

Science Planning & Sequence Team

### SATURN TARGET WORKING TEAM

**Rev 23 Segment Legacy Package** 

Segment Boundary: April 27, 2006 – April 30, 2006 2006-117T04:59 – 2006-120T04:44 (SCET)

Integration Began 07/22/2002 Segment Delivered to S20- Sequence 11/11/2002 Lead Integrator was Jerod Gross

Legacy Package Assembled by Kyle Cloutier

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

# **Segment Overview and Final Products**

• Saturn 23 is a periapse segment in the Prime mission. The spacecraft stays equatorial throughout the period. Surrounding periapse, science observations included VIMS and CIRS Saturn feature tracks, ISS color imaging of Janus and an ISS observation to determine orbits of newly discovered satellites.

• Other science observations included two UVIS stellar occultations, and two satellite transits across Titan (by Janus and and Epimetheus), VIMS thermal cylindrical mapping, CIRS F-ring rotation movie, and global color mapping of Rhea.

• Heading into the following TOST segment (T13), RADAR obtains distant Titan scatterometry and radiometer calibration data at near-zero Titan sub-spacecraft latitudes, near-zero sub-spacecraft longitude, and low phase angle.

• CDA requested pointing preference on DOY 119 (NEG\_Y to Saturn) for observations surrounding ring plane crossing.

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End	Primary	Secondary	Comments
SATURN rev 23 Segment		2006-117T04:59:00		002T23:45:00	2006-120T04:44:00			
NAV_023SK_OPNAV171_PRIME	Ν	2006-117T04:59:00		000T02:00:00	2006-117T06:59:00	ISS_NAC to Satellites	POS_Z to NSP	Starts at Earth point, ends at NEW waypoint
NAV_023SA_WAYPTTURN171_PRIME		2006-117T06:59:00		000T00:01:00	2006-117T07:00:00	ISS_NAC to Saturn	POS_Z to NSP	
NEW WAYPOINT		2006-117T07:00:00		001T11:30:00	2006-118T18:30:00	ISS_NAC to Saturn	POS_Z to NSP	
VIMS_023SA_FEATRACK004_PRIME	C, U	2006-117T07:00:00		000T06:00:00	2006-117T13:00:00	ISS_NAC to Saturn	POS_Z to NSP	
VIMS_023SA_THRCYLMAP001_PRIME	С	2006-117T13:00:00		000T06:29:00	2006-117T19:29:00	VIMS_IR to Saturn	POS_Z to NSP	
SP_023EA_DLTURN117_PRIME		2006-117T19:29:00		000T00:30:00	2006-117T19:59:00	XBAND to Earth	NEG_Y to Saturn	
SP_023EA_G34BWGOTB117_PRIME	C, N	2006-117T19:59:00		000T09:00:00	2006-118T04:59:00	XBAND to Earth	NEG_Y to Saturn	Secondary axis chosen for MIMI science.
SP_023SA_WAYPTTURN118_PRIME		2006-118T04:59:00		000T00:30:00	2006-118T05:29:00	ISS_NAC to Saturn	POS_Z to NSP	
UVIS_023ST_BETORI003_PRIME	I.	2006-118T05:55:00		000T01:10:00	2006-118T07:05:00	UVIS_FUV to 78.63/-8.2	POS_Z to NSP	
ISS_023JA_MUTUALEVE014_PRIME		2006-118T07:05:00		000T00:45:00	2006-118T07:50:00	ISS_NAC to Janus	POS_Z to NSP	
ISS_023EP_MUTUALEVE014_PRIME		2006-118T07:50:00		000T00:45:00	2006-118T08:35:00	ISS_NAC to Epimetheus	POS_Z to NSP	
UVIS_023ST_EPSORI003_PRIME	l i	2006-118T08:35:00		000T01:00:00	2006-118T09:35:00	UVIS_FUV to Star	POS_Z to NSP	
						ISS_NAC to Rhea (0.0,-50.0,0.0		
ISS_023RH_ORSRHCOL001_PRIME	C, U, V	2006-118T09:35:00		000T01:25:00	2006-118T11:00:00	deg. offset)	POS_Z to NSP	
SP_023EA_DLTURN118_PRIME		2006-118T11:00:00		000T00:30:00	2006-118T11:30:00	XBAND to Earth	POS_X to NEP	
								No roll possible b/c CIRS request within 4 hrs.
SP_023EA_M34HEFNON118_PRIME	С, М	2006-118T11:30:00		000T06:30:00	2006-118T18:00:00	XBAND to Earth	POS_X to NEP	of end of downlink.
SP_023SA_WAYPTTURN418_PRIME	С, М	2006-118T18:00:00		000T00:30:00	2006-118T18:30:00	ISS_NAC to Saturn	POS_X to NSP	
NEW WAYPOINT		2006-118T18:30:00		001T10:44:00	2006-120T05:14:00	ISS_NAC to Saturn	POS_X to NSP	
CIRS_023SA_FTRACK005_PRIME	I, M, V	2006-118T18:30:00		000T06:00:00	2006-119T00:30:00	CIRS_FPB to Saturn	POS_X to NSP	
Periapse R = 5.5 Rs, lat =		2006-118T23:59:10		000T00:00:01	2006-118T23:59:11			
ISS_023JA_COLORF006_PRIME	C, M, U	2006-119T00:30:00		000T01:00:00	2006-119T01:30:00	ISS_NAC to Janus	POS_X to NSP	
ISS_023OT_RETHIEQPL005_PRIME	М	2006-119T01:30:00		000T01:11:00	2006-119T02:41:00	ISS_NAC to Retargetable	POS_X to NSP	
VIMS_023SA_FEATRACK003_PRIME	М	2006-119T02:41:00		000T06:03:00	2006-119T08:44:00	ISS_NAC to Saturn	NEG_Z to NSP	
CIRS_023RF_FMOVIEB002_PRIME	I, M, R	2006-119T08:44:00		000T08:30:00	2006-119T17:14:00	CIRS_FP1 to Rings	NEG_Z to NSP	
RADAR_023TI_SCATT1CAL001_PRIME	М	2006-119T17:14:00		000T02:00:00	2006-119T19:14:00	NEG_Z to Titan	POS_X to North_Pole_Dir	
SP_023EA_DLTURN119_PRIME	M, R	2006-119T19:14:00		000T00:30:00	2006-119T19:44:00	XBAND to Earth	NEG_X to NEP	
SP_023EA_G70ARRNON119_PRIME	C, M, R	2006-119T19:44:00		000T09:00:00	2006-120T04:44:00	XBAND to Earth	Rolling	

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

					OBS	ERVATI	ON_PERI	OD					DOWNLIN	K_PASS			
						P4			P5	RECO	RDED			PLAYE	ACK		
DOWNLINK PASS NAME	Start doy <u>hh:mm</u>	End doy <u>hh:mm</u>	START (Mb)		HK+E (Mb)	TOTAL (Mb)	CPACTY (Mb)	MRGN (Mb)	OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_M (Mb)	ARGN (%)	CAROVR (Mb)
SP_023EA_G34BWGOTB117_PRIME SP_023EA_M34HEFNON118_PRIME SP_023EA_G70ARRNON119_PRIME	118 11:30	118 18:00		902 673 2612	51 22 97	953 1135 3441	3491 3491 3491	2538 2356 51	35 0 0	243 205 860	53 38 53	1284 1378 4354	844 647 4416	-440 -731 63	51 51 65	0% 0% 0%	440 731 0

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

Event	Start doy <u>hh:mm</u>	End doy <u>hh:mm</u>	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 OBSERVATION_OPN SP_023EA_G34BWGOTB117_PRIME DAILY TOTAL SCIENCE	117 04:59	118 04:59	0.0 32.4	0.0	133.1 0.0 86.4 219.5	2.7 0.0 1.6 4.3	0.0 34.8 0.0 0.0	32.4 0.0 19.4 51.8	64.5 0.0 38.9 103.4	0.0	70.7 0.0 42.4 113.2	23.7 0.0 2.5 26.2		0.0	0.0 0.0 0.0	34.8
OBSERVATION_NOR SP_023EA_M34HEFNON118_PRIME DAILY TOTAL SCIENCE			23.4	44.7 12.1 56.8	20.4 82.8 103.2	1.2 1.2 2.3	336.9 0.0 336.9	14.1 14.0 28.1	28.2 36.9 65.1		30.7 30.7 61.4	159.2 1.8 161.0	7.7 0.0 7.7	0.0 0.0 0.0		
OBSERVATION_NOR SP_023EA_G70ARRNON119_PRIME DAILY TOTAL SCIENCE			152.3	16.9	222.9 86.4 309.3	37.5 3.2 40.7	709.7 0.0 709.7	75.3 64.0 139.3	147.0 38.9 185.9	0.0	383.5 488.1 871.6	3.6 2.5 6.1	0.0	0.0		2596.9 852.2

### **Segment Geometry**

#### Saturn 23 Legacy

2006 AFR 27 04.59.00 UTC       NEP       2006 AFR 27 04.59.00 ACTT         1 2* field of view       1       7         2006 AFR 27 04.59.00 ACTT       2006 AFR 27 06.34.44 EER         2006 AFR 27 06.34.44 EER       2006 AFR 27 06.34.44 EER         2006 AFR 27 06.34.44 EER       2006 AFR 27 06.34.44 EER         2006 AFR 27 06.34.44 EER       2006 AFR 27 06.34.44 EER         2006 AFR 27 06.34.44 EER       20.32 EER         2006 AFR 27 06.30.44 EER       20.32 EER         2006 AFR 27 06.30.44 EER       20.32 EER         2006 AFR 27 07 EER       20.32 EER         2006 AFR 27 07 EER       20.32 EER	View of SJ														Rev 023 IM			
2006 ARE 27 06:14:44 BR         Appage 0:33 - 00:113:00:014         Light time         Bill         Color System Simulator v4:0         SEDF System Simulator v4:0         SEDF System Simulator v4:0         Color System Simulator v4:0         Bill         Color System Simulator v4:0         SEDF System Simulator v4:0 <td< th=""><th></th><th></th><th></th><th>DO UTC</th><th></th><th></th><th>NEP</th><th>NEP</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></td<>				DO UTC			NEP	NEP										
RACADE       Accope 0.23 + 01713 = 3.356         Red (up 1255) km 20.3 C km 20.3	14.2° field	I OF VI	ew															
Perfage       0.2       0.01110-00-14         Light       121559       ks       20.12         Radies       121559       ks       20.12         Radies       20.12       ks       20.12         Radies       20.12       ks       20.12         Radies       20.12       ks       20.12         Radies       20.12       ks       ks         Radies       20.02       ks </th <th></th> <th>6</th>																		6
RXMAC: <ul> <li>Clight time; 75.7 min Critical Status</li> <li>Clight time; 75.7 min Clight tim</li></ul>	1.1																	
Conset period: 39.1 days         Rad. cyl       212255 km       20.12 km         Mag. L       20.12 km       20.12 km         Self       Self       20.12 km         Self       Self       Self         Self       Self       Self         Self       Self       Self         Self       Self       Self         Self       Sall dag       Self         Self       Sall dag       Self         Dec       -17.04       Entr         Paste Current RA/DEC       Image       Down <i td="">       H les         Zoom In       FBVs       Axes       Work       Self dag         Dec       -17.04       Entr       Reset       Right         Image       Down<ii>H les<th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></ii></i>																		
Rad_cy1       1212552 km       20.12 km         Rad_cy1       2212552 km       20.12 km         Mag_L       20.12 km       20.12 km         Mag_L       20.13 km       36.89 km         Mag_L       20.13 km       36.82 km         Marth zanage       9.11 AM         Terth zanage       9.11 AM         Marth zanage       9.11 AM         Marth zanage       9.13 AM         Marth zanage       9.11 AM         Collatione       31.8 62.0         Camberra       28.0 5.5         Point       NEG Y C at SATURN       and align         POS_X C =       Up C with       NSP c collatione         Collatione       9.12 kdg       5.5 kdg         Vice and angle       Down       HiRs       Com Out V       Labels V Axes         Scored       Vice angle       Down       HiRs       Scored         Vice angle       Down       HiRs       Scored       Month       Day         Doc       Image       Down       HiRs       Scored       Mont																		
Rome       Random															Radius :	1212559 l	<m -<="" th=""><th>20.12 Rs</th></m>	20.12 Rs
Mag_L       20.12         Mag_L       20.13       Mag_L         Mag_L       20.13       Mag_L         Mag_L       20.11       Mag_L       20.12         Mag_L       20.11       Mag_L       20.12         Mag_L       20.11       Mag_L       20.12         Mag_L       20.11       Mag_L       20.12         Mag_L       20.11       Mag_L       20.11       Mag_L         Mag_L       10.01       Mag_L       10.01       10.01       10.01         Mag_L       10.01       Mag_L       10.01															Rad_cyl :	1212552 ]	km	20.12 Rs
Solar System Simulator v4 0         Solar Solar Simulator v4 0         Solar System Simulator v4 0         Solar System Simulator v4 0         Dec: -17.304         User vector - Ra: +81.514         Dec: -17.304         User Right         Zim analge Down P Hi Res         Zoom In P FOVs       Lati/ons         Solar Adams         Solar Adams         Solar Adams         Solar Adams         Solar Adams         Solar Adams         Solar Adams <td< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>Z_ht_cyl</th><th>-3968 ]</th><th>km</th><th>-0.07 Rs</th></td<>															Z_ht_cyl	-3968 ]	km	-0.07 Rs
Normal									$  = \rangle$	<u> </u>								
TENNELADUS         TENNELADUS         TENNELADUS         TENNELADUS         TENNELADUS         TENNELADUS         TENNELADUS         TENNELADUS         Satura age 9.13 AU Barth range 9.13 AU Barth r																		36.89 Rs
Bill Arrange       9.13 AU         Bun_range       9.13 AU         Barth range       9.13 AU         Barth range <th>- dallar</th> <th></th> <th>-Z</th> <th></th> <th></th> <th></th> <th></th>	- dallar													-Z				
Barth range       9.11 AU         - USS ELV       SATURN         Solar System Simulator 4.0         Point NEG_Y © at SATURN © and align POS_X © = Up © with NSP         Point NEG_Y © at SATURN © and align POS_X © = Up © with NSP         Consens FP © 0.000 Re ERS 6.328 deg         Below Point NEG_Y © at SATURN © and align POS_X © = Up © with NSP         Point NEG_Y © at SATURN © and align POS_X © = Up © with NSP         Point NEG_Y © at SATURN © and align POS_X © = Up © with NSP         Point NEG_Y © at SATURN © and align POS_X © = Up © with NSP         Point NEG_Y © at SATURN © and align POS_X © = Up © with NSP         Point NEG_Y © ta SATURN © to EARTH © about Z © on RWA © = 10.5 min / 101.2 deg         Point NEG_Y © COCC7       EARTH © about Z © on RWA © = 10.5 min / 101.2 deg         EVEX OCCC COCC7       EARTH © about Z © on RWA © = 10.5 min / 101.2 deg         EVEX OCC OCCC7       EARTH © READED IMMETER SUS S/C ALON VERL E BANK         SATURN = - 102222 17.89 1073021 17.99 78.3 0.02 0.38 133 -0 -150 15.0 35 4.48 96.7 1.4.4 10.0         MIMAM = - 1027222 17.89 1073021 17.98 78.3 0.02 0.38 133 -0 -140 11.6 3 2814 6.4 107.4 10.0         MIMAM = - 1026227 17.89 1073021 17.98 78.3 0.02 0.38 133 -0 -140 11.6 3 2814 6.4 107.4 10.0         MIMAM = - 1026227 17.89 1073021 17.98 78.3 0.02 0.38 133 -0 -140 11.6 1.3 2814 6.4 107.4 10.0         MIMAM = - 1026227 17.89 1073021 17.98 78.3 0.02 0.38 133 -0 -140 11.6 3 2814 6.4 107.4 10.0	Konnes											TENO	ELADUS					
User       SATURN         Selar System Simulator v4.0         Point NEG_Y C at SATURN C and align POS_X C = Up C with NSP         Coalesame SP_0         Coalesame SP_0         Boor System Simulator v4.0         Point NEG_Y C at SATURN C and align POS_X C = Up C with NSP         Coalesame SP_0         Boor System Simulator v4.0         Point NEG_Y C at SATURN C and align POS_X C = Up C with NSP         Coale state st										1.1								
Usor       SATURN       Goldstone       31.8       62.0         Soler System Simulator 4.0       SEP       Sep       Sep       Sep       Sep         Soler System Simulator 4.0       SEP       Sep       Sep       Sep       Sep       Sep         Point NEG_Y C at SATURN C and align POS.X C = Up C with NSP       Sep       Sep       Sep       Sep       Sep       Sep         User vector - RA:       HB1514       Tit L       Up       Tit R       Zoom Out ✓       Labels ✓ Axes       Sep Ses rad angle 107.7 deg         User vector - RA:       HB1514       Tit L       Up       Tit R       Zoom Out ✓       Labels ✓ Axes       Month → Minute         Paste Current RA/DEC       Image Down ✓ HiRes       Zoom In ✓ FOVis ✓ Lat/lons       Vectors       Sep       Second         EXCV 0CC2 CCC27       EANDIA       ALT1TUDE       Res       AMOLE DIAMITER       SAUGE S/ Adol (Meg) (Meg) (Meg)       Ken       Second         EXCV 0CC2 CCC27       EANDIA       ALT1TUDE       Res       AMOLE DIAMITER       SAUGE S/ Adol (Meg) (Meg)       Ken       Second         EXCLAUSE       A.11       19.12       84.5       5.70       95.45       94       -0       0       6.7       0       0.0       10.1.2 <th></th>																		
User         SATURN         SATURN         Camberra         28.0         5.5           Boldr         System         Simulator v4.0         SEP         5.5         Secondary																		
User     SATURN     SATURN     SATURN       Solar System Simulator 4.0     SEP     s.       Point NEG_Y     at SATURN     and align     POS_X     =     Up     with     NSP       Point NEG_Y     at SATURN     and align     POS_X     =     Up     with     NSP     OES     >0.000 Ra       Exat     6.1323 dag     s.313 dag     s.313 dag     s.313 dag     Sep     s.314 dag       User vector - RA:     +81.514     Tilt L     Up     Tilt R     Zoom Out     Labels     Axes       Paste Current RA/DEC     Image     Down     HiRes     Zoom in     FIUS creen     Orbits     Vectors       Numa									17									
Upper         CATURN									<b>」</b> // .									
Open         Stork         Prov         34.2 deg         248.3 meral           Solar System Simulator 4.0         SEP         Set         -6.159 deg         -6.159 deg           Bool N RG_Y         c at SATURN         c and align         POS.X         = Up         with         NSP         6.329 deg           Bool N RG_Y         c at SATURN         c and align         POS.X         = Up         with         NSP         6.328 deg           User vector - RA:         +81.514         Tit L         Up         Tit R         Zoom Out         Labels         Axes         Fill Screen         Orbits         Vectors         Month         →         Hour           DEC:         -17.304         Left         Reset         Right         Zoom In         FIVS         Lat//ons         Vectors         Month         →         Hour           DOV         OCC OCCC         [km]         [Ra]         ALT1TUDE         Plane         Aword         = 105.5min / 101.2 deg         Event         →           SATURN         0         EARTH         C about         Z         on         RWA         C = 0.5min / 101.2 deg         Event         →         →           SATURN         0         EARTH         C about         <									-	0								
Scie/ System Simulator v4.0         SEP         SSP           Point NEG_Y C at SATURN C and align POS_X C = Up C with NSP         Gas base and			lser					17	SATU	IRN								
Ster         Ster <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>																		
SEP         Sep <th></th>																		
Solar System Simulator v4.0         Same         Same <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th>11</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>Crosses RP</th><th>0 0.0</th><th>000 Ra</th><th></th></t<>							11								Crosses RP	0 0.0	000 Ra	
Point         NEG_Y         C at         SATURN         C and align         POS.X         =         Up         with         NSP         OBS         Manya         95.4         deg           User vector - RA:         +81.514         Tilt L         Up         Tilt R         Zoom Out         Labels         Axes         Year         Image         Hour           DEC:         -17.304         Left         Reset         Right         Fill Screen         Orbits         Vectors         Month         Image         Minute           Paste Current RA/DEC         Image         Down         If Res         Zoom In         F FOVs         Lat/lons         Month         Image         Second           Turn analyzer:         SATURN         to         EARTH         C about         Z C on         RWA         C = 10.5 min / 101.2 deg         Event         Image         Second           ROV         OCC OCC7         (Em         [Ra]         ALT1TUDE         PHAME         AWGLE DIAMITER         SUGN LAT         Los         Month         Image         Second           RATURN         =         102225         1152291         19.12         84.5         5.70         95.45         94         -0         0         6.7<						SEP	SSP								EPS	6.	328 deg	*
Point         NEG_Y         © at         SATURN         © and align         POS_X         © =         Up         © with         NSP         ©         OES         rad angle 107.7 deg           User vector - RA:         #81.514         Tilt L         Up         Tilt R         Zoom Out         Labels         Axes         Year         Image         Hour           DEC:         -17.304         Left         Reset         Right         Fill Screen         Orbits         Vectors         Month         Image         Minute           Paste Current RA/DEC         Timage         Down         HiRes         Z         on         RWA         C =         10.5 min / 101.2 deg         Event         Image         Second           Turn analyzer:         SATURN         C         to         EARTH         C about         Z         on         RWA         C =         10.5 min / 101.2 deg         Event         Image         Second           RODY         SCC2         CC2         RATE         RATE         RATE         RATE         Image	Solar Syst	lem Si	mulat	or v4.0		•									SEP	88.	034 deg	
User vector - RA:         +B1.514 DEC:         Tit L         Up         Tit R         Zoom Out         ✓         Labels         ✓ Axes           DEC:         -17.304         Left         Reset         Right         Fill Screen         Orbits         ✓ Vectors         Month         →         →         Minute           Paste Current RA/DEC         ✓ Image         Down         ✓ Hi Res         Zoom In         ✓ FOVis         ✓ Lat//ons         Day         →         →         Second           Turn analyzer:         SATURN         C         to         EARTH         C         about         Z         on         RWA         > = 10.5 min / 101.2 deg         Event         →         >         Second           BODY         OCC2         OCC2         CCC2         CCC2         CCC2         CCC2         CCC2         CCC2         CCC2         Im         Ran         Image         Didnit         Iddidnit         Iddidnit         Availa         Log V         X/C         ALON         VERL         Z BDIT         Availa         KAR         RANCE         RANCE<		2.14	•	- CATU		A			1.1.	•		NOR		•				
DEC:         -17.304         Left         Reset         Right         Fill Screen         Orbits         Vectors         Month         Image         Minute           Paste Current RA/DEC         Image         Down         HiRs         Zornin         FOVs         Lat/lons         Day         Image         Second           Turn analyzer:         SATURN         ©         to         EARTH         C         about         Z         on         RWA         ©         10.5 min         /10.12 deg         Event         Image         Second           BODY         OCC2         CC2         RANDE         Image         AMOLE         Plaase         AWGLE         DIAMITER         8U.8         AC         ALOS         LAT/lons         Day         Image         Event         Image         FOV         CC2         COC         COC         CK         Moth         Image         DIAMITER         SUS         LAT         DIAMITER	Point	3_T	~	at SATU	RIN	<ul> <li>and all</li> </ul>	ign POs	5_A V	= _ Op	v	with	NSP		~	ORS rad and	gle 107.	7 deg	
Paste Current RA/DEC         Image         Down         H is         Zoom in         FOVs         Lat/Ions         Day         Second           Turn analyzer:         SATURN         ©         to         EARTH         °         about         Z         on         RWA         °         = 10.5 min / 101.2 deg         Event         Second           BODY         OCC 20C7         EAROBE         ALTITUDE         Image         PLANE         ANGLE         DIAMETER         3US         X         ALON         Event         Image         PLANE         ANGLE         DIAMETER         3US         X         ALON         KENT         RANCE         Event         Image         ANGLE         PLANE         ANGLE         DIAMETER         3US         LAT         (km)         KE         KE         KMCL         KMGL         Z         10         NGLE         Event         Image         ANGLE         DIAMETER         SUS         LAT         KMGU         KMGL         KMGL <th>User vector</th> <th>- RA:</th> <th>+81</th> <th>.514</th> <th>Tilt L</th> <th>Up</th> <th>Ti</th> <th>lt R</th> <th>Zoor</th> <th>n Out</th> <th>&lt; □</th> <th>Labels</th> <th>Axe</th> <th>S</th> <th>Year</th> <th></th> <th><b>4 &gt;</b></th> <th>Hour</th>	User vector	- RA:	+81	.514	Tilt L	Up	Ti	lt R	Zoor	n Out	< □	Labels	Axe	S	Year		<b>4 &gt;</b>	Hour
Turn analyzer:         SATURN         ©         to         EARTH         ©         about         Z         ©         on         RWA         ©         =         0.55 min / 101.2 deg         Event         Event           SATURN         CC22         CC27		DEC:	-17	.304	Left	Reset	Ri	ght	Fill S	creen		Orbits	Vec	tors	Month		• •	Minute
S/C         SAT         RAME         ALTITUGE         PHASE         ANDLE         DIMMTER         SUB_S/C         ALON         VERL         Z_BOIN           DOUY         OCC7         OCC7         [km]         [Rs]         [km]         [Rs]         [deg]         Int         LON         LAN         (deg)         (km/s)         Z_BOIN         ANDLE         FROM           SATUR         -         -         1223559         20.12         1152221         19.12         64.5         5.70         99.45         94         -0         0         6.7         0         0.0         101.2         16.6           MENAM         -         -         1078222         17.89         1078021         17.89         78.3         0.02         0.38         131<-2         41         16.3         2814         6.6         10.7.4         10.0           RECLADUS         -         1370505         22.80         1373545         22.79         74.1         0.05         0.79         52         1         118         13.1         9         11.0         111.4         5.6           DIOME         -         1458653         24.20         145789         24.19         0.015         0.5	Paste	Currer	nt RA/	DEC	🗹 Ima	ge Down	✓ F	li Res	Zoo	m In	✓ FO\	/s	Lat/	lons	Day 属		4 Þ	Second
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BODY         OCC7         OCC7         IKm1         ILox         ILox         ILox <th< th=""><th></th><th>s/c</th><th>SAT</th><th>RAN</th><th>GE</th><th>ALT II</th><th>UDE</th><th>PHASE</th><th>ANGLR</th><th>DIAMETER</th><th>SUB</th><th>s/c</th><th>ALON</th><th>VREL</th><th>Z HGHT</th><th>ANG</th><th>SLE P</th><th>ROM</th></th<>		s/c	SAT	RAN	GE	ALT II	UDE	PHASE	ANGLR	DIAMETER	SUB	s/c	ALON	VREL	Z HGHT	ANG	SLE P	ROM
MIMAS           1078222         17.89         1078021         17.89         78.3         0.02         0.38         131         -2         41         16.3         2814         6.6         107.4         10.0           ENCELADUS           1422576         23.60         142320         23.60         89.1         0.02         0.36         33         -0         -150         15.0         35         4.3         96.7         21.4           FURTYS          -1372650         23.60         142320         23.60         89.1         0.05         0.79         52         118         18.1         9         11.0         111.4         5.6           DIONE          -1522721         25.27         152.18         25.26         93.2         0.06         1.05         55         -0         140         11.7         61         91.9         20.2         23.7           RIEA          145863         24.20         25.26         93.2         0.06         1.05         55         -0         107         15.0         3077         20.2         20.20         3.7           TITAN          2410514	BODY	0002	OCC?	[ km ]	[R8]	[ km ]	[Rs]	[deg]			LON	LAT	[deg]	(km/s)	(km)	SATRN	EARTH	RAM
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TITAN           2410514         40.00         2407939         39.95         58.9         0.12         2.14         350         -0         -171         10.5         3089         4.6         96.8         21.2           HYPERION           469644         7.79         463489         7.79         23.2         0.04         0.70         208         -13         20         7.0         -6806         93.2         151.0         32.6           INPETUS           2510302         41.65         124.3         0.03         0.60         357         3         -17         4.5         -692055         143.9         49.6         161.5																		
HYFERION 469644 7.79 469489 7.79 23.2 0.04 0.70 208 -13 20 7.0 -6806 99.2 151.0 82.6 IAPETUS 2511080 41.67 2510332 41.65 124.3 0.03 0.60 357 3 -17 4.5 -652055 149.9 49.6 161.5																		
IAPETUS 2511080 41.67 2510332 41.65 124.3 0.03 0.60 357 3 -17 4.5 -692055 149.9 49.6 161.5																		
SATURN 1212559 20.12 1152291 19.12 84.5 5.70 99.45 94 -0 0 6.7 0 0.0 101.2 16.6																		

	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	20.12 Rs	84.5 deg	0
Periapse	5.48 Rs	44.2 deg	0
Segment End	15.18 Rs	149.3 deg	0

### Segment Start: 2006-117T04:59

### Periapse: 2006-118T23:59:10

View of SAT 2006 APR 2 51.7° field	28 23	5:59:1	CASSINI O UTC		NEP						ΕN	R	•	Rev 023 1 2006 - 11 2006 APR 2 2006 APR 2 Apoapse_C Periapse_C Light time Orbit peri Radius Rad_cyl Z_ht_cyl Mag_L Semi_axs Eccentrici Inclinatic Sun range	18723:59: 28 23:59: 29 01:15: 023 + 019: 023 - 00: 1023 - 00: 1025 - 00:	10 SCET 09 ERT T13:54: 00:04 0 min 3 days km km km km	5.48 Rs 5.48 Rs 5.48 Rs -0.01 Rs 37.01 Rs
														Sun_range Earth rang		13 AU 14 AU	
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lser vector - D Paste C urn analyzer:	RA: DEC: Curren : SA	+81 -17 at RA/I	.514 .304 DEC	Tilt L Left Imag	Up Reset	t Til t Rig n ⊄ H	S_X ≎ It R ght fi Res	= Up Zoon Fill S Zoo	n Out creen m In	<ul> <li>✓</li> <li>✓</li> <li>FOV</li> </ul>	Labels Orbits /s	✓ Vec	¢ s tors lons	EPS SEP ORS b/s ar ORS rad ar Year Month Day	e_8 0. 6. 86. ngle 135. ngle 107.	000 Rs 322 deg 307 deg 8 deg 6 deg • • •	Hour Minute
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Joser vector - D Paste C Vurn analyzer: BODY SATURN HIMAS ENCELADUS RETRIXS DIONE RHEA TITAN	RA: DEC: Curren : SA	+81 -17 at RA/I ATURN SAT OCC2 	.514 .304 DEC 	Tilt L Left ✓ Imag to E [R8] 5.48 8.41 8.75 7.86 9.59 10.34	Up Reset Down ARTH 	Till t Rin v H v C at vute [Ra] 4.48 8.40 8.74 7.55 9.58 10.33	S_X ≎ It R ght di Res PHASE [deg] 44.2 37.3 28.4 17.7 79.7	= Up Zoon Fill Sc Zoo ANGLR_ [deg 21.05 0.05 0.05 0.13 0.11 0.11	n Out creen m In on RWA DIAMETER mrad] 367.31 0.82 0.97 2.28 1.95 2.46	✓ FOV ✓ FOV LON 341 344 338 317 33 35	Labels Orbits /s = 	<ul> <li>✓ Vect</li> <li>✓ Lat/</li> <li>12.6 min</li> <li>ALON</li> <li>[deg]</li> <li>0</li> <li>-158</li> <li>-135</li> <li>-98</li> <li>109</li> <li>90</li> </ul>	Constant </td <td>EFS - SEP ORS b/s at ORS rad at Year Month Day deg z_nGHT (km) 0 -0 -33 1736 48 -1739</td> <td>P.P. 0. 6. 86. 135. 1391e 107. Event ( SATEN) 0.0 7.8 136.0 38.0 38.0 57.7 7.9.0</td> <td>0000 R8 322 deg 307 deg 6 deg 6 deg 8 de 7 de 7 de 9 de 9 de 9 de 9 de 9 de 9 de 9 de 9</td> <td>Hour Minute Second RAM RAM 30.0 32.1 71.4 52.0 128.0 128.0 128.7</td>	EFS - SEP ORS b/s at ORS rad at Year Month Day deg z_nGHT (km) 0 -0 -33 1736 48 -1739	P.P. 0. 6. 86. 135. 1391e 107. Event ( SATEN) 0.0 7.8 136.0 38.0 38.0 57.7 7.9.0	0000 R8 322 deg 307 deg 6 deg 6 deg 8 de 7 de 7 de 9 de 9 de 9 de 9 de 9 de 9 de 9 de 9	Hour Minute Second RAM RAM 30.0 32.1 71.4 52.0 128.0 128.0 128.7
Jser vector - D Paste C Paste C Vurn analyzer: BODY SATURN WINAS SNCELADUS FERTINS SNCELADUS FERTINS FERTINS FITAN WYERRION	RA: DEC: Curren : SA	+81 -17 at RA/I ATURN SAT OCC2 	.514 .304 DEC 	Tilt L Left ✓ Imag C to E (Ra) 5.48 8.41 8.75 7.86 9.59 10.34 20.74	Up Reset Down ARTH 269745 506494 526844 473070 577311 622377	Till t Rig 1 ✓ H ↓ ↓ At (Ra) ↓ 4.48 8.40 8.74 8.40 8.74 7.85 9.58 10.33 20.70	3_X C C C C C C C C C C	= Up Zoon Fill Sc Zoo C - I I I I I I I I I I I I I I I I I I I	n Out creen m In 000 RWA DIAMETER mrad] 367.31 0.82 0.97 2.28 1.95 2.46 4.12	✓ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	Labels Orbits /s > = 	✓ Vect ✓ Lat/ 12.6 min ALON (deg) 0 -158 -135 -98 109 90 -86	Constant </td <td>EFS - SEP CORS b/a ar ORS frad ar Year - Month - Day - - - - - - - - - - - - - - - - - - -</td> <td>P.P. 0 6. 86. 85. 13gle 135. 13gle 107. Event ( SATRN 0.0 7.8 18.6 38.0 57.7 79.0 58.8</td> <td>0000 Rs 322 deg 307 deg 8 deg 6 deg 4 b 4 b 5LE 5 5LE 5 5LE 5 136.4 145.4 153.2 94.3 75.7 143.4</td> <td>Hour Minute Second Second 7K0M RAM 90.0 92.1 71.4 52.0 128.0 128.0 147.7 11.1</td>	EFS - SEP CORS b/a ar ORS frad ar Year - Month - Day - - - - - - - - - - - - - - - - - - -	P.P. 0 6. 86. 85. 13gle 135. 13gle 107. Event ( SATRN 0.0 7.8 18.6 38.0 57.7 79.0 58.8	0000 Rs 322 deg 307 deg 8 deg 6 deg 4 b 4 b 5LE 5 5LE 5 5LE 5 136.4 145.4 153.2 94.3 75.7 143.4	Hour Minute Second Second 7K0M RAM 90.0 92.1 71.4 52.0 128.0 128.0 147.7 11.1
JSer vector - D Paste C furn analyzer furn analyzer sAtura MIMAS BODY SATURA MIMAS BODY SATURA MIMAS DIONE RETIRS DIONE RETIRS	RA: DEC: Curren : SA	+81 -17 at RA/I ATURN SAT OCC2 	.514 .304 DEC 	Tilt L Left ✓ Imag C to E (R8) 5.48 8.41 8.75 7.86 9.59 10.34 20.74 24.36	Up Reset Down ARTH 	Till t Rig ✓ H ♦ 448 (Ra) 4.48 8.40 8.74 7.85 9.58 10.33 20.70 24.36	S_X t R ght ti Res put Z PHASE [deg] 44.2 37.3 28.4 17.7 98.6 40.9 99.8	= Up Zoon Fill S Zoo C ANGLR_ [deg 0.05 0.05 0.13 0.11 0.14 0.01	n Out creen m In on RWA DIAMETER mrad] 367.31 0.82 0.97 2.28 1.95 2.46 4.12 0.22	✓ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	Labels Orbits /s 	<ul> <li>Vect</li> <li>Lat/</li> <li>Lat/</li> <li>12.6 min</li> <li>(deg)</li> <li>0</li> <li>-158</li> <li>-98</li> <li>109</li> <li>90</li> <li>-86</li> <li>109</li> </ul>	↓ 129.5 VREL (km/8) 14.6 28.3 25.1 19.8 20.3 16.9 15.1 17.2	EFS - SEF ORS b/s ar ORS rad ar Year - Month - Day - deg z_HGHT (km) - 0 33 - 1736 48 -1733 -1726 -15500	P.P. 0 6. 86. 86. 15. 1391e 107. Event ( SATEN SATEN 18.6 330.0 53.0 53.0 53.7 79.0 58.8	0000 Ra 322 deg 307 deg 5 deg 5 deg 100 deg 5 deg 100 deg 1129.5 136.4 145.4 158.2 94.3 75.7 143.4 74.5	Hour Hour Second Second RAM 90.0 82.1 71.4 52.0 128.0 147.7 11.1 143.3
User vector - D Paste C	RA: DEC: Curren : SA	+81 -17 at RA/I ATURN SAT OCC2 	.514 .304 DEC 	Tilt L Left ✓ Imag C to Er (RB) 5.48 8.41 8.41 8.41 8.41 9.59 10.34 20.74 20.74 20.74 20.74	Up Reset ge Down ARTH 	Til t Right ↓ Til t Right ↓ H ↓ H ↓ H ↓ H ↓ H ↓ H ↓ H ↓ H	S_X C C C C C C C C C C	= Up Zoon Fill S. Zoo € ANGLR_ [deg 21.05 0.06 0.05 0.06 0.13 0.11 0.14 0.24 0.02	n Out creen m In DIAMETER mrad] 367.31 0.82 0.97 2.28 1.95 2.46 4.12 0.22 0.41	✓ FOV SUB_ LON 341 344 338 317 33 35 339 234 12	Labels Orbits /s = _S/C LAT -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0	✓ Vect ✓ Lat/ 12.6 min (deg) 0 -158 -38 109 90 -88 109 90 -88 109 90 -88 109	♦ 1000 € 10000 € 10000 € 1000 € 1000 € 1000 € 1000 € 1000 € 1000 € 1000 € 1	EFS - SEP ORS b/a ar ORS rad ar Year Month Day deg z_HGHT (xm) 0 0 -0 -33 17354 48 -17337 7256 -19590 -726137	P.P. 0 6. 86. 86. 15. agle 107. Event ( SATEN 8. 38.0 57.7 79.0 58.3 8. 74.9	0000 Rs 322 deg 307 deg 8 deg 6 deg 4 <b>b</b> 4 <b>b</b> 5 deg 4 <b>b</b> 4 <b>b</b> 5 deg 5 deg 5 deg 5 deg 6 deg 4 <b>b</b> 4 <b>b</b> 5 deg 5 deg	Hour Minute Second 780M RAM 90.0 82.1 71.4 52.0 128.0 147.7 11.1 143.8 161.2

K. Cloutier

09/27/2017

### **Segment Geometry**

Saturn 23 Legacy

liew of SA						NEP								Rev 023 OU			
2006 APR 18.8° field			0.010			THE A	NEP							2006 - 12 2006 APR 3			
18.8" field	I OF VIE	ew				. I											
														2006 APR 3			
														Apoapse_0			
														Periapse_0			6
														Light time		2 min	
														Orbit peri			
														Radius	914628 1		15.18 Rs
														Rad_cyl	914608 1		15.18 Rs
														Z_ht_cyl	5976 l		0.10 Rs
														Mag_L	15.3		
														Semi_axs			36.95 Rs
Re7n											MIM	15		Eccentrici		852	
	ENCE	LADU	5											Inclination		37 deg	
														Sun_range		13 AU	
														Earth_range		16 AU	
													1 C C	DSN EL			
														Goldstone	32.		
														Canberra	27.1		
														Madrid	-29.		
		ser					freedo	SATU	RN						DK DIREC!		
														FOV			129.0 mra
														RA		814 deg	
														DEC		884 deg	
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						SSR								EPS		310 deg	*
olar Syste	em Sir	mulate	or v4.0						·					SEP		197 deg	
oint NEG	2 Y	0	at SATUR	DNI .	and ali	gn POS	x o	= Up	0	with	NSP			ORS b/s an			
						-								ORS rad an	gie 107.	a caeg	
ser vector	- RA:	+81	.514	Tilt L	Up		R	Zoon	n Out	<ul> <li>✓</li> <li>□</li> <li>I</li> </ul>	Labels	Axes	6	Year		• •	Hour
	DEC:	-17	304	Left	Reset	Rig	ht	Fill S	creen		Orbits	Vect	ors	Month		• •	Minute
Paste	Curren	nt RA/I	DEC	🗸 Ima	ge Down		Res	Zoo	m In 🖉	FOV	s	☑ Lat/I	ons	Day 🖪		<b>4 b</b>	Second
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rn analyze	. S/			to E		A ab	out Z	<u> </u>	PWA		/		27 A de	a	Event	4 1	1
rn analyze		ATURN			ARTH	۵b ک			on RWA			1.9 min /		-	Event	<b>4</b>	)
	s/c	SAT	RAN	IGE	ALTI	UDE	PHASE	ANGLR_1	DIAMETER	SUB	_s/c	ALON	WREL	Z_HGHT	ANG		) ROM
	s/c													-	C		ROM RAM
עסנ	s/c	SAT	RAN	IGE	ALTI	UDE	PHASE	ANGLR_1	DIAMETER	SUB	_s/c	ALON	WREL	Z_HGHT	ANG		
DY TURN	s/c	SAT	RAN	IGE[Rs]	ALTI1 [km]	UDE[RB]	PHASE [deg]	ANGLR_1 [deg	DIAMETER mrad]	SUB_ LON	S/C LAT	ALON [deg]	VREL (km/s)	Z_HGHT (km)	ANG	EARTH	RAM
DY TURN MAS	s/c	SAT	RAN [km] 914628	IGE [Rs] 15.18	ALTI1 [km] 854360	[R8]	PHASE [deg] 149.3	ANGLR_1 [deg 7.56	mrad]	SUB_ LON 119	_S/C LAT	ALON [deg]	VREL (km/s) 8.1	Z_HGHT (km) 0	ANG SATRN 0.0	EARTH 27.4 32.4	RAM
DY TURN MAS CELADUS	s/c	SAT	[km] 914628 1067061	IGE [Rs] 15.18 17.71	ALTI1 [km] 854360 1066856	ILDE [R8] 14.18 17.70	PHASE [deg] 149.3 143.7	ANGLR_1 [deg 7.56 0.02	DIAMETER mrad] 131.88 0.39	SUB_ LON 119 327	S/C LAT 0 1	ALON [deg] -140	VREL (km/s) 8.1 22.1	Z_HGHT (km) 0 5127	ANG SATRN 0.0 6.5	EARTH 27.4 32.4	RAM 169.2 175.7
NDY MURN MAS ICELADUS THYS	s/c	SAT	RAN [km] 914628 1067061 701593 1170816	IGE [R8] 15.18 17.71 11.64 19.43	ALTI1 [km] 854360 1066856 701338 1170278	TUDE [R8] 14.18 17.70 11.64 19.42	PHASE [deg] 149.3 143.7 155.2	ANGLR_1 [deg 7.56 0.02 0.04 0.05	DIAMETER mrad] 131.88 0.39 0.73	SUB_ LON 119 327 153	S/C 	ALON [deg] -140 23	VREL (km/s) 8.1 22.1 6.5 14.7	Z_HGHT (km) 0 5127 -10	ANG SATRN 0.0 6.5 7.6 8.1	27.4 32.4 22.8 22.8	RAM 169.2 175.7 161.6 161.2
DDY TURN MAS ICELADUS THYS IONE	s/c	SAT OCC 7	RAN [km] 914628 1067061 701593 1170816 830629	IGE [R8] 15.18 17.71 11.64 19.43 13.78	ALTI1 [km] 854360 1066856 701338 1170278 830068	TUDE [R8] 14.18 17.70 11.64 19.42 13.77	PHASE [deg] 149.3 143.7 155.2 155.3 162.7	ANGLR_1 [deg 7.56 0.02 0.04 0.05 0.08	DIAMETER mrad] 131.88 0.39 0.73 0.92 1.36	SUB_ LON 119 327 153 26 91	_S/C LAT 0 1 1 -0 0	ALON [deg] -140 23 146 65	VREL (km/s) 8.1 22.1 6.5 14.7 3.1	Z_HGHT (km) 0 5127 -10 2355 -4	ANG SATRN 0.0 6.5 7.6 8.1 24.4	27.4 32.4 22.8 22.8 20.1	RAM 169.2 175.7 161.6 161.2 144.8
ATURN MAS CELADUS THYS IONE HEA	s/c	SAT OCC 7	RAN [km] 914628 1067061 701593 1170816 830629 1185825	IGE [Rs] 15.18 17.71 11.64 19.43 13.78 19.68	ALTI1 [km] 854360 1066856 701338 1170278 830068 1185060	TUDE [Rs] 14.18 17.70 11.64 19.42 13.77 19.66	PHASE [deg] 149.3 143.7 155.2 155.3 162.7 162.7	ANGLR 1 [deg 7.56 0.02 0.04 0.05 0.08 0.07	131.88 0.39 0.73 0.92 1.36 1.29	SUB_ LON 119 327 153 26 91 50	S/C LAT 0 1 1 -0	ALON [deg] -140 23 146 65 108	VREL (km/s) 3.1 22.1 6.5 14.7 3.1 3.1	Z_HGHT (km) 0 5127 -10 2355 -4 -2601	ANG SATRN 0.0 6.5 7.6 8.1 24.4 25.0	EARTH 27.4 32.4 22.8 22.8 20.1 20.3	RAM 169.2 175.7 161.6 161.2 144.8 144.2
ATURN MAS CELADUS THYS IONE HEA ITAN	s/c	SAT OCC 7	RAN [km] 914628 1067061 701593 1170816 830529 1185825 330332	GE [Rs] 15.18 17.71 11.64 19.43 13.78 19.68 5.48	ALTI1 [km] 854360 1066856 701338 1170278 830068 1185060 327757	TUDE [R8] 14.18 17.70 11.64 19.42 13.77 19.66 5.44	PHASE [deg] 149.3 143.7 155.2 155.3 162.7 162.7 33.4	ANGLR 1 [deg 7.56 0.02 0.04 0.05 0.08 0.07 0.89	131.88 0.39 0.73 0.92 1.36 1.29 15.59	SUB_ LON 119 327 153 26 91 50 358	 LAT 0 1 1 -0 0 0 -0	ALON [deg] 0 -140 23 146 65 108 1	VREL (km/s) 8.1 22.1 6.5 14.7 3.1 8.1 6.0	Z_HGHT (km) 0 5127 -10 2855 -4 -2601 8197	ANG SATRN 0.0 6.5 7.6 8.1 24.4 25.0 176.7	EARTH 27.4 32.4 22.8 20.1 20.3 150.2	RAM 169.2 175.7 161.6 161.2 144.8 144.2 7.5
ATURN MATURN MAS SCELADUS STHYS IONE HEA ITAN YPERION	s/c	SAT OCC 7	RAN [km] 914628 1067061 701593 1170816 830629 1185825 330332 2219143	GE [Rs] 15.18 17.71 11.64 19.43 13.78 19.68 5.48 36.82	ALTI1 [km] 854360 1066856 701338 1170278 830068 1185060 327757 2219018	14.18 17.70 11.64 19.42 13.77 19.66 5.44 36.82	PHASE [deg] 149.3 143.7 155.2 155.3 162.7 162.7 33.4 141.0	ANGLR 1 [deg 7.56 0.02 0.04 0.05 0.05 0.05 0.08 0.07 0.89 0.01	DIAMETER mrad] 131.88 0.39 0.73 0.92 1.36 1.29 15.59 0.15	SUB_ LON 119 327 153 26 91 50 358 271	0 LAT 0 1 1 -0 0 0 -0 -30	ALON [deg] 0 -140 23 146 65 108 1 -163	VREL (km/s) 8.1 22.1 6.5 14.7 3.1 8.1 6.0 13.2	Z_HGHT (km) 0 5127 -10 2355 -4 -2601 8197 -24252	 SATRN 0.0 6.5 7.6 8.1 24.4 25.0 176.7 10.0	EARTH 27.4 32.4 22.8 20.1 20.3 150.2 34.7	RAM 169.2 175.7 161.6 161.2 144.8 144.2 7.5 179.1
TT analyze	s/c	SAT OCC 7	RAN [km] 914628 1067061 701593 1170816 830529 1185825 330332 2219143 4402734	IGE [R8] 15.18 17.71 11.64 19.43 13.78 19.68 5.48 36.82 73.05	ALTI1 [km] 854360 1066856 701338 1170278 830068 1185060 327757 2219018 4401986	[R8] 14.18 17.70 11.64 19.42 13.77 19.66 5.44 36.82 73.04	PHASE [deg] 149.3 143.7 155.2 155.3 162.7 162.7 33.4 141.0 133.0	ANGLR 1 [deg 7.56 0.02 0.04 0.05 0.08 0.07 0.89 0.01 0.02	DIAMETER mrad] 131.88 0.39 0.73 0.92 1.36 1.29 15.59 0.15 0.34	SUB_ LON 119 327 153 26 91 50 358 271 1	 LAT 0 1 1 -0 0 0 -0	ALON [deg] -140 23 146 65 108 1 -163 -152	VREL (km/s) 8.1 22.1 6.5 14.7 3.1 8.1 6.0 13.2 11.1	Z_HGHT (km) 0 5127 -10 2355 -4 -2601 3197 -24252 -324115	ANG SATRN 0.0 6.5 7.6 8.1 24.4 25.0 176.7 10.0 24.4	EARTH 27.4 32.4 22.8 20.1 20.3 150.2 34.7 41.2	RAM 169.2 175.7 161.6 161.2 144.8 144.2 7.5 179.1 164.5
ODY ATURN IMAS NCELADUS ETHYS IONE HEA ITAN YPERION	s/c	SAT OCC 7	RAN [km] 914628 1067061 701593 1170816 830629 1185825 330332 2219143	GE [Rs] 15.18 17.71 11.64 19.43 13.78 19.68 5.48 36.82	ALTI1 [km] 854360 1066856 701338 1170278 830068 1185060 327757 2219018	14.18 17.70 11.64 19.42 13.77 19.66 5.44 36.82	PHASE [deg] 149.3 143.7 155.2 155.3 162.7 162.7 33.4 141.0	ANGLR 1 [deg 7.56 0.02 0.04 0.05 0.05 0.05 0.08 0.07 0.89 0.01	DIAMETER mrad] 131.88 0.39 0.73 0.92 1.36 1.29 15.59 0.15	SUB_ LON 119 327 153 26 91 50 358 271	0 LAT 0 1 1 -0 0 0 -0 -30 -30 -3	ALON [deg] 0 -140 23 146 65 108 1 -163	VREL (km/s) 8.1 22.1 6.5 14.7 3.1 8.1 6.0 13.2	Z_HGHT (km) 0 5127 -10 2355 -4 -2601 8197 -24252	 SATRN 0.0 6.5 7.6 8.1 24.4 25.0 176.7 10.0	EARTH 27.4 32.4 22.8 20.1 20.3 150.2 34.7	RAM 169.2 175.7 161.6 161.2 144.8 144.2 7.5 179.1

	Saturn Range	Phase Angle	Sub-S/C Lat.
Segment Start	20.12 Rs	84.5 deg	0
Periapse	5.48 Rs	44.2 deg	0
Segment End	15.18 Rs	149.3 deg	0

### Segment End: 2006-120T04:44

Saturn 23 Legacy

No ORS Boresight Solar Constraints on Science Pointing Noted.

Saturn 23 Legacy

No Daily Science Highlights Noted.

# **Segment Integration Planning**

Saturn 23 Legacy

- Trying to integrate the following requests into the plan:
  - · Periodic feature track prior to and following the primary feature track
  - UVIS occultations
  - One of the Ring movies
  - Janus
  - Radar

### Geometry Events

- Periapse = 2006-118T23:55
- Ring Plane Crossing = 2006-119T02:41

#### Periapse Info

- Range = 5.47 Rs
- Phase @ -1 day = 66°
- Phase @ periapse = 45°
- Phase @ +1 day = 144°

Proposed Order For Rev 23 Strawman
VIMS Feature Track
ISS SatOrbs
OTM 58 back-up over Madrid (moved ~1 day earlier)
VIMS Feature Track
UVIS Stellar Occs
RADAR Titan
Downlink over 6-hr Madrid pass (for Nav? For Data Volume?)
ORS Feature Track
Janus & ISS Retargs
ORS Feature Track (resolve CIRS-VIMS timing discrepancy)
CIRS Rings F Movie
RADAR Titan
Downlink over Gold 70-m

### **Beginning of Integration:**

 SMT data below - current data volume plan fits perfectly - can only accommodate zerosum changes

DATA VOLUME SUMMARY																				
						OBSERVAT	ION_PERI	IOD				DOWN	LINK_PAS	SS			l I			
						P4			P5				PLAY				-1 			
				 					 		ا - ا						4			
	Start	End							N   OPNAV					MARGI		CAROVR				
DOWNLINK PASS NAME of	ioy hh:r	nm doy	hh:mm	(Mb)					%)  (Mb)				(Mb)	(Mb)		(Mb)				
SP_023EA_G34BWGOTB117_PRIME 1	17 19:5	9 118	04:59	0							53	1434				590				
SP_023EA_M34HEFNON118_PRIME 1 SP 023EA G70ARRNON119 PRIME 1										236 475	38 53	1450 4086		-803 -1 368	124% 8%	803 0				
SP_023EA_G/UARRNONII3_PRIME		4 120			2009 0		3304			475		4086	4404		015		1			
DATA VOLUME REPORT																				
	Star		End		CAPS	GDA	CIRS	S INMS	ISS	MAG	MIMI	RADAF	RPW	s uv	IS	VIMS	PROBE	ENGR	TOTAL	
Event	doy	hh:mm	doy	/ hh:mm	(Mb	o) (Mb	) (Mi	b) (Mb	) (Mb)	(Mb)	) (Mb	o) (M	ib) (i	Mb)	(Mb)	(Mb)	) (Mb)	(M	b) (M	
Event OBSERVATION_NOR	doy	hh:mm	doy		(Mb	o) (Mb	) (Mi	b) (Mb	) (Mb)	(Mb)	) (Mł	o) (M	Ъ) (I	Mb)	(Mb)	(Mb)	) (Mb)	(M	b) (M	
	doy 	hh:mm	doy 117	19:59	(Mb	22.8	) (Mi	b) (Mb  2.7	) (Mb)	(Mb)	) (Mł	o) (M	Ъ) (I  70.7	Mb) 21.	(Mb)	(Mb)	) (Mb)	(M 0.0	b) (M	
OBSERVATION_NOR	doy 117 117	hh:mm 04:59 04:59	doy 117 117	19:59 19:59	(Mb 54.0	22.8 0.0	) (M1 179.8 0.0	b) (Mb 2.7 ) 0.0	o) (Mb) 0.0	(Mb)	) (Mb 48.6	o) (M  0.0	Ъ) (I  70.7	Mb)  21. 0 0.	(Mb) 7 7:	(Mb) 	) (Mb) 0.0	(M 0.0	b) (M 	
OBSERVATION_NOR OBSERVATION_OPN	doy 117 117 Æ 117	hh:mm 04:59 04:59 19:59	doy 117 117 118	19:59 19:59 04:59	(Mb 54.0 0.0	<ul> <li>(Mb</li> <li>22.8</li> <li>0.0</li> <li>16.9</li> </ul>	) (M1 179.8 0.0	b) (Mb 2.7 ) 0.0 1.6	0.0 0.0 43.5	(Mb) 32.4 0.0	) (M1 48.6 0.0	0.0 0.0	(b) (1 70.7 0.0 42.4	Mb) 21. 0 0. 2.	(Mb) .7 7: .0 5	(Mb) 10.0 0.0	) (Mb) 0.0 0.0	(M 0.0 0.0	b) (M  1142.7 43.5	
OBSERVATION_NOR OBSERVATION_OPN SP_023EA_G34BWGOTB117_PRIM	doy 117 117 117 117 118	hh:mm 04:59 04:59 19:59 04:59	doy 117 117 118 118	19:59 19:59 04:59 11:30	(ME 54.0 0.0 32.4 23.5	<ul> <li>(Mb</li> <li>22.8</li> <li>0.0</li> <li>16.9</li> </ul>	) (M1 179.8 0.0 0.0	<ul> <li>b) (Mb</li> <li>2.7</li> <li>0.0</li> <li>1.6</li> <li>1.2</li> </ul>	0.0 0.0 43.5 0.0 188.0	(Mb) 32.4 0.0 19.4	) (Mł 48.6 0.0 29.2	0.0 0.0 0.0 0.0	(b) (1 70.7 0.0 42.4	Mb) 21. 0 0. 2. 250.	(Mb) .7 7: .0 5	(Mb) 10.0 0.0 0.0	) (Mb) 0.0 0.0 0.0	(M 0.0 0.0 0.0	b) (M 1142.7 43.5 144.4	
OBSERVATION_NOR OBSERVATION_OPN SP_023EA_G34BWGOTB117_PRIM OBSERVATION_NOR	doy 117 117 E 117 E 117 118 E 118	hh:mm 04:59 04:59 19:59 04:59 11:30	doy 117 117 118 118 118	19:59 19:59 04:59 11:30 18:00	(ME 54.0 0.0 32.4 23.5 23.4	22.8 0.0 16.9 24.7	) (M 179.8 0.0 0.0 10.8 86.4	<ul> <li>b) (Me</li> <li>2.7</li> <li>0.0</li> <li>1.6</li> <li>1.2</li> <li>1.2</li> </ul>	0.0 0.0 43.5 0.0 188.0	(Mb) 32.4 0.0 19.4 14.1 14.0	) (M1 48.6 0.0 29.2 21.1 34.3	0.0 0.0 0.0 0.0 0.0	(1) (1 70.7 0.0 42.4 30.7	Mb) 21. 0 0. 2. 250.	(Mb) .7 7: .0 5 .3 8	(Mb) 10.0 0.0 0.0	) (Mb) 0.0 0.0 0.0 0.0	(M 0.0 0.0 0.0 0.0	(b) (M 1142.7 43.5 144.4 564.4	

**K. Cloutier** 

Pointing notes:

- CDA requires -Y to Saturn pointing (+/- 1 Rs of Saturn's mass center) from 119T02:41 to 05:30.

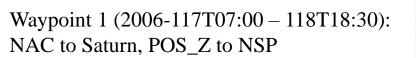
- Can ISS\_23OT\_RETHIEQPL010\_PRIME (119T01:30 04:30) meet this requirement?
  - Waypoint Strategy
    - Below is the Attitude Strategy for the Rev 23 segment
    - l've made some educated guesses on the waypoints and observation attitudes, but we need to finalize these.

						Observation /	Attitude	
Request	Riders	Start (SCET	t (Ep	Dur	End (SCET)	Primary	Secondary	Comments
Start Saturn 23 Segment		2006-117T04:59:00			2006-220T04:44:00			
NAV_023SA_OPNAV171_PRIME		2006-117T04:59:00		00T02:01:00	2006-117T07:00:00	ISS_NAC to RA_DEC	POS_Z to NSP	Include turn from XBAND to Earth, ???
NEW WAYPOINT		2006-117T07:00			2006-118T05:29	ISS_NAC to Saturn	POS_Z to NSP	
VIMS_023SA_FEATRACK004_PRIME		2006-117T07:00:00		00T06:00:00	2006-117T13:00:00	ISS_NAC to Saturn	POS_Z to NSP	
VIMS_023SA_THRCYLMAP001_PRIME		2006-117T13:00:00		00T06:29:00	2006-117T19:29:00	ISS_NAC to Saturn	POS_Z to NSP	
SP_023EA_DLTURN117_PRIME		2006-117T19:29:00		00T00:30:00	2006-117T19:59:00	XBAND to Earth	POS_X to NEP	
SP_023EA_G34BWGOTB117_PRIME		2006-117T19:59:00		00T09:00:00	2006-118T04:59:00	XBAND to Earth	rolling	OTM-58 Backup
SP_023SA_WAYPTTURN118_PRIME		2006-118T04:59:00		00T00:30:00	2006-118T05:29:00	ISS_NAC to Saturn	POS_X to NSP	
NEW WAYPOINT		2006-118T05:29			2006-120T04:44:00	ISS_NAC to Saturn	777	
UVIS_023ST_BETORI003_PRIME		2006-118T05:55:00		00T01:10:00	2006-118T07:05:00		???	
ISS_023JA_MUTUALEVE014_PRIME		2006-118T07:05:00		00T00:45:00	2006-118T07:50:00	ISS_NAC to Janus	???	
ISS_023EP_MUTUALEVE014_PRIME		2006-118T07:50:00		00T00:45:00	2006-118T08:35:00	ISS_NAC to Epimetheus		
UVIS_023ST_EPSORI003_PRIME		2006-118T08:35:00		00T01:00:00	2006-118T09:35:00		???	
ISS_023RH_GLOCOL001_PRIME		2006-118T09:35:00	_		2006-118T10:15:00	ISS_NAC to Rhea	???	
CIRS_023RH_FP1FAZ0P5293_PRIME		2006-118T10:15:00		00T00:45:00	2006-118T11:00:00	CIRS_FP1 to Rhea	???	
SP_023EA_DLTURN118_PRIME		2006-118T11:00:00		00T00:30:00	2006-118T11:30:00	XBAND to Earth	POS_X to NEP	
SP_023EA_M34HEFNON118_PRIME		2006-118T11:30:00		00T06:30:00	2006-118T18:00:00	XBAND to Earth	POS_X to NEP	No roll possible b/c CIRS request within 4
								hrs. of end of downlink
SP_023SA_WAYPTTURN418_PRIME		2006-118T18:00:00		00T00:30:00	2006-118T18:30:00		POS_X to NSP	
CIRS_023SA_FTRACK005_PRIME		2006-118T18:30:00			2006-119T00:30:00		POS_X to NSP	
ISS_023JA_COLORF006_PRIME		2006-119T00:30:00	_		2006-119T01:30:00	ISS_NAC to Janus	???	
ISS_023OT_RETHIEQPL010_PRIME		2006-119T01:30:00		00T00:30:00	2006-119T04:30:00	Retarg	???	CDA requires -Y to Saturn (+/- 2 Rs) from 119T02:41 - 05:30
VIMS_023SA_FEATRACK003_PRIME		2006-119T04:30:00		00T04:14:00	2006-119T08:44:00	ISS_NAC to Saturn	POS_Z to NSP	CDA requires -Y to Saturn (+/- 2 Rs) from 119T02:41 - 05:30
CIRS_023RF_FMOVIEB002_PRIME		2006-119T08:44:00		00T08:30:00	2006-119T17:14:00	ISS_NAC to Rings	POS_Z to NSP	
RADAR_023TI_SCATT1CAL001_PRIME		2006-119T17:14:00		00T01:00:00	2006-119T18:14:00	NEG_Z to Titan	PIC	
RADAR_023TI_RAD1CALIB001_PRIME		2006-119T18:14:00		00T01:00:00	2006-119T19:14:00	NEG_Z to Titan	PIC	
SP_023EA_DLTURN119_PRIME		2006-119T19:14:00		00T00:30:00	2006-119T19:44:00	XBAND to Earth	POS_X to NEP	
SP_023EA_G70ARRNON119_PRIME		2006-119T19:44:00		00T09:00:00	2006-120T04:44:00	XBAND to Earth	rolling	No roll possible if CIRS within 4 hrs. of end of downlink

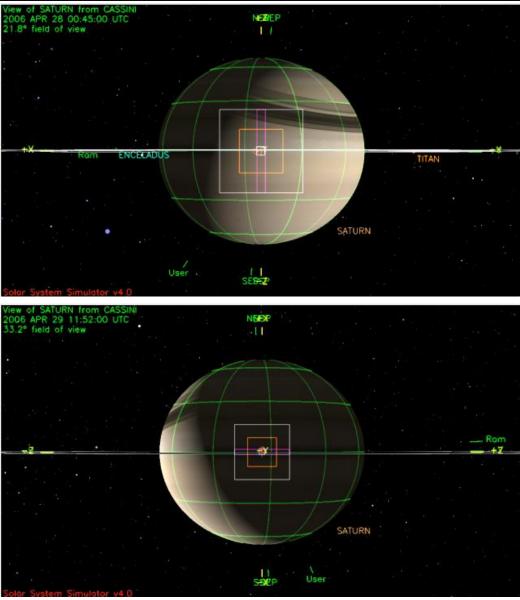
K. Cloutier

## **Waypoints Chosen**

Saturn 23 Legacy



Waypoint 2 (2006-118T18:30 – 120T05:14): NAC to Saturn, POS\_X to NSP



#### Pointing

- All waypoints have been verified as being Flight Rule-safe.
- All downlink attitudes have been verified as being Flight-Rule safe.
- All SP turns have been allocated enough time and are Flight Rule-safe.
- Data Volume
  - No issues. We carry data over for the first two passes, then empty the SSRs with 9% margin at the end of the third and final pass.
- CIMS
  - All of the expected requests for this delivery are approved in CIMS.
- OpModes
  - All OpMode transitions are in the CIMS delivery. No issues at this time.
- Flight Rule / Mission Planning Guideline & Constraint Issues
  - None known at this time.
- Other Notes & Issues
  - Originally OTM-58 b/u was scheduled on DOY 118 over periapse. In agreement with the X-D TWT (K. Perry) & NAV (J. Jones), OTM-58 was moved to DOY 116 in the X-D 22/23 segment, and OTM-58 b/u was moved to DOY 117. To compensate for the "missing pass" at periapse, a short DSN pass was added to DOY 118 (see below).
  - The DSN pass at 118T11:30 is only 6.5 hours and provides only 4:49 of two-way coverage. Nav (J. Jones) has agreed to the shortened pass and the reduced two-way coverage.