ANOMALOUS PROPAGATION

Newsletter: ***The Midwest VHF/UHF Society***

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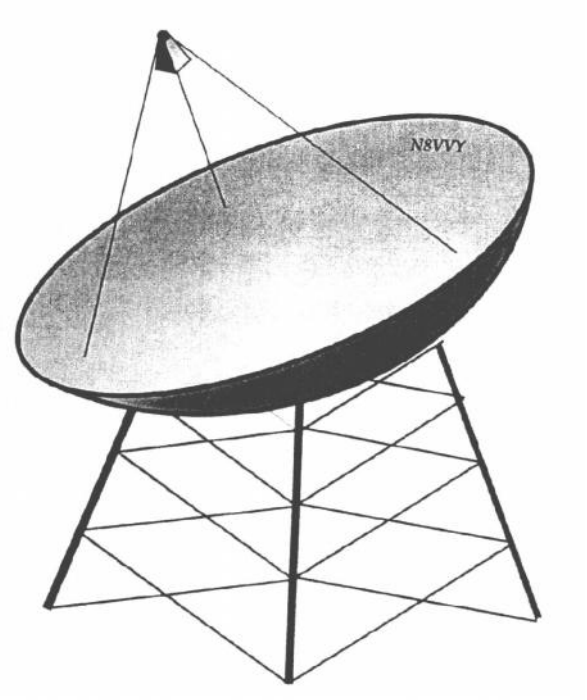

Annual Society membership is $ 12.00. Please make checks payable to Gerd Schrick

MIDWEST VHF-UHF SOCIETY

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Mtg Fri 29th of June (6:30PM) MCL Cafeteria on 4485 Far Hills Av (Rt. 48) in Kettering. Going South from Dayton drive past the Town and Country Shopping Center on your left. At the next light turn right, then left into a small shopping center. MCL is at the end on the right. Notice this is the 5th Friday this month!

Contents

Upcoming Events

Central States:

46th Annual CSVHFS Conference,
in Cedar Rapids, IA,
July 26–28, 2012.

Noise Sources Available

Tom and his crew are still working to crank out more noise sources.

Two models are available. The model 6V will provide a nominal 5 dB ENR (calibrated) usable up through 2.5 GHz, while the model 6M will offer a nominal 5 dB ENR from 3 GHz through 10 GHz, also calibrated.

The model 6V will sell for $50, while the 6M will be $90 due to the higher cost of the noise diode. These units are compatible with most Automatic Noise Figure Meters such as the HP 8970 models. Prices are “Post paid”.
Send your order to: Tom Holmes, N8ZM, 1055 Wilderness Bluff,
Tipp City, OH 45371. Make check payable to MVUS,Inc.

DE N8ZM

Well, the 2012 Hamvention is history, and by all accounts, it went very smoothly. Not nearly as much crap in the flea market as last year, though. OK, you knew I had to say something about that, didn't you?

The weather was nearly perfect with not a drop of rain. The MVUS booth was a popular stop for people, the VHF/Microwave forum was very well attended, the balloon launch, which we help sponsor, went off on schedule, and we sold quite a few Noise Sources. All is well in the world. Let's see if we can pull it off again next year.

Regarding the noise sources, we delivered 11 VHF units at the show, with 5 orders for the microwave version received either at the show or by mail. I have ordered the Noise/Com diodes for those, and once they arrive, we will have another work session to get them built, calibrated, and shipped. Noise/com quoted 2-3 weeks delivery from the order date of June 5th, so should have the diodes before July 1st. Unfortunately, with my work schedule, it will be the last week of June before I have a free day to host the work party. But we will get them out to those who have orders in. And once we ship those, we will get close to break-even for the project.

One of my Hamvention houseguests (out of the 17 who stayed here this year) has donated some Motorola GTX 900 MHz mobile radios to our cause. Another of the guests has offered to program them for us. I would like to put these on the same frequencies as the ones that Mike, N8QHV, has been modifying for us so that they will be compatible. Once I have that data, I can get the programming done. Mike…What simplex and repeater frequencies are you set up for? The next step is to use a couple of the radios to build a repeater and find a decent site for it. You guys have any ideas?

Finally, we have confirmed August 18th for the picnic at Daun's place. As always, MVUS will provide the burgers and dogs, soft drinks, and miscellany. You are requested to bring a small side dish or dessert. Enough for 4 -6 people is adequate as we always have much more than we need. Figure on starting at Daun's around 11 Am, with eats about 1:00. Of course, no MVUS picnic would be worth the name without a tech session so bring stuff to test, measure, or just drool over! Rumor has it that Daun has a new Spec An to show off! One request: please let me know what you might be bringing to test so that we can have the right test gear handy. And that includes antennas!

The 4th Friday this month is the 22nd. Unfortunately, I will be trying to get home from Vegas that evening after teaching a class there all week. In truth, even if I were home, I'd have to miss the meeting since we have tickets to a concert at the Fraze for that night, which now will be used by my better half and the grandson. Or his mother if he decides he can't stand his Grandpa's taste in jazz.

Given that we have a 5th Friday this month, is anyone averse to moving the meeting back to the 29th? If we decide to move, I need to ask Mike, W8RKO, to advise the folks at the MCL about the date change. SO, please let me know if you object to the change by June 20th.

See you soon, hopefully! Tom, N8ZM

This and That 6-12

Car. “They think of a car as a giant bummer. Think about your dashboard. It’s filled with nothing but bad news.” [Ross Martin, Executive VP of MTV Scratch]

Casinos. Seems we have hundreds of casinos in the United States. They are called banks; you put the money in, they make the bet and roll the dice. [“Speak Up” Local Newspaper]

Zilch etc. “Any calls for me while I was out? ---None. Not a Peep! … Nada…Zilch…Zip…One Big Goose Egg…---She gets a kick from telling me ‘NO’ “ [Beetle Bailey Cartoon]

Moving Boulder: Imagine “a granite boulder with a rocket engine” and you better understand what the 2.5-ton 550-hp, twin –turbo (Mercedes) ML63 AMG is all about. [EdmundsinsideLine.com]

And Nanny Technology. …”This high performance SUV has been made “brilliantly capable” by its computer-controlled air suspension, active roll stabilization, and other electronic technologies.”… [EdmundsinsideLine.com]

Aviation 101. Takeoffs are optional. Landings are mandatory.

And: The propeller is just a big fan in front of the plane to keep the pilot cool. Want proof? Make it stop; then watch the pilot break out into a sweat.

And: The only time you have too much fuel is when you are on fire!
[Machine Design, Nov. 2011– authors unknown]

Flash-Matic. Eugene Polley, a Zenith engineer who in 1955 invented the remote control for the TV passed away recently. About his invention he said: ”Maybe I did something for humanity, like the guy who invented the flush toilet.” [The Week, June 8-2012]

Clicker Ad. “A flash of light from across the room (no wires, no cords) turns set on, off or change channels … and you remain in your easy chair!” Which is where many of us have remained since. [D.L. Stewart]

Worst Passwords. A security firm has isolated the 25 worst passwords to use online. These include “123456”, “qwerty”, “letmine”, and the worst, “password.” [ABCNews.com]

Progress. Progress isn’t made by early risers. It’s made by lazy men trying to find easy ways to do something. [Robert Heinlein]

The Earth. “We do not inherit the earth from our ancestors; we borrow it from our children.”
[Chief Seattle]

Gold It is estimated that all the gold ever mined in the world (160,000 tons as of 2007), could be placed in a single cube roughly 60 ft. on a side. [www.onlygold]

HF Band Conditions..depend a lot on the K-iondex. Here an explantion of K: A 3-hourly quasi-logarithmic local index of geomagnetic activity relative to an assumed quiet-day curve for the recording site. Range is from 0 (quiet) to 9 (severely disturbed). The K index measures the deviation of the most disturbed component (see geomagnetic elements). Also see Kp. [NASA]

Alcohol...may lead nowhere, but it sure is the scenic route. [Molly Ivins]

Other people. People travel to faraway places to watch, in fascination, the kind of people they ignore at home. [Dagobert D. Runes]

Advice. “Be yourself, everyone else is taken”. [Oscar Wilde]

Balloon Launch at the 2012 Hamvention

By Jim Shaw, AL7BA,
and Tom Holmes, N8ZM.
Article provided courtesy of
Dayton Hamvention.

As has been the case for many years at the Dayton Hamvention®, a weather balloon carrying amateur radio equipment was launched following the Balloon Sat Forum on Friday, May 18.

Because amateur radio operators, or hams, are known as do-it-yourselfers usually finding a way to make their project work, the Dayton Hamvention® is where so many of them meet to share ideas, and find the pieces, parts, and goodies needed to create the do-it-yourself projects. It somehow seems fitting that an activity like the balloon launch takes place during this weekend event.

This years balloon will carry Automatic Packet Reporting System (APRS) transmitters on 144.39 MHz (WB8ELK-11) as well as multi-mode downlinks on DominoEX22, continuous wave (CW), and slow scan TV (SSTV) on 144.34 MHz. The balloon should reach a peak altitude of 100,000 feet and will then parachute back to earth. Onboard video camcorders will record an aerial view of the Dayton Hamvention® during the ascent and will provide amazing views from the very edge of space that will show the blackness of space and the curvature of the earth.

This activity is just another aspect of the many facets of Amateur Radio. The equipment on board will use ham frequencies to transmit pictures and telemetry back to Earth. Hams have a myriad number of areas and endeavors in which to dabble within the Ham Radio hobby. For this launch, there is the aspect of engineering the electronics payload by choosing the correct operating frequencies, antennas, transmitters, etc., in addition to keeping the weight within the parameters for the balloon size to achieve the desired height. It's analogous to an airplanes' thrust-to-weight ratio, only here there is a helium-to-weight ratio…so to speak. In addition, there is also the balloon and gas (helium) physics' aspect to learn.

The payload usually consists of cameras, a GPS, and one or more radio transmitters. One of the transmitters broadcasts the GPS location of the balloon so that it can be tracked, located, and recovered when it lands. The cameras can take photos, movies, or send slow-scan images back to the ground. The cameras may be 'looking' down or sideways. The sideways images show the curvature of the Earth best when the balloon reaches the higher altitudes.

The balloon is made of latex, which allows it to expand to several times the size it had when it left the ground. As the balloon rises higher, the air pressure is substantially lower while the pressure of the helium inside is still fairly high, so the balloon expands. At some altitude, usually around 100,000 feet above the ground, the stress on the latex is too much and the balloon bursts and falls to Earth. The air is so thin at that altitude that the parachute is almost useless, so the balloon and its payload simply free-fall until the density of the air is enough for the parachute to begin working.

Once the chute becomes effective, the balloon's velocity slows a bit, but because the chute is not very big, the payload hits the ground much harder than a person using a parachute does. The payload is usually built into a Styrofoam container which serves to provide insulation for the electronics (it gets cold up there!) and to cushion the impact when it hits the ground. Often, the balloon lands in a tree or some other hard-to-reach area, which can make it difficult to locate and retrieve.

A launch team needed to assist with the launch. On the ground, the balloon is 6-8 feet in diameter and very unwieldy if there is any sort of breeze. Also, the payload is usually strung out over some 30 feet of line below the balloon and several people are needed to carry all out it out to the launch site while one or two people wrangle the balloon. It is filled with helium and the payload is attached in a sheltered area so the any wind does not tear the balloon while it is being filled, which takes several minutes. The balloon typically uses about 150 cubic feet of helium, which is used because it is lighter than air at the same pressure, thus providing the lift. Launching the balloon also requires notifying the local Federal Aviation Administration office so that they are aware of it and can direct aircraft accordingly.

The balloon flight manager this year, Bill Brown, WB8ELK, will study the winds aloft patterns for several days before the launch and will use a computer program with that data to plan/predict the path of the balloon. While he can't control the flight once it launches, he can use the computer program to decide how much helium to put in the balloon. The amount of gas determines how fast the balloon rises to the burst altitude, which gives him some control over where the balloon begins its descent. In past Dayton Hamvention® launches, Bill has used this technique to cause the balloon to land 'out in the country' rather than having it come down in downtown Columbus for example.

Sometimes the balloon can be located by the chase team very quickly, other times, not so fast. In some cases, it might take a few days to retrieve the balloon from a tree within fenced-in property where the owner's permission is needed. Sometimes it is caught high up in a tree and it simply requires some engineering effort to figure out how to get it down safely. Regardless, there is a sense of accomplishment and enjoyment felt by the entire team at the culmination of the event.

A large number of Hamvention® participants usually attend this event, so why not attend the BalloonSat forum, learn about what's going to take place, and then follow the crowd out to the launch site? This is just one of many events taking place at the 2012 Dayton Hamvention®.

The flight is part of this year's celebration of the 25th anniversary of Amateur Radio High Altitude Ballooning in the US. Bill Brown, WB8ELK and chief flight engineer, launched the first flight from Findlay, OH, on Aug. 15, 1987.

This years weather balloon was filled to a diameter of seven feet and provided five pounds of lift to the payloads totaling approximately three pounds. The transmitter payloads consisted of slow-scan television (SSTV), digital-mode DominoEX, and an Automatic Packet Reporting System (APRS).

The two-hour flight reached an altitude over 87,000 feet and landed in a pasture approximately eight miles southwest of the Hamvention®, one mile northwest of Farmersville, OH. Ironically, the pasture was owned by a Ham, Donald Fourman, AB8OS. The balloon was tracked and recovered in the pasture by Mark Garrett, KA9SZX; Jeremy Lamb, KC9KGJ; Jessie Risley, K9JLR; Steve Polley, N0SWP; and Ron Malinowski, Jr., WX4GPS.

Brown and Doug Loughmiller, W5BL, assistant flight engineer, are members of ARBONET, the Amateur Radio Balloons Over Northeast Texas Club. ARBONET, The Midwest VHF / UHF Society, Inc., (MVUS), and Hamvention® all sponsored the launch.

The Launch Crew.
All the people in one way or another associated with the preparation, launch and recovery of the Balloon

All Photos by Allan Neubauer, KF9SO, Dayton Hamvention

Inflating the Balloon with Helium

Watching the take-off

The Balloon followed by a small parachute and the Styrofoam encased payload

Some Results from the Spring Sprint 2012

Call: W9SZ, Zack
Single Operator/Low Power
State: IL

BAND	QSO	Distance PTS
902	6	1202
1.2	10	1915
2.3	4	738
3.4	5	899
5.7	2	378
10G	1	160
Totals	28	5292

The weather was very good once the fog lifted between 8 and 9 am. I wish the bands had been as good. The lower bands seemed OK but the higher we went in frequency in this area, the worse things got. 10 GHz just wasn't happening. I only made one QSO on that band, with W9ZIH. I spent quite a bit of time trying with several St. Louis
stations and with W9OBG with no luck. I worked W9SNR/R on 902 through 5760 when he was in both of his grid squares but we had no luck on 10 GHz. 5760 was marginal.

Anyway, it was the most fun of the Spring Sprints for me so far. Now I just have to recoved from the sunburn. :-)

435 MHz Sprint: Wednesday 25 April: NE8I/r

So far, I have kept to the minimal fuel for 3 grids. US127 Harrison to St Johns, EN74/73/72. Set up: 18 element M2, and 200W amp. Adjusted for about 150W. Set up, continue testing all cables for loss, etc. Been finding too many bad jumpers, and water hoses. I have been pitching them into the local recycle.

Before I left, looked at WX forecast, radar. Noticed all the rain. Most to the South of me. Had a bad feeling about lack of activity, but went ahead. Remembered the CW key, tape recorder and all. Got to my EN74 rover spot North of Harrison in EN74oa. Start of contest. Only station heard, K9MRI. Could not work. Not even on CW. Left early, heading South. Tried EN73ou. Now hearing K9EA also. Again Nada. Started raining at Mount Pleasant. Rained for the rest of the sprint. First 90 minutes, no contacts.

Got down to St John's Marsh. Finally heard, worked WB8TGY. With no GPS, nice to have someone with maps, familiar with the area, to give me the 6 digits to where I am. Even if I had a GPS, the problem is, taking eyes off the road while driving. Even for a second is not a good thing. Log, is a steno pad, done blind, one hand, and a tape recorder. Tape recorders, don't work as well as one might like or expect. Not to mention RFI issues. Really need that full time driver.

Finally at St Johns, EN72xr. Found stations to work. With the rain, I got a chance to explore the effects, and sounds of rain scatter distortion on 432 signals. Had my digital processor along, to try and fight through. Many stations were on CW, and I was sort of in the middle. They were not hearing each other. That I figured from the comments that were made. Rain, ruined many of the paths or made them much more difficult. Many stations did not get on because of it. At 9:30 I moved to EN73ra, only 7 minutes away. After 10 PM, drove home. Nothing more heard.

Claimed score: 14 contacts, 9 grids and 2 grids activated. On 222 The numbers were 25-11-3 and on 144 : 9-4-3 .

For me the best QSO producers are: Coopersville, and Lenon. Both are in the 2 hours plus drive one way, but are a major increase in the fuel budget.

73, Lloyd, NE8i/r

The Sprint Idea:

Everyone is encouraged to participate, even if only in a small way. The rules have intentionally remained simple, and the focus of these FIVE events continues to be for single operator, single transmitter entries, both "fixed", "rover" and "Rookie".

The Rockie --- Elmer Part of Sprint:

The "Rookie" classification IS to ENCOURAGE 'first-time' participants, from their own stations OR as "guest-op" at an "experienced" station to introduce newcomers to weak signal vhf/uhf operations which, hopefully, will 'whet' their interest in such and lead to their participation in the future. This is NOT intended to be multi-op, the "Rookie" operator is expected to be the voice behind the mic, hand on the key/keyer, hands on the keyboard, PTT, tuning knobs and rotor controls. When an experienced operator is present for a "Rookie", their role IS to be "Guidance", NOT operating. Clear identification of Rookie entrants is requested by comments in the SOAPBOX: lines for Cabrillo formatted logs or in the Comment area of the Summary Sheet for paper logs. The detail should identify who is the "Rookie" and list any "experienced" operator(s) who was(were) present.

Sponsored and organizationally supported by the Central States VHF Society (csvhfs.org)

Wishing you the very best of VHF! 73, John Kalenowsky, K9JK

Computer parts on the Cheap

By Steve, K8UD

Every Hamvention for the past 20 years, I always buy a computer or an item for one of my computers. Well, this year was the first year that I did not find a computer vendor. I saw a couple of lap top vendors, but no computer vendors. No one selling motherboards, computers, or any related products.

Hmm, I was looking for a motherboard and mentioned this to Mike Schulsinger who was working the MVUS booth most of the weekend. He suggested that I visit the Goodwill outlet store on Woodman Dr. They have a technology area where they sell computers and related equipment.

So I took him up and went to visit the store. The technology area is just to the left when you walk into the store. They have computers being brought out everyday. They have a rack of video cards, tote boxes of motherboards, fans, CD Roms, DVD, just about everything you can think of. Complete computers with operating systems and well as without windows. All reasonably priced.

They will even negotiate with you. I bought a couple of mother boards for $25.00 each with CPU, Pentium 4 and memory. They also have additional memory sticks you can get for $5-7. Time to upgrade your computer or get a slightly new/used computer?

Check the Goodwill outlets in your area. Maybe you find one with a technical department. You could get a bargain PC, you could help Goodwill by donating technical items yourself and on top keep a few workers employed. Have fun…..Steve Coy, K8UD.

When Long Distance was Long Distance.

By Gerd, WB8IFM

The older ones of us remember when calling long distance was a big deal, cost a lot of money and was only employed for important events and news that couldn't wait. There were cables, but they were only good for CW and these were the days of the telegraph and the telegram. The messages were called a wire or a cable! I remember when I got married a large number of congratulations came by cable.

Of course, TV required just too much bandwidth and the method there was to film the event, then fly it across the ocean. We are talking here about the 1940s and -50s. I was reminded of all this watching the 60-year celebration of Queen Elizabeth. I happened to watch the original coronation (1952) in real time on TV, at the time relayed from England via Belgium and the Netherlands to Germany. Our boss decided to give the "kid" apprentices a treat and let them watch TV that was specifically set up in the company classroom. The one thing I remember was that switching the signal to direct it (in maybe ½ dozen hops cover the 200 miles or so to reach Germany) took quite a while and made us sit on edge. Nowadays they switch these signals in fractions of a second and we get nervous if it gets any longer than that.

This was before glass fibers were employed which by now dominate wideband. How wideband? Well nobody knows, the weak point of the link being the limited bandwidth of the head amplifiers. So what was the thinking in the late 40s after WW2? There were two plans: One was to construct a chain of microwave towers. It was figured that 60 towers, one every 60km would cover the distance between New York and Los Angeles. Or you could fly 8 relay aircrafts at an altitude of 8 km for the same distance. Quite a number of towers were built and some are still around to this day. I came across an article in a Dec. 1946 German magazine "Funkschau" titled: "Progress of the TV technology in the USA." The picture below illustrates the concept.

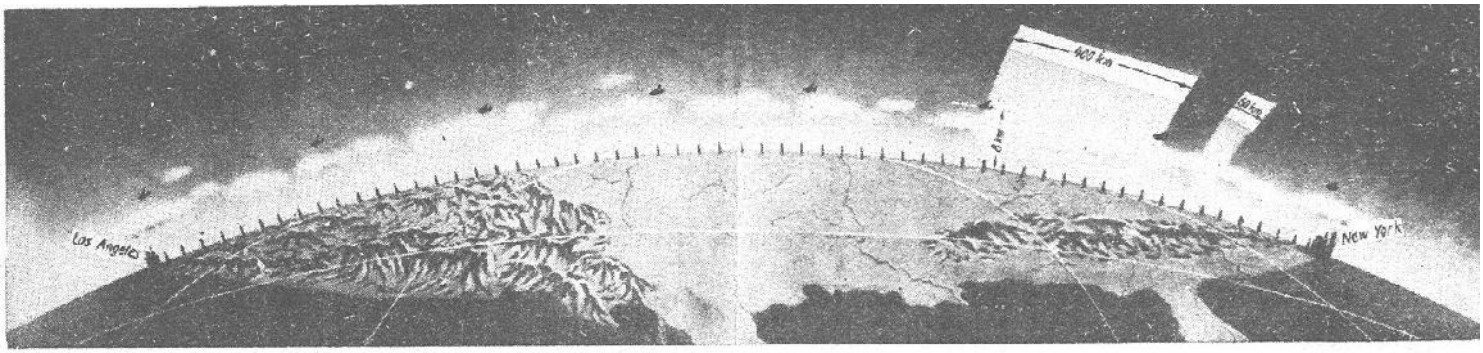


Bild 1. Amerikanische Fernsehpläne. Es ist vorgeschlagen, zur Übermittlung der Fernsehsendungen Relaistürme oder Relaisflugzeuge zu verwenden

The 2012 Dayton Hamvention.

By Gerd, WB8IFM

The increase in gasoline prices earlier this year sure put a damper on our expectations for the Hamvention (May18-20). But several factors were helpful; gas prices got lower, we had a real mild spring, and the weather turned just super days before the Hamvention. We were afraid it wouldn't last but it did.

I was busy this year with three "inside" assignments, so I didn't get outside much. But from what I saw the crowds were about equally divided, the way it ought to be.

There were a number of venders, individuals as well as small organizations, offering kits. Seems like they are trying to fill a gap left by the big companies. At the same time they bring the new hams closer to the goal of being able to fix their equipment and do some experimentation. I even heard rumors that Heathkits might come back to market.

When I got back on the air earlier this year, I was confronted with some ugly "line noise" which subsequently turned out to be coming from inside the house and what was really bad, it was intermittent.

I had been using the MFJ-852 Line noise meter (operating around 135 MHz) which is really sensitive and vy good to pinpoint line noise from some distance, but when you get close, for more accuracy you need a shorter wavelength. Here the best approach is to use ultrasound, with a frequency of about 40 kHz. That amounts to a wavelength of 7.5mm or .3". A small (smooth) dish, maybe 6" across would give you sufficient gain to point right at the offending arc!

It turned out right next to our Midwest VHF/UHF booth, was a ham from Kansas representing the "X-tal set Society" and selling kits and memberships. And "low and behold" one of their kits was a small ultrasound rx. Just what I needed.

Another indication is that MFJ is now including "hard to find ham radio parts" in their cataloge. I can see where soon the MFJ catalog will be as indispensable as the Sears catalog used to be in every American house.

Studying a few German ham magazines I found in every issue some very interesting home brew projects. So homebrewing is picking up!

Finally, Jameco, a well-known parts supplier, is asking customers to send in suggestions for kits. If they select something and decide to put a kit together you even get a cut on the sales. Thinking of our yearly homebrew contest, I am sure we have talent right among us!

On the antenna front: verticals still are in the foreground, followed by various single and multiband wire antennas. Beats me what is so hard about stringing a dipole. I can see you buying a few traps for multiband operation. Yagis are ,of course, offered but their price makes a lot of hams think twice, same as with linear amplifiers. I shot an interesting picture in the ice arena: surrounded by lots of verticals a single 6m (horizontal) Yagi with a big sign that said "New". Maybe horizontal beams are coming back. Often the extra gain you get with a beam will make up for a missing linear.

Being with the international booth, something new for this year's Hamvention, we had a steady trickle of foreign hams stop by giving us a taste of what it will be in June 2012 at the Friedrichshafen "HamRadio" where, also for the first time, DARA will have a booth to represent Dayton and the Hamvention. We might be able to sign up new members offering them to participate in our door prizes on a proportional basis.

On Saturday we had a chance to leave Hara at lunchtime, to pick-up a rental car at the former Salem mall. In many years past we used to go out regularly for lunch in peace and quiet with friends. Well, getting off the premises was easy, so was getting the car and driving back. But finding a parking spot again was nothing compared how easy it is earlier in the morning. So forget about the "quiet lunch!"

From some reports regarding the flea market, I conclude, there was money floating around freely. Tremendous bargains were had, and the stuff from the garage was moving out.

Before we knew it, Sunday came with the conclusion and final prize drawings. The afternoon went by, no telephone rang. Another Hamvention was history!

VSWR or Bust (The Radio-Feedline-Antenna System)

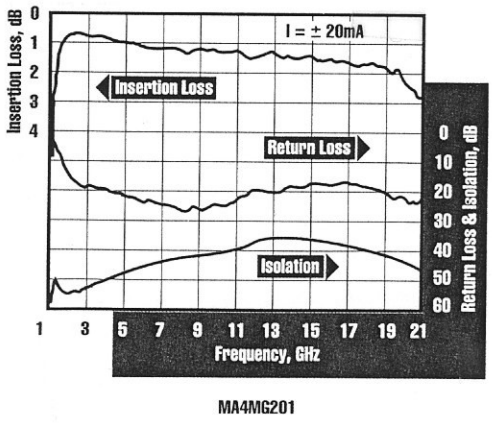
A recent letter from a small antenna manufacturer questioned but strived to achieve the radio amateur's demand for a 1.01 VSWR, and a conversation with a friend who insists to measure rf-voltage prompts me to lay out some thoughts I had for some time on this subject of VSWR.

By now it is generally accepted that a VSWR under 2:1 is ok, and 1.5:1 better than average. A better VSWR is required, if we have a long and/or lossy feedline. However, if one measures this legendary 1.01:1, chances are you might have accidentally switched to a good "dummy load" (so goes the joke!). VSWR, of course, stands for "voltage standing wave ratio" and refers to the maximum versus the minimum rf-voltage on a line as we move along that line with our "probe". It is difficult to visualize what the VSWR means in terms of a match of the antenna to our line or how much power is radiated versus the power that is available from the transmitter. And, is it not the latter, what we really want to know!- VSWR does answer that question only in a round about way involving some not so straight forward calculations. -- In the past, when open wire feedlines were used, you could move a neon tube along the line, and the changing length of the illuminated column which corresponds to rf-voltage would indicate your VSWR, Nowadays, (almost) nobody measures voltages on lines, but directional couplers are employed to separate and measure power flowing in the forward and reverse direction. And this is how far the professionals go: they divide the forward by the reflected power and express this ratio in dBs. This easy to figure term, however, got the very unfortunate name of "return loss". The telephone industry introduced this and used it first. It is the easiest and best descriptive "matching criterium" yet and deserves wide acceptance. To my knowledge only the hams and Bird-Co are holding on to VSWR. Let's shake the old habit and relegate the "Visuar" to the memory patch.

by WB8IFM

VSWR	1	1.01	1.25	1.43	1.92	3.01	5.85
Ret. Loss dB	∞	46	20	15	10	6	3
PWR returned	0%	.003%	1%	3%	10%	25%	50%

$$\text{Return Loss (RL)} = 10 \log_{10} \frac{\text{Forwd PWR}}{\text{Refl. PWR}} \qquad RL = 20 \log_{10} \frac{VSWR + 1}{VSWR - 1}$$



MA4MG201

PIN-DIODE Switch

a good example to present specifications that make sense!

$$VSWR = \frac{1 + 10^{-\frac{RL}{20}}}{1 - 10^{-\frac{RL}{20}}}$$