

Solar Eclipses

Types of Eclipses

Partial solar eclipse

- Most common, where only a part of the sun is obscured by the moon
- Total solar eclipses, when viewed outside the path of totality, will appear as partial eclipses



Total solar eclipse (April 8, 2024)

- The most spectacular, where the moon perfectly obscures the sun
- The path of total shadow across the Earth's surface can reach 30 to 150 miles wide while the path of partial shadow (penumbra) can reach over 1,000 miles wide.



This is a “composite” of a Total Eclipse over the Mittens in Monument Valley



Diane Miller/The Image Bank/Getty Images

Annular solar eclipse (October 14, 2023)

- When the moon is further away from Earth, and does not fully obscure the sun, leaving a bright ring visible.



Hybrid solar eclipse

- The rarest type of solar eclipse
- When an eclipse changes from annular to total and back to annular during the path of the eclipse.
- Only 5 will happen on the planet in the 21st century.

The 4 Eclipse Phases

Phases of the Eclipse



First Contact
Edge of the Moon starts to overlap the edge of the Sun. The eclipse begins.



Second Contact
The Moon covers the entire disk of the Sun. Total eclipse begins.



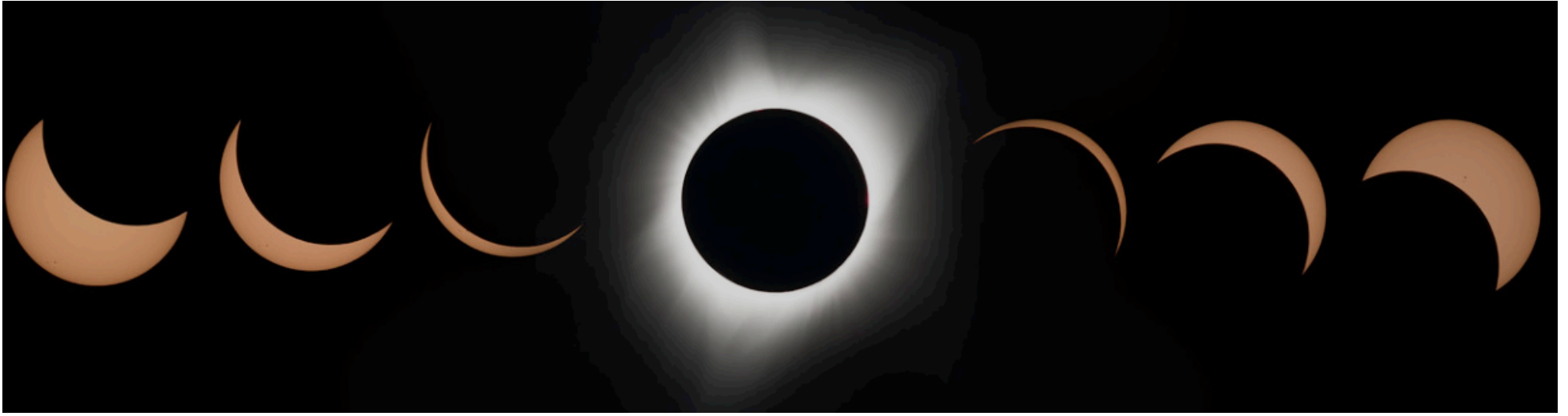
Totality
Max phase of a Total Solar Eclipse. The Sun is completely covered.



Third Contact
The Moon starts moving away. Parts of the Sun's disk reappear.

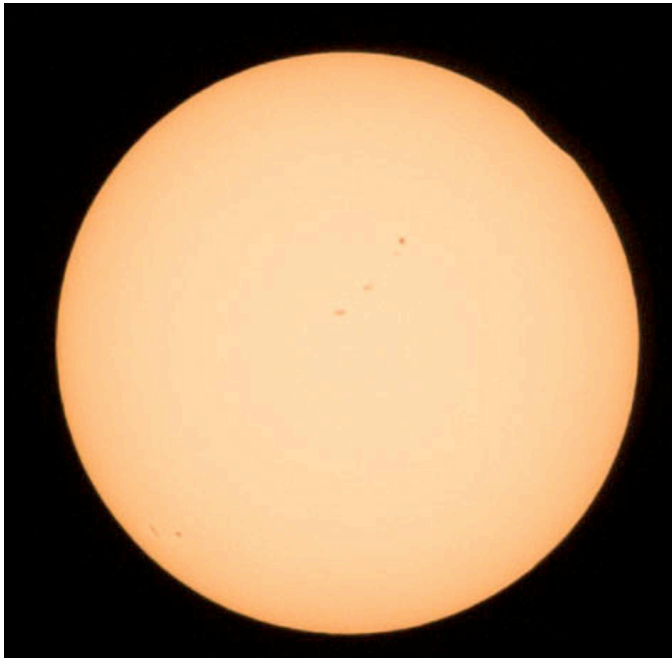


Fourth Contact
The Moon stops covering the Sun. The eclipse ends.



FIRST CONTACT – C1

- The partial eclipse begins. You see a tiny notch on the Sun.



SECOND CONTACT – C2

- The TOTAL eclipse begins.
- Moon covers the last of the Sun and creates the diamond ring effect
- **Filters OFF** for the duration of C2



THIRD CONTACT – C3

- The TOTAL eclipse ends.
- Another diamond ring announces the end of totality.
- **FILTERS ON** for the rest of the Eclipse

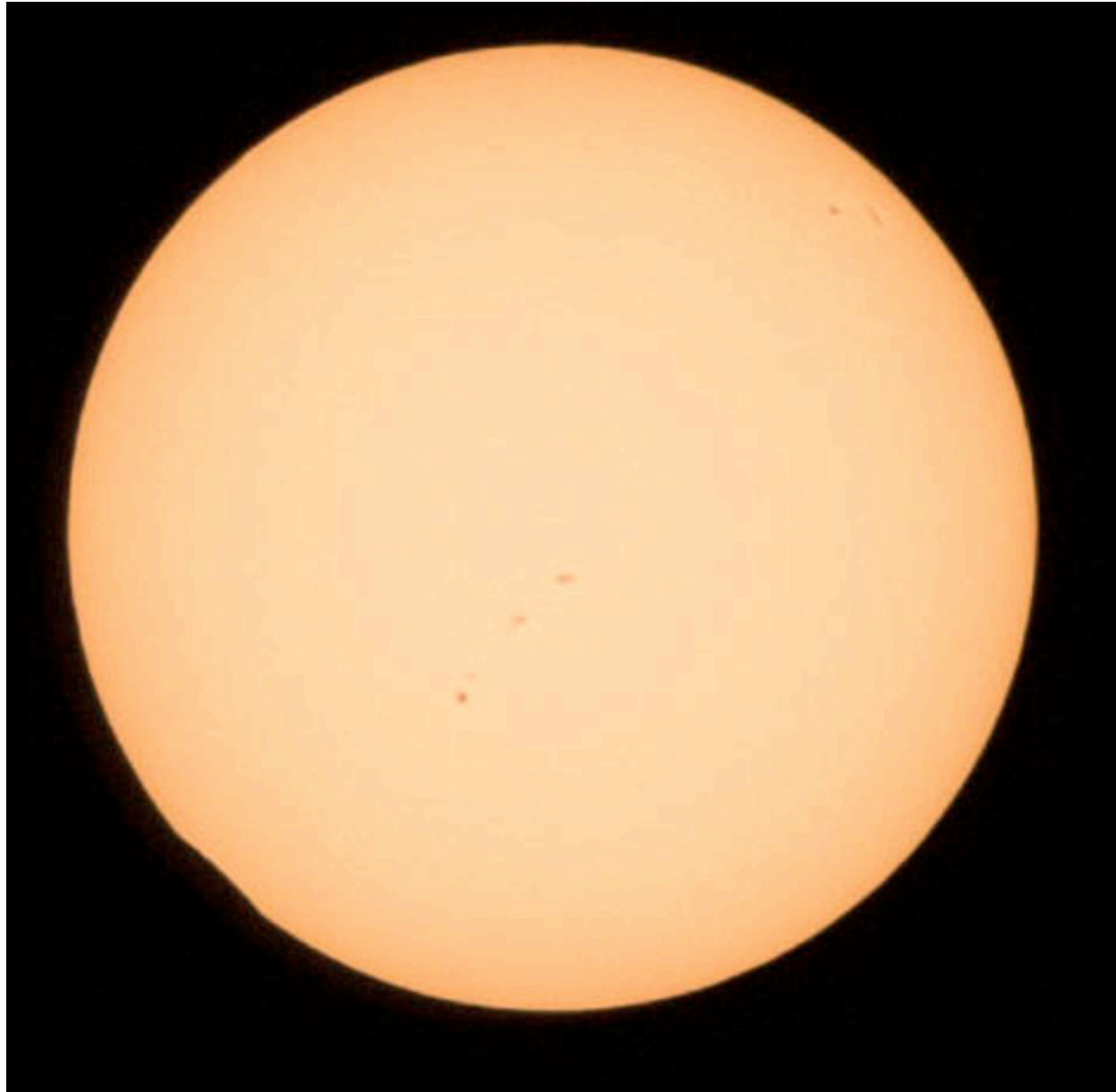




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FOURTH CONTACT – C4

- The partial eclipse ends
- The Moon leaves the Sun in a final tiny notch opposite to where it started



Safety Considerations

- Eclipse Glasses for you - It has been estimated that 20 to 100 people will have serious irreversible eye damage at each eclipse
MUST be CE and ISO certified



- Filters for your camera lenses to protect your eye and you sensor



I would NOT suggest using this type of homemade filter

WHY ?



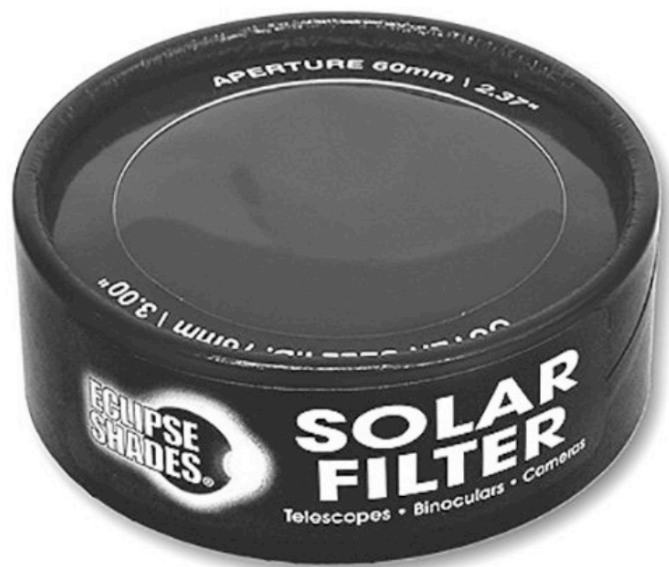


CELESTRON SOLAR SAFE FILTER TECHNOLOGY

The ultimate protection from harmful solar radiation—
filters out harmful IR and UV light **plus** 99.999%
of visible light



Roll over image to zoom in





This filter was made from cardboard and a black polymer sheet. Making your own filter like this one, cost just a fraction compared to buying a factory made filter.

Preparation *PRIOR* to the Eclipse Day

Location

- Your location should be chosen 12 to 24 months ahead of time.
- This allows ample time to reserve a hotel room or a campsite.
- Choose a site that has a clear sky with little or no chance of cloud coverage and as few “other people” as possible”.
- Make sure you have ample parking space and that your departure route is as unobstructed as possible.

Weather

- Study the weather history of your chosen location.
- Chose an area that is known to have clear skies with no rain or snow in their history.

Practice, Practice, Practice

- The following techniques can be difficult to remember, especially during Totality and you don't want to waste precious time during the eclipse on trial and error.
- As they say... Practice Makes Perfect.

Preparation on the day of the Eclipse

Photo Equipment you will need

- A full-frame DSLR or Mirrorless camera with full manual controls
- Spare Batteries for every camera (*2x what you think you will need*)
- Media Cards (*3x what you think you will need*)
- A super-telephoto lens - at least 300mm, but the longer, the better.
- Consider renting a lens with a longer focal length. You could also use a tele-converter. They are typically available in 1.4x, 1.5x or 2x.
- A Solar Filter to prevent damage to you and your sensor. There are several manufacturers offering solar filters, the best being Thousand Oaks Optical. Avoid screw-on filters, if possible. Time is of the essence and using a magnetic filter or Mylar filter is the fastest way to add or remove a filter.
- A Super Heavy Duty Tripod. This is important when shooting at a long focal length because motion, the slightest vibration or gust of wind is multiplied. Rent or borrow one if necessary.
- Gimbal Head with 45° tilt-back (*preferred over a ballhead*)
- Shutter release cable. This can be a cable plugged into your camera or a remote control that allows you to capture images without physically touching your camera. For the sharpest possible image, this is an important gadget to have in your arsenal.
- Eclipse glasses - essential for looking at the sun with the naked eye.

Fresh Batteries

- Re-charge all your batteries the night before the eclipse.
- Be sure to install fresh, recharged batteries in ALL your cameras and other devices you will be using (intervalometer) just prior to the start of the eclipse.

Make a Checklist

Make sure you DO NOT forget anything. Your brain will go “fuzzy” during the eclipse and that’s not the time to remember what you forgot to bring.

Clean your lenses and sensors

- Photographing in strong light means any specks of dust will be seen on your image. Invest some time and energy cleaning your equipment before your trip.
- Clean your camera sensor too, if you’re uncertain how to do this, find out if your local camera shop offers a professional cleaning service.

Get to your location early

- Arrive with plenty of time to set up, checking there is nothing obscuring your view.

Level your tripod

- Due to the earth's rotation, you will be recomposing your frame every few minutes so ensure your tripod is positioned somewhere stable, level, and ideally as far away from other people as possible.

Fit your solar filter

- Before composing your shot, remove the lens cap and fit your solar filter.
- Confirm that you can attach and remove it quickly

Compose your shot

- Use your camera's screen to line up your image.
- Do not use the optical viewfinder.
- You can always crop later, so it isn't critical to have the sun perfectly in the centre of the frame.

Finding focus

- Getting sharp and accurate focus is of critical importance, but you cannot always rely on autofocus to do this correctly.
- Take a test shot and zoom in using your camera's screen to ensure it is sharp. If not, switch to manual focus and adjust incrementally, taking a series of test shots until you're happy.
- Once you are confident that your lens is in focus, switch to manual focus and do not touch the focus ring again.
- Carry a small roll of tape to tightly secure the ring to the barrel so even if you brush the focus ring with your fingers, it remains in place.

Start of Photographing

- Be sure all your batteries are 100%, change them if necessary.
- Have spare and back-up batteries in your tripod apron.
- If your doing a Time Lapse and/or Video, start about 10 minutes prior to C1 and plan on "shutting down" about 10 minutes after C4.

Constantly Monitor the images on your screen

- Just to make sure that your exposures are correct, the composition is correct (*which will change over time*) and other “things” are not a problem, constantly monitor the images.

Suggested Settings

For *most* of a total solar eclipse - and for the duration of an annular or partial eclipse - your settings will remain unchanged.

- **Aperture Priority** - Here you select an aperture to remain fixed throughout your shoot. Experiment beforehand to establish where your lens is sharpest and has the least chromatic aberration. Somewhere between f/5.6 and f/8 is the sweet spot on many lenses.
- **ISO** - Too low and the shutter speed required will be too long. Too high and you're introducing unnecessary noise. Choose carefully.
- **Shutter Speed** – choose a shutter speed that is appropriate for the focal length of your lens.

- **Shoot raw** - This allows you to capture greater dynamic range and provides more data to play with during the editing process.
- **Spot metering** - because your entire frame is going to be dark apart from the sun. Meter on the sun before the event begins.
- **Absolutely bracket your exposures** - This is a technique where you take a sequence of images in quick succession, some correctly exposed, some overexposed and some underexposed. Most new cameras have this feature built in to take between 3 and 9 images with various increments of exposure. If some cloud obscures your view you will lose some light, but by bracketing your exposures you should still come away with a well-exposed image in the sequence. As you're shooting in aperture priority with a fixed ISO, your camera will compensate by increasing and decreasing the shutter speed for the other frames in the sequence.

Shooting Totality

Totality begins and ends with the “diamond ring” effect. Once the diamond ring has gone, the magical moment of totality has arrived. The world around you has been plunged into darkness, but this also means some quick changes are required to continue shooting.

- **Remove your solar filter.** It is not needed during totality. You can remove your solar glasses too.
- Adjust your **ISO**. You should now be able to return to a lower ISO while the filter is off.
- **Bracket your shots** if you weren't already doing so. There is a vast dynamic range in the sun's corona, meaning that by taking rapid-fire shots with different exposures, later you can choose the one that looks best. This isn't the time to experiment, so use technology to make things easier for you.

Non-Camera Related Things To Bring

- Lawn Chair
- Ice Chest with water and food
- Binoculars (must have solar filters on it)
- Sunscreen
- Tripod Apron (to put water and snacks in)
- Small collapsible TV tray-type table (for gear, food, etc.)
- Sand Bags for your tripod (it will get windy)
- Small damp white washcloths (*put over each camera body*)

100% Totality Experience

- “You will not see anything particularly spectacular unless you are in the path of 100% totality,”
- The sky suddenly becomes night... but not pitch black. The landscape around you plunges into an eerie “twilight”.
- Venus and Mercury often appear in the darkened sky near the eclipsed sun.
- The horizon, in any direction, takes on the warm glow of sunset. It is twilight in the distance, painted with faint hues of yellow and orange.
- As the shadow moves towards you, there will be a chill in the air. The temperature may suddenly drop 10 – 20° accompanied by a strong breeze known as an “eclipse wind”.
- Birds stop singing, flowers begin to close and crickets start to chirp “good night”.
- For most people, this is the only time in their life they will see this type of light. The color of everything around you changes because you’re being illuminated only by the sun’s corona, which is the “unseen” light surrounding the sun that shoots millions of miles from the sun’s surface into outer space. This light is like nothing you have ever experienced before.
- Take a deep breath and enjoy the eclipse that lasts for only a few fleeting moments. For some, this will become a spiritual experience and the memory will last a lifetime.

Post Production

- When shooting, consider the final purpose of your images.

Still images only?

Video?

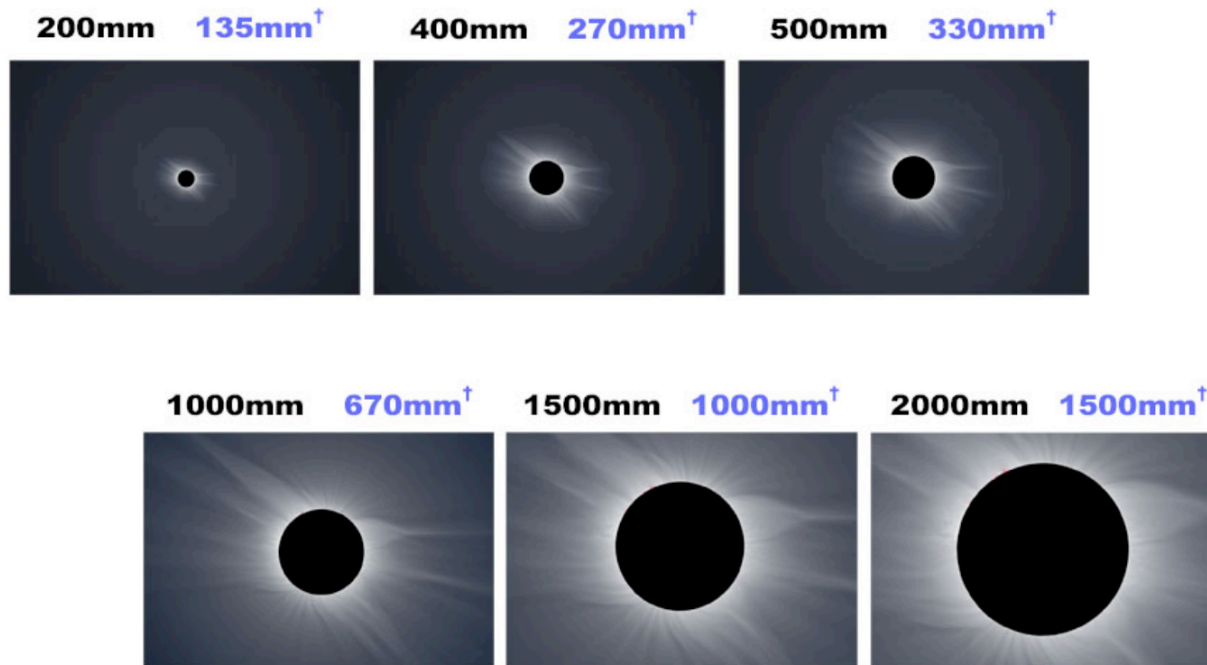
Time Lapse?

Slide Show?

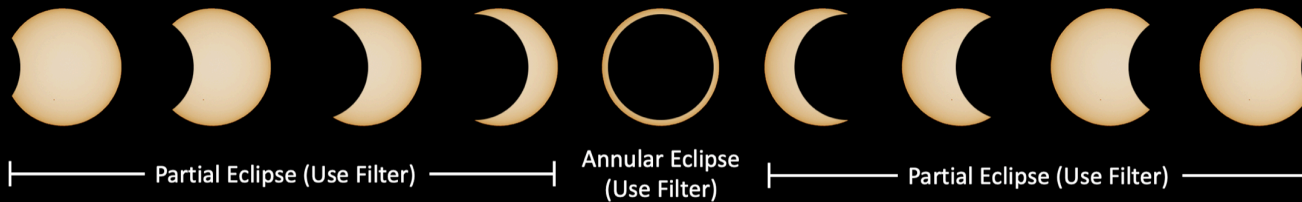
AI?

- Shoot RAW

Lens Focal Length vs. Image Size – Solar Eclipses



[†]Focal lengths in **BLACK** are for Full-Frame DSLRs
Focal Lengths in **BLUE** are for Crop-Sensor DSLRs.



Except during the total phase of a total solar eclipse, the Sun is dangerously bright. At all times during an annular or partial solar eclipse, or when no eclipse is occurring at all, view the Sun only through special-purpose solar filters that comply with the transmission requirements of the ISO 12312-2 standard.

Upcoming Eclipses

Annular Eclipse Oct. 14, 2023

- This workshop will be centered in Mexican Hat, Utah
- The entire duration is 2 hours 51 minutes 10 seconds
- Totality duration is 4 minutes 36 seconds (*one of the longest*)
- Start time is 09:10:27 MDT
- End time is 12:01:37

Total Eclipse April 8, 2024

- This workshop will be centered in Southern Texas
- The entire duration is 2 hours 40 minutes 53 seconds
- Totality duration is 4 minutes 20 seconds (*one of the longest*)
- Start time is 12:21:23 CDT
- End time is 3:01:16