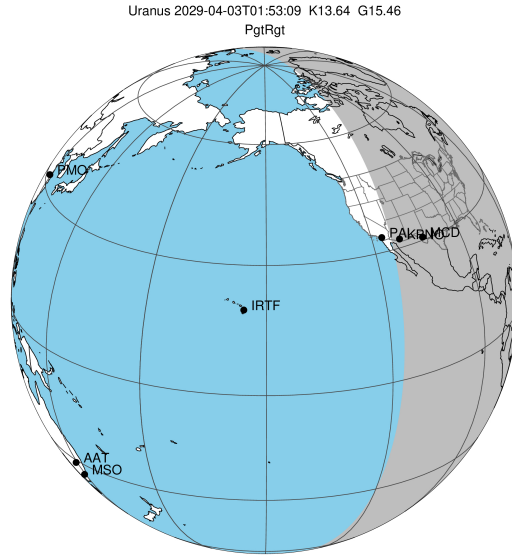


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-04-03T01:53:09.900  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 144913472173512576  
 2Mass ID (if available) : 04362284+2202150

Uranus 2029-04-03T01:53:09 K13.64 G15.46 PgtRgt

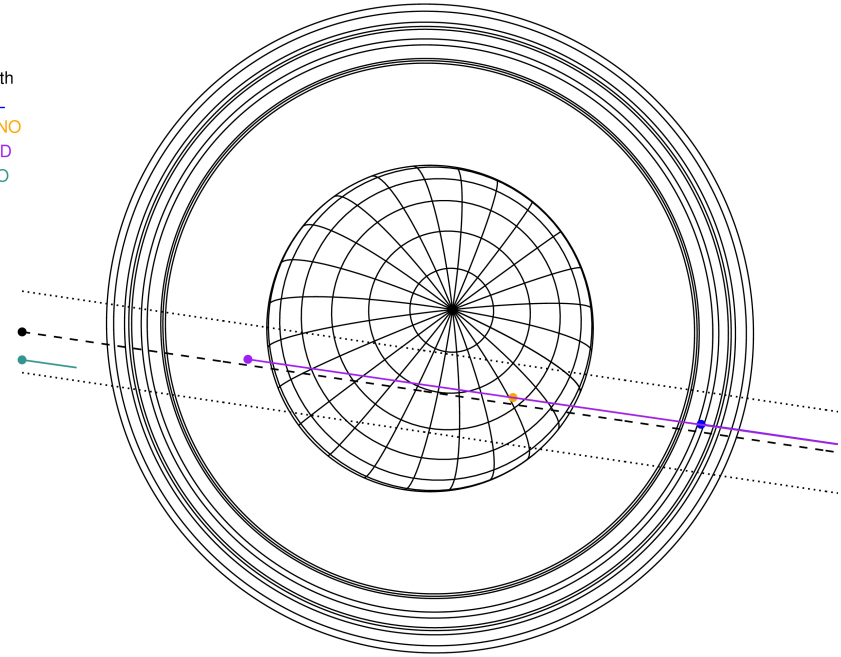
ICRS Star Coord at Epoch: 04h 36m 22.85005s +22:02:14.95983s

RUWE (>1.4 is poor) : 0.98  
 K magnitude : 13.639  
 G magnitude : 15.463  
 RP magnitude : 14.827  
 BP magnitude : 15.919  
 DUPflag : 0  
 Distance (au) : 19.790  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 22.32  
 Sun-Target sep (deg) : 57.49  
 Sun-Moon sep (deg) : 176.82  
 B (ring opening deg) : 79.63  
 PA of pole (deg) : -49.99



2029-04-03T01:53:09.9000 ex: 04 36 22.8501 s: +22 02 14.960 C/A 0.683° PA 351.60 deg v\_sky +22.32 km/s D 19.79 AU  
 Credit: Styled after SORA/Lucky Star

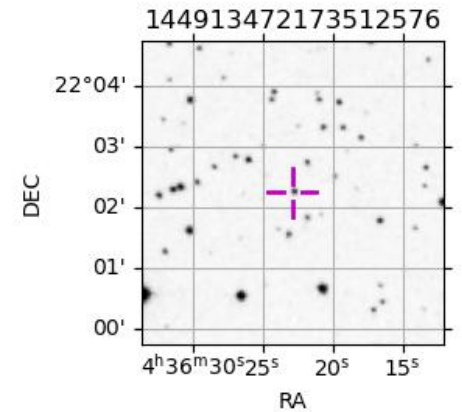
Earth  
 PAL  
 KPNO  
 MCD  
 ESO



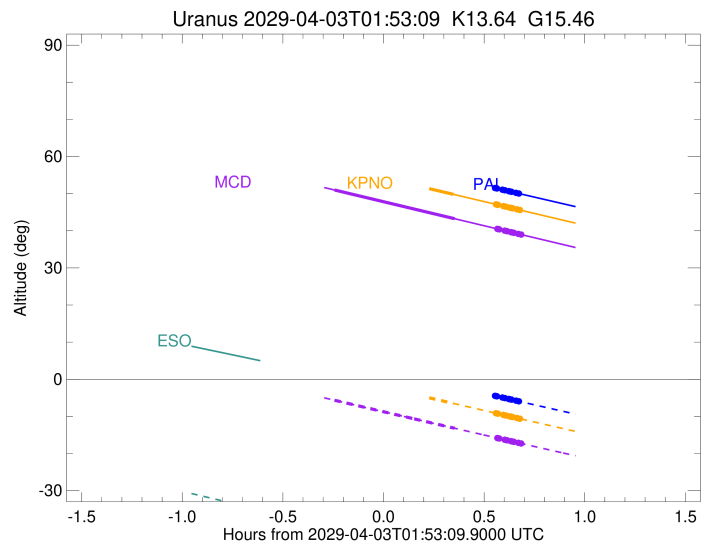
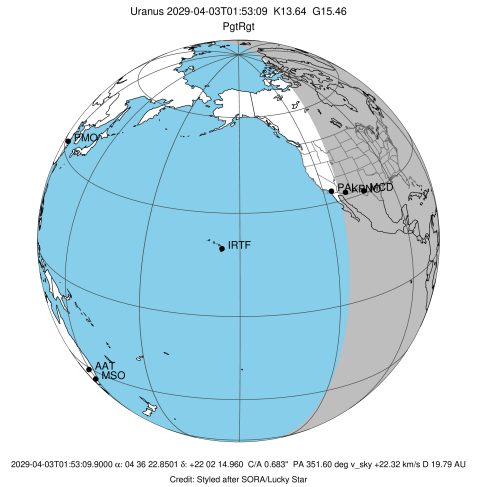
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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 (200")	33.4	243.1			+++++	APR 03 02:29 - APR 03 02:33	PnnRne
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4		+	+++++	APR 03 02:13 - APR 03 02:34	PneRne
MCD	McDonald Obs. 2.7m	30.7	256.0		+	+++++	APR 03 01:38 - APR 03 02:34	PieRne
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European Southern Obs	-29.3	289.3					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

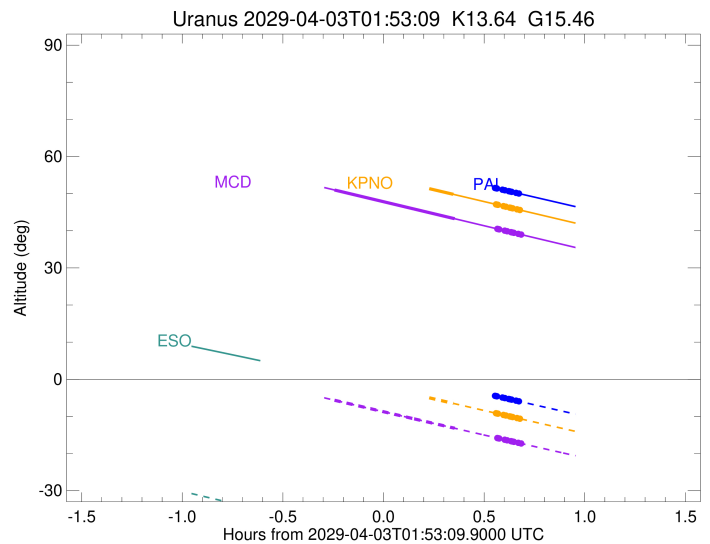
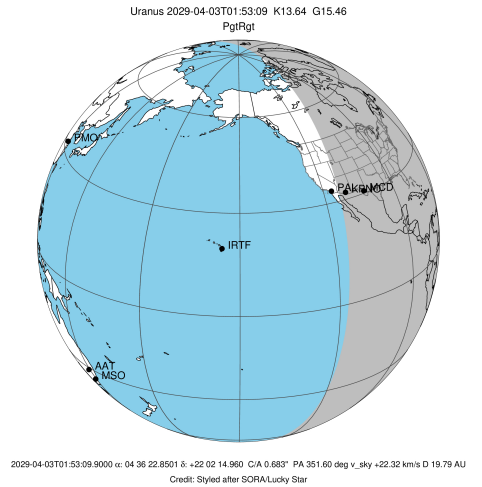


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-04-03T01:55:33.530  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 144913472173512576  
 2Mass ID (if available) : 04362284+2202150  
 ICRS Star Coord at Epoch: 04h 36m 22.85005s +22:02:14.95983s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 13.639  
 G magnitude : 15.463  
 RP magnitude : 14.827  
 BP magnitude : 15.919  
 DUPflag : 0  
 Distance (au) : 19.790  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 22.32  
 Sun-Target sep (deg) : 57.49  
 Sun-Moon sep (deg) : 176.99  
 B (ring opening deg) : 79.63  
 PA of pole (deg) : -49.99  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.609  
 C/A sky separation (km) : 8735.6  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 ura111.bsp  
 IAU\_URANUS\_for\_RINGFIT.tpc  
 vgr2.ura111.bsp  
 ura161.bsp  
 vgr2.ura161.bsp  
 peph.ura160.bsp  
 earthstns\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



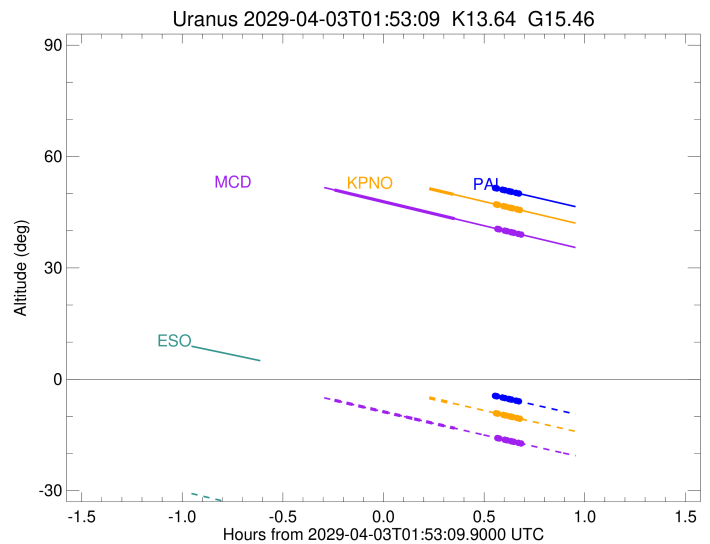
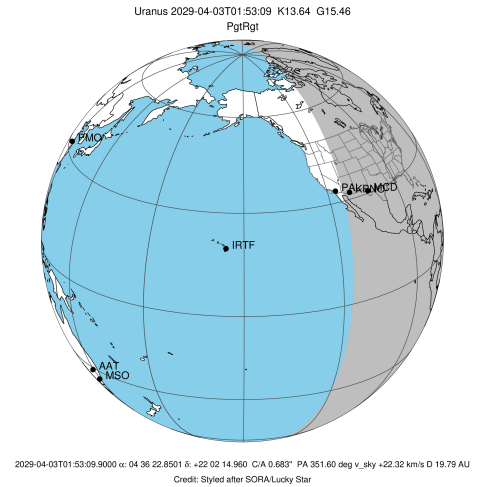
Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-04-03T01:17:58.683	65.51	9.78x	50821.47	-21.75		
lambda	I	2029-04-03T01:18:35.207	65.39	9.65x	50026.71	-21.75		
delta	I	2029-04-03T01:19:54.608	65.13	9.38x	48300.35	-21.73		
gamma	I	2029-04-03T01:20:25.452	65.03	9.27x	47630.29	-21.72		
eta	I	2029-04-03T01:20:46.366	64.96	9.20x	47176.12	-21.71		
beta	I	2029-04-03T01:21:55.479	64.73	8.96x	45675.81	-21.68		
alpha	I	2029-04-03T01:22:40.477	64.58	8.80x	44700.23	-21.67		
4	I	2029-04-03T01:24:20.915	64.25	8.45x	42530.35	-21.62		
5	I	2029-04-03T01:24:37.631	64.19	8.39x	42162.94	-21.61		
6	I	2029-04-03T01:24:54.868	64.14	8.33x	41796.71	-21.61		
Uranus	I	2029-04-03T01:37:42.049	61.57	5.66x	25113.76		-9.15	-9.58
Uranus	E	2029-04-03T02:13:41.712	54.17	-1.84x	25479.63		3.81	3.99
6	E	2029-04-03T02:26:25.659	51.52	-4.47x	41868.86	21.68		
5	E	2029-04-03T02:26:44.943	51.46	-4.54x	42286.27	21.68		
4	E	2029-04-03T02:26:59.340	51.41	-4.59x	42600.65	21.70		
alpha	E	2029-04-03T02:28:38.214	51.06	-4.93x	44746.42	21.75		
beta	E	2029-04-03T02:29:19.410	50.92	-5.07	45642.36	21.76		
eta	E	2029-04-03T02:30:29.816	50.67	-5.31	47176.12	21.79		
gamma	E	2029-04-03T02:30:50.238	50.60	-5.38	47621.26	21.80		
delta	E	2029-04-03T02:31:21.378	50.49	-5.49	48300.35	21.81		
lambda	E	2029-04-03T02:32:40.469	50.22	-5.76	50026.71	21.84		
epsilon	E	2029-04-03T02:33:42.063	50.00	-5.97	51372.63	21.84		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-04-03T01:55:53.620  
 Event type : PgtRgt  
 : Uranus 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 : 144913472173512576  
 2Mass ID (if available) : 04362284+2202150  
 ICRS Star Coord at Epoch: 04h 36m 22.85005s +22:02:14.95983s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 13.639  
 G magnitude : 15.463  
 RP magnitude : 14.827  
 BP magnitude : 15.919  
 DUPflag : 0  
 Distance (au) : 19.790  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 22.32  
 Sun-Target sep (deg) : 57.49  
 Sun-Moon sep (deg) : 177.03  
 B (ring opening deg) : 79.63  
 PA of pole (deg) : -49.99  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.615  
 C/A sky separation (km) : 8832.3  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 ura111.bsp  
 IAU\_URANUS\_for\_RINGFIT.tpc  
 vgr2.ura111.bsp  
 ura161.bsp  
 vgr2.ura161.bsp  
 peph.ura160.bsp  
 earthstns\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-04-03T01:18:20.952	61.57	5.23x	50820.85	-21.75		
lambda	I	2029-04-03T01:18:57.444	61.44	5.10x	50026.71	-21.76		
delta	I	2029-04-03T01:20:16.838	61.16	4.82x	48300.35	-21.73		
gamma	I	2029-04-03T01:20:47.680	61.06	4.71x	47630.28	-21.72		
eta	I	2029-04-03T01:21:08.592	60.98	4.63x	47176.12	-21.71		
beta	I	2029-04-03T01:22:17.703	60.74	4.39x	45675.77	-21.69		
alpha	I	2029-04-03T01:23:02.694	60.59	4.23x	44700.32	-21.67		
4	I	2029-04-03T01:24:43.138	60.24	3.88x	42530.29	-21.62		
5	I	2029-04-03T01:24:59.855	60.18	3.82x	42162.84	-21.61		
6	I	2029-04-03T01:25:17.091	60.12	3.76x	41796.67	-21.60		
Uranus	I	2029-04-03T01:38:04.564	57.43	1.05x	25111.55		-9.17	-9.60
Uranus	E	2029-04-03T02:13:59.433	49.82	-6.50	25480.97		3.78	3.95
6	E	2029-04-03T02:26:43.377	47.11	-9.15	41868.81	21.69		
5	E	2029-04-03T02:27:02.651	47.04	-9.22	42286.17	21.69		
4	E	2029-04-03T02:27:17.045	46.99	-9.27	42600.59	21.70		
alpha	E	2029-04-03T02:28:55.879	46.64	-9.61	44746.45	21.76		
beta	E	2029-04-03T02:29:37.054	46.49	-9.75	45642.35	21.77		
eta	E	2029-04-03T02:30:47.426	46.24	-10.00	47176.12	21.81		
gamma	E	2029-04-03T02:31:07.836	46.17	-10.07	47621.26	21.81		
delta	E	2029-04-03T02:31:38.959	46.06	-10.17	48300.35	21.83		
lambda	E	2029-04-03T02:32:58.006	45.78	-10.45	50026.71	21.85		
epsilon	E	2029-04-03T02:33:59.544	45.56	-10.66	51372.20	21.85		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-04-03T01:56:20.190  
 Event type : PgtRgt  
 : Uranus 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 : 144913472173512576  
 2Mass ID (if available) : 04362284+2202150  
 ICRS Star Coord at Epoch: 04h 36m 22.85005s +22:02:14.95983s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 13.639  
 G magnitude : 15.463  
 RP magnitude : 14.827  
 BP magnitude : 15.919  
 DUPflag : 0  
 Distance (au) : 19.790  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 22.32  
 Sun-Target sep (deg) : 57.49  
 Sun-Moon sep (deg) : 177.07  
 B (ring opening deg) : 79.63  
 PA of pole (deg) : -49.99  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.617  
 C/A sky separation (km) : 8861.1  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 ura111.bsp  
 IAU\_URANUS\_for\_RINGFIT.tpc  
 vgr2.ura111.bsp  
 ura161.bsp  
 vgr2.ura161.bsp  
 peph.ura160.bsp  
 earthstns\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-04-03T01:18:50.555		55.24	-1.45x	50820.49	-21.77		
lambda	I	2029-04-03T01:19:26.996		55.11	-1.58x	50026.71	-21.78		
delta	I	2029-04-03T01:20:46.314		54.82	-1.86x	48300.35	-21.75		
gamma	I	2029-04-03T01:21:17.126		54.71	-1.97x	47630.27	-21.74		
eta	I	2029-04-03T01:21:38.019		54.64	-2.05x	47176.12	-21.73		
beta	I	2029-04-03T01:22:47.064		54.39	-2.29x	45675.75	-21.71		
alpha	I	2029-04-03T01:23:32.008		54.23	-2.45x	44700.36	-21.69		
4	I	2029-04-03T01:25:12.360		53.87	-2.81x	42530.26	-21.64		
5	I	2029-04-03T01:25:29.061		53.81	-2.87x	42162.78	-21.63		
6	I	2029-04-03T01:25:46.280		53.74	-2.93x	41796.65	-21.63		
Uranus	I	2029-04-03T01:38:33.064		50.99	-5.65	25110.55		-9.18	-9.61
Uranus	E	2029-04-03T02:14:23.945		43.25	-13.20	25481.08		3.77	3.95
6	E	2029-04-03T02:27:06.873		40.51	-15.84	41868.81	21.72		
5	E	2029-04-03T02:27:26.118		40.44	-15.90	42286.18	21.72		
4	E	2029-04-03T02:27:40.491		40.39	-15.95	42600.60	21.74		
alpha	E	2029-04-03T02:29:19.175		40.03	-16.29	44746.45	21.79		
beta	E	2029-04-03T02:30:00.287		39.88	-16.43	45642.35	21.81		
eta	E	2029-04-03T02:31:10.550		39.63	-16.67	47176.12	21.84		
gamma	E	2029-04-03T02:31:30.929		39.56	-16.74	47621.26	21.85		
delta	E	2029-04-03T02:32:02.003		39.45	-16.85	48300.35	21.86		
lambda	E	2029-04-03T02:33:20.925		39.16	-17.12	50026.71	21.89		
epsilon	E	2029-04-03T02:34:22.370		38.94	-17.33	51372.31	21.88		