

Mike Hotka's

Binocular Solar System Observation Log

1. SUN: Sunrise, Sunset Azimuth Positions (*B*)

Observation: I completed this activity, naked eye, when I did this activity for the Solar System Program from January, 2001 thru December, 2001.

2. SUN: Solar Eclipse (*B*)

Observation: I watched the August 21, 2017 Great American Solar Eclipse from a location just west of Alliance, Nebraska. I used several things to look at the eclipse but took several naked eye looks as the Sun was approaching totality with my solar viewing glasses. Once total, I used my 8x50 binoculars without any filters to pan around the edge of the Sun, noting the beautiful pink solar prominences and then noted the long coronal streamers that swept away from Sun quite a ways. I was impressed at the detail seen in the corona.

Partial Eclipse Start: 10:27:08 am CDT

Total Eclipse Start: 11:49:10 am CDT

Mid-eclipse: 11:50:27 am CDT

Total Eclipse End: 11:51:44 am CDT

Partial Eclipse End: 1:16:41 PM CDT

3. SUN: Sunspots (*B* if sunspots are visible in binoculars)

Observation: I have used my solar viewing glasses, and before that, my 8" solar Baader telescope filter, held in front of my face like a welder's helmet, to see large sunspots when they were present on the solar disk. In the Denver area, we have many solar observers that post emails when there were large sunspot groups present. I would make a point to get a look at these with my naked eye to see what they looked like. I used my 20x80 binoculars to complete Activity #10 for the Galileo Observing Program from September 2004 thru November 2004 (See Activity #10 at <http://mikehotka.com/CertLogs/GalileoClub/GalileoObsLog.pdf>).

4. MOON: Maria (*B*)

5. MOON: Highlands (*B*)

Observation: I used my 20x80 binoculars to complete Activity #2 for the Galileo Observing Program on 8/27/09 at 9:27 PM (See Activity #2 at <http://mikehotka.com/CertLogs/GalileoClub/GalileoObsLog.pdf>). I made a sketch of a 1st quarter Moon, which includes both the Marias and Highlands.

6. MOON: Occultations (*B*)

Observation: I completed this activity using my 20x80 binoculars, when I did this activity for the Solar System Program from 9/10/2001 and 11/30/2001.

7. Moon: Lunar Eclipse (*B*)

Observation: Total Lunar Eclipse January 31, 2018. Naked eye observation. Danjon Scale was L2 just before mid-eclipse.

Penumbra start: 3:52 am MST

Umbra start: 4:49 am MST

Totality Start: 5:52 am MST

The Moon entered low lying clouds above the western mountains about 6:30 am and I never saw it again before it set behind the mountains.

8. Mercury Location (*B*)

Observation: I completed this activity using my 20x80 binoculars, when I did this activity for the Solar System Program. My evening Mercury readings were taken on 3/19/04 and 3/20/04. The morning observation was taken on 5/23/04.

9. Venus: Low Power Crescent (*B*)

Observation: I completed this activity using my 20x80 binoculars, when I did this activity for the Solar System Program. I observed the crescent on 3/19/04 at 6:33 PM.

10. Venus: Daytime Observation (*B*)

Observation: I observed Venus during the daytime on March 23, 2018 at 5:20 PM MDT using 7x50 binoculars. I was careful to block the Sun by the slit opening of a telescope dome. I used the telescope to find Venus and then used the 7x50 binoculars to find Venus off the end of the telescope. It was a brilliant white dot in a nice, blue sky.

11. Venus: Phases (*B* if you can see the thin crescent Venus in binoculars)

Observation: I used my 20x80 binoculars to complete Activity #9 for the Galileo Observing Program from 3/10/09 to 11/7/09 (See Activity #9 at <http://mikehotka.com/CertLogs/GalileoClub/GalileoObsLog.pdf>).

12. Mars: Retrograde Motion (*B*) Didn't do.

Early naked eye observers had a problem. The planet Mars, slowly drifting west to east from night to night, when seen against the background stars, would once a year act very strangely. As Mars approached opposition it would suddenly slow down, reverse itself, drift westward for a while (retrograde motion), before again reversing to assume its normal (prograde) eastward motion. We now know that this is an illusion caused by the motion of the Earth catching up to and passing the slower Red Planet, causing Mars to appear to be moving backward. You are to plot the apparent motion of Mars through this retrograde loop. Determine what constellation Mars will be in at the time of opposition. This can be done by consulting the astronomy periodicals. Make a copy of that area out of a star atlas. For example, Will Tirion's Star Atlas 2000.0. Then watch Mars beginning about a month before opposition until a month after opposition. Plot the planet's daily position on your copy by comparing its position to the fixed stars of the constellation. After these two months you should be able to trace out Mars' retrograde motion. Fortunately for us, the Copernican Revolution solved nicely the odd behavior of Mars, and also the behavior of Jupiter and Saturn, the other classical outer planets which exhibit a lesser amount of retrograde motion.

Include Copy of Your Map of Mars Retrograde Motion.

Observation:

13. Ceres Locating (*B* if you can see it in binoculars)

Observation: I used my 20x80 binoculars to observe Ceres for the Asteroid Program on the nights of 1/3/13 and 1/4/13. See my observation at <http://mikehotka.com/CertLogs/Asteroid/CeresObs.jpg>.

14. Comet Observing (*B* if it is visible naked-eye or in binoculars)

Observation: I used my 20x80 binoculars to complete Activity #11 for the Galileo Observing Program during Feb 2004 (See Activity #11 at <http://mikehotka.com/CertLogs/GalileoClub/GalileoObsLog.pdf>).

15. Jupiter: The Galilean Satellites (*B*) Didn't do.

Ever since Galileo it has been noted that the planet Jupiter and its four brightest and largest satellites form a kind of miniature solar system with a speeded up time scale. This magnification of time scale makes the system specially interesting to those who study potential changes in orbital mechanics. We have observing data on Jupiter's moons going back about 300 years. This consists of the recorded times when a satellite disappeared on entering Jupiter's shadow or reappeared upon exiting from it. Studying

this data makes it possible to determine if Jupiter's satellite's orbits, and by inference, planetary orbits, change over periods of time. These eclipses are spectacular phenomena to watch in a small telescope. Since timings require a WWV time signal receiver. For this exercise we will only ask you to sketch the satellite positions on this page for six consecutive nights identifying each satellite in your sketches. Include a copy of them in your report. As much as possible, try not to skip more than one night between consecutive viewings. The "Jupiter's Moons" chart in the Almanac section of astronomy magazines each month will help you to identify the individual moons.

Observation:

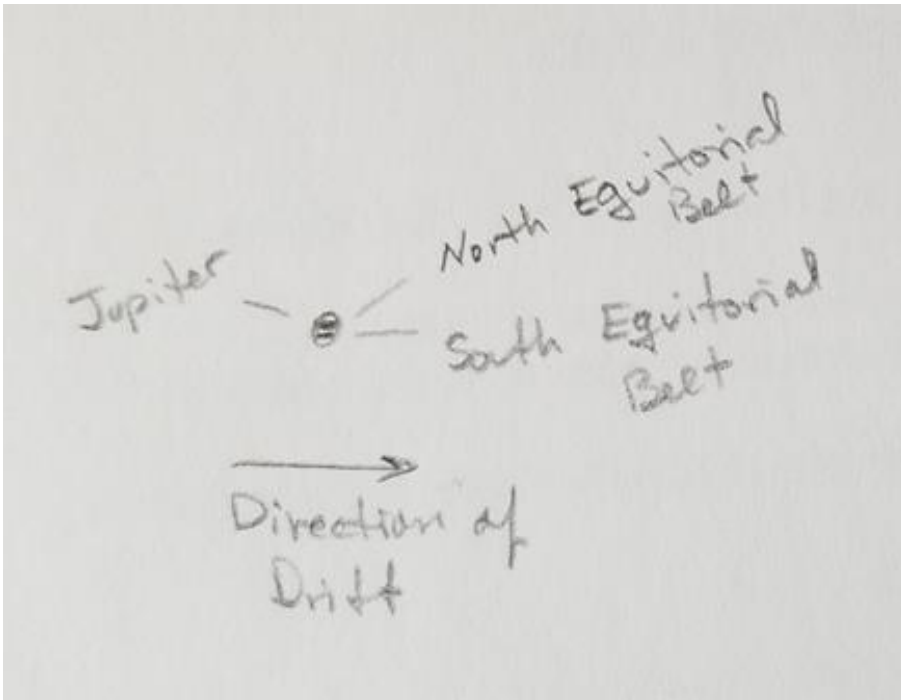
16. Jupiter: The Cloud Belts (*B*)

The first thing that comes to a person's attention when looking at the disk of the great planet Jupiter are the striated clouds of its turbulent atmosphere. Fascinating and compelling, even a modest telescope reveals a good amount of detail, but always leaves you yearning for more. Through the years a system of nomenclature has been applied to the alternating dark and light areas called belts and zones, respectively. Coupled with the giant's fast rate of spin (Jupiter's bulk rotates once in a little under ten hours) even the casual observer can notice something new. Below is a detailed list of the main cloud bands. Not all are always present all of the time. Jupiter's dynamics are too complicated for that. How many can you see? Make your own sketch and label those parts that seem to match up with the accompanying diagram. Include a copy of your sketch in your report.

Do not worry about a lot of detail. In fact Jupiter rotates so rapidly that features may move if you take too long to work on details. NOTE: Your telescope may show Jupiter inverted.

To show the East-West direction of your sketch show with an arrow the direction of drift in your field-of-view without a drive running.

Observation:



On August 25, 2021 at 11:45 PM, I used my 20x80 binoculars mounted on a parallelogram mount to make this observation. I was doing exercise #19 below. I was amazed to see the North Equatorial Belt and the South Equatorial Belt on the bright white disk of Jupiter. They stood out very nicely. The seeing and transparency were good this night.

17. Jupiter: Satellite Discovery (*B*)

Observation: I completed this activity when I performed Activity #3 of the Galileo Observing Program. I watched the positions of the Moons from 8/11/09 thru 8/24/09 and from my sketches, deduced which Moon was which. See my results for Activity #3 at <http://mikehotka.com/CertLogs/GalileoClub/GalileoObsLog.pdf>.

18. Jupiter: Satellite Eclipses (*B*)

Observation: I used my 20x80 binoculars to complete Activity #4 for the Galileo Observing Program on 8/18/09 and 11/7/09 (See Activity #4 at <http://mikehotka.com/CertLogs/GalileoClub/GalileoObsLog.pdf>).

19. Jupiter: Satellite Occultations (*B*)

Occultations of the Galilean satellites occur as they move behind or out from behind the planet Jupiter. This is different than an Eclipse (see previous requirement). Time the disappearance or reappearance of one of these satellites by using a radio tuned to the WWV National Time Standards signal out of Ft.

Collins, Colorado. Then compare it to the time printed in the astronomy periodicals. Note the time when the satellite completely disappears or reappears from behind Jupiter. Timing a reappearance is much more difficult since you do not know precisely when or where it will appear. Note the name of the moon that you observed.

Observation:

On the night of August 25/26, 2021, I used my 20x80 binoculars mounted on a parallelogram mount to make this observation. I looked at the possible choices of moons and having just completed the Galileo TOES Observing Program, I chose an occultation of Io, because it was the bright and moved quickly.

This was a lot more difficult to do than I anticipated. I had Europa nicely placed to help me spot Io's point on Jupiter's disk it would disappear. I think the closeness of Europa hampered my ability to see Io disappear. It was also very near to the disk.

I could see Io at 11:50 PM. It was a lot fainter than I thought it would be close to the brilliant Jupiter. By 00:00 AM, Aug 26, I could no longer see Io to the right of Jupiter.

After completing Galileo TOES, I noticed Callisto dimming as it was going into occultation, but didn't notice this effect with Io using my 8-inch Newtonian. I was surprised that it dimmed so in my binocular's field-of-view.

20. Saturn: The Rings (*B* They will appear as "ears" in binoculars)

Observation: I completed this activity when I performed Activity #8 of the Galileo Observing Program on 3/11/08 at 8:30 pm. See my results for Activity #8 at <http://mikehotka.com/CertLogs/GalileoClub/GalileoObsLog.pdf>.

21. Saturn: The Satellites (*B* if Titan is visible in binoculars)

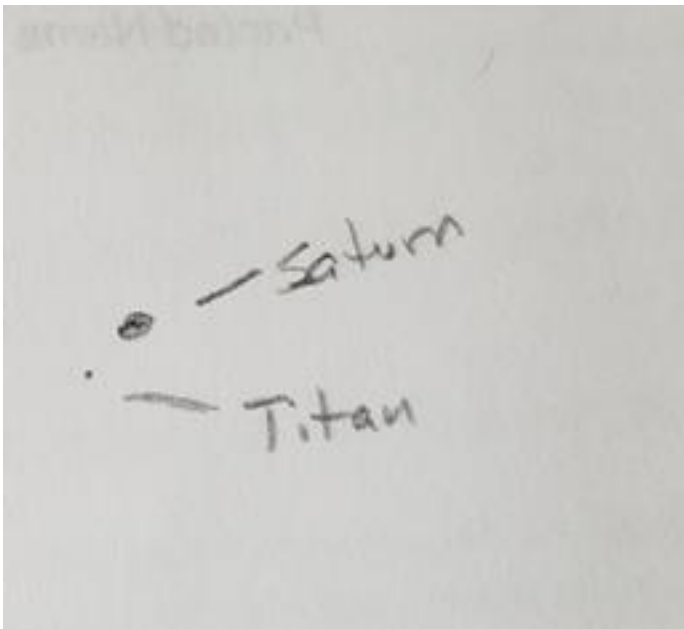
Of all the satellites of Saturn, only six of them can be seen in telescopes with moderate sized apertures. How many can you spot?

	Magnitude	Orbital Period (Earth Days)	Recommended Aperture
Enceladus	11.8	1.37	8-inch
Tethys	10.3	1.9	6-inch
Dione	10.4	2.7	6-inch
Rhea	9.7	4.5	3-inch
Titan	8.4	15.9	2-inch
Iapetus	10.2-11.9	79.3	8-inch

How many satellites you will be able to see will depend a great deal on atmospheric conditions . For example, I have seen all of them in a six-inch. In contrast with Jupiter, where all four moons orbital plane is nearly a straight line from Earth's viewpoint, Saturn's equatorial plane is considerably more tilted. This means that the orbits of the satellites can vary from a nearly straight line configuration to that of nearly a 30° ellipse depending on where Saturn and Earth are located in their orbits. This inclination changes at about a 15 year interval. Finder charts can be found in astronomy periodicals that will help you determine which of the Saturnian satellites you are seeing.

A note on Iapetus. The magnitude variation can be explained by the fact that it has two vastly different hemispheres. One reflects light almost two magnitudes brighter than the other. What satellites did you see?

Observation:



On August 25, 2021, at 11:41 PM, I used my 20x80 binoculars mounted on a parallelogram mount to make this observation. I could easily see Titan in my binoculars at about 7 o'clock and near the oval glow of Saturn. Titan was faint but I could see it. As I watched it for a few minutes, I noticed it would disappear for several seconds and then pop back into view for several seconds. I didn't anticipate this. It was like looking at the central star of M57. It is not steadily visible but pops into view when the transparency is great. Titan appeared to be doing this same thing in the field-of-view of my binoculars.

I looked up the position of Titan, using the Sky and Telescope's Interactive Saturn Moon app and it was right where I saw it. See following screen image of the app. Note the time of the app is UT.



Saturn's Moons

This diagram shows the positions of Saturn's brightest moons in their orbits about the planet for any entered date and time between January 1, 1900 to, December 31, 2100.

Date: Time: U

(mm/dd/yyyy)

Reset to current
date and time

Calculate using
entered date & time

-1 Day

-1 hour

+1 Hour

+1 Day

Time-zone offset from UT in hours
(from your web browser)

Telescope type: **Direct View**

Key to Saturnian satellites: E = Enceladus T = Tethys
D = Dione R = Rhea
Ti = Titan

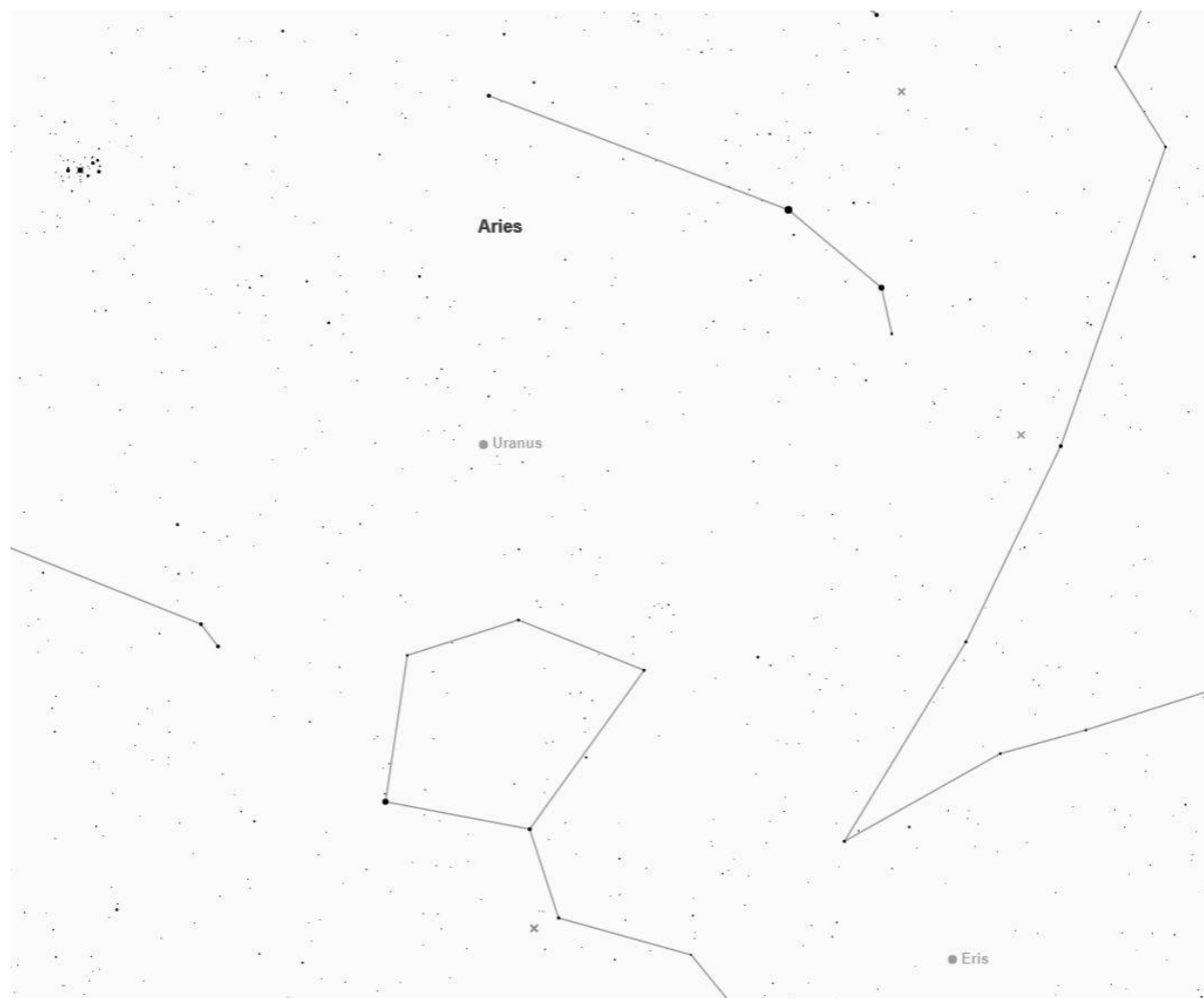


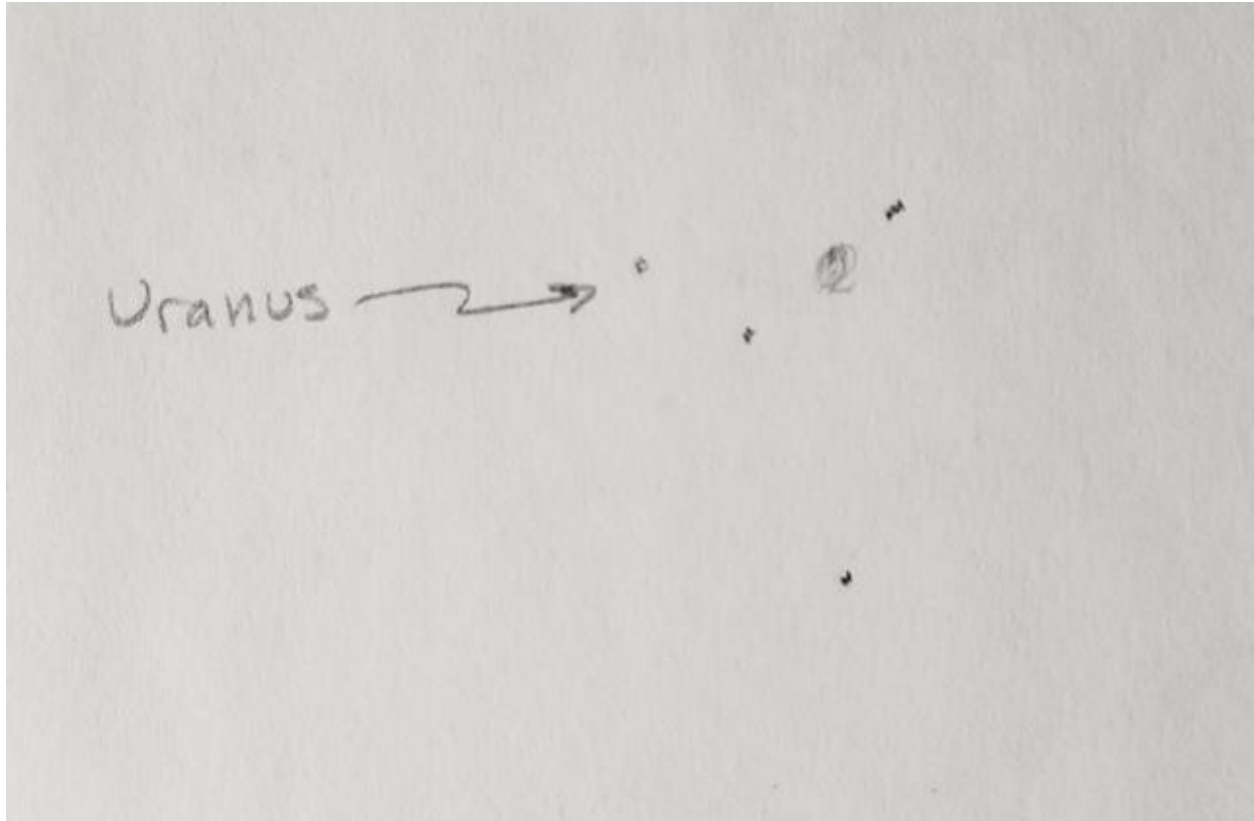
22. Uranus Locating (*B*)

In 1781 the first non-classical planet was discovered by amateur astronomer William Herschel. The discovery changed Herschel's life forever and was a blow to astrologers who by their "craft" had no inkling that a seventh planet existed. Actually the planet had been seen and charted years before on no fewer than seventeen different occasions. Uranus is visible to the dark adapted naked eye under good skies. But the astronomers simply added it to their charts just like any other sixth magnitude star. It was Herschel who finally had enough resolving power and the observer's eye who could tell it had, in fact, a tiny disk, and was not a simple star-like point. He first suspected the tiny object to be a distant comet and took a series of measurements of its position. It was somewhat later that he realized its true nature.

It is much easier today for you and I. The 3.8 arc-second greenish disk shines at a magnitude of 5.7 and can be readily found using locator charts published in the astronomical periodicals. Give a verbal description your eyepiece impression.

Observation:





On Sept 5, 2021 at 11:55 PM, I was out at the Denver Club's Dark Sky Site east of Deer Trail, CO. By using the above finder chart, I was able to star-hop to and locate Uranus with my 20x80 mounted binoculars. Once I knew where to look, I found Uranus in my 8x50 binoculars. It was dimmer in the 8x50s but easy to see.

Uranus was one of the brighter objects in the Field of View. Was a whiter color than the surrounding blue-white stars. I couldn't see the green color because it was so bright. But it was an off colored object.

23. Neptune Locating (*B*)

Observation: I used my 20x80 binoculars to complete Activity #12 for the Galileo Observing Program on 9/17/09 at 9:22 pm and 10/17/09 at 7:19 pm (See Activity #12 at <http://mikehotka.com/CertLogs/GalileoClub/GalileoObsLog.pdf>).