Boulder Amateur Television Club
TV Repeater's REPEATER

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BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

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SKEW PLANAR WHEEL 437 MHz ANTENNA

Michael Vonlanthen, HB9AFO

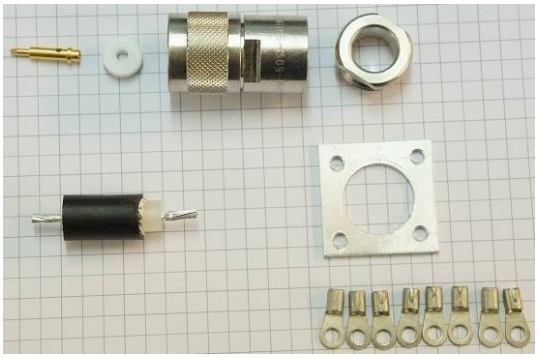
Michael, HB9AFO, in Bussigny, Switzerland, has just sent us this article about his mobile antenna. He writes "Hello Jim -- Here is a decription of the Skew planar wheel 437 MHz antenna, the best mobile antenna I have ever used on DATV."

Michael is a very dedicated ATVer. Here is his brief bio from www.qrz.com ---
Actually and since more than 20 years, I am mainly interested by ATV (now DATV) and microwaves. During years, I was co-holder of the ATV 10GHz distance world record. I have a very active web site devoted to ATV and named: ATV french connection (***www.hb9afo.ch***). I was the first and former president of the SWISS ATV association until 1999. I am also doing reflexion QSO to the Mont Blanc in 10GHz DATV. For the moment the best distance is 322 km (with F9ZG/P). I am also QRV on oscar-100 in DATV and SSB with an home-made PA of 150 W. Historically I was knew as 4W1M and 4W1Z in Yemen in 1968.

Skew Planar Wheel 437MHz Antenna: Hervé F4CXQ's mobile DATV tests on 437 MHz surprised me because, with little power (180mW at the start then 4 W), he transmitted us images of excellent quality with very few cuts in urban areas. This performance is partly due to the qualities of DVB-T, which is well suited to our mountainous region because it takes advantage of reflections instead of being disturbed by them. And on the other hand, on the antenna that Hervé built, a Skew Planar Wheel Antenna, a sort of weird four-leaf clover that I now call "4-leaf clover". VE3BYT and VE3KL exhumed it from the oblivion of history in 2006 and, subsequently, in 2012, VK6YSF described an easy-to-build version from which I took great inspiration. What is remarkable is that this antenna is omni-directional and is circularly polarized (RHCP), which is ideal for mobile traffic with fixed stations equipped with horizontal or vertical polarization antennas. In addition, it does not have a SWR adjustment system, the 4 "petals" are simply connected in parallel. Just tilt them more or less to bring the SWR down to almost 1:1. As a result, losses are reduced to the strict minimum. And this is reflected in traffic.

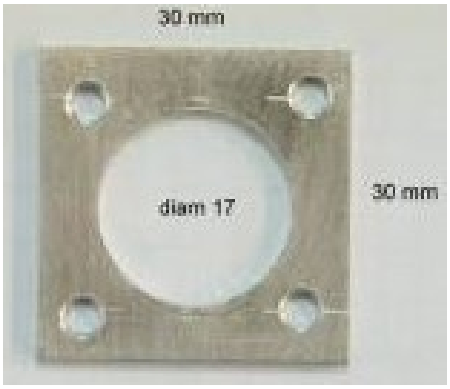
My achievement I opted for the construction described by VK6YSF ***http://vk6ysf.com/skew_planar_wheel_antenna.htm***

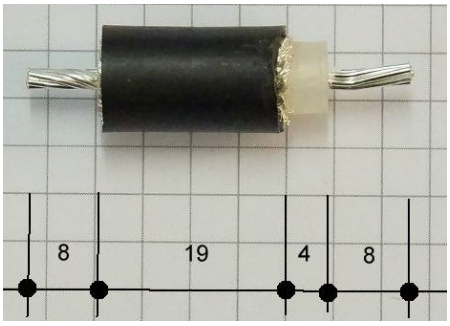
The heart of the antenna is an N plug for RG-213 (or 14) cable. It supports the 4 "petals" and plugs into a female-female N connector for chassis, what he calls Generic Antenna Mount.

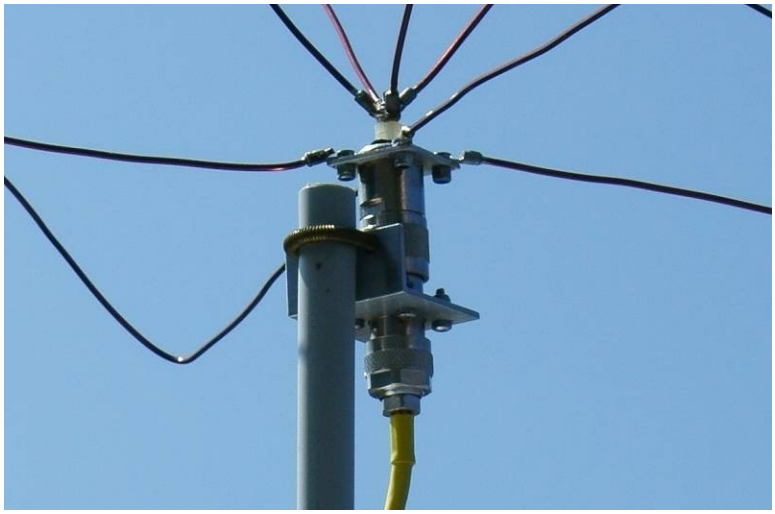


We see above the parts used: at the top what I kept from the N plug, below the piece of RG-214 cable which connects the central pin of the plug to the upper part of the 4 "petals" and on the right the aluminum piece which takes place

between the rear cap and the N plug. The enamelled copper wire of 2 mm in diameter is connected to the ground of the plug and to the core of the coax using 2 x 4 soldered terminals. Below we see the dimensions of the cable and those of the aluminum plate which forms the mass.







The "petals" are made of enameled wire 2mm in diameter and are each 72cm long, including the bare areas soldered into the terminals. The side of a “petal” is 18.5cm (lambda/4). The 2mm wire is very suitable but I had doubts about its resistance to the wind. Well no, the antenna holds up well, I tested it in the car at 100 km/h. It has not suffered any deformation. The fact that copper is relatively soft is perhaps an advantage; like a reed it bends but does not break.

I built and tested this antenna in less than a day. I plan to make versions of this awesome antenna for other bands.

1290 MHz version ----- Dimensions: Length element = 24,3 cm, petal side: 6,1 cm (λ/4)

ATN - DATV

Success Story

Aloha, Jim, and All --- As you can see, I am OTA on DAT through the ATN's Santiago Peak Repeater!!! THANK YOU so MUCH for your expertise on this project. Your equipment is working PERFECTLY! Beyond my wildest dreams!

I am receiving the repeater with the 1.2 GHz downconverter analog. I'm not sure if we are set up for digital transmit yet, but when we are, I'm ready with my new HV-120-1.2 GHz.

AA6GJ's new DVB-T station and his signal after going through the Santiago Peak, ATN TV repeater, 30 miles away.

West End Amateur Radio Group K6BTV

440-6SS Yagi

Santiago Peak as seen from AA6GJ's QTH

Attached are three photos. My ham shack Digital ATV setup. My M-Squared 440-6SS, 70cm, Yagi antenna up about 11 feet on a tripod. The Coax is LMR 600. Still looking for the best place to hang it on the house. It works pretty well there. Also a photo of a shot of Santago Peak about 30 miles south of me.

I will definitely recommend you to anyone who would want a turn-key Digital Amateur TV station. Thank you once again for all your hard work! 73 de Gary, AA6GJ, Rancho Cucamonga, California

GOOD NEWS about Hi-Des Products

Well, finally after a couple years of extreme frustration, I think I am finally able to share some really good news regarding the current production Hi-Des DVB-T products. (***www.hides.com.tw***)

Recently I needed to purchase several Hi-Des modulators and receivers for customers. When they arrived, they all had issues. Some minor, but some very major to the point of not being functional. Fortunately, the folks at Hi-Des are very responsive to email inquiries and complaints. The key contact at Hi-Des is Calvin Yang. If you ever have problems with your Hi-Des gear, contact Calvin at: ***calvin@hides.com.tw***

For the past couple of years I had problems with the Hi-Des receivers, but not their HV-320 modulator. So I was surprised when the most recent shipment had a minor problem with the channel up/down buttons not working. Calvin had recently announced they were now shipping a new version, called the HV-320B. Fortunately, with my feed-back, they were able to quickly come up with a new firmware fix.

The Hi-Des model HV-110 and HV-120-1.2G receivers have had much more severe issues. But Calvin and the engineers at Hi-Des have finally gotten some working firmware for them also. So, if any of you ATV hams out there have bought Hi-Des gear in the last couple of years and have been dissatisfied with it's performance, I suggest that you contact Calvin for an update on the firmware.

Firmware: In summary -- these are the most recent versions of the Hi-Des firmware which finally seem to be "bug-free" and actually worked for me.

HV-110 Receiver	f/w	0.0.1.72.171
HV-120-1.2G Receiver	f/w	0.0.5.72.171
HV-320B Modulator	f/w	0.0.3.5.56 (*note: only for B version*)

Technical Performance: While I had the new Hi-Des modulators and receivers on hand, I decided to give them a more complete evaluation to know how well the current production performs. I tested them with both 6 MHz and 2 MHz channel band-widths. Here is a summary of my findings.

HV-110 Receiver: Price = $119 Frequency coverage = 170 - 950 MHz draws about 200mA @ +13.8Vdc I measured the digital threshold receiver sensitivity at both 70 & 33cm bands. I used my standard test conditions of: Trans Config = 6 MHz BW, QPSK, 8K FFT, 5/6 code rate (FEC), 1/16 guard. Media Config. = HDMI, H.264, 1080P, 5.5 Mbps, 60 GOP, 30fps + Audio MPEG2, 96kbps For testing at 2 MHz band-width, I used lower 720P resolution and 1.5 Mbps. I found that the on-screen-display rf power meter which reads out in dBm to be accurate within ±2 dB, except for very weak signals.

The receiver sensitivity was at a digital threshold S/N of 8dB which gave solid P5 video & Q5 audio with no freeze framing. At 70cm, the sensitivity was -96dBm. At 33cm, the sensitivity was -95dBm.

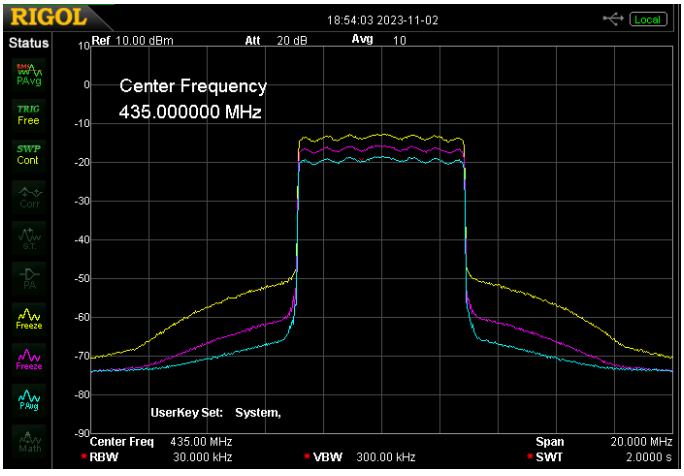
I also tested the 70cm sensitivity with 2 MHz band-width. It was considerably improved at -101dBm. A 5dB enhancement with S/N = 7dB. A low noise, pre-amp would improve these numbers a bit.

HV-120-1.2G Receiver: Price = $259 Frequency coverage = 100 MHz to 2.65GHz with a 1.2 GHz SAW filter installed for the upper (> 1GHz) band. draws 330mA @ +13.8Vdc The on-screen-display rf power meter reads out in dBm. However, it is not accurate. It does reflect a 1dB displayed change for a 1dB rf input change. But there are very significant offsets in the readings from the true value. The offset correction factor changes with each band and band-width. It needs to be calibrated for each band. The biggest error was on the 23cm band where the OSD reads too high by about +21dB.

The receiver digital threshold sensitivity was also measured. The results were: 70cm = -97dBm, 33cm = -96dm, 23cm = -90dBm, and 13cm = -51dBm. With 2 MHz BW, the 70cm sensitivity = -103dBm. The very poor sensitivity at 13cm (2.4GHz) was to be expected due to the presence of a 1.2 GHz SAW pre-selector filter being installed in this model. The 23cm sensitivity could be considerably improved if one were to use a good low noise, pre-amplifier in front of the receiver.

HV-320B Modulator: Price = $399 New revised design, designated as **"B"** version. Frequency coverage = 100 MHz to 2.65GHz draws 500mA @+13.8Vdc The major difference I found from the previous "E" version was about +3 dB more rf output power. I measured the rf output power using an HP-432A power meter with an HP-478A, thermistor rf power sensor head. I set the internal attenuator to 0 dB and used 6 MHz BW and QPSK modulation. The results were: 70cm = +10.5dBm, 33cm = +8dBm, 23cm = +8dBm, 13cm = +3dBm. 16QAM & 64QAM gave slightly different readings. 16QAM was typically +1.5dB stronger. 64QAM was typically -1dB weaker.

At the max. rf output (atten = 0dB), there is evidence of the output amplifier starting to distort the signal. This is seen by an increase in the out-of-channel, spurious shoulders. At 0dB, the shoulder break-points were -37dB. At -3dB internal attenuation, the break-points improved by 6dB to -43dB. At -6dB or greater attenuation, no more improvement was seen, bottoming out at about 46dB.



RF Output Spectrum - 0, -3 & -6dB internal attenuation. 10dB/div & 2 MHz/div

No Video Input - Color Bar Display

The other improvement noted in this new "B" model was the video image transmitted when there was no video input signal. In the past, a simple B&W text message of "No Video" was displayed. Now with the "B" version, we get a really nice color bar image as shown in the above photo.

I hope this info is of value to our ATV newsletter readers.

73 de Jim Andrews, KH6HTV, Boulder, Colorado

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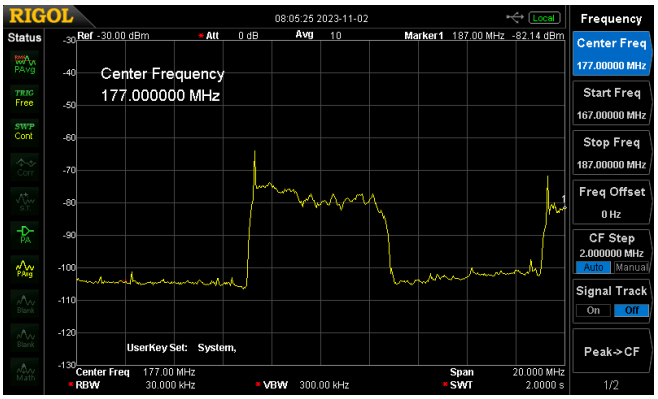
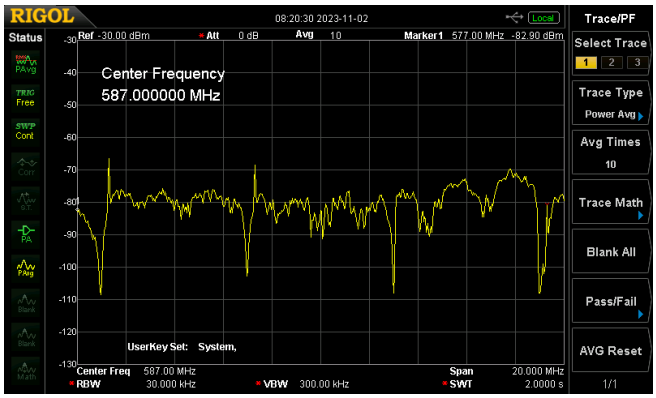


Channel 7



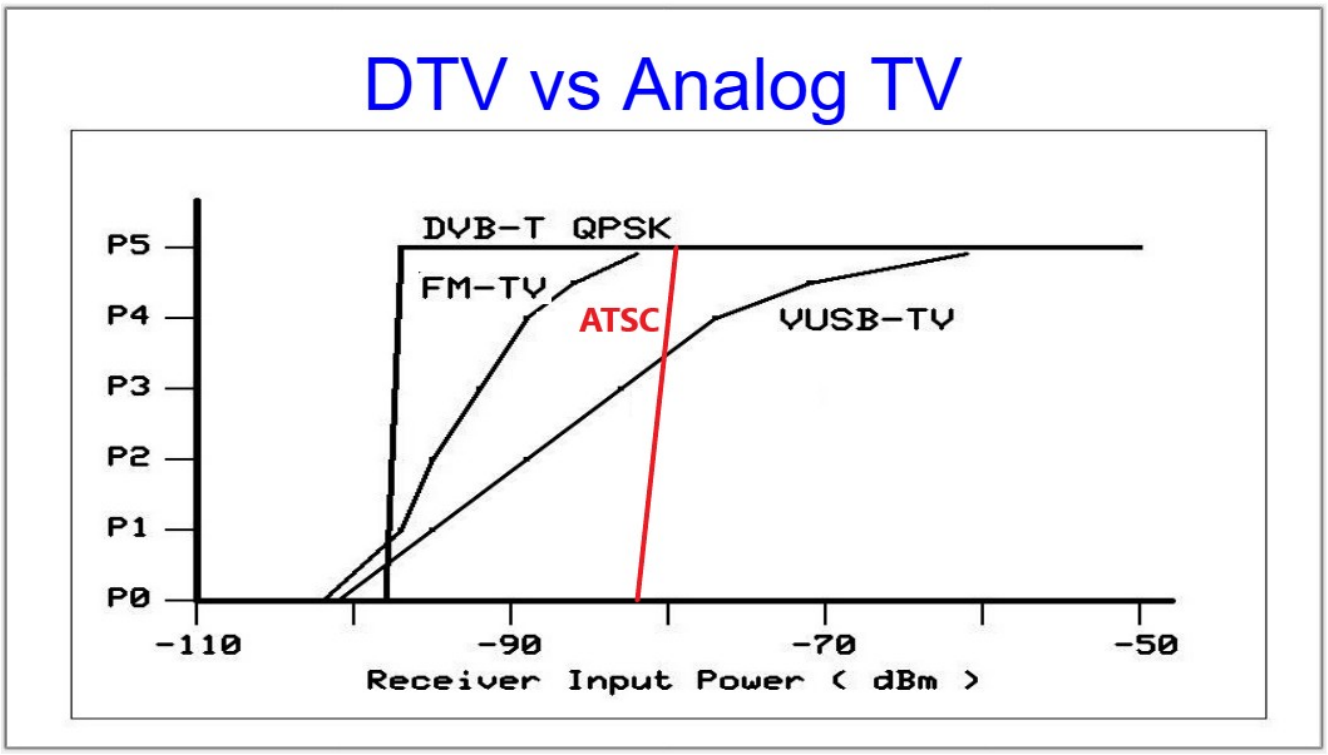
Channel 33

ATSC Receiver Sensitivity

Jim, KH6HTV

Recently I was chatting on the phone with Wolfgang, KV4ATV, ATN, in Panama City, Florida. He asked "What is the sensitivity of a typical home TV, ATSC, receiver compared to the DVB-T you ATV hams are using?" He felt based upon his experience that they were quite insensitive compared to older analog, NTSC, receivers. He said the ATSC seemed to quit working at an rf level at which he could still see a very usable P3, NTSC signal.

OK, guess it was thus time to dig out the test gear again and see what I could measure. My test signals were the off the air signals from a multitude of Denver broadcast TV stations on both hi-band VHF and UHF. My receiver was a typical home set. It was a 24" Vizio, model 2414-J01. I used my indoor TV patch antenna. I added a rotary step (1dB & 10dB steps) attenuator to adjust the rf level into the receiver. I first looked at the rf spectrum of the TV broadcast bands on my Rigol spectrum analyzer. I wanted to use the best quality signal possible for my measurements. I looked for the flatest spectrum signals, un-corrupted with multi-path. The test was complicated by the fact that TV stations typically no longer actually transmit on their original channel number designations. They use phantom channel numbers now that don't correlate to their actual rf channels. So I needed to consult the internet to try to decode this mess. I ended up selecting Denver digital channels 6.1 & 7.1 (rf channels 33 & 7 = 587 & 177 MHz). The above photo shows their spectrums. The test TV spectrums were not closed circuit, test bench quality. Thus, there was a bit more uncertainty in saying what exactly was the true rf signal strength. But some valid info could still be extracted.



Conclusion: The digital threshold for an ATSC receiver is of the order of -80 to -82dBm. This is for a perfect P5/Q5 picture/audio. The digital cliff width was of the order of 3 to 4 dB wide with pixelating occuring in the picture/audio. Total loss of signal at about -84 to -87dBm. This result tends to confirm Wolfgang's observations about it being equivalent to a P3, NTSC signal. It also appears to match the level for a full quieting FM-TV signal.

Comparison with DVB-T: Measurements I have made in years past consistantly showed better receiver sensitivy with DVB-T. For example, from my app. note, AN-29, for typical digital parameters (5/6 FEC), I measured the perfect P5/Q5 digital threshold sensitivity to be -95dBm (QPSK), -90dBm (16QAM) and -82dBm (64QAM). Thus ATSC and 64QAM/DVB-T are compareable. If we cranked in even more aggressive forward error correction (FEC), we know we can even improve the DVB-T performance more. Also going to a narrower bandwidth DVB-T pushes the sensitivity numbers even lower. Plus adding a low noise, pre-amp also helps. Thus for our low power, amateur DATV stations, DVB-T with QPSK will give us much greater distances with still excellant 1080P performance compared to using ATSC.

73 de Jim, KH6HTV, Boulder, Colorado

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ATN - Arizona: Rod, WB9KMO, on Nov. 4th, hosted at his QTH in Mesa, a MESH WORKSHOP. He advertised it as "You are guaranteed to have fun and learn more about Mesh Networking. We also cover ATV, DMR and just about any other ham radio topic." Afterwards, Rod reported -- "The workshop went well and we covered many topics. Whereby allowed a few checking in

from outside and Roland described his studio setup, including Raspberry Pis, ATV connections and MESH connections. He's a pioneer, integrating Mesh and ATV. I'll follow in his footsteps."

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NASA Laser Communications

What's Next for ATV?

It's not RF anymore, but very narrow band light communication in a very small compact, light weight unit. Stay tuned, and the new space Internet demonstration is upon us now between the ISS, Hawaii, LCR and California. 4K video, audio and data speeds are AWESOME!

73 de Mario, KD6ILO, Oceanside, California

ARRL Announcement includes Buried ATV Trivia

The ARRL, Nov. 9th, weekly e-mail newsletter contained an announcement of the retirement of Joe, AH0A, as the Pacific Section manager. His replacement is Maui ham club member, Alan, AD6E.

Who is that tall, thin, Hawaiian in the middle, demonstrating ATV at the Queen Kaahumanu Center? (courtesy of qrz.com)

Maui, Spring, 2017

Alan,

The announcment included the photo in the center of Alan standing by the ARRL banner. This photo caught the editor's eye for two reasons. First note the presence of a TV camcorder on a tripod along with a rubber duck whip antenna also on the tripod. Second, I remembered exactly where the photo was taken. In the spring of 2017, the Maui ham club had a ham radio exhibit set up in the main shopping center mall on the island. Alan and I (KH6HTV) manned the display table as shown in the photo I dug up from the archives. Along with HF transceiver, 2m/70cm rigs, we were also had a live demo of DATV.

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W0BTV - TV Repeater Status Report

W0BTV recently required some minor repairs. The video ID generator has gotten "flaky". Many of the frames in the 5 minute, video ID movie were showing tearing, but not all of them. We had previously tried simply replacing the USB memory stick thumb drive, thinking some files had gotten corrupted, but that didn't cure the problem. So we decided to replace completely the Media Player. We have purchased a new Agptek HD Media Player, model Mini 1080 from Amazon ($40). The new unit worked a bit differently from previous ones. Old remotes would no longer work with it. The new unit has f/w EN 1.1.1C2. The new ID generator will be installed the next time Don, N0YE, needs to make a maintenace trip to the repeater

A Good Idea -- Bad Execution Now for Alternative Solution

In our two previous October issues #143 & 144, we discussed the idea of adding 70cm remote receiving sites to our Boulder, Colorado, W0BTV TV repeater. The objective was to somehow find a work-around from the severe, broad-band RFI which was clobbering our repeater on it's 441 MHz input. The concept was for area ATV hams to dedicate a local DVB-T receiver tuned to 441 MHz and when it received a valid TV signal to key up their 23 cm transmitter and re-broadcast the signal on 1243 MHz up to W0BTV. Idea sounded good. The previous issue #144 reported on the first such remote receive site becoming operational and it did in fact work as expected.

So what could go wrong ? The first operational site located at the qth of KH6HTV had a great view of the eastern part of Boulder County which had previously been shielded from the repeater. This site was shielded from the city of Boulder and Boulder Valley, but did have a good line-of-sight view to W0BTV. Well in actual practice, this turned out to be a Bad Idea ! Why? Some of our BATC ATV hams in the city of Boulder are still using the 70cm input to W0BTV. They are Jack, K0HEH, and Steve, WA0TQG's remote repeater. Normally they put in very strong 70cm signals to W0BTV sufficient to override the RFI. They also are shielded from a line-of-sight view to KH6HTV's QTH.

OK fast forward to our weekly ATV net. Suddenly they are no longer able to reliably access W0BTV. Instead W0BTV is cycling on & off with some other strange picture which also contains their video. What is it? Well it seems that weak signals from K0HEH & WA0TQG are being reflected off of the Flatiron mountains and being received out east by KH6HTV's remote base. I was the culprit ! Plus I was not at home at the time to be able to disable the system. OPS ! Not the intended result.

What is a possible solution ? --- Well 2m & 70cm voice repeaters which have multiple, remote receivers all feeding into the transmitter site, also include a Voter Control Circuit. The Voter box selects automatically the receiver site with the best signal to noise and only allows it access. Thus for our video remote receive site concept to work we really would need to design a similar video voter box. Sorry, but I am not up to that task. Too much of a major undertaking.

However, Don, N0YE, has instead come up with a much simpler suggested solution. Simply put the remote receiver sites on different 70cm frequencies from the W0BTV's 441 input. So, I have already switched mine down to 429 MHz / 6 MHz BW. Now, if BCARES needs access to W0BTV for an emergency field operation, they can select the appropriate TV channel depending upon where they are located in the county.

73 de Jim, KH6HTV, Boulder, Colorado

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W0BTV 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/***

W0BTV 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/**

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