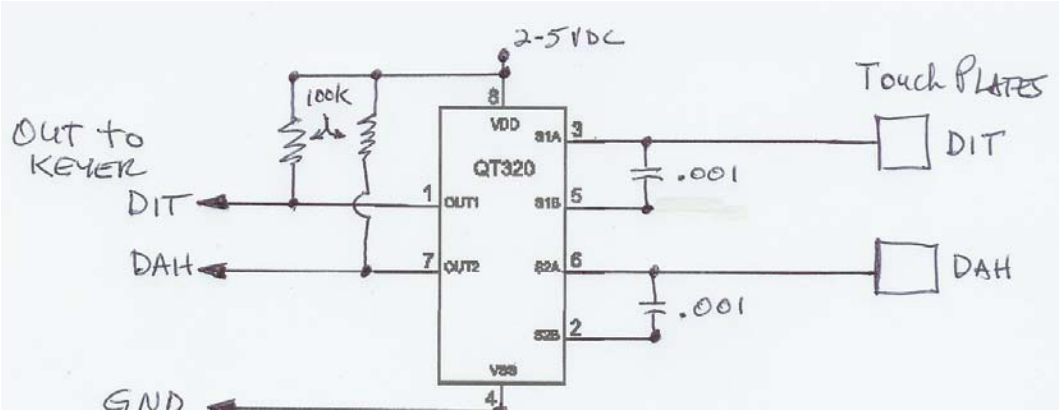
....beginning of part TWO....IA-QRP Journal, May 2007.....the finger tapper

QT320 Touch Switch

Ron had been researching the web for good touch circuits during which he found an IC series especially designed for touch switch applications. They are the QT310 and 320 from Quantum Research. They rely on capacitance changes when touched to trigger an output. Back to the breadboard we went. The QT320 circuit from their web site[2] (below) performed extremely well, very reliable and easy to use. It is a dual channel chip and seemed to be our best effort yet. Then I plugged the keyer into the rig and went on the air. All of a sudden it had a mind of it's own, dits and dahs flew like magic and I wasn't sending them! The circuit was very sensitive to RF and was unuseable. No amount of bypassing helped since the RF was riding in on the touch plates. But if you want a really good touch or proximity sensor, try these chips, they work. I should say these aren't the same chips marketed by CW Touchkeyer[3]. Their touch keyers get very good reviews for rock solid operation.



Keyboard Switch Pads:

Our final device turned out to be deceptively simple and it was based on Ron's previous AL foil switch. We got the idea of using the switch patterns on the pcb of a defunct computer keyboard. After scrounging a keyboard and cannibalizing a piece of the PC board, a useable finger tapper was born. In the version below I used electrical tape for isolation. Tapping the conductive traces bridges the switch contacts on the board just like the normal keyboard key.. It works well, although for long qso's the required touch is just a little heavy for my puny digits..

The keyboard paddle worked so well that we decided that, even though it wasn't the golden grail, it was the answer to our quest. It makes a nice lightweight paddle for the Spartan Sprints and is so compact its a nearly perfect paddle for portable operations, if you like finger tappers. Surprisingly learning to use it isn't a steep curve at all. Just try it and see which finger you want to be sending dits and dahs and you're well on the way to enjoying a very unique paddle a 2 finger keyboard!

Oh, for the golden grail paddle? You probably have to go to Italy ... or Dayton.

72 Terry, WAØITP Ottumwa wa0itp@mchsi.com

1. 73 Amateur Radio Today, April 2000, p28, 29.
2. http://www.qprox.com/products/index.php Editor's note: the QT310 is now QT100 and the QT320 is now the QT220
3. http://www.cwtouchkeyer.com

Thanks, Terry, for sharing a great group project with the QRP world!

HF is fun.....BUT....

VHF QRP: Give it a Try

Bob Witte, KØNR
http://www.k0nr.com/vhfqrp.html

Mention "QRP operation" and most radio amateurs think of a small CW transceiver for the HF bands. Mention "VHF QRP" and the response may be more like "what's the matter, your transmitter broke?" The surge of interest in QRP is largely focused on the HF bands and most weak-signal operation on the VHF bands is high power, for good reason. Putting together a competitive weak-signal station requires careful attention to every decibel in the system --- receive sensitivity, transmission line loss, antenna gain and, yes, transmitter power. On the other hand, there is something to be learned from the QRP community about having fun with amateur radio.

What is QRP?
QRP is normally defined as operating with 5 Watts of output power or less. If you dig a little deeper, you'll find that low power operation carries a lot more with it.

QRP is generally associated with:
• Compact, portable, battery-powered equipment (often used portable in the outdoors)
• A personal challenge and/or a minimalist approach (get the job done using efficient equipment)
• Emphasis on operator skill (especially CW operation)
• Contesting or other events that promote QRP activity

Are these elements of radio operating relevant to VHF and up?

Our VHF equipment is not always compact and portable but in recent years there has been a significant reduction in the size and weight of VHF and up equipment. It started with the combination HF/VHF/UHF mobile rigs from ICOM (IC-706) and Yaesu (FT-100). For QRP enthusiasts, the FT-817 from Yaesu is a backpack-ready 5 Watt rig that spans HF through 70 cm. (Unfortunately, none of these rigs include the 222 MHz band.) Now that I think of it, we should include the older single-band all-mode rigs such as the FT-290R and the IC-502. More importantly, we see hams using these rigs for VHF/UHF mountaintop and grid expeditions. So, yes, there is a match between compact, portable operation and VHF and up.

With regard to taking on a personal challenge in radio operating, the weak-signal VHF/UHF enthusiasts are already there. The higher bands were once thought to be of no use except for limited line-of-site propagation. The weak-signal ham community has proved that idea wrong.

The weak-signal VHF world also puts on emphasis on operator skill, including the use of CW. You must be a fast and efficient radio operator to make contacts when VHF band conditions are marginal or changing rapidly. Most serious VHF operators have had the experience of trying to work a distant station on SSB, then switching over to CW to complete the contact. Whether you like using CW or not, it does get through tough conditions better than phone, so it is important to have in your bag of tricks.

With regard to contests, this is where QRP VHF is formally established. The major VHF contests have a special entry category for QRP operation, with a maximum power level of 10 watts, not 5 watts. The ARRL contests refer to this category as "Single Operator Portable" while the CQ World-Wide VHF contest just calls it "QRP". The intent of these categories is to encourage portable operation, presumably from a rare grid or mountaintop location.

In summary, we can check the box on all of the main QRP elements as applying to VHF and higher.

Intro to VHF QRP

First, let's talk about some of the more popular frequency bands above 50 MHz. I am going to discuss the bands up through 70 cm because they are the most commonly used. Certainly, there is a huge amount of spectrum above 70 cm with lots of potential, especially if you are into experimentation and homebrewing of equipment. Note that I am using the term VHF quite loosely, to mean any band above 50 MHz.

Band	Frequency Range	Calling Frequencies	Comments
6 M	50 to 54 MHz	SSB: 50.125 MHz FM: 52.525 MHz	Normally local communications but Sporadic-E and F2 propagation are common.
2 M	144 to 148 MHz	SSB: 144.200 MHz FM: 146.52 MHz	The most popular VHF band, used for local communication via simplex and repeaters. Normally local communications but long distance tropo propagation and Sporadic-E propagation occasionally occurs.
1.25 M	222 to 225 MHz	SSB: 222.100 MHz FM: 223.5 MHz	Propagation similar to 2M but rarely sporadic-E
70 cm	420 MHz to 450 MHz	SSB: 432.100 MHz FM: 446.0 MHz	Propagation similar to 2M but no sporadic-E

Note: This table shows the US amateur bands, other countries may have different frequency allocations.

Equipment

There are a number of transceivers available for VHF QRP. One of the most exciting rigs to appear on the scene is the FT-817, which covers HF, 6M, 2M and 70 cm. More recently, ICOM introduced the IC-703, which is primarily an HF QRP rig but is available in a version that includes 6 meters. MFJ offers a couple of single-band transceivers, the MFJ 9406X 6M SSB rig with 7 watts output and the MFJ 9402X 2M SSB rig with 10 watts output.

Elecraft, the well-known manufacturer of radio kits, recently introduced a line of transverters that will allow HF rigs to operate on VHF (see "CQ VHF Reviews the Elecraft K2 Transceiver", CQ VHF, Summer 2003). According to the Elecraft web site, there are three models: XV50 (50 MHz), XV144 (144 MHz) and XV222 (222 MHz) with 20 to 25 watt output.

There are older rigs available on the used market such as the FT-290R series from Yaesu and the IC-202 series from ICOM. These are low power, single-band rigs for 6M, 2M and 70 cm. Check out your local hamfest or online auction such as Ebay (http://www.ebay.com).

Antenna

The antenna for any amateur radio station is a critical component. The key difference at VHF and higher is the shorter wavelength, which means antenna elements are much shorter and perhaps more numerous. The polarization of the antenna is important under most situations, since you want to have your antenna with the same polarization (horizontal or vertical) as the station you are contacting. Most FM-oriented stations use vertical polarization, consistent with easy mobile mounting and simple omni-directional antennas. Serious weak-signal VHFers almost always use SSB or CW and horizontal antennas.

For the 6-meter band, we can adapt many of the standard HF wire antenna designs. For example, the classic half-wave dipole is a good choice, providing an efficient radiator about 9 ½ feet long. A quarter-wave vertical is also a possibility, especially for mobile installations. Antenna polarization is not an issue for long distance propagation via the ionosphere since the polarity tends to change anyway. For local contacts, horizontally-polarized is generally the way to go. Yagi beam antennas for 6 meters are normally mounted horizontal and provide gain over a dipole.

For the 2-meter band, the wavelength and antenna elements are quite short (about 1 meter or 39 inches) compared to the typical HF antenna. Here, the yagi antenna is the most popular, with as few as 3 elements and as many as 17 elements. For CW or SSB work on this band, you'll definitely want to be horizontally polarized. For FM, vertical is more common.

The bands higher than 2 meters tend to also use yagi antennas but with correspondingly shorter elements. The shorter wavelength allows for more antenna gain within the same antenna dimensions. Of course, a directional antenna means that you need a method for pointing the antenna in the desired direction.

Transmission Lines

Transmission line loss is an issue at VHF and higher frequencies. This loss is usually specified in dB per 100 feet of cable length. The losses of some common coaxial transmission lines are shown in the table below. Small cables such as RG-58 have high loss at VHF frequencies, losing 3 dB (half the power) in 100 feet at 50 MHz. However, RG-58 might be acceptable for shorter cable runs, say 25 feet or less. RG-8x is not much larger in diameter but delivers lower loss. For longer runs, the larger "full size" RG-8U and 9913 are necessary to control transmission line loss.

Cable Type	Loss per 100 feet (50 MHz)	Loss per 100 feet (150 MHz)	Loss per 100 feet (450 MHz)
RG-58/U	3.1 dB	6.2 dB	10.6 dB
RG-8x	2.3 dB	4.7 dB	8.6 dB
RG-8U/foam	1.2 dB	2.3 dB	4.7 dB
9913FX	0.9 dB	1.6 dB	2.8 dB

Source: Cable X-perts, Inc. catalog, http://www.cablexperts.com

Operating

The place to start on VHF is to go to the calling frequency and call CQ. Unlike the HF bands, there is a tendency to mix CW and SSB operation on the same frequency space on VHF. For example, on 2 meters you might hear an SSB signal calling CQ on 144.200 MHz then a few minutes later hear a CQ using CW. Someone might even respond to the CW CQ using SSB and take up the QSO on phone. It is good operating practice to move off of the calling frequency once contact is established. However, you'll hear people rag-chewing on the calling frequency, especially in areas that have little VHF activity.

Without a band opening, you are dependent on local activity to make contacts on the VHF bands. Local activity is, well, local and depends on how many VHF operators there are in your area and how often they get on the air. The amount of activity on these bands will vary dramatically from place to place. Some areas have a formal or informal activity night, sometimes by band. For example, Monday night may be the 2-meter activity night, while Tuesdays might be for 1.25 meters. Obviously, this is a good time to get on the air, check out your equipment and work some of the local VHF crowd. Another opportunity is a local VHF net, most common on 2 meters.

Finally, VHF contests are great for concentrating activity and represent a chance to work lots of stations in a short period of time. These weekends are my favorite weekends to operate VHF, not so much to compete in the contest but to enjoy the higher level of activity on the bands.

VHF Contests with QRP Competition	
VHF Contest	**URL**
ARRL January VHF Sweepstakes	http://www.arrl.org/contests/forms
ARRL June VHF QSO Party	http://www.arrl.org/contests/forms
CQ WW VHF Contest (July)	http://www.cq-amateur-radio.com/World Wide VHF Contest.html
ARRL September VHF QSO Party	http://www.arrl.org/contests/forms

Grid Locators

Besides a signal report, a key piece of information that gets exchanged on the VHF bands is the grid locator, which indicates your approximate position on the planet. The Maidenhead Locator System divides the earth into rectangles that are 1 degree latitude by 2 degrees longitude. The VUCC (VHF/UHF Century Club) and other awards are based on the number of grids contacted. When you get on the SSB/CW portion of the VHF bands, the operator on the other end will likely want to know your grid. For example, the grid that covers greater Denver, CO is DM79. For most VHF and UHF operation the four-character grid is used (e.g., DM79), but two more characters can be added to create a more precise 6-character locator (e.g., DM79nc).

The best way to determine your grid is to take an accurate latitude and longitude measurement and convert it. A GPS receiver is a very convenient and accurate way to determine your position and many of them can display the location in the maidenhead grid format (usually 6 characters). Otherwise, you may need to consult a map of your area that shows latitude and longitude. The ARRL web site (http://www.arrl.org/locate/gridinfo.html) has more information on the grid system, including a web page that can calculate the grid locator based on latitude and longitude.

Mountaintop Operating

One of the advantages of QRP operating is that the equipment is small and portable. You can operate from almost anywhere! For VHF, the obvious thing to do is increase your height above average terrain. In other words, drive or hike to your favorite mountaintop location and activate it. In Colorado, we have an event designed just for this purpose, called the Colorado 14er Event. VHF contests are excellent opportunity to operate from your local high spot. If you don't have a mountain close at hand, then check out the local fire tower, lighthouse, grain silo or skyscraper.

Summary

We made a quick tour through some basic operating information for the bands above 50 MHz. This is just a start, so please give me your feedback, ideas and suggestions on future topics.

72, Bob KØNR.

References

ARRL Web site, vhf grid information: http://www.arrl.og/locate/gridinfo.html
Yaesu web site, FT-817 information: http://www.yaesu.com/
ICOM web site, IC-903 information: http://www.icomamerica.com
Elecraft web site, vhf transverters: http://www.elecraft.com/
MFJ Enterprises: vhf transceivers: http://www.mfjenterprises.com/

Editor's note: Bob – K0NR is currently writing for two ham radio publications: the VHF QRP column for *QRP Quarterly*, published by the QRP Amateur Radio Club International, and the FM VHF column for *CQ VHF* magazine.

Bob, thanks for sharing and promoting QRP!

Want to learn more about the upper bands!

The Central States VHF Society (CSVHFS) is a not-for-profit organization chartered in the state of Missouri. It was begun in the mid-1960s to foster amateur radio operation on the bands above 50 MHz. Membership currently numbers about 300, principally in the Midwest states.

http://www.csvhfs.org/

Cheap Yagi Antennas for VHF/UHF

by Kent Britain, WA5VJB edited by John Maca, AB5SS

[***Editors notes:*** *The antennas described in this article were built as the result of several discussions between Kent and a Cuban radio operator. While there are plenty of high performance antenna designs, most of the parts required to build them are not available in Cuba. There just isn't an EPO or Radio Shack available in Cuba. Kent accepted this as a challenge to design a really good antenna that could be built with little more than ground wire, coax and a wooden boom. Using the latest antenna design software, he has developed several variations for 144 thru 1296 MHz. Apparently, the designs work very well... Kent entered the 432 MHz version in a recent antenna contest and lost by 0.2 dB to a Midwest ham who had copied his design. Though disappointed in losing, it did prove to Kent that the antennas can be easily replicated with consistant performance.*]

If your planning to build an EME array, don't use these antennas. But, if you want to put together a Rover station with less than $500 in the antennas or just want a good antenna for the home, read on.

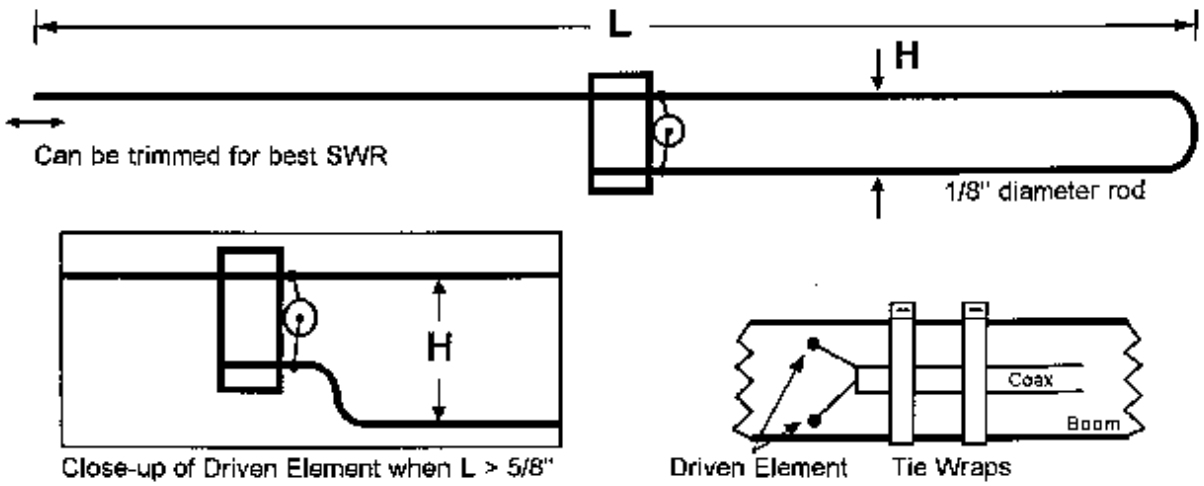
These antennas are relatively small, easily constructed from common materials/tools and have surprising performance. The feed method is greatly simpified by directly soldering the coax to the driven element. No baluns or gamma matches are used in this design. This simplified feed uses the structure of the antenna itself for impedance matching. The spacing of the director and reflector elements from the driven element directly affects the feed point impedance of the antenna. So, the design starts with the feed (driven element) and the elements are built around it. Typically, a high gain antenna is designed in the computer, then you try to come up with a matching arrangement for a 31.9 Ohm feed! For the cost about 0.5 dB of gain, these antennas make some design compromises for the feed impedance, use an asymmetrical feed and make trade offs for a very clean pattern. But, they allow simple measurements, have wide bandwidth, the ability to grow with the same element spacing AND... you can build these antennas for $5!!!!

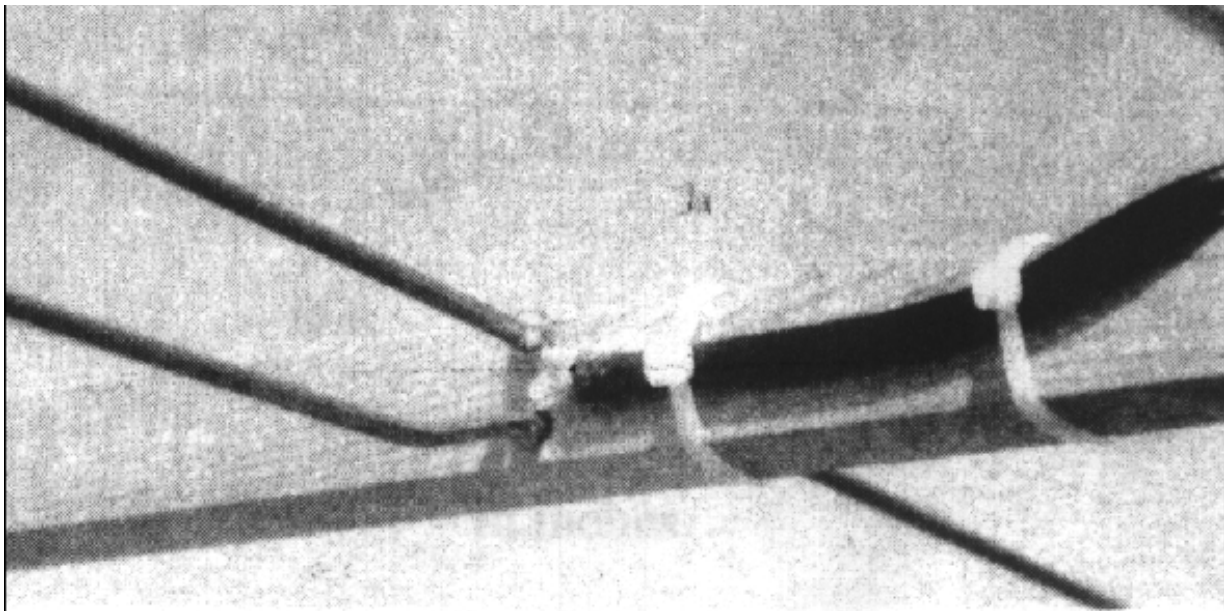
The booms used for these antennas is 1/2" X 3/4" wood. The elements have been made from silicon bronze welding rod, aluminum rod, hobby tubing and solid ground wire with no change in performance. Since you want to be able to solder to the driven element, silicon bronze welding

rod, hobby tubing and #10 or #12 solid copper wire have been used and work fine. A drop of "Super Glue", epoxy or RTV is used to hold the elements in place. A good coat of Polyurethane should be applied to the wooden boom to protect it from the weather. A polyurethane varnished 902 MHz version has been in the air for a year now with little deterioration in performance.

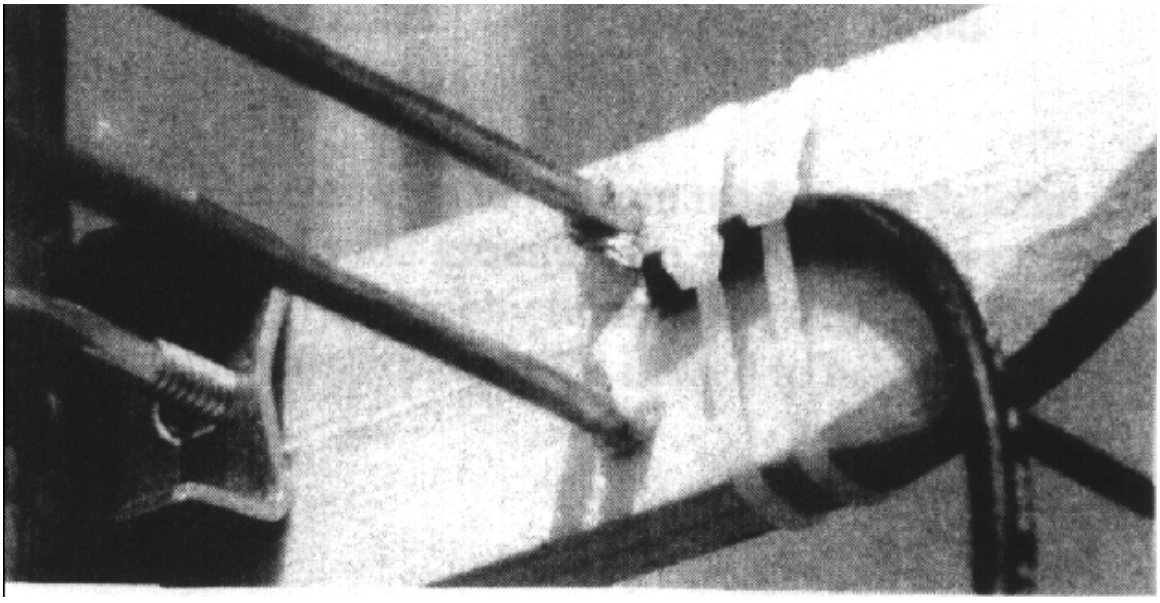
And now for the antenna designs. These antennas have been carefully designed to have the highest dB's/Dollar ratio of anything around They were designed with YagiMax, tweaked using NEC and the driven elements experimentally determined on the antenna range. The driven element design is the same for all frequencies except for the length (L) and separation (H). See Figure 1 for details on the driven element. All dimensions are in inches.

Driven Element Construction (*all versions*)





mounting of the feedline and driven element



144 MHz. This antenna is peaked for 144.2 MHz but performance is still good at 146.52 (emergency use only!) Driven element dimensions are L = 38.5" and H = 1.0" Elements are 1/8" diameter.

144 MHz		REF	DE	D1	D2	D3	D4
3 Element	Length Spacing	41.00 0.00	8.50	37.00 20.00			
4 Element	Length Spacing	42.00 0.00	8.50	37.50 19.25	33.00 40.50		
6 Element	Length Spacking	40.50 0.00	7.50	37.50 16.50	36.50 34.00	36.50 52.00	32.75 70.00

222 MHz. This antenna is peaked for 222.1 MHz but performance bearly changes at 223.5 MHz. Driven element dimensions are L = 24.5" and H = 1.0" Elements are 3/16" diameter.

222 MHz		REF	DE	D1	D2	D3	D4
3 Element	Length Spacing	26.00 0.00	5.50	23.75 13.50			
4 Element	Length Spacing	26.25 0.00	5.00	24.10 11.75	22.00 23.50		
6 Element	Length Spacing	26.25 0.00	5.00	24.10 10.75	23.50 22.00	23.50 33.75	21.00 45.50

432 MHz. This antenna is peaked for 432.1 MHz. At this frequency, this antenna is getting very practical and easy to build. Driven element dimensions are L = 13.0" and H = 3/8" Elements are 1/8" diameter.

432MHz		REF	DE	D1	D2	D3	D4	D5	D6	D7	D8	D9
6 Element	Length Spacing	13.50 0.00	2.50	12.50 5.50	12.00 11.25	12.00 17.50	11.00 24.00					
8 Element	Length Spacing	13.50 0.00	2.50	12.50 5.50	12.00 11.25	12.00 17.50	11.00 24.00	12.00 30.75	11.25 38.00			
11 Element	Length Spacing	13.50 0.00	2.50	12.50 5.50	12.00 11.25	12.00 17.50	12.00 24.00	12.00 30.75	12.00 38.00	11.75 45.50	11.75 53.00	11.00 59.50

902/903 MHz. This was the first antenna I built using the antenna to control the driven element impedance. The 2 1/2' length has proven practical, so I haven't built any other versions. Driven element dimensions are L = 5.7" and H = 1/2" Elements are 1/8" diameter.

902/903 MHz		REF	DE	D1	D2	D3	D4	D5	D6	D7	D8
10 Element	Length Spacing	6.20 0.00	2.40	5.60 3.90	5.50 5.80	5.50 9.00	5.40 12.40	5.30 17.40	5.20 22.40	5.10 27.60	5.10 33.00

1296 MHz. This antenna is the veteran of several "Grid Peditions" but I have yet to actually measure the gain. Dimensions must be followed with great care. The driven element is small enough to allow 0.141 semi-rigid coax to be used instead of RG-58. Silicon Bronze welding rod was used for the elements but any material can be used. Driven element dimensions are L = 4.0" and H = 1/2" Elements are 1/8" diameter.

1296 MHz		REF	DE	D1	D2	D3	D4	D5	D6	D7	D8
10 Element	Length	4.30		3.90	3.80	3.75	3.75	3.65	3.60	3.60	3.50
	Spacing	0.00	1.70	2.80	4.00	6.40	8.70	12.20	15.60	19.30	23.00

OTHER VERSIONS

421.25 MHz ATV. 421 MHz Vestigial Sideband video is popular in North Texas for receiving the FM video repeaters. The driven element for these antennas is designed for an impedance of 75 ohms. So RG-59, or an `F' adapter to RG-6, can be directly connected to a cable TV converter/Cable Ready TV on channel 57. Driven element dimensions are L = 13.0" and H = 1/2" Elements are 1/8" diameter. Spacing is the same for all versions.

421 MHz ATV		REF	DE	D1	D2	D3	D4	D5	D6	D7	D8	D9
6 Element	Length	14.00		12.50	12.25	12.25	11.00					
8 Element	Length	14.00		12.50	12.25	12.25	12.00	12.00	11.25			
11 Element	Length	14.00		12.50	12.25	12.25	12.00	12.00	12.00	11.75	11.75	11.50
	Spacing	0.00	3.00	6.50	12.25	17.75	24.50	30.50	36.00	43.00	50.25	57.25

450 MHz FM. Yea, I understand it's FM, but sometimes a newcomber needs a cheap antenna to get into a repeater or give you a simplex QSO during a contest. Driven element dimensions are L = 12.0" and H = 3/8" Elements are 1/8" diameter. Spacing is the same for all versions.

450 MHz FM		REF	DE	D1	D2	D3	D4
6 Element	Length	13.00		12.10	11.75	11.75	10.75
	Spacing	0.00	2.50	5.50	11.00	18.00	28.50

435 MHz AMSAT. The larger versions have not been fully tested and I appreciate the help and motivation from KA9LNV for these antennas. Updates and performance evaluations are planned for a later edition of the AMSAT Journal. A high Front-to-Back ratio was the major design consideration for all versions. The computer predicts 30 dB F/B for the 6 element and over 40 dB for the others. NEC predicts 11.2, 12.6, 13.5 and 13.8 dBi for the 6, 8, 10 and 11 element respectively. Using 3/4" square wood makes it easy to build two antennas on the same boom for cross- polarized operation. Offset the two antennas 6 1/2" and feed in phase for Circular Polarization. Or, just build one antenna for portable operation. Driven element dimensions are L = 13.0" and H = 1/2" Elements are 1/8" diameter. Spacing is the same for all versions.

435 MHz AMSAT		REF	DE	D1	D2	D3	D4	D5	D6	D7	D8	D9
6 Element	Length	13.40		12.40	12.00	12.00	11.00					
8 Element	Length	13.40		12.40	12.00	12.00	12.00	12.00	11.10			
10 Element	Length	13.40		12.40	12.00	12.00	12.00	12.00	11.75	11.75	11.10	
11 Element	Length Spacing	13.40 0.00	2.50	12.40 5.50	12.00 11.25	12.00 17.50	12.00 24.00	12.00 30.50	11.75 37.75	11.75 45.00	11.75 52.00	11.10 59.50

thanks to the CLARC for sharing http://www.clarc.org/jprod/

The Arizona Scorpion Paddles and homebrew paddle case won the Grand Prize at the St. Louis QRP Society "Builder's Contest" in March 07

The builder, **John - KC0EYF** has just moved to the Cedar Rapids area from St. Louis. John and family are starting new jobs so when they get settled we hope to have him join the IA-QRP.

John, is the past Editor of the SLQS "Peanut Whistle."

Editor's comments

This May 2007 "Journal" is the first time that the edition was too large to send via conventional email accounts, ie 10 meg accounts. The only way to keep the size in email compatible form was to have the "Journal" in a down load version with TWO parts.....de k5est

The Iowa QRP Club

KQØRP

The Iowa QRP Club was formed to promote amateur radio low power operation, to hone operating skills, to improve building skills, and to introduce the hobby to prospective new amateur radio operators.

Membership in the Iowa QRP Club is limited to current Iowa residents, former Iowa residents, residents of bordering states, those with strong Iowa ties, and in some cases by special invitation. For membership information please see the club's **new** website http://www.geocities.com/iaqrpjrnl/index.html

For news, articles, or inquiries for the Journal: iaqrpjrnl@yahoo.com

The IAQRP Journal Editor – Walter Dufrain – K5EST/0