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### Select start of calculation:

Date:

Time:  :  :  .   in TDT

### Select duration:



## Bright Satellites

### Select satellite events for your location

- Tracking of satellites all over the sky.
- Searching for satellites in lower Earth orbit (LEO) found within an area of 20° diameter and centered at coordinates RA=16.7 h Dec=38.9166°. This point is taken from the last starchart geometry. To change the center and diameter, click [here](#) (field of view must be at least 1° and at most 90°). Satellites are chronologically sorted as they pass the selected point. If you are an astro photographer, you can also find the time interval where no LEO satellite will pass through your field of view.
















Mag. **Maximum magnitude** cutoff used for the following list (  Manual selection)









**Visible or not:** Calculate all passes, day or night, even if not optically visible
















### Thursday 18 June 2009
















Time (24-hour clock)	Object (Link)	Event
	Observer Site	On center line, France WGS84: Lon: +5d02m19.24s Lat: +43d47m28.40s Alt: 142m All times in CET or CEST (during summer)
23h50m39s ET-UT1=65.95s	<a href="#">Cosmos 862</a> (09495 1976-105-A)	<b>Appears</b> 23h05m26s 14.7mag az:326.4° NNW horizon <b>Culmination</b> 23h38m47s 11.2mag az: 67.3° ENE h:84.9° distance: 10087.8km height above Earth: 10072.3km elevation of Sun:















		<p>-17° angular velocity: 1.51'/s</p> <p><b>Closest</b> 23h44m38s 11.4mag <b>separation: 2.2° PA:-110.0°</b></p> <p><b>at Meridian</b> 1h26m05s 13.1mag az:180.0° S h:38.2°</p> <p><b>Disappears</b> 4h49m52s 14.0mag az:212.1° SSW horizon</p>	
 <p>23h51m27s ET-UT1=65.95s</p>	 <p><b>COSMOS 886 DEB</b> (09651 1976-126-H)</p> <p>→Ground track →Star chart</p>	<p><b>Appears</b> 23h39m51s 16.5mag az:325.8° NW horizon</p> <p><b>Culmination</b> 23h50m53s 10.9mag az:239.3° WSW h:85.7°</p> <p>distance: 1607.5km height above Earth: 1604.0km elevation of Sun:</p> <p>-18° angular velocity: 0.24°/s</p> <p><b>at Meridian</b> 23h51m23s 10.9mag az:180.0° S h:81.6°</p> <p><b>Closest</b> 23h51m27s 10.9mag <b>separation: 8.9° PA:-115.2°</b></p> <p><b>Disappears</b> 23h57m57s 11.9mag az:153.1° SSE h:24.9°</p>	
 <p>23h51m46s ET-UT1=65.95s</p>	 <p><b>IRIDIUM 33 DEB</b> (33852 1997-051-V)</p> <p>→Ground track →Star chart</p>	<p><b>Appears</b> 23h43m55s 16.1mag az:355.9° N horizon</p> <p><b>Culmination</b> 23h51m37s 10.5mag az:267.9° W h:88.0°</p> <p>distance: 788.0km height above Earth: 787.7km elevation of Sun: -18°</p> <p>angular velocity: 0.53°/s</p> <p><b>Closest</b> 23h51m46s 10.4mag <b>separation: 9.8° PA: -86.1°</b></p> <p><b>at Meridian</b> 23h53m31s 10.9mag az:180.0° S h:40.9°</p> <p><b>Disappears</b> 23h54m18s 11.3mag az:179.6° S h:29.8°</p>	
 <p>23h51m56s ET-UT1=65.95s</p>	 <p><b>FENGYUN 1C DEB</b> (29880 1999-025-GA)</p> <p>→Ground track →Star chart</p>	<p><b>Appears</b> 23h43m52s 16.2mag az: 12.5° NNE horizon</p> <p><b>at Meridian</b> 23h51m46s 11.4mag az: 0.0° N h:86.8°</p> <p><b>Culmination</b> 23h51m51s 11.4mag az:284.3° WNW h:89.2°</p> <p>distance: 817.9km height above Earth: 817.9km elevation of Sun: -18°</p> <p>angular velocity: 0.52°/s</p> <p><b>Closest</b> 23h51m56s 11.4mag <b>separation: 9.6° PA: -69.5°</b></p> <p><b>Disappears</b> 23h55m06s 12.5mag az:195.2° SSW h:23.6°</p>	
 <p>23h52m00s ET-UT1=65.95s</p>	 <p><b>THORAD AGENA D D</b> (04717 1970-025-CB)</p> <p>→Ground track →Star chart</p>	<p><b>Appears</b> 23h42m50s 15.6mag az: 16.0° NNE horizon</p> <p><b>Culmination</b> 23h51m55s 11.2mag az:105.6° ESE h:80.8°</p> <p>distance: 1076.4km height above Earth: 1064.6km elevation of Sun:</p> <p>-18° angular velocity: 0.39°/s</p> <p><b>Closest</b> 23h52m00s 11.2mag <b>separation: 25.5' PA: 112.2°</b></p> <p><b>at Meridian</b> 23h53m17s 11.2mag az:180.0° S h:58.7°</p> <p><b>Disappears</b> 23h56m34s 12.5mag az:191.7° SSW h:20.7°</p>	
 <p>23h52m03s ET-UT1=65.95s</p>	 <p><b>WESTFORD NEEDLES</b> (00629)</p>	<p><b>Appears</b> 23h28m39s 14.5mag az:355.6° N horizon</p> <p><b>Culmination</b> 23h51m20s 10.4mag az: 89.9° E h:86.9°</p>	











		<p>distance: 3510.3km height above Earth: 3507.2km elevation of Sun: -18° angular velocity: 6.13'/s</p> <p><b>Closest</b> 23h52m03s 10.4mag <b>separation:</b> 4.9° <b>PA:</b> -85.0°</p> <p><b>at Meridian</b> 0h05m01s 11.0mag az:180.0° S h:23.5°</p> <p><b>Disappears</b> 0h07m03s 11.2mag az:180.5° S h:17.3°</p>	
 23h52m27s ET-UT1=65.95s	 DELTA 1 DEB (07142) 1973-086-DG) →Ground track →Star chart	<p><b>Appears</b> 23h46m44s 11.1mag az:161.5° SSE h:23.5°</p> <p><b>at Meridian</b> 23h52m16s 10.2mag az:180.0° S h:79.8°</p> <p><b>Closest</b> 23h52m27s 10.2mag <b>separation:</b> 9.3° <b>PA:</b> -103.0°</p> <p><b>Culmination</b> 23h52m53s 10.3mag az:250.4° WSW h:86.5°</p> <p>distance: 1580.5km height above Earth: 1578.4km elevation of Sun: -18° angular velocity: 0.26°/s</p> <p><b>Disappears</b> 0h04m44s 16.0mag az:342.0° NNW horizon</p>	
 23h53m26s ET-UT1=65.95s	 Cosmos 2252 (22687) 1993-038-A) →Ground track →Star chart	<p><b>Appears</b> 23h46m48s 10.7mag az:186.3° S h:17.0°</p> <p><b>Closest</b> 23h53m26s 9.4mag <b>separation:</b> 8.7° <b>PA:</b> -76.1°</p> <p><b>Culmination</b> 23h53m38s 9.5mag az:277.1° W h:89.5°</p> <p>distance: 1409.3km height above Earth: 1409.4km elevation of Sun: -18° angular velocity: 0.29°/s</p> <p><b>at Meridian</b> 23h53m52s 9.5mag az: 0.0° N h:85.8°</p> <p><b>Disappears</b> 0h04m51s 14.0mag az: 9.3° N horizon</p>	
 23h53m33s ET-UT1=65.95s	 IRIDIUM 33 DEB (34152) 1997-051-EF) →Ground track →Star chart	<p><b>Appears</b> 23h45m59s 16.6mag az:356.4° N horizon</p> <p><b>at Meridian</b> 23h52m18s 11.9mag az: 0.0° N h:55.2°</p> <p><b>Culmination</b> 23h53m25s 10.9mag az: 87.5° E h:88.2°</p> <p>distance: 725.7km height above Earth: 725.5km elevation of Sun: -18° angular velocity: 0.58°/s</p> <p><b>Closest</b> 23h53m33s 10.8mag <b>separation:</b> 5.6° <b>PA:</b> -86.4°</p> <p><b>Disappears</b> 23h55m37s 11.6mag az:176.6° S h:33.1°</p>	
 23h53m38s ET-UT1=65.95s	 SL-16 DEB (22224) 1992-076-F) →Ground track →Star chart	<p><b>Appears</b> 23h46m31s 12.6mag az:203.3° SSW h:9.0°</p> <p><b>Closest</b> 23h53m38s 10.5mag <b>separation:</b> 9.8° <b>PA:</b> -59.1°</p> <p><b>Culmination</b> 23h53m40s 10.5mag az:294.1° WNW h:89.0°</p> <p>distance: 1036.5km height above Earth: 1036.5km elevation of Sun: -18° angular velocity: 0.40°/s</p> <p><b>at Meridian</b> 23h53m46s 10.5mag az: 0.0° N h:87.5°</p> <p><b>Disappears</b> 0h02m33s 14.5mag az: 25.7° NNE horizon</p>	









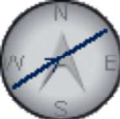






 <p>23h54m26s ET-UT1=65.95s</p>	 <p>FENGYUN 1C DEB (30968) 1999-025-BBJ) →Ground track →Star chart</p>	<p><b>Appears</b> 23h52m14s 12.6mag az:159.1° SSE h:32.6°  <b>Closest</b> 23h54m26s 11.9mag separation: 16.3' PA:-100.0°  <b>Culmination</b> 23h54m38s 12.0mag az: 73.5° ENE h:84.4°  distance: 794.7km height above Earth: 791.4km elevation of Sun: -18°  angular velocity: 0.55°/s  <b>at Meridian</b> 23h55m13s 12.4mag az: 0.0° N h:70.7°  <b>Disappears</b> 0h02m21s 18.3mag az:346.3° NNW horizon</p>	
 <p>23h54m35s ET-UT1=65.95s</p>	 <p>FENGYUN 1C DEB (29850) 1999-025-EU) →Ground track →Star chart</p>	<p><b>Appears</b> 23h46m07s 15.3mag az: 12.5° NNE horizon  <b>Culmination</b> 23h54m30s 10.6mag az:104.0° ESE h:89.4°  distance: 903.5km height above Earth: 903.6km elevation of Sun: -18°  angular velocity: 0.47°/s  <b>at Meridian</b> 23h54m35s 10.6mag az:180.0° S h:87.5°  <b>Closest</b> 23h54m35s 10.6mag separation: 7.7° PA: -70.1°  <b>Disappears</b> 23h58m11s 11.7mag az:194.3° SSW h:23.0°</p>	
 <p>23h54m57s ET-UT1=65.95s</p>	 <p>OV 3-1 (02150) 1966-034-A) →Ground track →Star chart</p>	<p><b>Appears</b> 23h33m15s 15.5mag az:349.6° N horizon  <b>at Meridian</b> 23h53m59s 11.3mag az: 0.0° N h:89.7°  <b>Culmination</b> 23h54m02s 11.3mag az: 84.5° E h:90.0°  distance: 3337.1km height above Earth: 3337.3km elevation of Sun:  -18° angular velocity: 5.80°/s  <b>Closest</b> 23h54m57s 11.3mag separation: 6.9° PA: -91.2°  <b>Disappears</b> 0h09m08s 11.9mag az:176.5° S h:20.3°</p>	
 <p>23h55m35s ET-UT1=65.95s</p>	 <p>SL-16 DEB (20628) 1990-046-E) →Ground track →Star chart</p>	<p><b>Appears</b> 23h45m33s 16.9mag az:335.1° NNW horizon  <b>at Meridian</b> 23h54m00s 11.3mag az: 0.0° N h:62.5°  <b>Culmination</b> 23h55m14s 10.7mag az: 64.0° ENE h:77.2°  distance: 1166.8km height above Earth: 1142.5km elevation of Sun:  -19° angular velocity: 0.34°/s  <b>Closest</b> 23h55m35s 10.7mag separation: 8.2° PA: 70.9°  <b>Disappears</b> 23h59m24s 11.5mag az:146.4° SSE h:28.2°</p>	
 <p>23h56m24s ET-UT1=65.95s</p>	 <p>COSMOS 1275 DEB (12656) 1981-053-L) →Ground track →Star chart</p>	<p><b>Appears</b> 23h47m38s 14.6mag az:352.6° N horizon  <b>at Meridian</b> 23h53m33s 11.0mag az: 0.0° N h:35.8°  <b>Culmination</b> 23h56m11s 8.9mag az: 81.8° E h:79.2°  distance: 948.2km height above Earth: 933.6km elevation of Sun: -19°  angular velocity: 0.44°/s  <b>Closest</b> 23h56m24s 8.9mag separation: 4.4° PA: 88.1°</p>	

		<b>Disappears</b> 23h59m14s 9.6mag az:164.9° SSE h:31.0°	
 23h56m30s ET-UT1=65.95s	 IRIDIUM 33 DEB (35077 1997-051-PC) →Ground track →Star chart	<b>Appears</b> 23h48m33s 15.8mag az:357.3° N horizon <b>at Meridian</b> 23h52m01s 13.9mag az: 0.0° N h:16.6° <b>Culmination</b> 23h56m21s 10.3mag az: 86.7° E h:80.3° distance: 834.5km height above Earth: 824.0km elevation of Sun: -19° angular velocity: 0.50°/s <b>Closest</b> 23h56m30s 10.2mag separation: 2.9° PA: 92.9° <b>Disappears</b> 23h58m57s 11.0mag az:170.2° S h:32.3° Time uncertainty of about 2 seconds	
 23h56m56s ET-UT1=65.95s	 IRIDIUM 33 DEB (34896 1997-051-MY) →Ground track →Star chart	<b>Appears</b> 23h49m27s 15.7mag az:357.1° N horizon <b>at Meridian</b> 23h53m26s 13.3mag az: 0.0° N h:21.3° <b>Culmination</b> 23h56m47s 10.0mag az: 87.0° E h:82.7° distance: 740.3km height above Earth: 735.0km elevation of Sun: -19° angular velocity: 0.57°/s <b>Closest</b> 23h56m56s 10.0mag separation: 35.9' PA: 93.1° <b>Disappears</b> 23h58m56s 10.6mag az:171.8° S h:34.7°	
 23h56m58s ET-UT1=65.95s	 IRIDIUM 33 DEB (35305 1997-051-PV) →Ground track →Star chart	<b>Appears</b> 23h50m06s 15.5mag az:358.3° N horizon <b>at Meridian</b> 23h51m58s 14.5mag az: 0.0° N h:7.9° <b>Culmination</b> 23h56m51s 9.7mag az: 86.4° E h:74.3° distance: 645.9km height above Earth: 624.1km elevation of Sun: -19° angular velocity: 0.66°/s <b>Closest</b> 23h56m58s 9.6mag separation: 9.0° PA: 93.1° <b>Disappears</b> 23h58m18s 10.1mag az:161.9° SSE h:40.9°	
 23h58m15s ET-UT1=65.95s	 IRIDIUM 33 DEB (34493 1997-051-GJ) →Ground track →Star chart	<b>Appears</b> 23h49m57s 17.4mag az:356.7° N horizon <b>at Meridian</b> 23h55m05s 14.4mag az: 0.0° N h:29.6° <b>Culmination</b> 23h58m05s 11.9mag az: 87.2° E h:84.9° distance: 872.9km height above Earth: 870.0km elevation of Sun: -19° angular velocity: 0.48°/s <b>Closest</b> 23h58m15s 11.8mag separation: 1.4° PA: -87.3° <b>Disappears</b> 0h00m55s 12.6mag az:174.2° S h:31.2°	
 23h58m27s ET-UT1=65.95s	 IRIDIUM 33 DEB (34488 1997-051-GD) →Ground track →Star chart	<b>Appears</b> 23h50m55s 16.0mag az:357.1° N horizon <b>at Meridian</b> 23h55m03s 13.5mag az: 0.0° N h:22.3° <b>Culmination</b> 23h58m19s 10.3mag az: 87.1° E h:83.1° distance: 748.6km height above Earth: 743.9km elevation of Sun: -19°	











		angular velocity: 0.56°/s Closest 23h58m27s 10.3mag separation: 29.1' PA: 92.9° Disappears 0h00m28s 10.9mag az:172.2° S h:34.9°	
 23h58m40s ET-UT1=65.95s	 IRIDIUM 33 DEB (33860) 1997-051-AD) →Ground track →Star chart	Appears 23h51m01s 16.3mag az:358.0° N horizon at Meridian 23h53m15s 15.1mag az: 0.0° N h:9.5° Culmination 23h58m31s 10.7mag az: 86.3° E h:75.5° distance: 791.0km height above Earth: 768.6km elevation of Sun: -19° angular velocity: 0.53°/s Closest 23h58m40s 10.7mag separation: 8.2° PA: 92.6° Disappears 0h00m42s 11.3mag az:165.3° SSE h:35.1°	
 23h58m44s ET-UT1=65.95s	 COSMOS 1806 (17213 1986-098-A) →Ground track →Star chart	Appears 14h21m00s 12.3mag az:195.1° SSW horizon at Meridian 23h43m19s 10.4mag az: 0.0° N h:72.7° Culmination 23h54m37s 9.8mag az: 58.3° ENE h:80.5° distance: 10305.8km height above Earth: 10251.4km elevation of Sun: -18° angular velocity: 1.61'/s Closest 23h58m44s 9.6mag separation: 6.2° PA: 60.0° Disappears 0h24m51s 8.9mag az:145.6° SE h:19.7° Time uncertainty of about 2 seconds	
 23h58m58s ET-UT1=65.95s	 Iridium 28 unc (24948 1997-051-E) →Ground track →Star chart	Appears 23h51m12s 11.2mag az:358.0° N horizon at Meridian 23h53m21s 10.1mag az: 0.0° N h:9.0° Culmination 23h58m48s 5.7mag az: 86.3° E h:74.9° distance: 807.7km height above Earth: 783.0km elevation of Sun: -19° angular velocity: 0.52°/s Closest 23h58m58s 5.6mag separation: 8.8° PA: 92.5° Disappears 0h01m03s 6.2mag az:164.9° SSE h:34.8°	
 23h59m28s ET-UT1=65.95s	 IRIDIUM 33 DEB (33873 1997-051-AS) →Ground track →Star chart	Appears 23h51m50s 15.3mag az:357.6° N horizon at Meridian 23h54m42s 13.8mag az: 0.0° N h:13.0° Culmination 23h59m19s 9.7mag az: 86.7° E h:78.4° distance: 780.8km height above Earth: 766.7km elevation of Sun: -19° angular velocity: 0.54°/s Closest 23h59m28s 9.7mag separation: 5.3° PA: 92.5° Disappears 0h01m31s 10.3mag az:168.0° SSE h:35.1°	

## Friday 19 June 2009

















Time (24-hour clock)	Object (Link)	Event
0h00m28s ET-UT1=65.95s	 IRIDIUM 33 DEB (34599) 1997-051-JR) →Ground track →Star chart	<p>Appears 23h53m14s 16.1mag az:357.3° N horizon</p> <p>at Meridian 23h57m05s 13.6mag az: 0.0° N h:20.5°</p> <p>Culmination 0h00m20s 10.3mag az: 87.2° E h:82.7°</p> <p>distance: 690.9km height above Earth: 685.9km elevation of Sun: -19°</p> <p>angular velocity: 0.61°/s</p> <p>Closest 0h00m28s 10.2mag separation: 1.3° PA: 92.6°</p> <p>Disappears 0h02m08s 10.8mag az:171.3° S h:38.1°</p> 
0h00m28s ET-UT1=65.95s	 IRIDIUM 33 DEB (35295) 1997-051-PK) →Ground track →Star chart	<p>Appears 23h52m54s 15.8mag az:356.7° N horizon</p> <p>at Meridian 23h58m15s 12.1mag az: 0.0° N h:36.5°</p> <p>Culmination 0h00m20s 10.1mag az: 87.4° E h:86.4°</p> <p>distance: 748.5km height above Earth: 747.3km elevation of Sun: -19°</p> <p>angular velocity: 0.56°/s</p> <p>Closest 0h00m28s 10.0mag separation: 2.4° PA: -87.5°</p> <p>Disappears 0h02m30s 10.7mag az:175.0° S h:35.0°</p> 
0h00m41s ET-UT1=65.95s	 IRIDIUM 33 DEB (34090) 1997-051-CZ) →Ground track →Star chart	<p>Appears 23h53m03s 16.5mag az:357.9° N horizon</p> <p>at Meridian 23h55m35s 15.2mag az: 0.0° N h:11.0°</p> <p>Culmination 0h00m32s 10.9mag az: 86.5° E h:77.0°</p> <p>distance: 772.8km height above Earth: 755.2km elevation of Sun: -19°</p> <p>angular velocity: 0.54°/s</p> <p>Closest 0h00m41s 10.8mag separation: 7.0° PA: 92.3°</p> <p>Disappears 0h02m37s 11.4mag az:166.4° SSE h:36.1°</p> 
0h00m56s ET-UT1=65.95s	 Cosmos 1861 (18129) 1987-054-A) →Ground track →Star chart	<p>Appears 23h57m08s 7.4mag az:184.8° S h:24.8°</p> <p>at Meridian 0h00m25s 6.3mag az:180.0° S h:73.5°</p> <p>Closest 0h00m56s 6.3mag separation: 4.8° PA: -77.9°</p> <p>Culmination 0h01m05s 6.4mag az: 96.5° E h:88.1°</p> <p>distance: 999.5km height above Earth: 999.1km elevation of Sun: -19°</p> <p>angular velocity: 0.43°/s</p> <p>Disappears 0h10m00s 11.3mag az: 8.8° N horizon</p> 
0h00m58s ET-UT1=65.95s	 IRIDIUM 33 DEB (35296) 1997-051-PL) →Ground track →Star chart	<p>Appears 23h53m13s 15.8mag az:356.6° N horizon</p> <p>at Meridian 23h59m02s 11.8mag az: 0.0° N h:43.2°</p> <p>Culmination 0h00m49s 10.2mag az: 87.5° E h:87.2°</p> <p>distance: 788.2km height above Earth: 787.5km elevation of Sun: -19°</p> 









		angular velocity: 0.53°/s Closest 0h00m58s 10.1mag separation: 3.1° PA: -87.6° Disappears 0h03m12s 10.8mag az:175.8° S h:33.7°	
 0h01m06s ET-UT1=65.95s	 THOR ABLESTAR DE (00545) 1961-015-GE →Ground track →Star chart	Appears 23h56m44s 12.2mag az:200.5° SSW h:18.6° at Meridian 0h00m10s 10.7mag az:180.0° S h:61.2° Closest 0h01m06s 10.7mag separation: 6.5° PA: 123.5° Culmination 0h01m09s 10.7mag az:117.7° ESE h:75.9° distance: 923.5km height above Earth: 899.3km elevation of Sun: -19° angular velocity: 0.46°/s Disappears 0h09m37s 14.9mag az: 32.6° NNE horizon	
 0h01m07s ET-UT1=65.95s	 Amazns BrzTank (28395) 2004-031-C →Ground track →Star chart	Appears 23h28m53s 10.6mag az:293.2° WNW horizon Culmination 23h56m11s 9.1mag az: 1.3° N h:90.0° distance: 7723.1km height above Earth: 7723.3km elevation of Sun: -19° angular velocity: 1.89°/s Closest 0h01m07s 9.3mag separation: 37.9' PA: 34.3° Disappears 2h44m20s 10.7mag az:148.8° SSE horizon	
 0h01m07s ET-UT1=65.95s	 Globalstar 58 (25910) 1999-049-D →Ground track →Star chart	Appears 23h49m18s 8.6mag az:233.8° SW horizon at Meridian 0h00m54s 5.9mag az:180.0° S h:88.2° Culmination 0h00m58s 5.9mag az:146.0° SE h:88.5° distance: 1419.0km height above Earth: 1418.7km elevation of Sun: -19° angular velocity: 0.28°/s Closest 0h01m07s 5.9mag separation: 5.7° PA: -28.3° Disappears 0h12m40s 9.0mag az: 58.6° ENE horizon	
 0h01m22s ET-UT1=65.95s	 IRIDIUM 33 DEB (34159) 1997-051-EN →Ground track →Star chart	Appears 23h53m36s 16.1mag az:357.2° N horizon at Meridian 23h57m20s 13.9mag az: 0.0° N h:18.8° Culmination 0h01m13s 10.5mag az: 87.0° E h:81.7° distance: 801.3km height above Earth: 793.9km elevation of Sun: -19° angular velocity: 0.52°/s Closest 0h01m22s 10.4mag separation: 2.5° PA: 92.3° Disappears 0h03m34s 11.1mag az:171.1° S h:34.4°	
 0h01m23s ET-UT1=65.95s	 IRIDIUM 33 DEB (33771) 1997-051-J →Ground track →Star chart	Appears 23h53m34s 14.9mag az:357.7° N horizon at Meridian 23h56m20s 13.4mag az: 0.0° N h:12.3° Culmination 0h01m13s 9.3mag az: 86.6° E h:77.9° distance: 808.1km height above Earth: 792.2km elevation of Sun: -19°	









		angular velocity: 0.52°/s Closest 0h01m23s 9.2mag separation: 6.3° PA: 92.2° Disappears 0h03m30s 9.9mag az:167.5° SSE h:35.0°
 0h01m27s ET-UT1=65.95s	 IRIDIUM 33 DEB (34097) 1997-051-DG) →Ground track →Star chart	Appears 23h53m22s 16.7mag az:356.1° N horizon at Meridian 0h00m57s 11.4mag az: 0.0° N h:80.1° Culmination 0h01m17s 11.2mag az: 87.8° E h:89.6° distance: 871.5km height above Earth: 871.6km elevation of Sun: -19° angular velocity: 0.48°/s Closest 0h01m27s 11.1mag separation: 5.5° PA: -87.7° Disappears 0h04m11s 12.0mag az:177.9° S h:31.0°
 0h01m44s ET-UT1=65.95s	 IRIDIUM 33 DEB (33967) 1997-051-CC) →Ground track →Star chart	Appears 23h54m03s 15.3mag az:357.6° N horizon at Meridian 23h56m56s 13.7mag az: 0.0° N h:13.1° Culmination 0h01m35s 9.6mag az: 86.7° E h:78.6° distance: 790.6km height above Earth: 776.7km elevation of Sun: -19° angular velocity: 0.53°/s Closest 0h01m44s 9.6mag separation: 5.7° PA: 92.2° Disappears 0h03m47s 10.2mag az:168.1° SSE h:35.5°
 0h02m00s ET-UT1=65.95s	 IRIDIUM 33 DEB (33886) 1997-051-BF) →Ground track →Star chart	Appears 23h54m13s 12.4mag az:357.4° N horizon at Meridian 23h57m34s 10.5mag az: 0.0° N h:16.0° Culmination 0h01m51s 6.8mag az: 86.9° E h:80.3° distance: 802.1km height above Earth: 792.1km elevation of Sun: -19° angular velocity: 0.52°/s Closest 0h02m00s 6.7mag separation: 3.9° PA: 92.2° Disappears 0h04m09s 7.4mag az:169.8° S h:34.9°
 0h02m14s ET-UT1=65.95s	 IRIDIUM 33 DEB (34829) 1997-051-MD) →Ground track →Star chart	Appears 23h56m07s 17.5mag az:357.7° N horizon at Meridian 23h58m57s 15.5mag az: 0.0° N h:15.1° Culmination 0h02m07s 11.5mag az: 87.2° E h:80.9° distance: 553.6km height above Earth: 547.3km elevation of Sun: -19° angular velocity: 0.78°/s Closest 0h02m14s 11.4mag separation: 3.4° PA: 92.6° Disappears 0h03m08s 11.7mag az:166.6° SSE h:48.5°
 0h02m52s ET-UT1=65.95s	 IRIDIUM 33 DEB (34899) 1997-051-NB)	Appears 23h54m51s 15.8mag az:357.9° N horizon at Meridian 23h57m10s 14.6mag az: 0.0° N h:9.9° Culmination 0h02m42s 10.3mag az: 86.4° E h:75.8°



		distance: 868.3km height above Earth: 845.0km elevation of Sun: -19° angular velocity: 0.48°/s <b>Closest</b> 0h02m52s 10.3mag separation: 8.6° PA: 91.9° <b>Disappears</b> 0h05m12s 10.9mag az:165.9° SSE h:34.1°	
 0h03m18s ET-UT1=65.95s	 IRIDIUM 33 DEB (34532) 1997-051-HZ →Ground track →Star chart	<b>Appears</b> 23h55m05s 16.6mag az:357.7° N horizon <b>at Meridian</b> 23h57m47s 15.2mag az: 0.0° N h:11.8° <b>Culmination</b> 0h03m08s 11.1mag az: 86.5° E h:77.4° distance: 903.6km height above Earth: 884.5km elevation of Sun: -19° angular velocity: 0.46°/s <b>Closest</b> 0h03m18s 11.1mag separation: 7.2° PA: 91.8° <b>Disappears</b> 0h05m51s 11.8mag az:167.6° SSE h:33.2°	
 0h03m19s ET-UT1=65.95s	 IRIDIUM 33 DEB (34079) 1997-051-CN →Ground track →Star chart	<b>Appears</b> 23h55m34s 16.1mag az:357.1° N horizon <b>at Meridian</b> 23h59m49s 13.5mag az: 0.0° N h:22.8° <b>Culmination</b> 0h03m10s 10.4mag az: 87.2° E h:83.4° distance: 783.1km height above Earth: 778.6km elevation of Sun: -19° angular velocity: 0.53°/s <b>Closest</b> 0h03m19s 10.4mag separation: 1.1° PA: 92.1° <b>Disappears</b> 0h05m24s 11.0mag az:172.4° S h:35.4°	
 0h03m23s ET-UT1=65.95s	 IRIDIUM 33 DEB (34889) 1997-051-MR →Ground track →Star chart	<b>Appears</b> 23h55m32s 16.2mag az:357.2° N horizon <b>at Meridian</b> 23h59m26s 14.0mag az: 0.0° N h:19.9° <b>Culmination</b> 0h03m14s 10.6mag az: 87.1° E h:82.2° distance: 810.8km height above Earth: 804.4km elevation of Sun: -19° angular velocity: 0.52°/s <b>Closest</b> 0h03m23s 10.6mag separation: 2.3° PA: 92.0° <b>Disappears</b> 0h05m35s 11.2mag az:171.5° S h:34.7°	
 0h03m28s ET-UT1=65.95s	 IRIDIUM 33 DEB (34776) 1997-051-LV →Ground track →Star chart	<b>Appears</b> 23h55m48s 14.3mag az:356.8° N horizon <b>at Meridian</b> 0h00m54s 10.9mag az: 0.0° N h:32.4° <b>Culmination</b> 0h03m19s 8.6mag az: 87.5° E h:85.8° distance: 762.1km height above Earth: 760.4km elevation of Sun: -19° angular velocity: 0.55°/s <b>Closest</b> 0h03m28s 8.5mag separation: 1.2° PA: -88.0° <b>Disappears</b> 0h05m28s 9.2mag az:174.5° S h:35.7°	
 0h03m34s ET-UT1=65.95s	 COSMOS 1275 DEB (12709)	<b>Appears</b> 23h53m56s 14.5mag az:352.1° N horizon <b>at Meridian</b> 0h01m09s 10.3mag az: 0.0° N h:47.8°	

		<p>1981-053-BD) →Ground track →Star chart</p>	<p><b>Culmination</b> 0h03m19s 9.0mag az: 82.4° E h:83.1° distance: 1121.9km height above Earth: 1115.2km elevation of Sun: -19° angular velocity: 0.36°/s <b>Closest</b> 0h03m34s 9.0mag separation: 1.8° PA: 87.2° <b>Disappears</b> 0h07m10s 9.8mag az:168.4° SSE h:29.7°</p>	
 0h04m19s ET-UT1=65.95s	 IRIDIUM 33 DEB (34143) 1997-051-DW) →Ground track →Star chart	<p><b>Appears</b> 23h56m34s 15.7mag az:357.3° N horizon <b>at Meridian</b> 0h00m11s 13.6mag az: 0.0° N h:18.0° <b>Culmination</b> 0h04m10s 10.1mag az: 87.0° E h:81.5° distance: 797.8km height above Earth: 790.1km elevation of Sun: -19° angular velocity: 0.52°/s <b>Closest</b> 0h04m19s 10.0mag separation: 3.2° PA: 91.9° <b>Disappears</b> 0h06m25s 10.6mag az:170.7° S h:35.5°</p>		
 0h04m26s ET-UT1=65.95s	 COSMOS 1320 (12975) 1981-116-A) →Ground track →Star chart	<p><b>Appears</b> 23h51m49s 14.8mag az:338.1° NNW horizon <b>Culmination</b> 0h04m02s 8.9mag az:251.1° WSW h:88.4° distance: 1529.9km height above Earth: 1529.6km elevation of Sun: -19° angular velocity: 0.26°/s <b>at Meridian</b> 0h04m20s 8.9mag az:180.0° S h:85.1° <b>Closest</b> 0h04m26s 8.8mag separation: 5.3° PA:-105.2° <b>Disappears</b> 0h09m30s 9.6mag az:162.9° SSE h:27.6°</p>		
 0h04m27s ET-UT1=65.95s	 STEX (25489) 1998-055-A) →Ground track →Star chart	<p><b>Appears</b> 23h56m54s 13.4mag az:355.2° N horizon <b>at Meridian</b> 0h02m07s 9.7mag az: 0.0° N h:34.7° <b>Culmination</b> 0h04m18s 7.5mag az: 85.2° E h:83.2° distance: 749.3km height above Earth: 744.8km elevation of Sun: -19° angular velocity: 0.56°/s <b>Closest</b> 0h04m27s 7.5mag separation: 1.7° PA: 90.0° <b>Disappears</b> 0h06m19s 8.1mag az:170.0° S h:37.3°</p>		
 0h05m18s ET-UT1=65.95s	 Transit 15 (02754) 1967-034-A) →Ground track →Star chart	<p><b>Appears</b> 0h01m56s 8.6mag az:168.4° SSE h:29.4° <b>Closest</b> 0h05m18s 7.8mag separation: 4.6° PA: 90.7° <b>Culmination</b> 0h05m31s 7.8mag az: 85.2° E h:80.4° distance: 1073.7km height above Earth: 1061.0km elevation of Sun: -19° angular velocity: 0.40°/s <b>at Meridian</b> 0h11m54s 11.9mag az: 0.0° N h:11.3° <b>Disappears</b> 0h14m42s 13.2mag az:359.5° N horizon</p>		

 0h05m21s ET-UT1=65.95s	 FENGYUN 1C DEB (32464) 1999-025-DCC) →Ground track →Star chart	<b>Appears</b> 23h58m37s 16.7mag az: 11.6° NNE horizon <b>at Meridian</b> 0h05m08s 11.5mag az: 0.0° N h:83.6° <b>Culmination</b> 0h05m17s 11.4mag az:283.2° WNW h:88.5° distance: 609.8km height above Earth: 609.8km elevation of Sun: -19° angular velocity: 0.71°/s <b>Closest</b> 0h05m21s 11.4mag separation: 7.7° PA: -72.8° <b>Disappears</b> 0h06m48s 11.9mag az:194.6° SSW h:38.7°	
 0h05m39s ET-UT1=65.95s	 Iridium 95 (27375) 2002-005-D) →Ground track →Star chart	<b>Appears</b> 23h58m09s 11.4mag az:356.7° N horizon <b>at Meridian</b> 0h03m44s 7.5mag az: 0.0° N h:38.9° <b>Closest</b> 0h05m54s 5.6mag separation: 1.8° PA: -88.3° <b>Culmination</b> 0h05m45s 5.7mag az: 87.5° E h:86.8° distance: 784.9km height above Earth: 783.9km elevation of Sun: -19° angular velocity: 0.53°/s <b>Disappears</b> 0h08m00s 6.2mag az:175.4° S h:35.5°	

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Used satellite data set is from 20 June 2009

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## Glossary:

### Time

The local time in 24-hour format at which the satellite is visible at its best. The satellite may be observable *before* this time. 0:00 or 0h00m is midnight, 12h is noon, 18h is 6 pm. The time zone is the one indicated on the left of the Earth icon on top of (almost) each page. Daylight saving is applied automatically.

### Appears

Local time at which the satellite appears visually. The first figure indicates the **visual brightness** of the object. The smaller the number, the brighter and more eye-catching it appears to an observer. The units are astronomical magnitudes [m]. **Azimuth** is given in degrees counting from geographic north clockwise to the east direction. The three-character direction code is given as well. In case the satellite exits from the Earth shadow and comes into the glare of the Sun, the elevation above horizon is given in degrees for this event. If this figure is omitted, the satellite is visible straight from the horizon.



### Culmination

Time at which the satellite reaches his highest point in the sky as seen from the observer. For description

of the figures see **Appears**.

Visually "better" passes of satellites are indicated by highlighting the information. The selection within the list of all possible transits is coupled with the observer level, the daylight, and several other conditions.

#### **at Meridian**

Time of the transit of the meridian, i.e. the satellite is due South or due North. At this time, the satellite will not reach its highest point of the pass. Look for culmination.

#### **Disappears**

Local time of visual disappearance of the satellite. This may either be the time at which the satellite moves below the observer's horizon or the entry of the object in the shadow of Earth (the elevation is given for this event). The low Earth orbiting (LEO) satellites are usually visible for about 10 seconds more than the listed time, when they start fading rapidly.

#### **Magnitude/Mag:**

The magnitude indicates the **visual brightness** of an object. The brightest star (Sirius) reaches -1.4m, whereas 6m is the limit of the unaided eye. Venus, the brightest planet, reaches -4m. The Moon at first quarter is -8m, about the same magnitude that the brightest Iridium flares can produce.

#### **Object**

The name and identification information of the satellite. Besides the name, the number in the catalog of the USSPACECOM is given (5-digits code, called Satellite, NORAD or NASA Catalog Number and USSPACECOM object number), and the International Designator Code in the form launch year - launch number of the year - launch part (usually one launch produces several orbiting objects). The latter is also called COSPAR designation and NSSDC ID.

#### **Spy Satellites:**

Satellites with name **USA** are US military satellites (common names e.g., Keyhole KH, Lacrosse).

#### **Close to Moon/Sun**

The satellite is closer than 1.5 degrees from the center of the Moon or the Sun, but the satellite does not cross in front of the Moon/Sun. The direction and distance to the center line on Earth is given. *For the Sun, move to the indicated center line position and observer with proper equipment. By no means observe the Sun without special filters!*

#### **Crosses the disk of Moon/Sun:**

The satellite passes in front of the Moon or the Sun; the event may be observed using a small telescope (equipped with special mylar filters for the Sun only!), especially if the event takes place in broad daylight. The direction and distance to the center line on Earth is given. Moon phases are not checked for. The timing may slightly change due to the quality and age of the used orbital elements and active orbit maintenance. *By no means observe the Sun without special filters!* Please feel free to report successful observations!

#### **Separation**

Angular distance of an object (e.g., star) with regard of the reference object (e.g., main star or center of moon), measured among the center of figures. Often, this value is given for the closest distance among two objects.

**Position Angle / PA**

Angle, defining a position on an apparent disk or the position of e.g. a dimmer star (or the anti-solar point for lunar eclipses) with regard of the main star or the center of disk. It is counted around the reference points (center of disk/brighter star) from *celestial north* direction 0° to east (left) 90°, south 180° to west (right) 270° in counter clockwise direction.

**Position Angle rel. Vertex**

Angle, defining a position on an apparent disk. It is counted around the reference points (center of disk) from local up, *zenith* direction 0° to east (left) 90°, south 180° to west (right) 270° in counter clockwise direction.

**Clock-face Direction**

In a simple clock-face coordinate system with the clock face superimposed on the satellite itself, with 12:00 o'clock being at the top and 9:00 o'clock being at the left, the satellite will seem to move toward the given direction. This number is helpful when observing with binoculars.

**Daylight pass**

This satellite pass over the observer is taking place on broad daylight and cannot be observed without special equipment (automated guided telescope or radio ham equipment).

**Radio pass**

The satellite is not outside the shadow of Earth during the whole pass (hence not lighted by the Sun) and is therefore not visible. However, using radio equipment, the satellite can be detected.

**Ascending/descending Orbit:**

Satellites are orbiting around the earth center. Therefore the point on the Earth surface "below" the satellite (i.e., the sub-satellite point) crosses the equator twice every orbit. The part of the orbit with northernbound motion component is called ascending, and a southernbound motion is called descending.

**Rise**

The satellites rises above the horizon of the observer (cf. **Appear** for visual rising of the satellite).

**Set**

The satellites sets below the horizon of the observer, but may not have been visible before (cf. **Disappear**).

**Side-look**

Time at which the observer is passing exactly at the side of the satellite (as seen from the satellite).

**Off-Nadir**

Angle at which the observer appears from the nadir (down direction) as seen from the satellite.

**Squint angle**

Angle relative to the satellite orbit; flight direction is 0°. The angle is counted clockwise, with right looking at 90° and left looking at 270°.

**Range**

Distance to the satellite.

**0-Doppler / Zero-Doppler**

Time at which the range between satellite and observer does not change, i.e., the range rate is zero.

**Forecasted Decay:**

All Earth orbiting satellites are exposed to atmospheric drag, which lowers the orbit. Usually, this is countermeasured by frequent firings of the rocket engines - as long there is propulsion available. At an altitude of about 120 km, the objects are destroyed in the atmosphere by a fiery play; the over 100 km long light trace is visible even at daylight. Predications however are difficult. CalSky calculates the evolution of the satellite elements and the time of final decay based on [SatEvo](#) by Alan Pickup.

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