

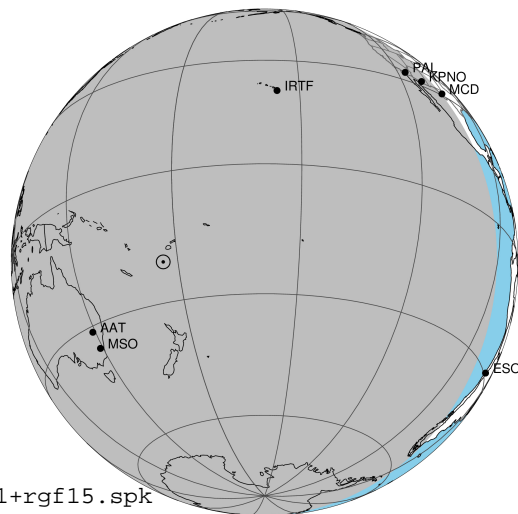
target : Jupiter  
 target radius (km) : 71492.00  
 C/A epoch : 2031-05-24T12:11:58.940  
 Event type : Pgt  
 : Jupiter occs: geocentric, topocentric  
 : Not a ringed target  
 Gaia source ID : 4116870193627491840  
 2Mass ID (if available) : 17435572-2252455

Jupiter 2031-05-24T12:11:58 K8.43 G14.31 Pgt

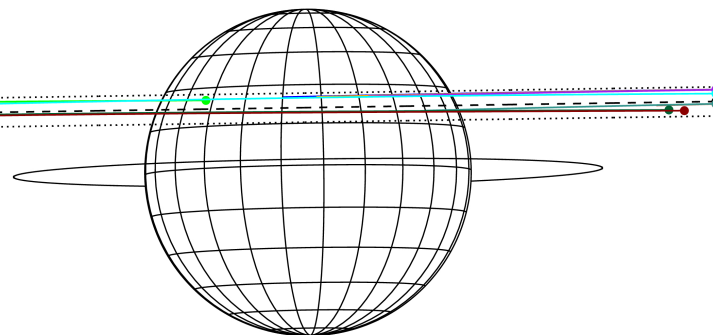
ICRS Star Coord at Epoch: 17h 43m 55.72328s -22:52:45.66874s

RUWE (>1.4 is poor) : 0.94  
 K magnitude : 8.426  
 G magnitude : 14.309  
 RP magnitude : 12.878  
 BP magnitude : 16.970  
 DUPflag : 0  
 Distance (au) : 4.344  
 f0 (km) : 0.00  
 g0 (km) : 0.00  
 skyplane vel. (km/s) : -13.99  
 Sun-Target sep (deg) : 156.42  
 Sun-Moon sep (deg) : 167.98  
 B (ring opening deg) : -2.61  
 PA of pole (deg) : 0.89  
 Pole direction: RA (deg): 268.05694  
 Dec (deg): 64.49651  
 C/A sky separation (") : 9.020  
 C/A sky separation (km) : 28420.2  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk

Jupiter 2031-05-24T12:11:58 K8.43 G14.31  
 Pgt



Earth  
 PAL  
 PMO  
 KPNO  
 MCD  
 IRTF  
 KAV  
 RIO  
 ESO  
 AAT  
 MSO

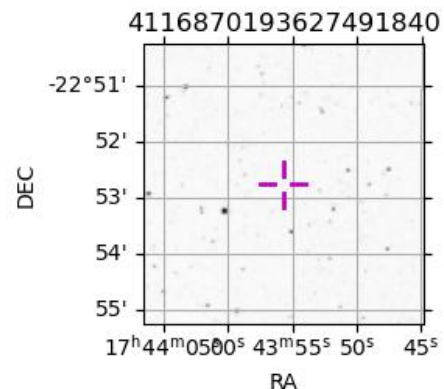


2031-05-24T12:11:58.9400 at: 17 43 55.7233 s: -22 52 45.6689 C/A 9.008" PA 180.86 deg v\_sky -13.99 km/s D 04.34 AU

Credit: Styled after SORA/Lucky Star

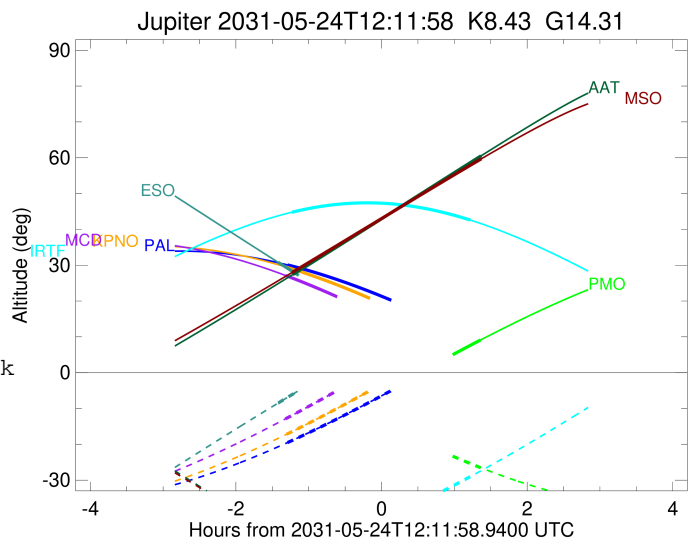
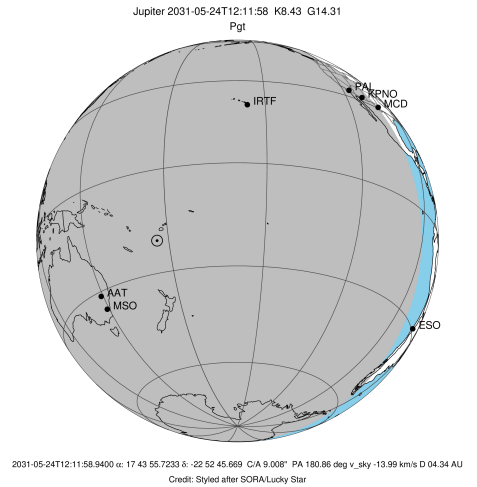
Observable events with sun below -5 deg and altitude above 5 deg

| Obs  | Location                          | lat   | Elon  | Target | Observed Events Interval    | OCode |
|------|-----------------------------------|-------|-------|--------|-----------------------------|-------|
| PIC  | Pic du Midi                       | 42.9  | 0.1   |        |                             | Pnn   |
| PAL  | Palomar Mt (200")                 | 33.4  | 243.1 | +      | MAY 24 10:54 - MAY 24 10:54 | Pin   |
| PMO  | Purple Mtn Obs. Nanking           | 32.1  | 118.8 | +      | MAY 24 13:33 - MAY 24 13:33 | Pne   |
| KPNO | Kitt Peak Natl Obs                | 32.0  | 248.4 | +      | MAY 24 10:53 - MAY 24 10:53 | Pin   |
| MCD  | McDonald Obs. 2.7m                | 30.7  | 256.0 | +      | MAY 24 10:52 - MAY 24 10:52 | Pin   |
| TEN  | Teide Obs./Tenerife               | 28.3  | 343.5 |        |                             | Pnn   |
| IRTF | Mauna Kea/IRTF                    | 19.8  | 204.5 | +      | MAY 24 10:58 - MAY 24 13:25 | Pie   |
| KAV  | Kavalur Observatory               | 12.6  | 78.8  |        |                             | Pnn   |
| RIO  | Rio de Janeiro                    | -22.9 | 316.8 |        |                             | Pnn   |
| ESO  | European Southern Obs. (3.6m)     | -29.3 | 289.3 | +      | MAY 24 10:46 - MAY 24 10:46 | Pin   |
| AAT  | Siding Spring (AAT)               | -31.3 | 149.1 | +      | MAY 24 10:58 - MAY 24 13:34 | Pie   |
| SAAO | So. Afr. Astro. Obs. (Sutherland) | -32.4 | 20.8  |        |                             | Pnn   |
| MSO  | Mt. Stromlo Observatory           | -35.3 | 149.0 | +      | MAY 24 10:58 - MAY 24 13:34 | Pie   |



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-05-24T12:08:10.550
Event type          : Pgt
                    : Jupiter occs: geocentric, topocentric
                    : Not a ringed target
Observer code       : PAL
Location            : Palomar Mt (200")
Latitude (deg)      : 33.35622
E. Longitude (deg)  : 243.13601
Altitude (km)       : 1.706
Gaia source ID      : 4116870193627491840
2Mass ID (if available) : 17435572-2252455
ICRS Star Coord at Epoch: 17h 43m 55.72328s -22:52:45.66874s
RUWE (>1.4 is poor) : 0.94
K magnitude         : 8.426
G magnitude         : 14.309
RP magnitude        : 12.878
BP magnitude        : 16.970
DUPflag            : 0
Distance (au)       : 4.344
f0 (km)             : 0.00
g0 (km)             : 0.00
skyplane vel. (km/s) : -13.99
Sun-Target sep (deg) : 156.42
Sun-Moon sep (deg)  : 167.42
B (ring opening deg) : -2.61
PA of pole (deg)    : 0.89
Pole direction: RA (deg): 268.05694
Dec (deg): 64.49651
C/A sky separation (" ) : 10.553
C/A sky separation (km) : 33249.4
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

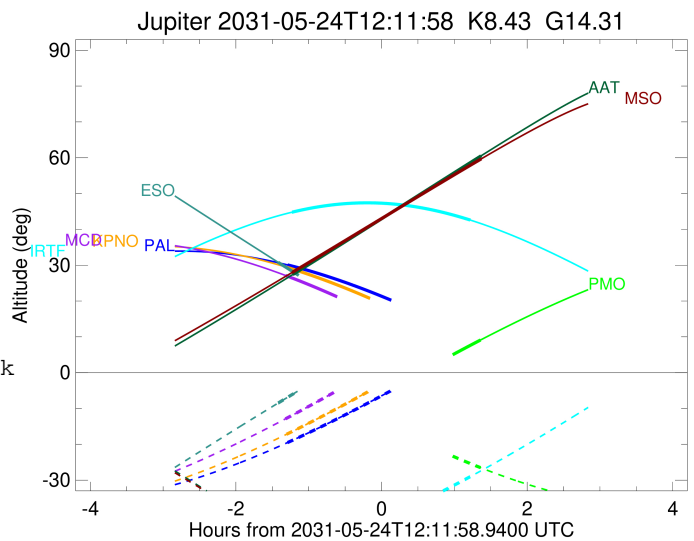
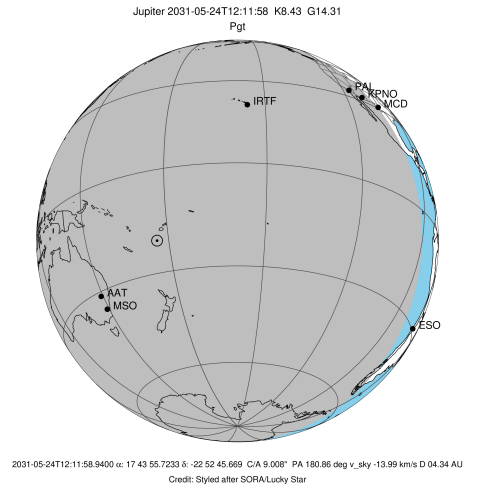


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-05-24T10:54:27.001 | 30.09 | -19.53  | 71490.0 | 27.95   | 31.19        |
| Jupiter | E   | 2031-05-24T13:22:15.475 | 10.48 | 6.84x   | 71490.0 | 27.26   | 30.46        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-05-24T12:17:59.310
Event type          : Pgt
                    : Jupiter occs: geocentric, topocentric
                    : Not a ringed target
Observer code       : PMO
Location            : Purple Mtn Obs. Nanking
Latitude (deg)      : 32.06667
E. Longitude (deg)  : 118.82089
Altitude (km)       : 0.364
Gaia source ID      : 4116870193627491840
2Mass ID (if available) : 17435572-2252455
ICRS Star Coord at Epoch: 17h 43m 55.72328s -22:52:45.66874s
RUWE (>1.4 is poor) : 0.94
K magnitude          : 8.426
G magnitude          : 14.309
RP magnitude         : 12.878
BP magnitude         : 16.970
DUPflag             : 0
Distance (au)        : 4.344
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -13.99
Sun-Target sep (deg) : 156.42
Sun-Moon sep (deg)   : 168.56
B (ring opening deg) : -2.61
PA of pole (deg)     : 0.89
Pole direction: RA (deg): 268.05694
Dec (deg): 64.49651
C/A sky separation ("): 10.087
C/A sky separation (km): 31781.8
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

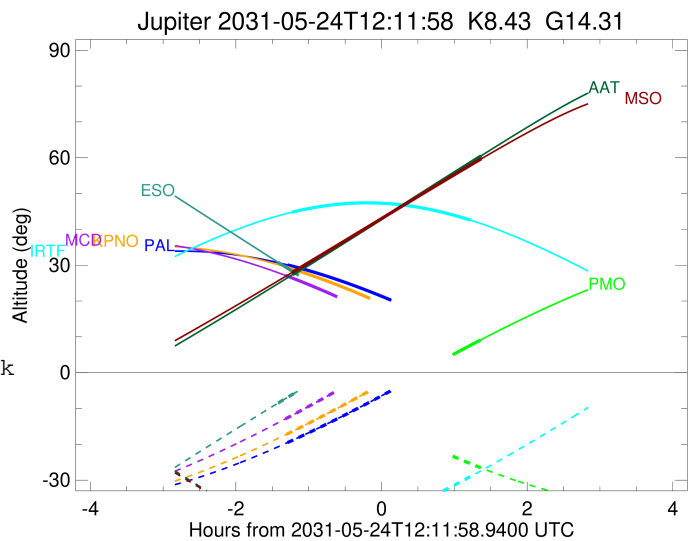
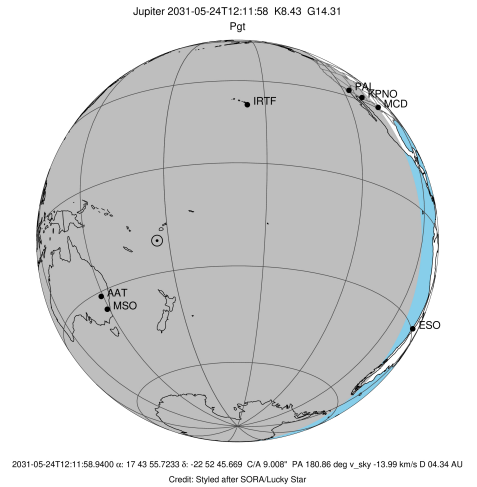


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt     | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|---------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-05-24T11:01:38.757 | -20.27x | -1.05x  | 71490.3 | 25.71   | 28.79        |
| Jupiter | E   | 2031-05-24T13:33:35.686 | 9.12    | -26.51  | 71490.1 | 26.99   | 30.17        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-05-24T12:07:42.990
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code         : KPNO
Location              : Kitt Peak Natl Obs
Latitude (deg)        : 31.96333
E. Longitude (deg)    : 248.40000
Altitude (km)         : 2.120
Gaia source ID        : 4116870193627491840
2Mass ID (if available) : 17435572-2252455
ICRS Star Coord at Epoch: 17h 43m 55.72328s -22:52:45.66874s
RUWE (>1.4 is poor) : 0.94
K magnitude           : 8.426
G magnitude           : 14.309
RP magnitude          : 12.878
BP magnitude          : 16.970
DUPflag              : 0
Distance (au)         : 4.344
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -13.99
Sun-Target sep (deg) : 156.42
Sun-Moon sep (deg)   : 167.36
B (ring opening deg) : -2.61
PA of pole (deg)     : 0.89
Pole direction: RA (deg): 268.05694
Dec (deg): 64.49651
C/A sky separation ("): 10.483
C/A sky separation (km): 33029.9
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

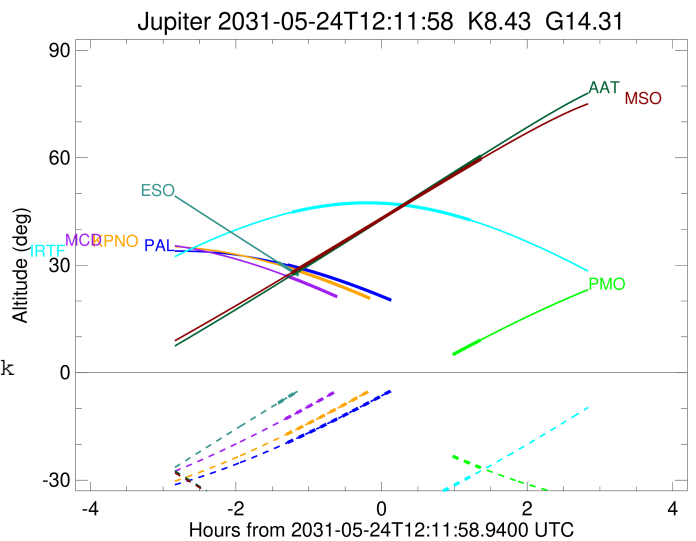
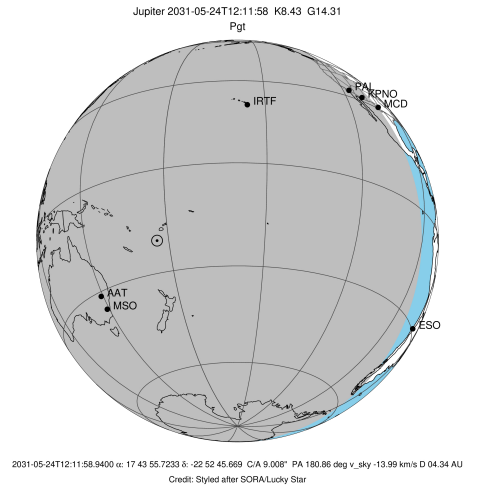


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-05-24T10:53:47.134 | 29.42 | -17.19  | 71490.0 | 27.80   | 31.04        |
| Jupiter | E   | 2031-05-24T13:22:03.308 | 7.65  | 10.53x  | 71490.1 | 27.02   | 30.20        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-05-24T12:07:08.220
Event type          : Pgt
                    : Jupiter occs: geocentric, topocentric
                    : Not a ringed target
Observer code       : MCD
Location            : McDonald Obs. 2.7m
Latitude (deg)      : 30.67158
E. Longitude (deg)  : 255.97844
Altitude (km)       : 2.075
Gaia source ID      : 4116870193627491840
2Mass ID (if available) : 17435572-2252455
ICRS Star Coord at Epoch: 17h 43m 55.72328s -22:52:45.66874s
RUWE (>1.4 is poor) : 0.94
K magnitude          : 8.426
G magnitude          : 14.309
RP magnitude         : 12.878
BP magnitude         : 16.970
DUPflag             : 0
Distance (au)       : 4.344
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -13.99
Sun-Target sep (deg) : 156.42
Sun-Moon sep (deg)  : 167.29
B (ring opening deg) : -2.61
PA of pole (deg)    : 0.89
Pole direction: RA (deg): 268.05694
Dec (deg): 64.49651
C/A sky separation ("): 10.389
C/A sky separation (km) : 32733.1
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

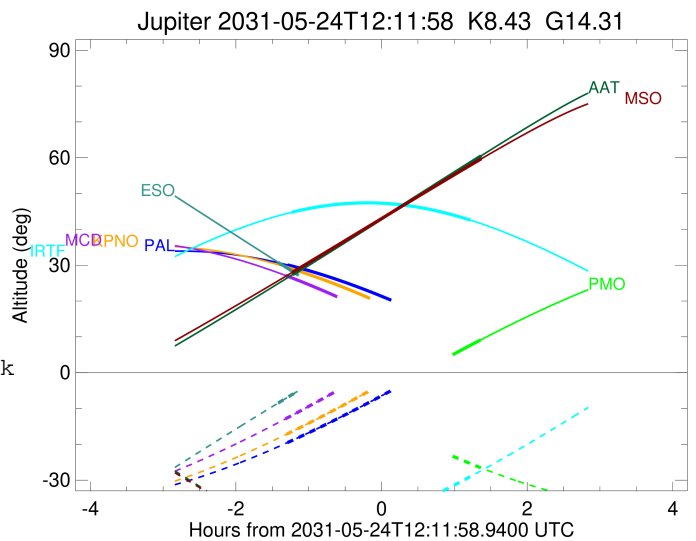
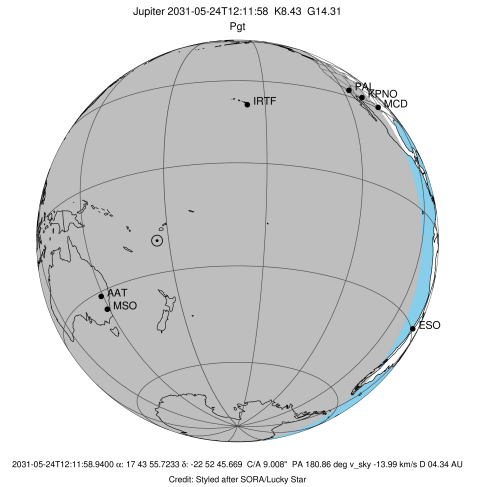


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-05-24T10:52:52.992 | 27.13 | -12.88  | 71490.0 | 27.60   | 30.82        |
| Jupiter | E   | 2031-05-24T13:21:51.967 | 2.78x | 16.35x  | 71490.1 | 26.70   | 29.86        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-05-24T12:11:41.430
Event type          : Pgt
                    : Jupiter occs: geocentric, topocentric
                    : Not a ringed target
Observer code       : IRTF
Location            : Mauna Kea/IRTF
Latitude (deg)      : 19.82622
E. Longitude (deg)  : 204.52800
Altitude (km)       : 4.168
Gaia source ID      : 4116870193627491840
2Mass ID (if available) : 17435572-2252455
ICRS Star Coord at Epoch: 17h 43m 55.72328s -22:52:45.66874s
RUWE (>1.4 is poor) : 0.94
K magnitude          : 8.426
G magnitude          : 14.309
RP magnitude         : 12.878
BP magnitude         : 16.970
DUPflag             : 0
Distance (au)       : 4.344
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -13.99
Sun-Target sep (deg) : 156.42
Sun-Moon sep (deg)  : 167.93
B (ring opening deg) : -2.61
PA of pole (deg)    : 0.89
Pole direction: RA (deg): 268.05694
Dec (deg): 64.49651
C/A sky separation ("): 10.391
C/A sky separation (km): 32738.4
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

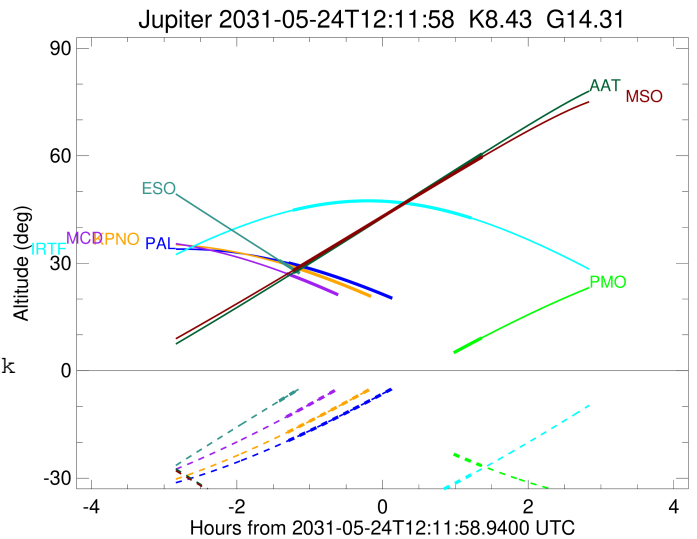
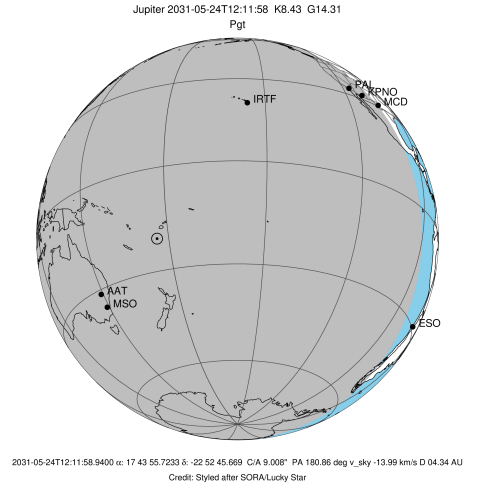


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-05-24T10:58:09.762 | 44.78 | -48.39  | 71490.1 | 27.10   | 30.28        |
| Jupiter | E   | 2031-05-24T13:25:11.959 | 42.59 | -29.01  | 71490.1 | 27.13   | 30.32        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-05-24T12:05:40.120
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
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        : 4116870193627491840
2Mass ID (if available) : 17435572-2252455
ICRS Star Coord at Epoch: 17h 43m 55.72328s -22:52:45.66874s
RUWE (>1.4 is poor) : 0.94
K magnitude           : 8.426
G magnitude           : 14.309
RP magnitude          : 12.878
BP magnitude          : 16.970
DUPflag              : 0
Distance (au)         : 4.344
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -13.99
Sun-Target sep (deg)  : 156.42
Sun-Moon sep (deg)    : 167.35
B (ring opening deg) : -2.61
PA of pole (deg)      : 0.89
Pole direction: RA (deg): 268.05694
Dec (deg): 64.49651
C/A sky separation (" ) : 8.181
C/A sky separation (km) : 25777.3
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

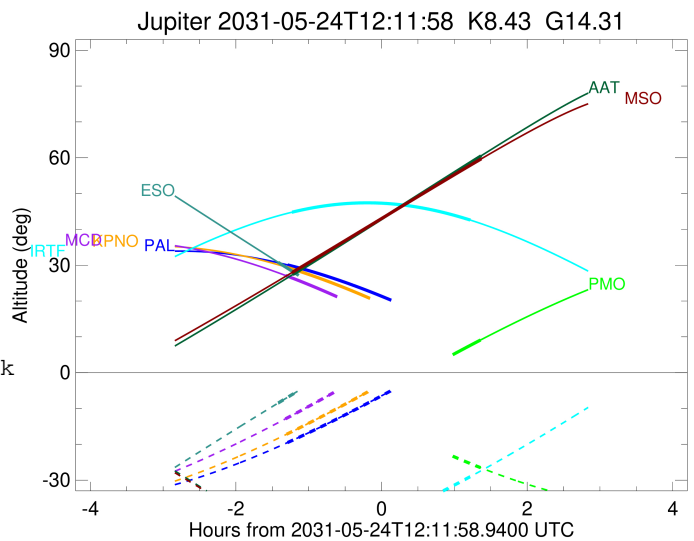
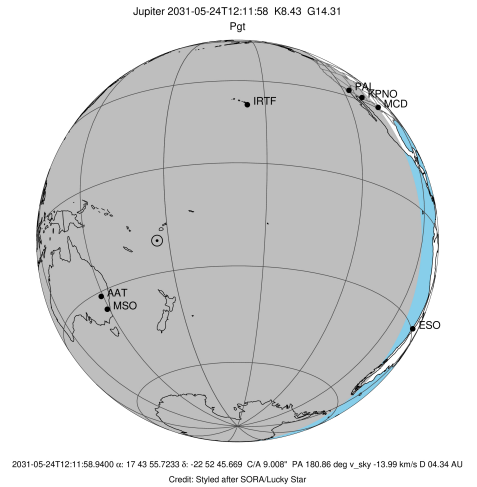


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt    | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|--------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-05-24T10:46:44.757 | 30.81  | -8.49   | 71490.7 | 21.70   | 24.44        |
| Jupiter | E   | 2031-05-24T13:25:18.177 | -1.95x | 21.55x  | 71490.9 | 20.50   | 23.12        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-05-24T12:16:45.300
Event type           : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code        : AAT
Location             : Siding Spring (AAT)
Latitude (deg)       : -31.27703
E. Longitude (deg)   : 149.06608
Altitude (km)        : 1.164
Gaia source ID       : 4116870193627491840
2Mass ID (if available) : 17435572-2252455
ICRS Star Coord at Epoch: 17h 43m 55.72328s -22:52:45.66874s
RUWE (>1.4 is poor) : 0.94
K magnitude           : 8.426
G magnitude           : 14.309
RP magnitude          : 12.878
BP magnitude          : 16.970
DUPflag              : 0
Distance (au)         : 4.344
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -13.99
Sun-Target sep (deg) : 156.42
Sun-Moon sep (deg)   : 168.74
B (ring opening deg) : -2.61
PA of pole (deg)     : 0.89
Pole direction: RA (deg): 268.05694
Dec (deg): 64.49651
C/A sky separation ("): 8.463
C/A sky separation (km): 26665.2
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```



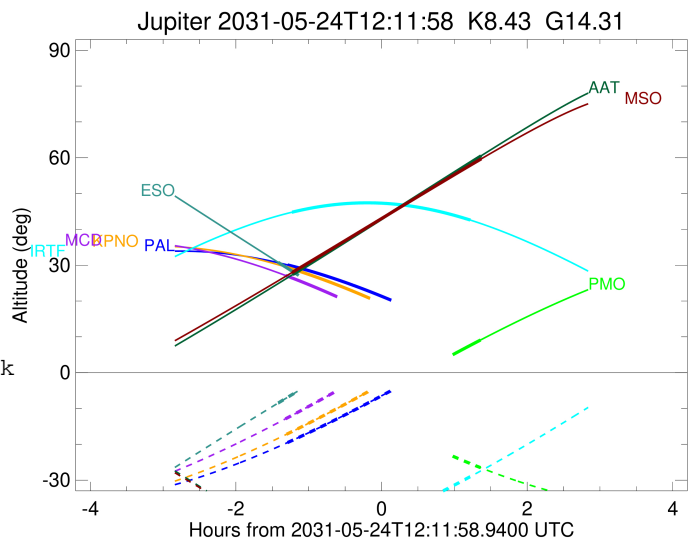
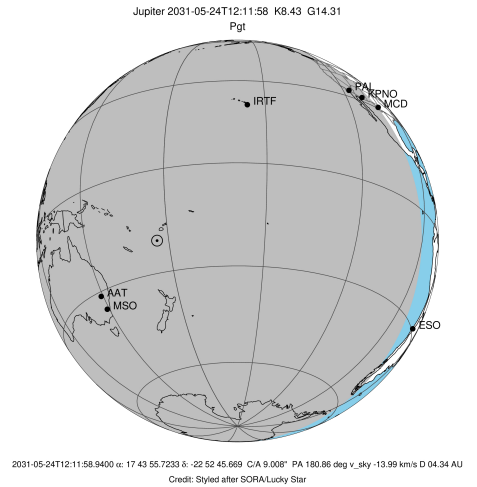
x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-05-24T10:58:44.819 | 27.36 | -48.14  | 71490.8 | 21.29   | 23.99        |
| Jupiter | E   | 2031-05-24T13:34:08.571 | 60.54 | -78.10  | 71490.7 | 22.33   | 25.13        |



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-05-24T12:16:32.620
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code         : MSO
Location              : Mt. Stromlo Observatory
Latitude (deg)        : -35.32000
E. Longitude (deg)    : 149.00833
Altitude (km)         : 0.770
Gaia source ID        : 4116870193627491840
2Mass ID (if available) : 17435572-2252455
ICRS Star Coord at Epoch: 17h 43m 55.72328s -22:52:45.66874s
RUWE (>1.4 is poor)  : 0.94
K magnitude           : 8.426
G magnitude           : 14.309
RP magnitude          : 12.878
BP magnitude          : 16.970
DUPflag              : 0
Distance (au)         : 4.344
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s)  : -13.99
Sun-Target sep (deg)  : 156.42
Sun-Moon sep (deg)    : 168.72
B (ring opening deg)  : -2.61
PA of pole (deg)      : 0.89
Pole direction: RA (deg): 268.05694
Dec (deg): 64.49651
C/A sky separation (") : 8.334
C/A sky separation (km) : 26259.3
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```



x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-05-24T10:58:17.688 | 27.96 | -47.63  | 71490.8 | 20.97   | 23.63        |
| Jupiter | E   | 2031-05-24T13:34:11.538 | 59.68 | -74.51  | 71490.7 | 21.96   | 24.73        |