

Vol. 22 No. 1

[www.mvus.org](http://www.mvus.org)

January, 2008

MVUS Sunday Net at 14:30 UT (currently 10:30 AM local time, EDT).

**The net frequencies are primarily 144.280 Mc and 28.960 Mc.**

**January Meeting Fri 25th of January**

**At the Hometown Buffet near SR 725 and Yankee Rd. in Centerville**

#### Contents

De N8ZM.....	3
This and That.....	4
Spark to Modern VHF/UHF/SHF VCOs.....	5
Kuhne Electronics New Building.....	7
NiMH Maintenance.....	8
New Satellite Tracking Program.....	9
Transponder Update.....	10

#### Upcoming Events

Dayton Techfest (At Sinclair College) **17/18 February**

#### Silent Key

**Clyde Schaffnit, KB8HV, age 88**, became a silent key on Dec 4, 2007. He was a longtime member of our club and also was a member and active in a great number of other organizations. He will be missed by all of us.

#### Miscellaneous

We are inviting Papers/Presentations for the 2008 Dayton Hamvention to be presented at the VHF Forum on Sat, 17 May 2008. Submit Abstract & Bio to: Mike Schulsinger, 1002 Woodlawn Ave, Springfield OH 45504-2140, e-mail [N8QHV@ARRL.net](mailto:N8QHV@ARRL.net) or to Red Dakin, W8ULC 4519 N Rt 123, Franklin, OH, 45005

#### 2006 Proceedings (Microwave Update) still available

**We have a few 2006 Microwave Update Proceedings left. Available for \$ 14 (including postage) or at the meetings for \$ 10.00. Send check to Gerd Schrick, 4741 Harlou Dr, Dayton, OH, 45432-1618**

## De N8ZM

Lot's to talk about this month, so I'll skip the usual ramblings about the weather and the passage of time and get right to business...

Hamvention is fast approaching, and several MVUS related irons are in the fire. First, I have submitted the paperwork for our booth space and talked with the Inside Exhibits Chair, so that all appears to be in order. We will likely be located in the same space as last year, although there are some layout changes pending that may cause us to be moved slightly. I don't think that is anything to worry about, so long as we can find it ( and our visitors, too).

Sadly, we won't have Clyde Schaffnit, KB8HV, to help us any more. It seemed like Clyde was always there to quietly help out when we needed him, and he will be missed. No doubt his good deeds and sense of humor assured him an immediate entry through the Pearly Gates.

You, however, are still with us, and we could certainly use your help with setting up and staffing the MVUS boot throughout the weekend. Please do your part to support the club. It ain't like it's work or anything!

Also at Hamvention, MVUS will be organizing the VHF/Microwave forum; an effort lead by Mike Schulsinger, N8QHV, and assisted by Red Dakin, W8ULC. Red promised on a stack of QSL cards that he did NOT have a wedding to go to on THAT weekend this year. We appear to be pretty fortunate in that we should have close to the same amount of time and space allocated again this year. If you have any ideas for presenters, or you have something of your own to talk about, please get with Mike to get on the program.

Also at Hamvention, we are planning to have our beacons running from the HARA roof again. Mike Suhar, W8RKO, is leading that charge along with John Human, N8VZW. More to come on this.

The last Hamvention related item is that our concept of organizing a high altitude balloon launch in conjunction with the show is making progress. I have talked with Bill Brown, WB8ELK, and he is very supportive of the idea. Of course, while Bill is able to be our technical tour guide, WE need to do the work of bringing it all together, so at the meeting this month we will discuss some of the possible payloads and the tasks that need doing. This requires a little bit of work with the FAA and NOAA, as well as some engineering, not to mention some money from the MVUS treasury. If everyone chips in a little bit of time to assist, we can have a fun time with this.

New subject: Our trip to visit the Space Science Center at Morehead State University in KY is scheduled for April 4/5<sup>th</sup>. We will drive there on Friday evening so that we can start early touring the Center and Jeff Kruth's huge surplus microwave equipment collection, and still not arrive home too late on Saturday. BTW, the night of the 4<sup>th</sup> is a DARA meeting, if that affects your plans. One suggestion was that while we should car pool, we shouldn't pile too many folks into one vehicle in order to leave room for whatever treasures we find at Jeff's and want to bring home! We can also double up on hotel rooms as appropriate. I don't have any info yet on what is available near Morehead, or what the rates might be. There will very likely be a sign up list started soon so that we can organize rides, rooms, and the like. (FYI: Easter Sunday is March 23<sup>rd</sup>).

At the last meeting, a question was asked about whether MVUS would like to host MUD again, maybe in 2009 or 2010. IF we want to do this, we need to start talking with the folks who 'own' it now so that we are on their radar. Any thoughts?

Last on my list of business to discuss is the date for our next FMT. The last one was a lot of fun, and the guys who really made it happen (W8RKO, N8UR, ND8I, and others) seem to be willing to do it again. The thought is to modify the format a bit, and the bands used, so some planning is in order. The biggest question is scheduling the date. I'd like to see it happen before May, but there have been suggestions to wait until June. April seems reasonable unless too many of us have other projects in that time frame. Let me know!

Oh, I did think of one more thing: A couple of you have asked about having another tech session for making measurements on whatever you have that needs measuring (restricted to electronic devices, of course). N8UR has offered to host it at his QTH so that we will have very good time and frequency references. I can probably dig up some test gear, but it would help with the planning if I know what you want to measure. Red has asked about checking out NF and IMD on some HF receivers that are used for IF's. That can be arranged, I think. Any other needs?

Well, we have a lot to talk about on Friday, January 25<sup>th</sup>, so be there to put you 2 cents in. I may be a little late as I expect to be driving back from western Michigan that afternoon. WX forecast doesn't look pretty, though.

See y'all soon... 73, Tom

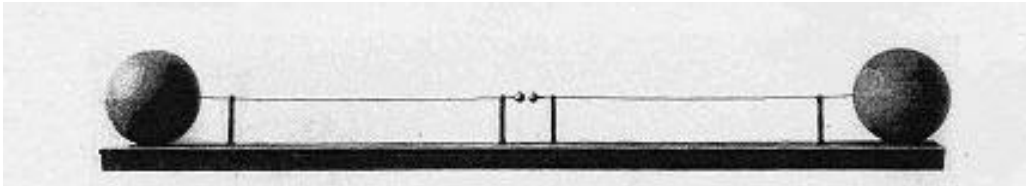
## This and That 1-08

- Newest Technology. I'm crazy about the newest technology, but I only want a gadget if it makes things faster, better or more amusing. A device is no good to me if I have to pull out the manual every time. If a gadget isn't easy to use and doesn't enhance your life - get rid of it.  
[Drew Carey]
- Business Hype. If you ever listened to a gasoline engine w/o a muffler you know it sounds like a wild shootout and accordingly it was originally named an explosion motor. But today with a muffler, this thing is very quiet, and now one hybrid car is advertised as having an "on board range extending power source". Of course, it is a powerful gasoline engine, which still provides for cruising at high speed. But it also charges a battery, which runs a weaker electric motor for stop and go traffic in town. [Gerd, WB8IFM]
- Out of Whack. The relative availability of healthy versus unhealthy items is way out of whack (in rural and in poorer areas) so the primary reason why people have unhealthy diets is simple availability. [Tom Farley, Study: Orangeburg County SC]
- Wind Power. Companies are manufacturing kites the size of football fields that can be deployed with a flexible cable from the bows of huge vessels. Rising nearly 1000 feet above sea level, they catch winds that are up to 50% stronger than at the surface and help pull the behemoths along. [Shelly Emling]
- TV. Philo Farnsworth invented the video recording tube and was instrumental in developing and implementing TV. He last stayed with ITT in Fort Wayne until 1967. Then he retired and moved back to Salt Lake City. As he saw what television had become he wondered if all his work had been worth it. Then in 1969 he and Pem watched a man walk on the moon and he knew his work had been worthwhile. Philo T. Farnsworth died in 1971. [Paul Schatzkin]
- Law of the Sea. An immutable law of the sea is that shipwrecks are attributable to one or more of these factors: human error, structural or equipment failure, and the weather. [Hank Whipple: The Wreck of the SS Wisconsin]
- Commuting on the 8:03. ...Only about half of the people have their noses in newspapers, magazines, and (rarely) books. The rest are either dozing or entertaining themselves with ipods, laptops loaded with TV shows and movies, and handheld devices that their owners peck at frantically, like pigeons in a Skinner box... [William Falk /The Week]
- Wrist Watch. It's on the way out. Cell phones are taking over the time function. This in spite of strenuous efforts of the manufacturers to sell weighty, jewel-encrusted timepieces with incomprehensible features, such as "caliber S chronograph black dial" and "perpetual retrograde calendar on tachymetre bezel". [Boston Globe Editorial]
- Vehicular Needs....Americans may want relief from the financial pain endured at the gas pump but most still want to drive comfortable and relatively powerful vehicles that can meet their "vehicular needs." [Jim Gorzelani / CTW Features]
- Quantum Physics. A person who is not shocked by quantum theory does not understand it. [Niels Bohr]
- And. While a modest number of people truly understand the theory of relativity, no one understands quantum mechanics. [Richard Feynman]
- Power of Words. Their sites have search engines. Ours has a find engine. [Ad by Coilcraft]

From Spark Generators to Modern VHF/UHF/SHF Voltage Controlled Oscillators

As we teach advances in the field of microwave oscillators, it may be fun to step back and look at the origin of oscillators. The very first one, invented by Heinrich Hertz in 1886, was generating RF energy based on a spark between a gap and used a resonant dipole as frequency determining element.

The original test circuit shown in Fig 1 is preserved at the Deutsches Museum in Munich, Germany. Fig 2 shows the current and voltage distribution along the dipole [1-2].



**Fig. 1. Original dipole made by Heinrich Hertz in 1887 using balls at the end to form a capacitive load**

**(Deutsches Museum, Munich) [1]**

The iron balls at the end of the 2 wires as shown in Figure 2 reduces the resonant frequency significantly. Today we call this capacitive loading, and this also makes the bandwidth of the circuit much narrower.

These spark “oscillators” were driven by a modulated voltage resulting in a hum like sound at the receiving station

Progress was made in the following years by inventing the electron tube in about 1932 suitable for microwave applications. While the tube was one of the requirements of the oscillator, the resonant circuit was another important part of the circuit. In 1935 so called acorn tubes (miniature tubes, triodes!) were developed, and probably the very first “crystal” triode transmitter was configured. Rather than get the energy from a spark, the next generation of oscillators consisted of an amplifier with feedback, where a small amount of energy is used to get oscillation started and then maintain oscillation. Today this is explained in terms of a negative resistance which compensates the losses, and can be expressed by concentrating them in form of a loading resistor parallel to the resonator (tuned circuit) By applying the right amount of feedback, the input (and or output) of the amplifier now shows a negative parallel (or transformed a negative series) impedance.

In the search of stable but tunable resonators the principle of a quarter wave line was applied. By mechanically tuning the inner portion of a coaxial resonator, a high Q (Figure of merit, ratio of stored energy vs. dissipated energy) the novel mechanical arrangements as shown in Fig 6 (a) and (b) were invented [2]. In case a, a screw allows fine tuning by extending the center coax a small amount, while in case b an extra wide plunger is extended and creates a much wider range. An actual circuit diagram is given in Fig 7, which shows how the tube is connected [2].

This system for obtaining very good resonators was applied to test equipment, where tuning the mechanical resonator set the frequency of the oscillator. This oscillator was used in the early Tektronix spectrum analyzers, where the actual frequency was modulated as part of a phase locked loop control system, which stabilized the frequency against a standard.

Hewlett Packard, now Agilent designed their HP 8640 signal generator around the tunable cavity, 200 to 400 MHz, and diving the output frequency down for lower frequency in segments of 2:1. These were built when the spectral purity of a (wide) tunable oscillator became interesting. This parameter is called Phase Noise, expressed in dB below the carrier in different offsets referenced to 1 Hz bandwidth.

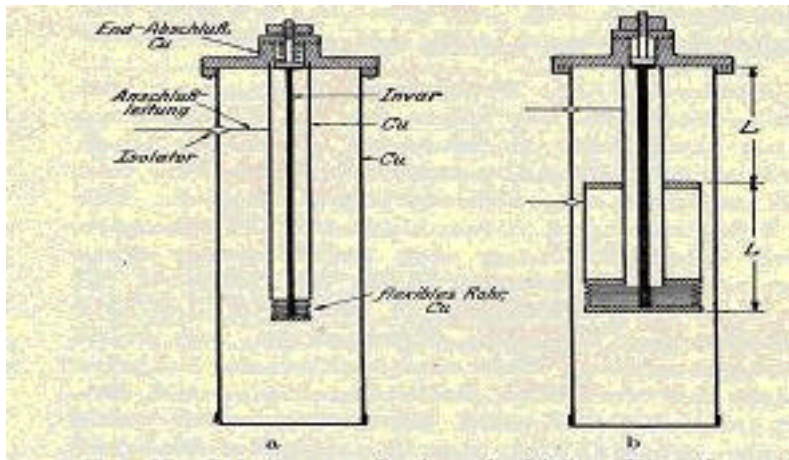


Fig. 6. Coaxial resonator oscillators [2]

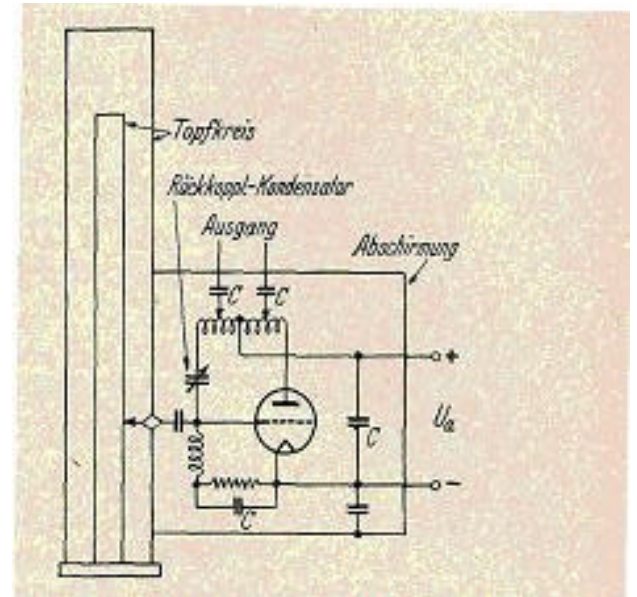


Fig. 7. Actual early tube oscillator circuit using a coaxial resonator [2]

Today with synthesized signal generators these mechanical systems are replaced by voltage controlled oscillators (VCOs), using tuning diodes or varactors. These are reversed biased Si or GaAs diodes, which become voltage depending semiconductor capacitors with a variation of up to 10 fold change of the capacitance. Their invention was one of the most important milestones in this field, as there would be no VCO without them! These oscillators are built around printed circuits, which have a Q of about 50 for the resonators. By applying modern 3D field theory of coupled lines and resonators, these modern marvels now realize a Q of up to 250 and compete well with the previous mechanical designs and meet the stringent requirements of modern wide tunable system with good phase noise. Figure 8 shows the measured phase noise of a modern coupled mode resonator (line) based wide band VCO. The layout of the modern printed resonator using this patented design is shown in Fig 9. [5-10].

For more details on these oscillators see the references [www.synergymwave.com].

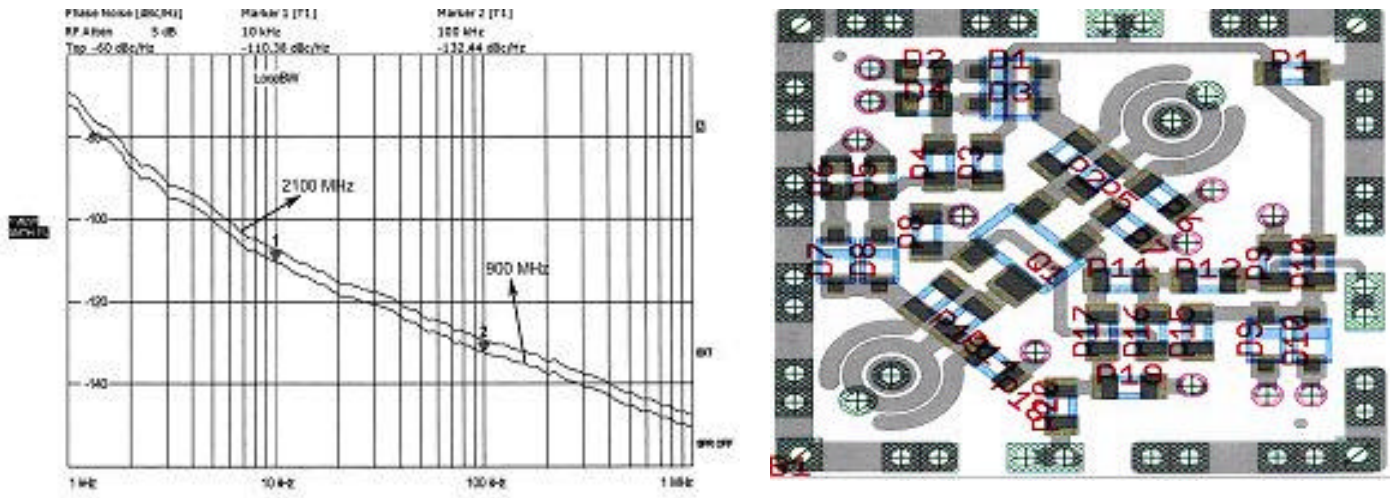


Fig. 8. Measured phase noise of a modern coupled mode

resonator (line) based wideband VCO (900-2100MHz) (Synergy Microwave Corp, USA)

Fig.9. Typical layout of the wideband VCO using modern printed coupled resonators

(Synergy Microwave Corp, USA)

#### References

- [1] H. E. Hollmann, "Physik und Technik der ultrakurzen Wellen", Verlag von Julius Springer, Berlin 1936.
- [2] H. Rothe and W. Kleen," Elektronenöhren Als Schwingungserzeuger und Gleichrichter", Akademische Verlagsgesellschaft Becker & Erler Kom.- GES. Leipzig, 1941.
- [3] G. Vendelin, A. Pavo, U. L. Rohde, "Microwave Circuit Design Using Linear and Nonlinear Techniques", Second Edition. John Wiley & Sons. INC 2005.
- [4] U. L. Rohde, "Microwave Wireless Synthesizers", John Wiley & Sons. INC., 1997.
- [5] U. L. Rohde, A. K. Poddar, and G. Boeck, *Modern Microwave Oscillators for Wireless Applications: Theory and Optimization*, John Wiley & Sons Inc., 2005.
- [6] U. L. Rohde and A. K. Poddar, "Technological Scaling and Minimization of 1/f Noise in Coupled Mode Oscillator For Wireless Systems", *Microwave Journal*, June 2007.
- [7] U. L. Rohde, A. K. Poddar, and R. Rebel," Integrated Low Noise Microwave Wideband Push-Push VCO", *US Patent No. 7,088189*.
- [8] U. L. Rohde and A. K. Poddar, "Noise Minimization Techniques for RF & MW Signal Sources (Oscillators/VCOs)", *Microwave Journal*, Aug. 2007.
- [9] A. Grebennikov, "Noise Reduction in Transistor Oscillators", *High Frequency Electronics*, May 2005. *Writer's Handbook*. Mill Valley, CA: University Science, 1989.
- [10] J. S. Schaffner, "Simultaneous oscillations in oscillators," *IRE Trans. Circuit Theory*, vol. 1, no. 2, pp. 2-8 Jun. 1954. T. Endo and S. Mori, "Mode Analysis of a multimode ladder oscillator," *IEEE Trans. CAS-23*, pp. 100-113, Feb 1976.

## **Kuhne Electronics added a new building (right) – Nov 2007**



**Last November a new building was added to the already spacious factory of Kuhne Electronics in central Germany.**

**During the holidays Michael, DB6NT and xyl Jutta took a well-deserved vacation on the sunny Canary islands.**

**Now it is back to Germany and work has started to furnish the building and get ready for new orders to fill.**

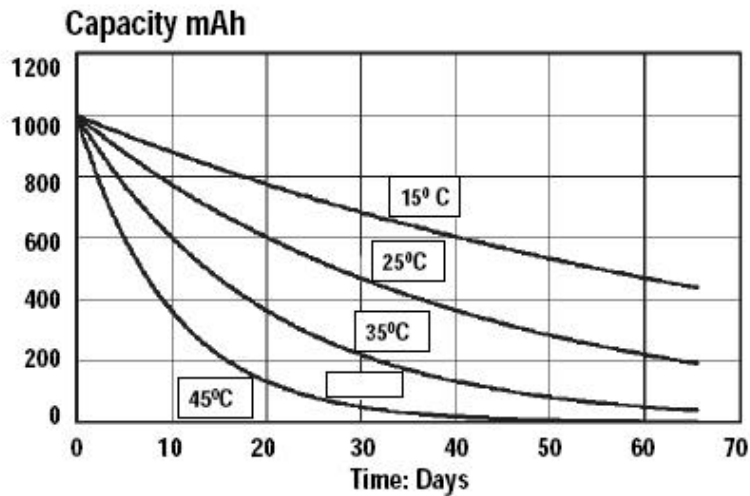
### **NiMH Maintenance**

By Gerd, WB8IFM

NiMH cells discharge when not in use relatively fast (in 1 to 2 months) depending on temperature See graph 1

When you purchase new cells that have been on the shelf longer you might have problems. So the first thing you want to do is check the cell voltage. If the voltage is below .7V there maybe trouble. Often those cells will not come back to their initial capacity. When we were picking cells for a satellite, which involved repeatedly charging and discharging a bank of cells, in order to find matching cells, dropping the voltage below .9 V was an absolute "NoNo".

## NiMH Self-Discharge Characteristics



- Self-Discharge 2.5%/day at 25C
- Higher T, Higher Self-discharge

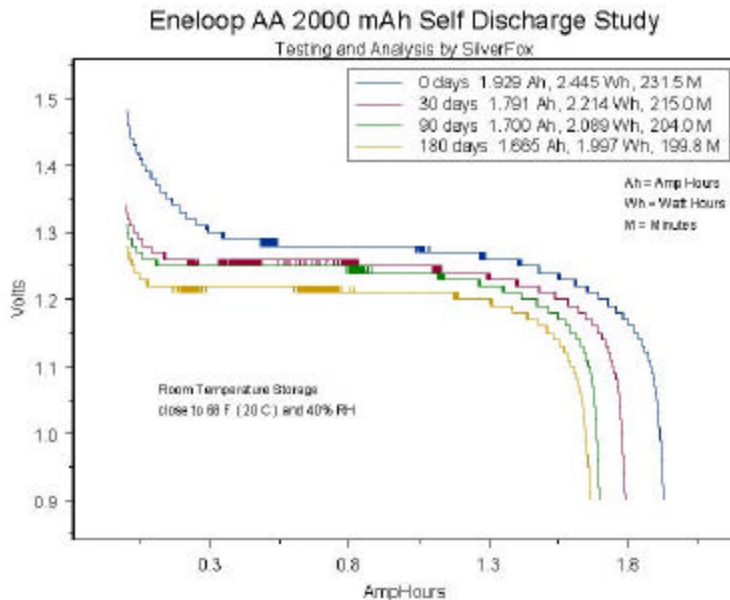
2006 TI Portable Power Seminar

The reason for this “self discharge” lies in the chemistry, you see the electrolyte between the electrodes is conducting and increasing it so the cell can deliver higher current also increases the self discharge, you can’t have one without the other.

Of course, you can counteract this “self discharge” by either trickle charging the cells before use (10 to 15 ma is an accepted value) or keeping them cool in the icebox\*, as all chemical reactions are slowed or even halted in low temperatures. When needed for use, they have to be brought up to temperature while cells on a trickle charge are immediately ready for use.

\* Some recommend keeping the cells in the freezer, however, sealed in an airtight plastic bag to keep moisture out.

Graph 2



There are now special cells on the market designed for low selfdischarge by using a special membrane in the electrolyte between the electrodes. These cells do have a somewhat reduced capacity.

See graph 2



## Transponder Update

By Gerd, WB8IFM

I've got the feeling we are finally making progress in getting this thing "on the air". To remind you the transponder, or translator, has input on 70 and 23 cm and a single output on 13 cm.

After the frequency measuring test, which demanded a lot of time and effort, Mike, W8RKO, has now promised a full bore effort on completing the local oscillators. This involves adding some multipliers and cavities (resonant circuits).

In the meantime John, N8VZW, and I have been working on installing the unit on the roof of Steve's, K8UD 2-story business in the Belmont area (SE) of Dayton. As you can see in the picture, a 10ft (3m) tower

is installed in the center of the roof, a large box holding the equipment is now also installed and we are working on getting the antennas ready. A big wheel for 23cm is available, leftover from the beacon project, a 70cm slot antenna was built and a 13 cm big wheel will be built or acquired shortly. Since we are not happy with the slot antennas SWR, Mike, KA8ABR has promised to build a 70 big wheel. Looks like we might wind up with an all big wheel installation.

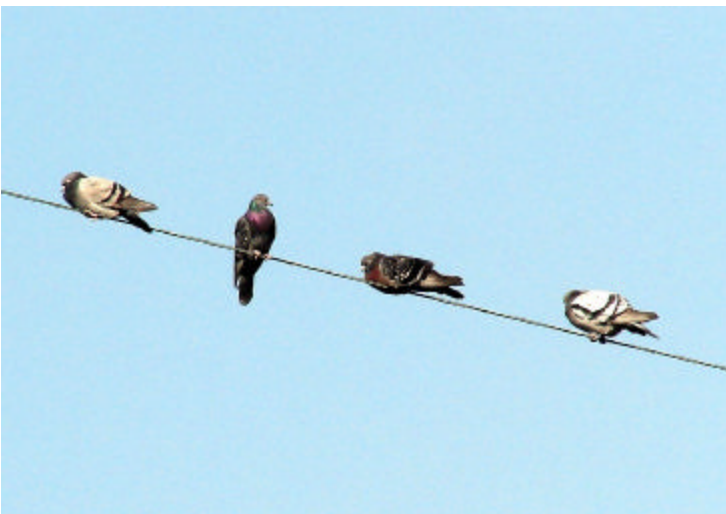
Unfortunately, the weather is not very hospitable right now and John, our great help and motivator, is heading to Florida to escape the worst of the winter. But we will watch the weather situation and get some work in whenever we can. Stay tuned.



**10' tower, guyed, socket: 3 cement blocks on a rubber mat**

**November, 2007**

**View is towards NW!**



**The birds are watching, not much interest though one is looking, three are turning their backs to t**