

Boulder Amateur Television Club TV Repeater's REPEATER

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issue #145

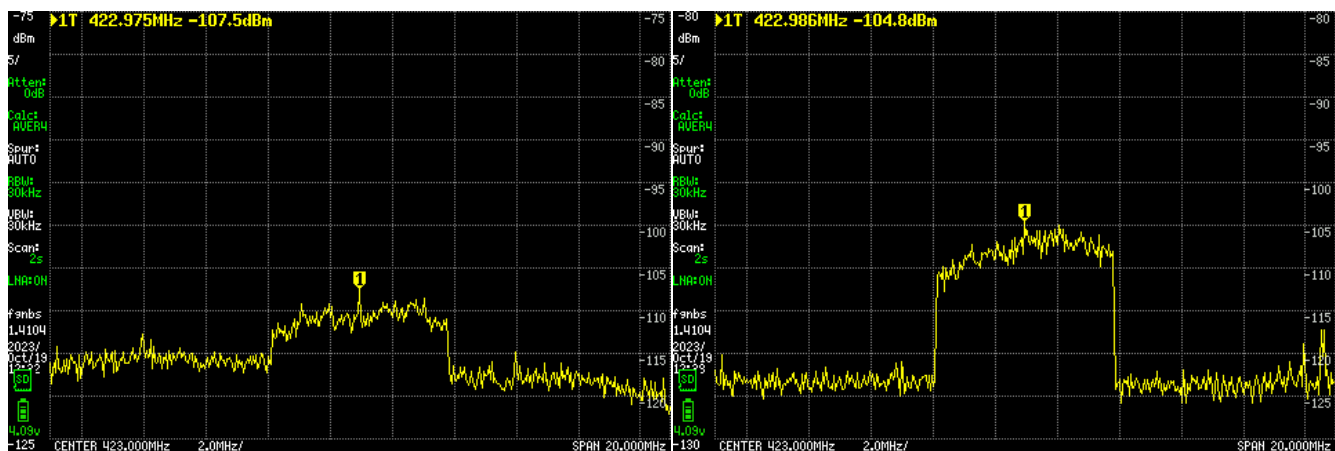


BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com



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Before

After !

Proof Once Again -- The Antenna is the Most Important Component !

We keep preaching "All Antennas Are NOT Equal". Especially when it comes to ATV. The antenna impacts us both on transmit and receive. A poor antenna makes our transmitted TV signal weak and hard to be seen by others. A poor antenna likewise makes it much more difficult for us to see other's TV signals. On the 70 cm band, we have 30 MHz, but most of the activity is in the upper 5-10 MHz with FM voice repeaters. Our ATV activity uses the lower portion of the band with our repeater outputs typically at the bottom end of the band at 420-426 MHz. We really need for ATV

antennas which are broad-band and will cover with good gain from 420 all the way up to 444 MHz. BROAD-BAND ! is the key word for ATV antennas. Unfortunately, most antennas offered for sale for the 70cm band are optimized and work well only in the upper portion of the band. Some even have very negative gains at the bottom end of the band.

How can you choose a good antenna for ATV service ? It is hard. Most all commercial antenna manufacturers don't publish any data on frequency coverage. To make it even worse, the ARRL refuses to allow antenna manufacturers to even publish in QST gain values. So what do you do ? The best advice is take the advice from other ATV Elmers on what they have found to work well. Don't just go to your local HRO and buy any antenna, just because it is labeled for 70cm.

Going all the way back to 2011, BCARES was having issues with poor antennas for ATV and they asked me to test a bunch of antennas and come up with recommendations. That resulted in one of my first app. notes, AN-4 "Antennas for Ham TV". Then again in 2017, I was able to set up a much better antenna test range, so I repeated some of my comparison tests. The results were published in my app. note, AN-40, "70 cm Antennas for ATV". My key recommendations are:

70cm Yagi -- M-Squared, 440-6SS, 3 ft., 6 element with 11 dBi gain

70cm Omni Base Station -- Diamond X-50NA, dual-band, 2m/70cm, 7-10dBi gain on 70 cm

70cm Mobile -- Diamond NR-2000NA on a Diamond DPK-4NM-N mag. mount, 3 to 7dBi gain

OK - fast forward to now. The previous Oct. issue #144, p. 7, talked about a recent trouble shooting house call to one of our local ATV hams, Larry, N8GGG. Larry was having issues with receiving our W0BTV, ATV repeater's signal. The signal he had been getting for the past year ever since buying a combo receiver at a BARC swap-fest was very marginal at best. He was right on the ragged cliff edge of digital threshold. Losing another dB, was pushing him over the edge. N0YE & KH6HTV visited Larry's qth and brought along an M-Squared yagi antenna and a TinySA-Ultra spectrum analyzer. The visit showed Larry that he really could get a good signal at his QTH. It made a believer of Larry, so he immediately purchased both a TinySA and an M² yagi. The yagi antenna Larry had previously been using was an old dual-band 2m/70cm, 3 ft. of unknown origin. Larry has just sent us the above Before & After screen shots from his new TinySA. He was looking at the signal from W0BTV repeater. He installed the new M² on the same mast and at the same identical location as he had his previous old yagi. The photos demo a dramatic difference between the two antennas of about 15 dB. If the M² had +11 dBi gain, then his old yagi had a negative -4 dBi gain at 423 MHz ! Solid Proof - not every yagi is the same.

73 de Jim, KH6HTV, Boulder, Colorado

Bake-Off Comparison of Mobile Antennas for ATV

Recently Don, N0YE, and Jim, KH6HTV, did a simple test to compare various antennas for use as mobile antennas for ATV. While we only tested very few, we would love to repeat the tests with many more sample antennas.

Jim's all time favorite has been (& still is) the Diamond NR-2000 which is a tri-band antenna for 2m, 70cm and 23cm bands. It is mounted on the Diamond DPK-4NM-N magnetic mount with an N

connector. We used the NR-2000 as our known reference antenna. Jim had already made antenna range measurements on it back in 2017 along with several other 70cm antennas. The 2017 results were documented in his application note, AN-40 "70cm Antennas for ATV". Diamond specs. the NR-2000 as having 6.4dBi gain on 70cm band, but does not specify at what frequencies. Jim's 2017 measurements for the NR-2000 showed: 3.1dBi (423), 3.5dBi (429), 3.3dBi (435) and 6.9dBi (441 MHz). Thus confirming Diamond's gain claim, but only at 441. But the antenna only lost 3-4 dB lower in the band. VSWR testing with a NanoVNA also confirmed the NR-2000 is broad-band with < 3:1 vswr reaching from 400-480 MHz, < 2:1 from 428-458 MHz, & < 1.5:1 from 434-454 MHz.

The antennas tested this time for broad-band ATV service were all dual-band, 2m/70cm antennas. We tested two mobile mag. mount antennas. They were a Diamond MR77 and a Bingfu BFN00023. We also tested three flexible whip antennas which are normally used on dual-band HTs. But for these whips, we added SMA/N adapters to them and mounted them on the Diamond DPK-4NM-N mag mount. One was the short 7" whip supplied with Baofeng HT. The other two were longer, 15" flexible whips. One was a Nagoya NA-771. The other was a Bingfu FBFN00606.

The antenna range was a real in the field test mobile test. Don transmitted from his home QTH with his 5 Watt, 70cm, DVB-T transmitter into a Diamond X-50 omni directional antenna. Jim parked his Saab convertible 4 1/2 miles away in the parking lot of the Boulder 911 center. Both Don and the 911 center are located on hill tops, thus providing a true line of sight path from south to north across the city of Boulder, Colorado. The mag. mount antennas were mounted on the rear trunk lid of the Saab with the rear of the car facing towards Don's QTH. As a receiver, Jim used a Hi-Des model HV-110. The 110 has the nice feature of having a very accurate, received signal strength meter which reads out directly in true dBm. We made measurements using DVB-T signals on each of the center frequencies for our 70cm ATV channels, i.e. 423, 429, 435 and 441 MHz. (cable channels 57, 58, 59 & 60). The below table lists the results. Conclusion: None can match the NR2000.

ANTENNA GAINS relative to Diamond NR2000NA

Frequency / Antenna	423	429	435	441
Diamond MR77, mobile, mag.mt.	-7dB	-7dB	-7dB	-9dB
Bingfu BFN00023, mobile, mag.mt.	-9dB	-9dB	-9dB	-9dB
Baofeng short 7" whip ant.	-5dB	-6dB	-10dB	-13dB
Nagoya NA-771 long15" whip ant	-3dB	-5dB	-7dB	-9dB
Bingfu BFN00606 long 15" whip ant.	-3dB	-2dB	-6dB	-10dB

Now this does not mean to imply that some of the various antennas tested were no good. Most of them in fact were never intended for our ATV useage in the lower portion of the amateur 70cm band. Most ham 70cm antennas were designed for the upper region, typically 440-460 MHz. Unfortunately, most antenna manufacturers' specs. (if any !) are very skimpy and they usually say nothing about frequency coverage.

Note: to other BATVC ATV hams -- We would like to be able to test lots of other antennas in the same manner. Do you have any others we could test ? ?

73 de Jim, KH6HTV, Boulder, Colorado

ATV Frequencies in S. California & Boulder, Colorado

I have been building DVB-T gear for ATN hams and supplying them with pre-programmed modulators and receivers. So we recently asked Mike, WA6SVT, what DVB-T frequencies was ATN using in southern California. Here is his reply:

"For Southern California I would recommend the following frequencies:

70cm band: 434.0MHz B/W 2 MHz, 427.0 MHz B/W 3 MHz, & 426.75 MHz B/W 2 MHz

33 cm band: 914.0 MHz B/W 6 MHz, & 921.0 MHz B/W 6 MHz

23cm band: 1242.0 MHz B/W 4 MHz, 1255.0 MHz B/W 6 MHz, 1267.0 MHz B/W 6 MHz, & 1291.0 MHz B/W 6 MHz

Here in Boulder, Colorado, for DATV we are using:

70 cm band: 423, 429, 435 & 441 MHz, all 6 MHz BW + plus 441 MHz, 2 MHz BW

23 cm band: 1243 & 1255 MHz, both at 6 MHz BW

13 cm band: 2.393 GHz, 6 MHz BW

9 cm band: 5.678 GHz, 6 MHz BW

3 cm band: 10.359 GHz, 6 MHz BW

So why the choices for 13, 9 & 3 cm bands ? On 13cm, we hams have a unique 10 MHz just below the 2.4 GHz wild-west, Wi-Fi band. So it made sense to pick the bottom end of that to try to stay as far away from Wi-Fi as possible. For 5 & 10 GHz, Don, N0YE, picked frequencies close to the SSB calling frequencies, so microwave hams could easily use their home-brew, SSB transverters. But offset our TV frequency just enough to avoid RFI to the SSBers.

So what frequencies are your ATV group using ? Send us your list and we will publish it.

EARLY TELEVISION

Roger Salaman, K0IHX

The first regularly scheduled television service in the United States began on July 2, 1928, fifteen months before the United Kingdom. The Federal Radio Commission authorized C. F. Jenkins to broadcast from experimental station W3XK in Wheaton Maryland, a suburb of Washington, D.C. For at least the first eighteen months, 48-line silhouette images from motion picture film were broadcast, although beginning in the summer of 1929 he occasionally broadcast in halftones.

WRGB claims to be the world's oldest television station, tracing its roots to an experimental station founded on January 13, 1928, broadcasting from the General Electric factory in Schenectady, NY, under the call letters W2XB. It was popularly known as "WGY Television" after its sister radio station.

Later in 1928, General Electric started a second facility, this one in New York City, which had the call letters W2XBS and which today is known as WNBC. The two stations were experimental in nature and had no regular programming, as receivers were operated by engineers within the company. The image of a Felix the Cat doll rotating on a turntable was broadcast for 2 hours every day for several years as new technology was being tested by the engineers.

About 7,000–8,000 television sets were made in the U.S. before the War Production Board halted manufacture in April 1942, production resuming in August 1945. Television usage in the western world skyrocketed after World War II with the lifting of the manufacturing freeze, war-related technological advances, the decrease in television prices caused by mass production, increased leisure time, and additional disposable income. While only 0.5% of U.S. households had a television in 1946, 55.7% had one in 1954, and 90% by 1962.

The FCC adopted NTSC television engineering standards on May 2, 1941, calling for 525 lines of vertical resolution, 30 frames per second with interlaced scanning, 60 fields per second, and sound carried by frequency modulation. Sets sold since 1939 that were built for slightly lower resolution could still be adjusted to receive the new standard. The FCC saw television ready for commercial licensing, and the first such licenses were issued to NBC and CBS owned stations in New York on July 1, 1941, followed by Philco's station WPTZ in Philadelphia

After the U.S. entry into World War II, the FCC reduced the required minimum airtime for commercial television stations from 15 hours per week to 4 hours. Most TV stations suspended broadcasting; of the ten original television stations only six continued through the war. On the few that remained, programs included entertainment such as boxing and plays, events at Madison Square Garden, and illustrated war news as well as training for air raid wardens and first aid providers. In 1942, there were 5,000 sets in operation, but production of new TVs, radios, and other broadcasting equipment for civilian purposes was suspended from April 1942 to August 1945.

By 1947, when there were 40 million radios in the U.S., there were about 44,000 television sets (with probably 30,000 in the New York area). Regular network television broadcasts began on NBC on a three-station network linking New York with the Capital District and Philadelphia in 1944; on the DuMont Television Network in 1946, and on CBS and ABC in 1948.

The New Haven Connecticut TV Station, WNHC-TV went on the air June 15, 1948, as channel 6, six days after WBZ-TV in Boston, thus just missing being the first operational television station in New England. WNHC was the first TV service for Hartford, Springfield, the Hamptons, and Eastern Long Island. In 1946, Roger had built multiple element antennas and mounted them on home roofs so long-distance reception of television signals from New York city was possible. WNHC-TV moved to Channel 8 on January 1, 1954. The call letters then became WTNH in 1971.

WNHC, with transmitter located on Gaylord Mountain, 8 miles from New Haven, was the first station to bring network TV to Connecticut. WNHC was the first DuMont affiliate. In the 1946, DuMont began operation as America's fourth television network, with headquarters and television station, WABD in New York City. Hindered by a lack of primary stations and a small budget, and by being

forced to utilize UHF affiliates in an era when UHF was not competitive, DuMont never achieved the success of the other networks, and folded its television network in 1956.



WNHC-TV Transmitter, 1948



WNHC-TV Test Pattern

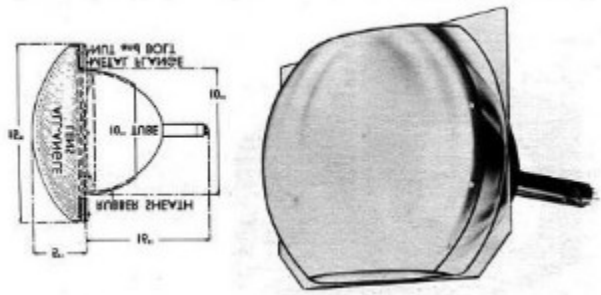
On its first day of operation, June 15, 1948, WNBC ran shows like Bishop Fulton Sheen's *Life is Worth Living*. The 1948 Democratic and Republican national conventions, at which Harry Truman and Thomas Dewey were nominated respectfully, were also broadcast live. At this early stage of television, newscaster, Ben Grauer, provided a real-time view of the transmitter and antenna on the Empire State Building. Television was very informal, and the newscasters did not wear coats.



Bob Smith and Claribel in the Howdy Dobby show, 1948

As television programming developed, WNBC-TV ran top NBC shows such as Milton Berle, Bob Hope, *Dragnet*, Perry Como, Groucho Marx, the *Today* show, *Mr. Wizard*, and the daily *News Caravan* with John Cameron Swayze, the original evening network newscast. It ran top CBS shows such as Ed Sullivan, Arthur Godfrey, Lucille Ball, Phil Silvers, Jack Benny, *Burns and Allen* and *Red Skeleton*. It ran top ABC shows such as *Ozzie and Harriet*, *American Bandstand* with Dick Clark, Walter Winchell, Lawrence Welk, *Leave it to Beaver*, the *Brady Bunch*, Dick Cavett and *Nightline* with Ted Koppel. In its earliest decades, ABC was oriented to the youth market.

On June 25, 1948, our parents invited a full living room of friends over to watch the Joe Louis, Jersey Joe Walcott boxing match on two, 10 inch black and white television sets that Roy Jr. and Roger built. The 10-inch tube was the largest that could be manufactured at that time. Therefore, Transvision developed an oil filled lens that could be placed in front of the tube to enlarge the picture. Joe Louis defeated Jersey Joe Walcott in an 11- round bout, thus retaining the world heavyweight boxing championship.



Oil-filled Lens for CRT Television Tube

Roy Jr. and Roger Worked for New Haven Connecticut WNHC

In 1948, with television just starting after World War II, Roger and his brother, Roy Jr. visited the WNHC-TV transmitter after reading in the New Haven Register about the Elm City Broadcasting Company building of the television station for New Haven. Roy and Roger talked to the chief engineer, Mr. deLaurentis, who said Roy, who was 18 years old, could work as a TV cameraman in the studio, and Roger, who was 16 years old, and a Freshman at New Haven High School, was given the job to run the relay station on Oxford Hill, Connecticut. Since Roger didn't have a First-Class Radio Telephone License, Mr. deLaurentis said he should obtain a Third-Class Radio Telephone License and tell anyone that he was supervised by a First-Class Licensee, Mr. deLorentis. Therefore, while in high school, in 1948, Roger ran and maintained the television relay station in Oxford, Connecticut. This station received New York television signals (on an RCA 630 conventional television receiver), processed the signals and relayed them by microwave to the new, New Haven, Connecticut television station WNHC-TV.



RCA model 630-TS --- The First Mass Produced Television Set in the United States 1946-1947

Roger Operated the Television Relay Station

At the relay station, besides switching to the correct network signal on the hour or half-hour, Roger needed to maintain a quality signal for transmission to the TV transmitter on Gaylord Mountain. For pickup of the off-the-air signals, Roger had to switch the television signal to the correct channel and tune the RF section of the receiver for the best quality signal according to the video signal on an oscilloscope. Therefore, during the 30 second station break, he fine-tuned the RF signal for best quality,

and adjusted the synchronization signal to meet the FCC standard. More times than not, he finished making these adjustments while WNHC-TV was on the air carrying the appropriate television signal for public viewing.

The Oxford Hill Relay station was half-way between New York, where the programs originated, and the WNHC-TV transmitter in New Haven, Connecticut. The relay station had a Microwave transmitter at the bottom of a wooden pole, with a parabola pointed straight up to a reflector which allowed the microwave signal to be beamed to the microwave parabola receiving antenna on a tower at the Gaylord Mountain transmitter station.

The New York signals from WABD, CBS, and NBC were received on a yagi antenna mounted at the top of the wooden pole. Later Roger built and installed a sloping-V antenna to improve the TV reception. The signal was fed inside the relay station to a fixed frequency crystal receiver tuned to receive the WABD signal on Channel 5. The signal from the antenna was also fed to an RCA 630 television set to receive the signals from CBS and NBC on Channels 2 and 4. Roger's job was to assure the relay station operated correctly to receive the WABD, WCBS and WNBC signals, convert the correct signal, according to the schedule of which station was to be carried by WNHC-TV at that particular time, to microwave, and beam it to the WNHC-TV transmitter on Gaylord Mountain. The WNHC-TV transmitter personnel and Roger established communications by normal telephone calls.

New England Hurricanes There were other externalities associated with this job. Hurricanes Edna, Carol and Hazel pounded New England in the 1950's, and knocked the relay station as well as the New Haven television station WNHC-TV off the air. To get the Oxford Hill relay station on the air as soon as possible, Roger drove around debris-littered roads, and activated an emergency power generator at the relay station. Roger put the relay station on the air, providing the New Haven area with information concerning the hurricane.

73 de Roger, K0IHX, Boulder, Colorado

As you can tell from the above history of TV, Roger is one of TV's pioneers. He and his wife, Naomi, KD0PDZ, were very active Boulder ATVers. The photo on the right was taken off the air from their DVB-T signal in 2018. They participated in every weekly ATV net up to Dec. 2021. Unfortunately, their lovely, hand-built home on the top of Davidson Mesa was destroyed in the disastrous Marshall Fire, which also burned down 1000+ other houses, including those of other hams.

Roger is now 91 years young. At the present time, they are living in the Sunrise assisted living center in Broomfield. Their Davidson mesa house is being rebuilt and is nearly finished. They hope to be able to move in by the first of December. Their son, Glen, has done a great job working with the general contractor and overseeing the rebuilding.



Roger, K0IHX & Naomi, KD0PDZ

Ham Radio in the Movies: Though not Amateur Television, I hope you will forgive (thank) me for passing on this fascinating, 13 minute, YouTube video. I hope you enjoy this...

https://www.youtube.com/watch?v=beFm_62YyUk

73 de Rod, WB9KMO

WOBTV Details: **Inputs:** 23 cm Primary (CCARC co-ordinated) + 70 cm secondary all digital using European Broadcast TV standard, DVB-T 23cm, 1243 MHz/6 MHz BW (primary), plus 70cm (secondary) on 441 MHz with 2 receivers of 6 & 2 MHz BW
Outputs: 70 cm Primary (CCARC co-ordinated), Channel 57 -- 423 MHz/6 MHz BW, DVB-T Also, secondary analog, NTSC, FM-TV output on 5.905 GHz (24/7 microwave beacon).
Operational details in AN-51c **Technical details in AN-53c.** **Available at:**
<https://kh6htv.com/application-notes/>

WOBTV ATV Net: We hold a social ATV net on Thursday afternoon at 3 pm local Mountain time (22:00 UTC). The net typically runs for 1 to 1 1/2 hours. A DVD ham travelogue is usually played for about one hour before and 1/2 hour after the formal net. ATV nets are streamed live using the British Amateur TV Club's server, via: <https://batc.org.uk/live/> Select *ab0my or n0ye*. We use the Boulder ARES (BCARES) 2 meter FM voice repeater for intercom. 146.760 MHz (-600 kHz, 100 Hz PL tone required to access).

Newsletter Details: This is a free newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 500+. News and articles from other ATV groups are welcomed. Permission is granted to re-distribute it and also to re-print articles, as long as you acknowledge the source. All past issues are archived at: <https://kh6htv.com/newsletter/>

ATV HAM ADS

Free advertising space is offered here to ATV hams, ham clubs or ARES groups. List here amateur radio & TV gear For Sale - or - Want to Buy.

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For Sale -- Complete, Turn-Key, Digital Amateur Television Station



Have you, or your ham buddies, been wanting to take the plunge into the fantastic new world of digital amateur television (DATV) ? Has the complexity of it been holding you back ? If someone offered you a complete DATV station which works right out of the box, would you buy it ? Jim, KH6HTV, is offering you this solution. He can provide you with the necessary equipment to get on the air on the 70cm and/or 23cm bands with fantastic, full color, full fast scan motion, in high definition 1080P resolution, digital TV plus CD quality stereo audio. The package offered includes a DVB-T modulator, RF Linear Power Amplifier and DVB-T receiver. Both the modulator and receiver come pre-programmed to work right out of the box on the amateur DATV channels. You supply the video source (camera, PC computer, DVD player, etc), video monitor, 13.8Vdc power supply, antenna(s) and coax cables. For a detailed quotation on a package deal, send your requirements to Jim, KH6HTV, at kh6htv@arrl.net