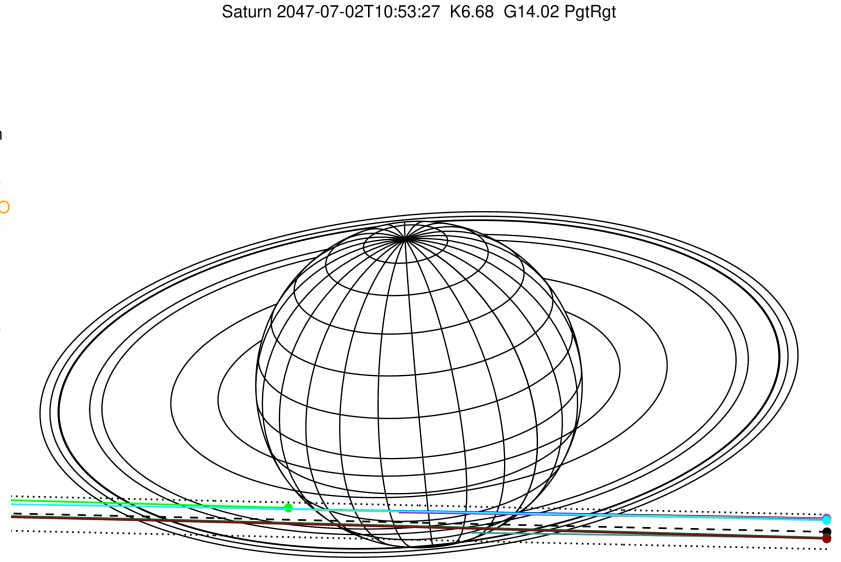
Stellar occultation prediction by rfrench@wellesley.edu Sat Jun 24 20:03:48 2023

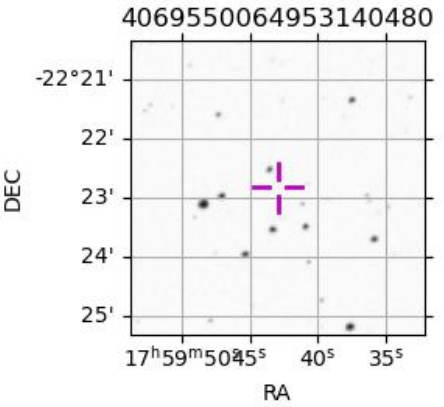
```
target                  : Saturn
target radius (km)      :  60268.00
C/A epoch               : 2047-07-02T10:53:27.700
Event type              : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Gaia source ID          : 4069550064953140480
2Mass ID (if available) : 17594295-2222492

ICRS Star Coord at Epoch: 17h 59m 42.96499s -22:22:49.52183s
RUWE (>1.4 is poor)     :   1.15
K magnitude             :  6.684
G magnitude             : 14.021
RP magnitude            : 12.451
BP magnitude            : 17.905
DUPflag                 : 0
Distance (au)           :  9.043
f0 (km)                 :       0.000
g0 (km)                 :       0.000
skyplane vel. (km/s)    : -19.72
Sun-Target sep (deg)    :  170.01
Sun-Moon sep (deg)      :   57.42
B (ring opening deg)    :   26.52
PA of pole (deg)        :    5.51
#     a(km)  ring
------------------------------
1   74490.6  C (IER)
2   91984.7  B (IER)
3  117571.2  B (OER)
4  122050.4  A (IER)
5  133423.3  Encke (IEG)
6  133744.9  Encke (OEG)
7  136774.4  A (OER)
8  140461.0  F ring
```

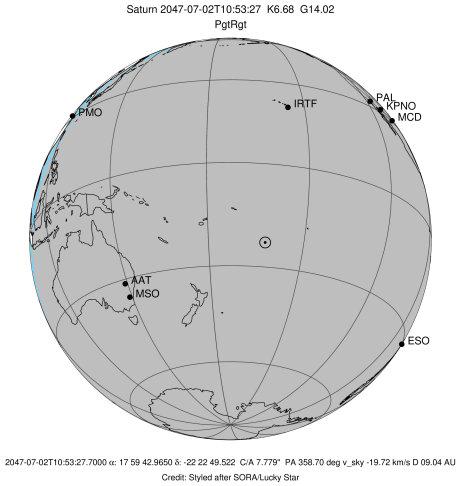


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

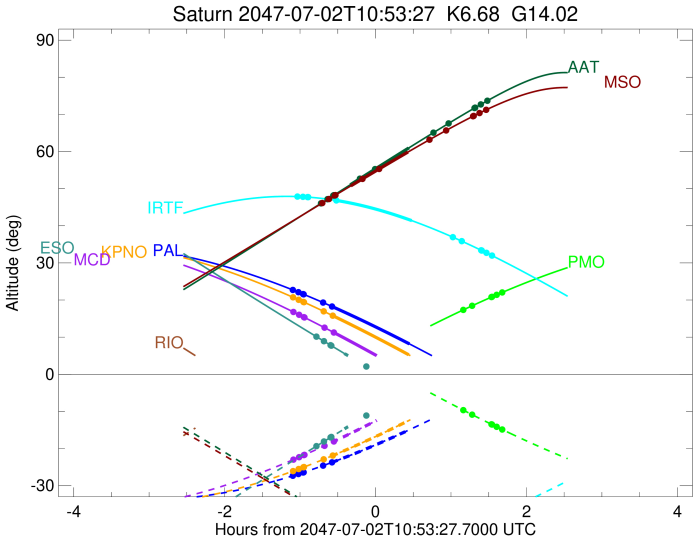
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (20	33.4	243.1	+ + + + +	+ +		JUL 02 09:47 - JUL 02 11:20	PieRin
PMO	Purple Mtn Obs	32.1	118.8			+ + + + + +	JUL 02 12:03 - JUL 02 12:34	PnnRne
KPNO	Kitt Peak Natl	32.0	248.4	+ + + + +	+ +		JUL 02 09:47 - JUL 02 11:19	PieRin
MCD	McDonald Obs.	30.7	256.0	+ + + + +	+		JUL 02 09:48 - JUL 02 10:18	PinRin
TEN	Teide Obs./Ten	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+ + + + +	+ +	+ + + + + +	JUL 02 09:51 - JUL 02 12:26	PieRie
KAV	Kavalur Observ	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European South	-29.3	289.3	+ + + +	+		JUL 02 10:06 - JUL 02 10:28	PinRin
AAT	Siding Spring	-31.3	149.1	+ + + +	+ +	+ + + + + +	JUL 02 10:10 - JUL 02 12:22	PieRie
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0	+ + + +	+ +	+ + + + + +	JUL 02 10:11 - JUL 02 12:21	PieRie



Saturn_2047-07-02T10_53_27.7000_PAL.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:13:22 2023




```
target                  : Saturn
target radius (km)      :  60268.00
C/A epoch               : 2047-07-02T10:49:24.170
Event type              : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code           : PAL
Location                : Palomar Mt (200")
Latitude (deg)          :  33.35622
E. Longitude (deg)      : 243.13601
Altitude (km)           :   1.706
Gaia source ID          : 4069550064953140480
2Mass ID (if available) : 17594295-2222492
ICRS Star Coord at Epoch: 17h 59m 42.96499s -22:22:49.52183s
RUWE (>1.4 is poor)     :   1.15
K magnitude             :  6.684
G magnitude             : 14.021
RP magnitude            : 12.451
BP magnitude            : 17.905
DUPflag                 : 0
Distance (au)           :  9.043
f0 (km)                 :       0.000
g0 (km)                 :       0.000
skyplane vel. (km/s)    : -19.72
Sun-Target sep (deg)    :  170.01
Sun-Moon sep (deg)      :   58.01
B (ring opening deg)    :   26.52
PA of pole (deg)        :    5.51
Pole direction: RA (deg):  40.60000
Dec (deg):  83.50000
C/A sky separation (")  :   7.130
C/A sky separation (km) :  46762.3
NAIF SPICE kernels      : RAJobs_U111+rgf15.spk
URKALLv1.spk
Saturn_ring_plane.tf
sat378.bsp
sat286.bsp
vgr1.sat286.bsp
vgr2.sat286.bsp
HST1081HSPephemUTC.bsp
pfbl0000r.bsp
cassini.bsp
earthstns_itrf93_040916.bsp
earth_200101_990628_predict.bpc
earth_720101_070426.bpc
cpck28Mar2008.tpc
pck.sat440.tpc
IAU_SATURN_for_RINGFIT.tpc
naif0012.tls
earth_flat_IAU.spk
```

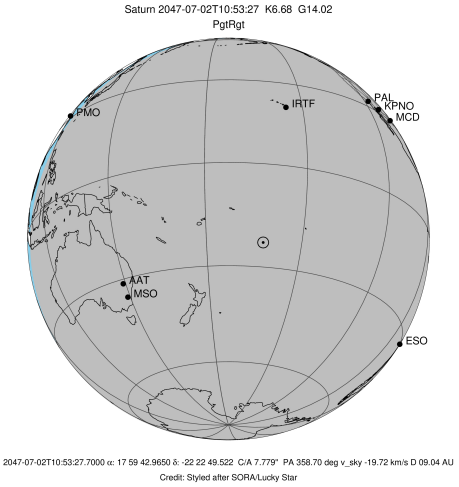


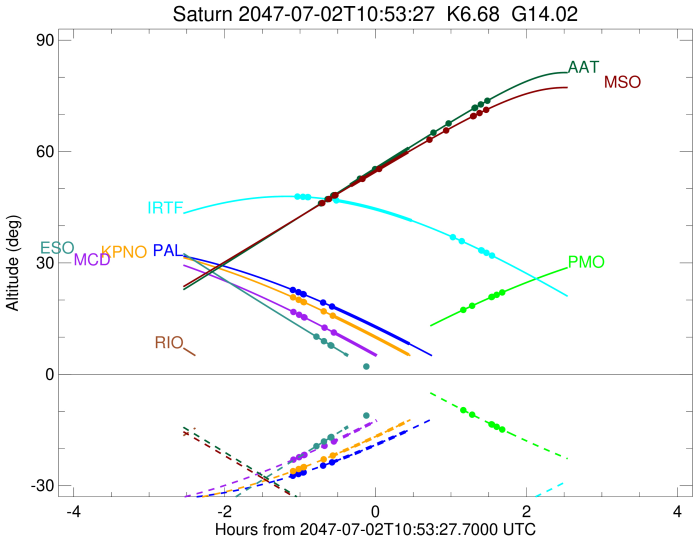
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-02T09:47:44.800		22.71	-27.34	140461.00	-14.10		
A (OER)	I	2047-07-02T09:52:10.455		22.11	-26.87	136774.40	-13.65		
Encke (OEG)	I	2047-07-02T09:55:55.711		21.59	-26.46	133744.89	-13.24		
Encke (IEG)	I	2047-07-02T09:56:20.035		21.53	-26.41	133423.31	-13.20		
A (IER)	I	2047-07-02T10:11:49.280		19.31	-24.61	122050.38	-11.19		
B (OER)	I	2047-07-02T10:18:49.503	b	18.26	-23.74	117571.16	-10.11		
Saturn	I	2047-07-02T10:18:46.540		18.27	-23.75	59445.19		-49.59	-54.96
Saturn	E	2047-07-02T11:20:26.092		8.18	-14.94	59692.49		-39.41	-45.02
B (OER)	E	2047-07-02T11:53:28.730		2.25x	-9.53	117571.16	10.05		
A (IER)	E	2047-07-02T12:00:31.870		0.94x	-8.32	122050.38	11.11		
Encke (IEG)	E	2047-07-02T12:16:10.168		-1.99x	-5.59	133423.31	13.05		
Encke (OEG)	E	2047-07-02T12:16:34.774		-2.07x	-5.52	133744.89	13.09		
A (OER)	E	2047-07-02T12:20:22.737		-2.79x	-4.84x	136774.40	13.48		
F ring	E	2047-07-02T12:24:51.814		-3.64x	-4.04x	140461.00	13.91		

Saturn_2047-07-02T10_53_27.7000_PMO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:14:16 2023

```
target                  : Saturn
target radius (km)      :  60268.00
C/A epoch               : 2047-07-02T10:57:50.490
Event type              : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code           : PMO
Location                : Purple Mtn Obs. Nanking
Latitude (deg)          :  32.06667
E. Longitude (deg)      : 118.82089
Altitude (km)           :   0.364
Gaia source ID          : 4069550064953140480
2Mass ID (if available) : 17594295-2222492
ICRS Star Coord at Epoch: 17h 59m 42.96499s -22:22:49.52183s
RUWE (>1.4 is poor)     :   1.15
K magnitude             :  6.684
G magnitude             : 14.021
RP magnitude            : 12.451
BP magnitude            : 17.905
DUPflag                 : 0
Distance (au)           :  9.043
f0 (km)                 :       0.000
g0 (km)                 :       0.000
skyplane vel. (km/s)    : -19.72
Sun-Target sep (deg)    :  170.01
Sun-Moon sep (deg)      :   57.12
B (ring opening deg)    :   26.52
PA of pole (deg)        :    5.51
Pole direction: RA (deg):  40.60000
Dec (deg):  83.50000
C/A sky separation (")  :   7.160
C/A sky separation (km) :  46964.8
NAIF SPICE kernels      : RAJobs_U111+rgf15.spk
URKALLv1.spk
Saturn_ring_plane.tf
sat378.bsp
sat286.bsp
vgr1.sat286.bsp
vgr2.sat286.bsp
HST1081HSPephemUTC.bsp
pfbl0000r.bsp
cassini.bsp
earthstns_itrf93_040916.bsp
earth_200101_990628_predict.bpc
earth_720101_070426.bpc
cpck28Mar2008.tpc
pck.sat440.tpc
IAU_SATURN_for_RINGFIT.tpc
naif0012.tls
earth_flat_IAU.spk
```

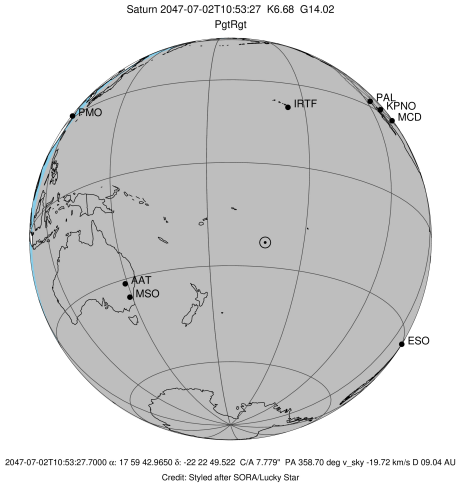




b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-02T09:57:47.510		-5.25x	14.12x	140461.00	-14.02		
A (OER)	I	2047-07-02T10:02:14.488		-4.39x	13.22x	136774.40	-13.59		
Encke (OEG)	I	2047-07-02T10:06:00.669		-3.65x	12.47x	133744.89	-13.19		
Encke (IEG)	I	2047-07-02T10:06:25.083		-3.57x	12.39x	133423.31	-13.15		
A (IER)	I	2047-07-02T10:21:55.921		-0.59x	9.30x	122050.38	-11.20		
B (OER)	I	2047-07-02T10:28:55.522	b	0.74x	7.92x	117571.16	-10.13		
Saturn	I	2047-07-02T10:27:17.558		0.44x	8.24x	59426.46		-50.37	-55.70
Saturn	E	2047-07-02T11:28:41.495		11.60	-3.47x	59701.33		-39.04	-44.65
B (OER)	E	2047-07-02T12:03:29.614		17.38	-9.70	117571.16	10.23		
A (IER)	E	2047-07-02T12:10:25.207		18.47	-10.90	122050.38	11.31		
Encke (IEG)	E	2047-07-02T12:25:46.462		20.81	-13.49	133423.31	13.30		
Encke (OEG)	E	2047-07-02T12:26:10.608		20.87	-13.56	133744.89	13.34		
A (OER)	E	2047-07-02T12:29:54.269		21.42	-14.18	136774.40	13.75		
F ring	E	2047-07-02T12:34:18.166		22.06	-14.90	140461.00	14.19		

Saturn_2047-07-02T10_53_27.7000_KPNO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:15:09 2023




```
target                  : Saturn
target radius (km)      :  60268.00
C/A epoch               : 2047-07-02T10:49:06.710
Event type              : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code           : KPNO
Location                : Kitt Peak Natl Obs
Latitude (deg)          :  31.96333
E. Longitude (deg)      : 248.40000
Altitude (km)           :   2.120
Gaia source ID          : 4069550064953140480
2Mass ID (if available) : 17594295-2222492
ICRS Star Coord at Epoch: 17h 59m 42.96499s -22:22:49.52183s
RUWE (>1.4 is poor)     :   1.15
K magnitude             :  6.684
G magnitude             : 14.021
RP magnitude            : 12.451
BP magnitude            : 17.905
DUPflag                 : 0
Distance (au)           :  9.043
f0 (km)                 :       0.000
g0 (km)                 :       0.000
skyplane vel. (km/s)    : -19.72
Sun-Target sep (deg)    :  170.01
Sun-Moon sep (deg)      :   58.00
B (ring opening deg)    :   26.52
PA of pole (deg)        :    5.51
Pole direction: RA (deg):  40.60000
Dec (deg):  83.50000
C/A sky separation (")  :   7.171
C/A sky separation (km) :  47031.6
NAIF SPICE kernels      : RAJobs_U111+rgf15.spk
URKALLv1.spk
Saturn_ring_plane.tf
sat378.bsp
sat286.bsp
vgr1.sat286.bsp
vgr2.sat286.bsp
HST1081HSPephemUTC.bsp
pfbl0000r.bsp
cassini.bsp
earthstns_itrf93_040916.bsp
earth_200101_990628_predict.bpc
earth_720101_070426.bpc
cpck28Mar2008.tpc
pck.sat440.tpc
IAU_SATURN_for_RINGFIT.tpc
naif0012.tls
earth_flat_IAU.spk
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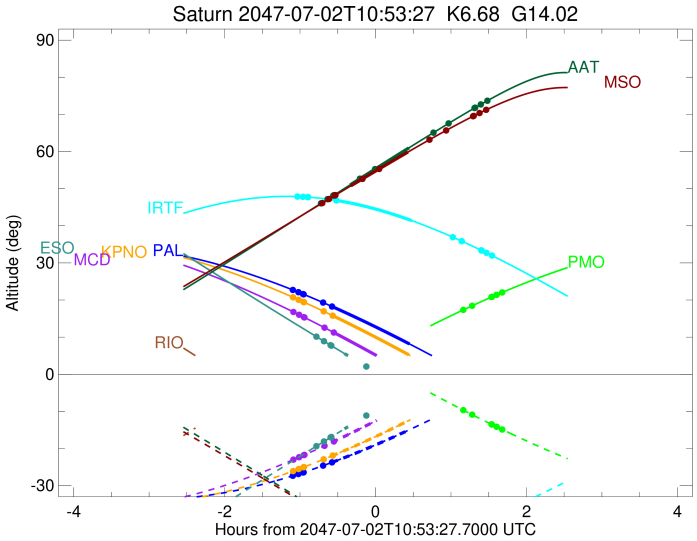
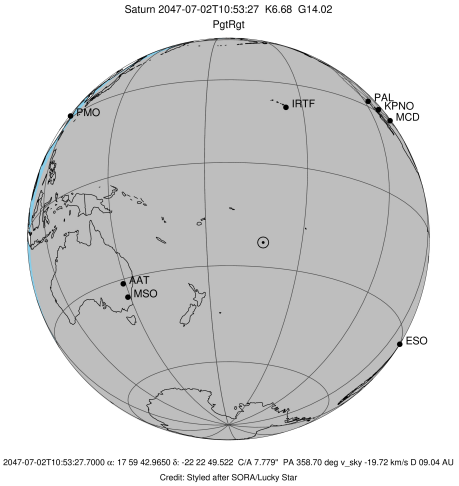


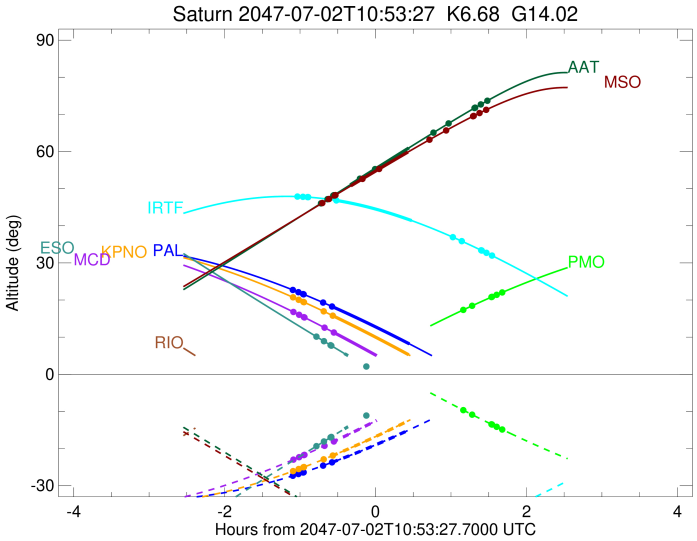
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-02T09:47:55.425		20.73	-26.09	140461.00	-13.98		
A (OER)	I	2047-07-02T09:52:23.378		20.06	-25.53	136774.40	-13.53		
Encke (OEG)	I	2047-07-02T09:56:10.782		19.48	-25.05	133744.89	-13.11		
Encke (IEG)	I	2047-07-02T09:56:35.351		19.42	-25.00	133423.31	-13.07		
A (IER)	I	2047-07-02T10:12:16.372		16.95	-22.91	122050.38	-11.02		
B (OER)	I	2047-07-02T10:19:24.246	b	15.80	-21.91	117571.16	-9.90		
Saturn	I	2047-07-02T10:18:44.556		15.90	-22.01	59438.22		-49.88	-55.23
Saturn	E	2047-07-02T11:19:53.450		5.25	-12.47	59683.60		-39.77	-45.39
B (OER)	E	2047-07-02T11:52:27.609		-0.87x	-6.80	117571.16	9.84		
A (IER)	E	2047-07-02T11:59:38.558		-2.25x	-5.51	122050.38	10.93		
Encke (IEG)	E	2047-07-02T12:15:29.122		-5.33x	-2.61x	133423.31	12.91		
Encke (OEG)	E	2047-07-02T12:15:53.987		-5.41x	-2.53x	133744.89	12.96		
A (OER)	E	2047-07-02T12:19:44.244		-6.17x	-1.82x	136774.40	13.35		
F ring	E	2047-07-02T12:24:15.802		-7.06x	-0.97x	140461.00	13.79		

Saturn_2047-07-02T10_53_27.7000_MCD.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:16:01 2023

target : Saturn
target radius (km) : 60268.00
C/A epoch : 2047-07-02T10:48:46.800
Event type : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : MCD
Location : McDonald Obs. 2.7m
Latitude (deg) : 30.67158
E. Longitude (deg) : 255.97844
Altitude (km) : 2.075
Gaia source ID : 4069550064953140480
2Mass ID (if available) : 17594295-2222492
ICRS Star Coord at Epoch: 17h 59m 42.96499s -22:22:49.52183s
RUWE (>1.4 is poor) : 1.15
K magnitude : 6.684
G magnitude : 14.021
RP magnitude : 12.451
BP magnitude : 17.905
DUPflag : 0
Distance (au) : 9.043
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.72
Sun-Target sep (deg) : 170.01
Sun-Moon sep (deg) : 57.95
B (ring opening deg) : 26.52
PA of pole (deg) : 5.51
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 7.225
C/A sky separation (km) : 47387.4
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
Saturn_ring_plane.tf
sat378.bsp
sat286.bsp
vgr1.sat286.bsp
vgr2.sat286.bsp
HST1081HSPephemUTC.bsp
pfbl0000r.bsp
cassini.bsp
earthstns_itrf93_040916.bsp
earth_200101_990628_predict.bpc
earth_720101_070426.bpc
cpck28Mar2008.tpc
pck.sat440.tpc
IAU_SATURN_for_RINGFIT.tpc
naif0012.tls
earth_flat_IAU.spk



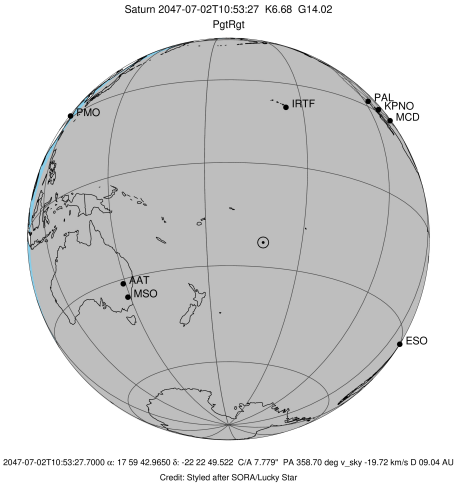


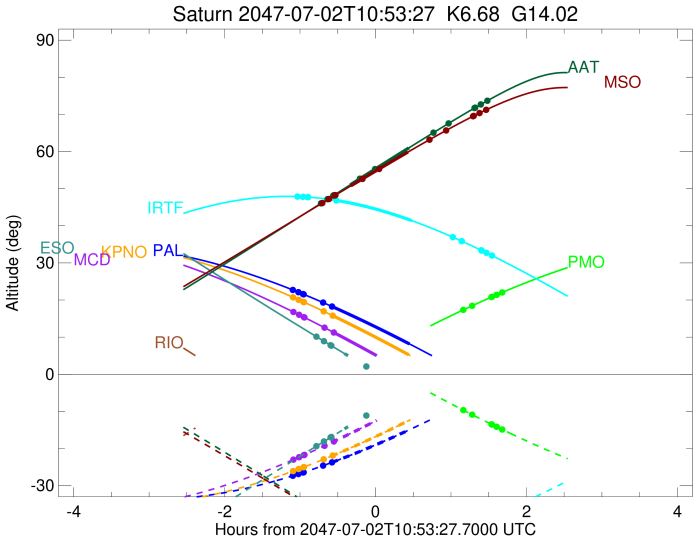
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-02T09:48:12.058		16.78	-23.00	140461.00	-13.82		
A (OER)	I	2047-07-02T09:52:43.276		16.03	-22.34	136774.40	-13.36		
Encke (OEG)	I	2047-07-02T09:56:33.730		15.38	-21.77	133744.89	-12.93		
Encke (IEG)	I	2047-07-02T09:56:58.645		15.31	-21.71	133423.31	-12.88		
A (IER)	I	2047-07-02T10:12:56.387		12.55	-19.27	122050.38	-10.78		
B (OER)	I	2047-07-02T10:20:15.222	b	11.26	-18.12	117571.16	-9.62		
Saturn	I	2047-07-02T10:18:44.741		11.53	-18.36	59428.85		-50.27	-55.60
Saturn	E	2047-07-02T11:19:13.820		0.28x	-8.02	59671.87		-40.26	-45.88
B (OER)	E	2047-07-02T11:51:10.432		-6.00x	-2.10x	117571.16	9.56		
A (IER)	E	2047-07-02T11:58:32.491		-7.48x	-0.70x	122050.38	10.69		
Encke (IEG)	E	2047-07-02T12:14:40.270		-10.74x	2.41x	133423.31	12.72		
Encke (OEG)	E	2047-07-02T12:15:05.497		-10.82x	2.49x	133744.89	12.77		
A (OER)	E	2047-07-02T12:18:58.953		-11.62x	3.25x	136774.40	13.18		
F ring	E	2047-07-02T12:23:33.966		-12.55x	4.15x	140461.00	13.63		

Saturn_2047-07-02T10_53_27.7000_IRTF.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:17:46 2023

target : Saturn
target radius (km) : 60268.00
C/A epoch : 2047-07-02T10:51:44.360
Event type : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : IRTF
Location : Mauna Kea/IRTF
Latitude (deg) : 19.82622
E. Longitude (deg) : 204.52800
Altitude (km) : 4.168
Gaia source ID : 4069550064953140480
2Mass ID (if available) : 17594295-2222492
ICRS Star Coord at Epoch: 17h 59m 42.96499s -22:22:49.52183s
RUWE (>1.4 is poor) : 1.15
K magnitude : 6.684
G magnitude : 14.021
RP magnitude : 12.451
BP magnitude : 17.905
DUPflag : 0
Distance (au) : 9.043
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.72
Sun-Target sep (deg) : 170.01
Sun-Moon sep (deg) : 58.20
B (ring opening deg) : 26.52
PA of pole (deg) : 5.51
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 7.150
C/A sky separation (km) : 46898.7
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
Saturn_ring_plane.tf
sat378.bsp
sat286.bsp
vgr1.sat286.bsp
vgr2.sat286.bsp
HST1081HSPephemUTC.bsp
pfbl0000r.bsp
cassini.bsp
earthstns_itrf93_040916.bsp
earth_200101_990628_predict.bpc
earth_720101_070426.bpc
cpck28Mar2008.tpc
pck.sat440.tpc
IAU_SATURN_for_RINGFIT.tpc
naif0012.tls
earth_flat_IAU.spk



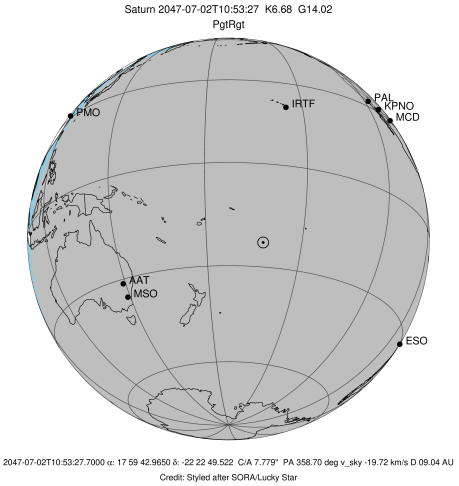


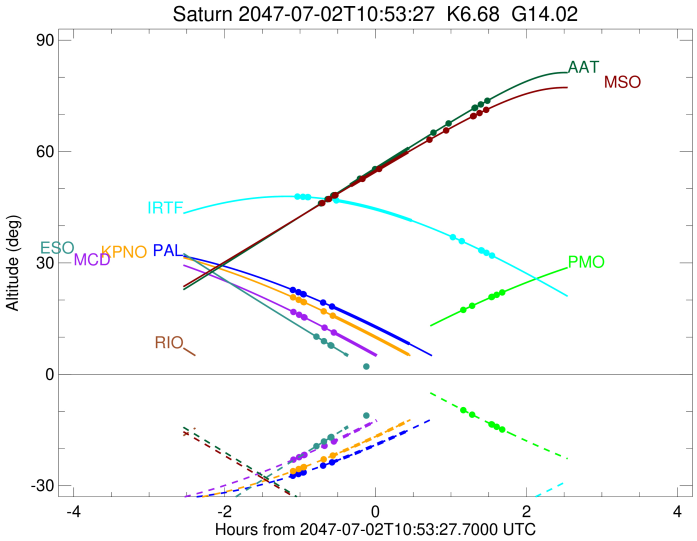
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-02T09:51:24.328		47.87	-46.46	140461.00	-14.22		
A (OER)	I	2047-07-02T09:55:47.773		47.80	-46.65	136774.40	-13.77		
Encke (OEG)	I	2047-07-02T09:59:31.160		47.72	-46.80	133744.89	-13.35		
Encke (IEG)	I	2047-07-02T09:59:55.283		47.71	-46.81	133423.31	-13.31		
A (IER)	I	2047-07-02T10:15:17.085		47.18	-47.20	122050.38	-11.28		
B (OER)	I	2047-07-02T10:22:14.288	b	46.83	-47.27	117571.16	-10.17		
Saturn	I	2047-07-02T10:21:33.411		46.87	-47.27	59437.77		-49.90	-55.25
Saturn	E	2047-07-02T11:22:17.570		41.39	-45.13	59691.83		-39.43	-45.05
B (OER)	E	2047-07-02T11:55:11.662		36.90	-42.06	117571.16	10.15		
A (IER)	E	2047-07-02T12:02:10.260		35.84	-41.26	122050.38	11.23		
Encke (IEG)	E	2047-07-02T12:17:37.028		33.38	-39.34	133423.31	13.22		
Encke (OEG)	E	2047-07-02T12:18:01.313		33.31	-39.29	133744.89	13.26		
A (OER)	E	2047-07-02T12:21:46.262		32.70	-38.79	136774.40	13.67		
F ring	E	2047-07-02T12:26:11.706		31.95	-38.18	140461.00	14.11		

Saturn_2047-07-02T10_53_27.7000_ESO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:20:24 2023

target : Saturn
target radius (km) : 60268.00
C/A epoch : 2047-07-02T10:48:34.340
Event type : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : ESO
Location : European Southern Obs. (3.6m)
Latitude (deg) : -29.26097
E. Longitude (deg) : 289.26831
Altitude (km) : 2.400
Gaia source ID : 4069550064953140480
2Mass ID (if available) : 17594295-2222492
ICRS Star Coord at Epoch: 17h 59m 42.96499s -22:22:49.52183s
RUWE (>1.4 is poor) : 1.15
K magnitude : 6.684
G magnitude : 14.021
RP magnitude : 12.451
BP magnitude : 17.905
DUPflag : 0
Distance (au) : 9.043
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.72
Sun-Target sep (deg) : 170.01
Sun-Moon sep (deg) : 57.84
B (ring opening deg) : 26.52
PA of pole (deg) : 5.51
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 8.302
C/A sky separation (km) : 54450.8
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
Saturn_ring_plane.tf
sat378.bsp
sat286.bsp
vgr1.sat286.bsp
vgr2.sat286.bsp
HST1081HSPephemUTC.bsp
pfbl0000r.bsp
cassini.bsp
earthstns_itrf93_040916.bsp
earth_200101_990628_predict.bpc
earth_720101_070426.bpc
cpck28Mar2008.tpc
pck.sat440.tpc
IAU_SATURN_for_RINGFIT.tpc
naif0012.tls
earth_flat_IAU.spk



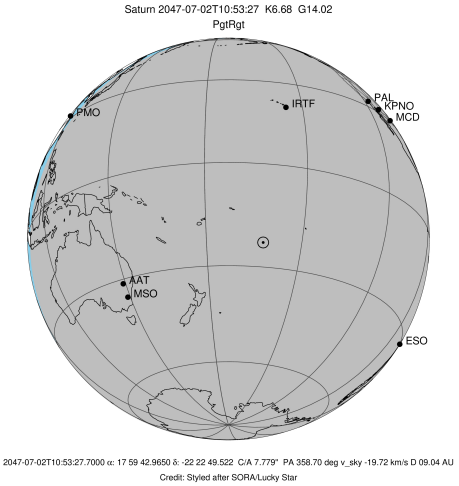


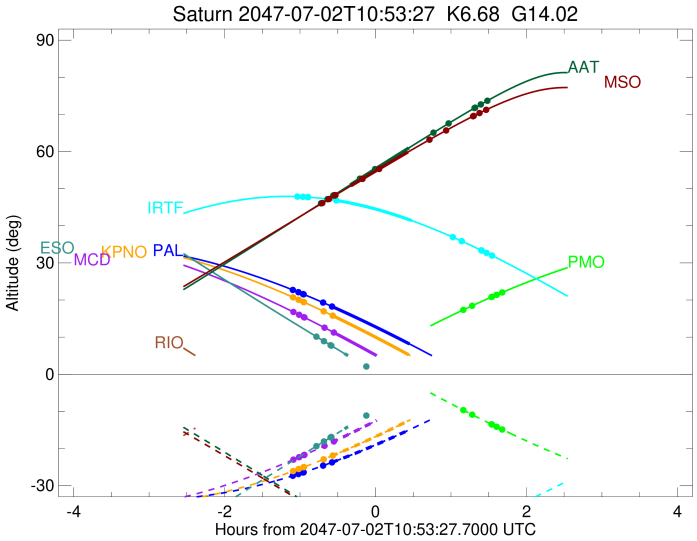
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-02T10:06:27.831		10.14	-19.36	140461.00	-10.69		
A (OER)	I	2047-07-02T10:12:25.713		8.91	-18.11	136774.40	-9.90		
Encke (OEG)	I	2047-07-02T10:17:43.467		7.83	-17.01	133744.89	-9.16		
Encke (IEG)	I	2047-07-02T10:18:18.753		7.71	-16.88	133423.31	-9.07		
A (IER)	I	2047-07-02T10:46:05.998	b	2.11x	-11.14	122050.38	-4.38		
Saturn	I	2047-07-02T10:28:48.258		5.58	-14.70	59232.30		-58.93	-63.55
Saturn	E	2047-07-02T11:08:46.094		-2.36x	-6.53	59414.88		-50.86	-56.15
A (IER)	E	2047-07-02T11:30:21.048		-6.51x	-2.23x	122050.38	4.37		
Encke (IEG)	E	2047-07-02T11:58:14.990		-11.69x	3.21x	133423.31	9.01		
Encke (OEG)	E	2047-07-02T11:58:50.533		-11.79x	3.32x	133744.89	9.09		
A (OER)	E	2047-07-02T12:04:10.842		-12.76x	4.34x	136774.40	9.82		
F ring	E	2047-07-02T12:10:12.098		-13.83x	5.48x	140461.00	10.58		

Saturn_2047-07-02T10_53_27.7000_AAT.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:21:19 2023

target : Saturn
target radius (km) : 60268.00
C/A epoch : 2047-07-02T10:56:27.090
Event type : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : AAT
Location : Siding Spring (AAT)
Latitude (deg) : -31.27703
E. Longitude (deg) : 149.06608
Altitude (km) : 1.164
Gaia source ID : 4069550064953140480
2Mass ID (if available) : 17594295-2222492
ICRS Star Coord at Epoch: 17h 59m 42.96499s -22:22:49.52183s
RUWE (>1.4 is poor) : 1.15
K magnitude : 6.684
G magnitude : 14.021
RP magnitude : 12.451
BP magnitude : 17.905
DUPflag : 0
Distance (au) : 9.043
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.72
Sun-Target sep (deg) : 170.01
Sun-Moon sep (deg) : 57.82
B (ring opening deg) : 26.52
PA of pole (deg) : 5.51
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 7.976
C/A sky separation (km) : 52315.6
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
Saturn_ring_plane.tf
sat378.bsp
sat286.bsp
vgr1.sat286.bsp
vgr2.sat286.bsp
HST1081HSPephemUTC.bsp
pfbl0000r.bsp
cassini.bsp
earthstns_itrf93_040916.bsp
earth_200101_990628_predict.bpc
earth_720101_070426.bpc
cpck28Mar2008.tpc
pck.sat440.tpc
IAU_SATURN_for_RINGFIT.tpc
naif0012.tls
earth_flat_IAU.spk



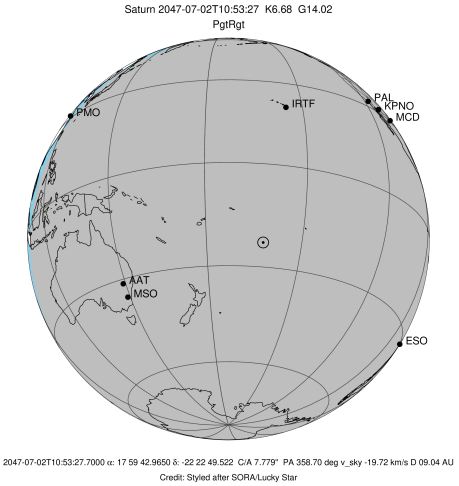


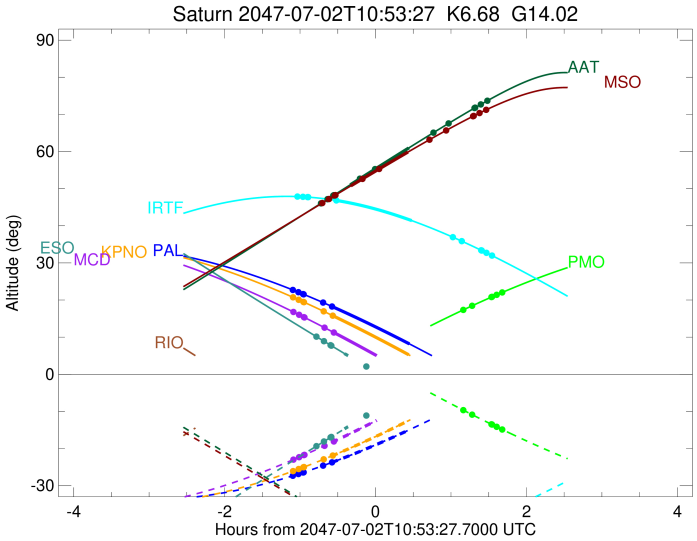
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-02T10:10:06.492		46.04	-37.09	140461.00	-12.08		
A (OER)	I	2047-07-02T10:15:19.980		47.16	-38.20	136774.40	-11.43		
Encke (OEG)	I	2047-07-02T10:19:52.164		48.13	-39.16	133744.89	-10.82		
Encke (IEG)	I	2047-07-02T10:20:21.971		48.24	-39.27	133423.31	-10.75		
A (IER)	I	2047-07-02T10:41:03.061	b	52.68	-43.68	122050.38	-7.43		
B (OER)	I	2047-07-02T10:52:53.761	b	55.21	-46.21	117571.16	-5.14		
Saturn	I	2047-07-02T10:33:16.120		51.01	-42.02	59281.72		-56.66	-61.50
Saturn	E	2047-07-02T11:20:00.741		60.99	-52.02	59512.54		-46.80	-52.30
B (OER)	E	2047-07-02T11:39:59.654		65.18	-56.29	117571.16	5.16		
A (IER)	E	2047-07-02T11:51:46.715		67.62	-58.79	122050.38	7.47		
Encke (IEG)	E	2047-07-02T12:12:20.940		71.75	-63.15	133423.31	10.81		
Encke (OEG)	E	2047-07-02T12:12:50.582		71.85	-63.25	133744.89	10.88		
A (OER)	E	2047-07-02T12:17:21.260		72.72	-64.20	136774.40	11.49		
F ring	E	2047-07-02T12:22:33.001		73.71	-65.29	140461.00	12.15		

Saturn_2047-07-02T10_53_27.7000_MSO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:23:09 2023

target : Saturn
target radius (km) : 60268.00
C/A epoch : 2047-07-02T10:56:20.100
Event type : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : MSO
Location : Mt. Stromlo Observatory
Latitude (deg) : -35.32000
E. Longitude (deg) : 149.00833
Altitude (km) : 0.770
Gaia source ID : 4069550064953140480
2Mass ID (if available) : 17594295-2222492
ICRS Star Coord at Epoch: 17h 59m 42.96499s -22:22:49.52183s
RUWE (>1.4 is poor) : 1.15
K magnitude : 6.684
G magnitude : 14.021
RP magnitude : 12.451
BP magnitude : 17.905
DUPflag : 0
Distance (au) : 9.043
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.72
Sun-Target sep (deg) : 170.01
Sun-Moon sep (deg) : 57.82
B (ring opening deg) : 26.52
PA of pole (deg) : 5.51
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 8.041
C/A sky separation (km) : 52742.4
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
Saturn_ring_plane.tf
sat378.bsp
sat286.bsp
vgr1.sat286.bsp
vgr2.sat286.bsp
HST1081HSPephemUTC.bsp
pfbl0000r.bsp
cassini.bsp
earthstns_itrf93_040916.bsp
earth_200101_990628_predict.bpc
earth_720101_070426.bpc
cpck28Mar2008.tpc
pck.sat440.tpc
IAU_SATURN_for_RINGFIT.tpc
naif0012.tls
earth_flat_IAU.spk





b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-02T10:11:09.084		46.12	-37.61	140461.00	-11.88		
A (OER)	I	2047-07-02T10:16:28.365		47.21	-38.70	136774.40	-11.21		
Encke (OEG)	I	2047-07-02T10:21:06.438		48.15	-39.65	133744.89	-10.58		
Encke (IEG)	I	2047-07-02T10:21:36.947		48.26	-39.75	133423.31	-10.50		
A (IER)	I	2047-07-02T10:43:05.284	b	52.63	-44.14	122050.38	-7.00		
B (OER)	I	2047-07-02T10:56:05.047	b	55.25	-46.79	117571.16	-4.45		
Saturn	I	2047-07-02T10:33:50.127		50.75	-42.25	59270.28		-57.17	-61.97
Saturn	E	2047-07-02T11:19:13.109		59.85	-51.50	59495.79		-47.49	-52.96
B (OER)	E	2047-07-02T11:36:54.093		63.28	-55.08	117571.16	4.46		
A (IER)	E	2047-07-02T11:49:50.128		65.72	-57.67	122050.38	7.03		
Encke (IEG)	E	2047-07-02T12:11:11.537		69.53	-61.89	133423.31	10.56		
Encke (OEG)	E	2047-07-02T12:11:41.883		69.62	-61.98	133744.89	10.63		
A (OER)	E	2047-07-02T12:16:18.463		70.40	-62.88	136774.40	11.27		
F ring	E	2047-07-02T12:21:36.024		71.26	-63.90	140461.00	11.94		