

Cassini Ultraviolet Imaging Spectrograph
UVIS HSP

Ring Stellar Occultation Atlas

Volume 4: Rev 060 – Rev 090

Version: 1.4
June 19, 2018

Table of Contents

The table lists all occultations in this volume, including the star name, rev number, indication of ingress (I) or egress (E), date of the occultation, duration of the occultation, radial range coverage and elevation angle of the star.

Occultations are presented chronologically in the order they were observed. To keep the file size of this atlas manageable, it is presented in multiple volumes, each one covering a subset of the occultations.

Introduction

Over the course of the Cassini mission, the High Speed Photometer (HSP) of the Ultraviolet Imaging Spectrograph (UVIS) observed 170 occultations of stars by Saturn's rings. Details on the UVIS instrument can be found in Esposito et al. (1998, 2004). Information on the handling of HSP ring occultation data as well as a summary of data calibration and reduction techniques for the first part of the Cassini mission are in Colwell et al. (2010). This document provides a tabular and visual overview of these stellar occultations.

Description of Data Products in the Atlas

The HSP data consist of a time series of measured photon counts. With the exception of observations of some faint stars where the background signal dominates or is a significant contribution, the measured signal is primarily due to starlight transmitted through the rings. The HSP integration times are 1, 2, 4, or 8 msec. The majority of occultations used a 1 msec integration period, with most of the rest at 2 msec. In this atlas the data are binned to 1 second.

The data are shown in two plots: (1) a plot spanning the range of 70,000 km to 150,000 km from Saturn for all occultations to allow direct comparison of signal and coverage on a single distance scale; and (2) a plot that shows the data zoomed to the radial range of coverage of the occultation.

Two additional geometry plots are included for each occultation: (1) the radial ring plane resolution of the occultation (in the frame of Saturn, not accounting for ring particle motion or diffraction); and (2) the value of ϕ , an angle measured in the ring plane in the counterclockwise sense from the outward radial vector at the measurement point to the direction to the star projected into the ring plane. Thus, an observation where the look vector to the star is tangent to the rings has $\phi=90$ degrees.

On the page following the data plots, a geometry visualization is shown at a time near the middle of the occultation. The position of the UVIS HSP field of view is labeled on each of these plots. Occultations that cut a chord across the rings, are presented here as separate "Ingress" and "Egress" occultations, referring to the portion of the occultation where the observation point is approaching or receding from Saturn, respectively. Some geometry visualizations are missing and will be included in the next revision of this volume.

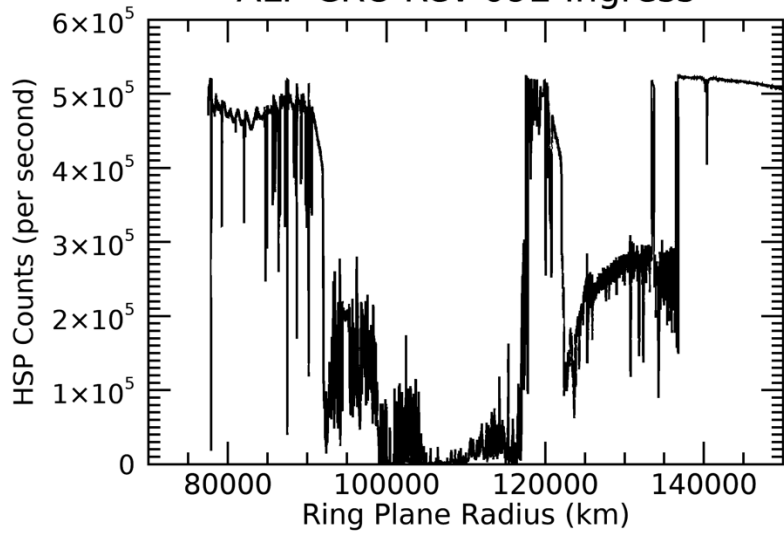
Document assembled by Joshua Colwell, UVIS Co-Investigator, University of Central Florida, with the assistance of Stephanie Eckert Grant, Richard Jerousek, and Tina Notrika, UCF.

References

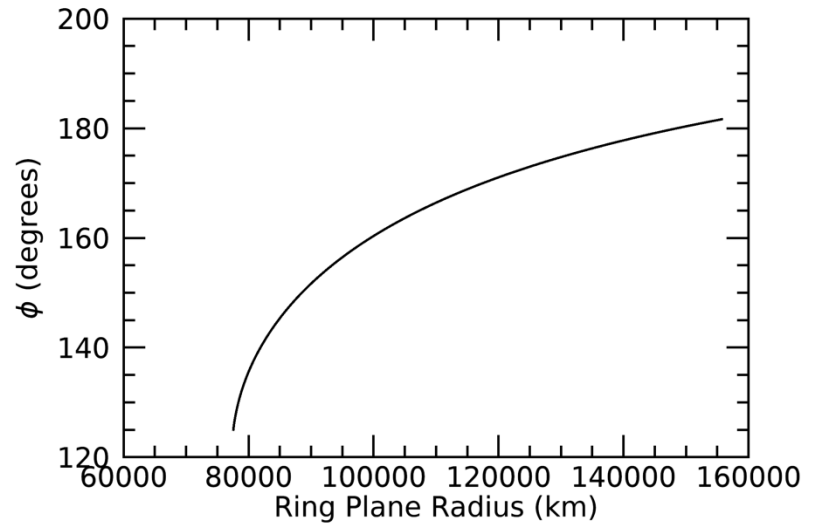
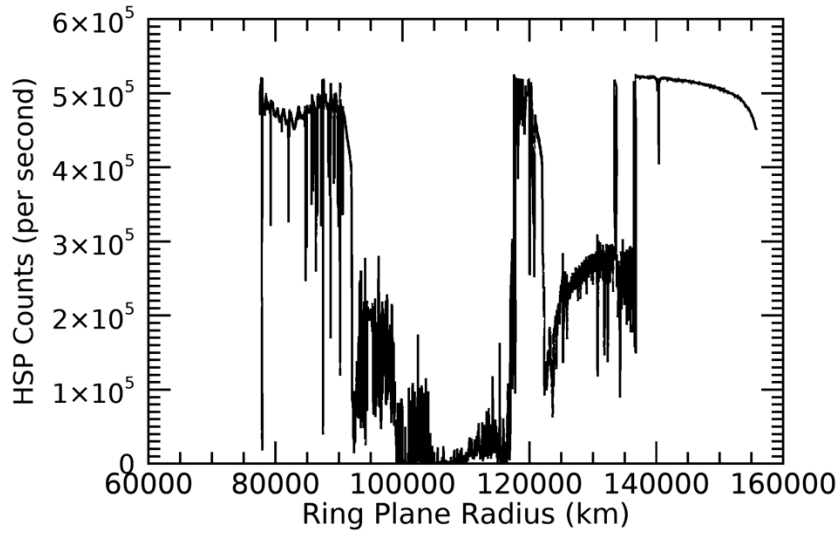
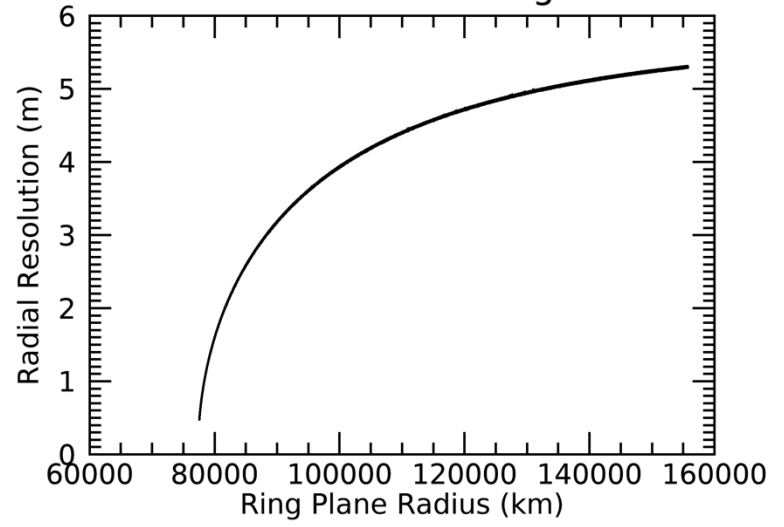
1. Colwell, J. E., L. W. Esposito, D. Pettis, M. Sremčević, R. G. Jerousek, E. T. Bradley 2010. Cassini UVIS Stellar Occultation Observations of Saturn's Rings. *Astron. J.* **140**, 1569-1578, doi:10.1088/0004-6256/140/6/1569.
2. Esposito, L. W., J. E. Colwell, and W. E. McClintock 1998. Cassini UVIS Observations of Saturn's Rings. *Planet. Space Sci.* **46**, 1221-1235.
3. Esposito, L. W., C. A. Barth, J. E. Colwell, G. M. Lawrence, W. E. McClintock, A. I. F. Stewart, H. U. Keller, , A. Korth, H. Lauche, M. Festou, A. L. Lane, C. J. Hansen, J. N. Maki, R. A. West, H. Jahn, R. Reulke, K. Warlich, D. E. Shemansky, and Y. L. Yung 2004. The Cassini Ultraviolet Imaging Spectrograph Investigation. *Space Sci. Rev.* **115**, 299-361.

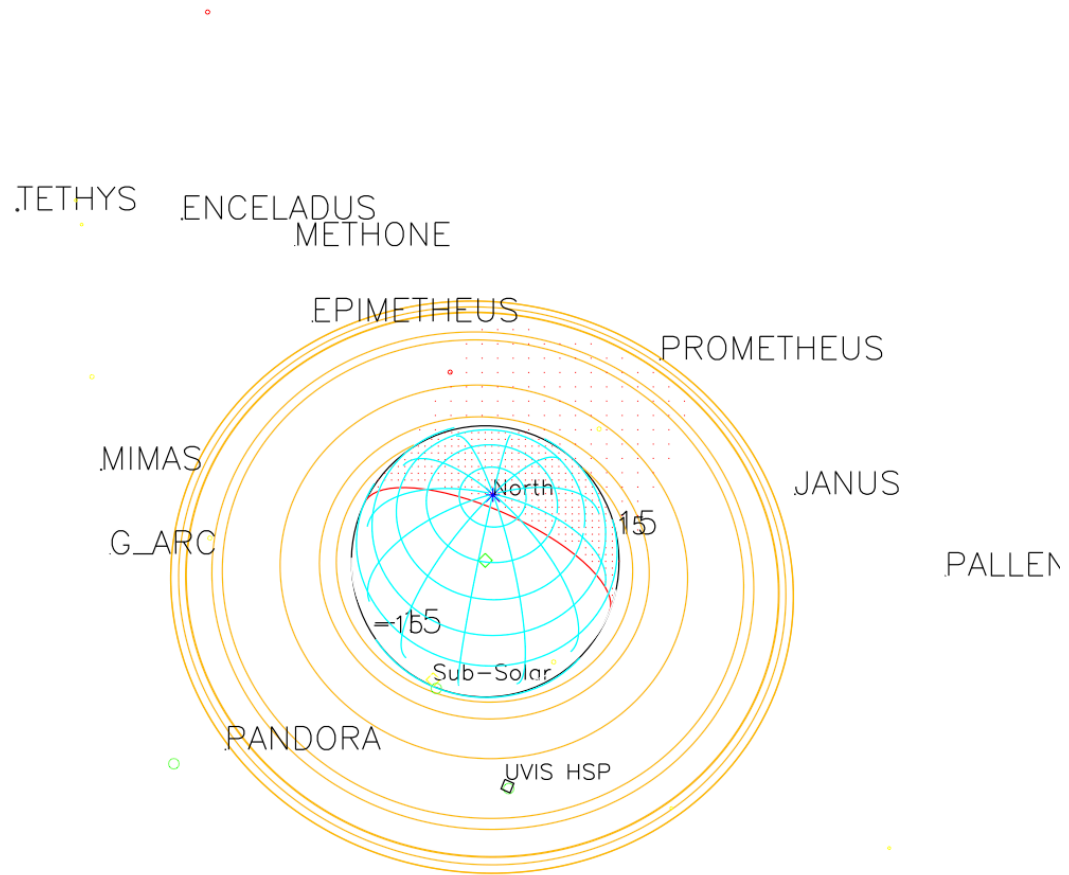
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β	CEN	92	E	2008-313	66.7	42.7- 59.1	50676-154574	269.7
γ	CRU	94	I	2008-328	62.3	218.5-219.6	155447- 51972	272.6
θ	HYA	94	E	2008-332	-1.4	89.5-169.9	83452-500670	57.4
θ	HYA	94	I	2008-332	-1.4	10.5- 89.5	436955- 83452	49.9
α	ARA	96	E	2008-344	54.4	46.9- 94.2	108169-155151	175.8
α	ARA	96	I	2008-344	54.4	1.6- 46.9	150852-108169	165
β	CEN	96	I	2008-343	66.7	264.8-288.7	155341- 72455	209.7
α	ARA	98	E	2008-360	54.4	42.3- 86.3	110536-152130	200.4
α	ARA	98	I	2008-360	54.4	357.4- 42.3	154531-110536	206.8
β	CRU	98	I	2008-359	65.2	202.6-157.3	154683- 58103	301.3
δ	CEN	98	I	2008-359	55.6	212.0-209.3	153102- 55446	242.2
α	CRU	100	E	2009-012	68.2	124.2- 83.5	114050-149449	241.8
α	CRU	100	I	2009-012	68.2	164.8-124.2	149156-114050	240.4
γ	CAS	100	E	2009-015	-66.3	86.4- 66.0	72440-140370	160.2
γ	CRU	100	I	2009-012	62.3	202.7-170.4	157021- 57789	280.9
β	CRU	101	I	2009-022	65.2	184.8-177.9	86104- 74900	36.8
β	CEN	102	I	2009-031	66.7	248.3-250.7	143508- 73241	171.8
β	CEN	104	E	2009-053	66.7	134.8- 94.7	68933-131988	259.8
β	CEN	104	I	2009-053	66.7	220.0-134.8	147290- 68933	450
ε	CAS	104	E	2009-058	-70	154.5-111.7	111694-151532	253.3
ε	CAS	104	I	2009-058	-70	198.7-154.5	154568-111694	264.4
θ	HYA	104	E	2009-062	-1.4	89.3-172.5	66876-561606	48.8
θ	HYA	104	I	2009-062	-1.4	3.0- 89.3	1051096- 66876	91.9
α	ARA	105	E	2009-066	54.4	39.2- 88.6	93917-143383	266.2
α	ARA	105	I	2009-066	54.4	343.9- 39.2	163844- 93917	330
β	CEN	105	E	2009-065	66.7	121.7- 91.5	77786-147359	255.7
β	CEN	105	I	2009-065	66.7	222.0-121.7	158713- 77786	540.5
ζ	CEN	112	I	2009-163	53.6	241.2-236.6	143213- 71485	274.4
α	LUP	113	E	2009-178	53.9	172.4-160.9	83839- 85540	67.8
α	LUP	113	I	2009-178	53.9	217.8-172.4	118955- 83839	337.8
μ	CEN	113	I	2009-177	48.7	240.6-236.2	155785- 75974	268.2
β	LUP	114	I	2009-193	49.6	217.4-186.8	144836-118473	268.2
λ	SCO	114	I	2009-195	41.7	-1.0- -1.0	148227-110857	530.7
σ	SGR	114	I	2009-199	29.1	329.2-332.1	149875- 84448	350.7
μ	SGR	115	E	2009-212	24.9	44.1- 80.3	90966-112618	411.8
μ	SGR	115	I	2009-212	24.9	27.4- 44.1	94934- 90966	168.4
α	VIR	116	I	2009-223	17.3	241.9-245.2	144565-103057	62.7
β	PER	116	E	2009-223	-47.4	153.8-138.5	131435-134741	36.8
β	PER	116	I	2009-223	-47.4	169.6-153.8	135217-131435	38.2

ALP CRU Rev 092 Ingress



ALP CRU Rev 092 Ingress





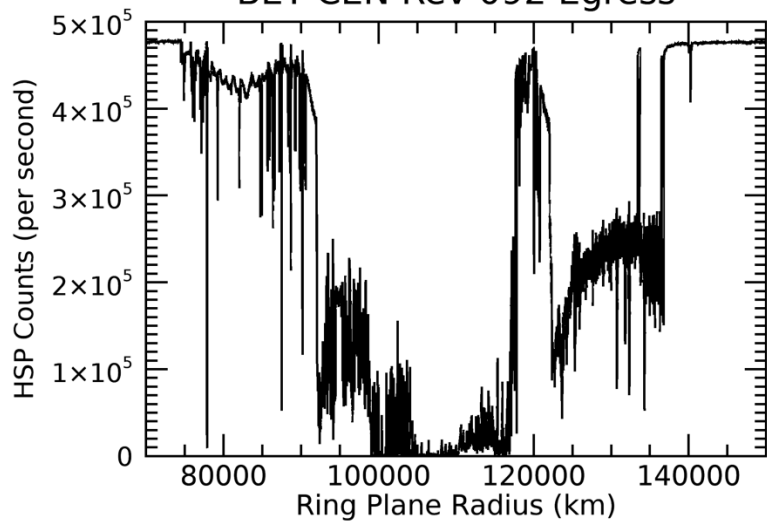
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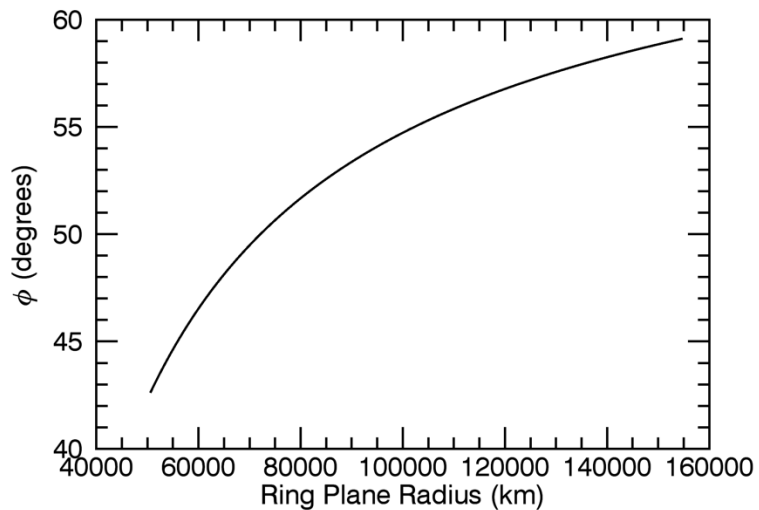
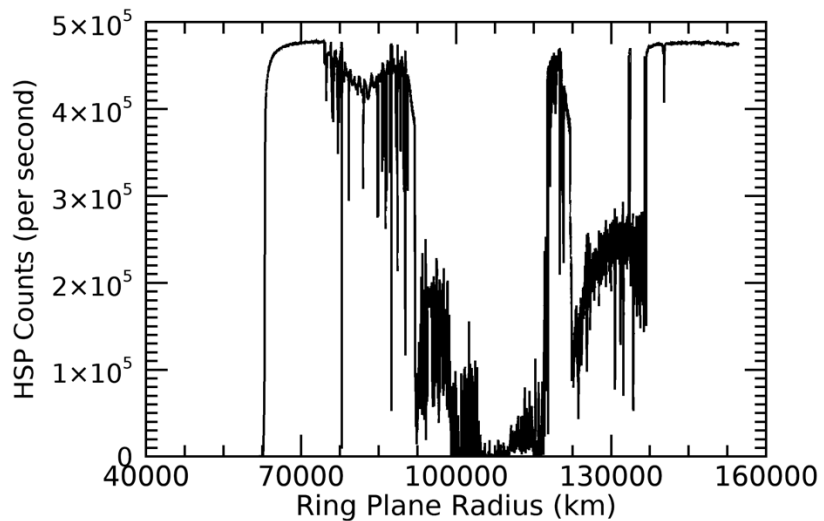
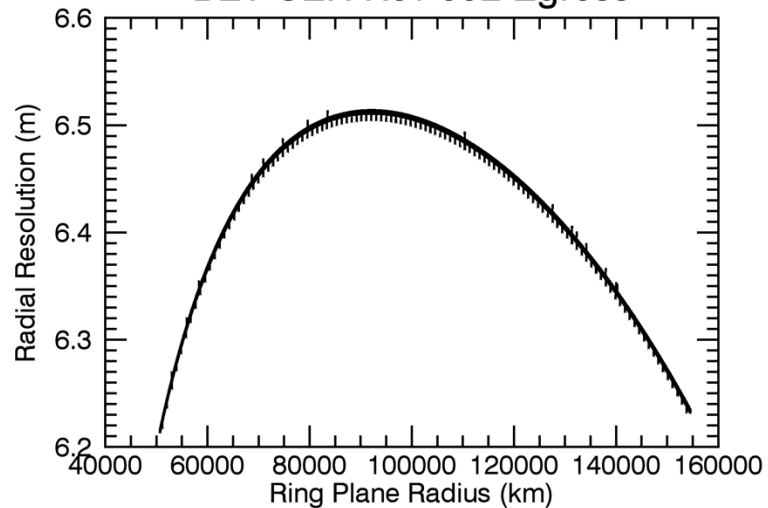
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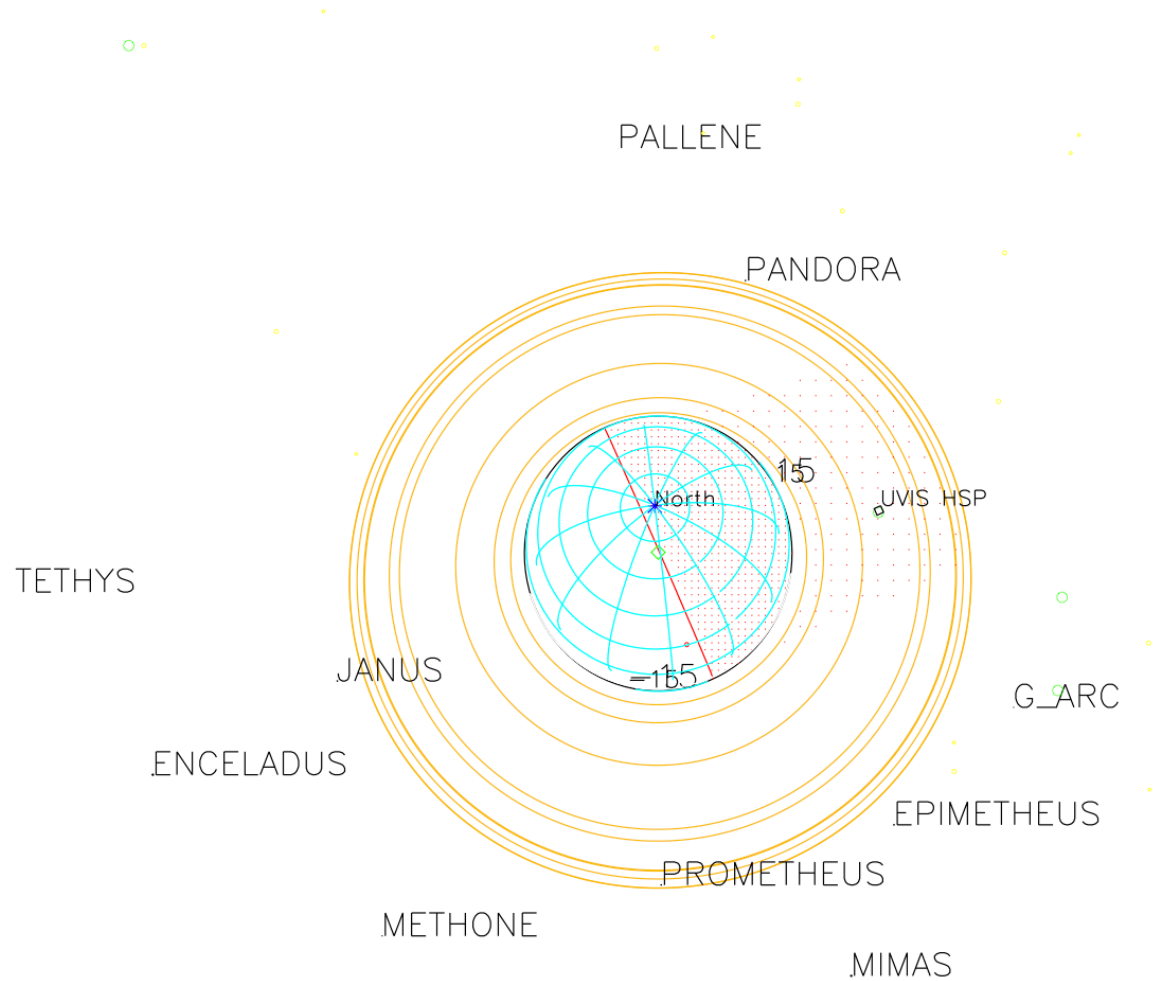
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BET CEN Rev 092 Egress



BET CEN Rev 092 Egress





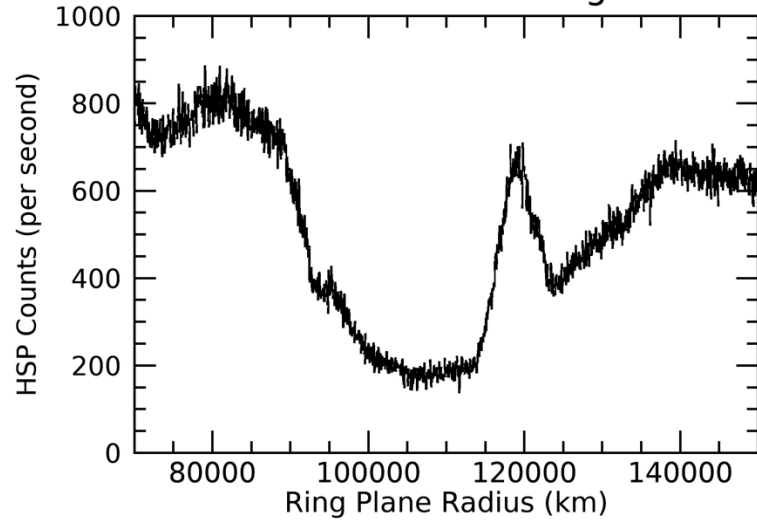
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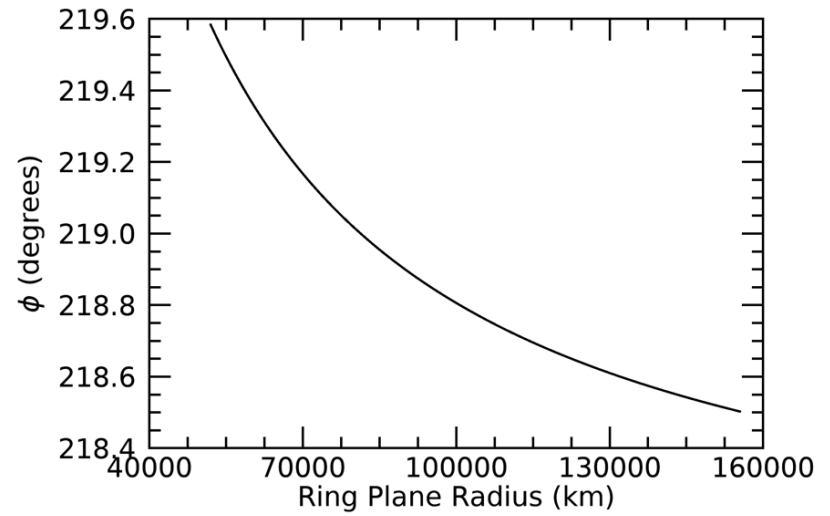
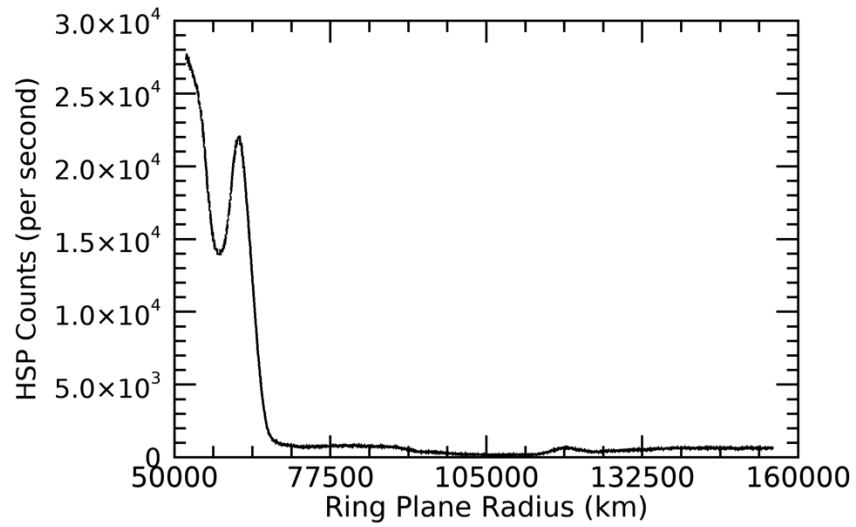
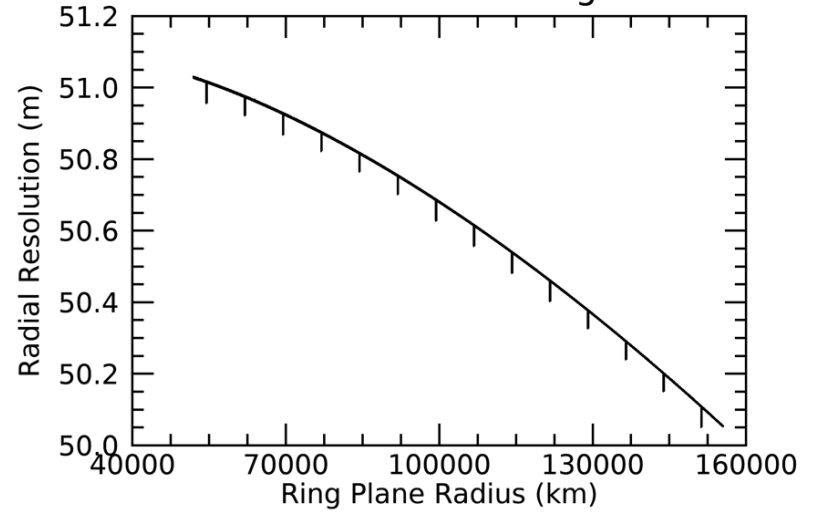
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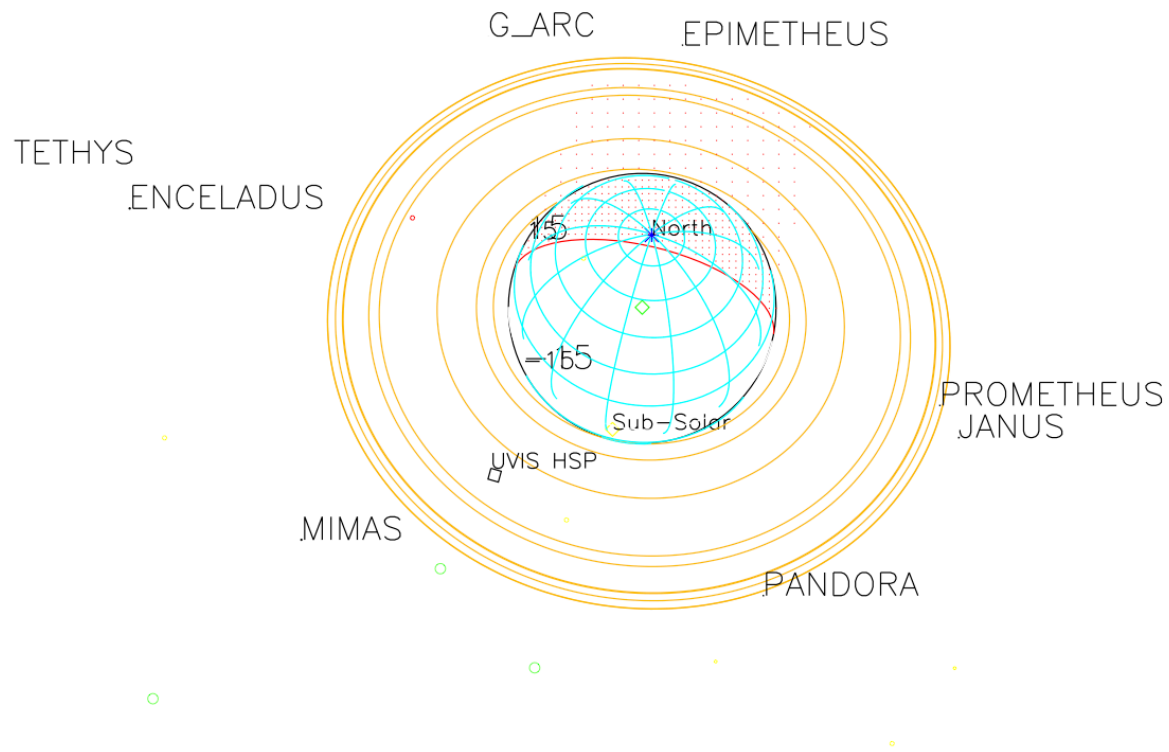
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GAM CRU Rev 094 Ingress



GAM CRU Rev 094 Ingress





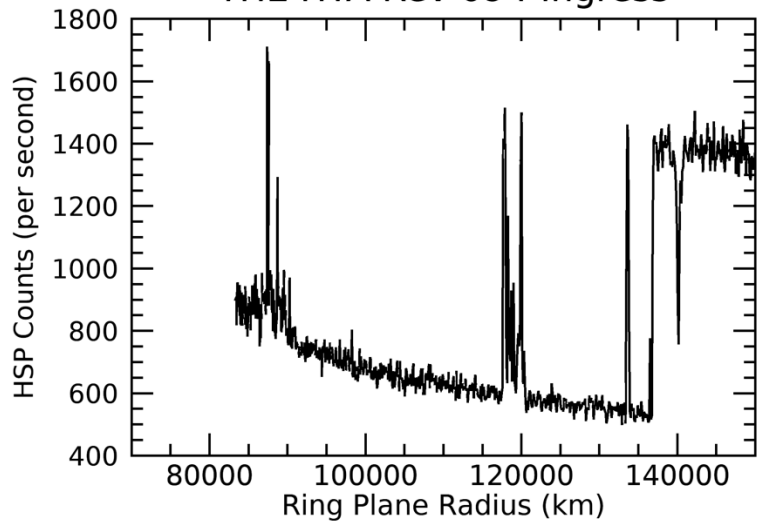
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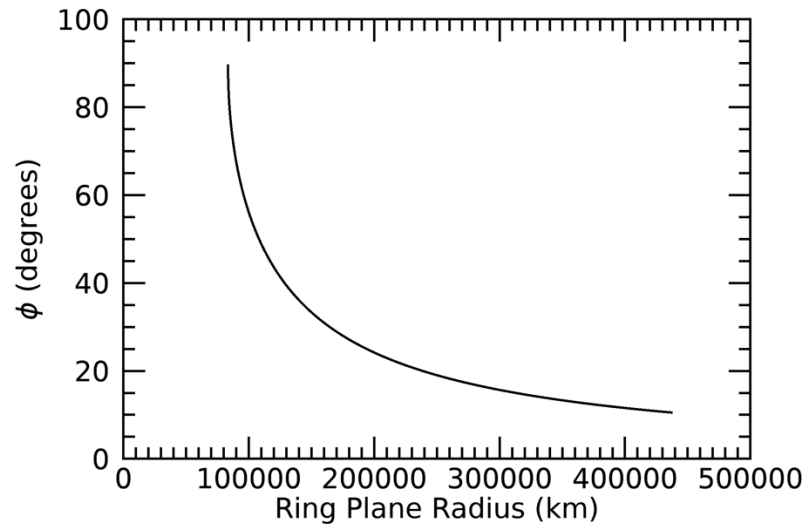
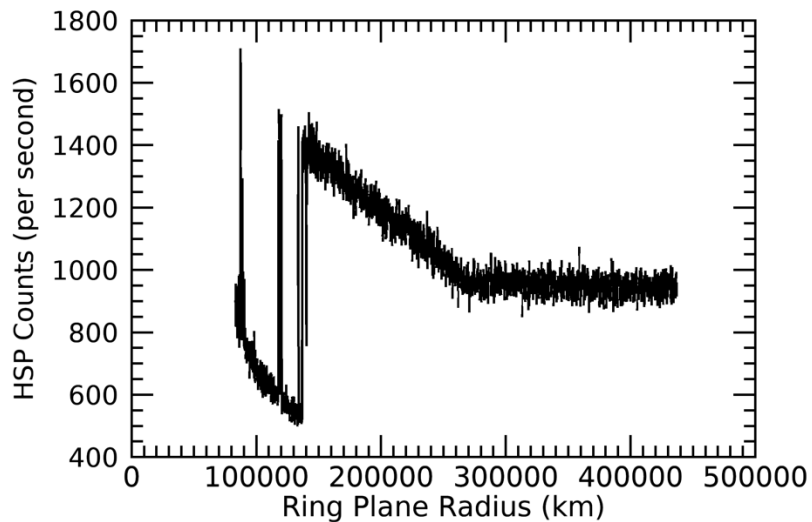
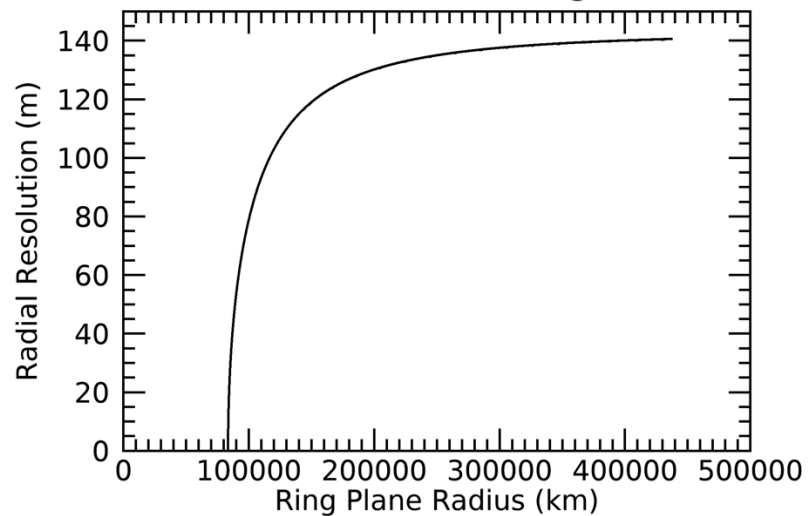
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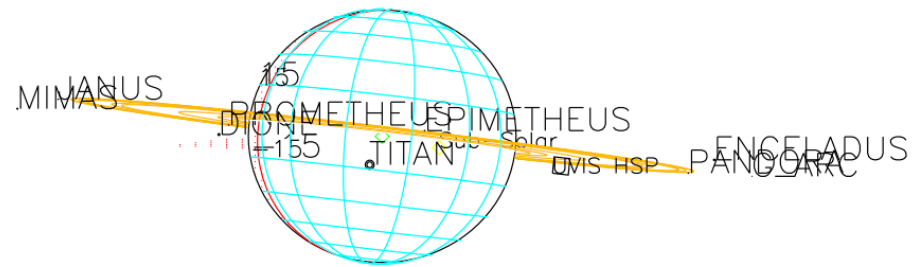
Sub-s/c lat/lon: 51.70, 9.94

THE HYA Rev 094 Ingress



THE HYA Rev 094 Ingress





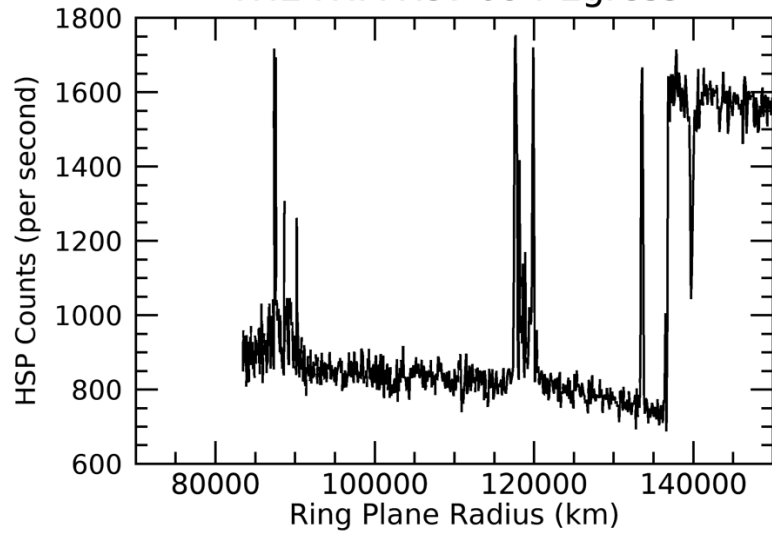
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Target RA/dec: 142.56, 2.87

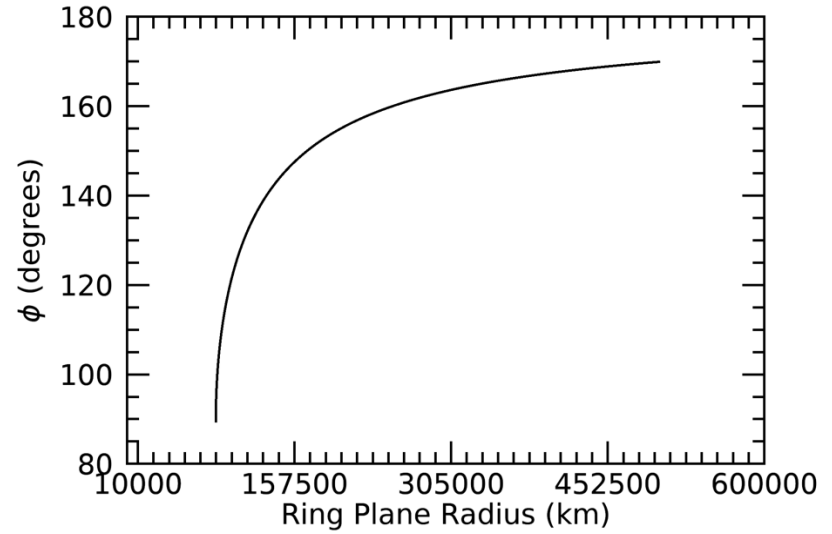
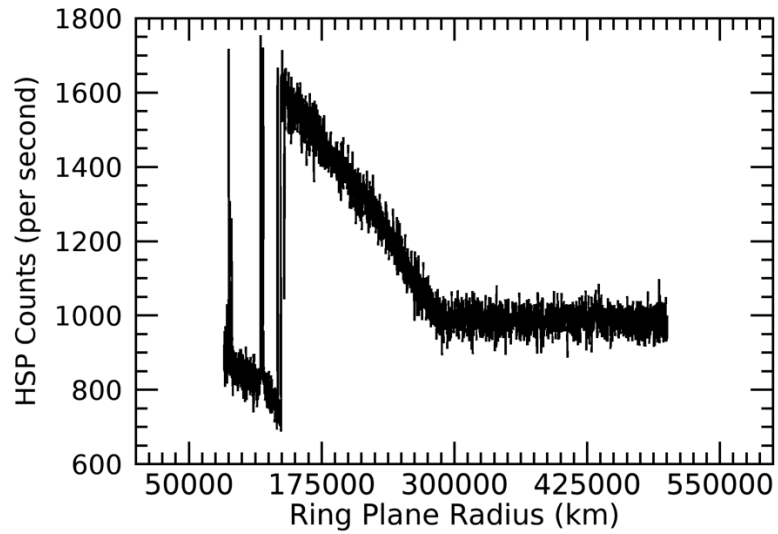
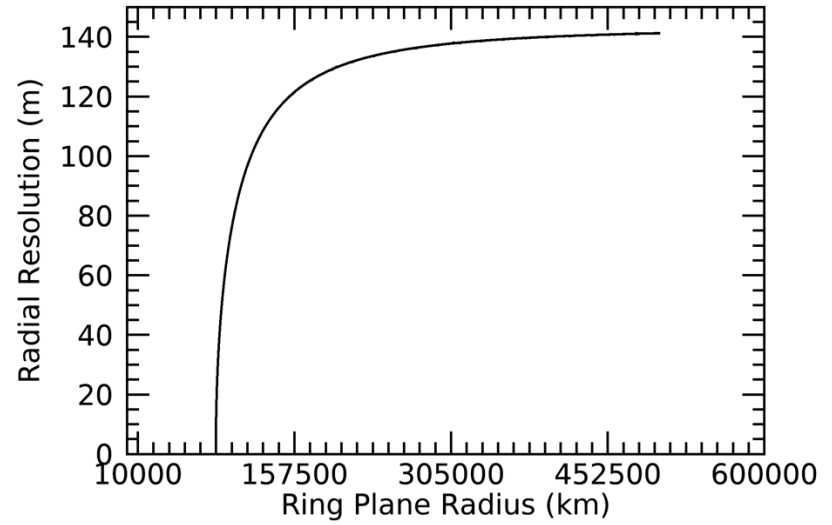
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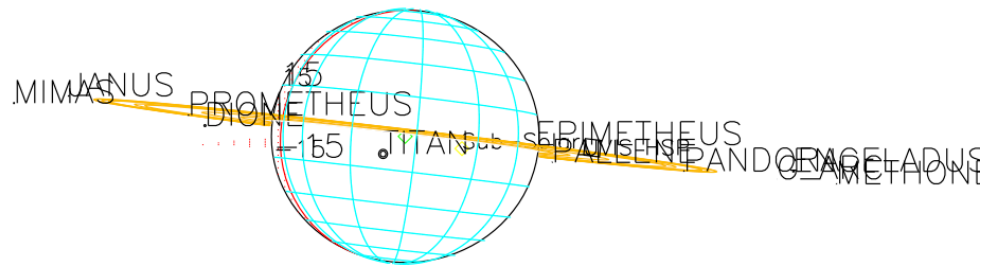
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THE HYA Rev 094 Egress



THE HYA Rev 094 Egress



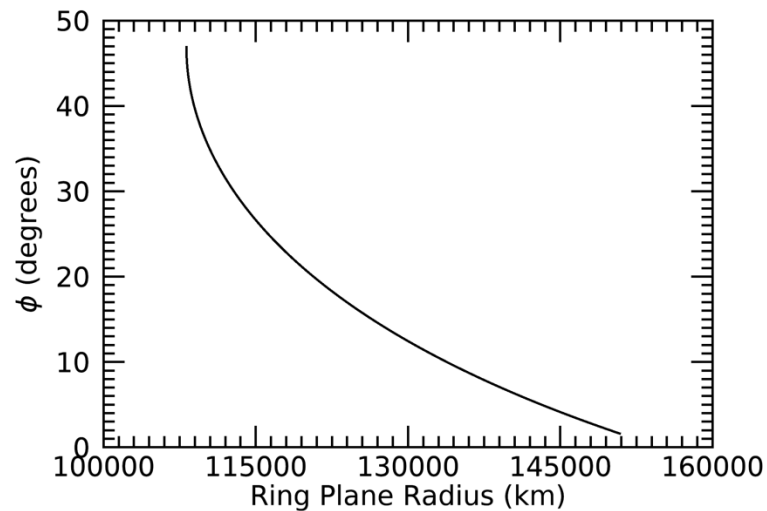
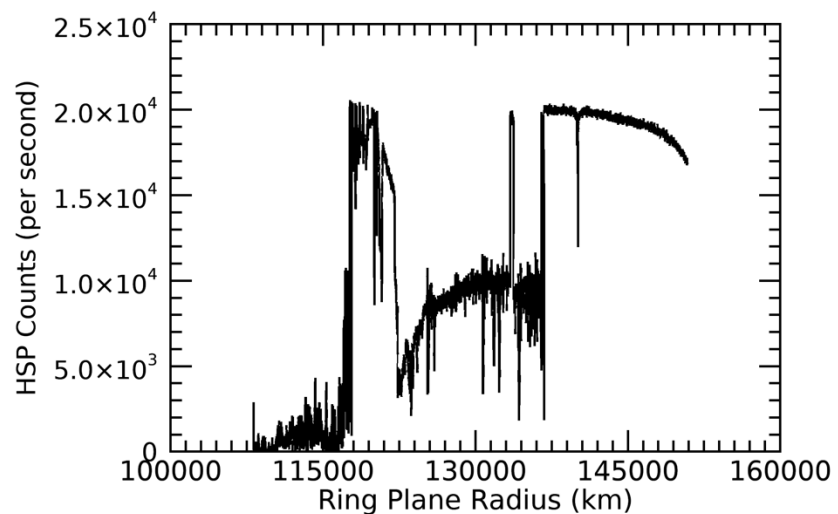
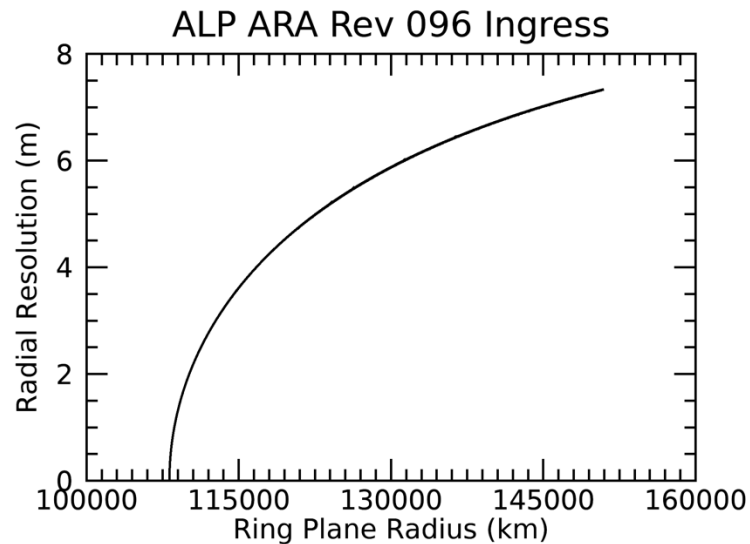
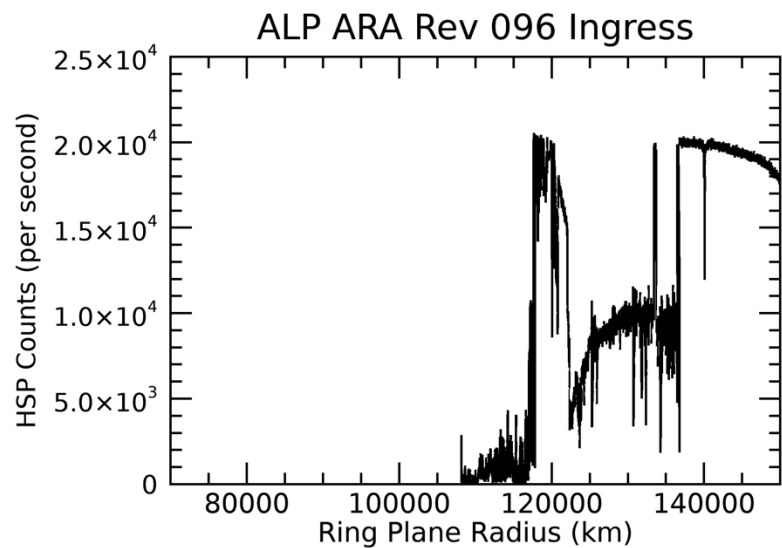


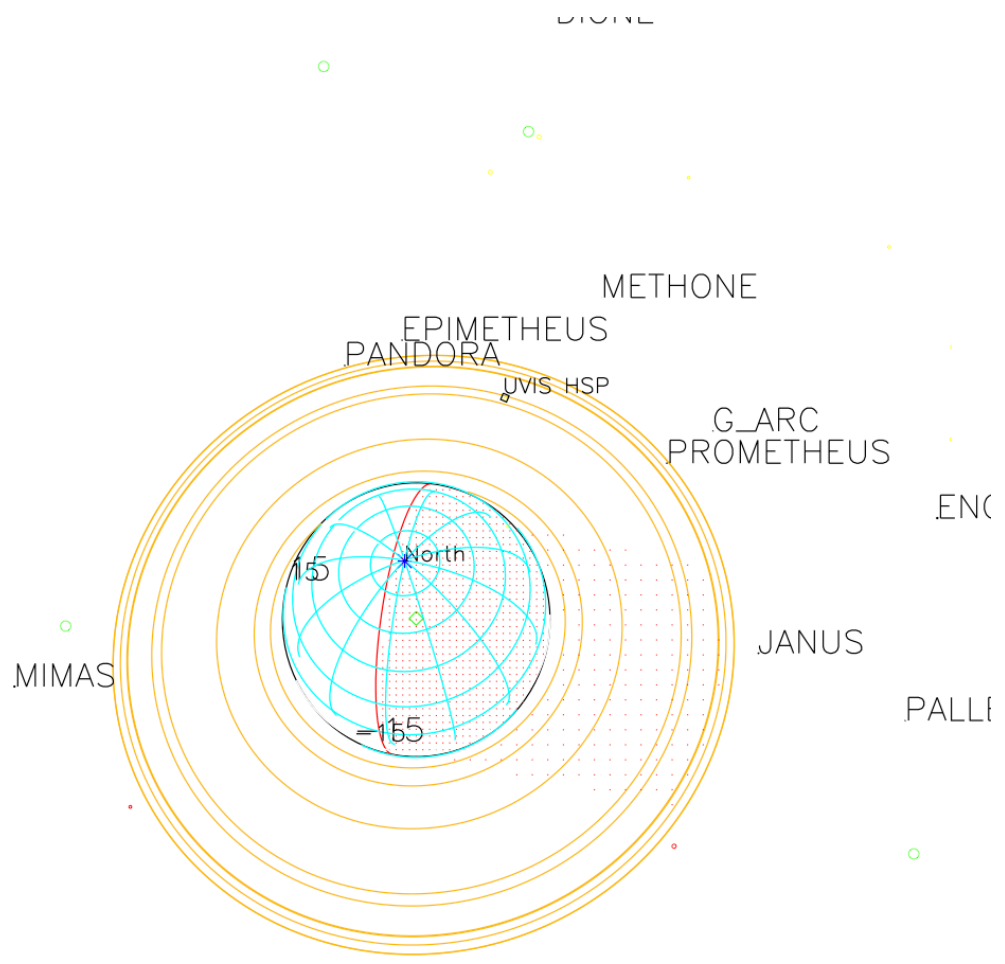
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Subsolar lat/lon: -3.22, -40.69

Sub-s/c lat/lon: -0.92, -65.01





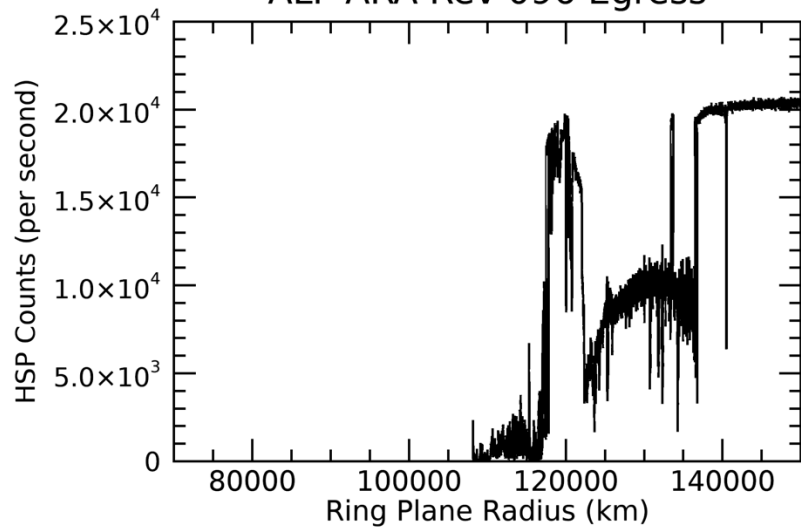
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Target RA/dec: 270.51, -61.61

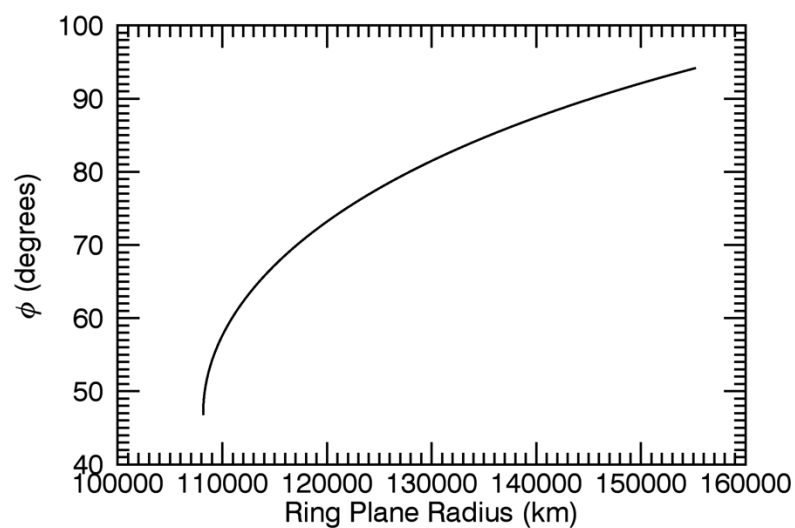
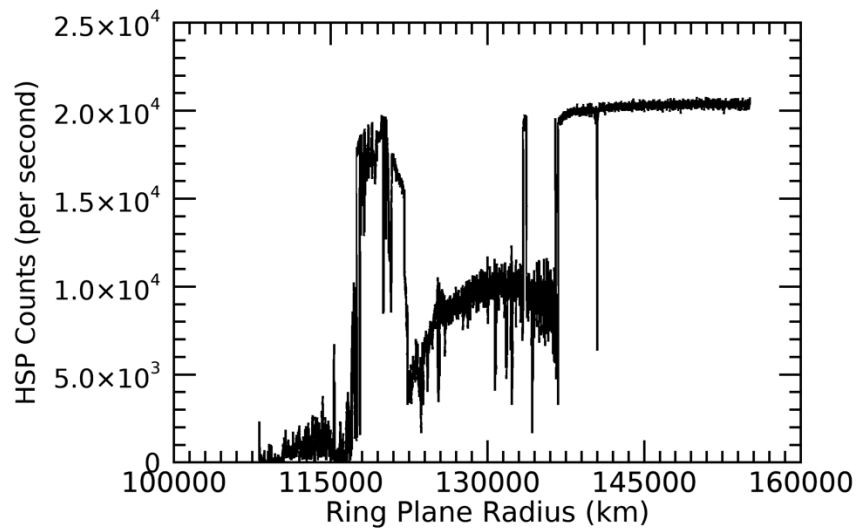
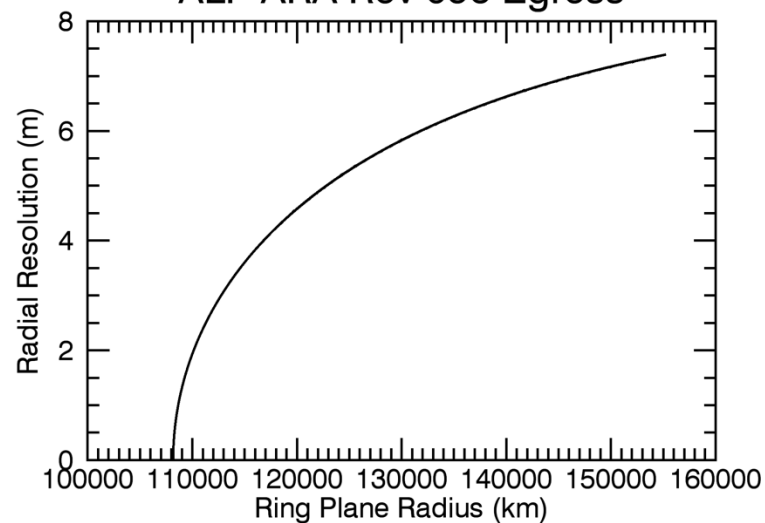
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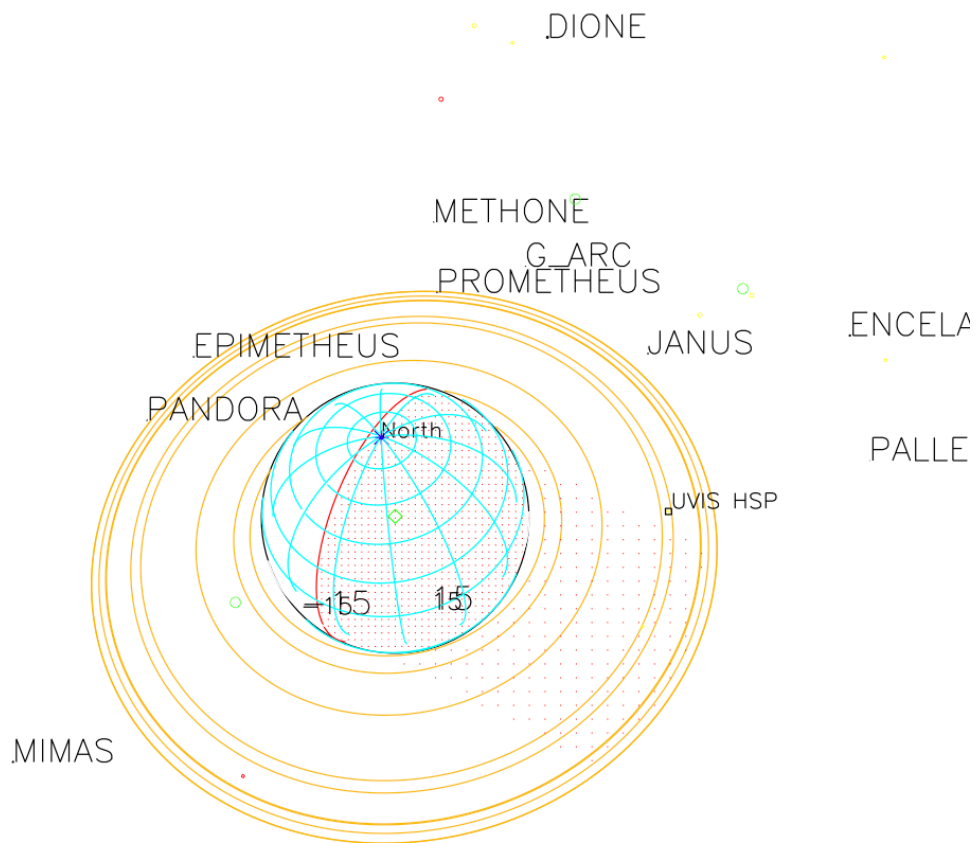
Sub-s/c lat/lon: 61.16, -36.75

ALP ARA Rev 096 Egress



ALP ARA Rev 096 Egress



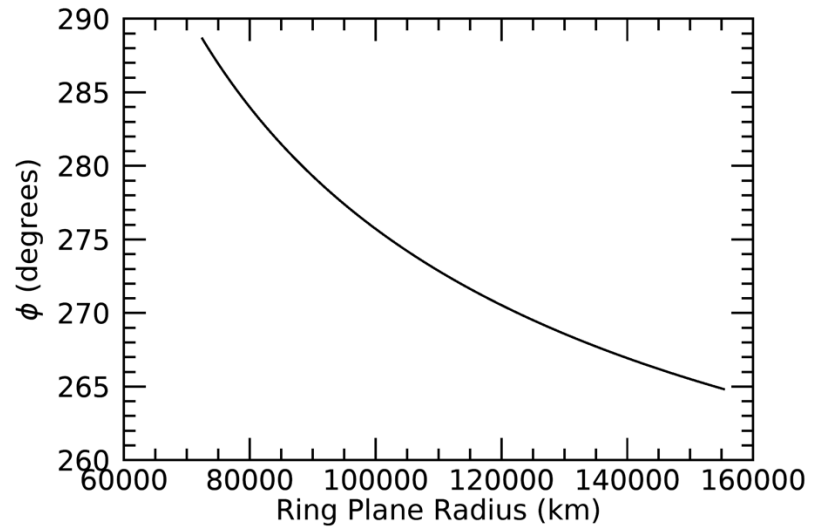
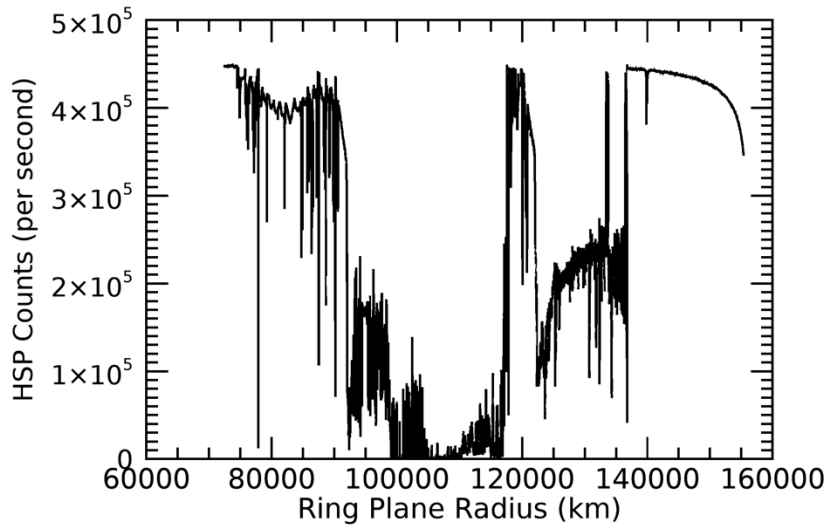
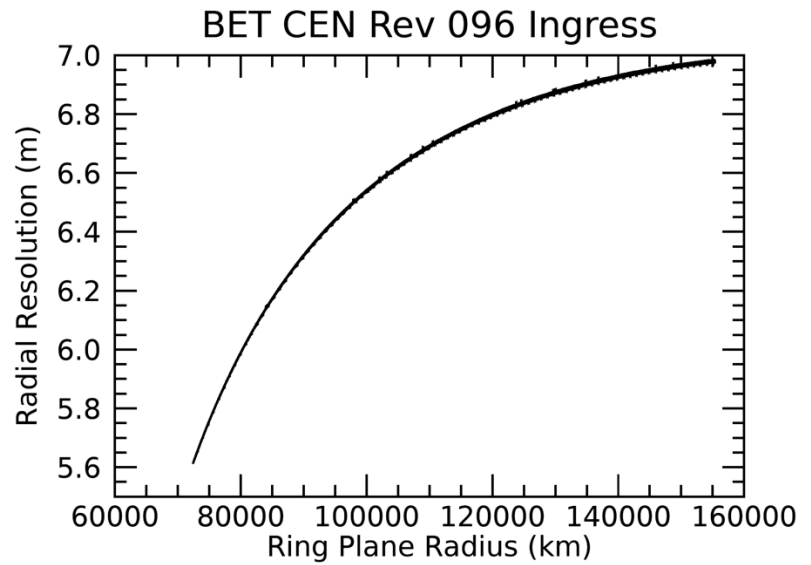
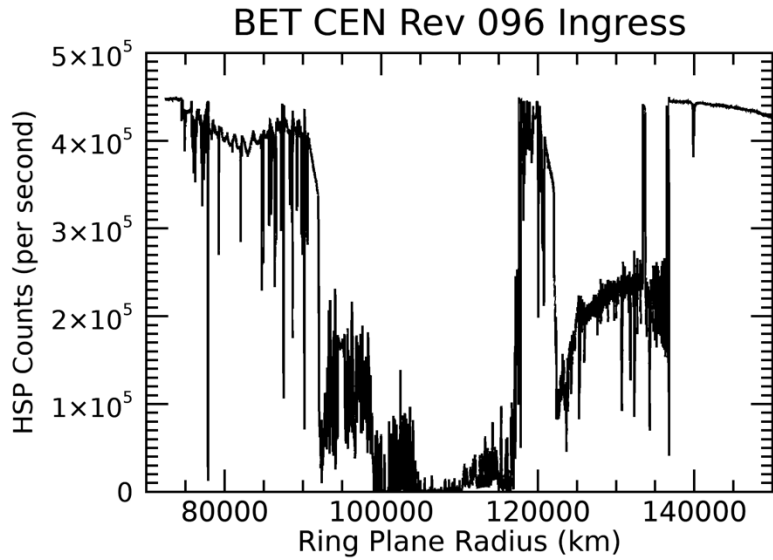


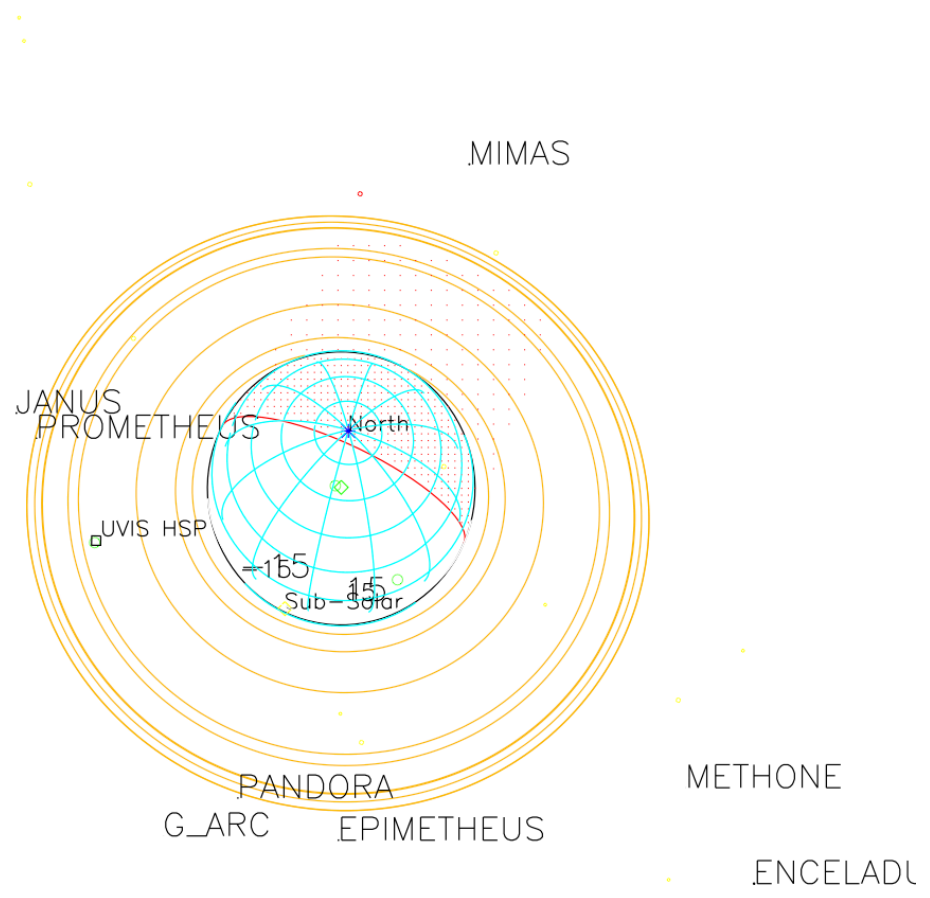
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Target RA/dec: 288.63, -52.99

Subsolar lat/lon: -3.07, 116.22

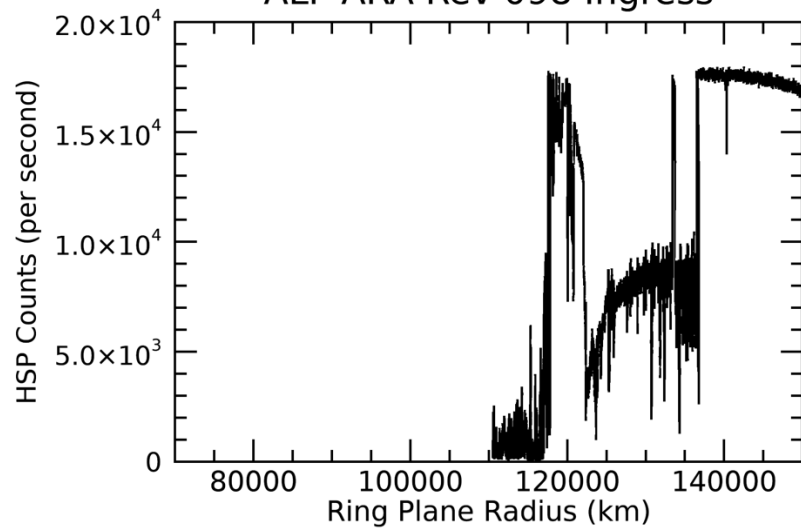
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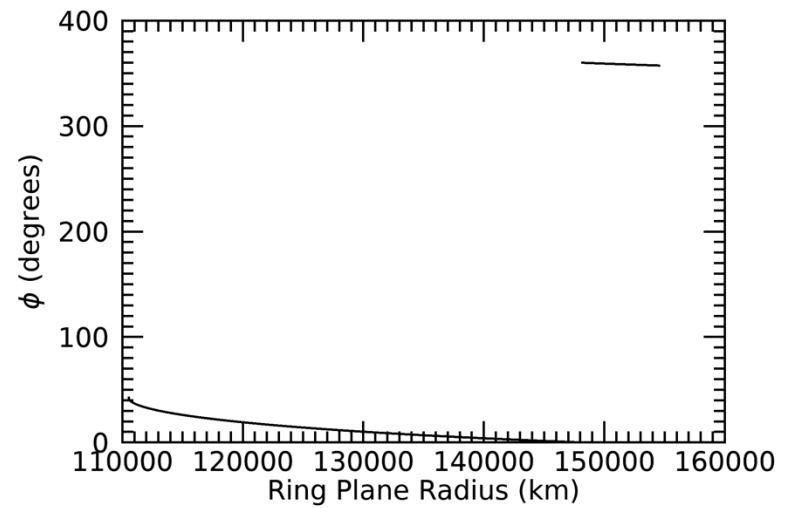
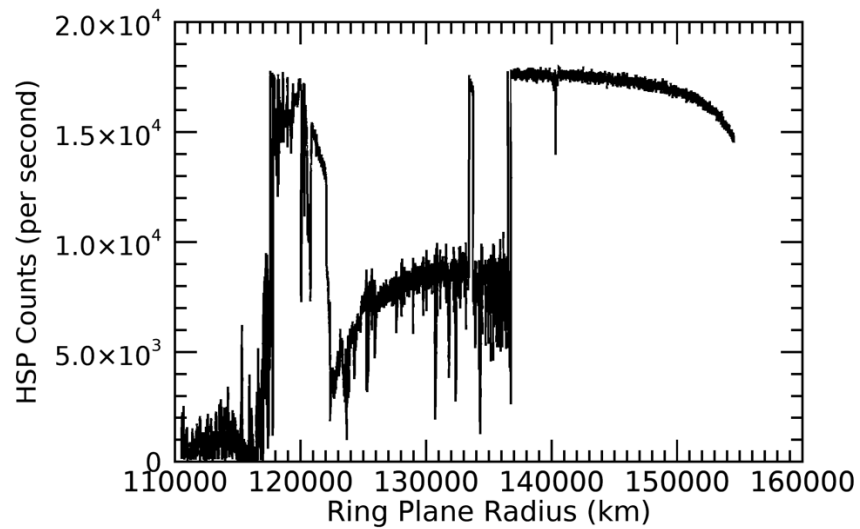
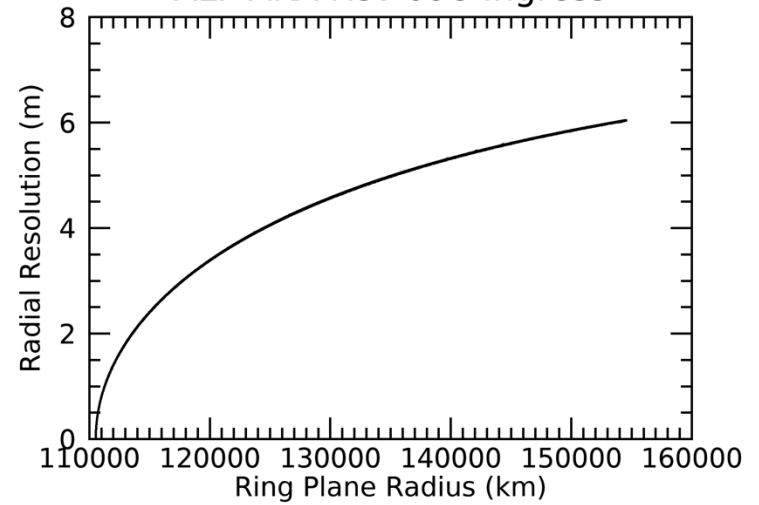


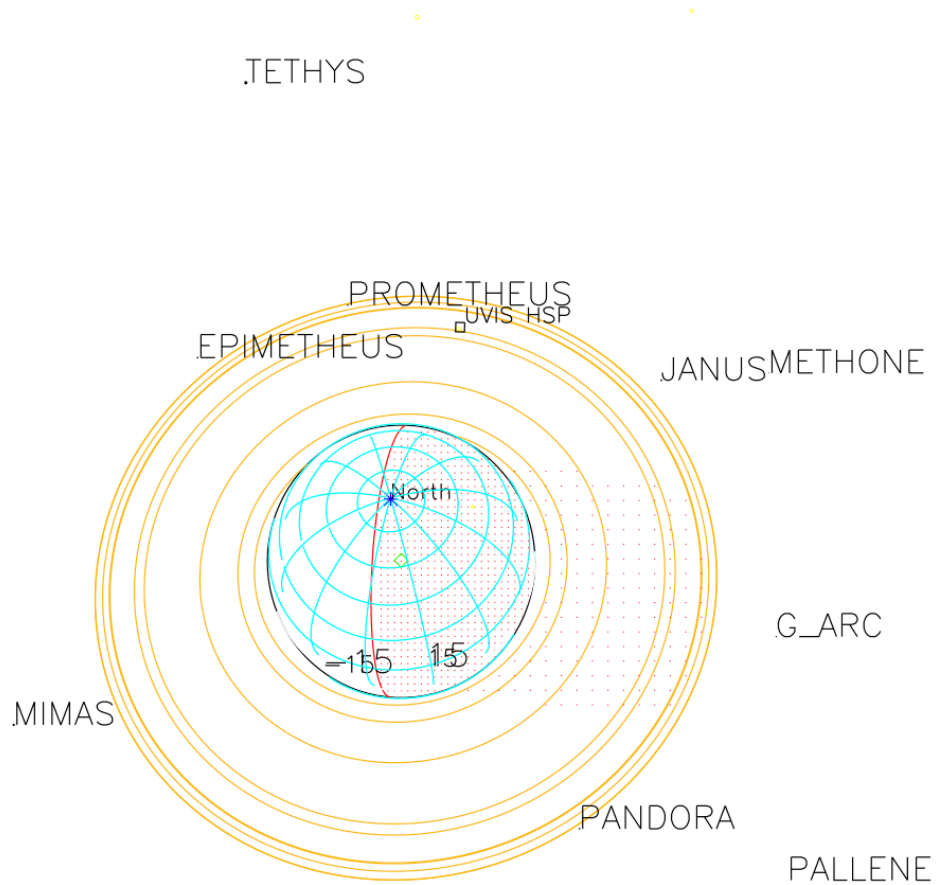
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 Target RA/dec: 191.48, -59.75
 Subsolar lat/lon: -3.08, -98.73
 Sub-s/c lat/lon: 60.87, -81.51

ALP ARA Rev 098 Ingress



ALP ARA Rev 098 Ingress





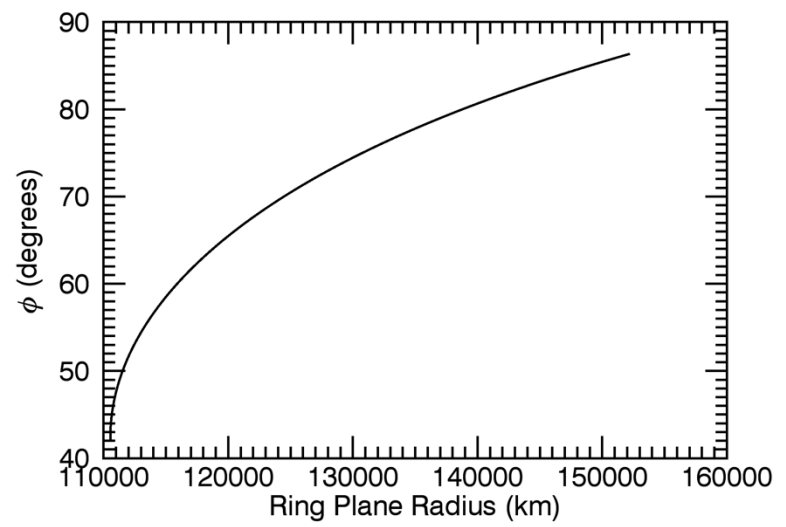
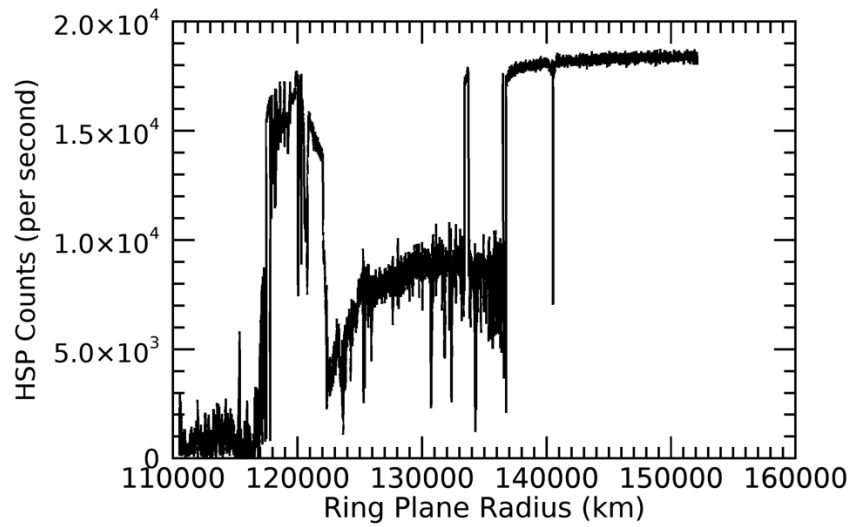
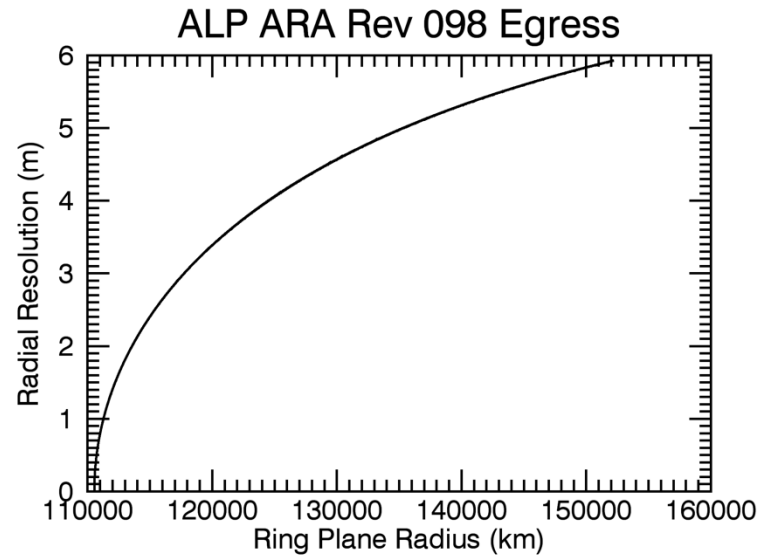
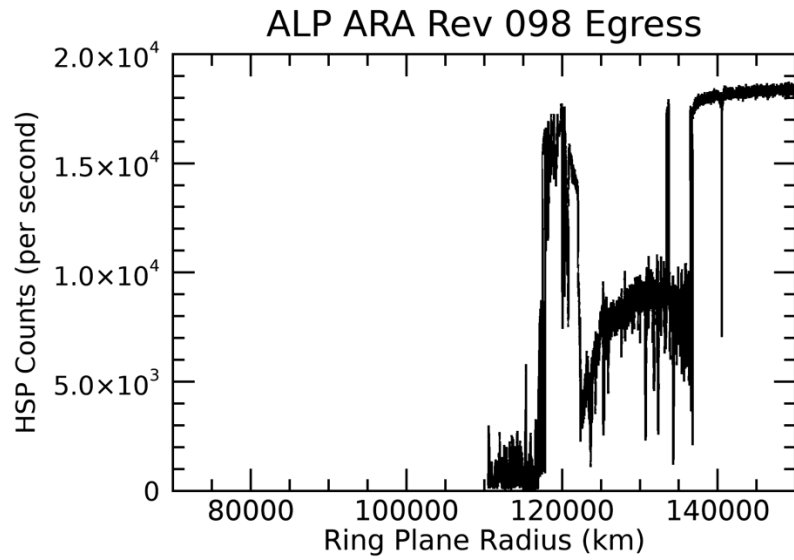
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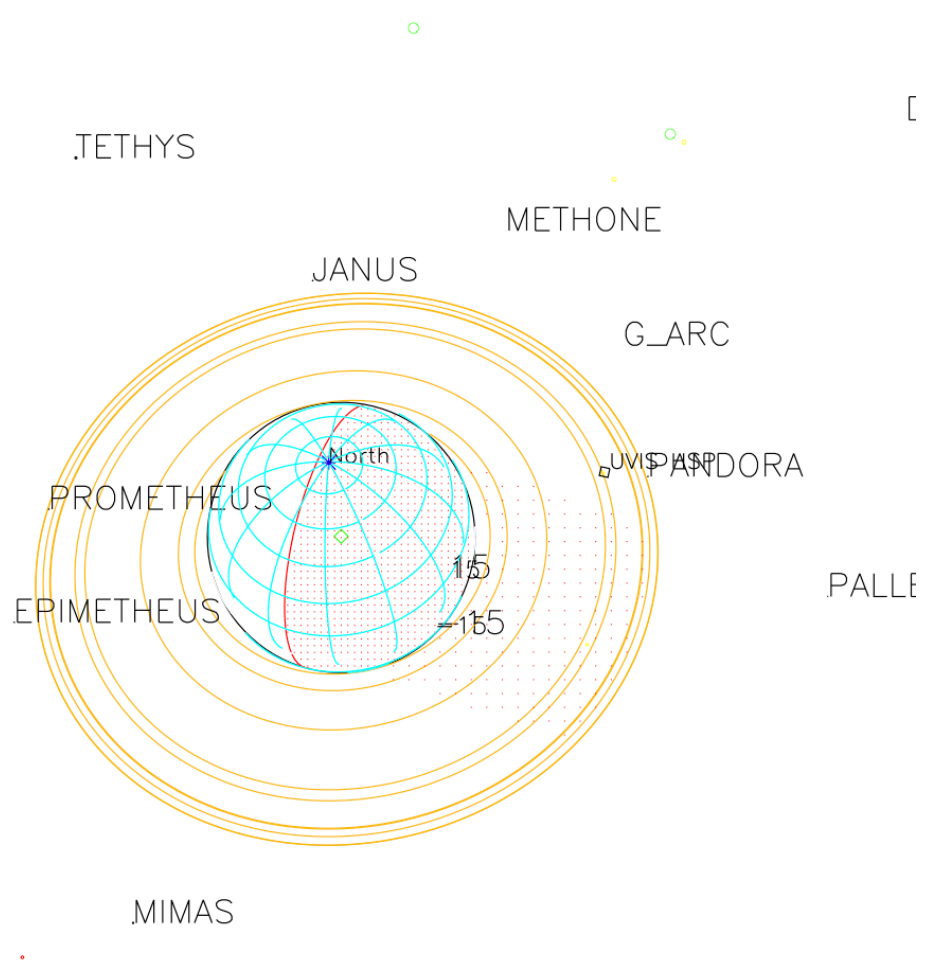
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Subsolar lat/lon: -2.87, 157.51

Sub-s/c lat/lon: 58.00, -95.39

ENCELADUS





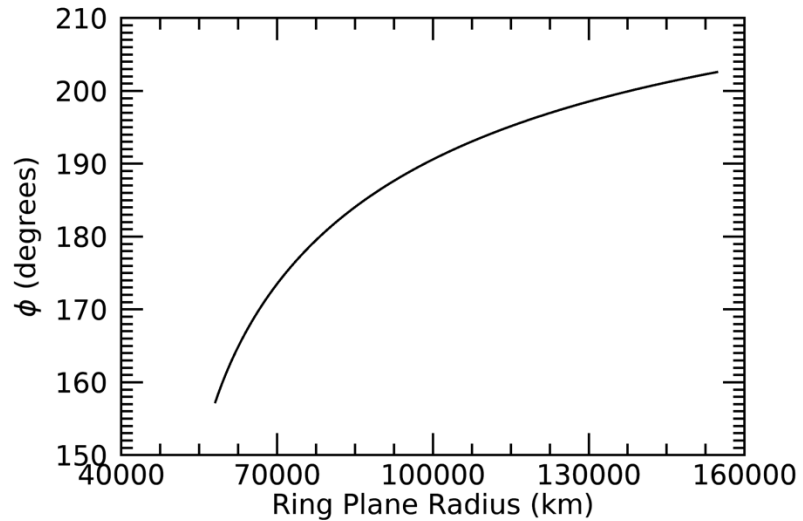
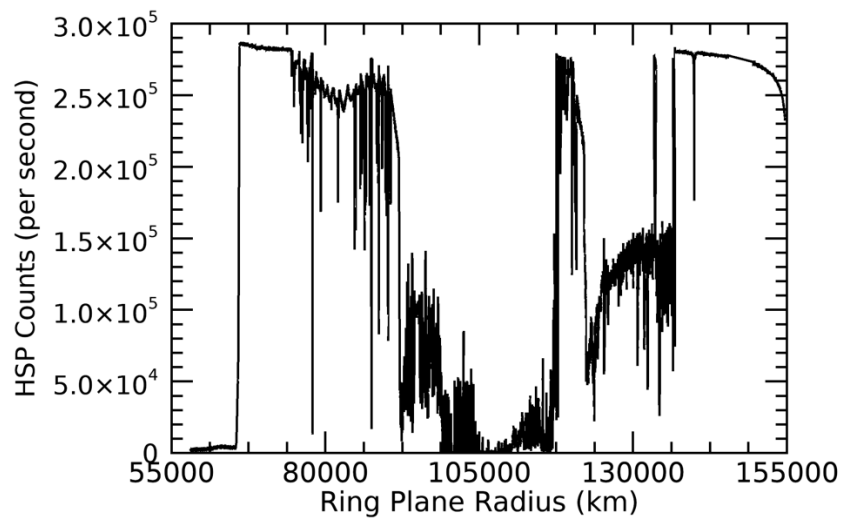
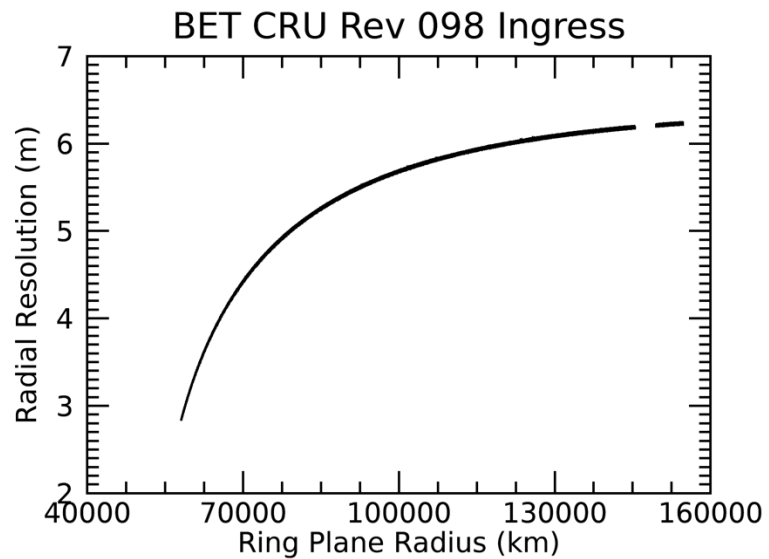
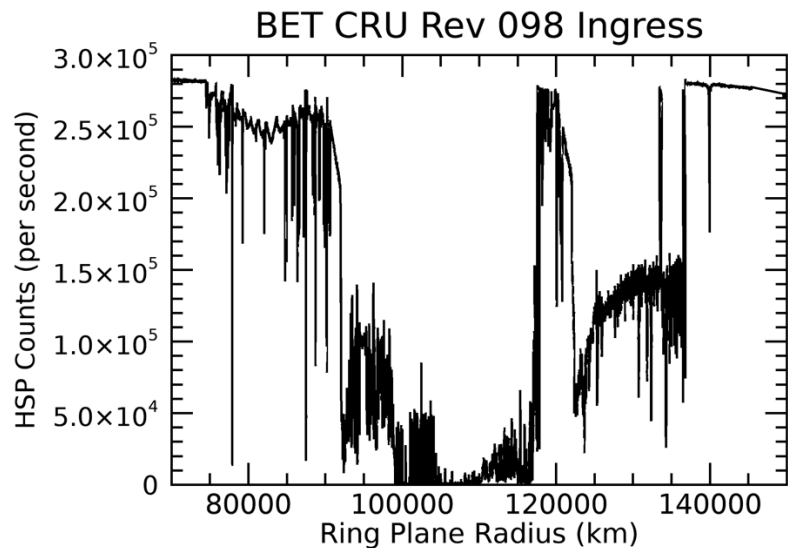
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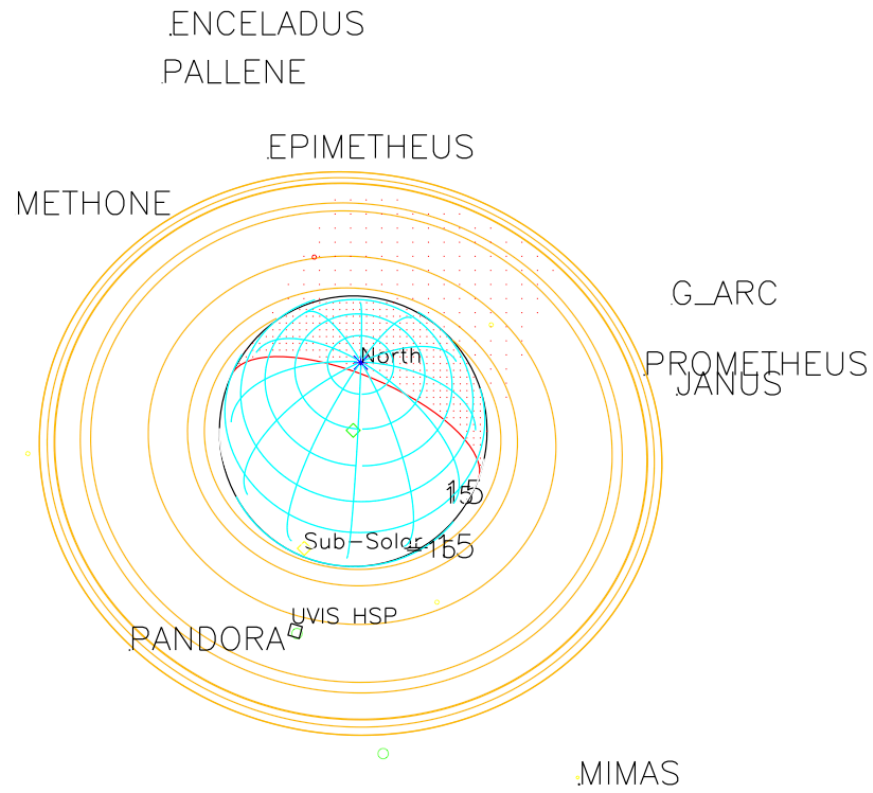
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Subsolar lat/lon: -2.87, 43.22

Sub-s/c lat/lon: 51.34, 162.75

ENCELADUS





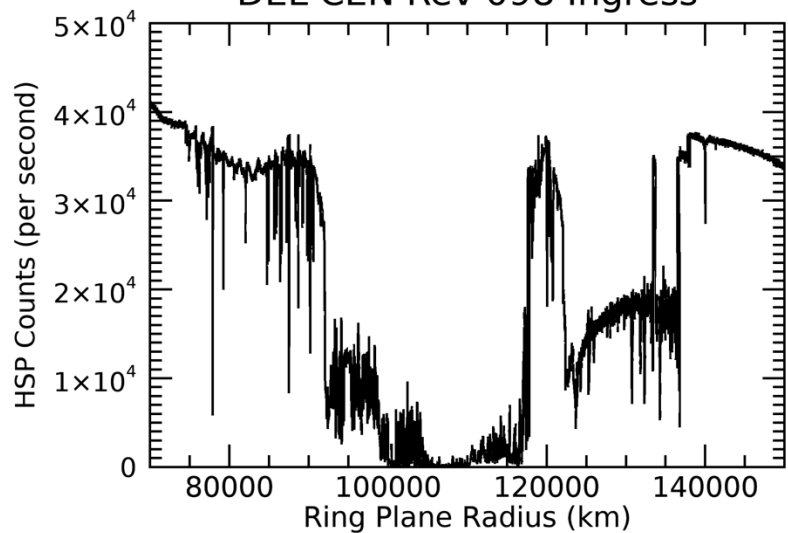
2008-359T10:01:00.000 863017.02 km

Target RA/dec: 188.61, -53.93

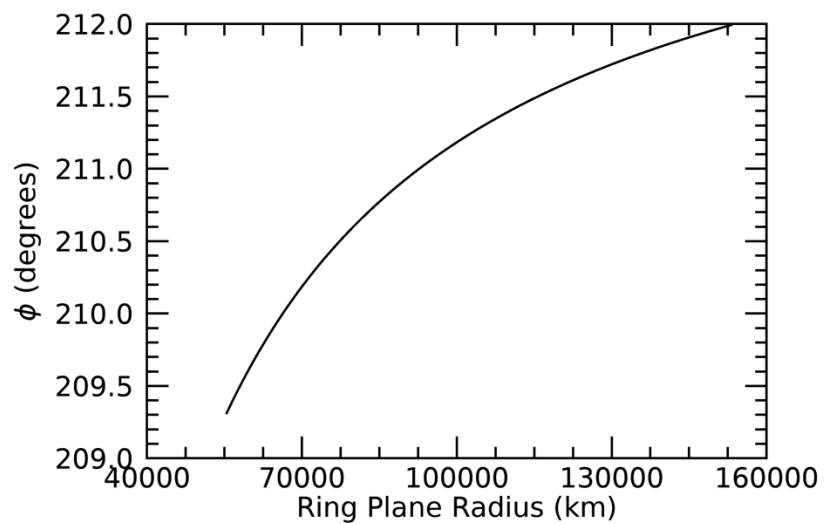
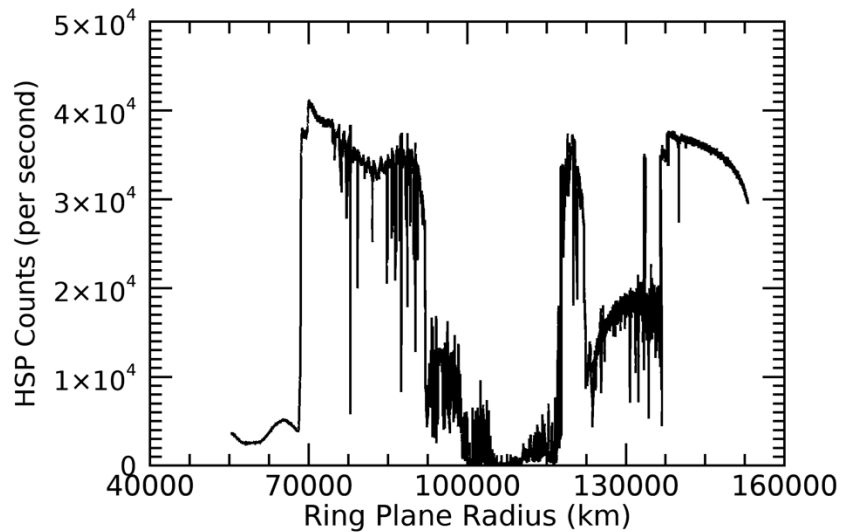
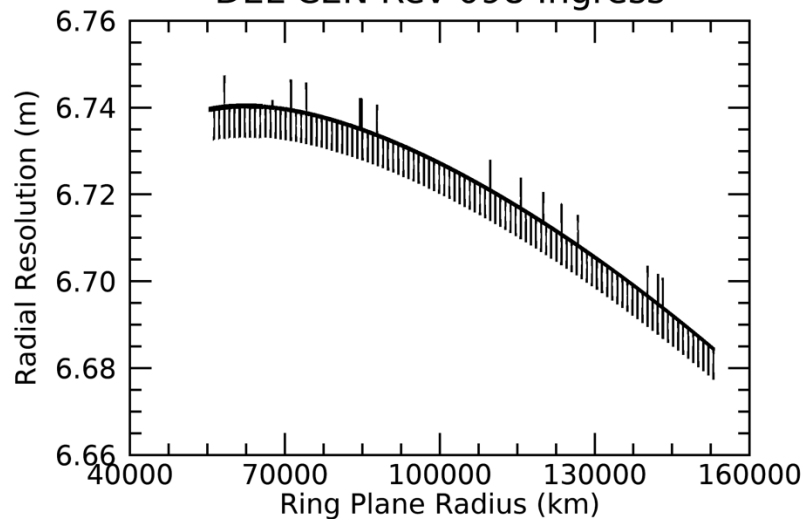
Subsolar lat/lon: -2.88, 161.01

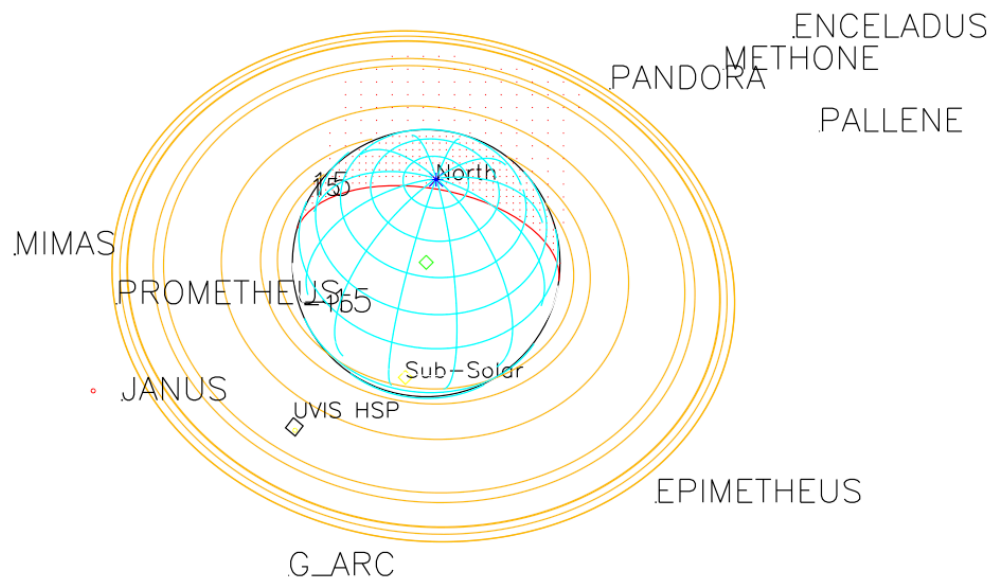
Sub-s/c lat/lon: 54.20, 175.95

DEL CEN Rev 098 Ingress



DEL CEN Rev 098 Ingress



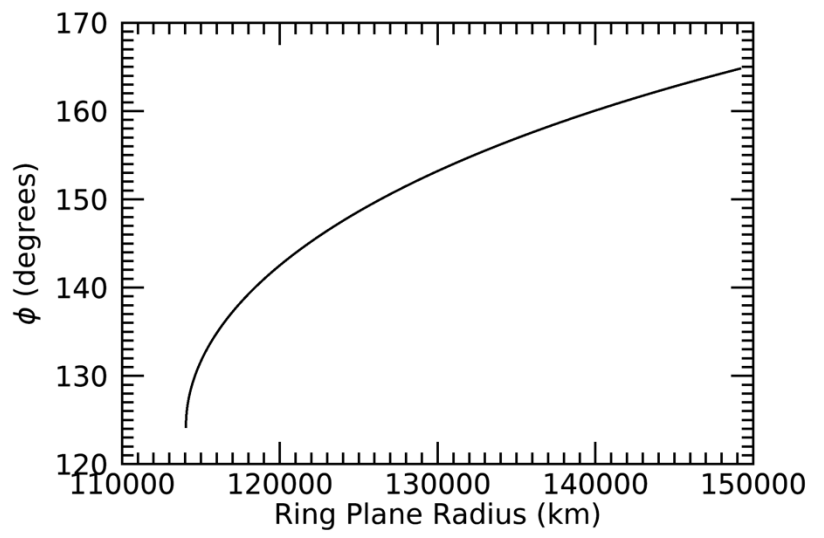
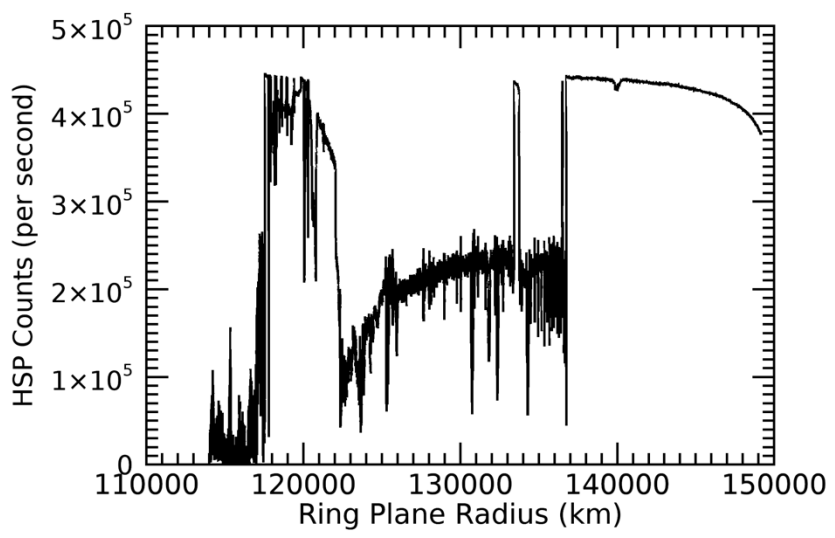
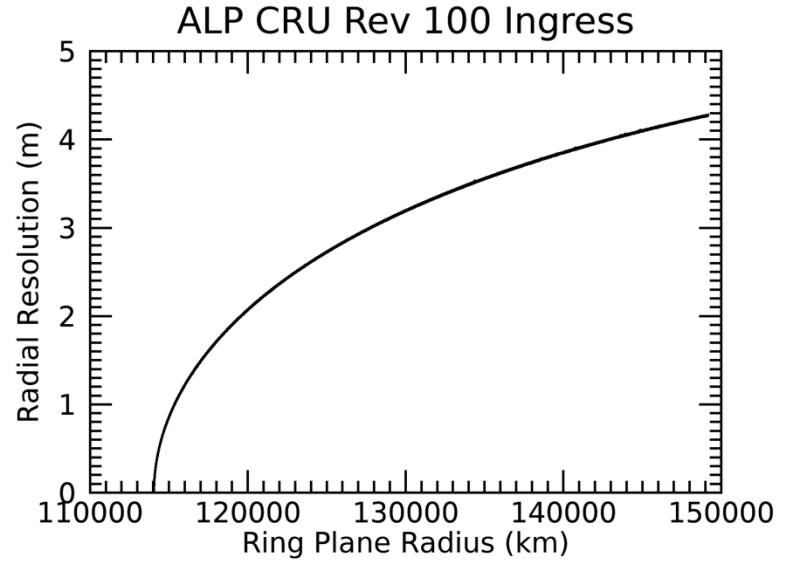
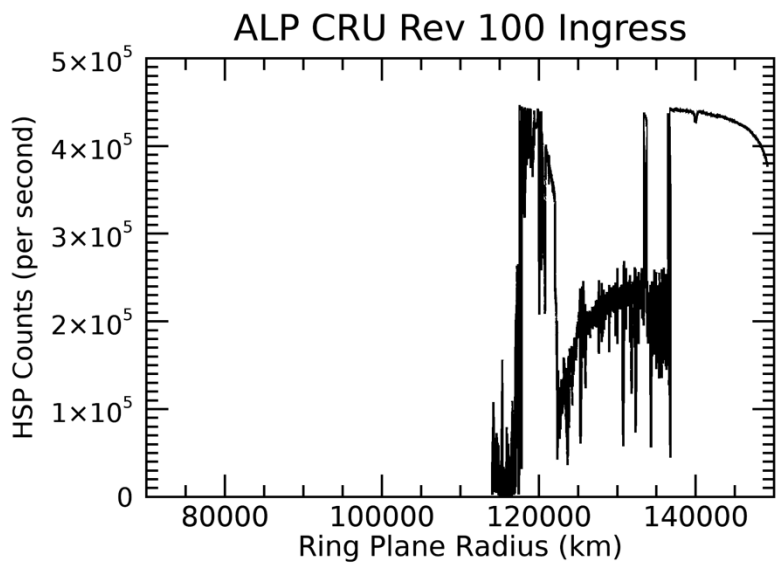


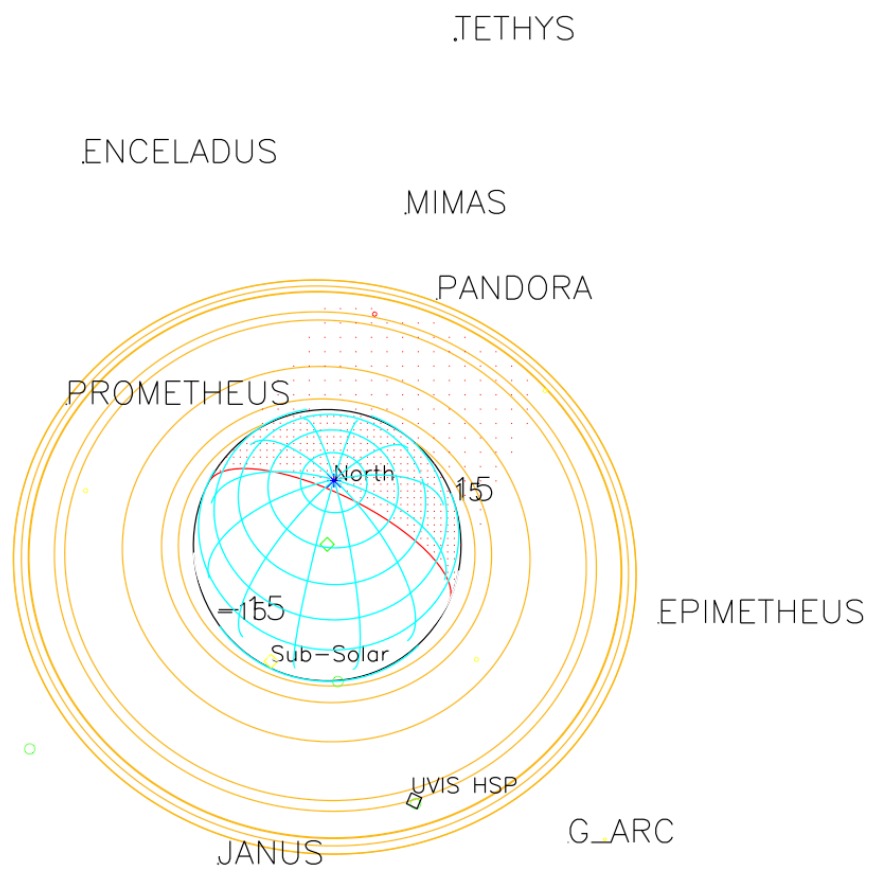
2008-359T02:06:00.000 929981.78 km

Target RA/dec: 176.35, -46.40

Subsolar lat/lon: -2.89, 68.45

Sub-s/c lat/lon: 45.33, 71.37





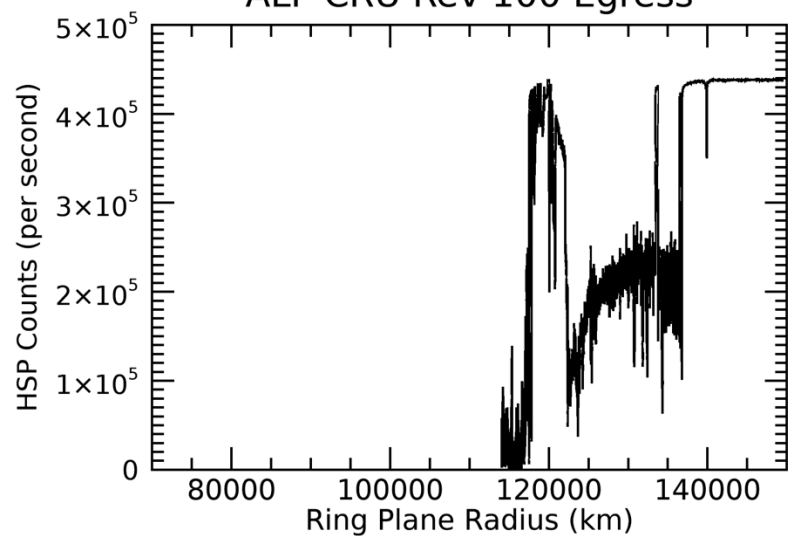
2009-012T15:30:00.000 845999.31 km

Target RA/dec: 192.57, -55.68

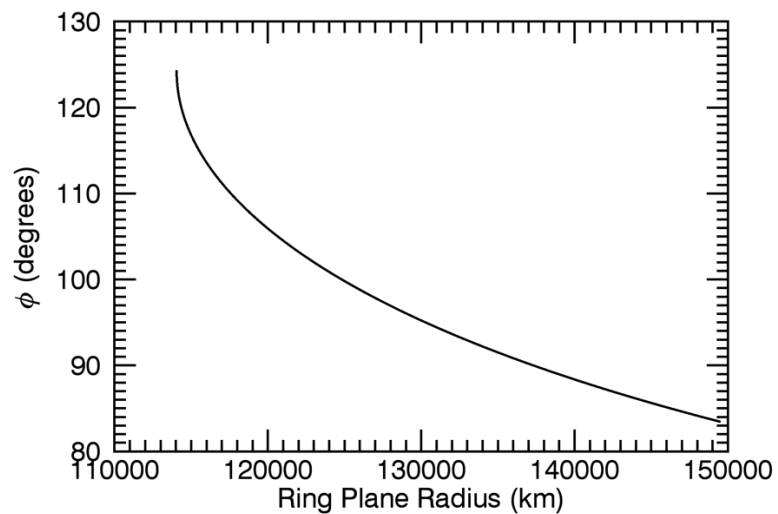
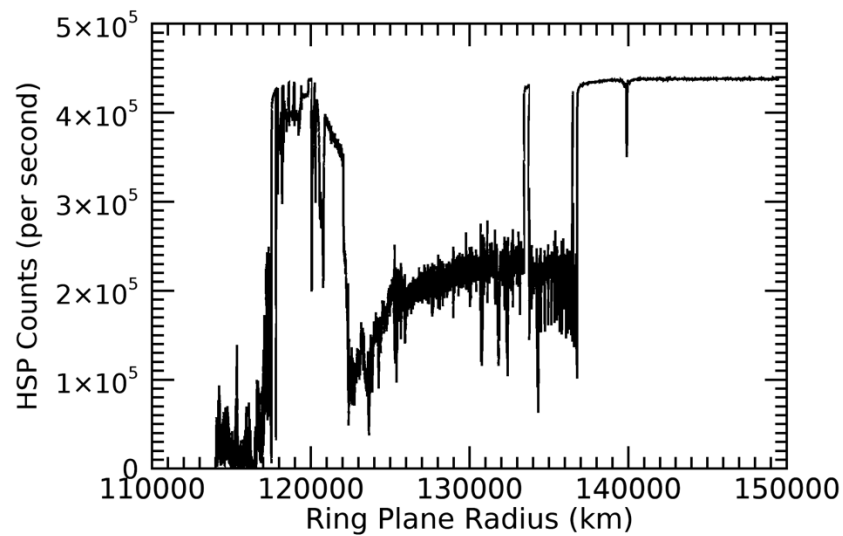
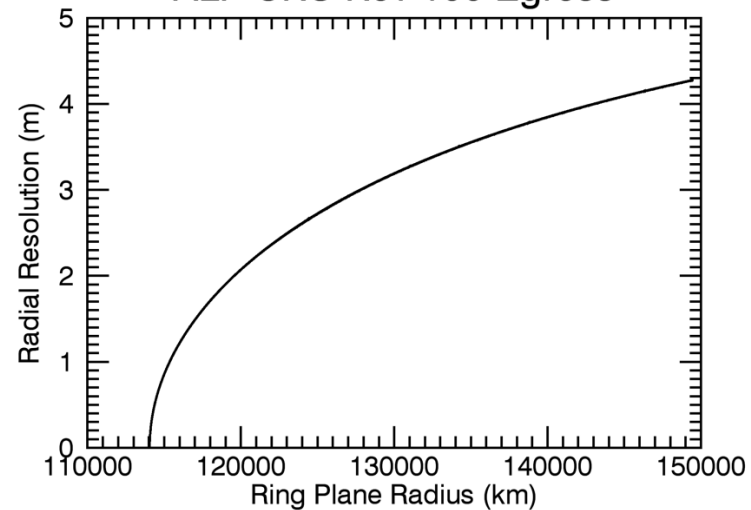
Subsolar lat/lon: -2.64, 51.27

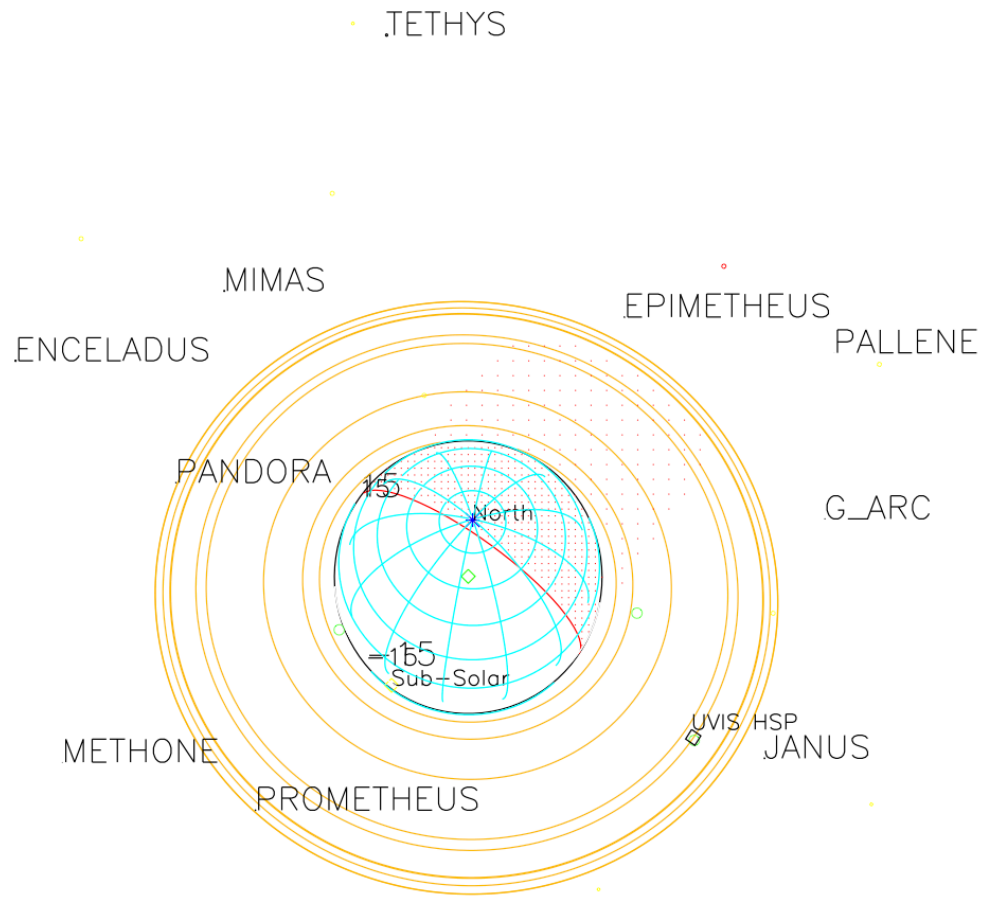
Sub-s/c lat/lon: 56.39, 69.79

ALP CRU Rev 100 Egress



ALP CRU Rev 100 Egress





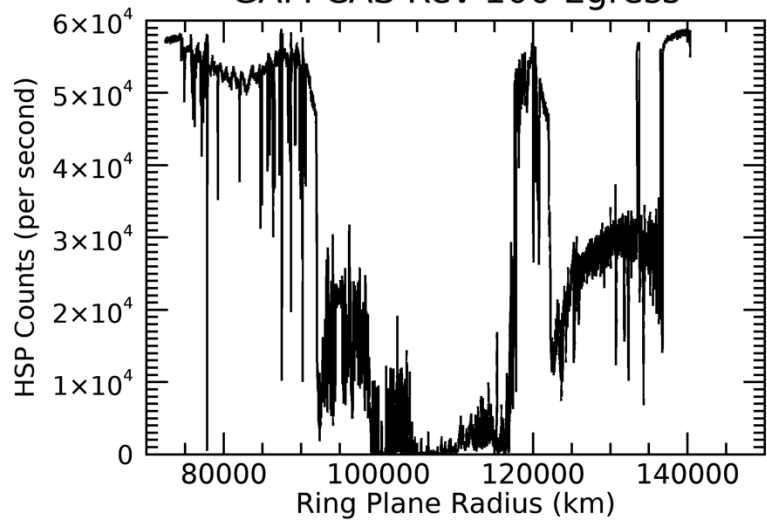
2009-012T19:27:00.000 809956.92 km

Target RA/dec: 202.62, -59.00

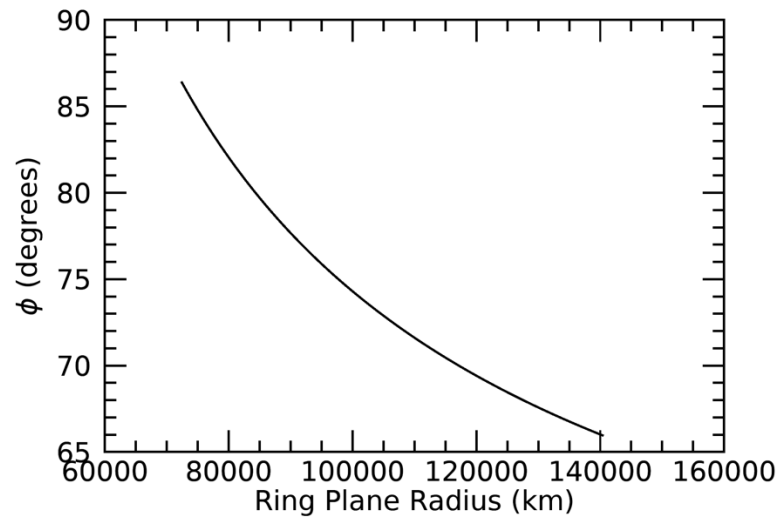
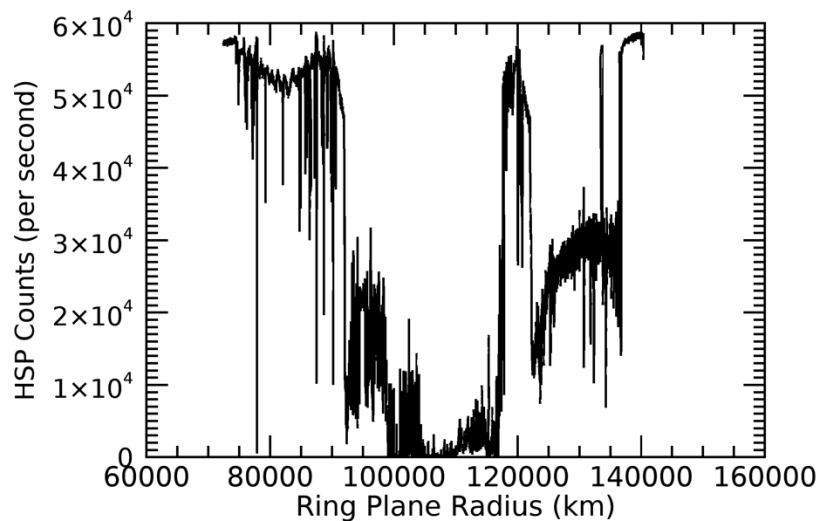
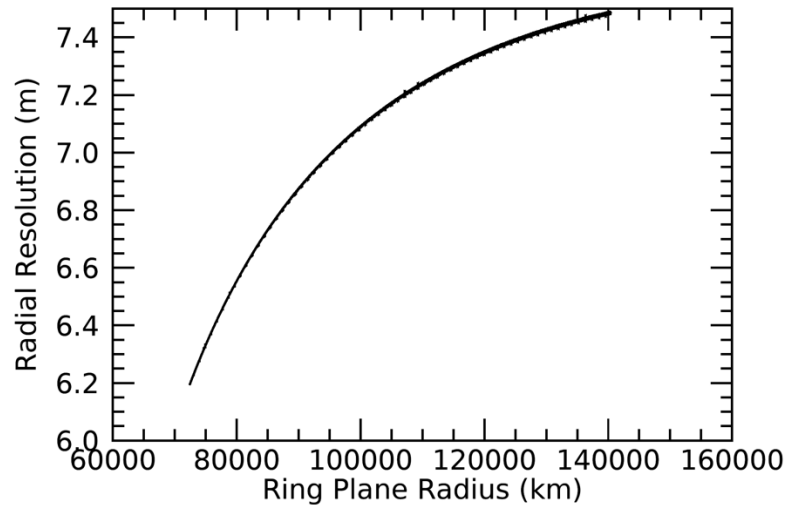
Subsolar lat/lon: -2.64, -82.17

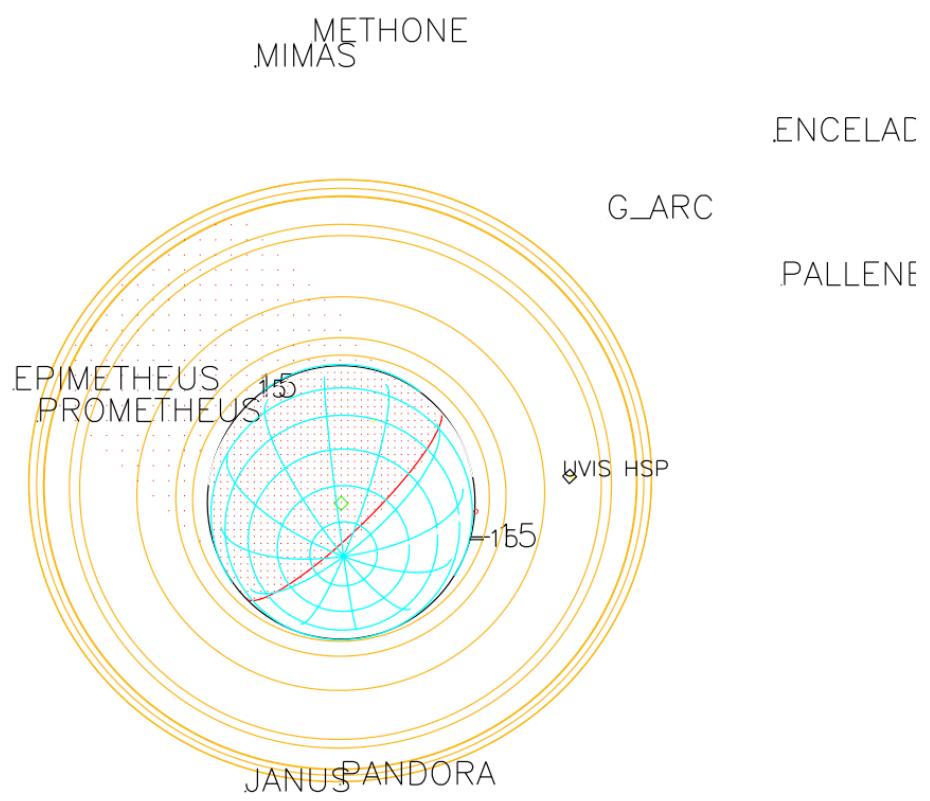
Sub-s/c lat/lon: 60.64, -52.40

GAM CAS Rev 100 Egress



GAM CAS Rev 100 Egress



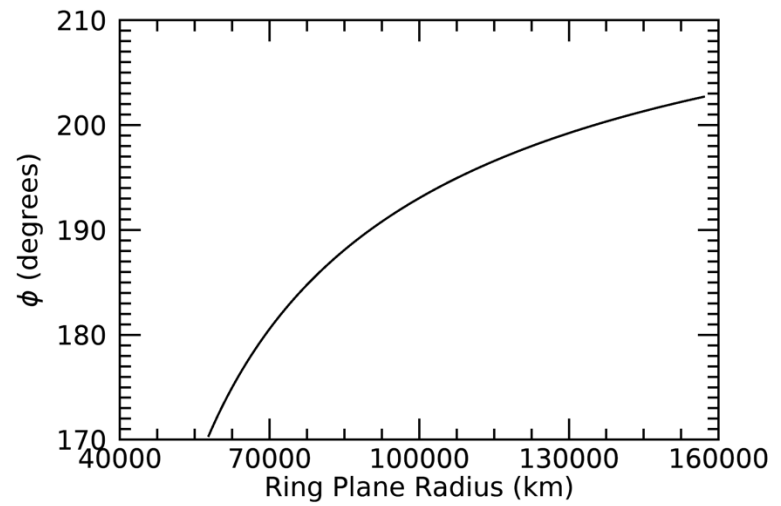
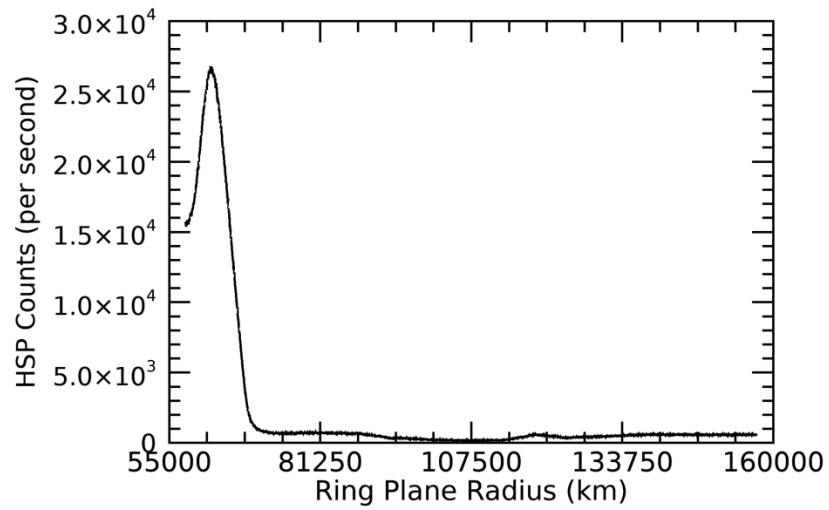
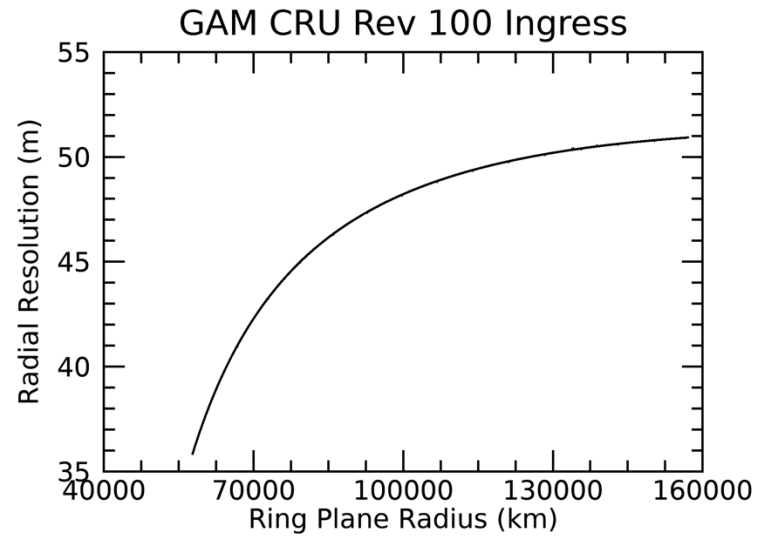
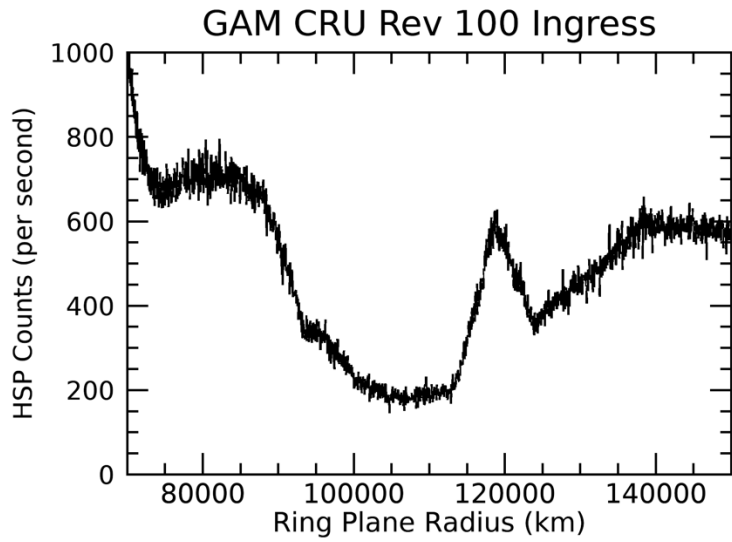


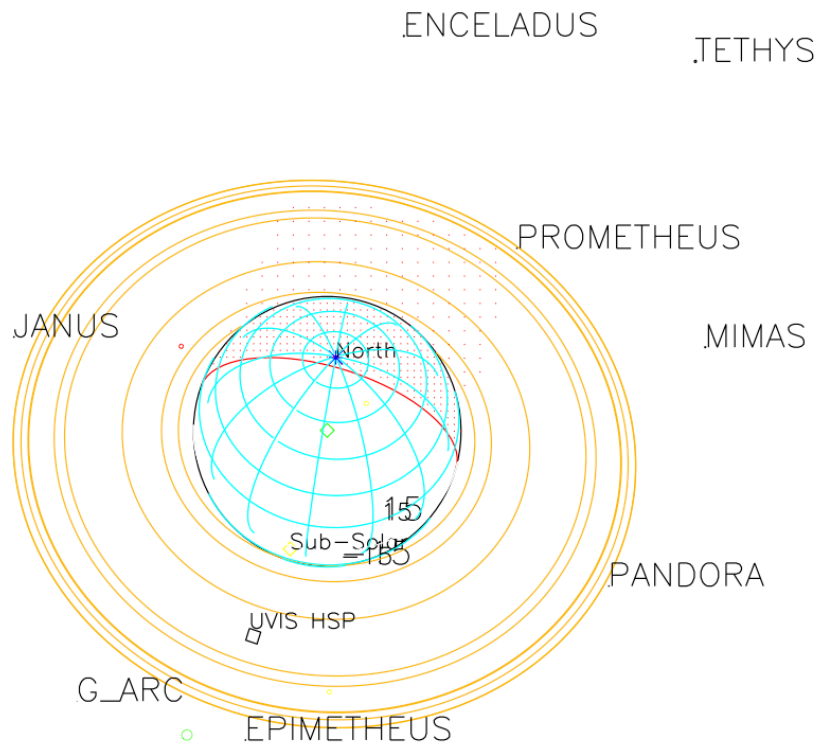
2009-015T12:39:00.000 720658.54 km

Target RA/dec: 31.21, 60.87

Subsolar lat/lon: -2.61, -124.74

Sub-s/c lat/lon: -63.10, 95.26





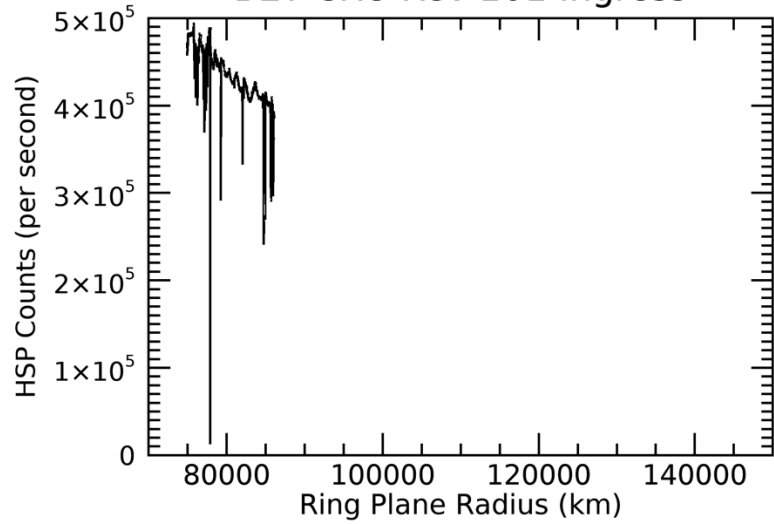
2009-012T10:59:00.000 885735.99 km

Target RA/dec: 183.90, -51.49

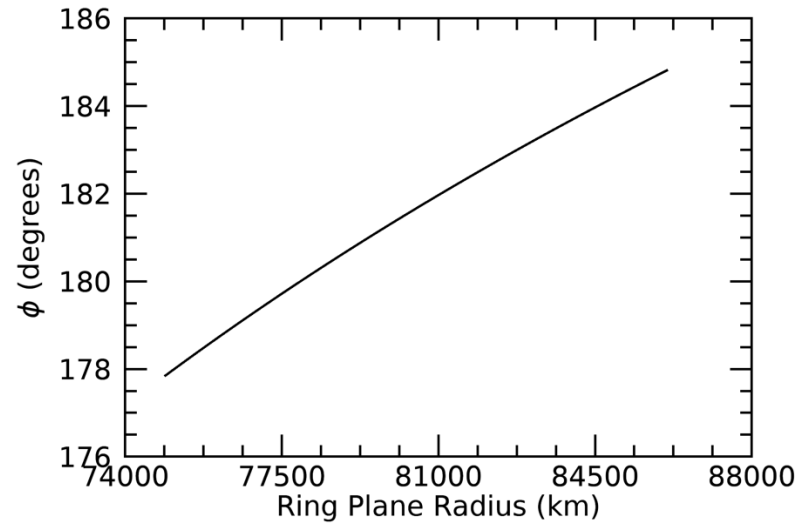
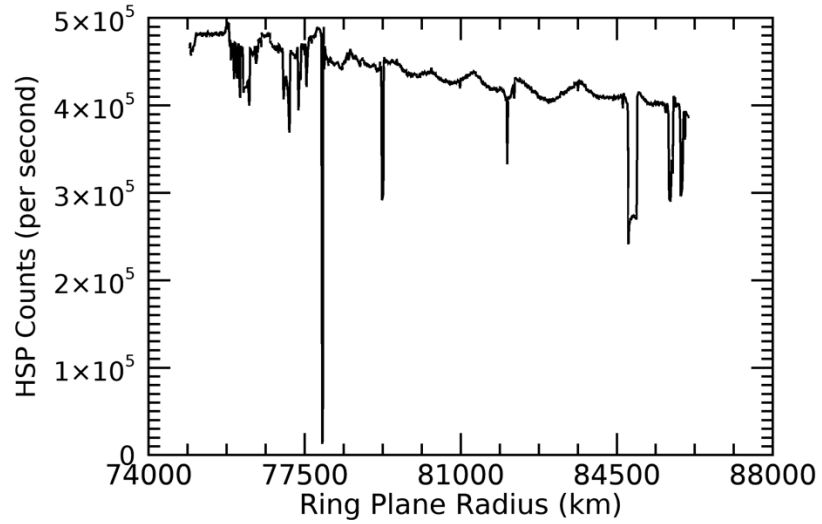
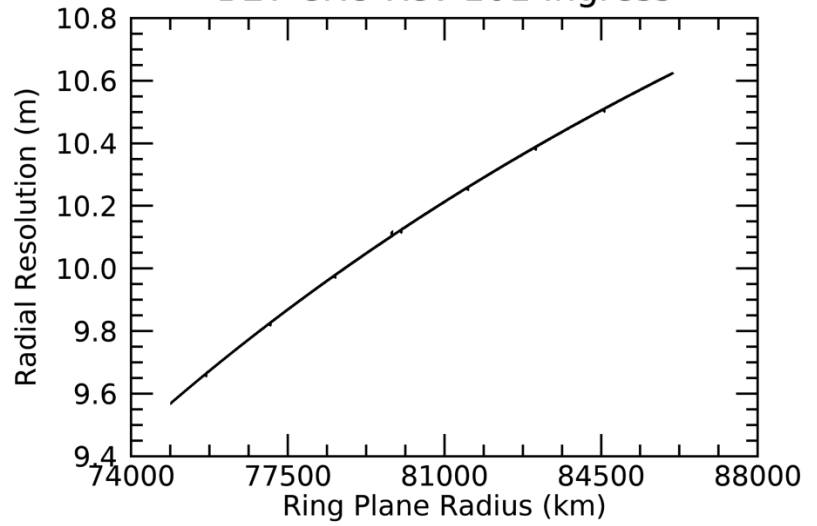
Subsolar lat/lon: -2.64, -156.15

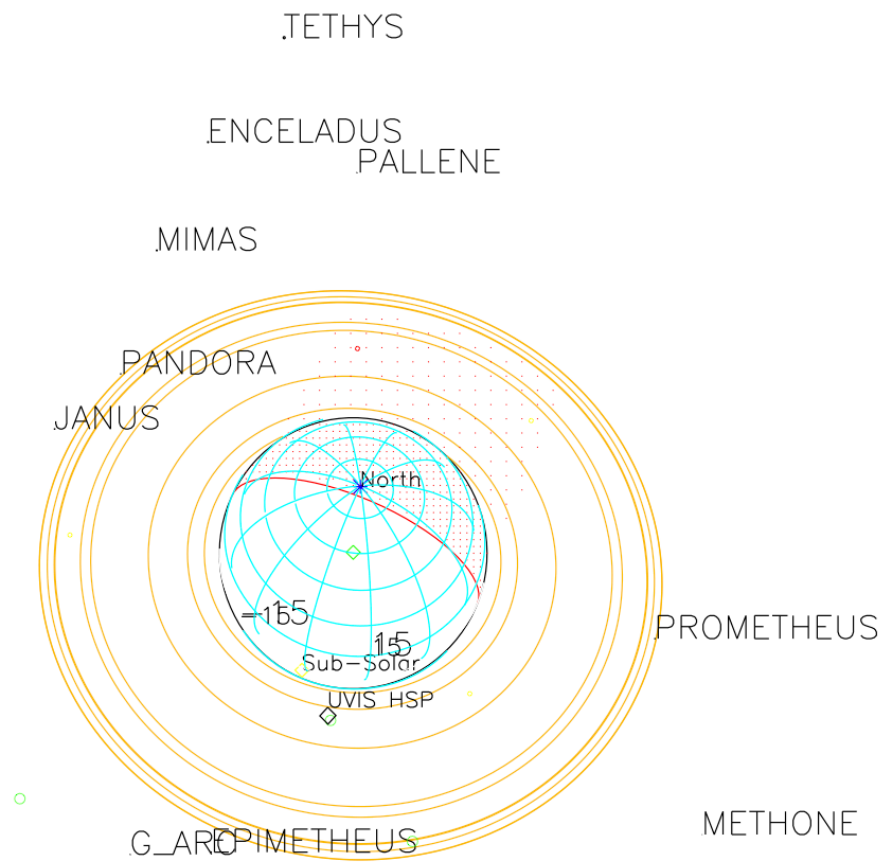
Sub-s/c lat/lon: 51.23, -146.58

BET CRU Rev 101 Ingress



BET CRU Rev 101 Ingress





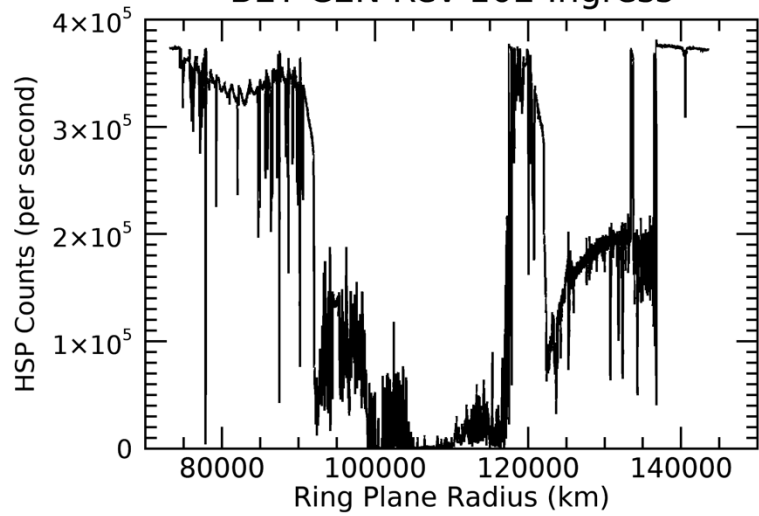
2009-022T04:20:00.000 854124.56 km

Target RA/dec: 190.57, -54.84

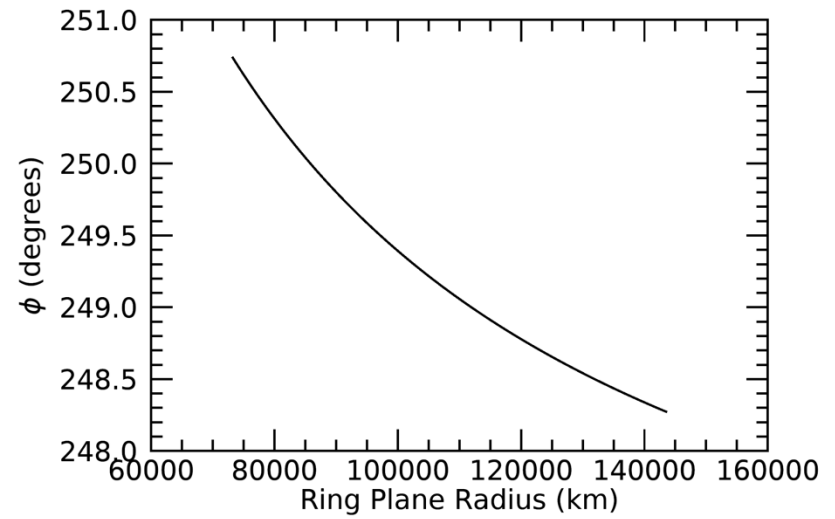
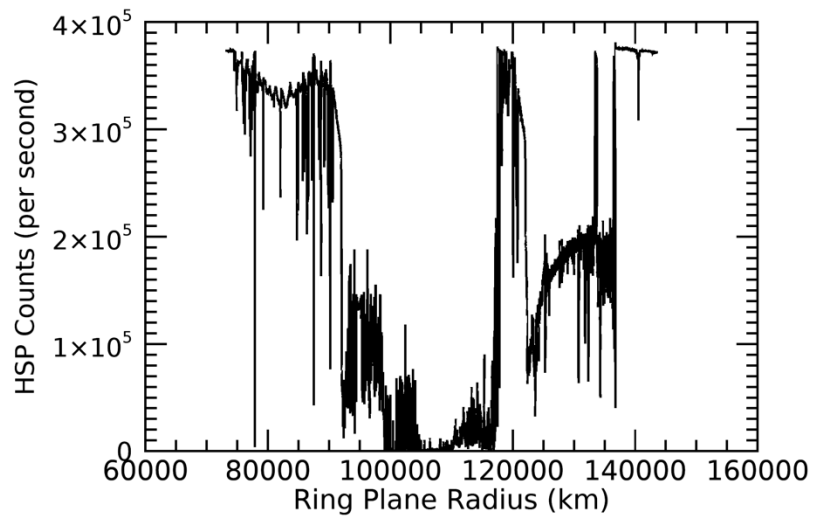
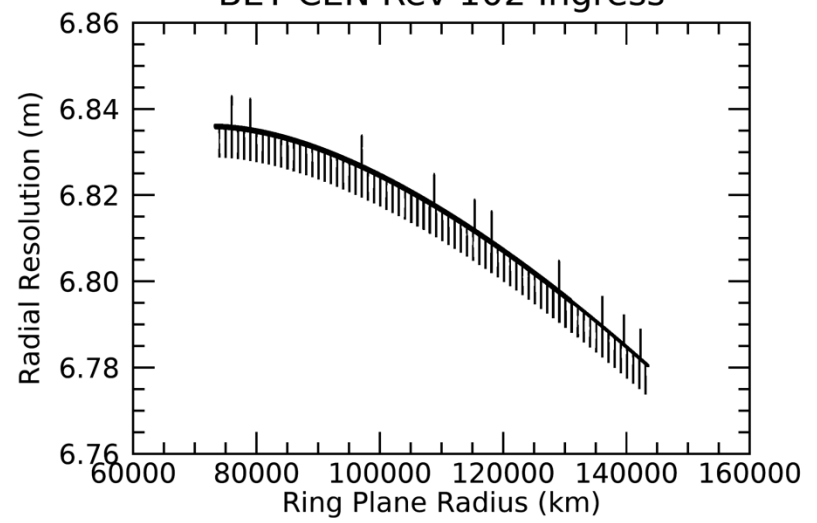
Subsolar lat/lon: -2.52, -119.13

Sub-s/c lat/lon: 55.33, -103.03

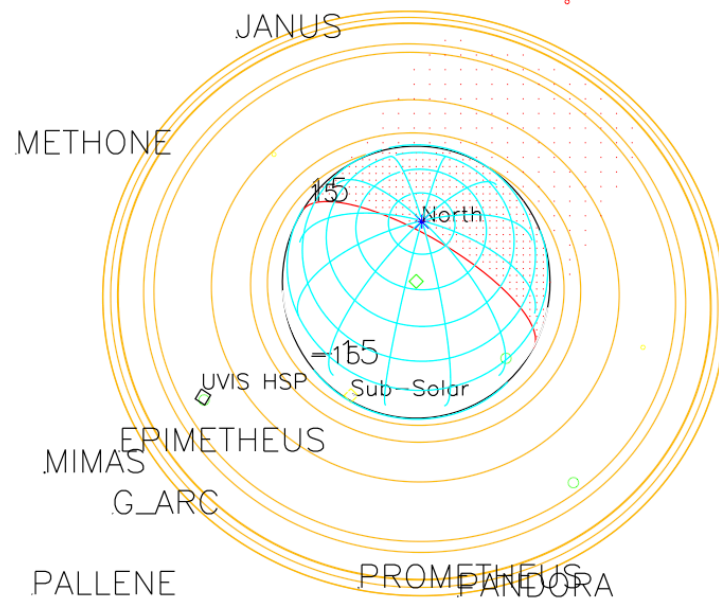
BET CEN Rev 102 Ingress



BET CEN Rev 102 Ingress



TETHYS ENCELADUS



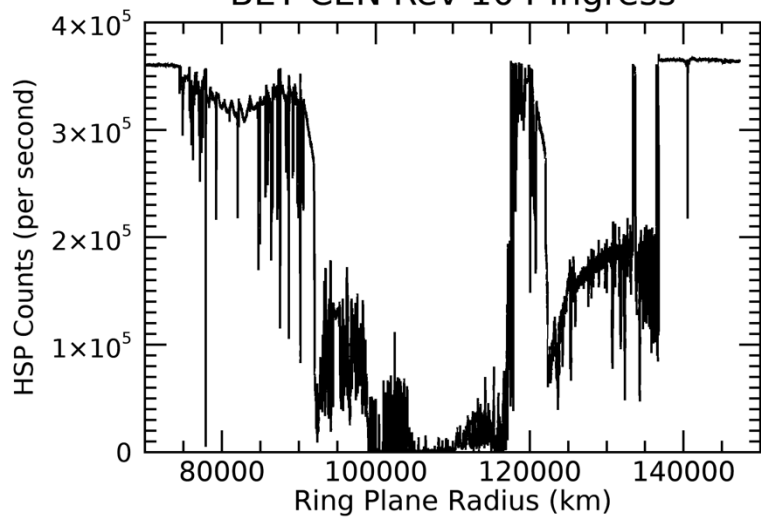
2009-031T20:33:00.000 825324.87 km

Target RA/dec: 197.50, -57.50

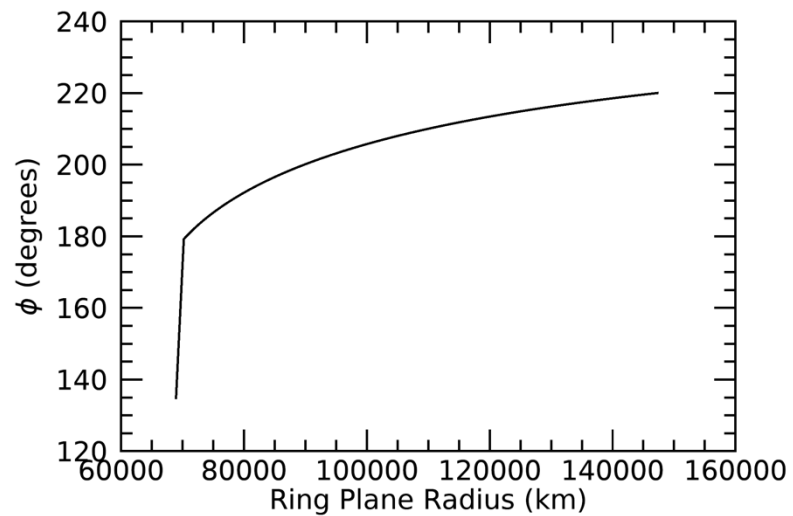
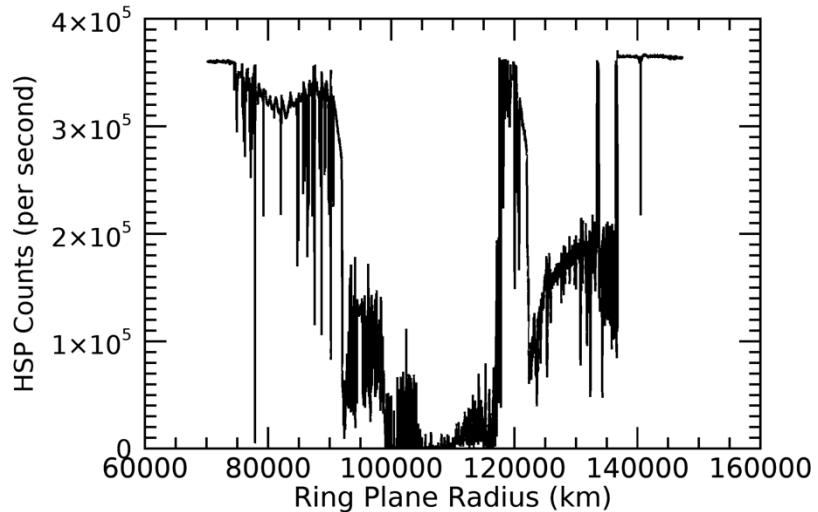
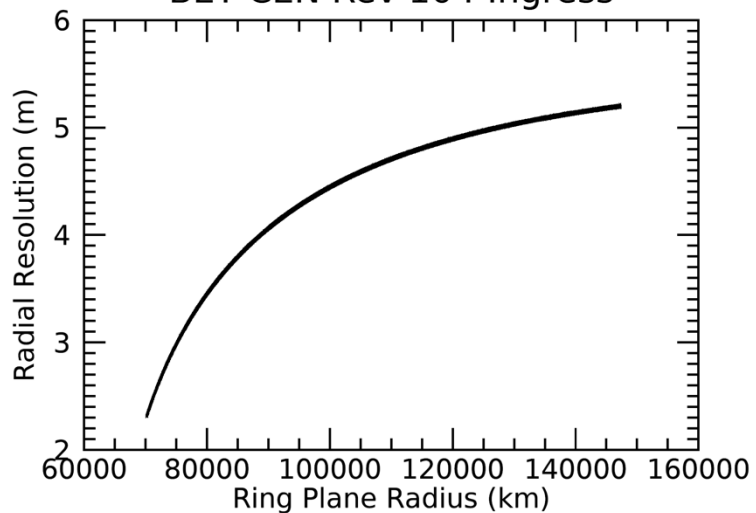
Subsolar lat/lon: -2.40, -43.82

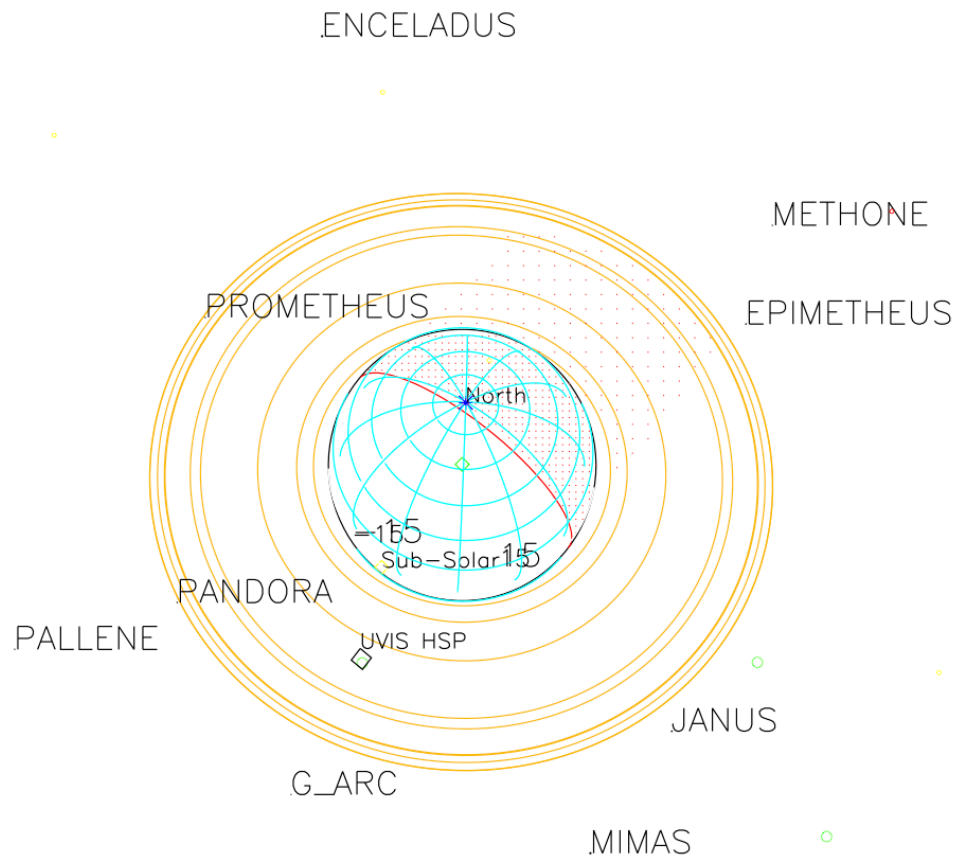
Sub-s/c lat/lon: 58.70, -20.50

BET CEN Rev 104 Ingress



BET CEN Rev 104 Ingress





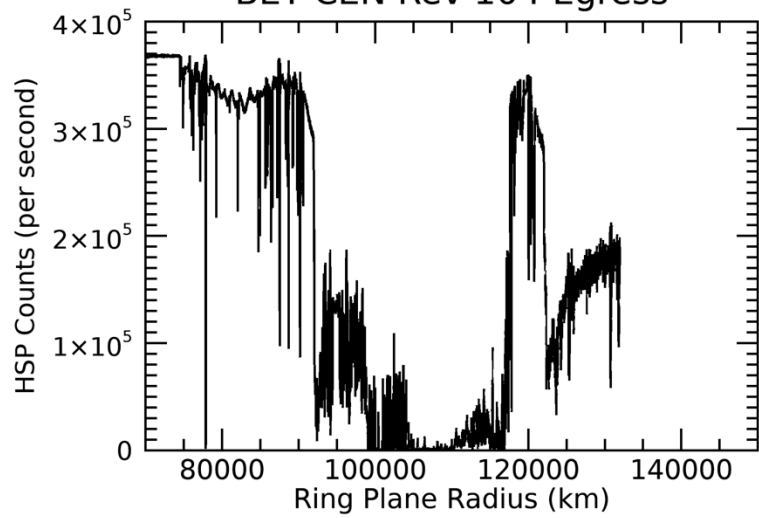
2009-053T18:00:00.000 1067440.4 km

Target RA/dec: 206.08, -55.87

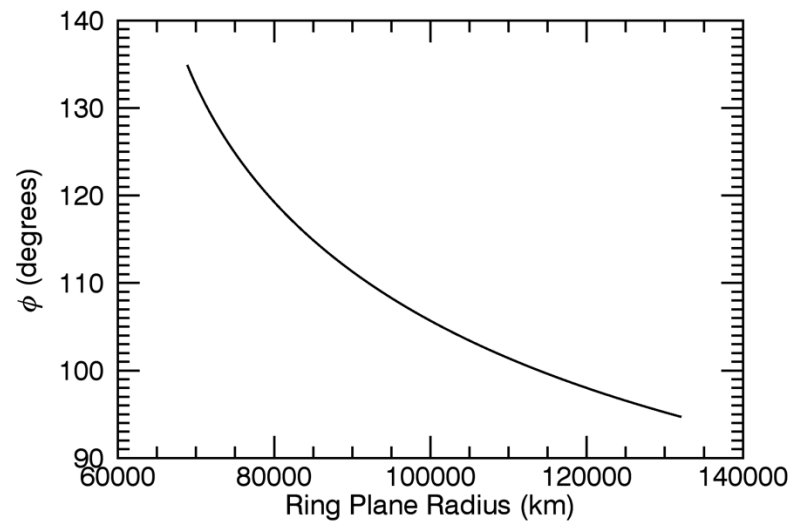
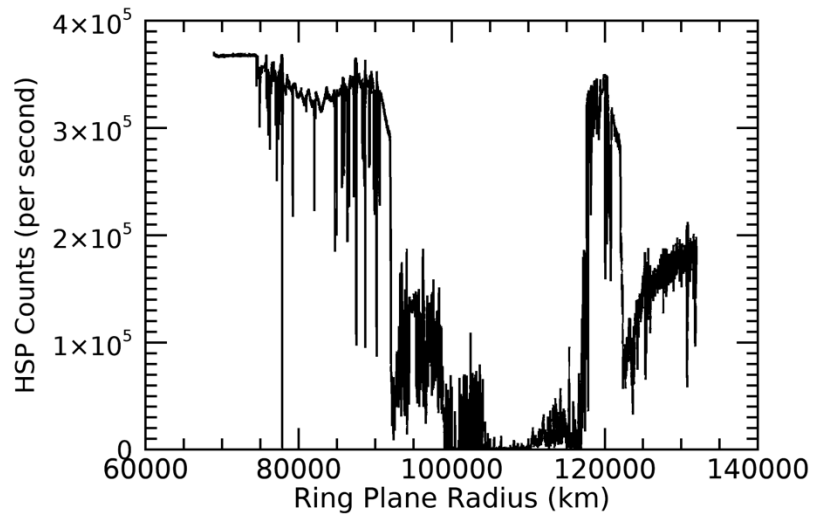
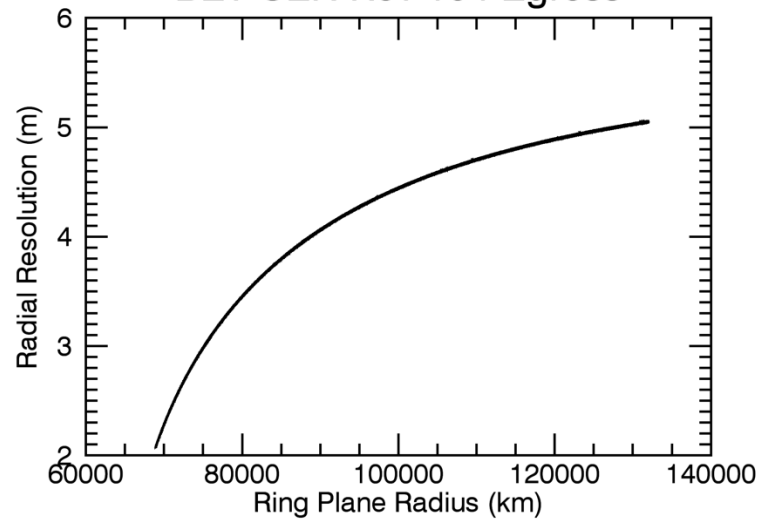
Subsolar lat/lon: -2.12, -154.46

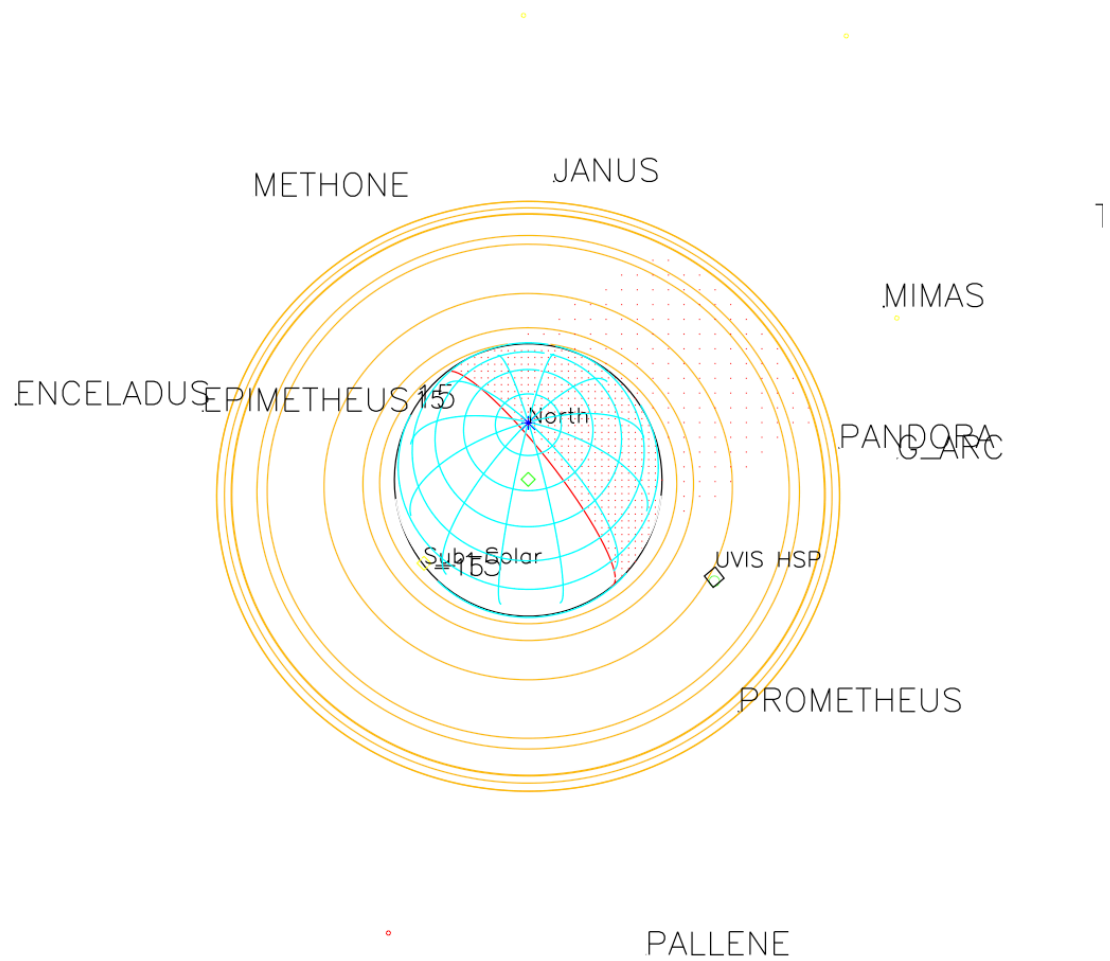
Sub-s/c lat/lon: 57.23, -121.29

BET CEN Rev 104 Egress



BET CEN Rev 104 Egress





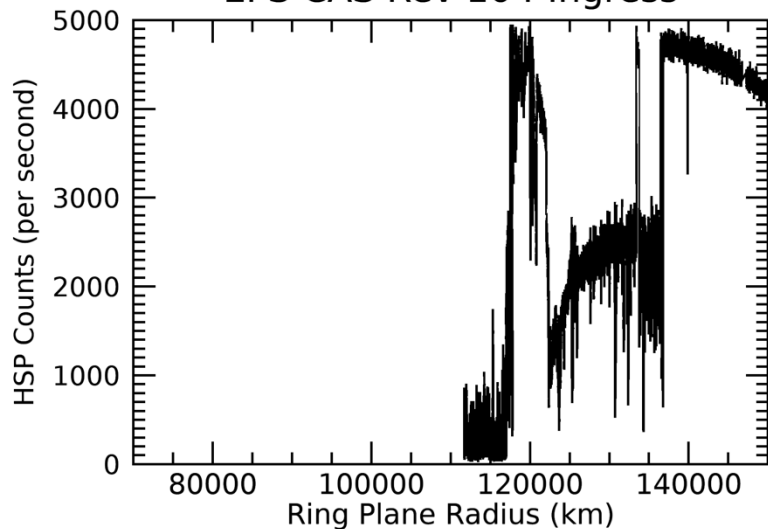
2009-054T01:10:00.000 1040025.5 km

Target RA/dec: 220.31, -58.28

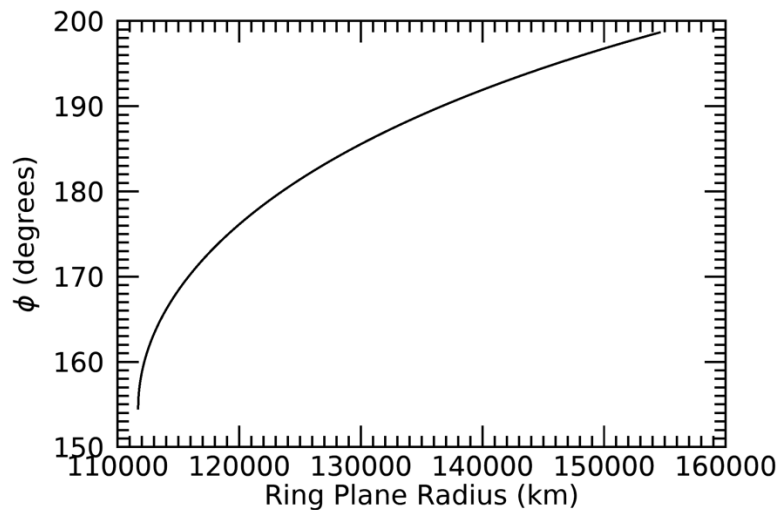
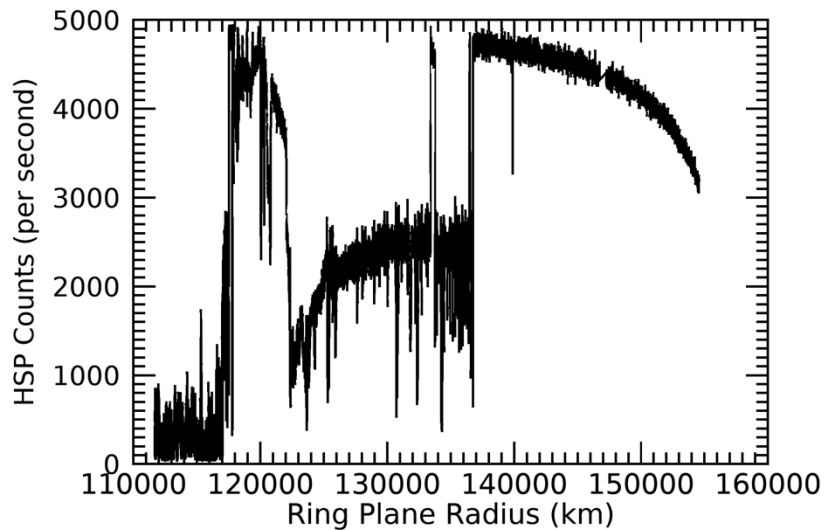
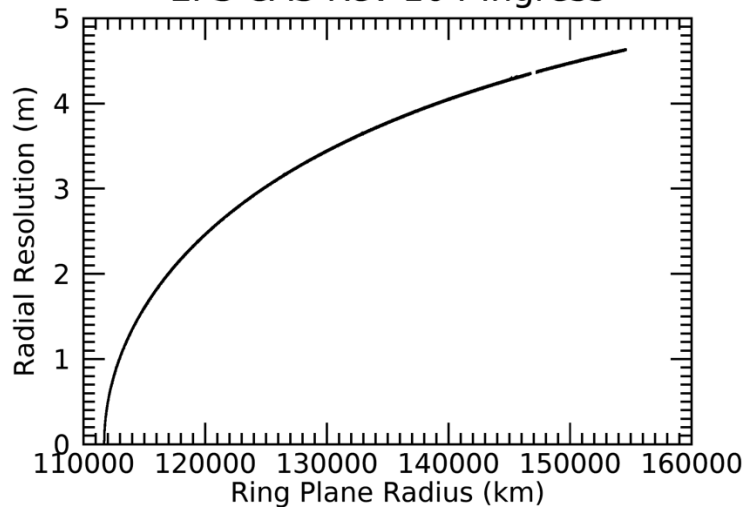
Subsolar lat/lon: -2.12, -36.56

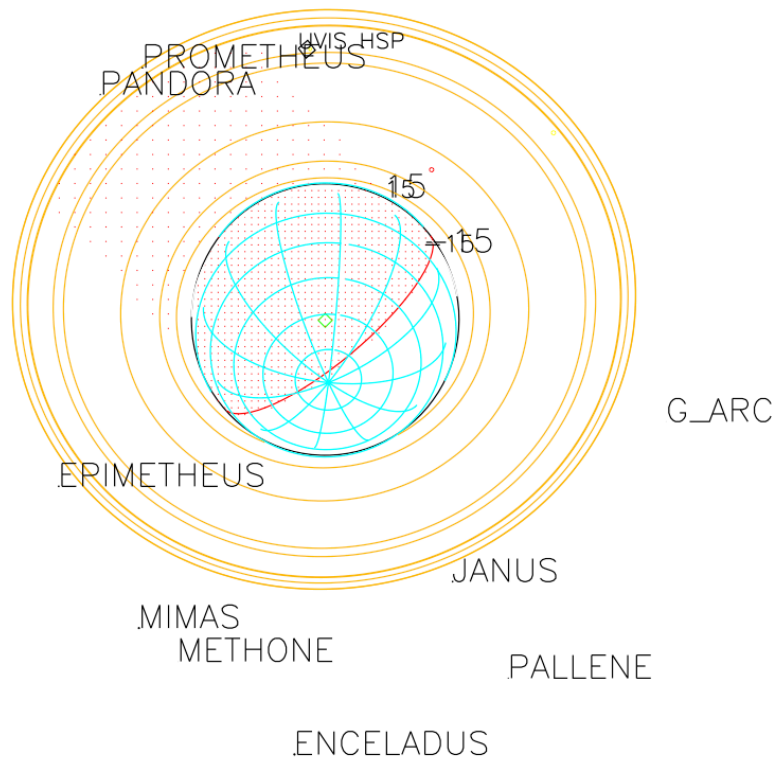
Sub-s/c lat/lon: 60.19, 13.74

EPS CAS Rev 104 Ingress



EPS CAS Rev 104 Ingress





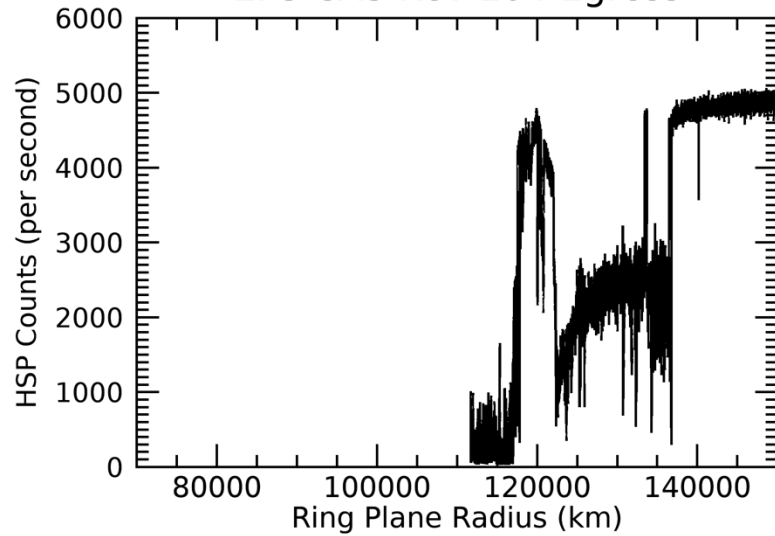
2009-058T11:58:00.000 895784.29 km

Target RA/dec: 27.63, 56.23

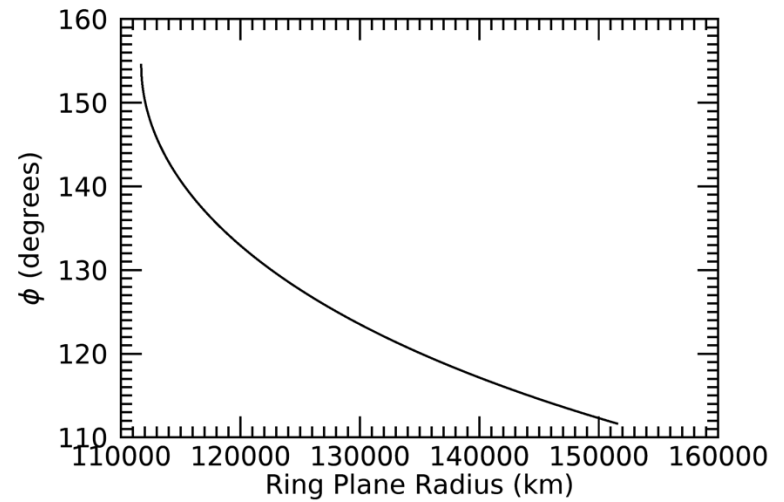
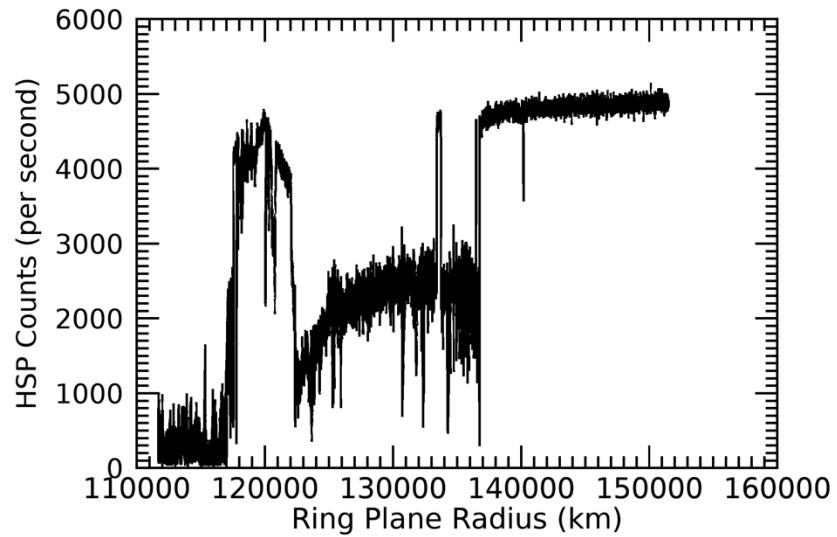
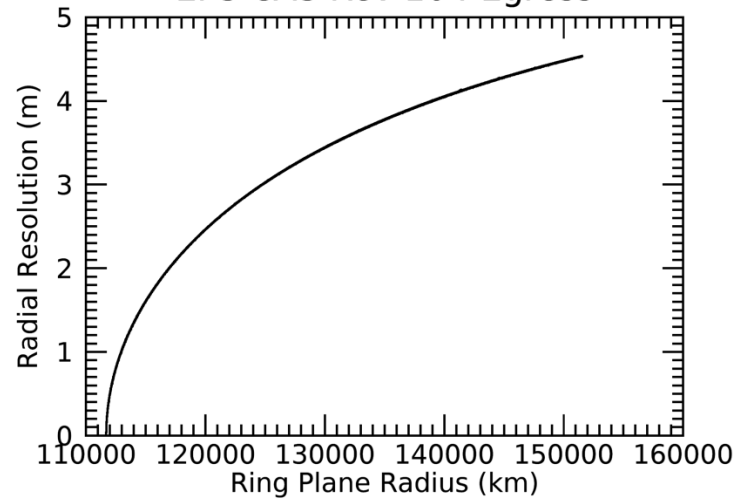
Subsolar lat/lon: -2.06, -44.46

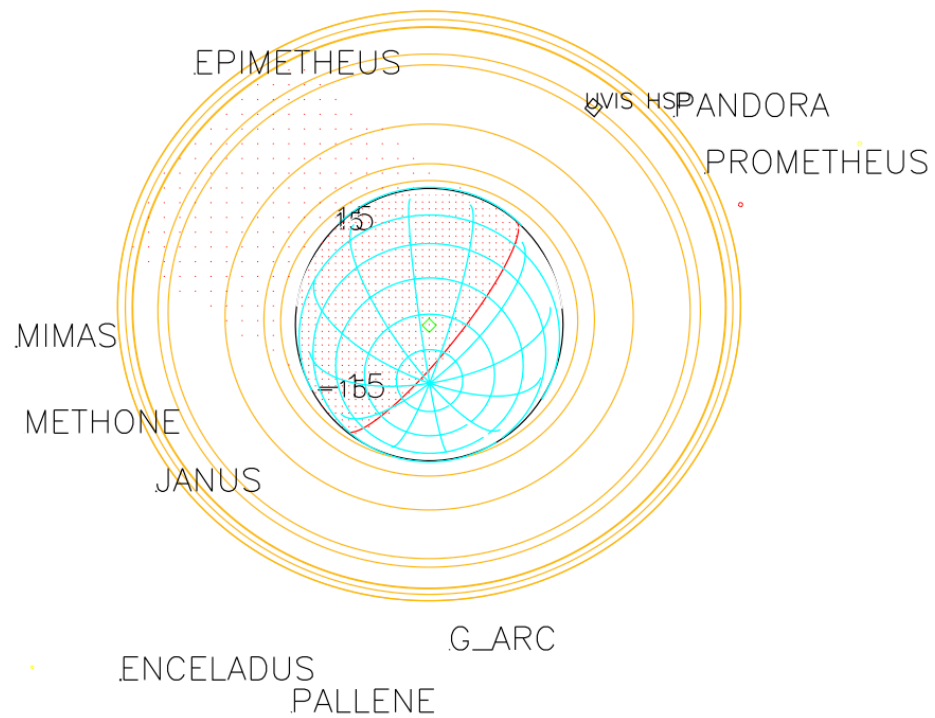
Sub-s/c lat/lon: -57.73, 170.38

EPS CAS Rev 104 Egress



EPS CAS Rev 104 Egress



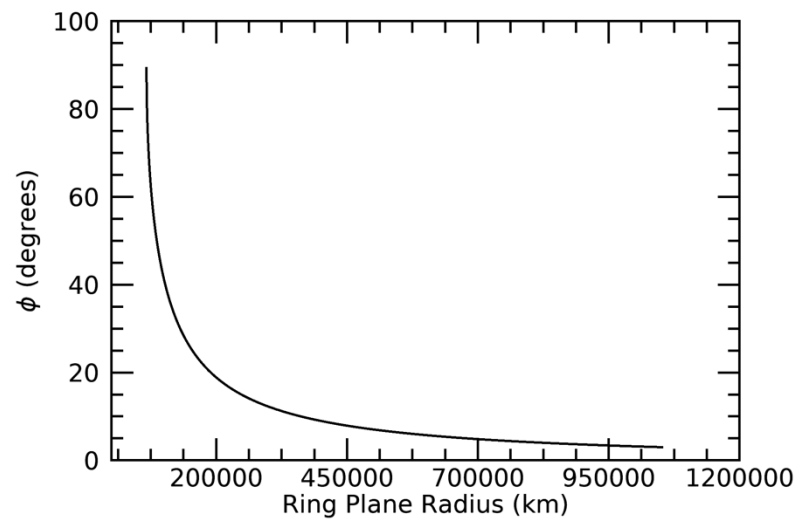
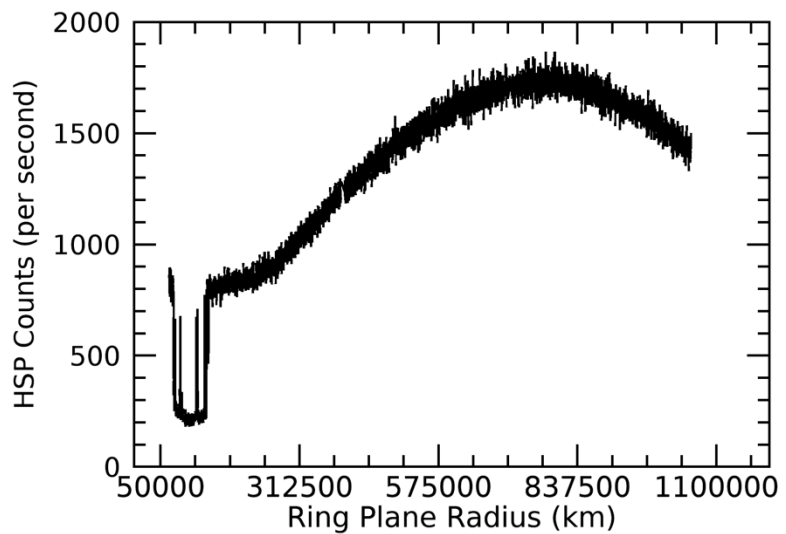
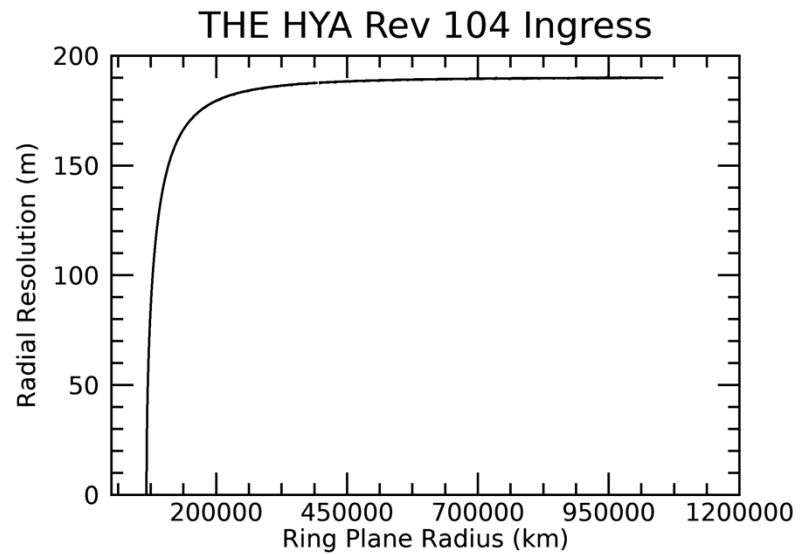
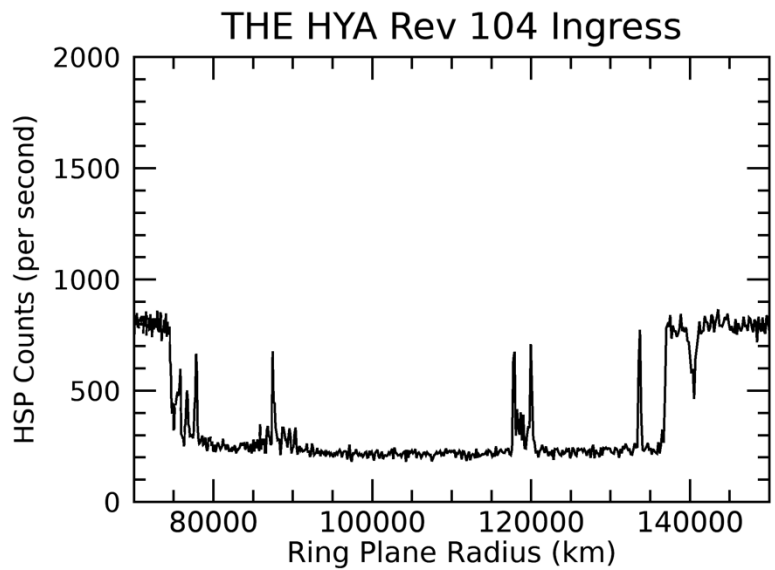


2009-058T16:16:00.000 912287.71 km

Target RA/dec: 39.28, 58.16

Subsolar lat/lon: -2.06, 170.28

Sub-s/c lat/lon: -60.09, 39.16



TETHYS

ENCELADUS

EPIMETHEUS

HELENE

TITAN

15

10

5

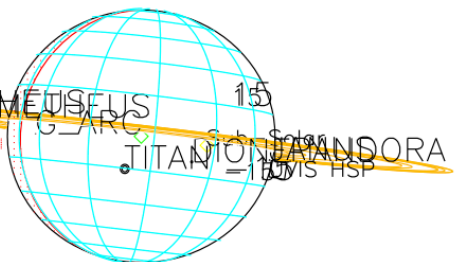
IONA

DESPINA

HEBE

MIMAS

MIMAS



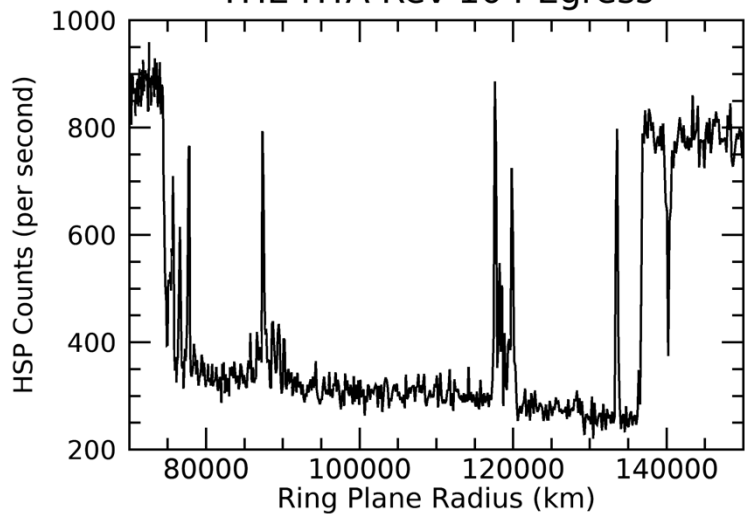
2009-062T04:34:00.000 1185240.9 km

Target RA/dec: 141.64, 2.95

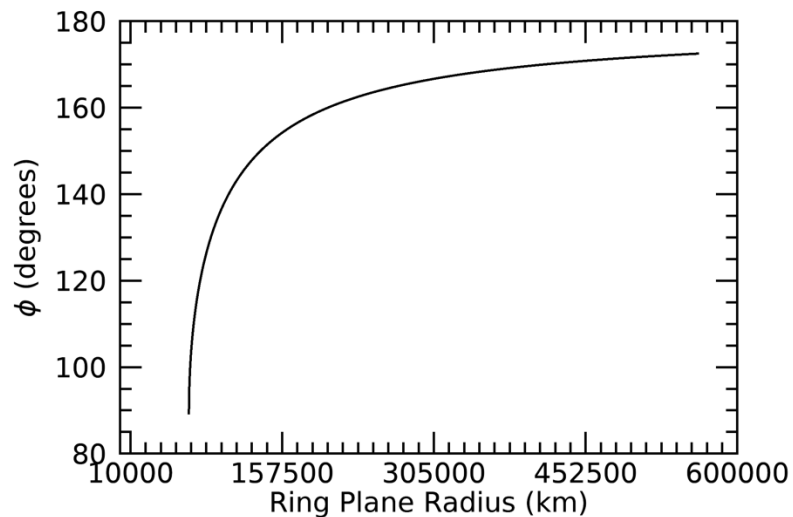
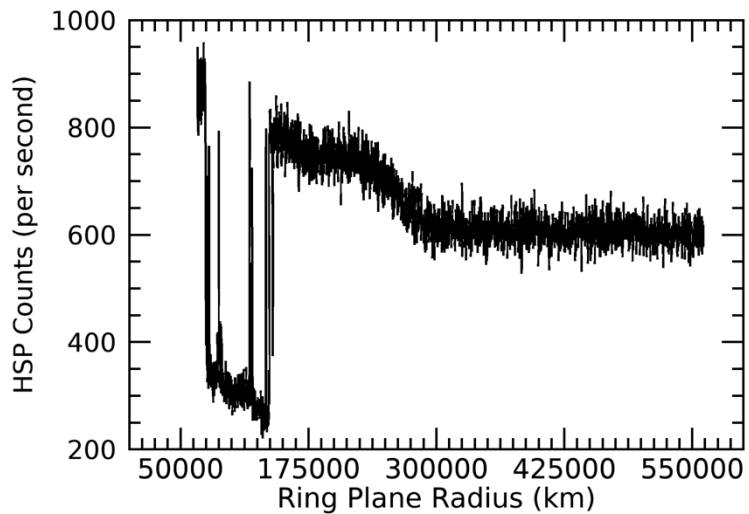
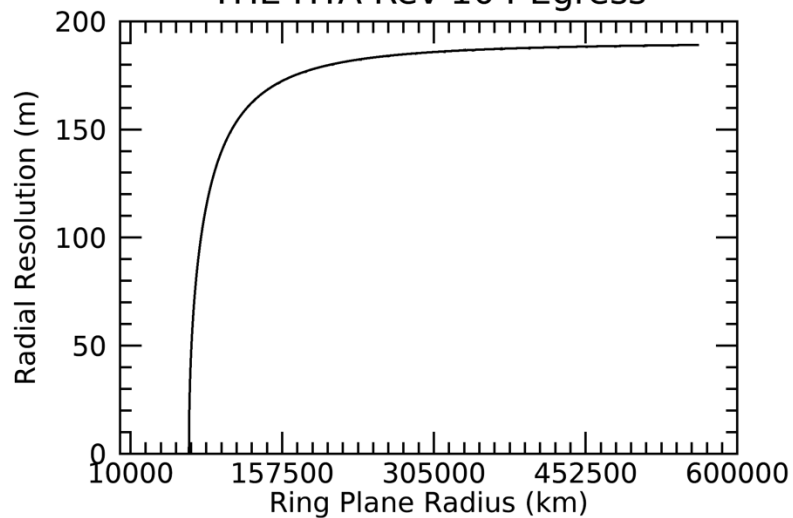
Subsolar lat/lon: -2.02, -157.52

Sub-s/c lat/lon: -1.40, 174.17

THE HYA Rev 104 Egress

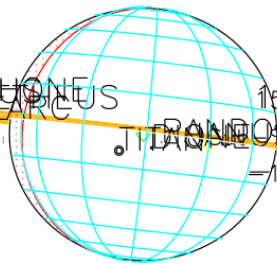


THE HYA Rev 104 Egress



TETHYS

ENCCELADUS
EPIMEDEUS
MITHRAS
ONEUS
JANUS
RANDBORA
HSP



PANDORA
PAMPHILE

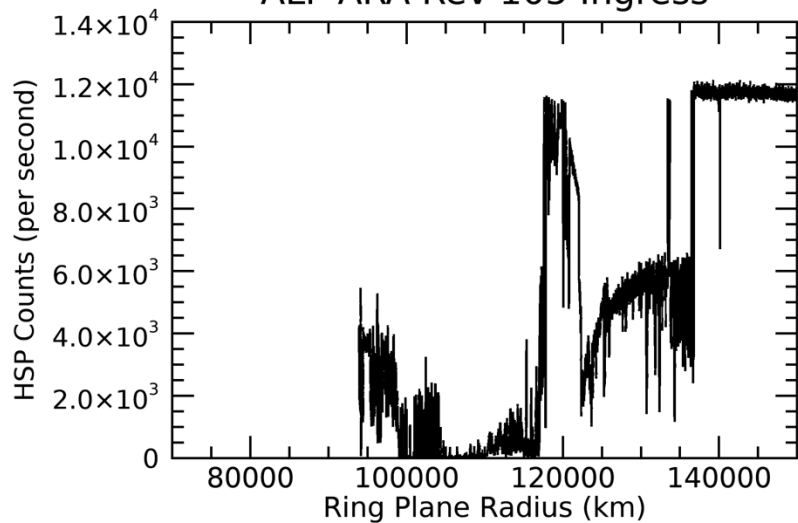
2009-062T05:20:00.000 1186159.2 km

Target RA/dec: 141.99, 2.37

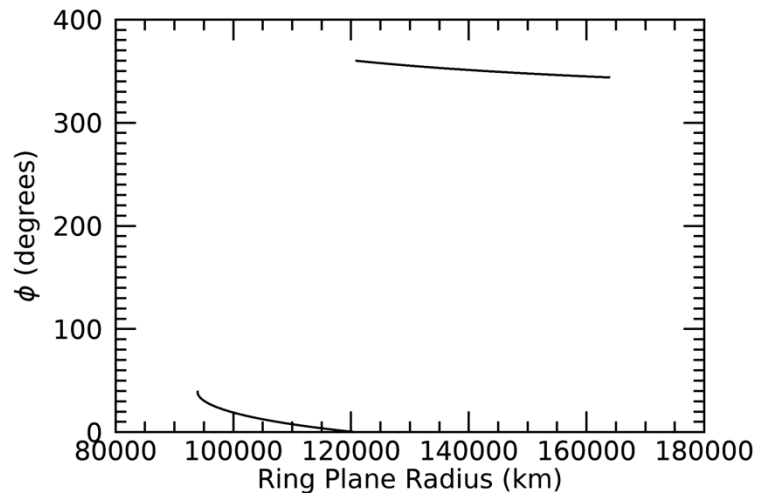
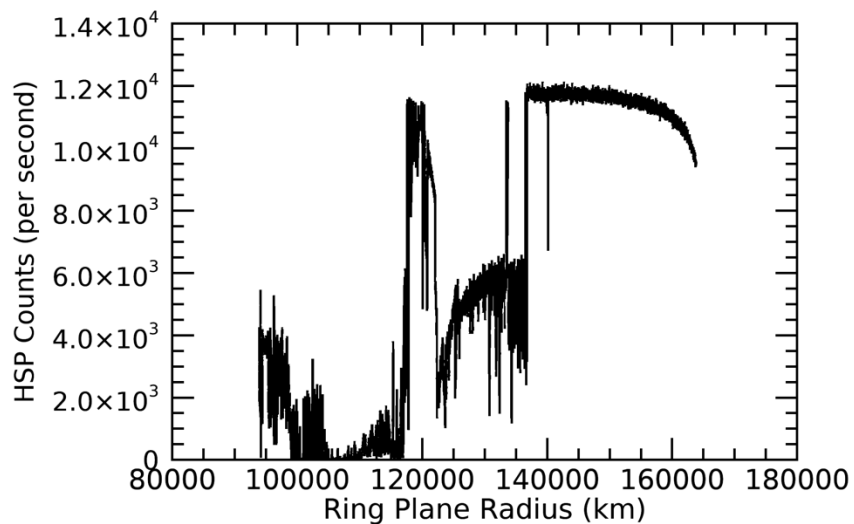
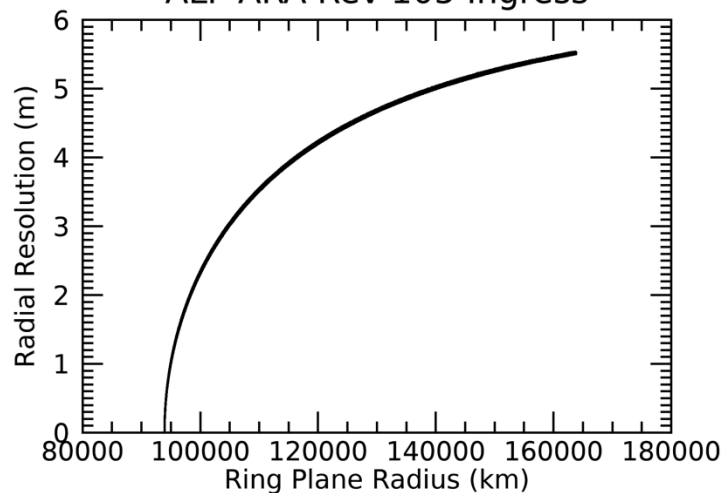
Subsolar lat/lon: -2.02, 176.58

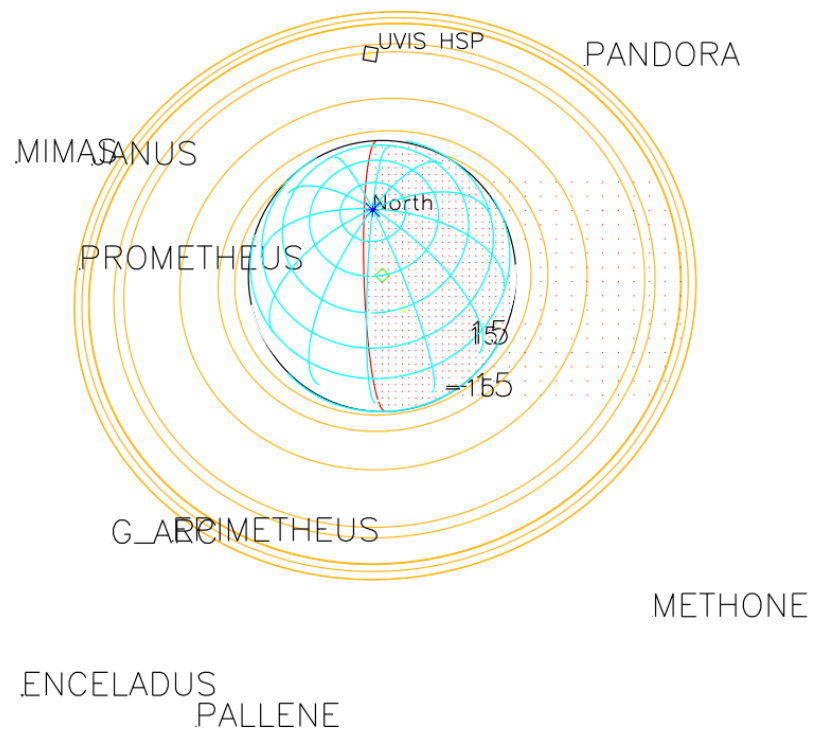
Sub-s/c lat/lon: -0.89, 148.56

ALP ARA Rev 105 Ingress



ALP ARA Rev 105 Ingress





2009-066T18:21:00.000 965182.54 km

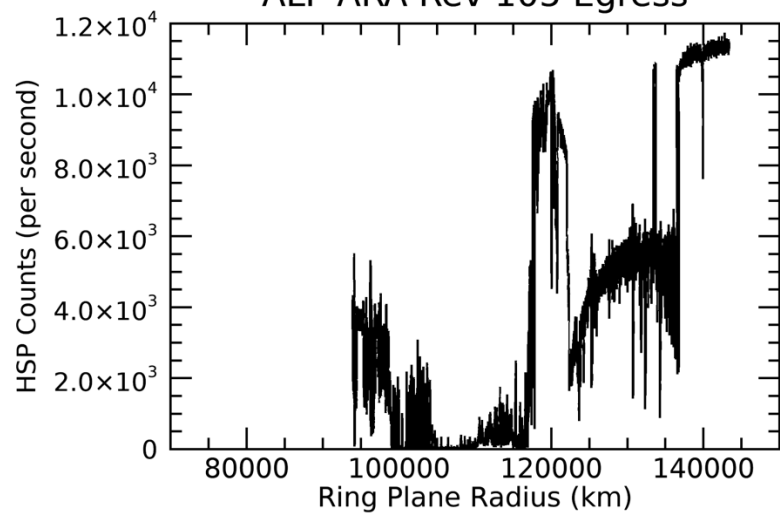
Target RA/dec: 262.37, -55.47

Subsolar lat/lon: -1.96, 93.80

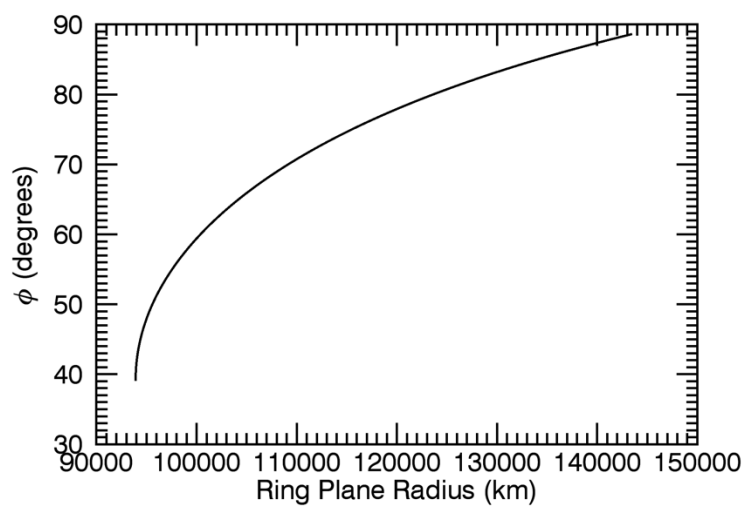
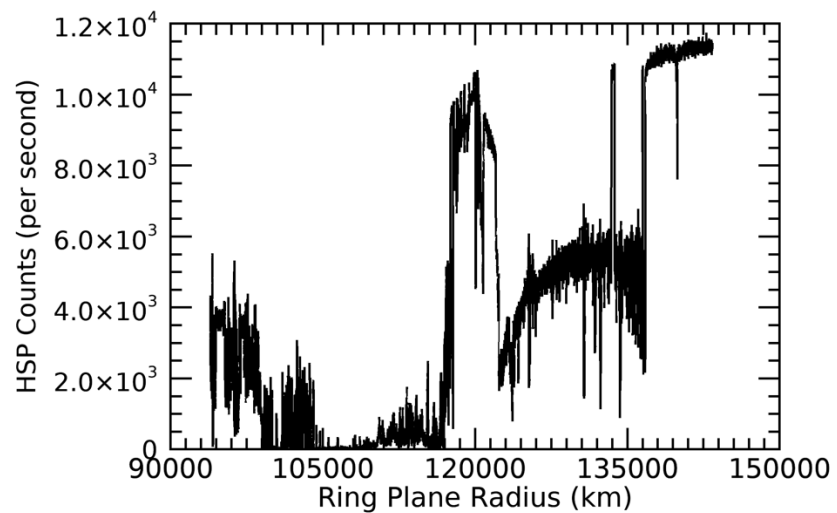
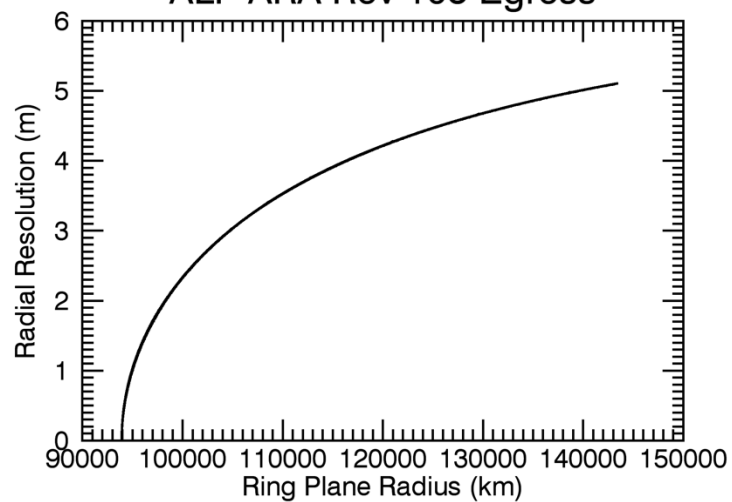
Sub-s/c lat/lon: 54.99, -166.87

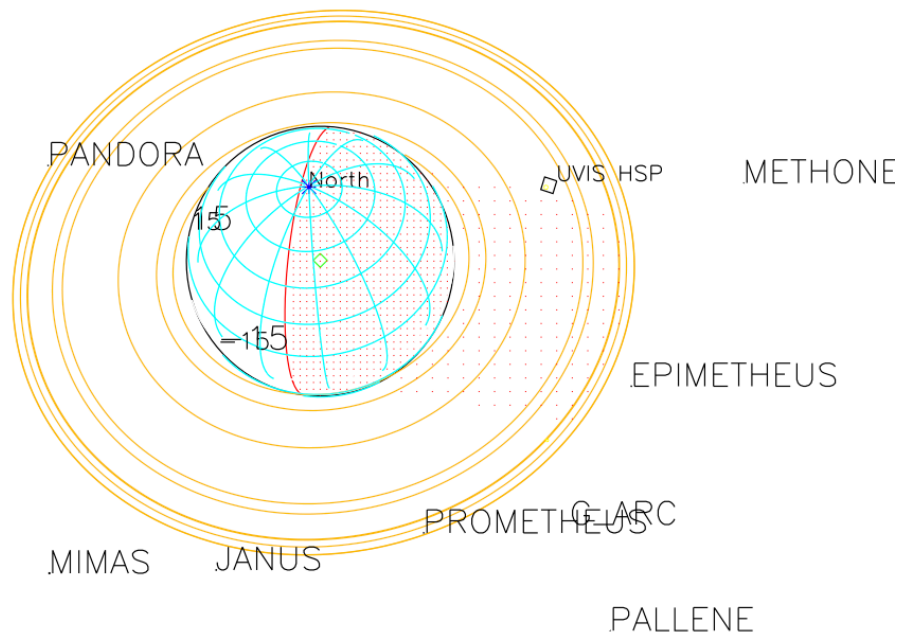
TETHYS

ALP ARA Rev 105 Egress



ALP ARA Rev 105 Egress





2009-066T23:19:00.000 944408.42 km

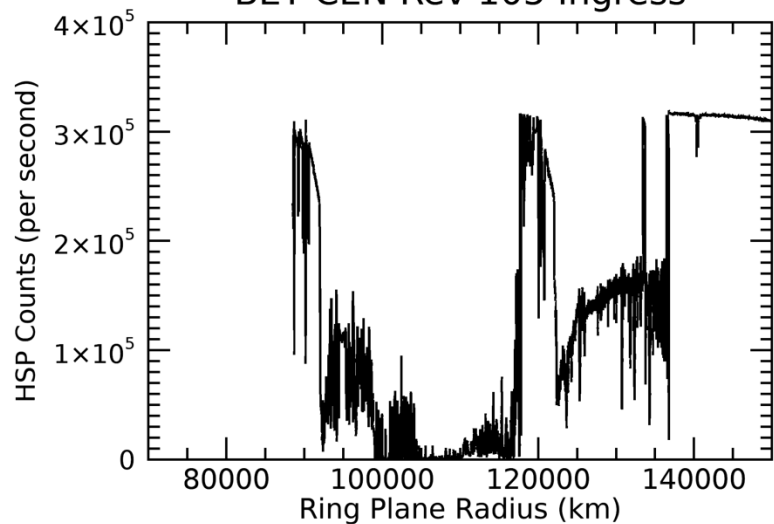
Target RA/dec: 272.53, -52.18

Subsolar lat/lon: -1.96, -73.99

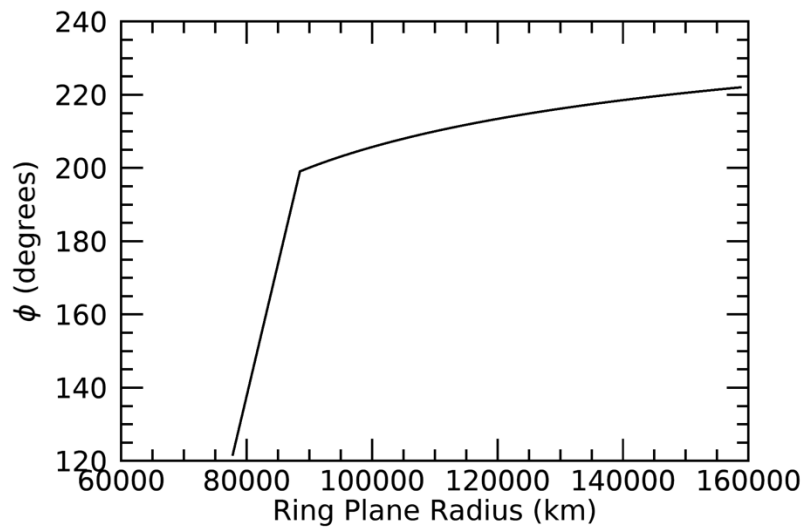
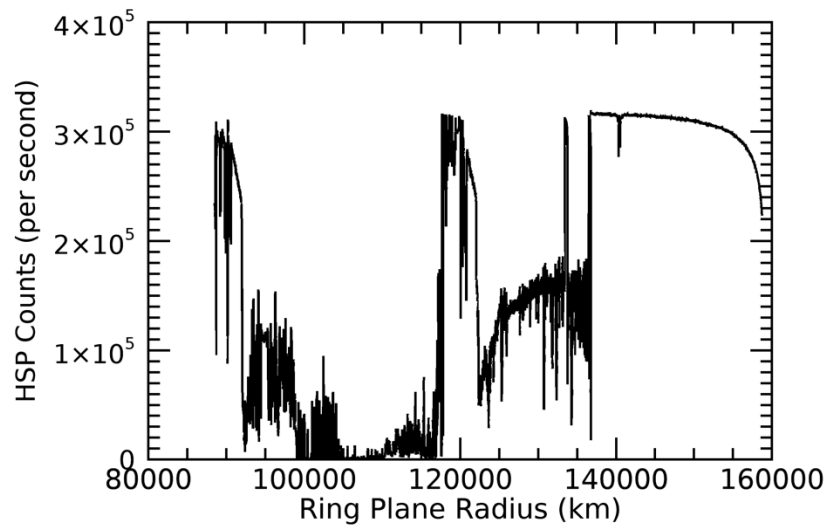
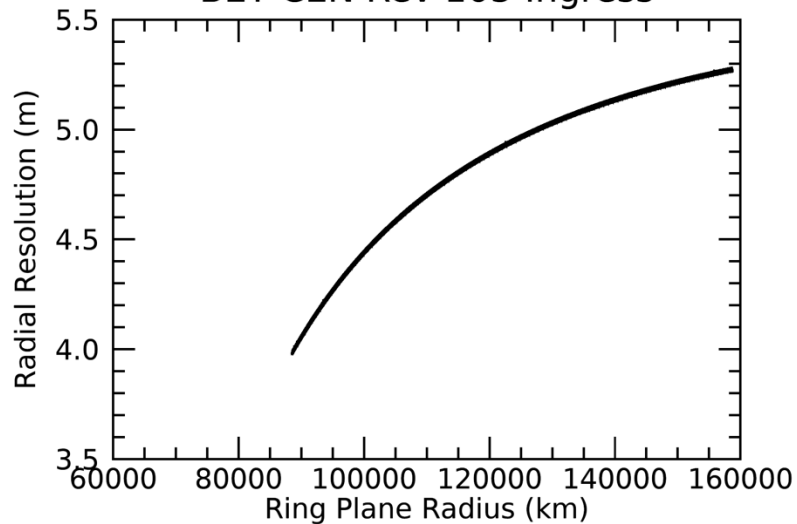
Sub-s/c lat/lon: 50.53, 35.55

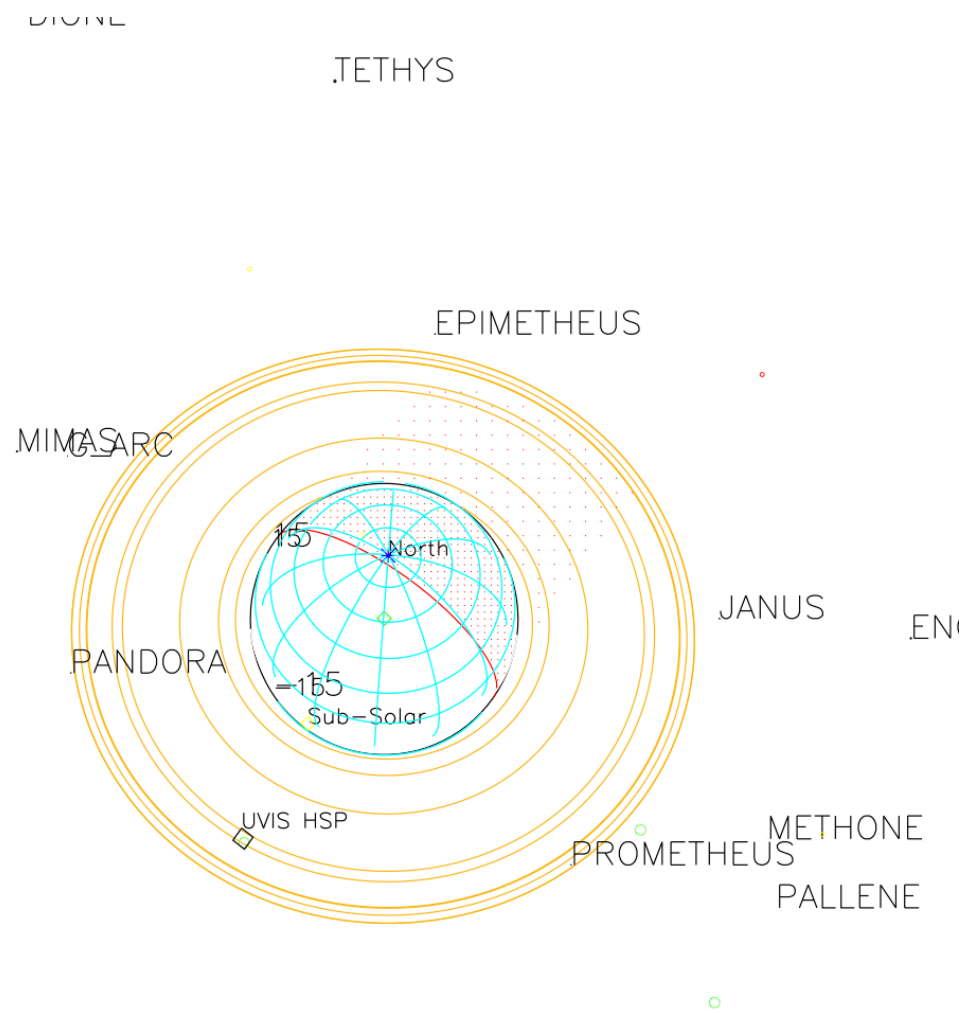
ENCELADUS

BET CEN Rev 105 Ingress



BET CEN Rev 105 Ingress





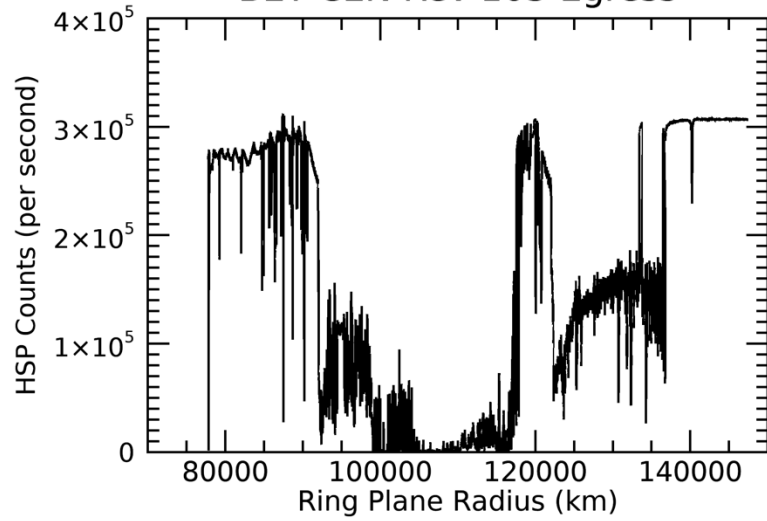
2009-065T15:49:00.000 1072027.4 km

Target RA/dec: 204.15, -55.39

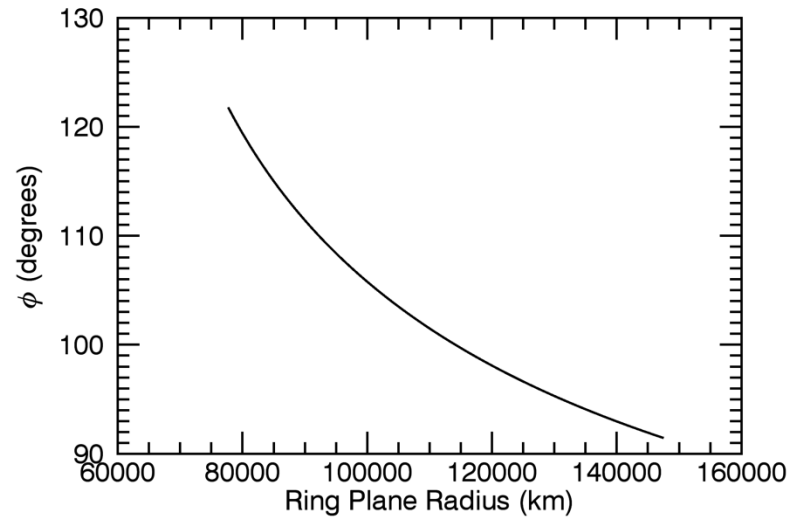
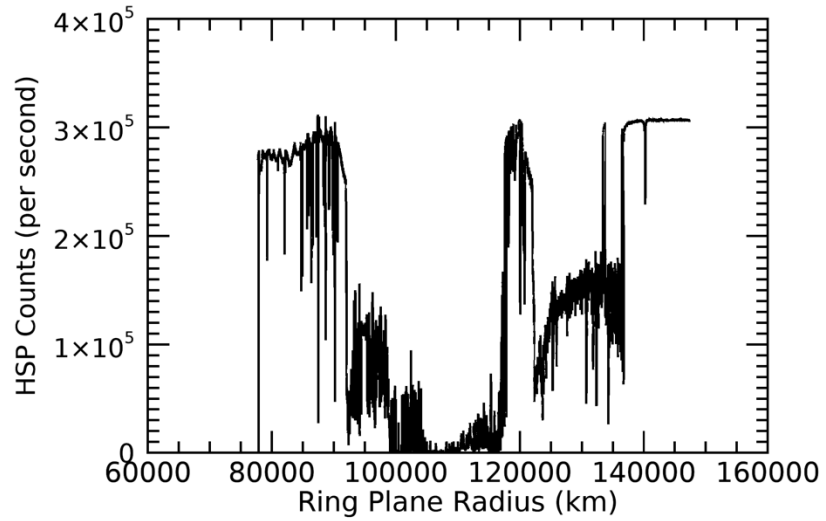
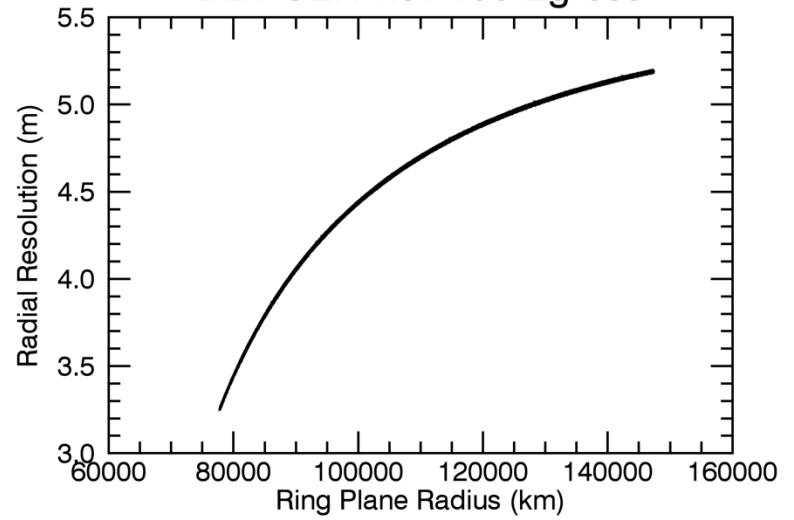
Subsolar lat/lon: -1.97, -89.86

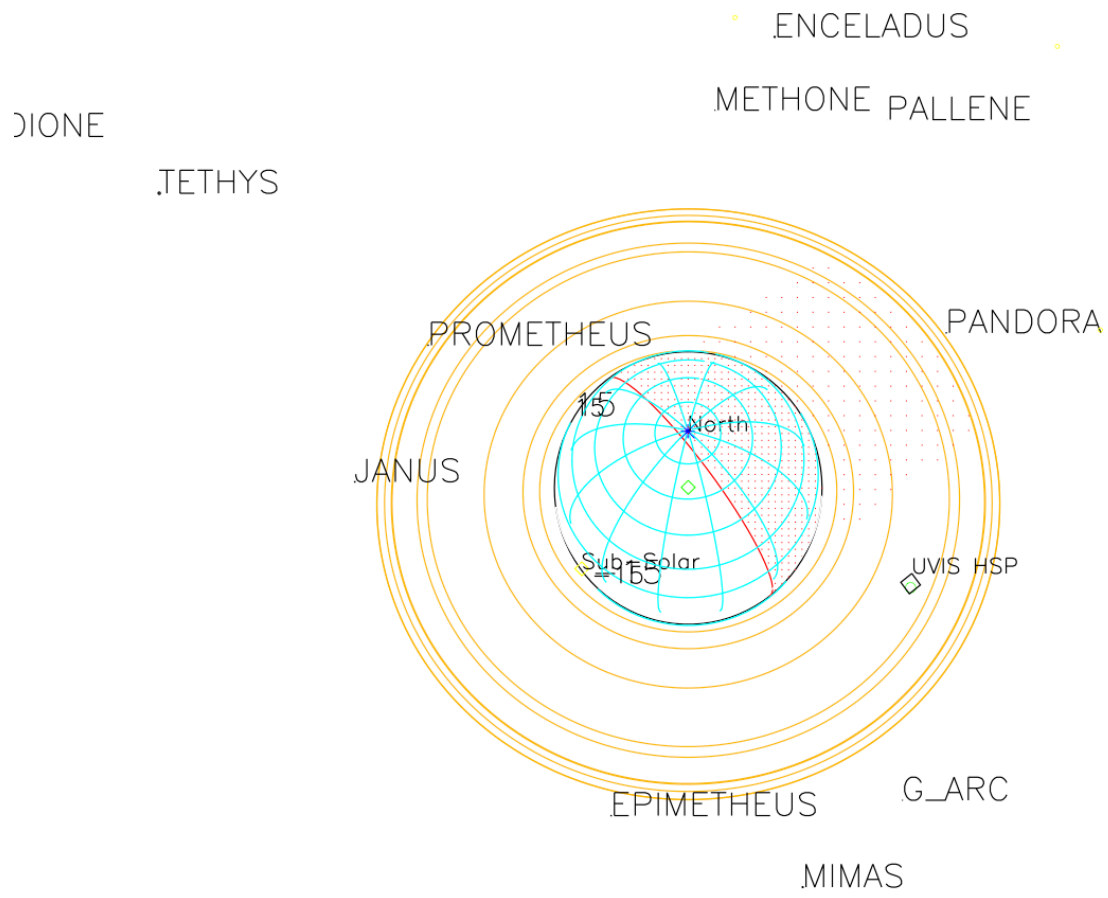
Sub-s/c lat/lon: 56.62, -59.29

BET CEN Rev 105 Egress



BET CEN Rev 105 Egress



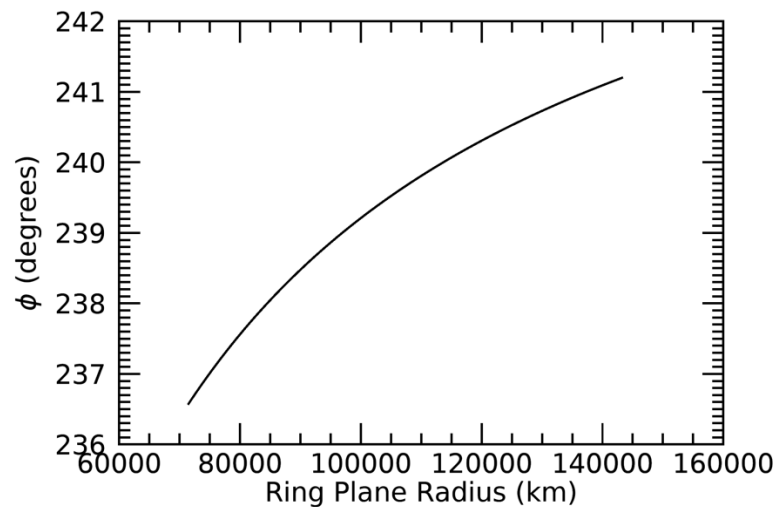
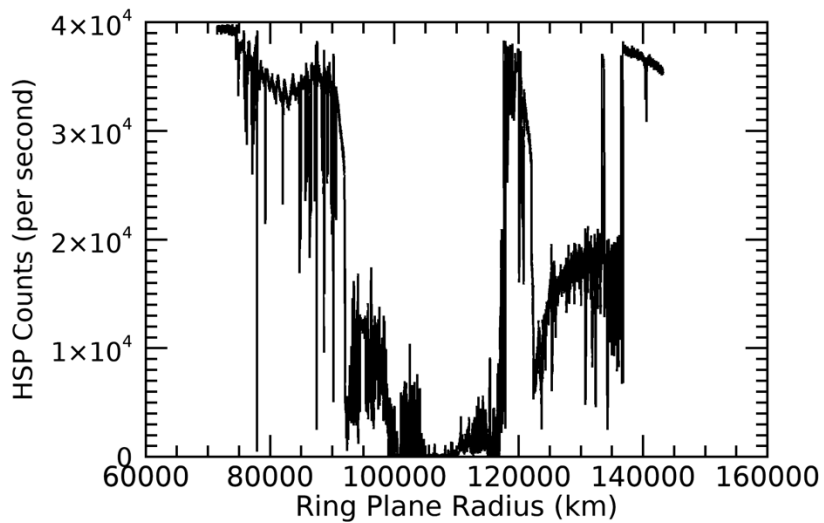
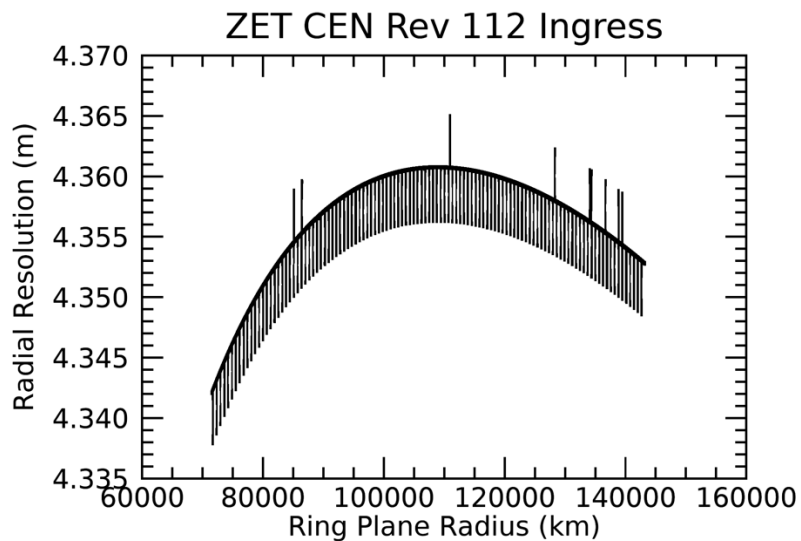
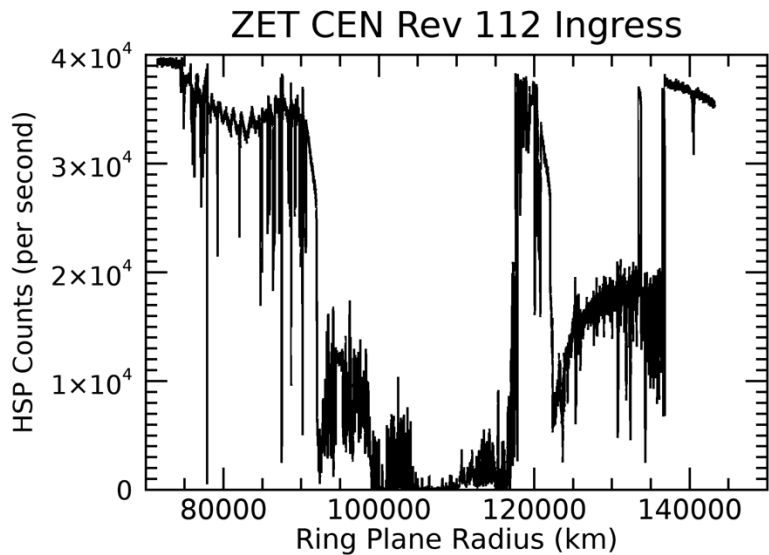


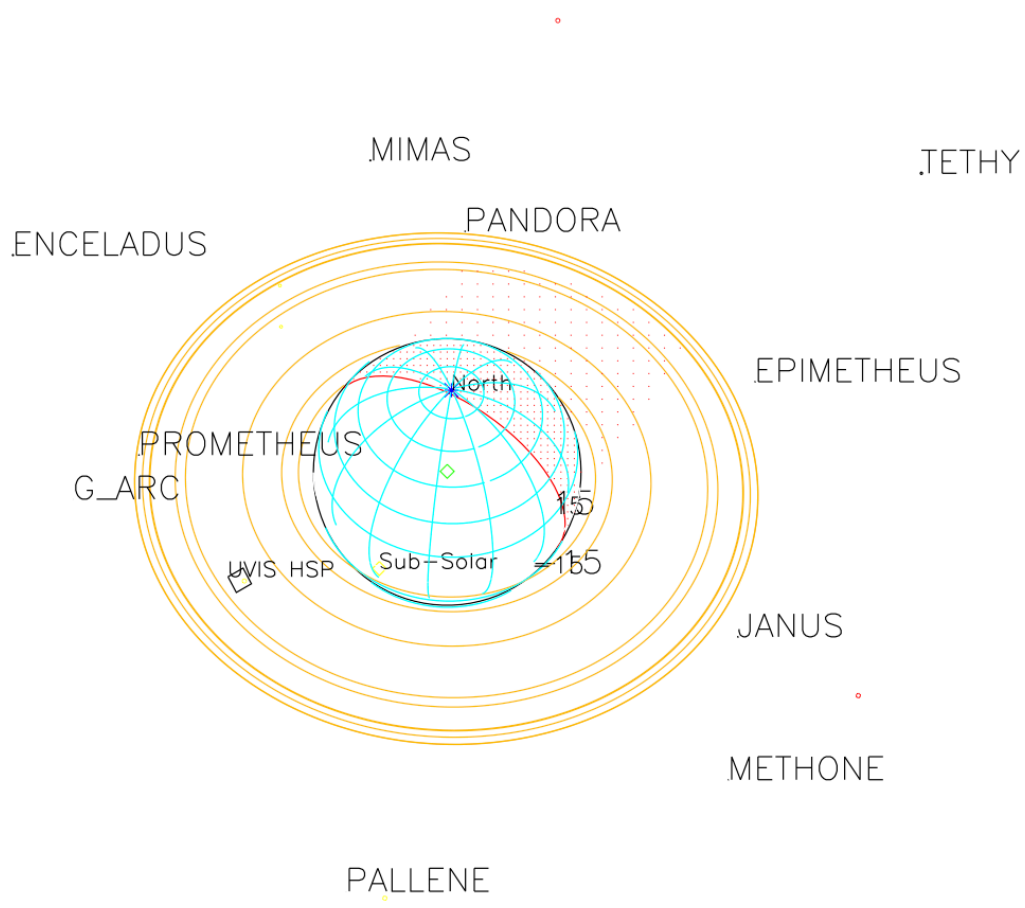
2009-066T00:56:00.000 1037178.0 km

Target RA/dec: 222.17, -58.46

Subsolar lat/lon: -1.97, -37.83

Sub-s/c lat/lon: 60.38, 14.39



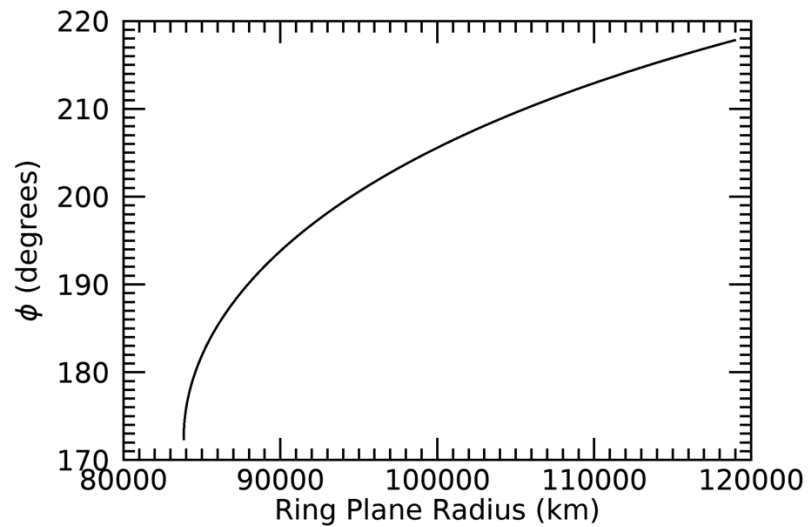
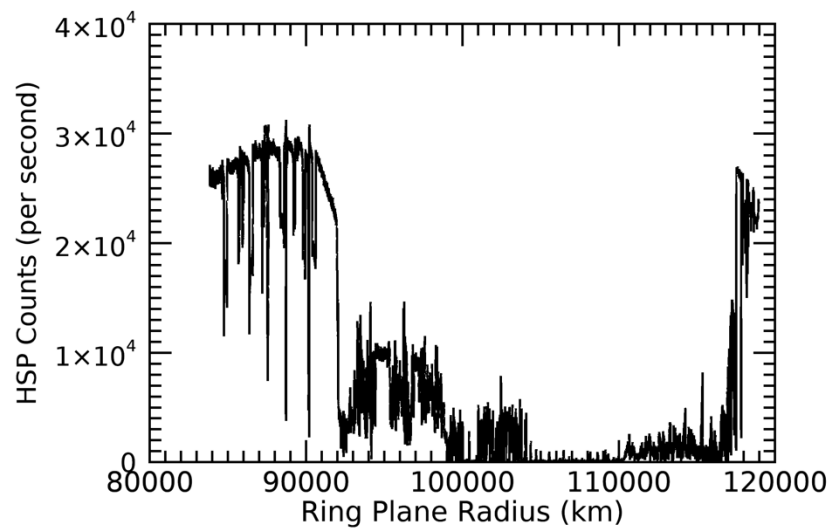
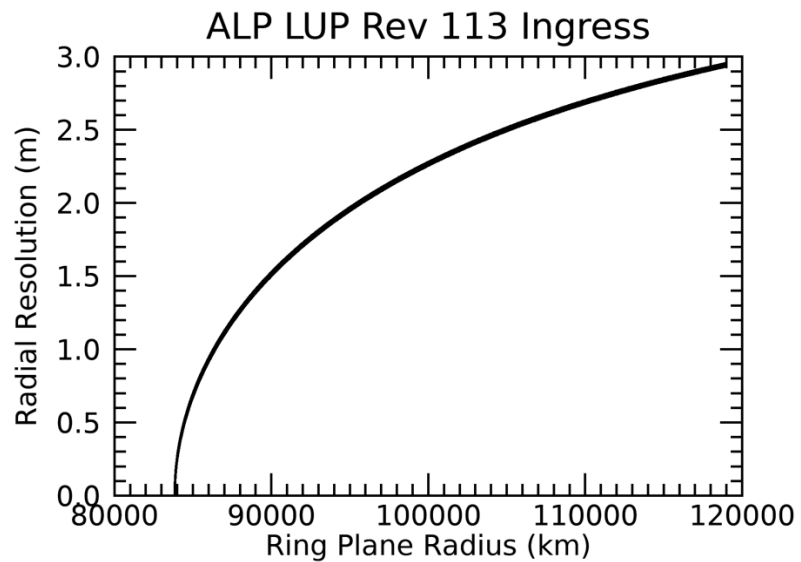
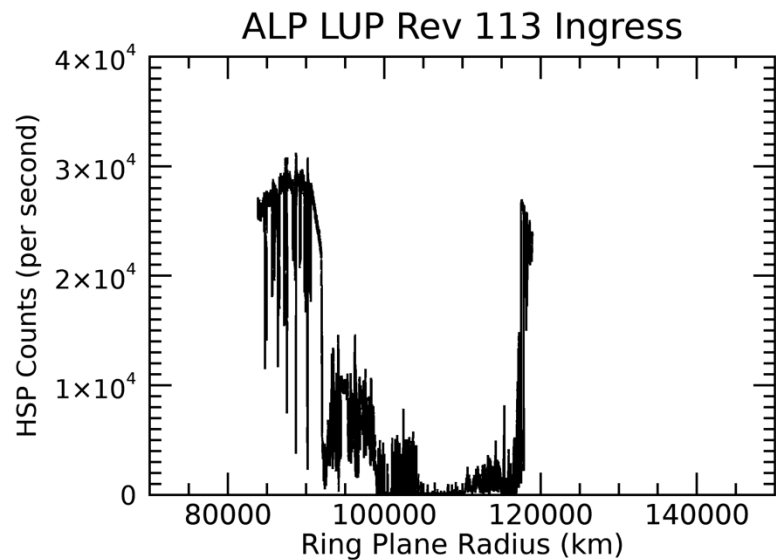


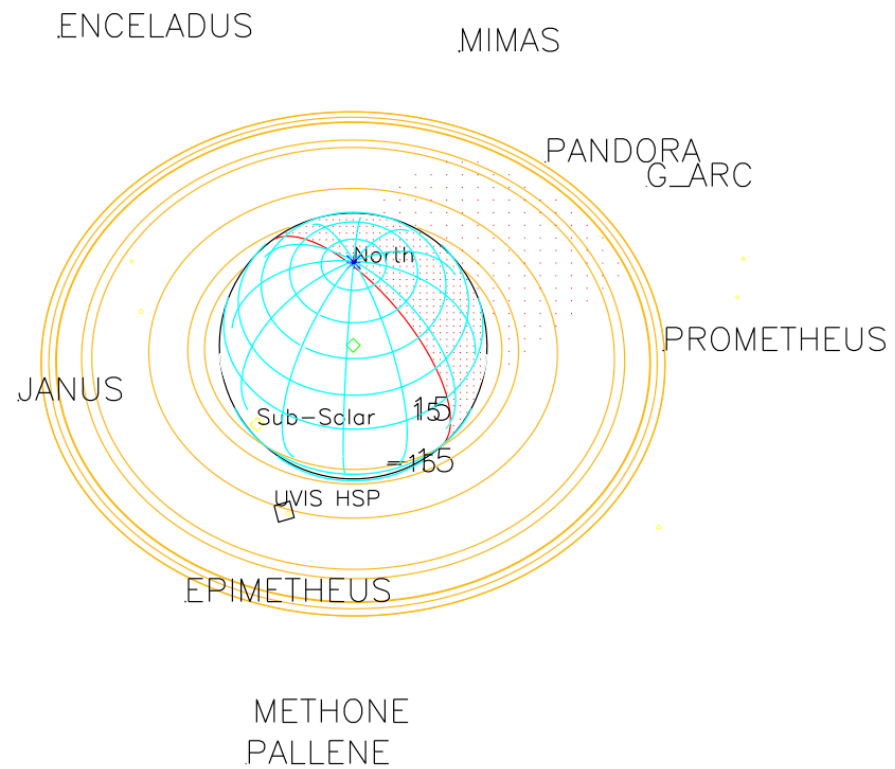
2009-163T12:27:00.000 1286071.9 km

Target RA/dec: 202.89, -45.34

Subsolar lat/lon: -0.74, 129.09

Sub-s/c lat/lon: 45.87, 156.31



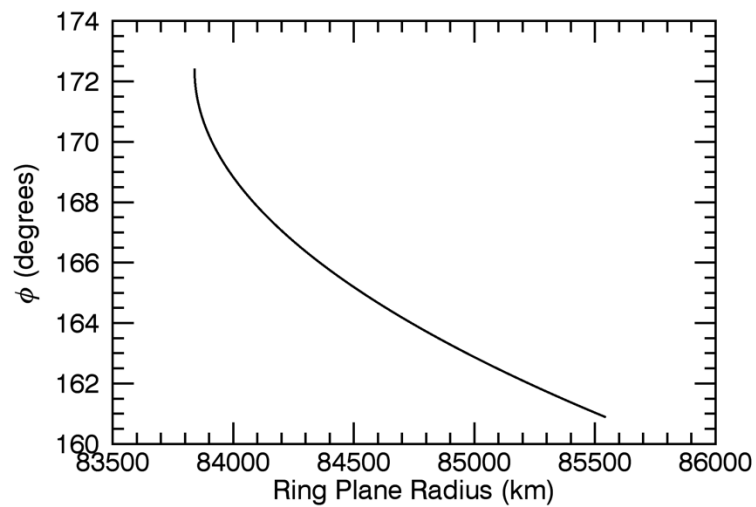
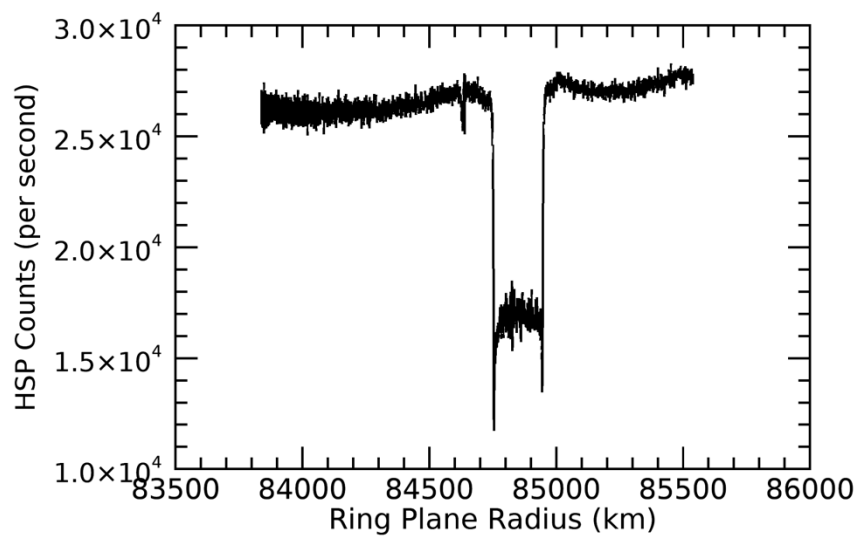
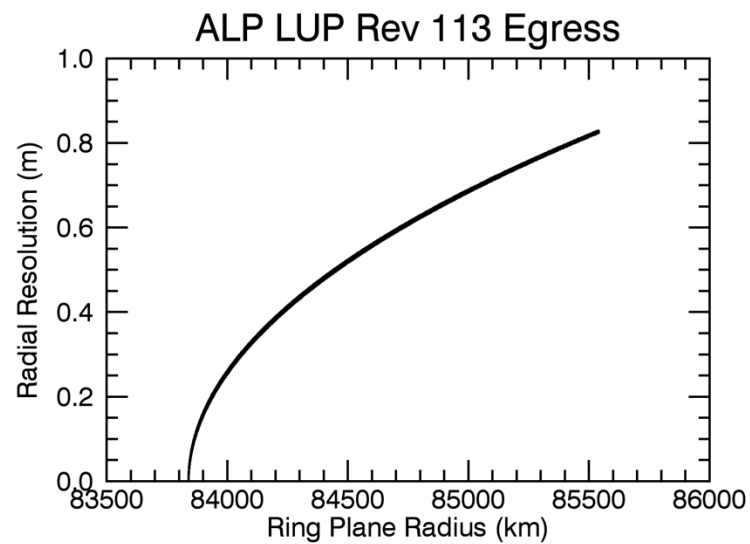
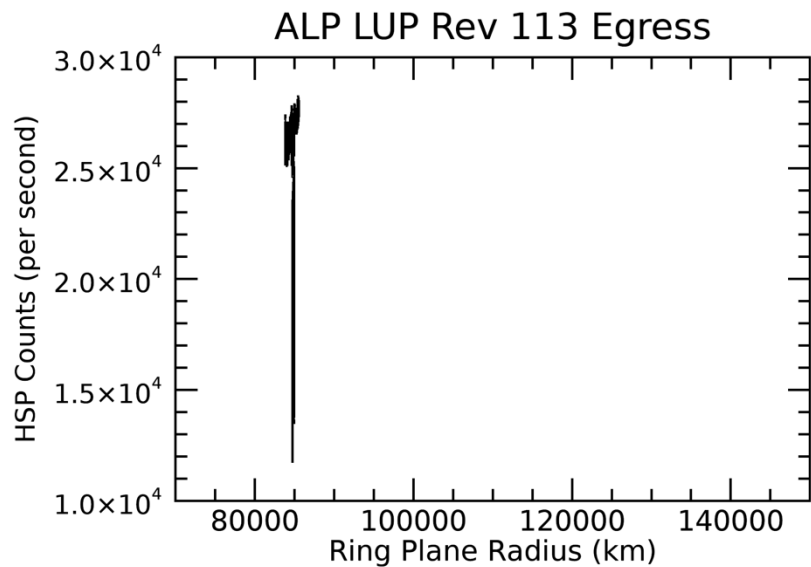


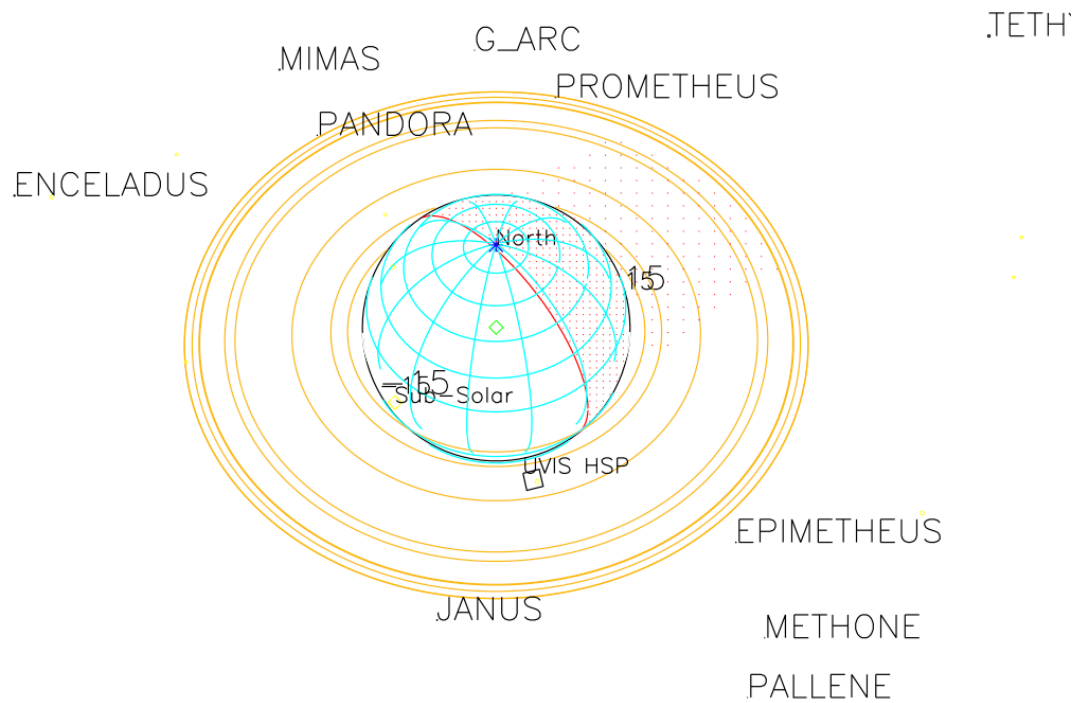
2009-178T13:34:00.000 1213407.1 km

Target RA/dec: 218.45, -43.99

Subsolar lat/lon: -0.56, 169.92

Sub-s/c lat/lon: 44.85, -145.69



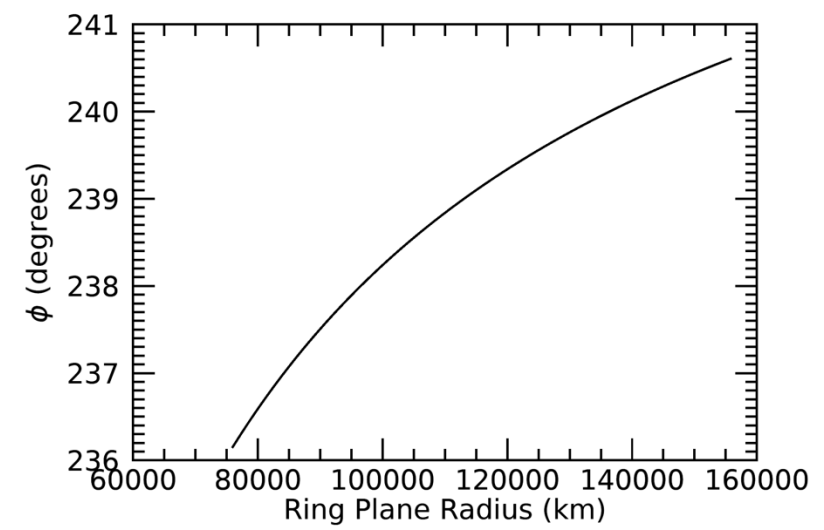
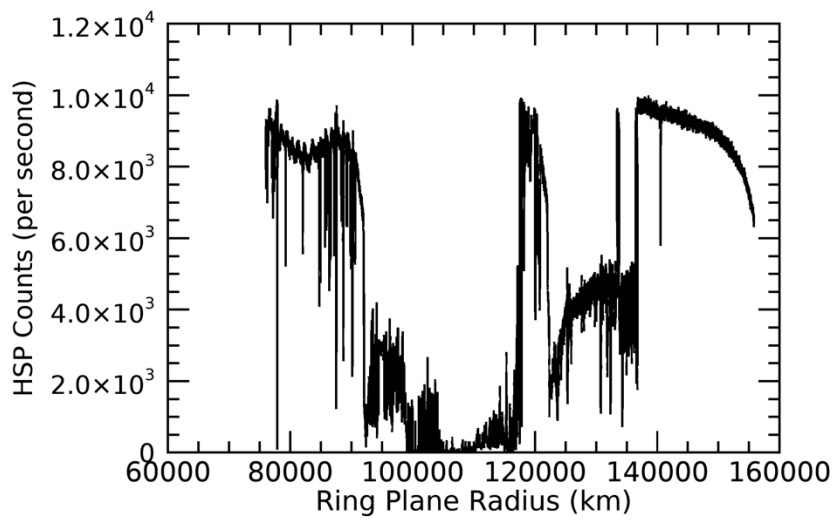
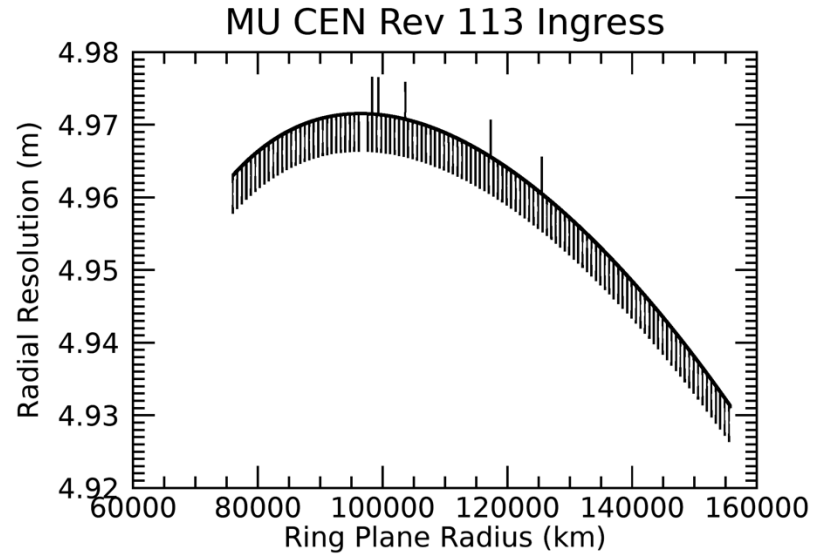
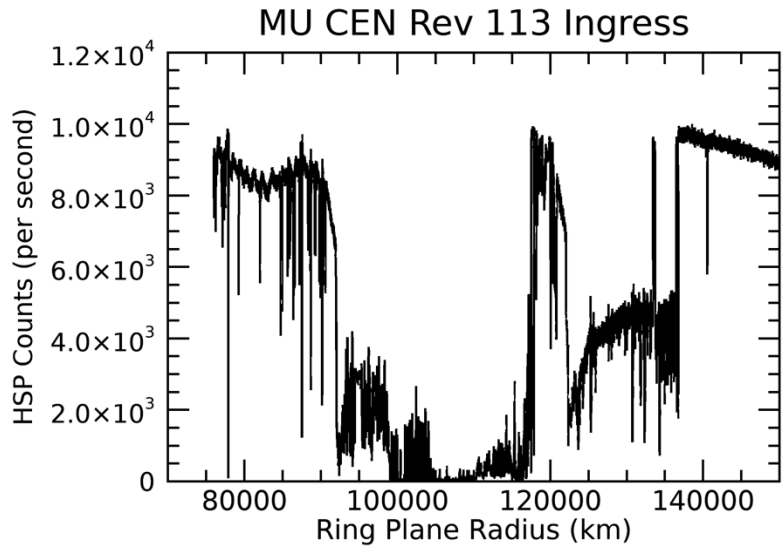


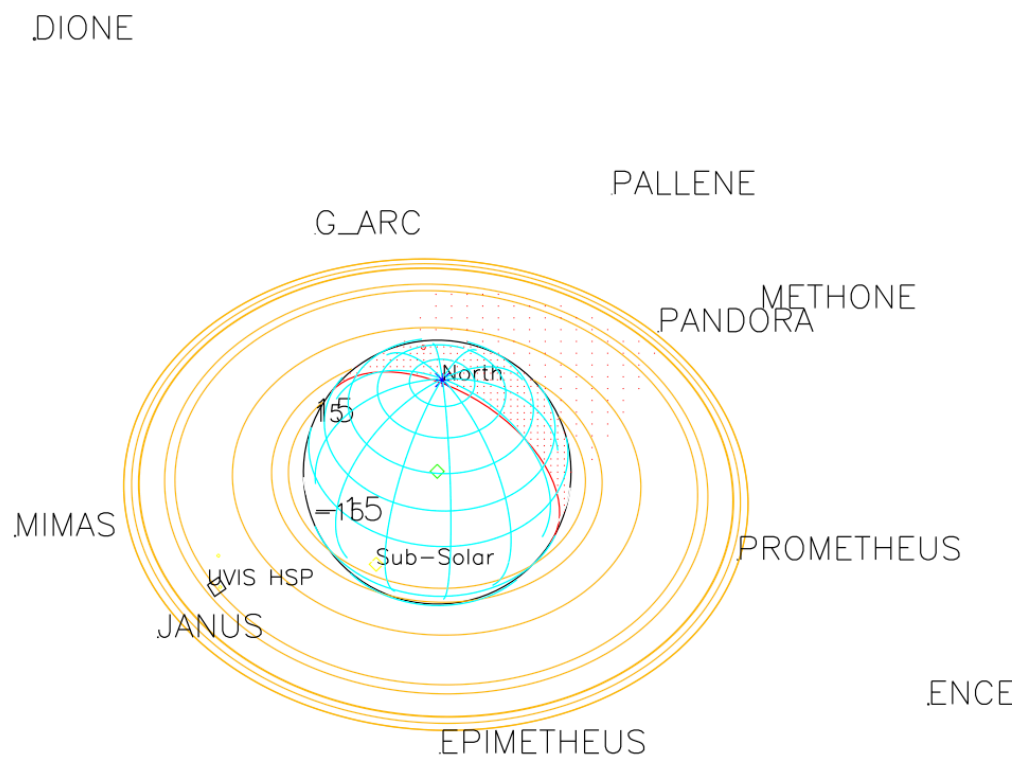
2009-178T16:57:00.000 1256614.3 km

Target RA/dec: 221.73, -44.36

Subsolar lat/lon: -0.55, 55.62

Sub-s/c lat/lon: 45.23, 103.72





2009-177T21:20:00.000 983875.42 km

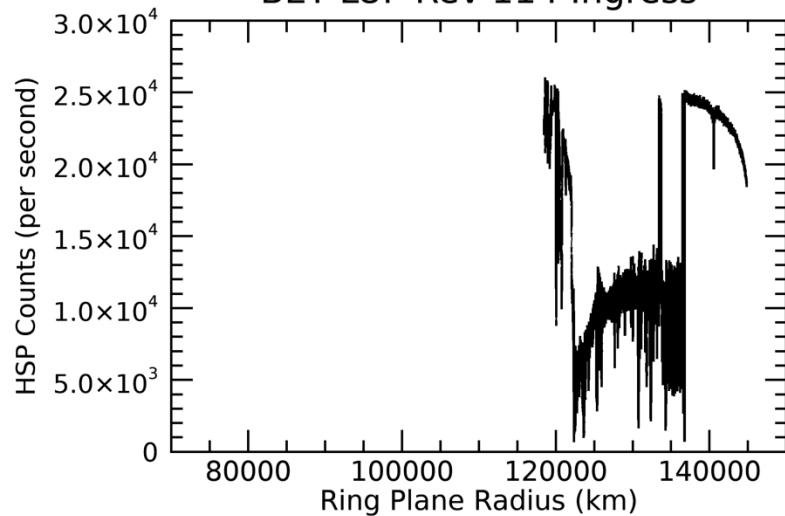
Target RA/dec: 199.70, -39.83

Subsolar lat/lon: -0.56, -1.70

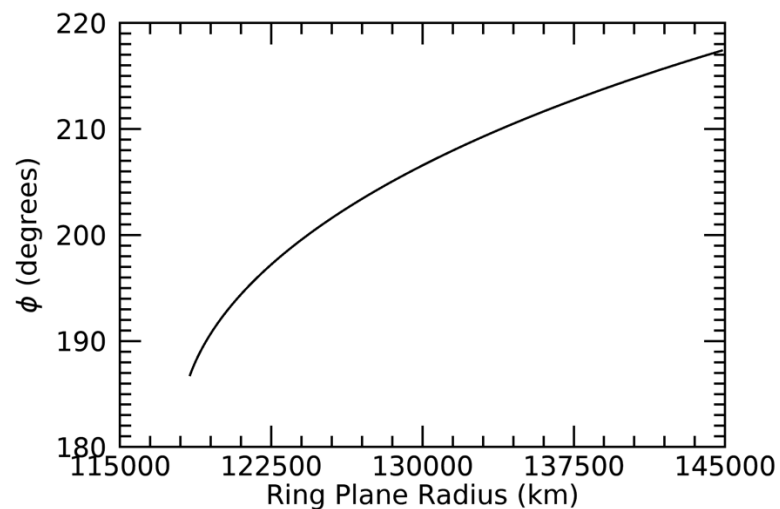
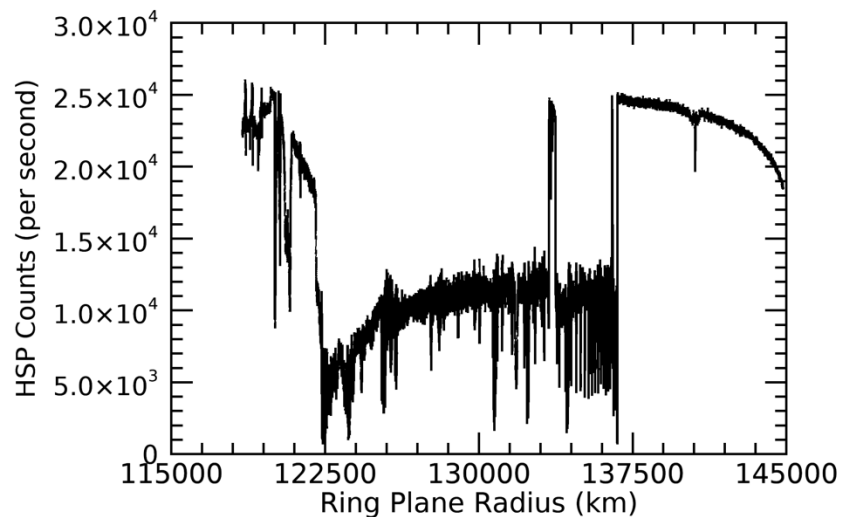
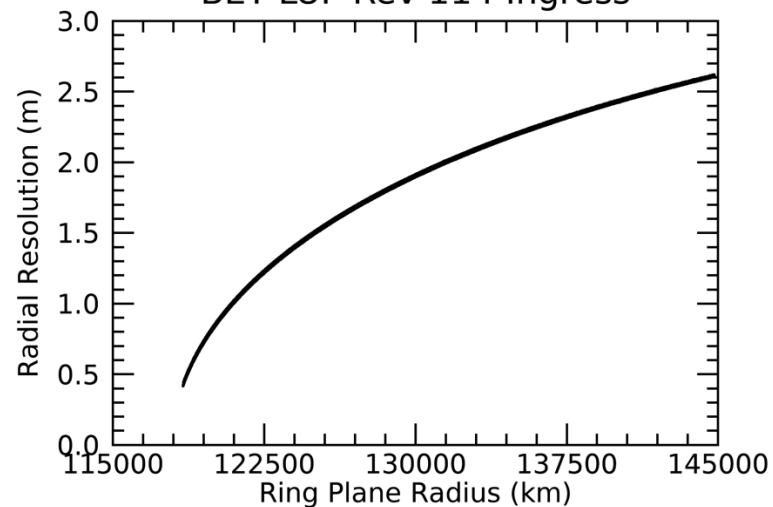
Sub-s/c lat/lon: 40.28, 21.99

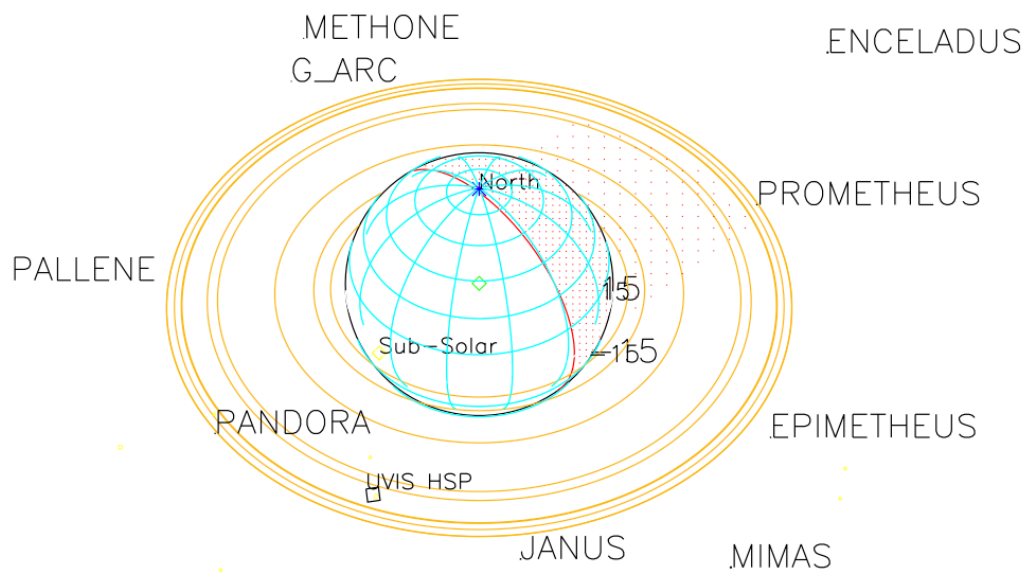
TETHYS

BET LUP Rev 114 Ingress



BET LUP Rev 114 Ingress





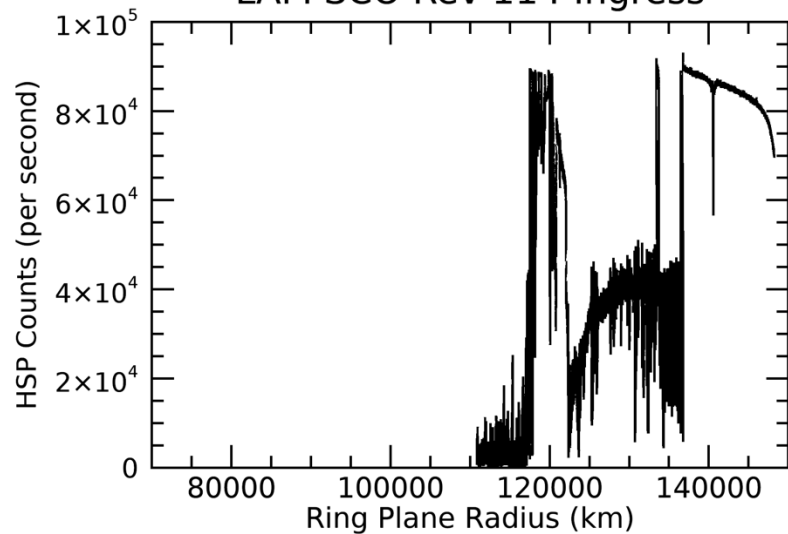
2009-193T07:39:00.000 937545.17 km

Target RA/dec: 220.76, -37.60

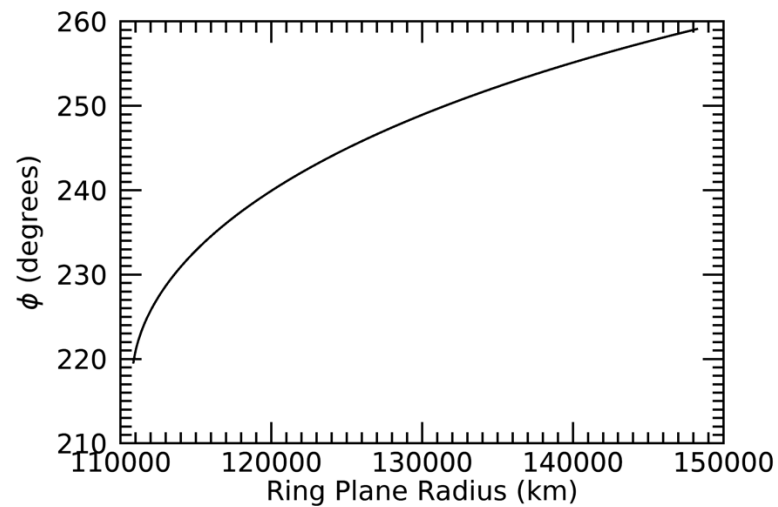
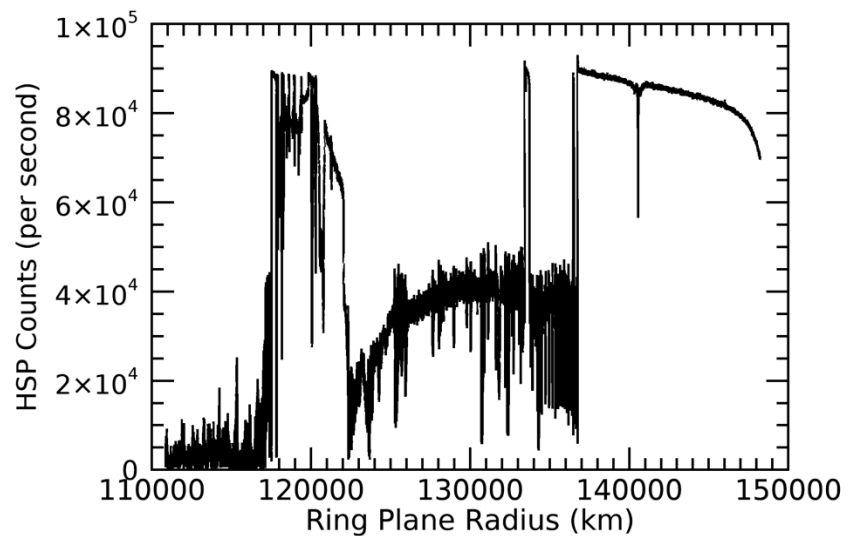
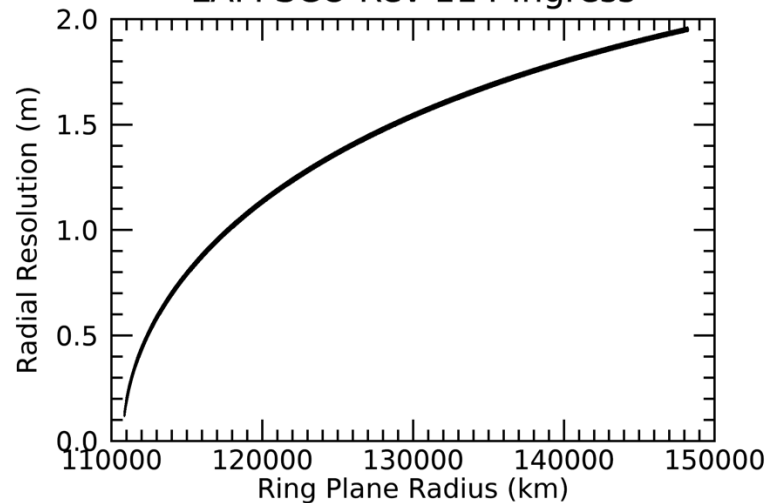
Subsolar lat/lon: -0.37, 88.33

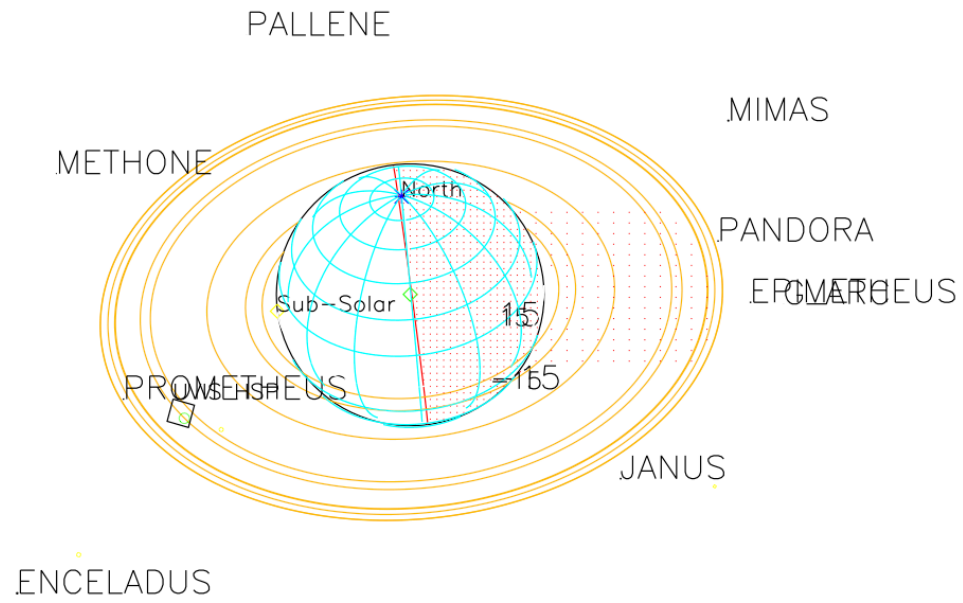
Sub-s/c lat/lon: 38.57, 134.88

LAM SCO Rev 114 Ingress

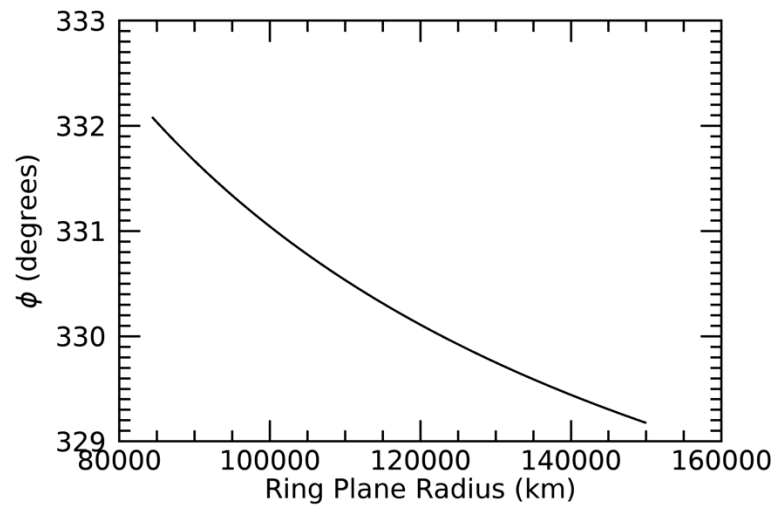
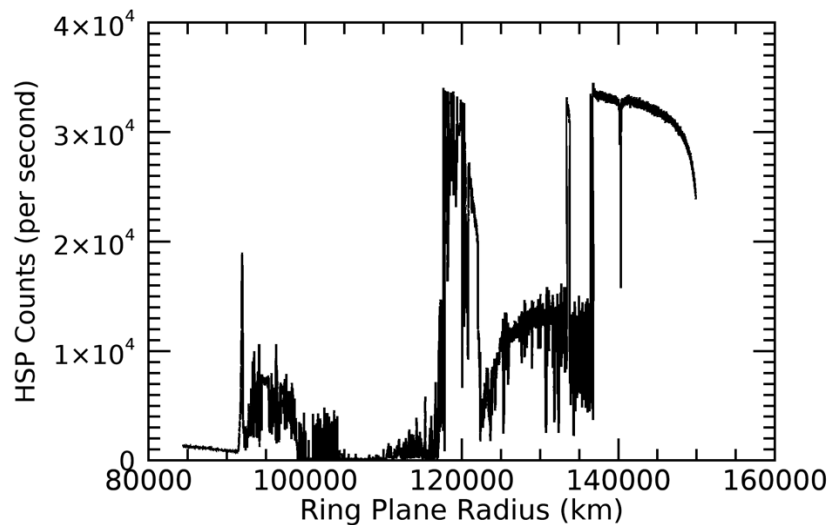
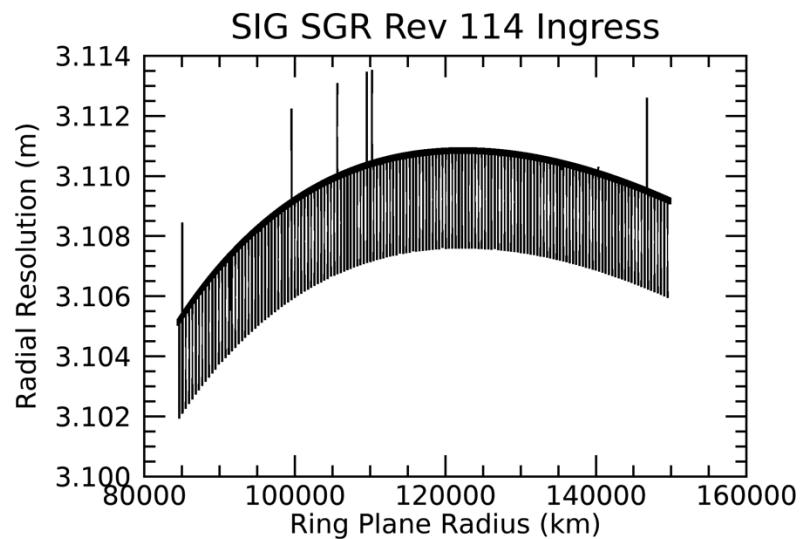
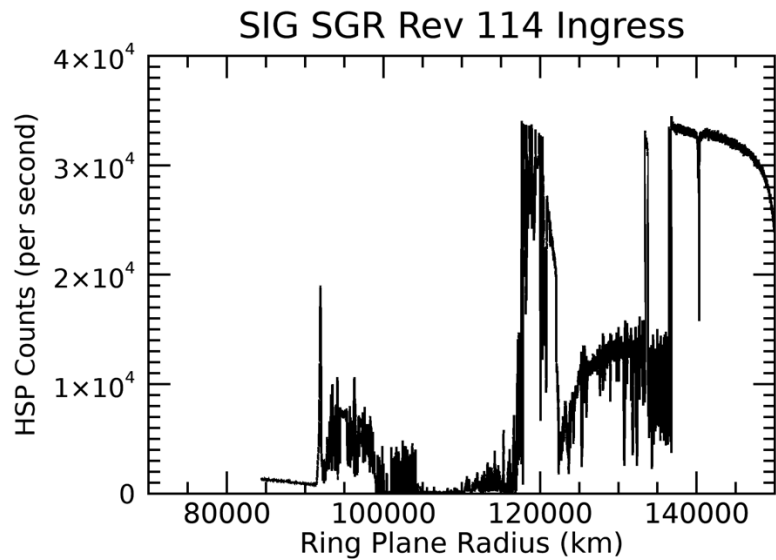


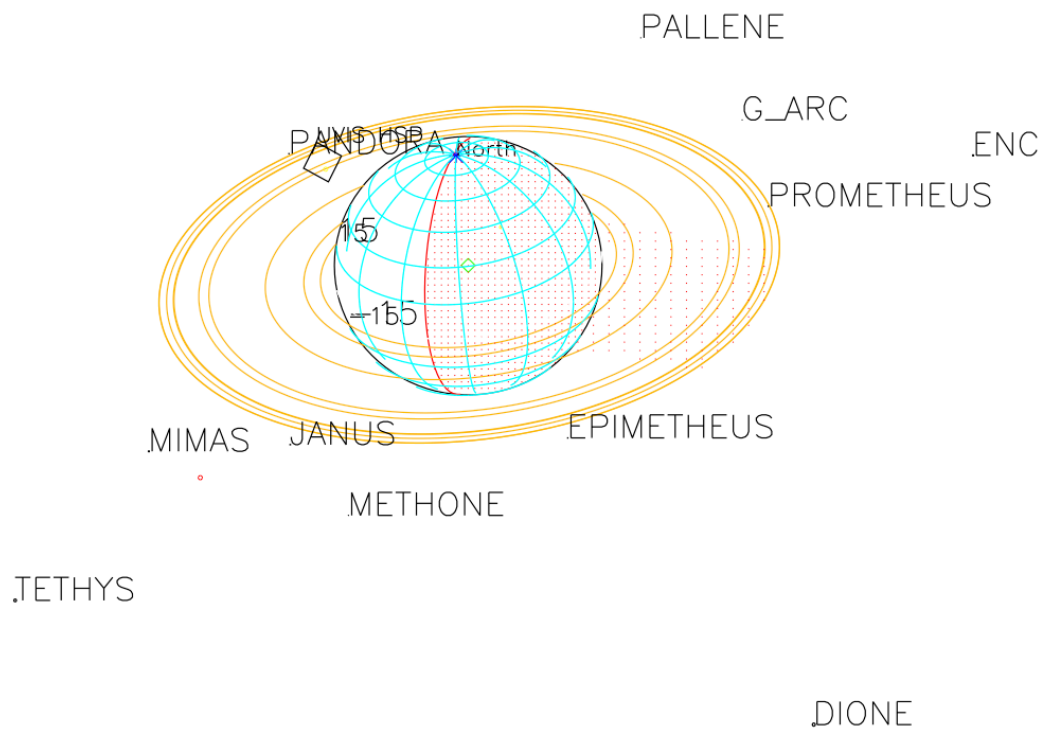
LAM SCO Rev 114 Ingress





2009-195T12:50:00.000 1653790.2 km
 DIONE
 Target RA/dec: 258.99, -35.34
 Subsolar lat/lon: -0.34, 91.73
 Sub-s/c lat/lon: 34.79, 179.65



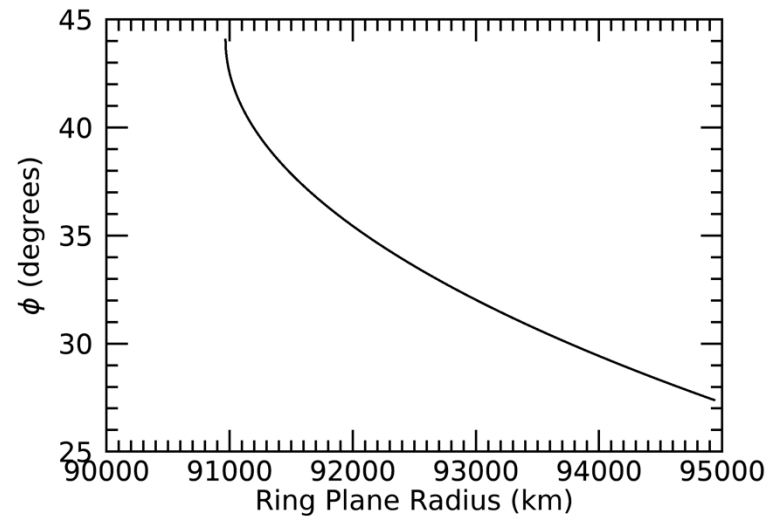
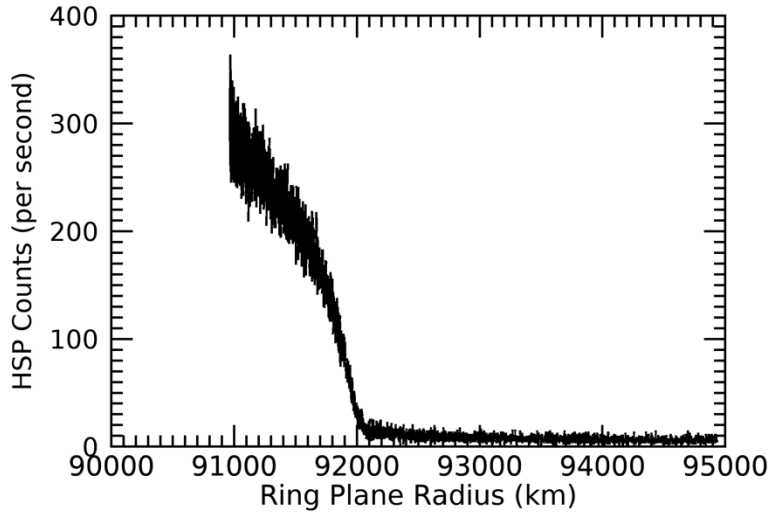
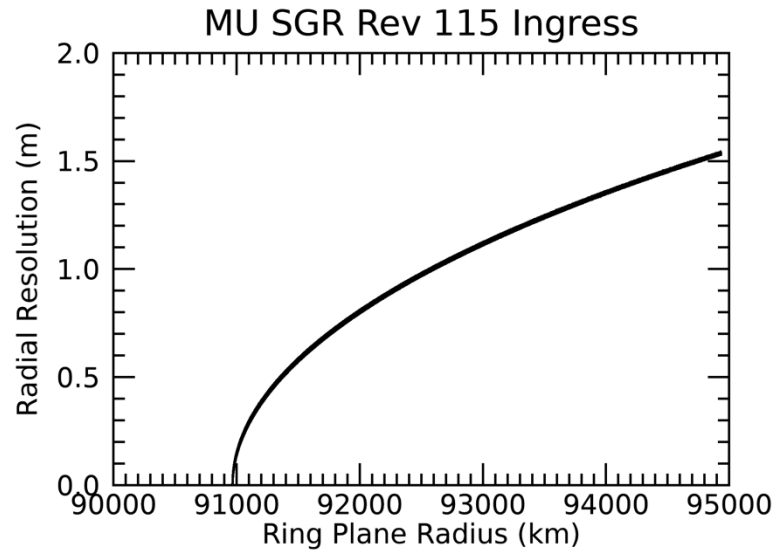
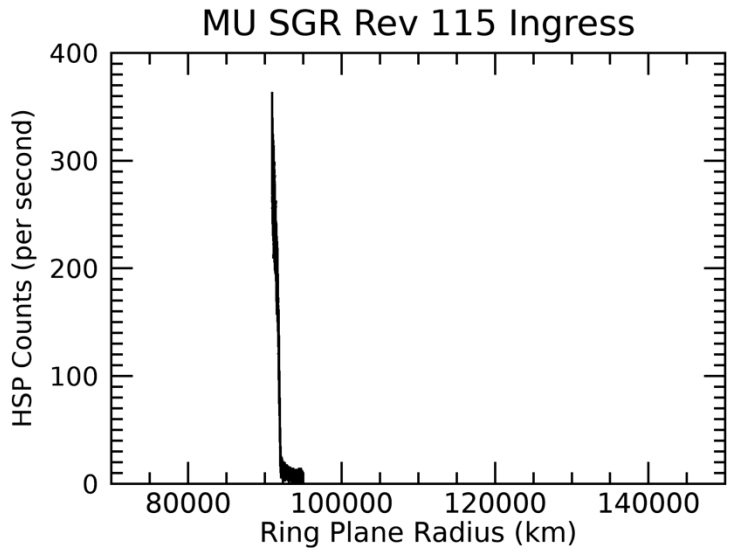


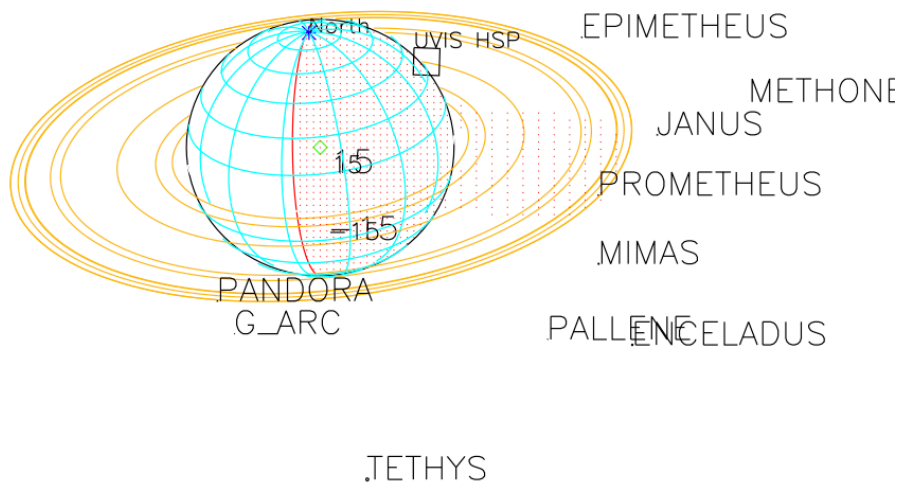
2009-198T22:09:00.000 2101042.3 km

Target RA/dec: 281.86, -27.44

Subsolar lat/lon: -0.30, -135.28

Sub-s/c lat/lon: 25.63, -24.64





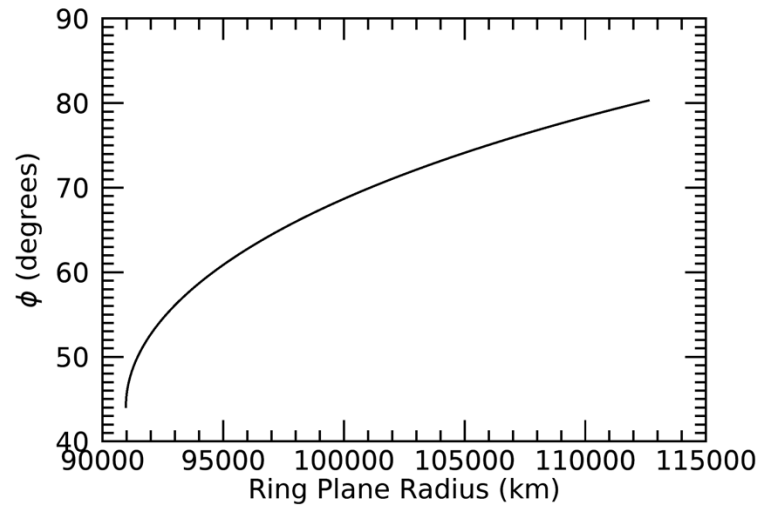
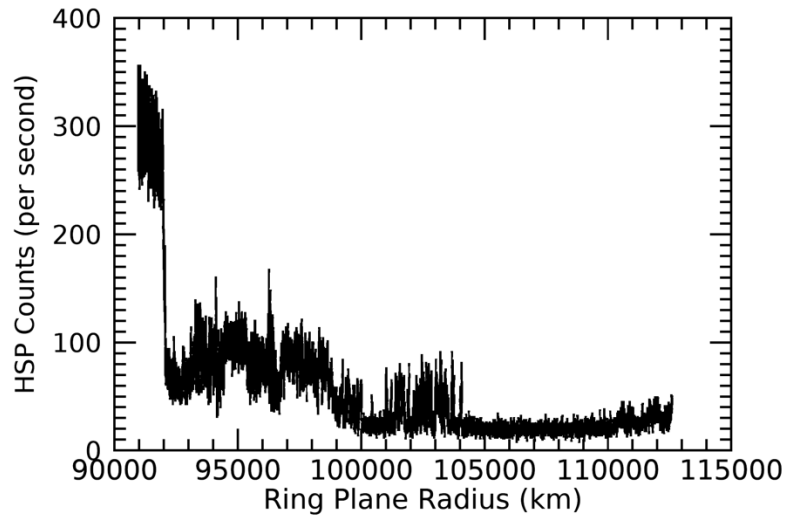
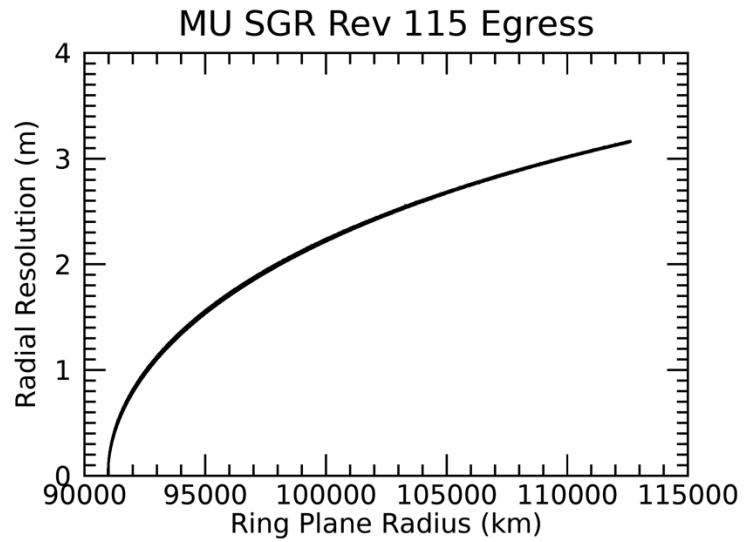
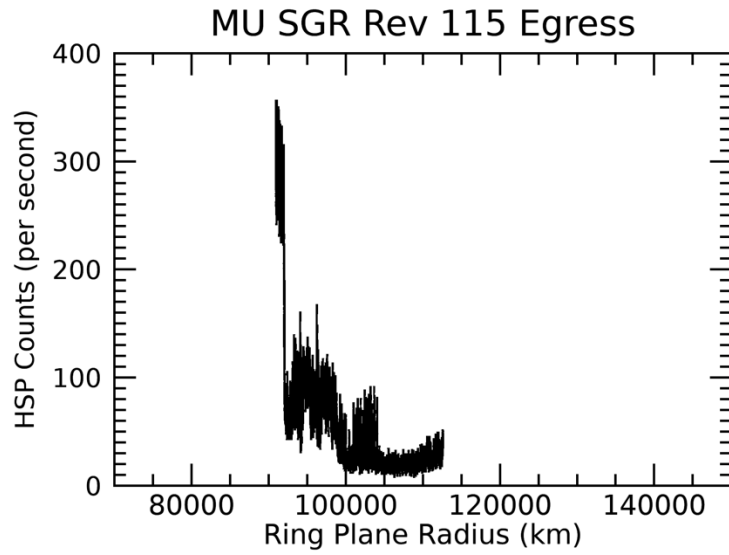
DIONE

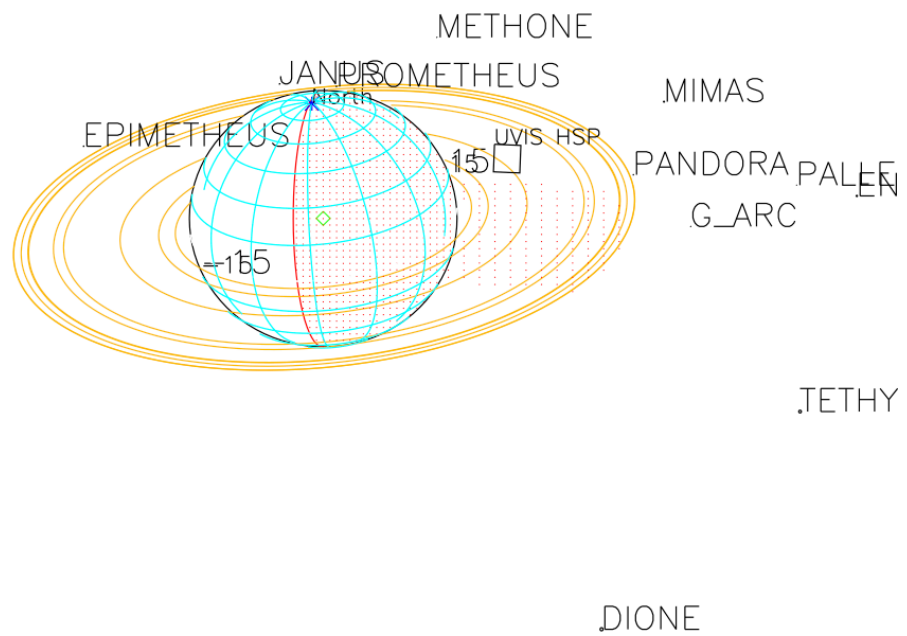
2009-212T07:51:00.000 1943190.8 km

Target RA/dec: 275.03, -22.10

Subsolar lat/lon: -0.13, 157.11

Sub-s/c lat/lon: 21.54, -100.30





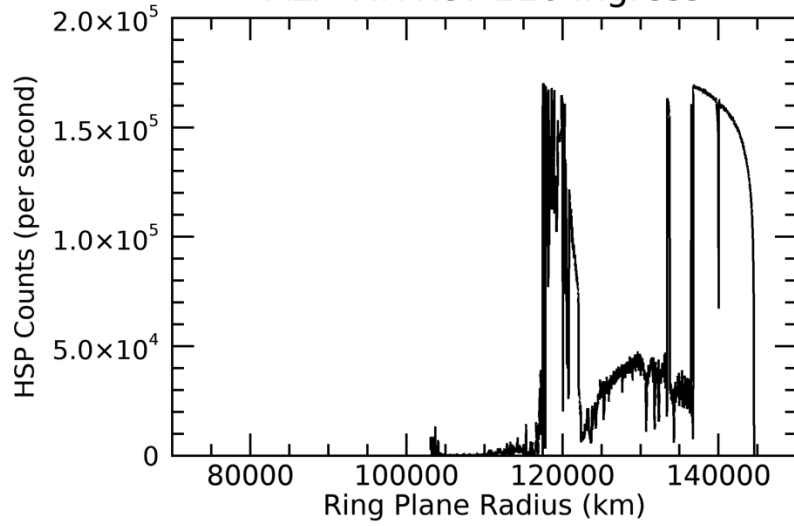
2009-212T12:41:00.000 1975733.0 km

Target RA/dec: 276.09, -21.77

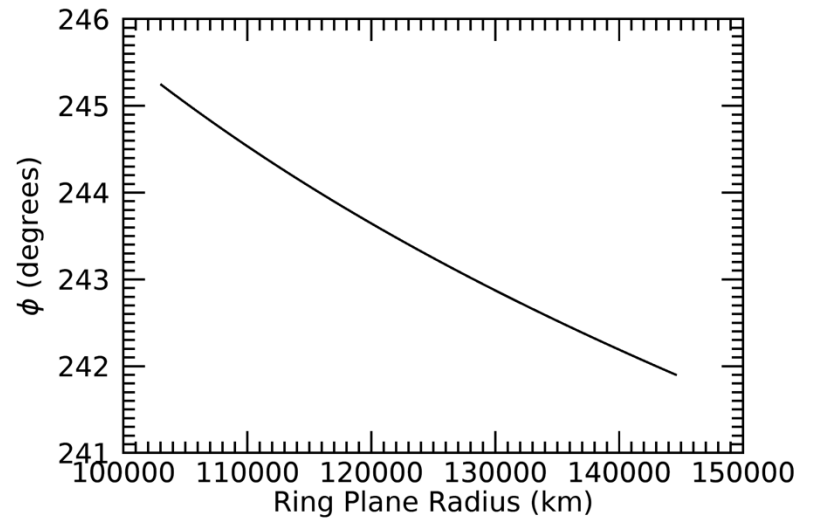
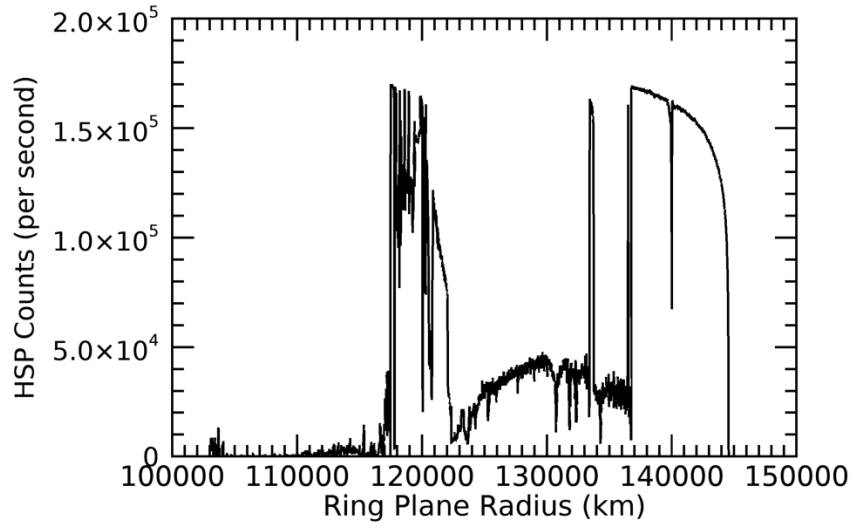
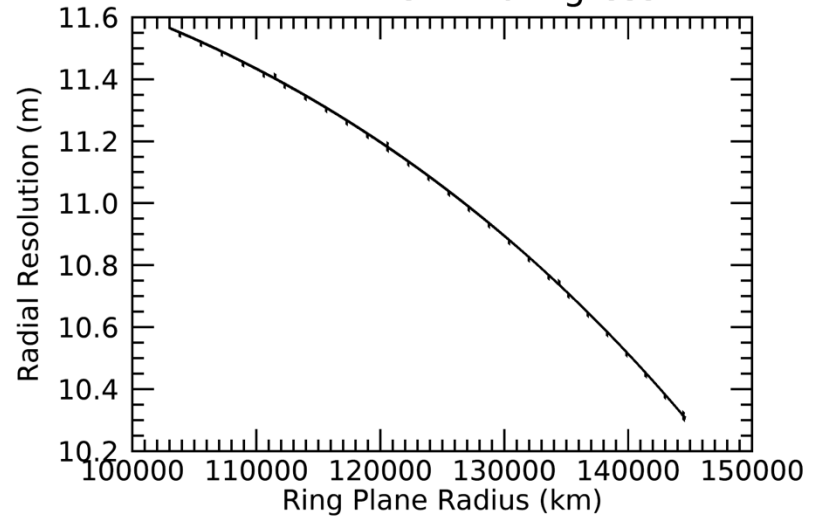
Subsolar lat/lon: -0.13, -6.17

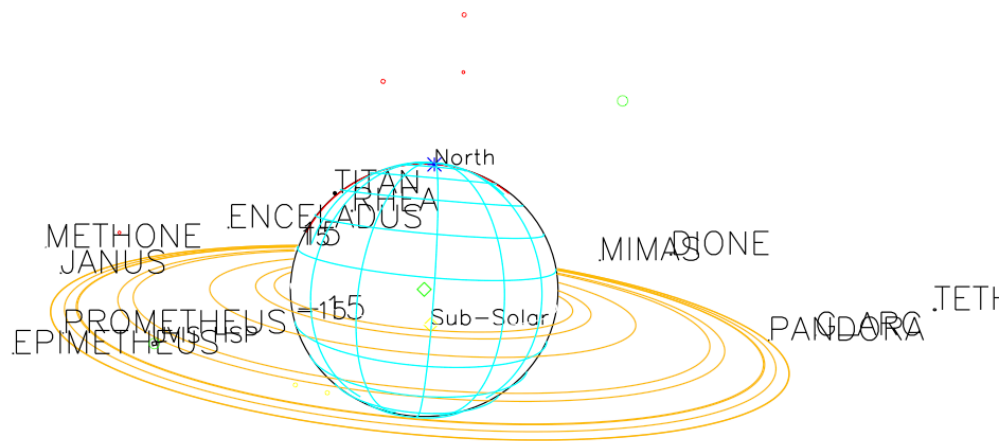
Sub-s/c lat/lon: 21.17, 97.46

ALP VIR Rev 116 Ingress



ALP VIR Rev 116 Ingress



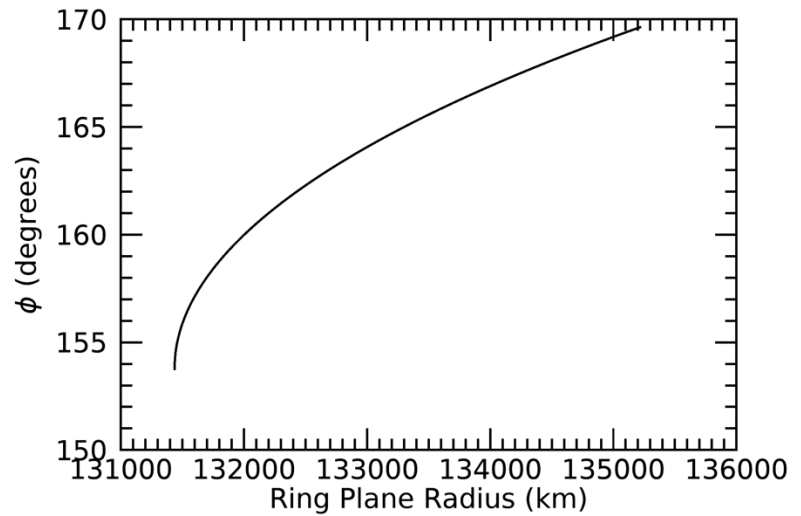
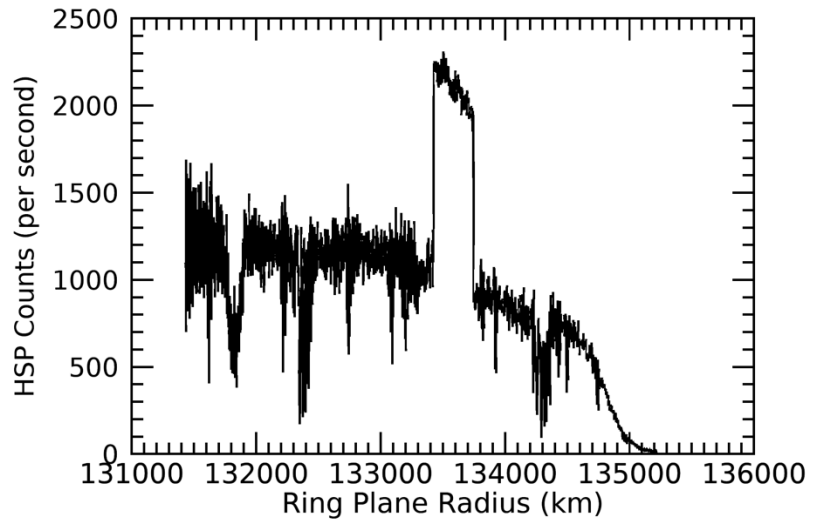
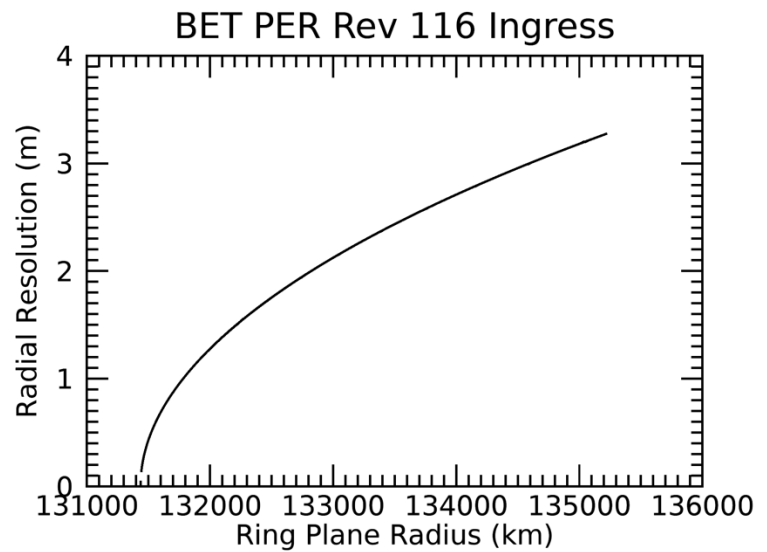
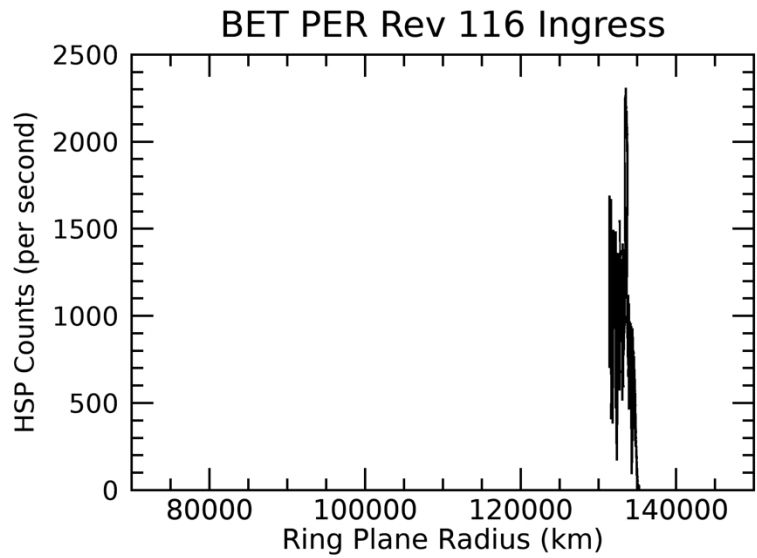


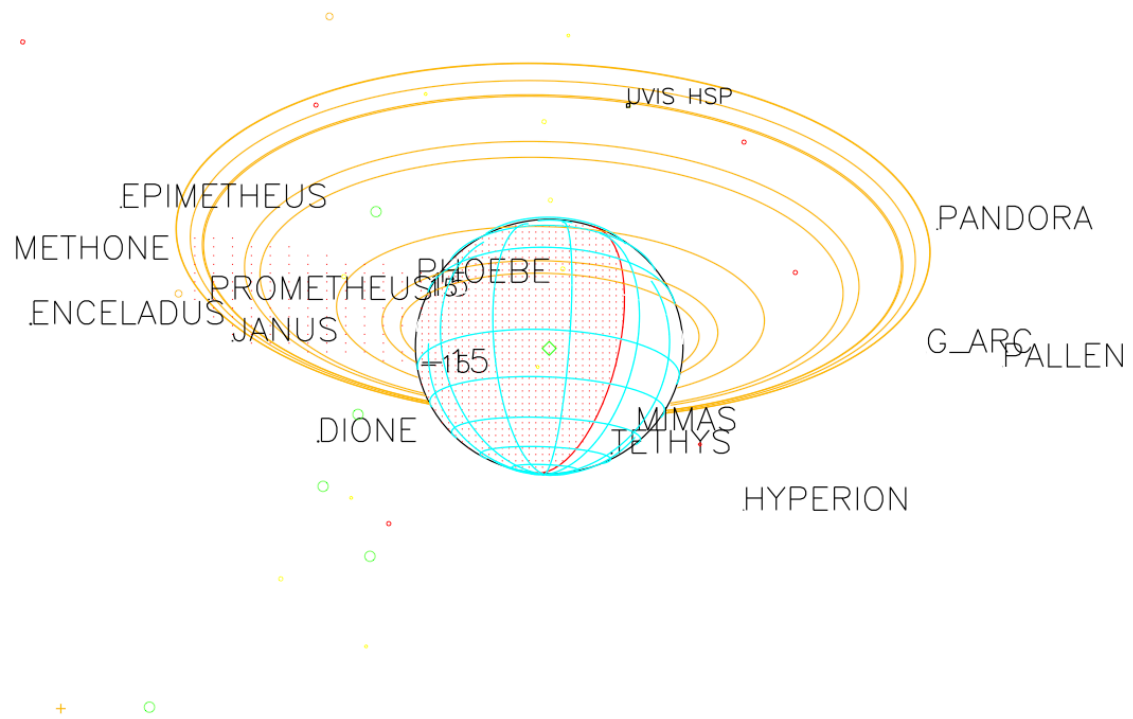
2009-223T14:56:00.000 236108.41 km

Target RA/dec: 172.80, -6.81

Subsolar lat/lon: 0.01, -0.63

Sub-s/c lat/lon: 9.54, -3.75



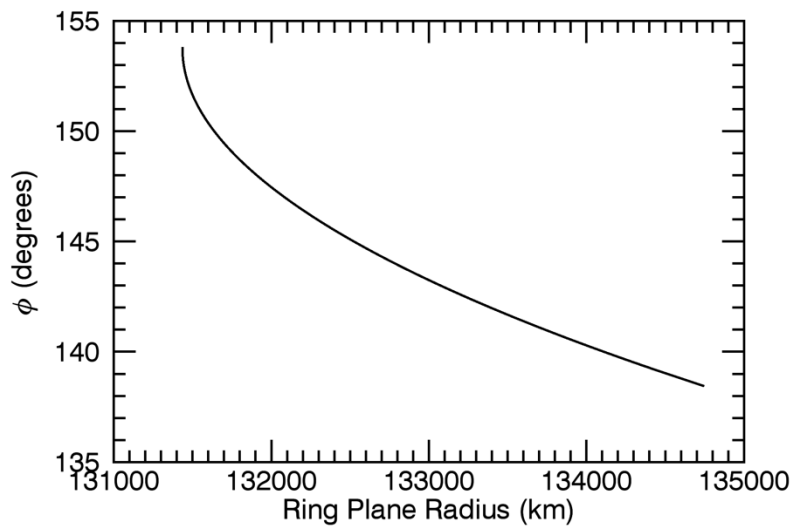
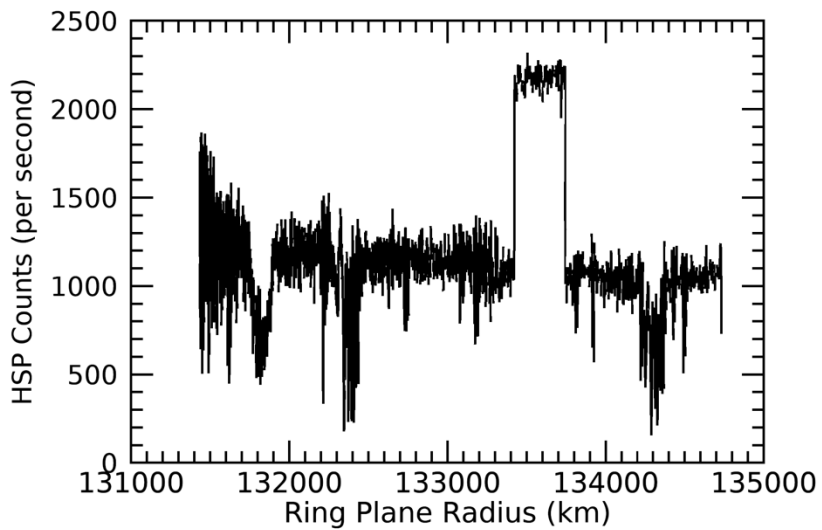
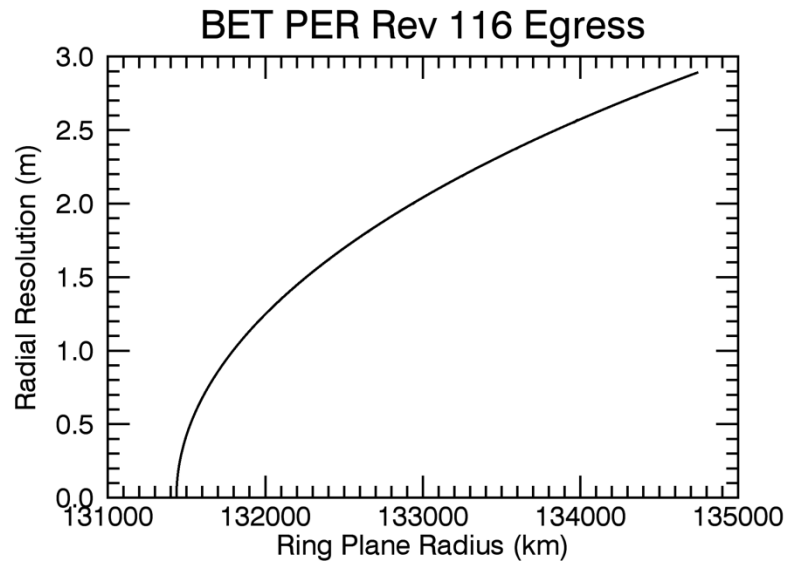
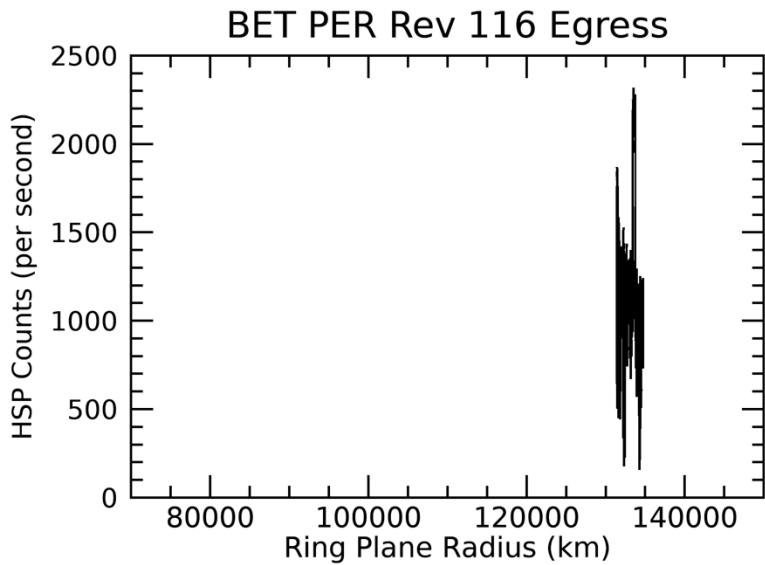


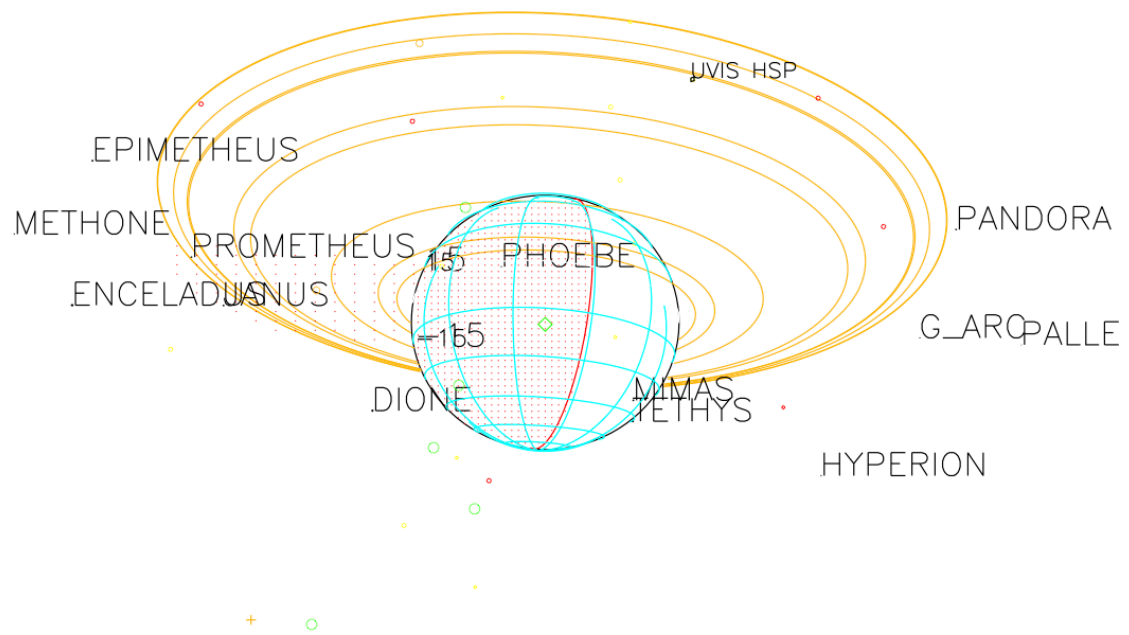
2009-223T09:03:00.000 215155.35 km

Target RA/dec: 58.70, 14.72

Subsolar lat/lon: 0.00, -161.88

Sub-s/c lat/lon: -18.11, 82.33





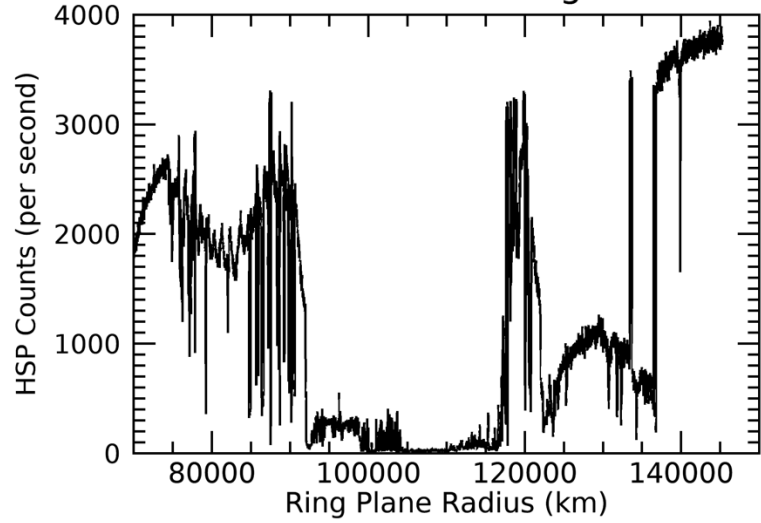
2009-223T09:41:00.000 199901.85 km

Target RA/dec: 69.80, 14.32

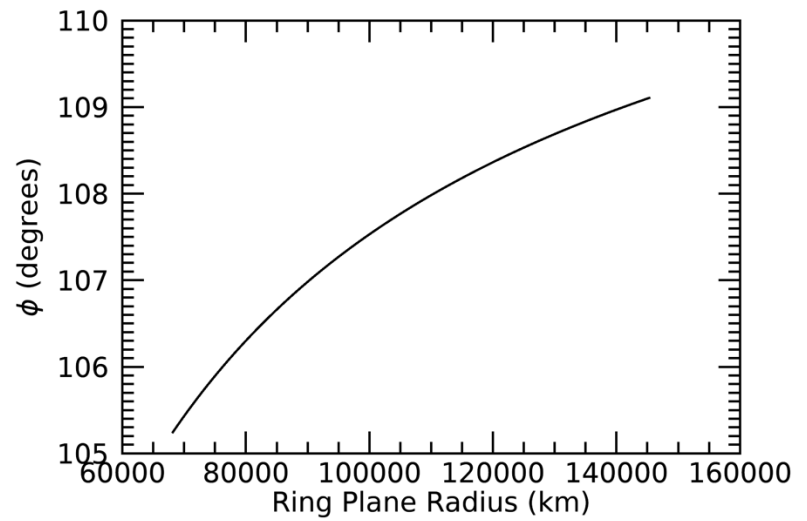
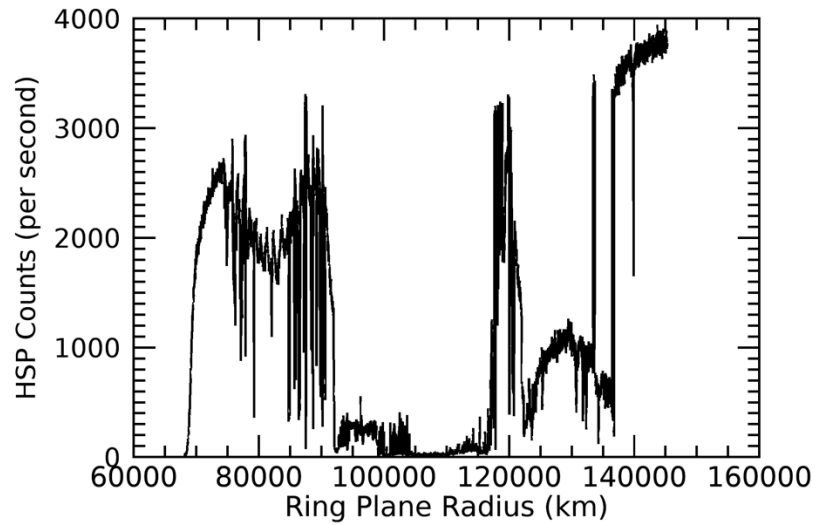
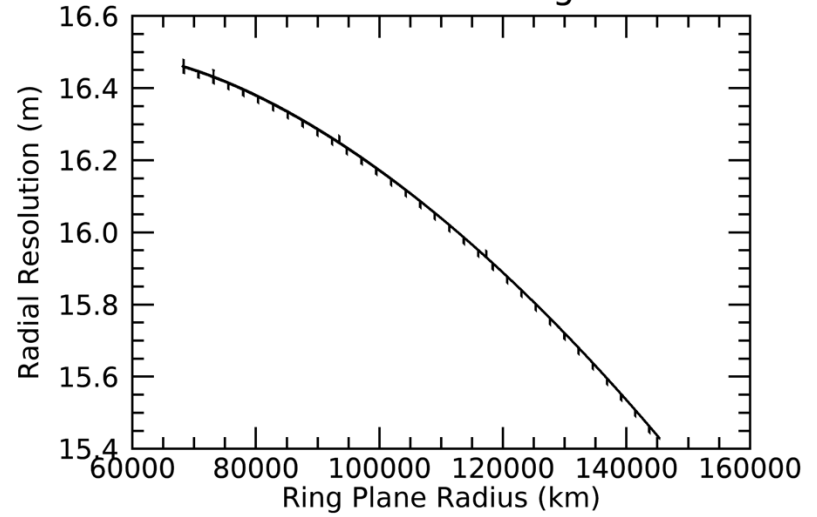
Subsolar lat/lon: 0.00, 176.72

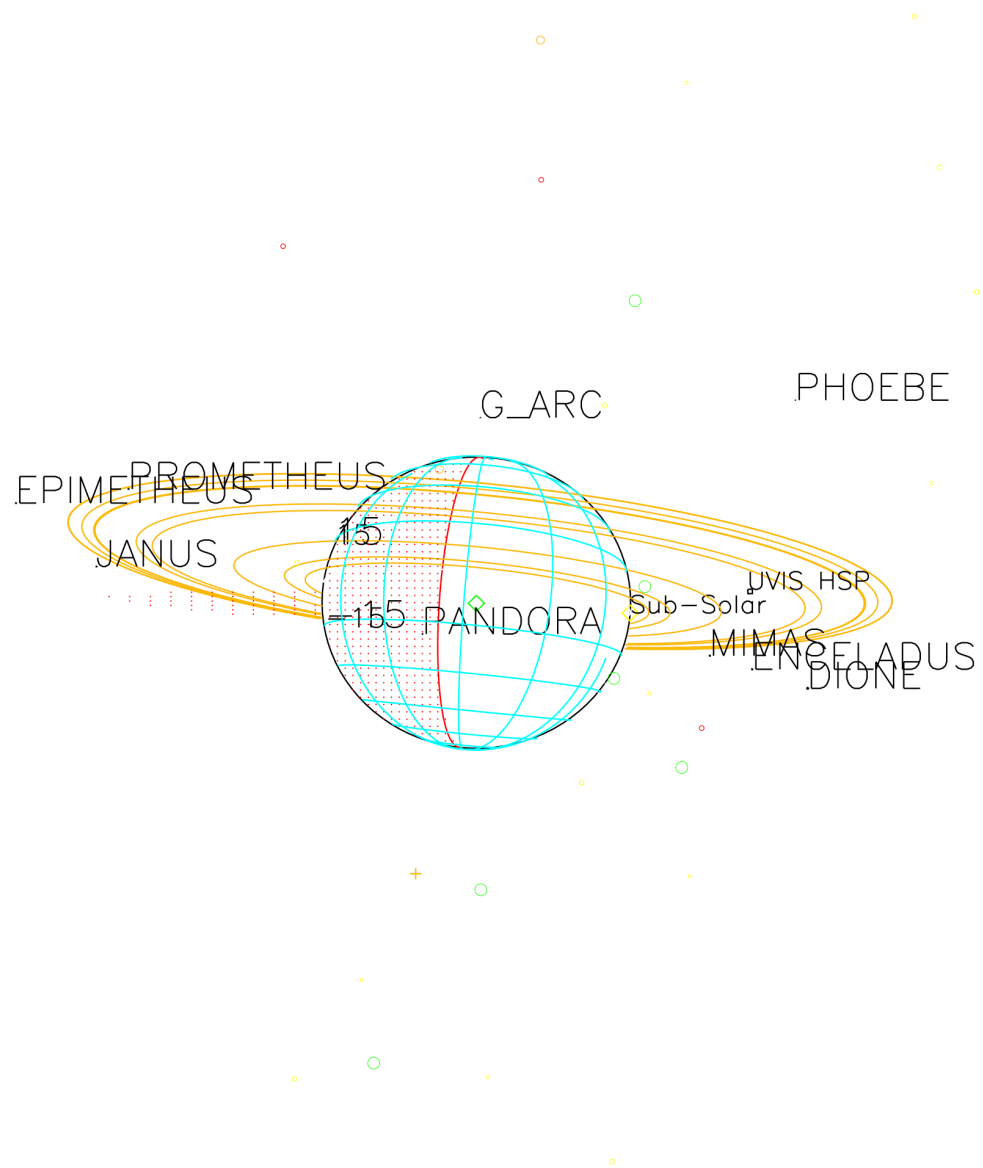
Sub-s/c lat/lon: -17.37, 72.36

PI4 ORI Rev 117 Egress



PI4 ORI Rev 117 Egress





2009-239T10:19:00.000 258177.17 km

Target RA/dec: 96.06, 5.14

Subsolar lat/lon: 0.20, 143.11

Sub-s/c lat/lon: -7.48, 64.19