

**OBSERVING HIGHLIGHTS for November 22 to December 8, 2024, a “dark Moon period”
Black Canyon Astronomical Society (BCAS), western Colorado, USA**

SUMMARY. As twilight fades during this dark Moon period, the Milky Way extends from Constellations Scutum and Aquila low in the west into Cassiopeia north of the zenith, to Auriga and Gemini in the northeast. Venus shines like a beacon in the southwest, Saturn is high in the south, and bright Jupiter is rising in the east northeast amidst the stars of Taurus. Portending the coming winter, the bright stars of Orion are rising in the east. On November 22 at about 5:40 PM MST, take a parting glance at Mercury low above the west-southwestern horizon, before the “Speedster Planet” races toward its solar conjunction on December 5. Reddish Mars, brightening rapidly, rises in the east northeast before 9:30 PM MST and remains visible in the west into early morning twilight. With binoculars or telescopes, try to find Uranus, the “Seventh Planet”, which is visible amidst the stars of western Taurus through most of the night.

The Moon reaches last quarter on the night of November 22-23. The Moon is new, and consequently invisible on November 30. After sunset on December 4, look for the crescent Moon about 3 degrees south of brilliant Venus. The Moon is just west of Saturn on December 7 and east of Saturn on December 8. The Moon reaches first quarter on December 8. Enjoy seeing earthshine on the dark, nightside of the crescent Moon, especially on mornings from November 25 to 29 and on evenings from December 3 to 5 (binoculars can provide eye-catching views). Always look at Venus, Mercury, and the crescent Moon after sunset (or before sunrise); risking a direct view of the Sun can cause severe eye damage.

As of November 21, there are many active regions with sunspots on the Earth-facing side of the Sun, and X-class (extreme) flares occurred on October 1, 3, 7, 9, 24, 26, and 31 and November 6 and 10. Moderate and even extreme, solar flares are likely, as are coronal mass ejections of charged particles. You can monitor solar activity safely in real time on the internet. This high solar activity is triggering geomagnetic storms, auroras (aka “northern lights”), and airglow. So, keep watch for these phenomena!

From western Colorado, view passes of interesting satellites, including evening passes of the bright International Space Station (ISS) on November 22 and 25 and from November 27 to December 6. And you can see evening passes of the almost-as bright Tiangong (Chinese) Space Station from November 21 to 23 and pre-dawn passes of Tiangong from December 3 to 8.

On October 25 AST SpaceMobile deployed large antennas (693 square feet in surface area!) from their first five BlueBird satellites. This company plans to launch 45 to 60 BlueBird satellites to provide continuous mobile phone coverage over the United States for AT&T and Verizon customers. There’s not much public information on the brightness of these first five BlueBird satellites. From November 30 to December 3, there are favorable, pre-dawn passes over western Colorado for BlueBird satellites SM005 and SM001. Let’s estimate their brightness and learn if these satellites are adding to the visible clutter in our night sky!

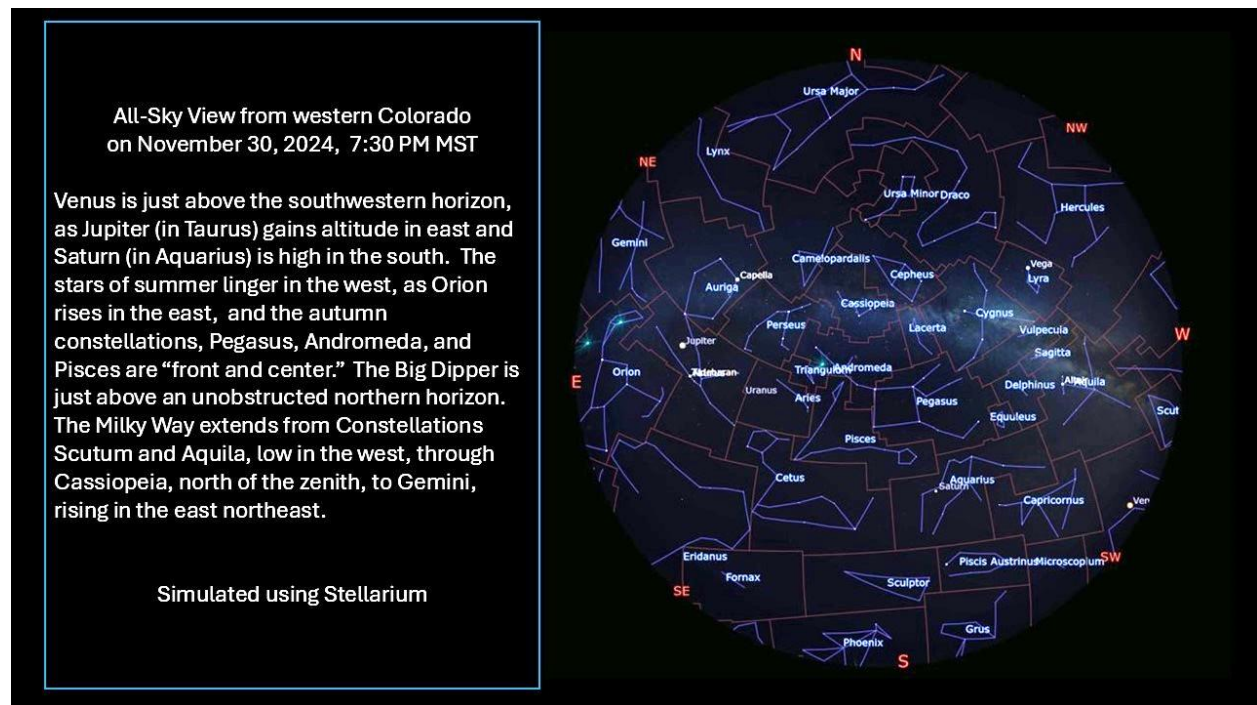
WESTERN SLOPE SKIES. Since 2011, BCAS and KVN Community Radio have been producing [Western Slope Skies](#) (WSS), a biweekly astronomy feature, which airs every two weeks at about 8:10 AM on Fridays and 7:00 PM on following Wednesdays. On November 22 and 27, Alexis Medina, an astronomy student of Dr. Catherine Whiting at Colorado Mesa University will present on “The Milky Way.” Then we will have a feature by park ranger, Nick Myers, on December 6 and 11.

Note: The apparent brightness of sky objects is measured in “magnitude” units. Many bright stars are magnitude +1, while the faintest stars easily visible to unaided eyes under dark skies are magnitude +6. Some of the brightest stars are 0 magnitude (e.g., Vega, Arcturus), while the brightest sky objects

have negative magnitudes (e.g., Sirius at -1.5, Jupiter at -2 to -3, Venus at -4 to -5, the full Moon at -12 to -13, and the Sun at -26.7 magnitude). Angular distances on the sky are usually cited in degrees of arc. Helpful ways to estimate 1, 5, 10, 15, and 25 degrees of arc can be found here:

<https://www.timeanddate.com/astronomy/measuring-the-sky-by-hand.html>

A DARK LATE FALL SKY. During early evenings of this “dark Moon period”, the Milky Way extends from Scutum and Aquila low in the west, into Cassiopeia north of the zenith, and through Auriga and Gemini in the northeast. Brilliant Venus is low in the southwest, Saturn (moving through Aquarius) is high in the south, and bright Jupiter is rising amidst the stars of Taurus in the east. Autumn constellations Pegasus, Andromeda, and Pisces are “front and center.” Constellation Orion, with its bright supergiant stars, blue-white Rigel and reddish Betelgeuse, is rising in the east, portending the coming winter. The Big Dipper is low above an unobstructed northern horizon.



THE MOON. The moon reaches last quarter on the night of November 22-23 (exactly at 6:28 PM MST on November 22). The Moon is new, and consequently invisible, on November 30 (exactly new at 11:21 PM MST). On December 4 between 5:25 and 7:20 PM MST, look for the 15%-illuminated, crescent Moon about 3 degrees south from brilliant Venus. The Moon is just west of Saturn on December 7 and east of Saturn on December 8. Moon reaches first quarter on December 8 (exactly at 8:26 AM MST). Enjoy seeing earthshine on the dark, nightside of the crescent Moon, especially on mornings from November 25 to 29 and on evenings from December 3 to 5 (binoculars can provide eye-catching views). NASA has published a [stunning visualization of lunar phases for year 2024](#). Another fun site is [NASA's daily Moon guide](#). **Please do your crescent Moon spotting before sunrise and after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

THE MOON OCCULTS BRIGHT STAR, SPICA: NOVEMBER 27!

For occultation fans, there's an interesting event in late November. The 12%-illuminated, waning crescent Moon occults (moves in front of) the first-magnitude star, Spica, on the morning of November

27. While Spica's disappearance occurs before moonrise in western Colorado, Spica's reappearance from behind the shaded limb of the waning, crescent Moon will be observable at about 4:17 AM MST (+/- several minutes, depending on your location) in a dark sky about 5 degrees above the eastern horizon. Occultations and reappearances of stars are nearly instantaneous, because stars are so far away that their apparent diameters are extremely small. This event may be observable with eyes unaided, although binoculars or a telescope may provide a better view.

VENUS: A BRILLIANT EVENING STAR. Even against bright evening twilight, Venus is prominent above the southwestern horizon. And as the sky darkens, Venus's brilliance is stunning! During this period Venus brightens from magnitude -4.12 to -4.23. "Earth's Sister Planet" sets after twilight's end, at about 7:35 PM MST on November 22 and 8:05 PM MST on December 8. Venus is getting closer to Earth: Our "Sister Planet" is 96 million miles distant on November 22 and 85 million miles distant on December 8. Through telescopes, Venus' gibbous phase wanes from 71% to 65% illuminated, as its apparent diameter increases from 16.2 to 18.2 arc seconds during this period. **Please do your Venus spotting after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

MERCURY DISAPPEARS FROM THE EVENING SKY. On November 21 and 22 at about 5:40 PM MST (with the Sun about 9 degrees below the horizon), you may be able to spot Mercury, shining at about magnitude 0, just 3 degrees above an unobstructed, west-southwestern horizon. That's about 20 degrees below and to the right of brilliant Venus. Viewing with binoculars may help you locate the Innermost Planet. After November 22, Mercury descends rapidly into bright evening twilight, prior to its solar conjunction on December 5. Mercury is 81 million miles distant on November 22, and through telescope its 43%- illuminated crescent appears 7.7 arc seconds wide. This is Mercury's third evening appearance of 2024, but the most challenging one for viewing from the northern hemisphere. **Please do your Mercury spotting after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

SATURN IN THE EVENING SKY. Saturn, moving against the stars of Aquarius, is about 40 degrees high in the south as the sky darkens. The Ringed Planet sets in the west at about 12:38 AM MST on November 22 and 11:33 PM MST on December 8. Saturn is 872 million miles distant on November 22 and 898 million miles distant on December 8. Saturn fades from magnitude +0.91 to +0.98 during this period. Through telescopes, the Ringed Planet appears 17 arc seconds wide, and its rings span 41 arc seconds. With a telescope or high-magnification binoculars, it's possible to spot Titan, Saturn's largest moon. Telescopes with apertures 5 inches or larger may reveal several other moons of the Ringed Planet. Saturn's rings now appear nearly "edge-on", so they may seem less impressive in telescopes than they did during the past several years. These thin rings will nearly disappear from our perspective during 2025. Because Saturn's rings now appear less inclined, and dimmer, than in past years, it may be easier to spot some of Saturn's mid-sized moons through telescopes. You can follow the changing positions of Saturn's moons by using various planetarium apps and/or logging onto this site: <https://skyandtelescope.org/observing/interactive-sky-watching-tools/saturns-moons-javascript-utility/> For more info on the appearance of Saturn's rings in 2024 and 2025 and phenomena associated with Saturn's moons, see this article... <https://skyandtelescope.org/astronomy-news/observing-news/see-mutual-events-close-approaches-of-saturns-moons/>

FIND URANUS, THE SEVENTH PLANET. The Planet Uranus was opposite the Sun in our sky and closest to Earth on November 17, and it's still observable through most of the night. On December 1 (the middle of this "dark Moon period"), the Seventh Planet is 1.730 billion miles from Earth. Uranus is moving

against the stars of western Taurus during this period, about 7 degrees southwest of the Pleiades Star Cluster (M45). Uranus shines at magnitude +5.65, and you may be able to see it with eyes unaided under dark skies. However, it helps to use binoculars or a telescope to find the “Seventh Planet.” Try using a “Go-To” mount, a planetarium app, or a finder chart, like the one at this link...

<https://theskylive.com/uranus-info>

If you have a telescope, can you resolve Uranus’ 4 arc second-wide disk? Does the Planet look colorful? Through telescopes, most people perceive Uranus as various shades of green or blue.

JUPITER: ALL NIGHT LONG. Bright Jupiter is opposite the Sun in our sky on December 7 and visible all night long. The Giant Planet is now in Constellation Taurus and rises in the east northeast at about 5:52 PM MST on November 22 and at 4:40 PM MST on December 8 (just before sunset). Jupiter is prominent from evening twilight until it descends in the west during morning twilight. During this period Jupiter shines at magnitude -2.8. On December 7, Jupiter is 380 million miles from Earth, as close to Earth as it gets this year. Through telescopes or binoculars, the Giant Planet’s apparent equatorial diameter is 48 arc seconds.

Use a telescope or binoculars to spot Jupiter’s four bright “Galilean” moons. You can identify them by their changing positions and referring to various planetarium apps or this website:

https://skyandtelescope.org/wp-content/plugins/observing-tools/jupiter_moons/jupiter.html

Use a telescope to view shadow transits (total solar eclipses on Jupiter!) by Jupiter’s large moons (see details below). **Ganymede, the largest moon in the Solar System, casts the largest shadow of Jupiter’s moons, and its shadow is usually the easiest to spot crossing the Giant Planet. From Colorado, there is a transit of Ganymede’s shadow in the early evening of December 8 (details below).** Io’s shadow is larger than Europa’s but smaller than Ganymede’s shadow. Callisto’s shadow does not cross Jupiter during this period.

November 22-23, 2024, 10:40 PM to 12:52 AM MST, Io’s shadow crosses Jupiter.

November 24, 2024, 5:10 PM to 7:20 PM MST, Io’s shadow crosses Jupiter (Locally, this event begins before Jupiter rises at 5:42 PM MST and ends with Jupiter 18 degrees above the eastern horizon).

November 25, 2024, 4:18 AM to 6:50 AM MST, Europa’s shadow crosses Jupiter (Locally, Jupiter is 45 degrees high in the west at the start of this event, but only 15 degrees above the horizon in bright twilight at event’s end).

November 28, 2024, 6:06 AM to 8:18 AM MST, Io’s shadow crosses Jupiter (Locally, this event begins during early twilight with Jupiter 22 degrees above the western horizon and ends after the Sun rises at 7:08 AM MST and after Jupiter sets at 8:06 AM MST).

November 28, 2024, 5:36 PM to 8:08 PM MST, Europa’s shadow crosses Jupiter (Locally, this event begins with Jupiter only 2 degrees above east-northeastern horizon and ends when Jupiter is 30 degrees high in the east).

November 30, 2024, 12:36 AM to 2:46 AM MST, Io’s shadow crosses Jupiter.

December 1, 2024, 7:04 PM to 9:16 PM MST, Io’s shadow crosses Jupiter.

December 5, 2024, 8:12 PM to 10:44 PM MST, Europa’s shadow crosses Jupiter.

December 7, 2024, 2:30 AM to 4:42 AM MST, Io's shadow crosses Jupiter. On December 7, Jupiter is opposite the Sun from our perspective, and Io's shadow is almost directly behind Io. This could be challenging (but interesting!) to observe.

December 8, 2024, 3:30 PM to 5:50 PM MST. Ganymede's shadow crosses Jupiter at a very high southern latitude on Jupiter. Occurring just one day after Jupiter's opposition to the Sun, the shadow of Ganymede is directly adjacent to the moon itself – likely an interesting sight! (Locally, this event begins before Jupiter rises at 4:39 PM MST and ends when Jupiter is 12 degrees above the east-northeastern horizon).

December 8, 2024, 8:58 PM to 11:10 PM MST, Io's shadow crosses Jupiter.

MARS RISES BEFORE 9:30 PM MST - GETTING CLOSER AND BRIGHTER! Reddish Mars rises in the east northeast at about 9:17 PM MST on November 22 and 8:18 PM MST on December 8. Mars is prominent in the eastern sky from just after it rises until morning twilight starts interfering. Between November 22 and December 8, Mars brightens from magnitude -0.39 to -0.68, as its distance from Earth decreases from 80 to 70 million miles. Compare Mars to the red supergiant star, Betelgeuse, and the red giant Star Aldebaran. Does Mars now appear brighter than these stars? Does Mars twinkle less? Through telescopes Mars' 91%- to 94%-illuminated, gibbous disk appears 10.9 to 12.4 arc seconds wide. Earth is getting closer to Mars, leading up to Mars' opposition from the Sun on January 16. From now through the winter, prominent surface features on Mars may be visible in small telescopes. You can identify various Martian surface features (for example, Syrtis Major, Mare Acidalium, and the North Polar Hood/Ice Cap) for any date and time by using an interactive chart at the following link...

https://skyandtelescope.org/wp-content/plugins/observing-tools/mars_profiler/mars.html

Find more info on observing Mars here:

<https://www.alpo-astronomy.org/mars/>

DON'T GIVE UP - KEEP WATCHING THE NORTHERN CROWN! Better late than never? Will there soon be a bright "new" star in Constellation Corona Borealis ("The Northern Crown"), at least briefly? During late November and early December, you can find Corona Borealis low in the west-northwestern sky as evening twilight fades and low in the east-northeastern sky just before morning twilight. T Coronae Borealis (T CrB) is a recurrent nova that (based on its past behavior) may rapidly increase in brightness 1500-fold (to second magnitude) to become the brightest star (or 2nd brightest star) in Corona Borealis between now and sometime in 2025. Then this "new star" may fade rapidly below naked-eye visibility in about a week. As of early on November 21, T CrB had not yet exploded. For more about T CrB, read the article, "Get Ready for a Nova's Bright Return", by astrophysicist Brad Schaefer in the March 2024 issue of Sky & Telescopes Magazine, p. 34-40. You can find additional info at these sites...

https://blogs.nasa.gov/Watch_the_Skies/2024/02/27/view-nova-explosion-new-star-in-northern-crown/

<https://skyandtelescope.org/astronomy-news/is-the-blaze-star-about-to-blow-you-may-be-the-first-to-know/>

https://en.wikipedia.org/wiki/T_Coronae_Borealis

<https://ui.adsabs.harvard.edu/abs/2023ATel16107....1S/abstract>

https://www.aanda.org/articles/aa/full_html/2023/12/aa48372-23/aa48372-23.html

THE SUN. The Sun has been very active over the past year, and intensely so in the past several months, when solar active regions have unleashed numerous flares and coronal mass ejections (CMEs) of charged particles. There have been M-class (moderate) solar flares each week for the past year, and

there have been many X-class (extreme) solar flares, including X-class flares on July 14, 16, and 29, August 5, 8, and 14, September 12 and 14, and October 1, 3, 7, 9, 24, 26, 31, and November 6 and 10. There also have been CMEs that have triggered geomagnetic storms that caused auroras. Many folks in Colorado and elsewhere viewed and/or photographed striking auroras during the nights of May 10-11 and October 10-11. As of November 21, there are many active regions with sunspots on the Earth-facing side of the Sun. So, we may experience more M- and possibly even X-class flares and powerful CMEs. [Airglow](#) and “SARs” also result from high solar activity, and these phenomena also have been photographed and/or observed from Colorado. You can monitor sunspots, solar flares, CMEs, and other solar activity safely and in “real time” at the following sites:

<https://sdo.gsfc.nasa.gov/data/>

<https://stereo.gsfc.nasa.gov/beacon/>

<http://halph.nso.edu/>

<https://www.swpc.noaa.gov/>

<https://sohowww.nascom.nasa.gov/data/realtime-images.html>

<http://www.sidc.be/silso/ssngraphics>

Do not look at the Sun directly without safe, specialized solar filters. Looking at the Sun can be very dangerous unless you take adequate precautions. Severe eye damage and even blindness can result.

AURORAS (aka “polar lights” or “northern lights”). It can be challenging to spot auroras from Colorado’s mid-northern latitudes. But on the nights of May 10-11 and October 10-11, many of us were able to see and/or photograph some amazing auroras from Colorado! Coronal mass ejections (CMEs) from the Sun were aimed at our planet. Charged particles from CMEs were captured by Earth’s magnetic field, energizing the ionosphere, thereby triggering geomagnetic storms and widespread auroras. As of November 21, there are many active regions with sunspots on the Earth-facing side of the Sun. So, the chances for geomagnetic storms are good and spotting auroras may be possible. You can get predictions and updates for auroras, their intensity, and geographic extent from NOAA’s Space Weather Prediction Center:

<https://www.swpc.noaa.gov/products/aurora-viewline-tonight-and-tomorrow-night-experimental>

Auroras are most frequently seen from high latitudes, e.g., from Canada, Alaska, Iceland, northernmost Europe, southern New Zealand and Antarctica. We can watch auroras in real-time from Yellowknife, Northwest Territories on an all-sky camera at the [Canadian Space Agency’s AuroraMax website](#). Like Colorado, Yellowknife is in the Mountain Time Zone. An aurora webcam at the University of Alaska-Fairbanks is two hours behind the Mountain Time Zone...

<https://www.youtube.com/watch?v=O52zDyXg5QI>

EARTH SATELLITE HIGHLIGHTS. The following predictions are for western Colorado, specifically Montrose, in Mountain Standard Time (MST). Numerous Earth satellites are visible every clear night. Brighter satellites have smaller magnitude numbers, and the brightest (e.g., the International and Tiangong Space Stations) may have negative magnitudes. These predictions are for selected passes of some bright and/or interesting satellites (as summarized from heavens-above.com). Satellite orbits can change. These predictions for satellite passes may be inaccurate. This is especially true for the International Space Station (ISS) and the Chinese Space Station, Tiangong, and we no longer show ISS and Tiangong predictions more than 5 days beyond the distribution date of the current “BCAS Observing Highlights” edition. Orbits of both space stations change frequently, due to periodic re-boosting and avoidance maneuvers (to prevent collisions with other orbiting objects). For accurate predictions of the ISS and Tiangong beyond November 26, check Heavens-Above.com or other satellite prediction sites for updates on the nights you wish to observe. Be sure to set application(s) for your location and time zone.

November 21, 2024. Tiangong (Chinese Space Station). 5:51 to 5:54 to 5:57 PM MST. W to SSW to SE. Max altitude 50 deg above SSW, Disappears into Earth's shadow 9 deg above SE, max magnitude -1.3 (Passing through Serpens, Ophiuchus, Aquila, Aquarius, and Cetus). **Predictions for Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

November 22, 2024. International Space Station (ISS). 5:30 to 5:31 to 5:32 PM MST. NNW to N to NNE. Max altitude 11 deg above NNW, disappears into Earth's shadow 5 deg above NNE, max magnitude -1.2 (Passing through Boötes and Ursa Major-Big Dipper). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

November 22, 2024. Tiangong (Chinese Space Station). 6:31 to 6:33 to 6:35 PM MST. WSW to SW to S. Max altitude 16 deg above SW, disappears into Earth's shadow 8 deg above SSE, max magnitude +0.7 (Passing through Ophiuchus, Scutum and Sagittarius/Capricornus, Grus/Piscis Austrinus, and Sculptor). **Predictions for Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

November 23, 2024. Tiangong (Chinese Space Station). 5:32 to 5:35 to 5:38 PM MST. W to SSW to SSE. Max altitude 27 deg above SSW, max magnitude 0.0 (Passing through Serpens, Ophiuchus, Scutum, Sagittarius, Capricornus, Piscis Austrinus, and Sculptor). This pass occurs during nautical twilight and may be challenging to see. **Predictions for Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

November 25, 2024. International Space Station (ISS). 6:20 to 6:21 PM MST. NW to N. Max altitude 10 deg above N, max magnitude -1.2 (Passing through Ursa Major-Big Dipper). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

As of this writing, additional evening passes for the ISS are predicted for November 27 to December 6. And pre-dawn passes of Tiangong are predicted for December 3 to 8. These predictions are subject to change due to orbital adjustments. For updates on times, check heavens-above (or other prediction websites) shortly before you want to observe. Be sure to enter your location and time zone info when using prediction websites.

AST SpaceMobile's BlueBird satellites deployed their large antennas (693 square feet of surface area!) on October 25, 2024. The good news is that [AST SpaceMobile's BlueBird satellites](#) may enable continuous mobile phone coverage over the entire U. S. (with no dead zones) for AT&T and Verizon customers. The bad news is that these satellites are huge and could be bright, adding to the visible clutter in our night sky. Currently, there's very little public information on the brightness of these BlueBird satellites. If you viewed any of the BlueBird passes noted in the "November 8 to 22 BCAS Observing Highlights", can you please send me your brightness estimates? I viewed passes of BlueBird SM002 and SM001 on the morning of November 14 under clear skies, estimating the maximum brightness of BlueBird SM002 at magnitude +3 (at 71 degrees max altitude) and BlueBird SM001 at magnitude +4 (at 50 degrees max altitude). [Based on FCC document DA 24-756](#), "AST must make a good faith effort to demonstrate an optical brightness with an initial aim of 6th magnitude and progress toward 7th magnitude or fainter..." Based on my November 14 observations, BlueBirds SM002 and SM001 were, respectively, about 16X to 6X brighter than that magnitude +6 target of the FCC. We have

a chance to estimate the brightness of BlueBird satellites during the following, upcoming passes over western Colorado...

November 30, 2024. BlueBird SM005 (direct-to-cell communications satellite). 5:54 to 5:57 to 6:01 AM MST. NW to NE to ESE. Appears from Earth shadow 19 degrees above NW, max altitude 52 deg above NE. Max magnitude unknown, but possibly bright, after large antennas deployed on October 25, 2024 (Passing through Perseus, Camelopardalis, Draco, Ursa Major, Boötes, and Libra). **Prediction subject to change.**

December 1, 2024. BlueBird SM001 (direct-to-cell communications satellite). 5:32 to 5:33 to 5:37 AM MST. NNW to NE to ESE. Appears from Earth's shadow 33 deg above NNW, max altitude 51 deg above NE, max magnitude unknown, but possibly bright, after large antennas deployed on October 25, 2024 (Passing through Camelopardalis/ Ursa Minor, Draco, Ursa Major, Boötes, and Libra/Virgo). **Prediction subject to change.**

December 1, 2024. BlueBird SM005 (direct-to-cell communications satellite). 5:37 to 5:39 to 5:43 AM MST. NNW to NE to ESE. Appears from Earth shadow 31 degrees above NNW, max altitude 57 deg above NE. Max magnitude unknown, but possibly bright, after large antennas deployed on October 25, 2024 (Passing through Camelopardalis, Draco, Ursa Major-Big Dipper, Canes Venatici, Boötes, and Libra/Virgo). **Prediction subject to change.**

December 2, 2024. BlueBird SM001 (direct-to-cell communications satellite). 5:14 to 5:15 to 5:19 AM MST. NNE to NE to ESE. Appears from Earth's shadow 52 deg above NNE, max altitude 55 deg above NE, max magnitude unknown, but possibly bright, after large antennas deployed on October 25, 2024 (Passing through Draco, Ursa Major-Big Dipper, Canes Venatici, Boötes/Coma Berenices and Libra/Virgo). **Prediction subject to change.**

December 2, 2024. BlueBird SM005 (direct-to-cell communications satellite). 5:20 to 5:21 to 5:24 AM MST. N to NE to ESE. Appears from Earth shadow 53 degrees above N, max altitude 61 deg above NE. Max magnitude unknown, but possibly bright, after large antennas deployed on October 25, 2024 (Passing through Camelopardalis, Draco, Ursa Major-Big Dipper, Canes Venatici, Coma Berenices, and Virgo). **Prediction subject to change.**

December 3, 2024. BlueBird SM001 (direct-to-cell communications satellite). 4:57 to 5:00 AM MST. E to ESE. Appears from Earth's shadow at max altitude 47 deg above E, max magnitude unknown, but possibly bright, after large antennas deployed on October 25, 2024 (Passing through Coma Berenices and Virgo). **Prediction subject to change.**

December 3, 2024. BlueBird SM005 (direct-to-cell communications satellite). 5:03 to 5:06 AM MST. E to ESE. Appears from Earth shadow at max altitude 57 degrees above E, max magnitude unknown, but possibly bright, after large antennas deployed on October 25, 2024 (Passing through Canes Venatici, Coma Berenices, and Virgo). **Prediction subject to change.**

As of November 21, BlueBird satellites are not listed on the home page of the heavens-above.com website. But you can get updates for the above passes and find additional passes for BlueBird Nos. SM001 through SM005 [at heavens-above.com](https://www.heavens-above.com) by searching the heavens-above.com "Satellite database" for "Sat. ID Nos." 610045, 61046, 61047, 61048, and 61049. Be sure to enter your location

and time zone. I'll try to view some of these passes myself. If you observe any BlueBirds, can you please send me your estimates of maximum brightness? We need more info on these! Thank you!

HAPPY OBSERVING!