The Aero Aerial

The Newsletter of the Aero Amateur Radio Club
Middle River, MD
Volume 17, Issue11
November ‘21

Editor Georgeann Vleck KB3PGN

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Website: http://w3pga.org
Facebook: https://www.facebook.com/pages/Aero-Amateur-Radio-Club/719248141439348

About the Aero Amateur Radio Club

Meetings

The Aero Amateur Radio Club meets at 7:30 pm on the first and third Wednesdays of the month at Essex SkyPark, 1401 Diffendall Road, Essex. Meetings begin at 7:30 p.m. local time. Meetings are canceled if Baltimore County Public Schools are closed or dismiss early.

Repeaters

W3PGA	2 M :	INPUT : 147.84 MHz, OUTPUT : 147.24 MHz, PL 123.0
W3PGA	70 Cm:	INPUT : 444.575 MHz, OUTPUT : 449.575 MHz, PL123.0
W3JEH	1.25 M:	INPUT : 222.24 MHz, OUTPUT : 223.84 MHz

Club Nets

Second Wednesday Net – 70 Centimeters (449.575 MHz Repeater PL123) @ 8 p.m. Local Time
Fourth Wednesday Net – 2 Meters (147.24 MHz Repeater PL123) @ 8 p.m. Local Time
Fifth Wednesday Net – 10 Meters (28.445 MHz) @ 8 p.m. Local Time

Radio License Exams

The Aero Amateur Radio Club sponsors Amateur Radio License Exams with the ARRL VEC. Examination sessions are throughout the year. Walk-ins are welcome; arrive no later than 30 minutes after start time. $15 charge.

2021 Examination Schedule

Time:	1 pm		
Dates:	November 20		
Where:	American Legion, Rosedale		

American Legion Post 180, 1331 Seling Ave., Rosedale, MD 21237
Contact: Patricia Stone AC3F, email: ac3fac3p@yahoo.com, landline: 410-687-7209

LOCAL AREA NETS

Day	Time	Freq. (MHz)	Net Name
Daily	9 – 10 am	145.330	Oriole Net
Daily	6 pm	3.820	Maryland Emergency Phone Net
Daily	6:30 – 7 pm	145.330 no PL	Balto. Traffic Net (b/u 146.670 PL 107.2)
Daily	7 pm & 10 pm	3.643	MD/DC/DE Traffic Net
2nd Tue	7:30 pm	146.670	Baltimore County RACES Net
2nd Wed	8 pm	449.575	Aero ARC Net
4th Wed	8 pm	147.240	Aero ARC Net
5th Wed	8 pm	28.445	Aero ARC Net
Fridays	7:30 pm	145.330	Back in the Day Net
When activated by NOAA		147.030	SkyWarn (primary)

Net Reports

The Aero ARC had a 440 Net on 8/11/21 it ran from 20:00 to 20:22. It had 3 participants.

W3PGA NCS Joe Essex
KC3HXL Joel Essex
KB3QWC Larry Middle River

The Aero ARC had a 2 meter Net on 8/25/21 it ran from 20:00 to 20:25. It had 4 participants.

W3PGA NCS Joe Essex
KB3VAE Richard Bowley's Quarters
N3RES Ray Lutherville
KC3HXL Joel Essex

9/8/21 No 440 net.

The Aero ARC had a 2 meter Net on 9/22/21 it ran from 20:00 to 20:22. It had 4 participants.

W3PGA NCS Joe Essex
N3FQC Don Perry Hall
W3ESX Jaminson Essex
KB3VAE Richard Bowley's Quarters

9/29/21 No Ten Meter Net Bad Conditions

The Aero ARC had a 440 Net on 10/13/21 it ran from 20:00 to 20:20. It had 7 participants.

W3PGA NCS Joe Essex
N3RES Ray Lutherville
K3DON Don Joppatowne
AC3F Pat Middle River
N3VBJ Jerry Rosedale
KB3VAE Richard Bowley's Quarters
W3VRD Phil Essex

The Aero ARC had a 2 meter Net on 10/27/21 it ran from 20:00 to 20:14. It had 6 participants.

W3PGA NCS Joe Essex
AC3F Pat Middle River
K3DON Don Joppatowne
KB3QWC Larry Middle River
WA3QWC Tom Middle River
W3VRD Phil Essex

VE CORNER

Our next test session has been changed to Saturday, November 20th at 1PM at the American Legion Post in Rosedale. Hope to see you there.

“You Tube” is not only for Cats, anymore!

A You Tube presentation by the Antique Wireless Museum and runs 48 mins about the History of Sideband.

It is Very will presented, some of your old timers may remember some of the equipment shown in some of the slides.

It’s an interesting history lesson about the early radio telephone links between the US and UK. It also has to history information about the beverage antenna (the kind Rob AE3B used a few Field Days ago).

You Tube - https://youtu.be/BBRntPJTr5Y

Thanks to Harry AC3EK

Where Does 468 Come From?

Created by Ward Silver - N0AX on 2010-05-04

"Where Does 468 Come From?"

We've all seen this number over and over again - the "magic number" that gives us the length of a half-wavelength dipole in feet from the dipole's resonant frequency: L = 468/f. In free space the wavelength in feet is 492/f, but a practical half-wavelength antenna is shorter so the constant is smaller. The number 468 is on the license exams and in the literature. It's been there ever since I started reading about ham radio in the mid-1960s. It's a pillar of amateur antenna theory. Every ham is expected to memorize it. And it's wrong.

It would be more accurate to say that it's rarely correct. There are certain instances where it's close, but using it often leads to wasted wire. The usual instructions to a new ham are, "Calculate how much wire you need using 468/f and then add a couple of feet." What that really means is the value 468 is too small and we compensate for the error by "adding a couple of feet". If 468 isn't right, why do we use it? Answering that question requires a trip along the paths of history.

Recently, I had the opportunity to spend a few days at ARRL Headquarters to plan upcoming writing and editing projects. The ARRL has a great Technical Library with every edition of ARRL publications and technical publications going back decades. (If you ever get close to Connecticut, it's well worth dropping in on the ARRL for a tour!) I had some time one afternoon and decided to find out when and how the number 468 first appeared in the ham literature.

My first stop was the *ARRL Antenna Book's* initial edition in 1939. Sure enough, on page 13 in the chapter on "Antenna Properties", the familiar formula 468/f appears. The *Antenna Book* states that the "end effect" due to the attachment of insulators at the ends of the antenna results in the approximately 5% reduction in length from the free-space 492/f to 468/f. The text goes on to state that the percentage "varies slightly with different installations", but doesn't say how, nor is a citation provided to identify how the value of 468 was obtained.

Since it is unlikely that the value of 468 appeared in the *Antenna Book* without any "prior art", I next turned to the *ARRL Handbook's* first edition in 1926. That turned out to be a dry hole - no formula for antenna length and nothing in 1927 or 1928 either. Then, in the 1929 edition's "Antennas" chapter on page 128, I hit pay dirt! The text defines natural wavelength as the highest wavelength (the lowest frequency) at which the Hertz antenna (a half-wavelength dipole) will resonate. It is stated that "The natural wavelength of the wire...will be its length in meters multiplied by 2.1" Hmmm...2.1 is 5% longer than would be the free-space value of 2. (Remember, the text is discussing wavelength, not frequency.) Farther down the page I saw, "Speaking in terms of feet, the natural wavelength of the antenna will be its length in feet divided by 1.56." That equation translates to L = (300 x 1.56)/f and 300 x 1.56 is 468! Here were the headwaters of the mighty River 468!

Still, no background for the correction was given. Where does the use of a correction factor originate? Back to the stacks! Did I really want to go through all of the *QST* magazines until I found my answer? Well, not really, but inspiration struck in the form of the online *QST* archives. I logged into the ARRL Web site, brought up the *QST* archive search page, and...hit another roadblock. I couldn't very well search for "468" because it was unlikely to be a keyword. "Dipole" would return hundreds of hits. Then I realized that in the early days, a half-wavelength dipole would have been referred to as a "Hertz antenna" or "Hertzian antenna". I entered the former and scrolled down to the very earliest entries.

The oldest article on Hertz antennas was in the July 1925 issue by 9BXQ and titled "The Hertz Antenna at 20 and 40 Meters" but it didn't discuss a formula for length. The next oldest article, October 1926's "The Length of the Hertz Antenna" by G. William Lang, turned out to be what I was looking for. In the article, Lang (who was apparently not a ham, but worked in the Dept of Radio Operations for Radio Station WBZ in Boston) set up some Hertz antennas at amateur station 1KA and also measured antennas at station 1CK and 1KF. He used an oscillator and a wavemeter to determine the frequency at which the antenna resonated then measured the entire antenna - tip-to-tip, including the counterpoise. A table of correction values was derived, with the free-space wavelength in meters multiplied by an average value of 1.46 to get the antenna's resonant wavelength in feet. This corresponds to an equation of L = 438/f. This is the first suggestion that the actual resonant length of a practical amateur antenna can be predicted by using a correction factor to a free-space wavelength.

The early experiments of 1925 and 1926 took place on or near 40 meters. In those days, CW operation on what we now call the "low bands" of 80 and 40 meters was the norm. At these wavelengths, a half-wavelength dipole was of a reasonable length. It could be made of ordinary copper wire, probably #8 to #14 AWG, and installed in the back yard at heights of 20 to 40 feet. For these antennas, 1/8th to 1/4th wavelengths above ground, a value of 468 is about right, resulting in the equation printed in the

ARRL Handbook in 1929.

In truth, many variables affect the resonant frequency of a half-wavelength dipole, the two primary factors being the length-to-diameter ratio of the antenna conductor and most strongly, the antenna's height above ground. These can combine to change the actual correction factor quite a bit! (Insulation can also affect an antenna's electrical length.) In my November 2009 *QST* column, "Hands-On Radio: Antenna Height", I modeled a typical 20 meter dipole made of #12 AWG un-insulated wire at heights from 1/8th to 2 wavelengths over realistic ground and calculated the correction factor at each height. It varied from 466 to 481 over that range! Clearly, using 468/f would lead to an antenna being too short most of the time.

If 468 is too small and rarely correct, what should you do? Realistically, you should expect to trim your dipole to get the resonant frequency you want. Instead of being frustrated that the calculations aren't exact, learn to adjust the antenna's length efficiently by using an instrument such as an antenna analyzer. Start with an estimated value based on a more realistic formula such as 490/f that results in a small amount of extra wire for attaching insulators. During tuning, twist the wire connections together or use clamps, then raise the antenna into position and measure. When it's right, only then solder and weatherproof the connections. Recognize that every antenna's circumstances are slightly different - height, ground conductivity, thickness of wire, nearby conductors, and so forth.

Another lesson to learn from this exploration is to realize that "magic numbers" in formulas have often been determined through experimentation under specific circumstances. As such, they likely depend on a variety of factors that you may not be able to replicate. They will only approximate what you actually encounter. If the assumptions behind the value are given - you can use that information by comparing it to your situation. If the assumptions are not known - you should allow for variations or try to find a more accurate model representative of your own circumstances.

I hope you've enjoyed reading about this journey as much as I enjoyed taking it, opening the covers of books nearly 80 years old and mapping the stream of knowledge back to its sources - finding there the footprints of wireless pioneers that set ham radio on the course we travel today.

Remember to keep an old copy of the ARRL Handbook, One for Tube information and for easy to find the explication of the 170 or so radio formulas. Mine is a 1980 edition.

Did you ever use one of these in High School or College?

Do you remember how to still use it? And do you still have it? Just a note a book sci-fi book written about a trip to Mars by a sci-fi writer from Europe. The writer wrote the book in 1948 and used a slide ruler to figure out all the math problems. The basis of this book called "Das Marsprojekt" written in 1948 and published in English in 1953 was written by Wernher von Braun. Who later became the chief architect of the Apollo Saturn V moon rocket that took men to the moon in 1969.

Radio Meteors

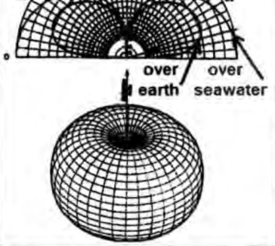
By R. B. Minton
Southern Colorado Astronomical Society

A radio meteor is a meteor that is heard on a radio receiver only because radio waves from a transmitter some 75 to 200 miles distant are reflected by the meteor's resulting ionization. The primary advantage of observing meteors using radio methods is that one can observe during daytime and inclement weather.

Meteor showers: The 1995 *American Radio and Relay League Antenna Handbook* lists the five best meteor showers that contribute to ham radio skip communication—where distant radio signals "skip" on an ionized area of the atmosphere, such as that produced by a meteor, and can be heard much farther away than normal. These are the Quadrantids (January 3), Arietids (June 7–8), Perseids (August 11–13), Orionids (October 20–22), and Geminids (December 12–13). I like to listen to all showers, and listen at random times with a portable FM radio. In 2014 and 2015, I heard a moderate daytime shower on July 3.

Physics: Meteors typically vaporize from 100 to 70 km altitude, producing visible and ionizing ultraviolet light and a 10 to 15 km long trail of free electrons, ionized air, and debris. If the trail of electrons is sufficiently dense, it reflects radio waves as if it were a metal cylinder. I like to think of the ionization trail as having the properties of both a radio antenna (a "wire") and a narrow illuminated slit. The "wire" can produce a sound like the original radio signal, while the "slit" creates a Fresnel diffraction pattern. The latter is a varying volume level that is co-added to the "wire" component (figs. 1 and 2).

Figure 1



Meteor (and other) signals: Radio meteors are observed at frequencies from 28 to 432 MHz, with the best region between 30 and 100 MHz. The FM band, from about 88 to 107 MHz, is well suited. A typical meteor signal usually lasts only as long as the meteor is visible—about half a second—but large meteors leave a persistent ionized cloud reflecting for many seconds or even minutes (fig. 3). However, large meteors are rare. Signals lasting longer than five or ten seconds are probably not meteors. If you ignore *all* these longer signals, your hourly counts will still be quite accurate.

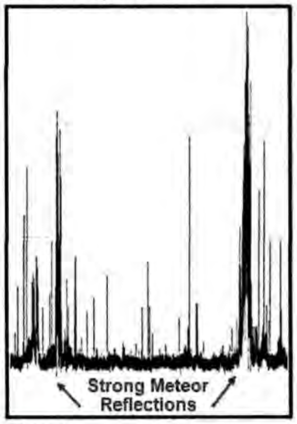


Figure 3

Interference: The vast majority of radio interference is from man-made sources such as lights, all electrical appliances, distant aircraft, and nearby cars. Cars produce a distinct, repetitive popping noise. I rarely hear interference from the Sun or other natural sources such as auroras, tropospheric ducting (when radio signals can propagate farther than normal because of a temperature inversion in the atmosphere), and lightning. Each type of interference also has unique characteristics that allow it to be identified. The first three last for many minutes to hours—not typical of a meteor. Lightning has a brief but very distinct frying sound. Aircraft are more difficult to discern, but they are only heard if they are flying both near the ground and near a transmitter. Their signal can last from a second to a minute. Unless you live close to a major airport, you will probably never record aircraft.

Hardware: A good FM radio and antenna are vital tools for detecting radio meteors. Modern AM/FM car radios are ideal. They have large-scale integrated circuitry, are sensitive, reject noise, have digital tuning, and are fairly inexpensive. They also use 50-ohm coaxial cable, which matches a ground plane (GP) antenna (fig. 1, top). Other antenna designs, such as Yagi, have more gain in a preferred direction, but nowhere else. The GP is better because of its omnidirectional reception pattern in azimuth. A vertical whip car antenna works okay, but not as well. You can build a GP antenna from five 29-inch lengths of 40-gauge (or heavier) copper wire, soldered and connected as shown in figure 1. Tape a paper wad on each tip for eye protection. A 29-inch wire is the correct length for the middle of the FM band.

If the radio and antenna pull in distant stations, you're ready to search for blank FM frequencies where meteors can be heard. The best time to search is early morning, because sporadic meteors are more numerous. Start at the low end of the FM band (88.1 MHz), listening for 30 seconds. If you hear nothing, go up to the next odd frequency (88.3 MHz—the even decimals are not used for FM radio stations in the United States). When you hear a brief signal (music, voice, etc.) write it down under "good"—you just heard a meteor reflecting the signal from a distant station. If you hear a constant radio station, write it down under "bad"—and also include the two frequencies below and above this one. These adjacent channels may get signal splatter imitating a meteor. In an hour or so you should have been able to search all frequencies. Do this again from time to time until you have a list of all good meteor frequencies. Some frequencies will reveal more meteors than others, either because the station is closer, or there are multiple stations on the same frequency. A frequency with two stations will detect twice as many meteors. The higher count from such a frequency will produce smoother data and can help determine when a radiant rises and sets.

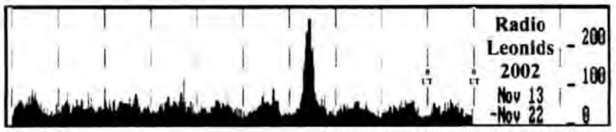


Figure 4

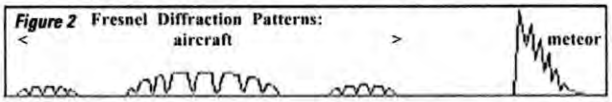


Figure 2

Data records: You should also record your observations on a computer. In 2002, I wrote a computer program in BASIC to sense a speaker's volume and write the time to a floppy disk using the game port. It was crude, but good enough to reveal a large peak in the Leonid meteors (fig. 4). Later, I used a PC-compatible multimeter to sense voltages. Today, I suggest using Radio-SkyPipe II software. It uses the computer's audio input line. It will capture data for 24 hours per record, and the display's scale can be compressed or expanded an immense amount. I like it, and the program and installation instructions are free. Note that the sound card information for a PC-compatible computer under "Options, Sound, Choose sound format" should be: Name = untitled, Format = PCM, Attributes = 11.025 kHz, 16-bit mono, 21 kb/sec.

Contacts: The International Meteor Organization has been (and probably still is) interested in radio observations, many of which are very different from the simple method I describe here (some types require a radio license). I can be reached at *astro.old.geezer @gmail.com*, and I recently opened a website, *astrooldgeezer.wix.com/ photography-studio*. Other references I suggest are "Listen in on a Meteor Shower," Dave Prochnow, *Popular Science*, November 2014 (also available at *www.popsci.com/article/diy/how-repurpose-your-old-radio-listen-meteor-showers*) and "Meteor Phenomena and Bodies," Zdenk Ceplecha and others, 1998, *Space Science Reviews*, v. 84, no. 3, p. 327–471. ✸

Radio meteor observing satisfies requirements of the AL Radio Astronomy Observing Program.

This photo and the cover photo were taken by Jerry N3VBJ.

Please remember your family, Here, Away or Departed this Thanksgiving Holiday.

Remember to always keep them in your thought and prayers.

From the Skies over Mt. Essex

SKY Events for November 2021

Nov 2nd- Double shadow transit on Jupiter 11:02UT 07:02 EDT.

Nov 4th - New Moon

Nov 5th - Uranus is at opposition

Nov 7th - Daylight Saving Time Ends 06 UT, 02:00 EDT

Nov 8th – Venus is 1.1° S of the Moon 5UT, 00:00 EST

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Nov 10th – Mercury is 1.1 ° N of Mars 4UT 23:00 EST on the 9th.

Nov 11th - First Quarter Moon

Nov 12th - N Taurid meteor shower peaks ≈ 15 per/hr.

Nov 17th- Leonid meteor peaks ≈ 20 per/hr.

Nov 19th - - Full Moon Traditional Name is Full Beaver Moon and Celtic is The Dark Moon.& A Partial Lunar Eclipse see the section on the eclipse.

Nov 22nd – Moon 1.8° N of M35 Open Cluster in Gemini, 8UT, 03 EST.

Nov 23rd - Double shadow transit on Jupiter 23:52UT 18:52 EST on Nov 22.

Nov 27th- Last Quarter Moon

Planet Lookout at mid-Month EST
Sunrise 06:41 EST and Sunset 16:52 ES T

Mercury – Morning Rise 06:01, Set 6:30, Mag- 0.9, Size 4.8 arc seconds.

Venus – Evening Rises 10:30, Sets 19:37, Mag -4.6 and 32.1 arc seconds.

Mars -- **Morning** Rises 05:39, Sets 16:13, Mag 1.6 and 3.6 arc seconds.

Jupiter -- Evening Rises 12:50, Sets 23:23, Mag -2.4 size 40.1 arc seconds.

Saturn – Evening , Rises 12:02 Sets 22:05, Mag 0.7, Size 16.4 arc seconds

Uranus— Evening Rises 16:11, Sets 05:53 ; Mag 5.7 size 3.6 arc seconds.

Neptune -- **Evening** Rises 14:00 Sets 01:39; Mag 7.8 size 2.3 arc seconds.

Partial Lunar Eclipse of 2021 Nov 19

Ecliptic Conjunction = 08:58:37.0 TD (= 08:57:24.4 UT)
Greatest Eclipse = 09:04:05.7 TD (= 09:02:53.1 UT)

Penumbral Magnitude = 2.0720 P. Radius = 1.1829° Gamma = -0.4552
Umbral Magnitude = 0.9742 U. Radius = 0.6434° Axis = 0.4104°

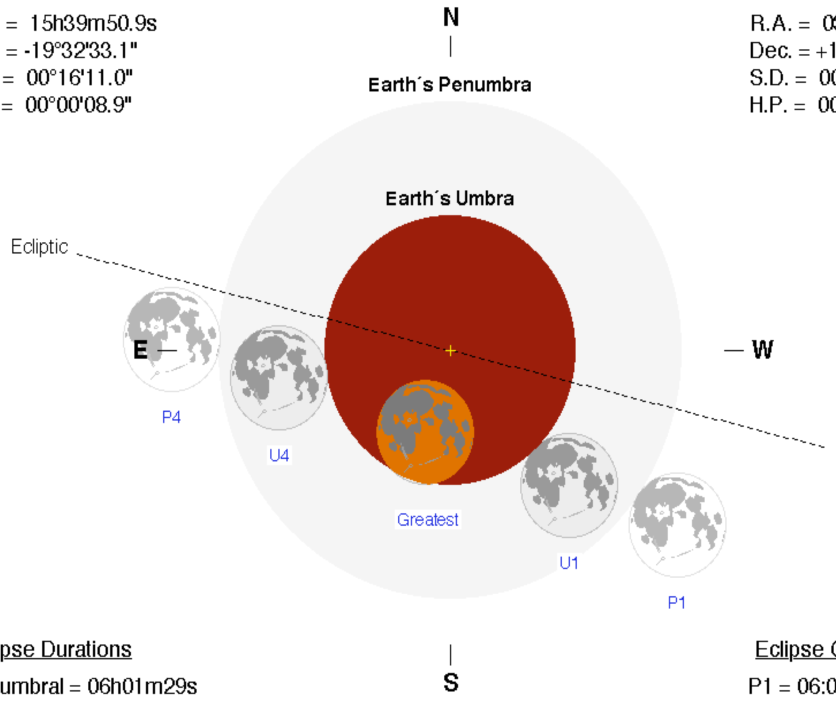
Saros Series = 126 Member = 46 of 72

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 15h39m50.9s
Dec. = -19°32'33.1"
S.D. = 00°16'11.0"
H.P. = 00°00'08.9"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 03h40m24.8s
Dec. = +19°09'15.5"
S.D. = 00°14'44.5"
H.P. = 00°54'06.1"

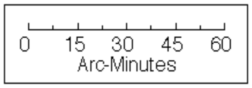


Eclipse Durations

Penumbral = 06h01m29s
Umbral = 03h28m23s

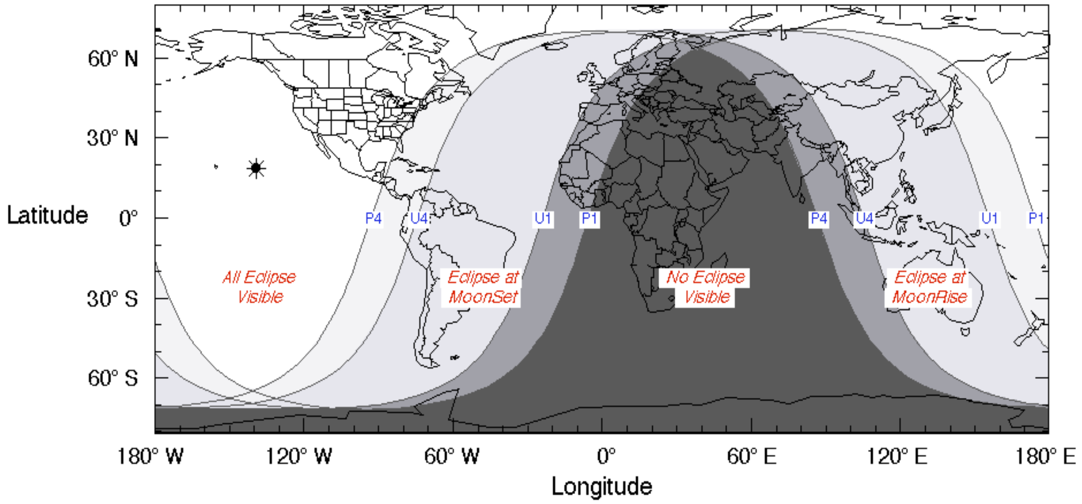
Eclipse Contacts

P1 = 06:02:09 UT
U1 = 07:18:41 UT
U4 = 10:47:04 UT
P4 = 12:03:38 UT



ΔT = 73 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html



2009 Apr 29

This Partial Lunar Eclipse

Starts P1 06:02UT , 01:02 EST - Moon enters the Penumbral

U1 07:18UT, 02:18 EST - Moon enters the Umbral

G 09:04 UT, 04:04 EST – Greatest Eclipse (Mid-Point)

U4 10:47UT, 05:47 EST - Moon leaves the Umbra

P4 12:03UT, 07:03 EST - The leaves the Penumbral

At the start of the eclipse the Moon's elevation will be 65°, mid-point it will be 33° and when it lives the umbra it will be 13° high.

The moon will move through the Earth shadow from West to East, beginning at the lower right-hand side (think 5 o'clock on a clock), The eclipse will end with the Moon leaving the Earth shadow at the lower left side of the Moon (7 o'clock on your watch).

The Earth has two shadow cones the fainter one is the Penumbral shadow it the outer shadow. The Umbra is the center shadow its cone is darker.

All you need to enjoy this eclipse is nice weather, jacket, warm beverage and chair. The only equipment need is a pair of binoculars