OK	OK	OK	0
SP_275EA_M34BWGRSS141_PRIME	2017-141T20:59:00	2017-142T03:09:00	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	**BAD**	0
SP_275EA_M34BWGRSS541_PRIME	2017-142T03:44:00	2017-142T04:29:00	**BAD**	**BAD**	OK	OK	**BAD**	**BAD**	**BAD**	OK	0
SP_275EA_G34BWGRSS142_PRIME	2017-142T04:29:00	2017-142T08:14:00	**BAD**	**BAD**	OK	OK	**BAD**	**BAD**	OK	OK	37
SP_275EA_G70METSEQ143_PRIME	2017-143T03:59:00	2017-143T12:14:00	OK	OK	OK	OK	OK	OK	OK	OK	OK

*** NEG_Y to Saturn not safe from 2017-142T08:14 to 143T02:22 (ORS to Sun < 15 deg.).**

- Minimum ORS to SUN angle is appx. 5.09 deg (CIRS Operational FR Zone).

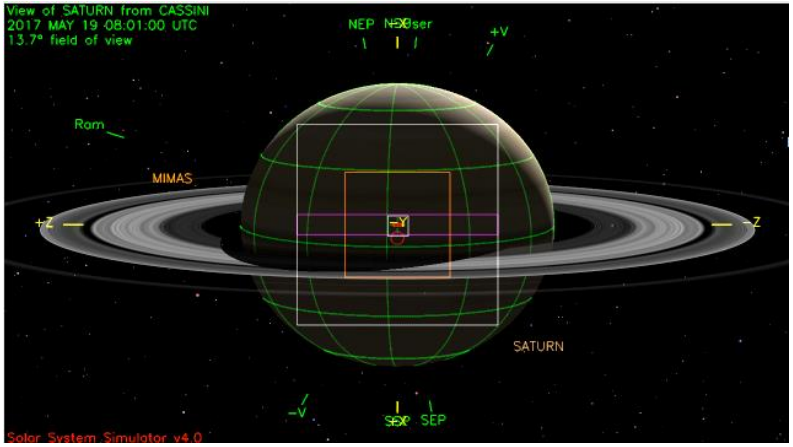
Waypoints during this time are:

XBAND to Earth, NEG_X to SSP from 141T13:44-142T17:44

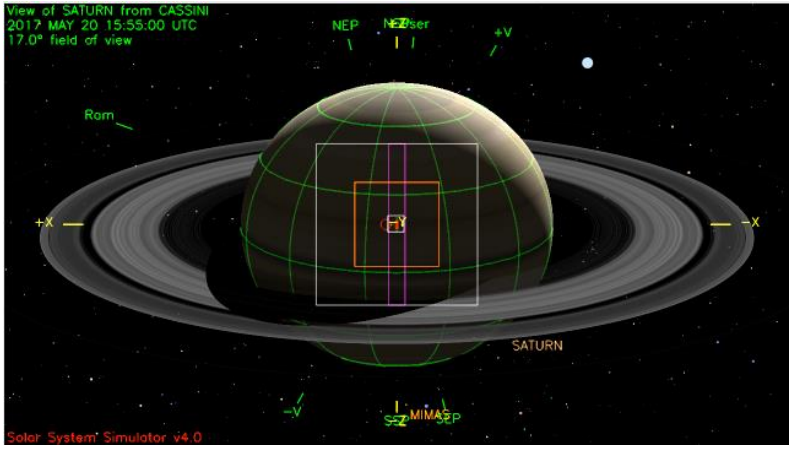
ISS_NAC to Saturn (-10,-8,0), NEG_Z to NSP from 142T17:44-143T02:29

Waypoints Chosen

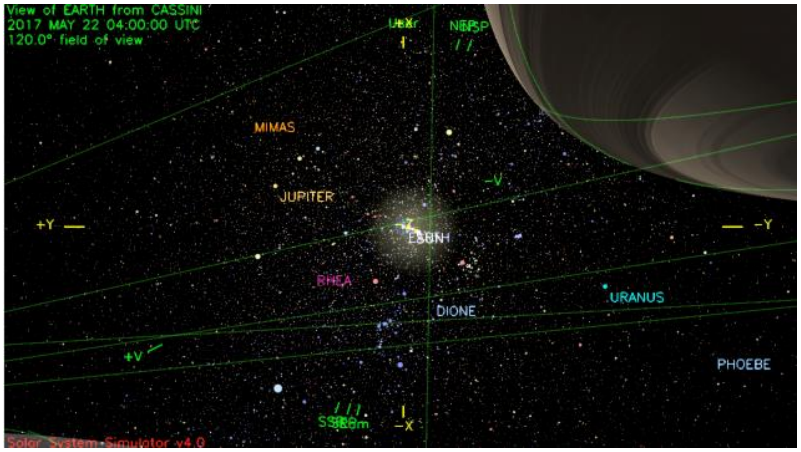
Waypoint 1 (2017-138T20:01 – 139T19:55):
NAC to Saturn, NEG_X to NSP



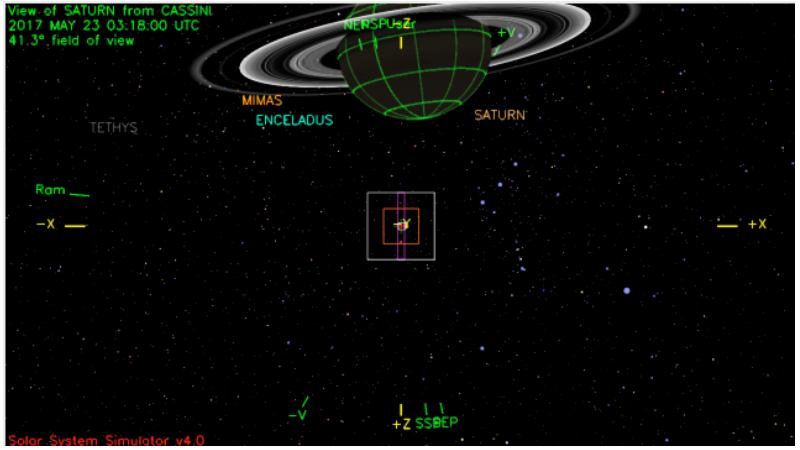
Waypoint 2 (2017-139T19:55 – 141T13:57):
NAC to Saturn, POS_Z to NSP



Waypoint 3 (2017-141T13:57 – 142T17:44):
XBAND to Earth, POS_X to 230.3/63.6
(Waypoint chosen for Radio Science occultations)



Waypoint 4 (2017-142T17:44 – 143T12:54):
NAC to Saturn (-10,-8,0 deg offset), NEG_Z to NSP



Notes 1/3

- Pointing:
  - YGAP141 duration shortened to 1hr17 duration. Two-part turn preceding RSS gravity science required, total duration of 53m turning. Shortened YGAP duration approval provided by SCO via email (Kirby, Burke, Burk 7/21)
    - If more bias time required, SCO suggested possible option to speed up the downlink turns
  - VIMS_275SA_ALPCMAOCC001_PIE was shortened by 5 minutes. This time was given to the preceding waypoint turn.
    - VIMS provided approval via email (Phil Nicholson 7/18)
    - CIRS and VIMS temperature/ boresight violations:
    - CIRS Max Temp = 83.37K (ΔT = 8.77K) @ 142T04:26 SCET
      - CIRS provided approval via email (Paul Romani, Rich Achterberg 9/29)
      - **Consumable FR Waiver will be required (See SPLAT item)**
    - VIMS Max Temp = 66.38K (ΔT = 6.72K) @ 142T05:29 SCET
      - VIMS provided approval via email (Ed Audi 8/18)
      - **Consumable FR Waiver will be required (See SPLAT item)**
    - CIRS Boresight to Sun < 15˚ during DOY 142 (During UVIS AURSLEW)
      - The CIRS Boresight is within 15˚ from Edge of Sun within 16 hours of CIRS Science (DSCAL)
      - CIRS provided approval via email (Paul Romani, Rich Achterberg 9/29)
      - **Operational FR Waiver will be required (see SPLAT item)**
    - KPT complaints (from Dave Bates):
      - 2017-142T03:19 RSS_275RI_PERIOCC001 CIRS Rise above 5 deg
      - 2017-142T03:14 RSS_275RI_PERIOCC001 VIMS Rise above 2 deg

- Periapse Jumpstart of Merged PDT & AACS analysis for teams early PDT deliveries during 2017-140T08:11 – 143T12:14 **(See SPLAT item)**

- Resource checker:
  - No resource checker errors

- Hydrazine:
  - N/A

Notes 2/3

- DSN:
  - No OTMs
  - Level 3 requests: Saturn Gravity and Rings Occultations Experiments: passes on DOY 141-142 (except ESA tracks)

Stations: DSS-35 (DOY 141), DSS-55, DSS-63, DSS-25, DSS-14, DSS-43, DSS-35 (DOY 142)

SP_275NA_C34BWGRSS141_SP
SP_275NA_M34BWGRSS141_SP
SP_275NA_M70METRSS142_SP
SP_275NA_G34BWGRSS142_SP
SP_275NA_G70METRSS142_SP
SP_275NA_C70METRSS142_SP
SP_275NA_C34BWGRSS142_SP

17	139	1005	1135	2040	2055	DSS-35	CAS	TP RSS OCCORT MC	N750	1A1
17	139	1005	1135	1400	1415	DSS-25	CAS	RSS OCCORT MC	N748	1A1
17	140	1035	1135	2040	2055	DSS-43	CAS	TKG PASS	N003	1A1
17	141	1205	1335	2220	2235	DSS-35	CAS	TP RSS GRAV/OCC	N750	1A1
17	141	1715	1800	0000	0015	DSS-74	CAS	RSS GRAV/OCC	0142	1A1
17	141	2030	2200	0555	0610	DSS-55	CAS	TP RSS GRAV/OCC	N750	1A1
17	141	2305	2350	1000	1015	DSS-84	CAS	RSS GRAV/OCC	0142	1A1
17	142	0200	0300	0600	0615	DSS-63	CAS	RSS GRAV/OCC	1645	1A1
17	142	0345	0515	1345	1400	DSS-25	CAS	RSS GRAV/OCC	N748	1A1
17	142	0415	0515	1345	1400	DSS-14	CAS	TP RSS GRAV/OCC	1645	1A1
17	142	0815	0915	1840	1855	DSS-43	CAS	RSS GRAV/OCC	1645	1A1
17	142	0755	0925	1840	1855	DSS-35	CAS	RSS GRAV/OCC	N750	1A1
17	143	0415	0515	1330	1345	DSS-14	CAS	TKG PASS	N003	1A1

- ap_downlink report check warnings:
  - Ignore 4 warnings about ESA codes and precal times:
    - Per Aseel Anabtawi, “was told by ESA recently that their standard pre-cal is 45 minutes not 1 hour, so we can change the pre-cal for these two tracks to 2700 seconds”
  - “RSS pass SP_275NA_M34BWGRSS141_SP overlaps start of DSS-55 weekly maintenance by 10 minute(s); move earlier to resolve”
    - Per Aseel Anabtawi: “The Madrid/Goldstone overlap is at low elevation angles. We’d like to keep DSS-55 as long as possible, so please keep EOT as is.” (L3 support) Work during DSN negotiations.
  - Ignore “SP_275EA_G70METSEQ143_PRIME is a SEQ upload pass and should be at least 9 hours in duration”
    - Pass duration is 8hr15. Due to the viewperiod, this is the longest the pass can be.

- Data Volume:
  - SP_275EA_G70METRSS142_PRIME was upgraded because RSS is requesting both 34M and 70M at this time anyway

Notes 3/3

- Special Activities:
  - RSS OCCORT from 2017-139T10:21:00 – 19:21:00 SCET
    - RSS Operations Readiness Test (ORT), to demonstrate DSN and RSSG preparedness to support the Rev275 Saturn gravity and rings occultation on 2017/141-142.
    - DSS-35 and DSS-25 required to obtain X- and Ka-band downlink data
  - RSS Gravity Science and Rings Occultations
    - RSS_275SA_GRAVITY001_PIE 2017-141T15:14:27 – 2017-142T15:14:27 SCET
    - RSS_275RI_PERIOCC001_PRIME 2017-142T02:22:00 – 2017-142T04:29:00 SCET
    - RSS_275RI_INGOCC001_PRIME 2017-142T06:47:00 – 2017-142T11:22:00 SCET
    - RSS_275RI_EGROCC001_PRIME 2017-142T11:22:00 – 2017-142T17:19:00 SCET
    - CDA collaborative on all, including Prime SP requests (C34BWGRSS141, M34BWGRSS141 , G70BWGRSS142)
      - Secondary chosen for CDA: POS_X to 230.3/63.6 (approved via email Georg Moragas-Klostermeyer 8/15)
      - SCR-118851 to replace 20° Z-offset, as desired by CDA, with equivalent RA/Dec secondary. Secondary defined by SP and held throughout RSS gravity and occultation period. Approved 10/04/2016.
  - PIEs:
    - VIMS_275SA_ALPCMAOCC001_PIE (139T19:55 SCET)
    - RSS_275SA_GRAVITY001_PIE (141T15:14:27 SCET) *not Prime

- Opmodes:
  - RSSKRWAF
    - Required for RSS OCCORT on DOY 139
    - Required for RSS_275SA_THERMAL001 and RSS_275SA_GRAVITY001 DOY 141/142
  - RSS3BRWAS required for RSS_275RI_THERMAL001 and RSS Peri/Ingress/Egress Occs on DOY 142

- **SIP SP_TURN PDT SASF Hand Edits required!**
  - Hand edit to SPturn SASF: Use RWA slow accels for SP_275EA_G70METRSS142_PRIME (accel(x,y,z) = (0.005, 0.008, 0.012 mrad/s^2))
  - Remind RSS to use RWA slow accels as well for the occultations (SPLAT Item # S99000082)

Liens 1/2

Sequence Liens (should all be SPLAT items):

- Target Motion Violations:
  - None

- CIRS heating violation **Consumable FR waiver** required during RSS Ring Occultations
  - CIRS Max Temp = 83.37K (ΔT = 8.77K) @ 142T04:26 SCET
  - CIRS provided approval via email (Paul Romani, Rich Achterberg 9/29)

- VIMS heating violation **Consumable FR waiver** required during RSS Ring Occultations
  - VIMS Max Temp = 66.38K (ΔT = 6.72K) @ 142T05:29 SCET
  - VIMS provided approval via email (Ed Audi 8/18)

- CIRS Boresight to Sun < 15˚ **Operational FR waiver** required on DOY 142 during UVIS_275SA_AURSLEW001_PRIME
  - The CIRS Boresight is within 15˚ from Edge of Sun within 16 hours of CIRS Science (DSCAL)
  - Minimum NEG_Y to Sun angle is ~13.8˚ @ ~142T18:03 SCET
  - CIRS provided approval via email (Paul Romani, Rich Achterberg 9/29)

Liens 2/2

Sequence Liens (should all be SPLAT items):

- The following science requests from 2017-140T08:11 – 143T12:14 in Saturn_275 have been designed in PDT during integration. Teams identified shall deliver these designs as part of the Port 1 delivery; SIP leads to monitor.

  CIRS_275SA_MIRMAP001_PRIME

  VIMS_275SA_NHEMMAP001_PRIME

  RSS_275RI_PERIOCC001_PRIME

  RSS_275RI_INGOCC001_PRIME

  RSS_275RI_EGROCC001_PRIME

  UVIS_275SA_AURSLEW001_PRIME

  VIMS_275SA_ALPORIOCC002_PRIME

  UVIS_275SA_AURNSTARE001_PRIME

- SIP Leads to check that the science requests from 2017-141T15:14 to 142T17:19 in Saturn 275 are the same as what has been approved in integration:
  https://cassini.jpl.nasa.gov/tools/index.php?q=file_exchange/dl/sip_xxm/s99/integration/sasf/Saturn_275_160811.sasf

RBOT Summary

AACS evaluation of Saturn_275 Periapse Jumpstart by David Bates

I looked at Rev 275, and it looks great!

No RBOT changes needed.

KPT found two thermal violations.

1) 2017-142T03:14 RSS_275RI_PERIOCC001 VIMS Rise above 2 deg

2) 2017-142T03:19 RSS_275RI_PERIOCC001 CIRS Rise above 5 deg