BOULDER TV Repeater's REPEATER

April, 2019

Jim Andrews, KH6HTV, editor - kh6htv@arrl.net

REPEATER STATUS: Don, N0YE, reports that the Boulder ATV repeater is presently working fine. Don is now streaming the TV repeater's weekly ATV nets over the BATC server under his own call sign. Don reports, "I have added the 146.76 MHz voice repeater output onto one of the ATV voice channels when streaming video via batc uk." Details about the repeater are available on our web site: www.kh6htv.com AN-43 gives all the technical details. If you have any questions about the current operations or status of the repeater, contact the asst. trustee, Don, N0YE.

Future Newsletters: If you have contributions for future newsletters, please send them to me. Jim Andrews, KH6HTV, email = kh6htv@arrl.net

Winter Antenna Woes: Don, N0YE, reports that this winter's wicked storms have not been kind to his antenna farm. Earlier this winter, his Cushcraft R7, vertical HF (40/30/20/17/15/12&10m) antenna came down in a strong wind storm. He now reports: "I have repaired the broken piece of aluminum on the R7 antenna that broke in a recent wicked wind storm. I then tried to tune it up. Do recall this antenna has six coil/cap tuned circuits that are separated by aluminum tubing to enable the antenna to tune up on seven bands. I found the, hard way, that four of the six tuned circuit coils had lossy connections where the wire of the coil was screwed to the aluminum. All wires and the adjacent aluminum had become corroded connections. So today I removed the thick plastic "shrink wrap" around the screws and cleaned with a file and reconnected via putting the screw back. I then taped everything back up. The antenna is back and so-so at this point. I may do some more fine tuning later. Today was in the 50s and sunny. We have a nasty storm coming in tomorrow with some non trivial snow. We shall see what happens. There are high winds forecast." (Forecast for 13th of March was for extreme low pressure over the prairie of eastern Colorado with cyclone winds up to 80mph and blizzard snow fall)

Summary of MidAtlantic ATV Meeting
March 9, 2019
Dan Rapak, WA3ATV

Mid-Atlantic ATV is a coalition of ATV repeater owners, hams interested in constructing ATV repeaters and hams generally interested in this aspect of amateur radio. As the name implies, members are from the various states that make up the Mid-Atlantic region of the US. A strategic planning meeting of sorts took place this afternoon at Hoss' Restaurant in York, Pennsylvania. There were seven ATV hams in attendance for the initial brainstorming session. Pennsylvania, Delaware and Maryland were represented. The meeting was held with an eye toward the future of this branch of our hobby, including the possibility of linking ATV repeaters in the region together. A great deal was accomplished!

White Rock Remote Receiver Results from the remote receiver our group has at the White Rock, PA tower site (with video viewable via the web) were discussed. There has been an issue where, under certain signal conditions, the receiver will hang up and become stupid. When this happens, someone needs to physically go to the receiver to reset / power cycle it as there is currently no way to reboot it via the web. This is a relatively remote site. It might be many days before someone is able to go to the site, and so Jeff Elliot (W3JVU) is going to supply an Internet controllable power switch that will permit us to do a hard reboot via the web when necessary.

The receiver is currently connected to a directional antenna as that particular antenna was already in place on the tower. It was felt that more testing should be done with an omni-directional antenna. That change out can be made with an antenna yet to be determined as weather conditions improve.

Rib-Cage Antenna Dave Stepenowski (KC3AM) and Vince Vitullo (N3BFZ) brought along a new, omni-directional, horizontally polarized, rib cage antenna they had constructed. Dave has been using a similar model at his Ebright, Delaware ATV repeater for some time. Vince did the physical blacksmithing on this one and did a great job! What remains is to tweak the antenna's matching transformer. To that end, yours truly brought the antenna to the home QTH in order to sweep it out with a return loss bridge to see where things stand and possibly make adjustments. We'll see how that goes.

Results of Our First DTV Beacon Transmitter Test Tests of the beacon transmitter which had been located at the WA3ATV QTH near Summerdale, PA are complete. Rich Reese (KR3EE) performed field reception tests at multiple locations. In a previous life, Rich performed field testing for a cellular company and so had his test procedures down pat. Rich did a super job! Many thanks for all the time and effort he put in on behalf of our group! The bottom line of the tests is that Rich found that the actual field test results tallied very closely with coverage predicted by the Radio Mobile software modeling our group has been using. This will hopefully reduce the number of field locations that need to be tested for future beacon tests at other locations.

A discussion of the next location for beacon transmitter tests ensued. Based on the Radio Mobile propagation modeling, it is hoped that we can obtain permission to place the beacon at the Cornwall, PA repeater / CPIN microwave relay site. This site is a stone's throw from the former location of the Cornwall analog ATV repeater which has since gone dark. If Dave's rib cage antenna can be tuned up in time, the hope would be to use it as an omni-directional antenna for the next beacon test.

Repeater Antenna Polarization The question of standardizing the polarity of DTV signals came up. The pros and cons of each mode for our application were discussed at length. Ultimately, the group unanimously decided to use horizontal polarization for repeater outputs. Advantages include the inherent isolation from interference to / from vertically polarized voice repeaters and compatibility with U.S. over-the-air broadcast television. The biggest obstacle is the need for omni-directional, horizontally polarized antennas at the repeater sites. The off-the-shelf pickings are rather slim and leave something to be desired in terms of performance. It is hoped that Dave's rib-cage antenna will provide a solution, hence the desire to use it in the next beacon test.

It's important to note that only the repeater sites themselves require the horizontally polarized, omni-directional antennas. Thus, only a few such antennas will be needed. Individual hams accessing a repeater will all be using directional antennas and therefore have multiple, readily available antennas to choose from.

Frequency coordination The group reached the conclusion that it would make sense to coordinate a common output frequency for all repeaters in the region, with input frequencies coordinated by the individual repeater operators as they see fit based on local operating practices and conditions.

Given the antenna systems and power levels we will be using, the terrain and predicted coverage plots from various active and potential repeater sites, it is unlikely that one repeater will interfere with another.

In addition, with COFDM modulation in use for both DVB-T and ATSC 3.0 it will eventually be possible to operate linked repeaters as a Single Frequency Network (SFN) that would allow the signals from multiple repeaters to augment rather than interfere with one another.

Finally, the use of a common output frequency will allow much more efficient use of valuable ham radio spectrum and (hopefully) make frequency coordination an easier task.

Power Amps Rich Reese, KR3EE, has also done a fair amount of research into the availability of power amplifiers that might be suitable for DTV use. The issue of course is the need for an absolutely linear amplifier since any sort of phase distortion will corrupt a DTV signal. This eliminates the use of Class B or Class C amplifiers.

Rich has found a number of amps on the web that are allegedly suitable for digital voice use. Whether they would be linear enough for application in the DTV world is another

matter. However, Rich did purchase surplus power amp modules from a decommissioned DTV broadcast transmitter that might serve as a PA. He also purchased a lower power linear amplifier that could be used as an IPA to drive the PA. He will keep us informed on how his experimentation progresses.

Status of ATSC 3.0 Deployment The status of deployment of the new ATSC 3.0 standard for over-the-air broadcast television here in the U.S.A. was discussed. This is similar to DVB-T in that both use COFDM modulation. However, ATSC 3.0 uses an IP based data protocol that more easily supports simultaneously connecting consumer devices to the web for interactive television programming. ATSC 3.0 is also more spectrally efficient, so much so that it can transmit full motion 4K images over the air in a standard 6 MHz U.S. television channel.

It was learned that Sinclair Broadcast Group will be partnering with Nexstar Broadcast Group to facilitate the rollout of ATSC 3.0. These are the two largest TV station group owners in the U.S. and own several stations here in the Mid-Atlantic region. Such partnerships are necessary for the transition from ATSC 1.0 to ATSC 3.0. During the transition, it will be necessary for two stations to broadcast their programming on one ATSC 1.0 transmitter while the second transmitter is being converted to ATSC 3.0. Surprisingly, Sinclair expects to have more than thirty (30) ATSC 3.0 stations on the air by the end of this year! This is a much faster rollout than most people would have predicted. This means we will likely be seeing ATSC 3.0 television receivers on store shelves and in Internet stores much sooner than expected. Sinclair is pushing hard for the new format as they view the interactive aspects of the system as a whole new revenue stream.

What does this mean of those of us interested in amateur DTV? If a repeater transmits using the ATSC 3.0 format, hams will be able to use consumer TV sets to receive the signals, similar to the situation we had in the analog NTSC days. To facilitate the rollout, Sinclair is also involving itself in the hardware end. They will be partnering with manufacturers to build and distribute low cost converter boxes for existing TV sets as well as dongles that will permit reception on smart phones, notebook computers and desktop PCs. It is unknown at this point whether these devices will be capable of receiving ATSC 3.0 / COFDM modulation on cable channels or not, but if this proves to be the case, it will be possible to tune these consumer devices directly to the 70 cm ham band.

An immediate question is, what does this mean for hams in the U.S. that already have an investment in DVB-T, DVB-S or analog equipment? The answer is, not much. ATSC 3.0 does *not* make other formats that hams are currently using obsolete. If anything, ATSC 3.0 simply adds to your tool belt. A repeater may transmit using ATSC 3.0, but that repeater can still receive whatever format is in use in the area in its input(s.) Just as it is possible to receive analog video at a repeater and re-transmit it as a DVB signal, it will be possible to receive DVB-T, DVB-S, ATSC 1.0, VSB, FM-TV or any other format and re-transmit it as ATSC 3.0. Repeater owners would be free to accept whatever signal formats on their inputs they choose based on their particular local practices and preferences.

501(c)3 There was brief discussion about the merits of making MidAtlantic ATV a 501(c)3 tax exempt organization which would allow companies and individuals to donate equipment and/or funds with tax benefits for the donor. It was decided that we are not yet at that point. In the meantime, should any opportunity to accept such a donation present itself, the donation could be made by way of one of the 501(c)3 clubs affiliated with our coalition.

Join the MidAtlantic ATV group's page at https://groups.io/g/MidAtlanticATV to keep abreast of future developments.

73, Dan Rapak, WA3ATV

HF Report from KH6 Islands - Jim, KH6HTV

With NO ATV activity to report from Hawaii, I will need to be content with talking about my recent HF activity instead. I have a friend, Bill, here on Maui who is retiring from his medical practice. Bill was looking for some new activity for retirement. I mentioned ham radio and it resonated with him. He recalled doing Morse code many years ago in Boy Scouts and being interested in radio then. He also liked the emergency communications possibilities with ham radio. He recalled that when he previously lived on the island of Kauai and hurricane Iniki whacked the island, ham radio was the only way to communicate with Honolulu for help. Bill is studying for both the tech and general class tickets. The local ham club here only gives exams three times a year. Bill is planning to take the next exam available in April. In the meantime, Bill wanted to get a head start on setting up a station. He asked what rig I would recommend. I immediately said "The New Icom IC-7300." But Bill came back and said that was just an HF rig -- is there any rig that does Everything ? I then said, well my old Yaesu FT-857 was the closest to doing that. It covered all of the normal bands used by hams. 160 m thru 70cm, and all modes. Bottom Line -- Bill wanted to buy my FT-857 and everything else needed. So he got the FT-857, my Yaesu ATAS-120 mobile HF antenna (40-6m), my Alpha-Delta DX-EE (40/20/15/10m), a 2m/70cm mobile mag. mount antenna, MFJ Antenna Tuner, Samlex power supply, plus digital interface cables, etc. I have helped Bill get the antennas installed and tuned up. He is catching onto the lingo already as he said "Thanks Elmer." He is already having fun listening to the HF bands with his new rig and antennas.

New, MFJ Ham Stick, HF Vertical Antenna with 20 buried ground radials

So, what did that leave Jim for an HF station ? Well, I brought my new IC-7300 (Xmas present !) out with me after Christmas back in Boulder. No antenna tuner needed as it is built-in the IC-7300. Already had a second 12Vdc power supply here on my electronics test bench. But I now needed new HF antennas. I still had the coax and ground radial system still in place which I previously used with the Yaesu screwdriver, mobile antenna. So I replaced that antenna with some inexpensive, MFJ ham sticks (models MFJ-16xxT) and the MFJ mounting clamp (model MFJ-342T). See photo above.. I got sticks for 75m & 30m bands to cover what my fan dipole didn't cover. This is the first time, I was able to get on 75 meters with an antenna. The ham stick is quite narrow band (60kHz for < 3:1 swr), and not very efficient and doesn't compare well to a full length, high dipole. However, it is very small and does fit well in my small backyard.. I was able to get on the daily, 9am, 75m, inter-island, Aloha net this morning (3/11) for the first time with it.

HF Fan Dipole Antenna for 40m, 20m, 17m, 15m & 10m bands

The real work horse antenna needed to be a wire dipole up as high as possible. I have enough room in the backyard for a full length 40 meter dipole. So I designed, using EZNEC, a fan dipole for 40m, 20m, 17m, 15m & 10m bands. It also kind of works on 6 meters as a bonus. It is installed as an inverted V with the apex at 26ft. I used an Unadilla W2AU, 1:1 BALUN as the coax input, balanced output center feed point. I used #14, bare, stranded copper wire. I spaced each dipole wire 3" apart and put the first spacers 18" from the center. The spacers were made out of 1/2" dia. PVC pipe. The overall length of the antenna was 65' 6". For the EZNEC model I used real earth with values from the University of Hawaii for typical Hawaiian, rich volcanic, red, moist soil. The wire lengths predicted by EZNEC were right on for 40, 15 & 6 meters. The wires were a bit long for the 20, 17 & 10 meter bands. I needed to shorten the 20m wires by -7", the 17m wires by -2.5" and the 10m wires by only -1".

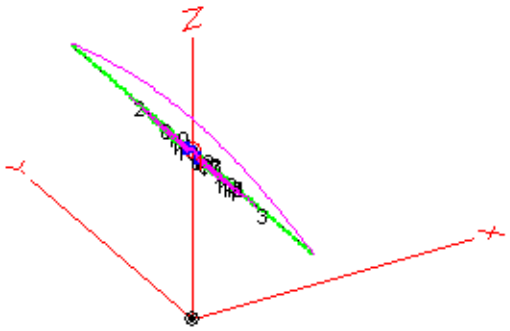
I measured the VSWR on all the bands using the built-in SWR meter on the IC-7300. I got perfect 1:1 matches on the 40m, 20m, 17m, and 10m bands 1.3:1 min. on 15m, 1.5:1 on 6m. On 40m < 1.7:1 at band edge. On 20m < 1.9:1 at band edges, flat across 17 & 15m bands. On 10m, < 3:1 at band edges. On 6m, < 2:1 at band edges.

I used EZNEC to calculate the far field radiation patterns. They are shown in 3-D on the following page. The below table is the predicted max. gains of the antenna. I also included in the table, the predicted gain for low angle radiation at 20 degrees, necessary for over the horizon, HF work.

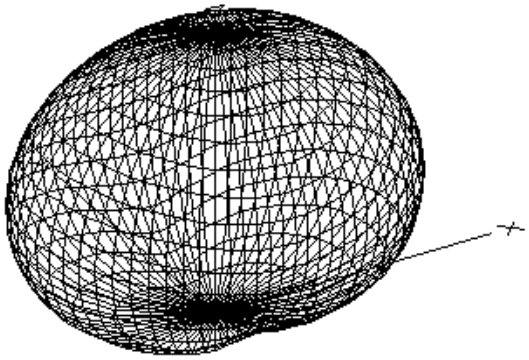
EZNEC FAR FIELD PATTERNS

Band	Max. Gain	Elevation	Gain (20^o)
40m	10dBi	90	2.9dBi
20m	9.1dBi	40	6.4dBi
17m	9.8dBi	30	6.4dBi
15m	10.9dBi	25	10.3dBi
10m	8.5dBi	20	8.5dBi
6m	11.7dBi	10	2dBi

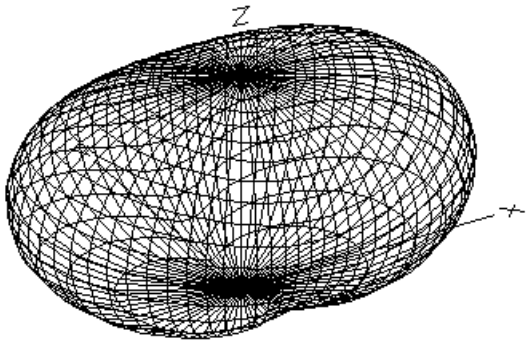
For 40 meters, at the low height of only 26 ft, the antenna is seen to be essentially a NVIS antenna. Which is good for working the inter-island, 4pm, daily, 40 meter net. However, when conditions are right, 40 meters reaches way out. In Feb. I worked Bill, ZS6CCY in S. Africa on 7.153 MHz, LSB in the late afternoon (5:30pm local). Since then I have often heard him on 40 meters about the same time.



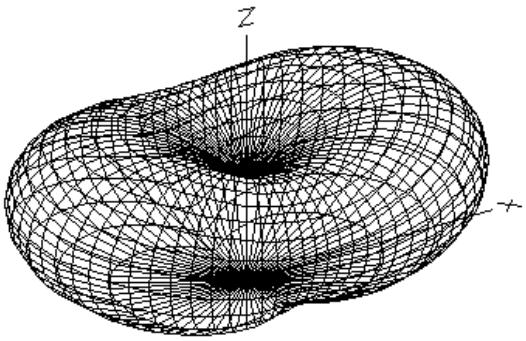
Fan Dipole Antenna Orientation for Far Field Radiation plots



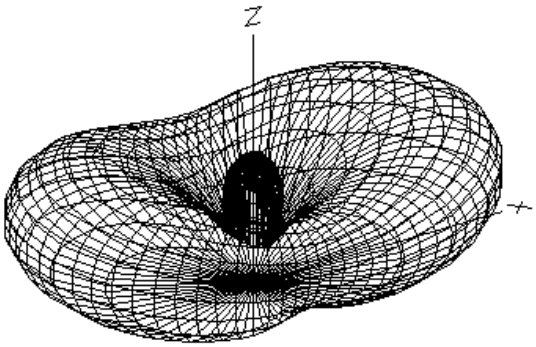
40 meters



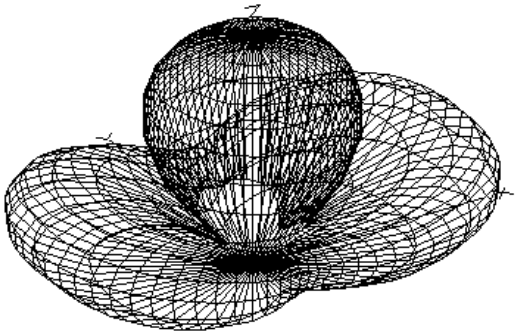
20 meters



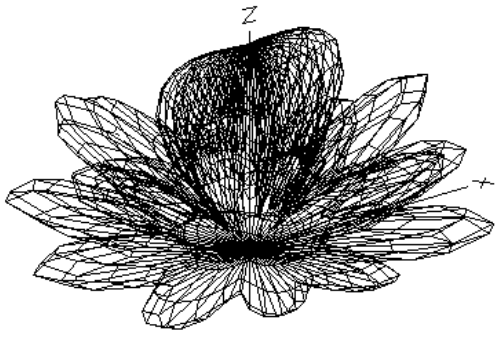
17 meters



15 meters



10 meters



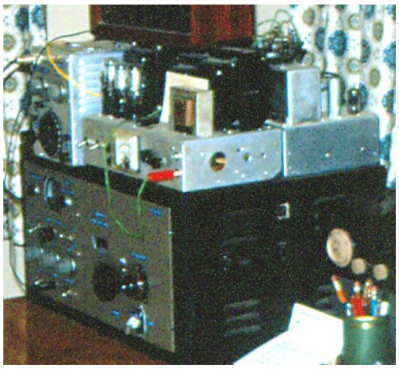
6 meters

March - Maui Amateur Radio Club - Meeting

At the March meeting of the MARC, the theme for the evening was antique radio. Each member was encouraged to bring something in, either actual gear, photos, etc. and briefly talk about it. I went through my old collection of photos and was able to find a few of my old ham gear. Didn't find very many. Most of the photos were of the kids, vacations, etc. Here are my power-point slides that I showed the club, plus my narrative comments.

I became interested in radio in the 8th grade. I made it my life's goal to be able to design radios. I studied electrical engineering at the Univ. of Kansas. After getting the B.S. degree in 1964, I felt I still had not learned enough to design radios, so I continued on for a Masters degree.

1965 – Novice license
First Rig – 40m ARC-5

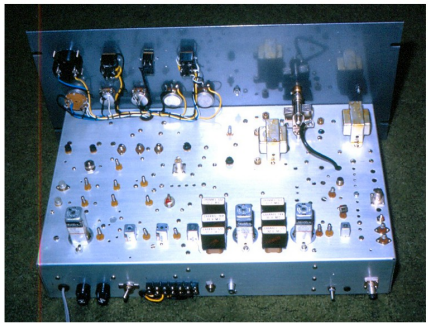


I got my novice license in 65 (WN0NHD) while in grad school. I got my first rig from my EE professor, Norris, K0EXP. It was home built by Norris from WWII command sets. CW & xtal controlled on 40 m only. Only contacts I was ever able to make were across town with Norris.

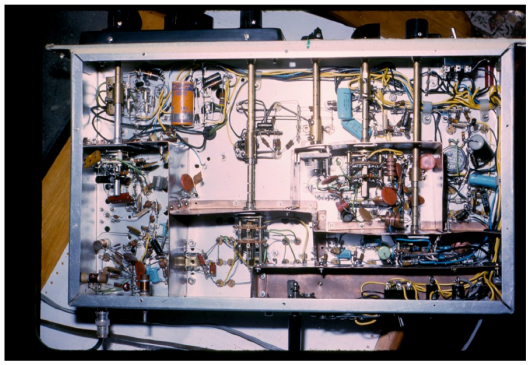
As a grad student, I finally felt I understood EE enough to start designing radios. My first ham project was to design and build my own HF receiver. It was for 80 meters only. My intent was to use 80m as the first IF. The second project was to then build down converters for the other HF bands. This was the early days of transistors. Most ham rigs of the day were all vacuum tubes.

65-66 First Receiver Design
80 meters only

Transition period - vacuum tubes to transistors. Note: use of sockets for transistors. Xtals were IF filter.

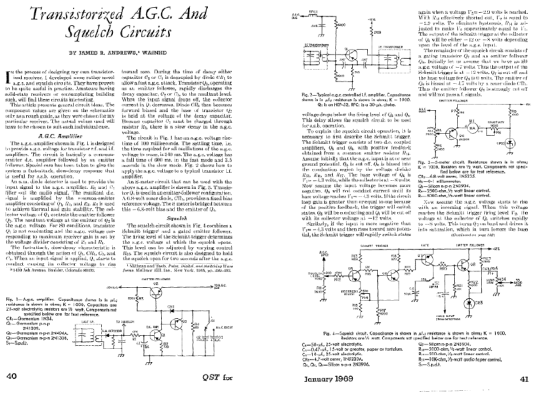


Pre PC board days !
Point to Point Wiring



Over the years, I have published a lot of technical articles. One of my earliest was in QST. Some of the circuits I had come up with for my first 80 meter receiver apparently were unique at the time. One unique feature for the time was having SQUELCH on an HF-SSB receiver. Because of this, QST accepted and published my article on the AGC and Squelch circuits.

1969 – First QST Article



Transistorized A.G.C. And Squelch Circuits

BY JAMES R. ANDREWS,* WA0NHD

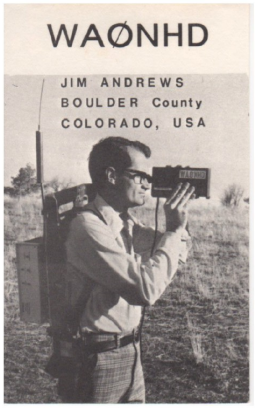
40 QST for

January 1969 41

In 1967, Janet & I moved from Kansas to Boulder, Colorado where I worked at NBS (now NIST). While there, I finished my Ph.D. in EE. I continued to be interested in ham radio. With the tech license. I was on 6m AM and 2m FM. At that time, there were only two, 2m FM repeaters in Colorado. 146.76 in Boulder. My 2m FM rig was an old Motorola, 2 channel, taxi-cab radio. It was huge and had a noisy dynamotor for the high voltage. The control head alone was bigger than today's FM rigs !

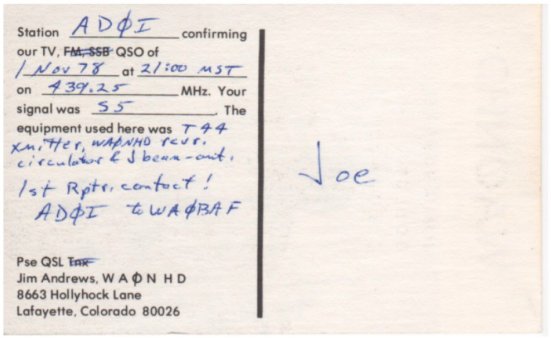
1975-78

- **Discovered ATV !**
- **First TV transmitter was converted Motorola 70cm FM with 2C39 – 50 watts**
- **2ed TV transmitter was own solid-state design, 1 watt, portable back pack**



1978- New Boulder TV Repeater

1st Contact QSL



Station ADØI confirming our TV, ~~FM, SSB~~ QSO of 1 Nov 78 at 2100 MST on 439.25 MHz. Your signal was 55. The equipment used here was T44 xmitter, WAØNHD rcvr, circulator & 5 beam-ant. 1st Rptr. contact! ADØI to WAØBAF

Joe

Pse QSL ~~Thx~~
Jim Andrews, W A Ø N H D
8663 Hollyhock Lane
Lafayette, Colorado 80026

1979 – BCARES Field Day

War surplus 6x was our emergency com van. Note: it included TV gear.

1980 – WA0NHD home station

1980 Ham Gear

By 1980, I had finally gotten my code speed up to 13wpm and passed the Advanced class exam and was finally able to get on HF. My station now covered 160m thru 70cm with HF SSB, 2m FM and 70cm ATV. The HF rig was a Yaesu FT-301. Also on the desk is my first 2m HT, a xtal controlled Wilson. In the rack cabinet on the left, I still had in it my original 1965, 80m receiver, a 2ed generation (1970), home built HF receiver, the original 2m, Motorola FM rig and the 70cm, Motorola T-44 transmitter converted to ATV.