January 2009 P.O. Box 1005, Newcastle, CA 95658

Earthrise

(Reported by Greg, KO6TH)

40 years ago, the crew of Apollo 8 became the first human beings to leave our little planet and venture out into space. Their destination was the Moon, and for 20 hours (10 orbits) that Christmas Eve in 1968, that's where they were.

40 years ago, I was with our family on a Christmas holiday vacation at Lake Tahoe. I was in my early teens, and my parents had rented a cabin with some friends. We loaded up the cars and trucked up there to spend a week or so playing in the snow. The area got hit with a record snowfall that year, so there was no shortage of the white fluffy stuff. In fact, we were basically snowed-in. But that was OK, given the objectives. There were icicles several feet long hanging from the roof to play and experiment with, and a long slope to the street, perfect for the toboggan.

The cabin had no TV, so we missed the live news coverage of the events in the heavens. But I remember standing out in the yard on Christmas Eve, looking up at a near-full moon shining down between a couple of tall snow-laden pine trees, and saying, "There are three guys in orbit up there!"

(*continued on page 2)*

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RESOURCES

REPEATERS
145.430 (-0.6 MHz/PL 162.2)
440.575 (+5.0 MHz/PL 94.8)
223.860 (-1.6 MHz/PL 100.0)

CLUB NET
Thursdays, 7:30PM, K6ARR/R 145.430

CLUB MEETINGS
Second Friday of the month, 7:30PM at the Library, 350 Nevada St, Auburn CA

CLUB BREAKFAST
Last Sat of the month at Susie's Café, Cirby at Riverside, Roseville – 8:00 AM

NET CONTROL OPS
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2009 Calendar of Events

Jan 3	**VE Session – 8:00 – 10:00am**
	Raley's - Douglas/Auburn Folsom
Jan 9	**Regular Meeting**
Jan 31	**Club Breakfast – Susie's – Cirby/Riverside**
Feb 2	**VE Session**
Feb 8	**Regular Meeting**
Feb 23	**Club Breakfast**

We encourage members to receive Sierra Signals via email to save the Club the cost of reproduction and mailing

50 Years Ago At The SFARC

(Reported by Gary, KQ6RT)

The meeting of January 7, 1959 was called to order at 8:10 PM by President Theron Woods. Letter from 12th Naval District public works officer regarding requirement for liability insurance if meetings to be continued at Naval Reserve facility was read by President. Announcement of other meeting places was made. By unanimous vote, new meeting place was chosen at fair grounds home economics building, Rental fee of $2.00 per meeting to be paid from the general fund.

Jerry Murch announced Arlene's resignation as treasurer. Bruce Witwer was nominated and elected unanimously as new club treasurer.

Buzz Labonte announced that he would make arrangements for a small bag of misc radio parts to be given as door prize at future club meetings.

It was decided, by informal vote to postpone the awarding of five dollar gift certificate from California Radio TV Supply Company until the Feb 4th meeting, at which time two certificates would be awarded.

Bruce Witwer conducted a discussion of the availability (to club members) of approximately 15,000 feet of coaxial cable, owned by the Master Antenna Company. A spot check was made to determine approximate number of club members who would be interested in assisting to take the cable down.

At 9:41 meeting was adjourned to re-assemble at the Pac Tel & Tel switching center, Lincoln Way. Eighteen members were present at that location for a very interesting and informative tour of the switching center. Mrs. Snider, Senior Evening Operator, conducted the explanation of the operator's switchboard and Bruce Witwer explained the other various installations. Tour was completed at 11:05 PM and meeting officially adjourned at that time.

New club member Bob Davis (WV6DDI) of Clipper Gap is heartily welcomed aboard.

73,

Gary

KQ6RT

Earthrise...

(Continued from front page)

The Apollo 8 mission was originally planned to take place entirely in low Earth orbit, as a mission to check out the combined Lunar and Command modules. When the development of the Lunar Module fell behind schedule, and rumors indicated that the Russian's Lunar program was accelerating, NASA decided to make a bold move. Less than five months before launch, Apollo 8 was changed to a lunar mission, testing the mighty Saturn-5 rocket, Apollo command and service modules, and especially the new crew, in a mission to survey landing sites for the upcoming flights.

On the fourth lunar orbit, armed with cameras and out of radio contact on the back side of the Moon, one of the crew members looked out the window as the spacecraft rotated in flight. The chance timing was perfect, for there in the cockpit window was the colorful Earth, rising up from behind the Moon's gray horizon. That first picture was in black and white, using the film that happened to be in the camera at the time. After a short scramble to change out the film, the historic color image we all recognize was taken. To this day, nobody knows for sure which member of the crew made that first sighting, nor who took either of the pictures.

It is interesting to note that the daily rising and setting of the Moon viewed here on Earth is virtually non-existent when standing on the Moon. This is because the Moon's rotation is locked to its orbit around the Earth, with the Moon always presenting the same face to the Earth. So, in reverse, if you were standing on the Moon, you would always see the Earth in the same place in the sky. The only place to see an Earthrise is from lunar orbit.

Hams often see the Moon in a different way; not as a symbol of the fragility of our home planet, but as a radio mirror in space. Among satellite operators, it's often called "Oscar Zero", the first Earth satellite to get involved (though passively) with amateur radio. Bouncing radio signals off the Moon, a mode known as EME (Earth-Moon-Earth) is quite an achievement, requiring large antennas, significant power, and good technique. Besides the very long distances involved, EME communication is made harder by the fact that the Moon is a really poor reflector. It's far from being "shiny" to RF, with only 7% of the incident energy getting reflected, and it is most surely not flat. For comparison, charcoal, one of the known universe's darkest substances, is 4% reflective. Earth (the planet) averages about 30%.

EME is being made easier these days by PC sound card-based Digital Signal Processing software, which is able to pull a usable signal out of the noise from space. A little over 10 years

ago, PC software was being used to generate special modulation techniques, specifically designed to overcome the challenges inherent in this mode. With ever more powerful PCs, software has become even more capable, to the point where EME contacts can be made with as little as 100 watts into a single beam antenna.

As it turns out, the best time to attempt an EME contact is when the Moon is low on the Earth's horizon, using the planet's surface as a mirror to help focus energy towards the Moon. In other words, right after Moonrise.

73s,

Greg KO6TH

I Remember

(Reported by Dave, NO6NO)

I remember my friend Oscar Hahn and myself going to visit another Pennsylvania high school freshman, Don Clark, early in 1955. Don was talking (via CW on 40 meters) with another ham in California.

We were astonished and also a little leery of having a hoax perpetrated on us. How could this be, talking with someone 3000 miles away using Morse Code and receiving a response? Don took his time and explained how it worked and how easy it was to obtain a license. (Novice exams were administered by any General Class Ham and were good for one year.)

Oscar and I were hooked, hooked really did not describe how we felt, we swallowed the hook and had no chance of getting away. A week later Oscar learned the code and some theory, took his exam and earned the call sign WN3HXL. I was not the genius that Oscar was and took 2 weeks to learn the code. I became WN3IJP shortly after that. It did not take that long and I built from scratch a 6L6 / 6AG7 two tube transmitter with a 5Y3 power supply rectifier that put out a whopping 10 watts on a good day into a 40 meter dipole. I used a Hallicrafters S38D for a receiver.

It did not take a lot of time and we made the trek to Gettysburg and sat before a federal examiner and copied 13 words a minute in addition to passing a much harder technical examination. We both passed handily. What a thrill!

I soon graduated to a 6146 rig that upgraded my transmitting power to 75 watts of input power.

Then later on I assembled a Heathkit DX 35. Multi-band already.

You cannot believe how much ham radio meant to us. We had a high school graduating class of 350 and had over 30 licensed hams in the class.

When I graduated from High School, I joined the US Navy and went to Aviation Electronics School in Memphis, TN. I spent a lot of time at the local base ham radio station and operated the famous W4ODR Navy ARS at NAS Memphis, located at Millington TN.

After 4 years in the Navy, I settled in California as W6HFK and operated on and off for many years here in Auburn.

I remember fondly, each transmitter I ever built and wish I still had them. Ham radio kept me out of a lot of trouble during my teen years, and helped provide me with a good living all my professional life.

I am very happy to be able to give a little back to the ham community by mentoring a few hams and serving as an ARRL Volunteer Examiner each month. I wish Ham Radio a long life and thank those hams who helped me, especially W3ATA Bill.

I Remember……..

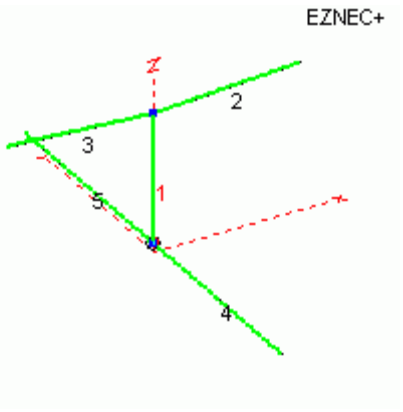
Dave Albright NO6NO

Miscellaneous Radio

Antenna Simulation

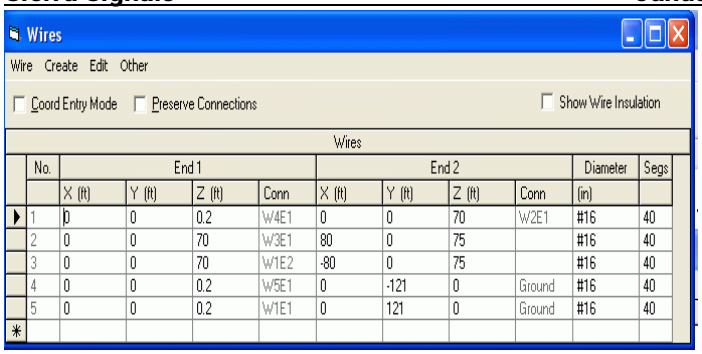
Part 2 – "The Marconi-T Simulated"

A couple of issues ago, we talked about a simple low-band antenna for 160 or 80. We'll use it as an example. If you remember, the Marconi-T is simply a vertical radiator with a top wire that acts as a capacity hat. It operates against ground and since most ground (other than salt water) is a poor conductor at best, ground losses are high. We solve this by putting out wire radials to act as our ground. In real, commercial applications such as an AM broadcast station, there would be hundreds of radials.



It turns out, however, that a very significant improvement in ground losses can be achieved with only a handful of them. In fact two will work well for amateur applications. The figure shows the antenna in the EZNEC coordinate system. It is modeled as 5 wires, the vertical and two top wires connect at the top, and the two radials connect. It is fed between the radials and the bottom of the vertical wire. Since the azimuth pattern is essentially omnidirectional, it doesn't really matter which direction is which, but for this one, I assumed that the X-axis points north, the Y-axis then points west, and of course the Z-axis is vertical, positive up.

So, how do we tell EZNEC about this 5-wire antenna system? Roy has made that pretty easy by making the coordinate entry look and act like a spreadsheet.



Wires

Wire Create Edit Other

Coord Entry Mode | Preserve Connections | Show Wire Insulation

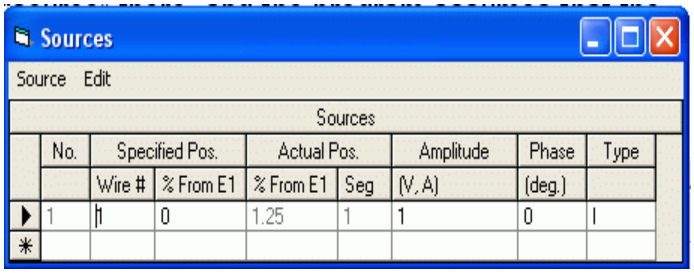
Wires

No.	End 1				End 2				Diameter	Segs
	X (ft)	Y (ft)	Z (ft)	Conn	X (ft)	Y (ft)	Z (ft)	Conn	(in)	
1	0	0	0.2	W4E1	0	0	70	W2E1	#16	40
2	0	0	70	W3E1	80	0	75		#16	40
3	0	0	70	W1E2	-80	0	75		#16	40
4	0	0	0.2	W5E1	0	-121	0	Ground	#16	40
5	0	0	0.2	W1E1	0	121	0	Ground	#16	40

The wire numbers are listed on the left. #1 is the vertical wire. It begins at the origin, 0.2 feet above ground, goes straight up, is 70 feet long (that happens to be the height of my suppor cable), and is made of #16 house wire. We'll get to the "Segs" stuff a bit later. Wires 2 and 3 are the top wires. They start at the same coordinate as End 2 of Wire 1, and go out 80 feet in the X direction, and slope upward just a little (to 75 feet) because the top sags just a little. Because they begin at the same coordinate as the vertical wire, EZNEC connects them electrically. Wires 4 and 5 are the radials.

Now this may seem a little strange, but EZNEC connects them to each other and to the bottom of the Wire 1. In reality, we will connect the center conductor of our coax to the bottom of the vertical wire and the shield to the radials. We're going to put an EZNEC "source" there, and the program assumes that the source has zero ohms internal impedance which means they're connected anyway.

OK, let's put our "source" in. It too is a spreadsheet-like screen and represents the RF energy going into the antenna.



Sources

Source Edit

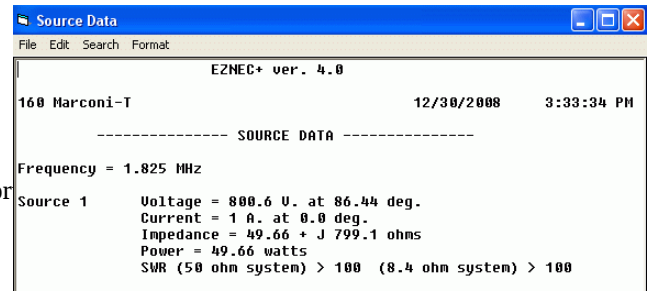
Sources

No.	Specified Pos.		Actual Pos.		Amplitude	Phase	Type
	Wire #	% From E1	% From E1	Seg	(V, A)	(deg.)	
1	1	0	1.25	1	1	0	I

The figure shows the screen. I have arbitrarily told EZNEC that it will be a current source of one amp and the resulting voltage will be in-phase with the current because there is only one source. You can probably see however that one can simulate a phased array (like a 4-square) simply by putting a source on each element and specifying the appropriate phases. All I have to do is tell the program which wire the source is connected to, and how far from End 1 to put the source. Note that the Source Type is "I" (current), and the amplitude is amp. Voltage sources are perfectly valid too, I just usually use a current source.

That's our model! The program knows the geometry of the antenna, and the parameters of the source of RF. There are some other choices to be made, such as ground characteristics. In this case, since I live in Auburn which is basically decomposed granite on top of granite that probably goes to the center of the Earth, I just chose "poor" for the ground characteristics. The program will allow you to specify conductivity in seimens/meter and the ground dielectric contstant if you wish.

So, you tell EZNEC to compute everything and it does. This model computes in about a second, more complex models will take a little longer. It computes the current and interactions for every segment, and then sums them to get the radiation pattern and source characteristics. Let's start with those.



Source Data

File Edit Search Format

```
                    EZNEC+ ver. 4.0

160 Marconi-T                                12/30/2008     3:33:34 PM

          ---------- SOURCE DATA ----------

Frequency = 1.825 MHz

Source 1       Voltage = 800.6 V. at 86.44 deg.
               Current = 1 A. at 0.0 deg.
               Impedance = 49.66 + J 799.1 ohms
               Power = 49.66 watts
               SWR (50 ohm system) > 100  (8.4 ohm system) > 100
```

The source data display is at the left. We have our 1 amp at a phase angle of zero, that's what we told it, it followed our orders, so far so good. Note the power of almost 50 watts. It computed this using Ohm's law. The impedance seen by our coax is complex … it has both resistance and reactance[1], in this case it is positive so it is inductive. Our coax will think it's feeding power into a coil. And finally, note the voltage. EZNEC computed this from Ohm's Law also. It has an almost 90º phase angle because nearly all of the impedance (801.6 ohms) is reactive. The SWR for a 50 ohm feedline is pretty much irrelevant at this point, we wouldn't try to feed this antenna with RG8 anyway. The "8.4 ohm system" is also meaningless, EZNEC allows you to specify an alternate feed system, mine just happened to be 8.4 ohms when I ran this.

OK, what do we know so far. Well the good news is that the radiation resistance of the antenna is 50 ohms (don't take the 49.66 ohms too literally, this is not reality, it is simulation, the real value will be moderately close once we build the antenna). That will be a nice match to our coax if we can do something about the 800 ohms of inductive reactance.

That's not so hard! Positive reactance is inductive – it looks like a coil. Negative reactance is capacitive – it looks like a capacitor. Negatives cancel positives, so all we need to do is put a capacitor in series with our coax to cancel the 800 ohms of inductive reactance, and we're home free. How much capacitive reactance? -j800 ohms worth. Unfortunately we don't measure capacitors in ohms, they're in farads. A farad is a very BIG capacitor, so we tend to measure them in microfarads (10^-6 farads) and picofarads (10^-12 farads). Fortunately there is a formula that relates the two. It is: $Xc = 1/(2\pi FC)$ where Xc is the capacitive reactance, F is

[1] Mathematicians (I am one) use "i" to denote the so called "imaginary part" of a complex number, mainly because the word "imaginary" begins with an "i". It stands for the square root of minus 1 and there is no real number which, when squared, equals –1. Electrical engineers had already used "i" to denote current because for them, "current" starts with an "i". So, they use a "j" instead, ignoring the fact that "imaginary" does not start with a "j". I kid my EE friendsJ

the frequency in Hz, and C is the capacitance in farads. Let me help you out here … a little algebra yields $C = 1/(2\pi FXc)$. F is 1,825,000 Hz (1.825 MHz) and Xc is 800 ohms. So, C = 1 divided by 6.28 times 1825000 times 800, or about 100pf or so. The capacitor (use a variable one, after all, this is simulation) needs to be well spaced for your power level, but that's all it takes. Your rig is happy, your line losses are low, and you have a vertical 160m antenna.

Next issue we'll tackle radiation patterns which you also get from the simulation, and some of the small "gotcha's" that can occur and how to avoid them.

I hope everyone had a great Holiday season, the best Christmas gift I can get would be some sunspots!

73,

Fred K6DGW

Antenna Preparation for Winter

(Reported by Carl , WF6J)

While California has a very mild winter compared to my home state of New York, never the less you should take a close look at not only your main antennas, but also your mobile antennas.

I began my inspection with my Comet SB97 Tribander. This antenna and mount has been on my vehicle for years and has seen it's share of road travel. There are a total of 8 set screws that hold it together. With constant wind buffeting and vibration from the vehicle, these can work loose. In my case I found most of the set screws tight, but not that tight. Then there was this hole, a set screw was missing. Thank goodness there was a second set screw holding things together or it might have become a short single band antenna!

Solution? Z-71 Thread locker, a T6 Torx allen wrench and a Q-Tip. Systematically I went screw to screw, taking them out, putting a dab of thread locker on each and replacing them, then making sure they were tight. Now I hope this will hold me until next year.

With the antenna ready to go, my inspection turned to the mount. I pulled it off the car and made some checks. Mechanically looking for worn insulation or kinks in the coax. Physically for loose hardware, bent pins, scratched paint. Turns out all was OK, except for some minor scrapes that took a bit of black touch-up paint. Be sure to clean the mount (or any surface) before painting.

Sound like too much work? Think of trying to "fix' your antenna at night, in the rain, alongside I 5 with people going by you at warp speed. That's a little bit faster than the posted limit... you know. An ounce of prevention is worth a pound of cure.

Now its off to the roof top for some QC on the bems.

73, de WF6J

Antenna Analyzer

Many of the newer club members are unaware that the Club owns an MFJ Antenna Analyzer. It was donated by World Radio a few years back and is available for any dues paying member to use. Currently it is in the hands of Jim Griffith - KI6AZH. If you would like to use it contact Jim and also please keep the Club Treasurer advised as to it's whereabouts.

George Simmons, KG6LSB

Newsletter

This will be my last month as Newsletter Editor. Matt Diridoni, KC6RUO will be taking over those duties for a while. Matt's email address is matteod@comcast.net

Thanks Matt! See you all at the next meeting.

73 – Deb, KF6LXN