Boulder Amateur Television Club
TV Repeater's REPEATER

September, 2020
3ed edition

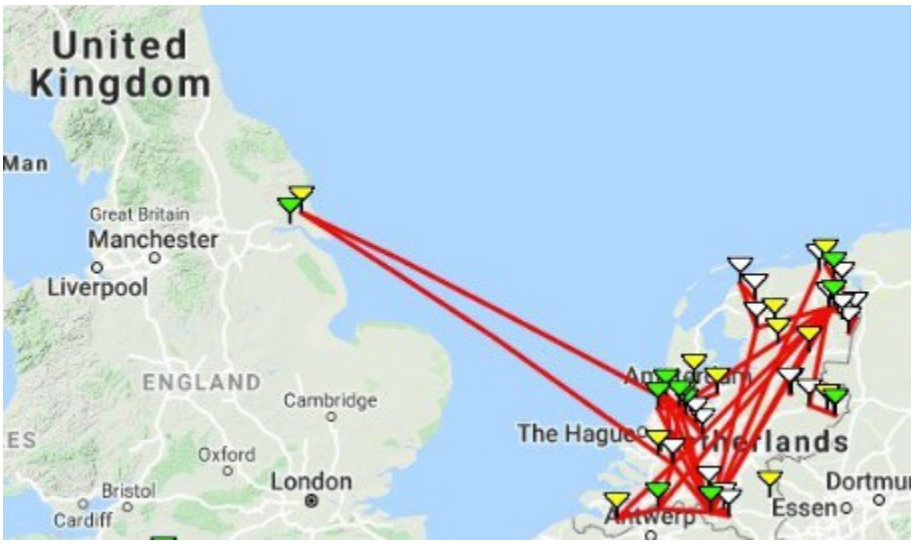
BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

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

W0BTV Details:

Inputs: 439.25MHz, analog NTSC; 441MHz/6MHz BW, DVB-T & 1243MHZ/6MHz BW, DVB-T Output: 423MHz/6MHz BW, DVB-T Operational details in AN-51a Technical details in AN-53a. Available at: https://kh6htv.com/application-notes/ We hold an ATV net on Thursday afternoon at 3 pm MDT. ATV nets are streamed live using the British Amateur TV Club's server, via: https://batc.org.uk/live/kh6htvtvr or n0ye.



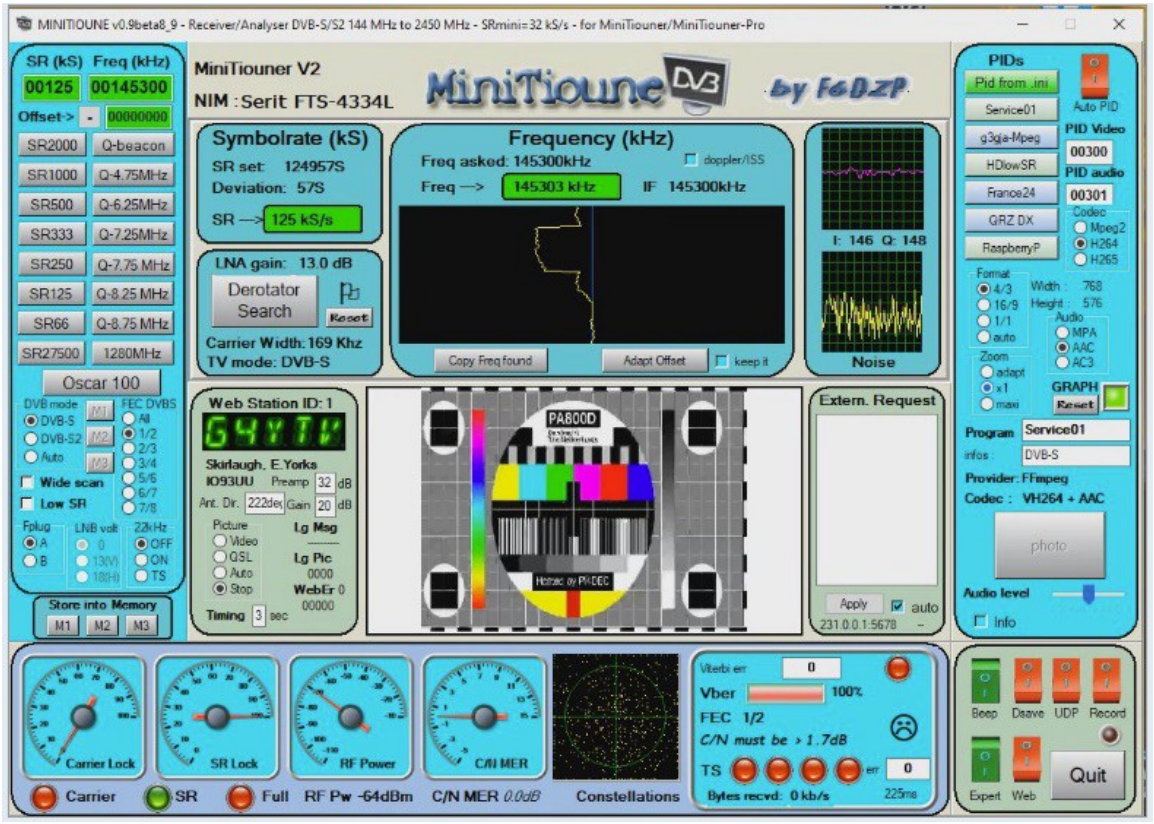
250 Miles - 2 Meter DTV:

News bulletin from Holland.

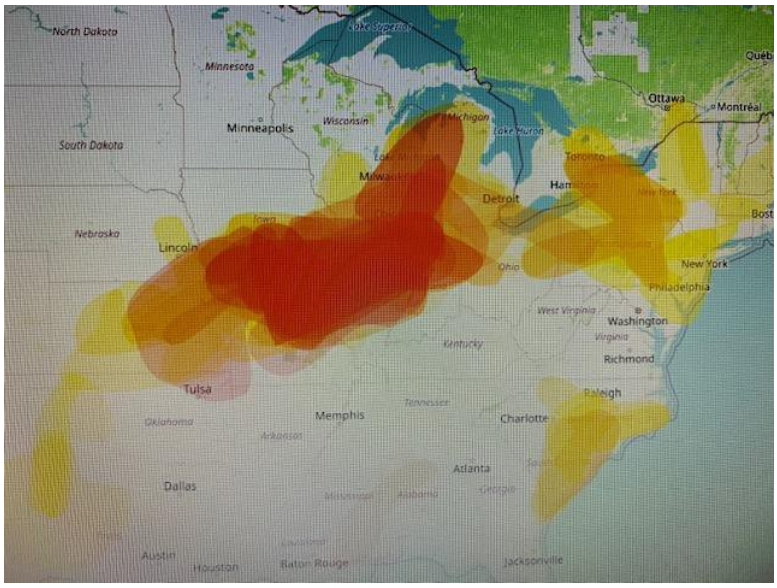
ENTHUSIASM FOR DUTCH AMATEURS' DATV EXPERIMENT

Hams have responded enthusiastically to an invitation by the Dutch amateur radio society VERON, opening the door to the use of 2 metres for digital amateur TV, or DATV. The organisation mounted the challenge in early July, hoping that hams would prove that 144

MHz was indeed well-suited for such use. The four-hour trial run on 144.600 and 145.300 MHz attracted a group of 27 participants and a video was made available to instruct them in the use of the software used to decode the images. https://www.youtube.com/watch?v=Q6vlRV1s3Hg For receivers, they used the RTL-SDR.COM, USB TV tuner dongle. For transmitters, they used the BATC Portsdown.

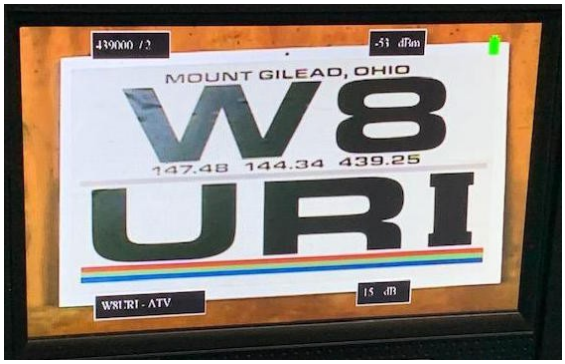


Jaap, PA2JSA, further reports: DATV connections where confirmed from more than 27 stations in The Netherlands as well as from the UK and Belgium. For feedback on received DATV stations a talk back channel was used, via http://dxspot.batc.org.uk/
Best DX was 403 km, PI4D received by G4YTV. The specifications for the DATV experiment on the 2 meter band in the Netherlands are: DVB-S2, H.256, QPSK, std. resolution (PAL 536 lines), 125 ks, FEC 1/2 and bandwidth of 162 kHz. The video signal was coded by the HEVC 265 standard (High Efficiency Video Codec). H.256 has 50% less bandwidh compared to the H.264 codec. At this URL you can find all detailed information about this experiment on the 2 meter band in the English language from PE1ITR. http://pe1itr.com/144mhz/datv-2m.htm

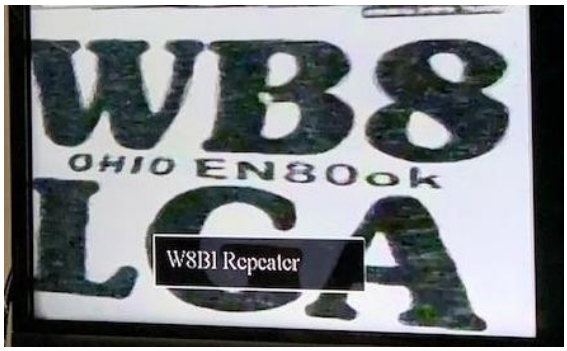


MIDWEST ATV DX - MULTIPLE BAND OPENINGS

Dave, AH2AR reports ---- Throughout the first week of September 2020, there has been multiple, early morning, 70cm, ATV DX band openings. Provided here are a few photos of what was being received. Typically, its possible to view the APRS propagation map (for 2 meters) to indirectly determine whether 70cm may also be open. Illustrated above is a snapshot of the APRS Propagation map that coincided with the 70cm band openings within this region. (URL is http://aprs.mennolink.org/) The RED areas indicate APRS 2 real-time reporting of 2 meter DX activity as the 70cm regional DX typically follows suit.



W8URI (DVB-T) in Mt. Gilead, OH rceived direct by AH2AR in Vandalia, OH, 84 miles



WB8LGA's analog (A5) 70cm video in Morrow county, OH to W8BI rptr in Huber Heights, OH (80 miles)

N9BNN, Lebanon, IN as received by the Grand Rapids, MI Ridgetop Receive Site. (200 miles)

N0BNN as received by W4HTB, Bowling Green, KY (220 miles)

W8URI, Mt Giliad, OH asreceived by W8KHP, Hebron, Kentucky (160 miles)

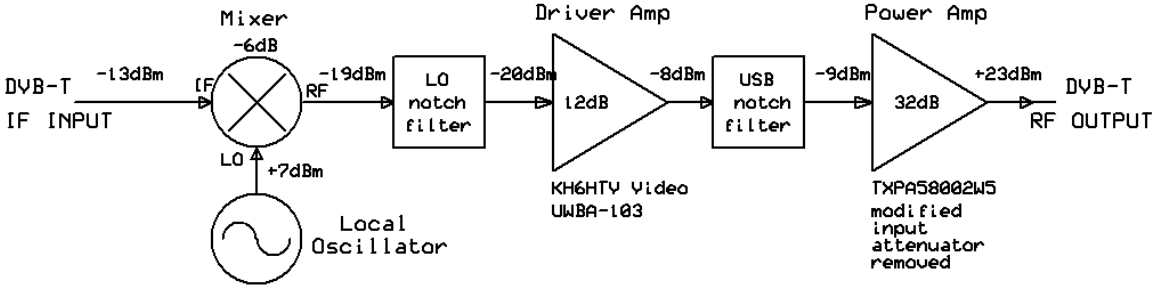
SAN DIEGO ATV News: San Diego - Oceanside - Vista, California, ADTV Society consortium continues experimentation with Amateur Radio - Television. transmitting multiple channel programing for our viewers. Channel programs are on local activities, training, projects, EmCOMM and ham radio presentations from abroad via IPTV media. The three network repeaters have worked flawlessly for three years now on DVB-T, DVB-S2 and FM modes {Vista, CA link}. Thirty three members are active in the society.

We have voted not to stream on any commercial public media platform{i.e. YouTube, ZOOM etc}. We do use IPTV technology from the THOR Broadcast equipment we own at our repeater sites along with our media server to stream to membership when away from QTH due to business travel, vacation etc. Members have IP access to Network link for rf local transmit using a pin assigned number {IP in, rf out}. Just a note no HiDes equipment in repeater network. We are using 6 MHz BW on our system. Each site has eight inputs, Outputs all DVB-S2, H.265 with the exception of the Vista site which has analog and digital mix in and out for the old timers in our group with their gear that are still in working order. Experimentation with the LimeSDR is being conducted with our STEM students. No further planned expansion of our network outside counties of San Diego we are pretty much done. Just maintaining what we have and lots of smart people on board to help and we have lots of fun like your group does. No interference issues.

73 de Mario, KD6ILO

DC Power for Frequency West Brick Oscillators

Pete, WB2DVS, has inquired "Where can I get a +12Vdc to -19Vdc power supply for my Frequency West brick oscillator. Bill, AB0MY, has found the solution. He says "I bought a Meanwell, model PSD-30A-24 from Jameco (www.jameco.com). It only cost $13. It is 12Vdc in, 24Vdc out, with isolated output. It is rated at 24V, 1.25 Amps output and 9-18 V input. The on board adjustment pot will lower the output to about 21Vdc. I changed the adjustment pot. It is just used as a series variable resistor, originally 500 ohms, replaced it with a 1K pot and was able to move it down as low as 16Vdc."



5.8GHz, DVB-T TRANSMITTER:

In the March, 2020 issue #37 of this newsletter, I discussed my development of a Transverter to be used on the 5cm, 5.8GHz band for DVB-T. A further enhancement (issue #54) boosted the rf power output up to +23dBm (rms) from +14dBm. This was done by adding a low cost ($25) Chinese model TXPA58002W5 amplifier with 13dB of gain. The most recent development reported in the last issue, #56, of this newsletter was the discovery that there is a -18dB input attenuator in that amplifier. So the obvious thing to do was to rip out that undesired attenuator. The modified amplifier then has +32dB of gain. This made the rf drive required for the final power amplifier a whole lot less stringent. A much lower cost driver amplifier could now be used in the transmitter. The above block diagram shows the basic elements now required to build this transmitter.

The first input component is the mixer. A very good quality, double-balanced mixer should be used here (not a cheap Chinese one ! - I found out the hard way.). The mixer I used was an E-Bay, surplus Watkins-Johnson model M-14 for C-band 4-8GHz. Diode mixers typically require +7dBm of LO drive power, or more. A good mixer with the proper LO drive power will then have about -6dB of conversion loss. A +7dBm mixer will typically have it's input IF drive -1dB compression point at about -7dB below the LO drive level, i.e. at 0dBm. For digital TV signals, it is extremely important to maintain

excellent linearity in all the components in the transmitter chain. DTV signal strength is expressed as the RMS value because it is a noise like signal with indistinguishable peaks and valleys. For DVB-T we have found that it is necessary to allow at least 10dB or more head-room above the RMS value to accommodate the peaks in the noise like signal. Thus for our input mixer, if the -1dB compression point is 0dBm, then our input DVB-T, IF signal must be < -10dBm. At -10dBm IF input, with -6dB mixer conversion loss, the mixer's RF output will be -16dBm.

The final RF power amplifier then becomes the modified TXPA58002W5. It's -1dB gain compression point is +33dBm. Backing off 10dB, we can thus expect to legitimately get +23dBm (RMS) of DVB-T power from this amplifier and still have acceptable, out of channel, spectrum shoulders. (note: the typical value used for ATV is -30dB shoulder break-points). So with +23dBm output and a final amp gain of 32dB, the required input drive to the final is thus -9dBm. From our above mixer calculations, we see that we will not get that much power from the mixer. Thus we will need an additional driver amplifier gain stage.

The driver amplifier used is the KH6HTV Video model UWBA-103. It is a low cost amplifier at $35 for an assembled and tested pc board version. The key specs for it are: 20dB gain, +20dBm (-1dB), 250kHz - 3GHz (-3dB bandwidth). While it is rated to 3 GHz, that is the -3dB BW. The amplifier still performs well at 5.8GHz. At 5.8, it has 12dB of gain and +9dBm (-1dB). This is plenty for this application.

The other components in the block diagram are optional, but good engineering practice dictates that they also be used. The RF output from the mixer will contain leakage of the LO frequency and both the upper and lower sidebands, LO + IF & LO - IF. We only want to use one of the sidebands. So we need to filter out the opposite sideband. If it is a good quality, double-balanced mixer, most of the LO will already be suppressed. With a good mixer, the LO leakage is down about -40dB from the input LO drive level. For Notch Filters, I have a found a very simple, and easy to build notch filter is to simply use an SMA tee and attach a short SMA cable to the third port of the tee. I then cut this cable to form an open-circuited stub. At 1/4 λ, or odd multiples, this open circuit presents a short circuit at the tee junction. With this technique one can easily get a -25 to -30dB notch at the desired frequency. With the particular LO, IF & RF frequencies I used, I had only about -1dB loss at the desired rf output frequency with my notch filters.

The resultant transmitter was designed to transmit on 5.678 GHz. The LO that was used was a Frequency West brick oscillator on 6.0924 GHz. Thus the resultant IF required was 414.4 MHz. The IF drive power used was -13dBm to get +23dBm of RF output. A Hi-Des model HV-320E modulator was used to provide the IF, DVB-T signal.

73 de Jim, KH6HTV

23cm BIG DISH: Thank you again Jim for the newsletter. --- The Lime SDR Mini caught me by surprise. I am bookmarking pages to learn more about this little gem. I can think of so many apps for it. Just need time.

I about have my new 15' surface and feed optimized for the ARRL Fall, EME 23cm contest. Sun noise and echo tests show it to be my best system to date. Even SSB, EME echoes are Q5 with 850 Watts at the feed. The solid state KW amp is behind the dish-hidden by some of my wife's Shasta Daisies. As a size comparison, the green disk at the center of the dish is 11" in diameter. If you look carefully, you can see my pup Dolly looking on with approval. I am old school - CW & SSB.

73 de Dale, W4OP

FEEDBACK: Ref. ATV Repeater Design -- Richard, WD0GIV writes -- "Hi, Jim. You can increase power while using the TX/RX duplexer if you do one thing. Install a low pass filter for about 500 MHz. The problem of desence with them is a second harmonic comes right back down and blows threw the duplexer with no problem. I found it out in 1985. I run 100Watts with a 439.25 MHz in and 421.25 MHz out. Before the LPF, I could not exceed 10Watts.

The Ultimate Ham Rover: Can anyone beat this Ultimate Ham Mobile ? 80 m thru 3cm ! SSB/FM/CW. Plus digital on HF thru 2m. Andrea, K2EZ, of New Jersey says "I can operate all but 160 meters from my mobile however the dish for 5.7GHz and 10GHz is carried in the vehicle and deployed when in position." OK, Andrea, the only thing missing now is for you to add ATV capability.

VALID SIGNAL SWITCH:

This is a an example of a build of the "Valid Signal Switch" used at the Dayton, Ohio, W8BI ATV repeater site that is used on a HiDes receiver. Typically, we bring out the green LED valid signal indicator on the HiDes receivers via an RCA jack. In that manner, we have access to the needed relay control voltage that is ported into this Chinese High-Low Level Trigger module. This module typically sells for less than $2.00 on eBay. A valid DVB-T signal energizes the Green LED, and the voltage provides a trigger this module to switch live NTSC video into the video controller at the repeater site.

Cheers -- Dave P., AH2AR, Dayton, Ohio

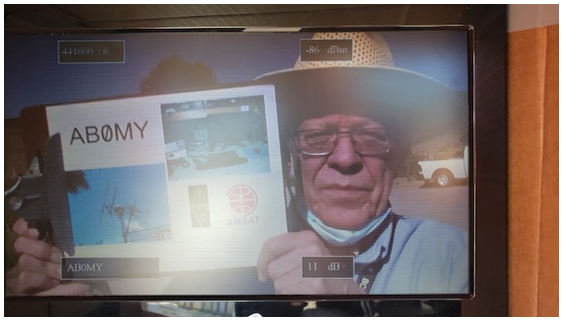
Editor's note: The valid signal mod for the Hi-Des receivers, Dave refers to is described in KH6HTV Video app. note, AN-23e, pp. 5-6. Mel, K0PFX, St. Louis, has produced mini-pc boards for the circuit. See the July newsletter, issue #50, pp. 13-14.

More Boulder 10 GHz Activity:

On Tuesday, Sept. 1st, the Boulder ATV hams again were on the air on 10.369 GHz with DVB-T. Bill, AB0MY, was at Rabbit mountain, near Lyons, CO. Pete, WB2DVS & Debbie, WB2DVT, were at NCAR, Boulder. Don, N0YE, was on CO-128 near the NREL windmills south of Boulder. Ed, K0JOY & Jim, KH6HTV, were at Mt. Joy (i.e. Ed's mountain QTH) north of Boulder in the foothills. There were some successful DATV contacts made and also the usual visits from Dr. Murphy. The longest distance covered was 23 miles between AB0MY & N0YE.

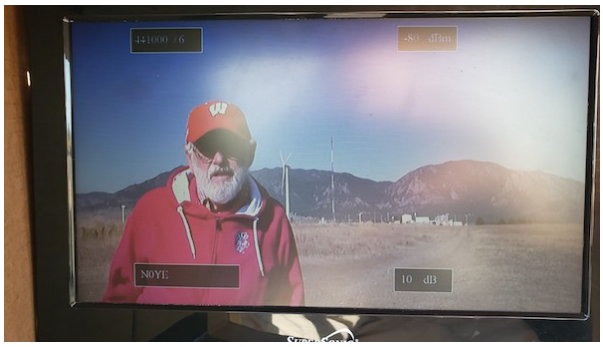
AB0MY's 10GHz rig at Rabbit Mtn.

WB2DVS/DVT -> AB0MY, 18.7 miles



AB0MY -> WB2DVS/DVT, 18.7 miles

K0JOY -> WB2DVS/DVT, 9 miles

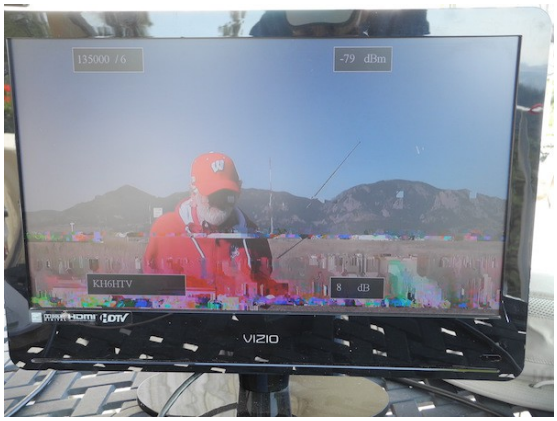


N0YE -> WB2DVS/DVT, 5.6 miles

WB2DVS/DVT -> NOYE, 5.6 miles

K0JOY -> N0YE, 14.3 miles

AB0MY -> N0YE, 23 miles



N0YE -> K0JOY, 14.3 miles


Ed, K0JOY, 10 GHz station on Mt. Joy

OK, so we are now out to 23 miles (37) km). We have a long ways to go yet. The world record is 287 miles (463 km) for 10 GHz using DVB-S. It was set in 2012 by JA0RUZ & JA0DAE in Japan. For a list of various DATV distance records for bands from 50 MHz to 76 GHz see W6HHC, Ken's list on the Orange County ham club's web site: http://www.w6ze.org/DATV/Known-DATV-DX-Records.pdf

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