Amateur Television Journal

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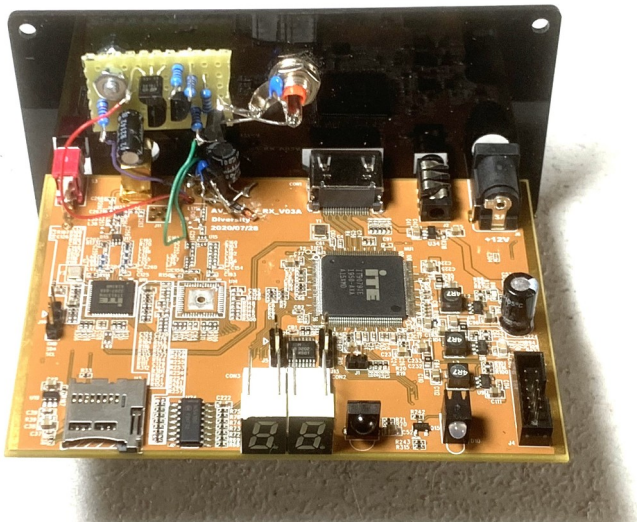
BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

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

New, Improved Valid Signal Detector Circuit for Hi-Des Receivers

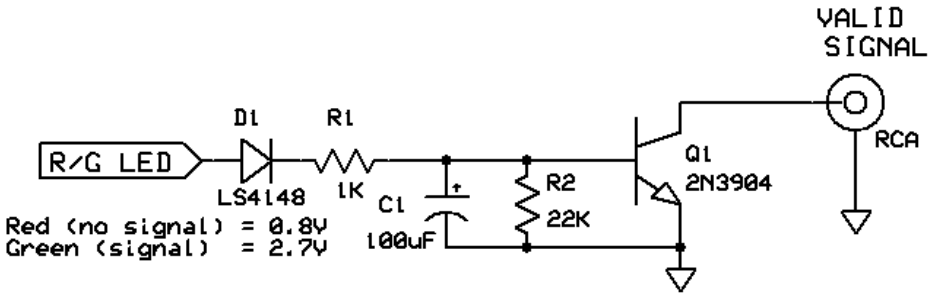
Jim, KH6HTV



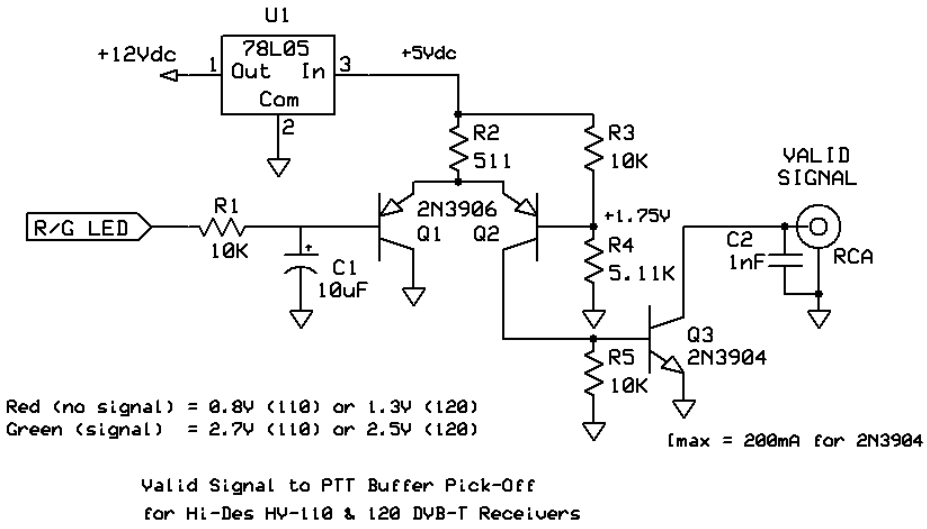
A key element in building a DATV repeater is having a detector circuit in the receiver to tell the repeater when an incoming rf signal is a valid TV signal. In a very simple, "KISS", DATV repeater this Valid Signal is used to directly drive the PTT line on the DATV transmitter.

Some DVB-T receivers include a front panel red/green LED "Valid Signal" indicator lamp. It glows red with no signal present and turns green when a valid TV incoming signal is detected. This is exactly what the repeater designer needs. It can then be a relatively simple matter to pick off from the LED circuit and create a logic level Valid Signal for use as PTT. Ten years ago, I published in my

application note, AN-23, "DVB-T Television Repeater", a very simple one transistor circuit to accomplish this for the Hi-Des model HV-110 receiver. It is shown here.



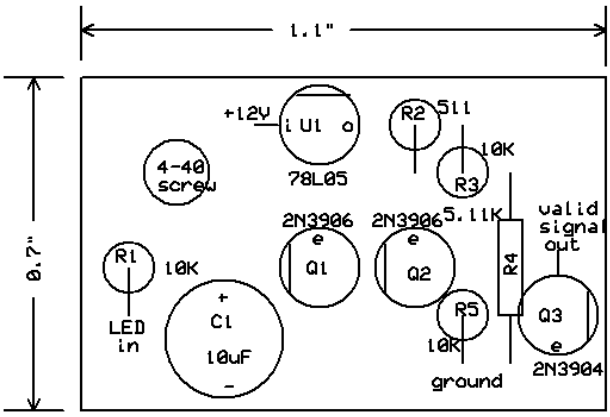
In most situations, this circuit worked fine. However, the open collector transistor, Q1, was only capable of driving relatively high impedance loads. I have encountered recently some situations where this circuit would cause on/off chattering of the PTT line and resultant transmitter rf output. So, I have come up with another slightly more complex circuit which is capable of driving lower impedance loads, up to 200 mA.



This circuit uses a differential amplifier pair, Q1 & Q2, as a comparator circuit. The 5mA output from Q2 gives a strong base current drive to the open collector transistor, Q3. The circuit provides a high impedance loading on the Hi-Des Red/Green LED circuit. R1 & C1 provide a low pass filter to minimize chattering on weak signals when the Red/Green LED is flickering. Users can alter the values of R1 and C1 to suit their particular needs.

I have built this circuit on a small 0.7" x 1.1" perf board using ordinary leaded components. This shows the component layout I used. I then mounted the perf board using a single 4-40 screw to the back panel of the Hi-Des receiver. It can be seen in the photo shown on the first page. App. Note, AN-23 shows where to find the LED voltage pick-off point on the Hi-Des HV-110 board.

73 de Jim, KH6HTV
trustee for W0BTV



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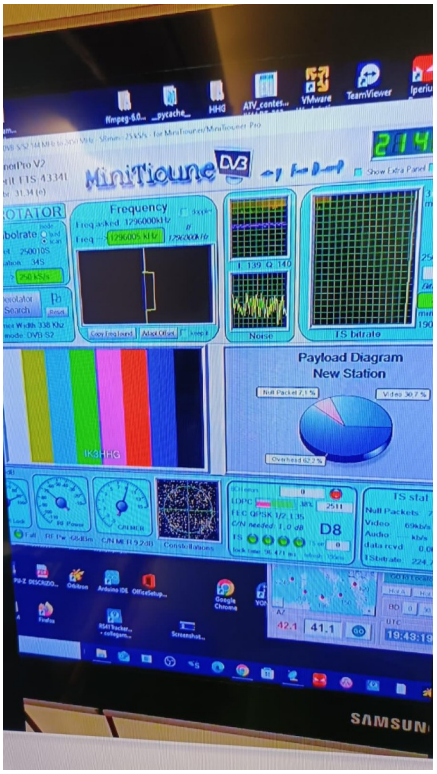
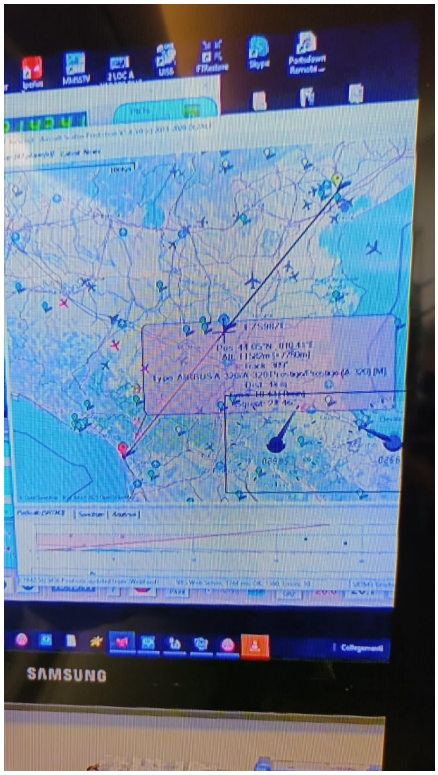
280 km, DVB-S2 via Aircraft Scattering





Filippo, IZ5TEP, has just shared with us the results of a recent 23cm, DVB-S2 contact via scattering from a Boeing 737 airplane. He sent us a short 50 second, MP4 video file (11 MB) recording the contact.

Filippo writes: --- What a fascinating experiment! What I'm describing is a spectacular example of advanced amateur radio communication, exploiting aeronautical scatter to transmit DVB-S2 DATV signals over long distances, bypassing natural obstacles such as the Apuan Alps.

✨ 📡 Connection Setup

Transmitters involved:

• IK3HHG from Treviso
• IZ5TEP from Viareggio

TX Equipment (IK3HHG):

• 2-meter dish with 50W transmission power
• Portdown with 144 MHz IF output
• DB6NT transverter for conversion to the 1296 MHz band

RX Equipment:

• 2-meter dish
• 25 dB LNA for receiving signal amplification
• MiniTiouner with software developed by F6DZP, known for amateur DVB-S/S2 reception

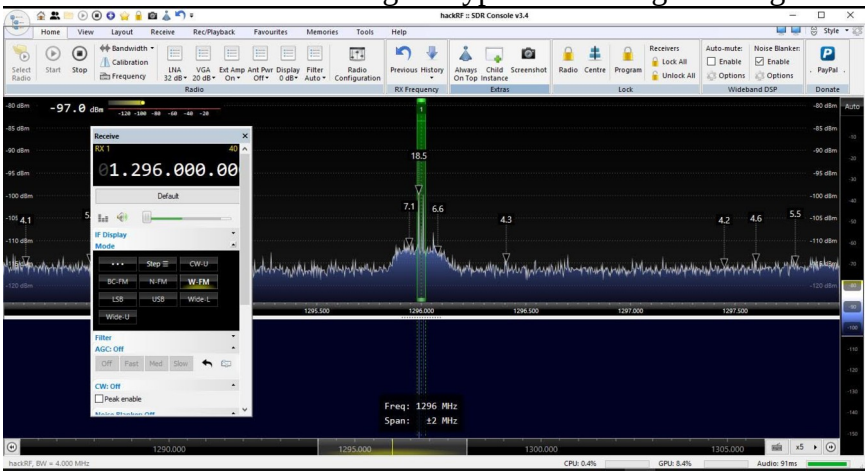
🛬 The Role of Bounce on Aircraft

The radio signal is reflected by the fuselage of an airplane in flight, allowing it to overcome geographical obstacles and reach distances otherwise impossible in a direct line of sight. This technique is not guaranteed, but when it works... it's pure radio magic!

📺 Video Insights

For those who want to see similar examples or better understand the technology used, here are some attached videos.

HD TEST PATTERN WITH AUDIO TEST shows a 16:9 HD test pattern with audio test, similar to the one used in the link. It is useful for understanding the type of video signal being transmitted.



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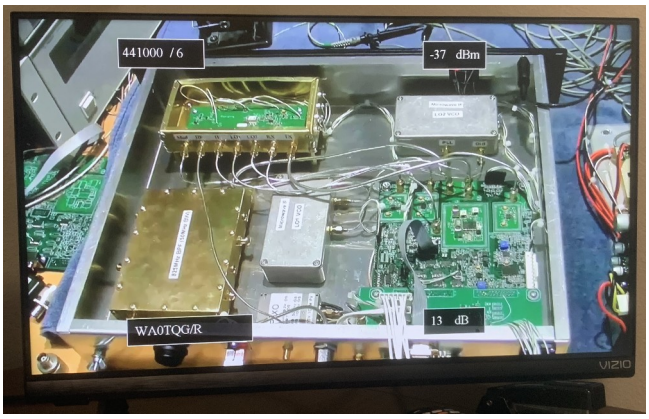

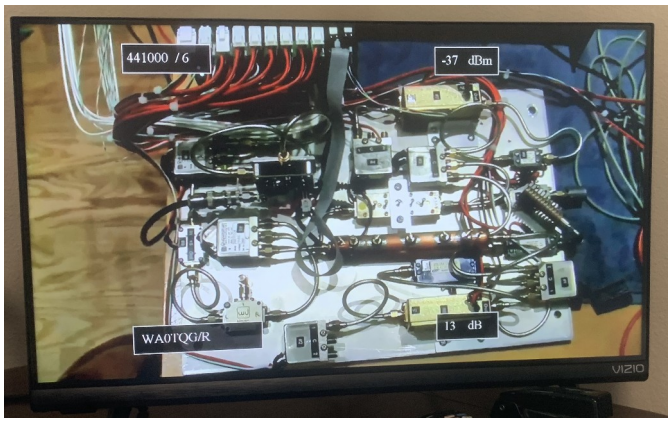

WA0TQG makes Microwave Progress: On the Boulder weekly ATV net, on Thursday Sept. 11th, Steve, WA0TQG, showed off his latest microwave design and construction project. He is in the process of adding the 5cm and 3cm bands to his DVB-T ATV station. He is planning on mounting the bulk of the rf hardware on the top of his antenna tower directly connecting to his 5 and 10 GHz dish antennas. The two photos shown here were taken off the air from the W0BTV ATV repeater when Steve was showing off his latest creations to the Boulder ATV gang. The photo on the right is the bulk of the microwave hardware. The final RF power amplifiers will be mounted on a separate heat sink, yet to be built. Steve was particularly proud of the ultra-low phase noise synthesized local oscillator he has built for the project. He said it was quieter than even his very expensive Hewlett-Packard low noise oscillator. The photo on the left is the controller box which will sit in the ham shack. Keep tuned for more exciting news to come soon from Steve.

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WORLD WIDE DATV QSO PARTY

Thanks to Mick, VK3CH, and his North East Victoria Amateur Radio Club, NEVARC News, newsletter (Sept-Oct, 2025 issue) for sharing this report.

The 13th Annual Worldwide Digital Amateur Radio Television QSO Party was held on the last weekend of August. This time instead of both a Friday night and Saturday event just Saturday was held this year.
Primary amongst these were amateur stations transmitting and using a variety of DVB technologies.
In Australia the key elements were VK3RTV in Melbourne and VK5RDC in Port Pirie.
The international link was between anchor stations WR8RMC, AB0MY, KC6JPG and G4FKK. ++
The morning session started around 0000 UTC was with the USA and the evening session starting around 1900 UTC.

It included stations all around the northern hemisphere via the ATV Satellite Q0100. This amateur satellite is unique as it is the only one that can manage HD ATV. Q0100 is the only amateur satellite in

the world that supports multiple channels of high quality video. The coverage almost makes the west coast of Australia and as such brings in stations from many countries.

The link between VK3RTV and the USA and the UK was by SRT (Secure Reliable Transport). SRT is an amazing relatively new internet protocol that delivers high quality pictures using very modest bandwidth.

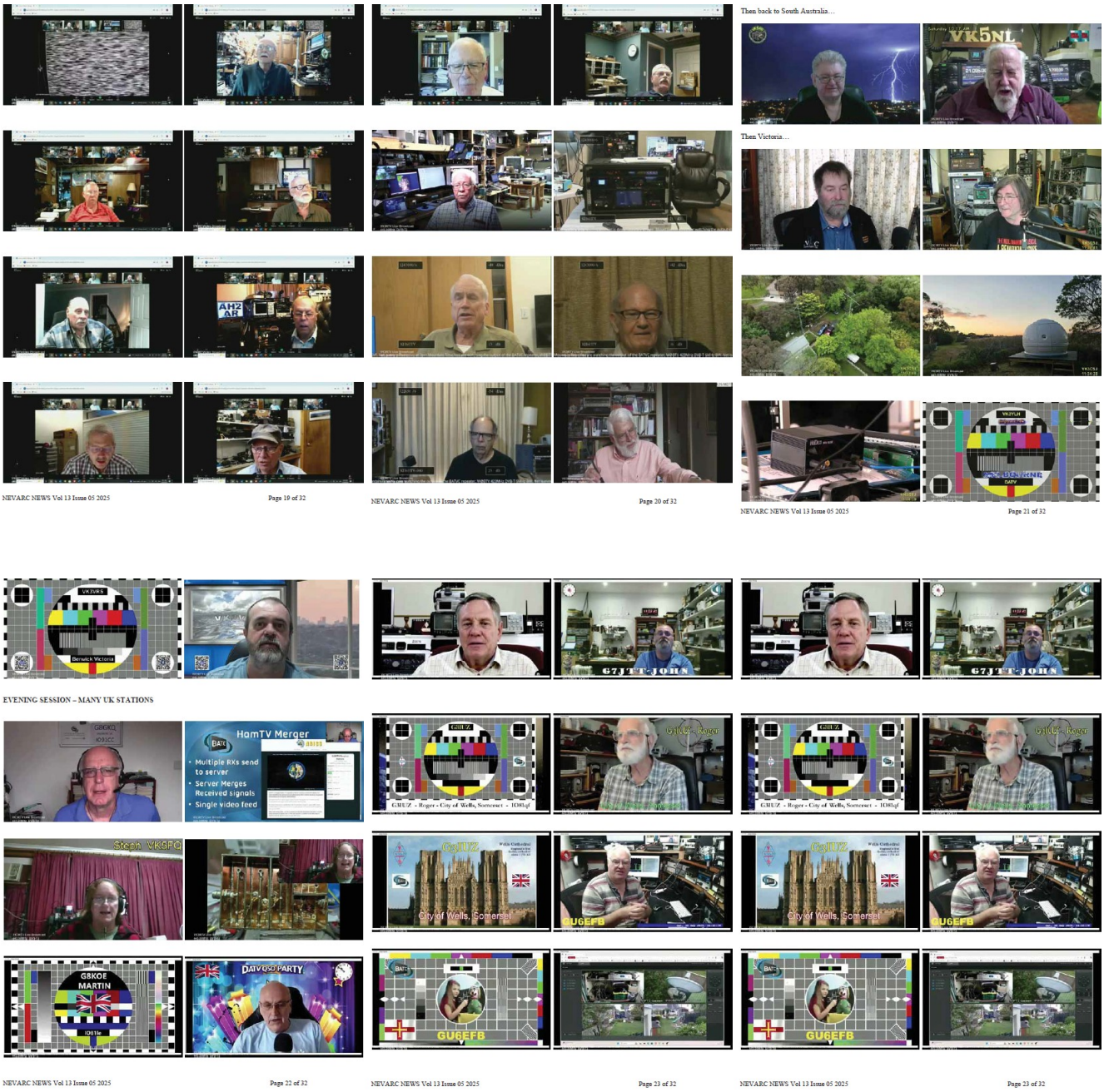
Anyone in Melbourne, Port Pirie or Whyalla could watch via VK3RTV or VK5RDC. The other options were VK3VRS YouTube Channel or the BATC Streamer. The event was very much worth a watch as it is the only International DATV QSO Party.

Not as many stations this year but those that were on had lots to say with news of projects and what they have been doing since last year. Some were very busy and had almost new looking shacks with new, alerted or improved layouts. For VK and the links to overseas Peter VK3BFG and Richard VK3VRS ran the entire show between them, a masterpiece of cooperation and liaison. As usual, but not too often, audio seems to be the one link that challenges live productions. Peter and Richard just roll with the flow and don't get that rattled about it.

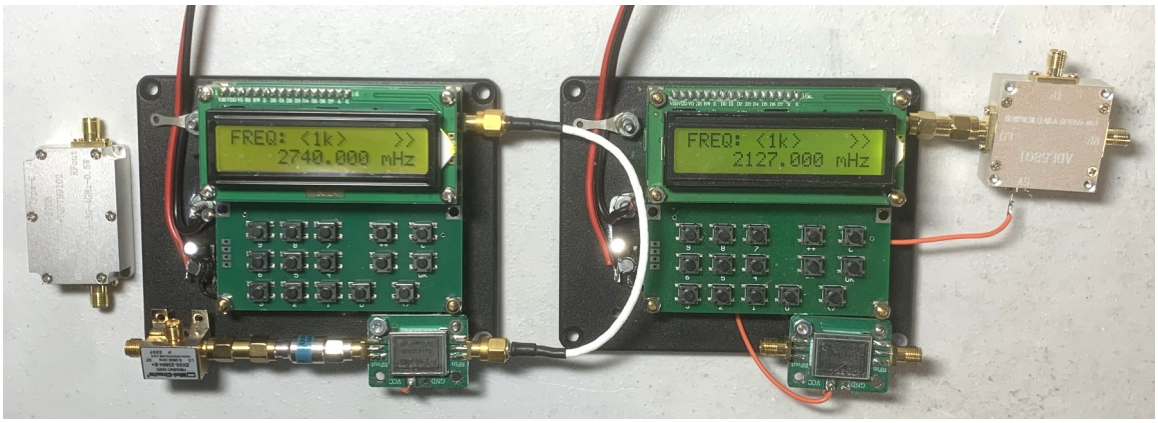
The morning session started to time at 10.00am local and continued to about 1.00pm after several round robin tours of all linked stations with many getting three sessions in for the morning, ample time for quite long over's for some. For me having pre-recorded video kept allocated time spot on, but this year was less rushed, due to less stations to have their turn. Pre-recorded video also means that all the items you wanted to talk about or explain since the last DATV QSO Party are all covered.

73 de Mick, VK3CH

Peter, VK3BFG, is the organizer of the DATV QSO parties



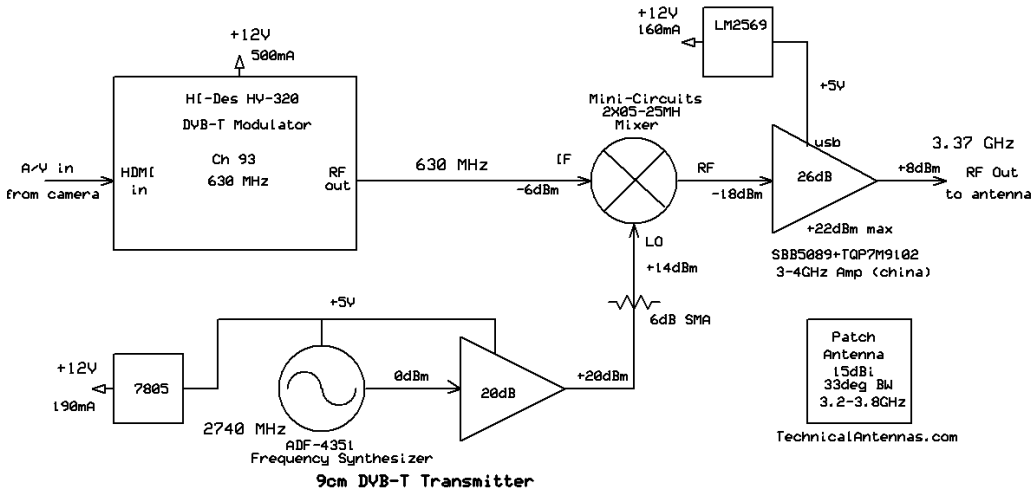
Editor's Note: Most Boulder, Colorado ATV hams were not able to participate in the QSO party this year. Our W0BTV ATV repeater had failed and was undergoing repairs at the time of the party. Our coordinator, Bill, ABOMY, did participate and played some short, pre-recorded video clips of some of our members as the Boulder contribution to the QSO party. Since then, the repeater has been repaired and returned to the repeater site. It is now once again performing normally.



DATV Transmitter & Receiver for 9cm Band

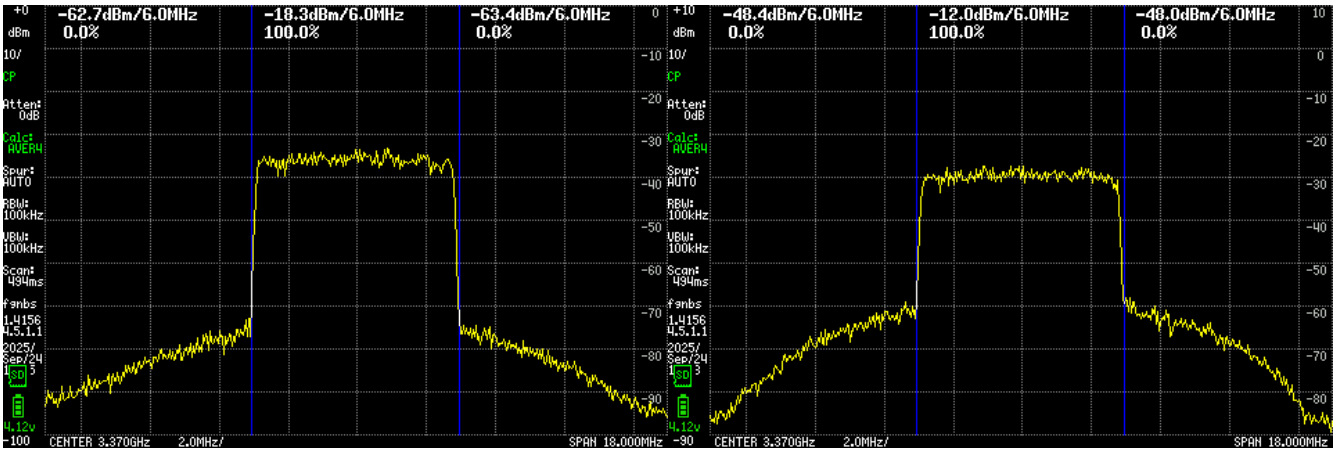
Jim, KH6HTV

I am slowly working on once again claiming "Worked All Bands on DVB-T". My previous claim in old log books was destroyed along with our home in the 2021 Marshall firestorm. I have already, in the last couple of years, logged two way contacts on the other microwave bands of 23cm, 13cm, 5cm and 3cm. The 9cm, 3 GHz band still remains. I am hoping to soon convince at least one other member of our Boulder ATV club to join me, at least once, on 9cm. In the meantime, I have assembled a bare bones, micro QRP, rig to make this last contact. See above photo and below schematics. For the DVB-T exciter/modulator, I use the Hi-Des model HV-320. For the receiver, I use the Hi-Des model HV-120. The HV-120 is no longer available, so most any other DVB-T receiver, such as the HV-110 can be used instead.



9cm DVB-T Transmitter Block Diagram

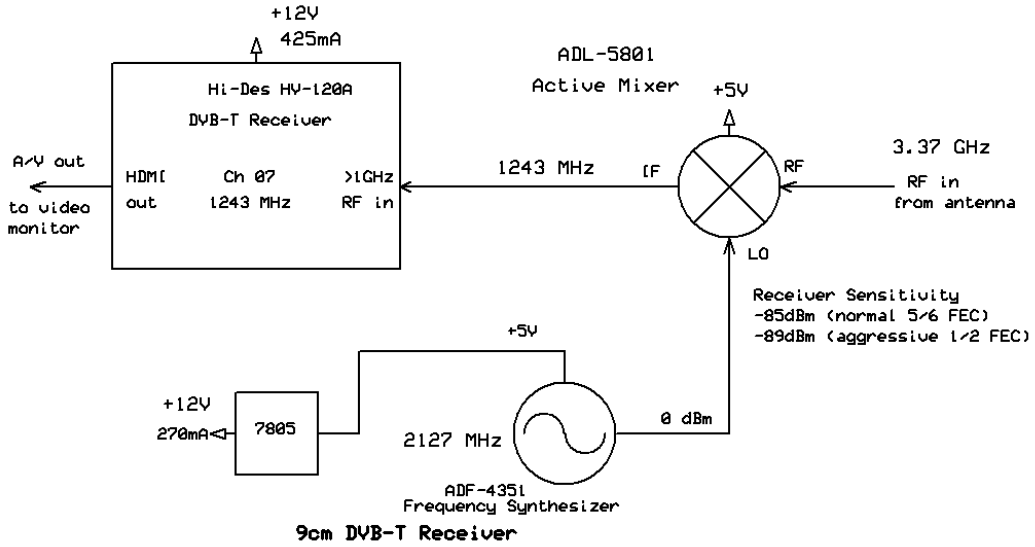
TRANSMITTER: This is the block diagram for my 9cm transmitter. It is shown on the left side of the above photo. I used a Chinese 4.4GHz Frequency Synthesizer based upon the ADF-4351 chip. The mixer is from Mini-Circuits. It requires +13dBm of LO drive. The ADF-4351 rf output power is too low, so I boosted it with a 20dB, +20dBm wide band amplifier. There are not many components advertised for the 3.4 GHz band. But after considerable google searching I did manage to find a suitable RF amplifier. It is the module on the far left side of the above photo. It does not put out much power, but at least it does give some boost to the output from the mixer. I found it on E-Bay and paid $30 for it. It is labeled as "SBB5089+TQP7M9102". They claim 0.5 W, but don't believe it. I got a max. Psat of +22dBm out of mine. It is powered by +5Vdc at about 300mA. I adjusted the drive level to this amp until the break point on the shoulders reached -30dB. I measured the output using the Channel Power measurement feature on my TinySA-Ultra spectrum analyzer. Here are plots showing the measured input and output spectrums for the amp.



3.37GHz input to amplifier 3.37GHz output from amplifier (used 20dB pad)

Because I did not use any band-pass filter on the output of the mixer, there are both the sum and difference frequencies present and being amplified. "They are at 3.37 and 2.11GHz. Thus the power capability of the amplifier gets shared with both frequencies. At 3.37, the power was +8dBm while at 2.11 it was +10dBm.

RECEIVER: This below is the block diagram for my receiver. It is the modules shown on the right side of the above photo. I again used an ADF-4351 frequency synthesizer. For the mixer, I used an ADL-5801. This is a very versatile device. It only requires a very weak LO drive power as it includes it's own internal LO buffer amplifier. Typical drive power is about 0dBm. It is also extremely broadband specified from 10 MHz to 6 GHz. While it is designed for differential in/out, the pre-packaged module I bought from China came with single ended SMA connections. Thus, it doesn't meet all specs. for conversion gain/loss. I set mine up for an IF output on 23cm to my HV-120 receiver. Most DVB-T receivers only go up to the 900 MHz band, so if using a different IF receiver, you would need to chose a different LO and IF frequencies. I measured the digital threshold sensitivity of this receiver to be -85dBm with 5/6 FEC and -89dBm with 1/2 FEC.



9cm DVB-T Receiver Block Diagram

ANTENNA: It also took some google searching to find any antennas for the 3.4 GHz band. I finally found a nice patch antenna at www.TechnicalAntennas.com It cost about $60. It's specs. are: 15dBi gain, bandwidth 3.4 to 3.6 GHz (vswr < 1.9:1), 30 deg beam width, >23dB F/B, N connector. It can be mounted easily for either vertical or horizontal polarization. Dimensions are 5 1/2" x 5 1/2".

I mounted my antenna on a camera tripod using a very simple metal bracket. The details of the bracket are covered in my app. note, AN-15.

9cm ATV Frequencies: Recently the FCC removed the upper portion of the 9cm ham band. As a result the ARRL has created a new Band Plan for 9cms. https://www.arrl.org/band-plan The new plan recommends that ATV be in the 20 MHz segment from 3.36 to 3.38 GHz. This is space enough for three, 6 MHz TV channels. Thus, I chose to put our Boulder ATV experiments in the center of this segment with a center frequency of 3.37 GHz and use 6 MHz band-width.

PREDICTED RESULTS: So with a pair of these 3.4 GHz transmitters/receivers and patch antennas as described above, what would be the ultimate distance (*assuming perfect free space loss*), one could expect to achieve. The relevant equations to do this prediction are:

Free Space RF Path Loss(dB) = 20 * log10 (f in MHz) + 20 *log10(D in Miles) + 36.6dB

Rcvr Pwr(dBm) = Trans Pwr (dBm) - Trans Cable Loss (dB) + Trans Ant Gain (dBi)
-RF Path Loss (dB) + Rcvr Ant Gain (dBi) - Rcvr Cable Loss (dB)

RF Path Loss (dB) = Trans Pwr (dBm) - Trans Cable Loss (dB) + Trans Ant Gain (dBi)
+ Rcvr Ant Gain (dBi) - Rcvr Cable Loss (dB) - Rcvr Pwr(dBm)

RF Path Loss (dB) = +8dBm - 0dB (*mounted at antenna*) + 15dBi
+ 15dBi -1dB (*5ft LMR-240 coax*) - (-89dBm)

RF Path Loss (dB) = 126 dB, thus **D = 8.76 miles max.**

I also used the **Radio Mobile** rf propagation prediction program to run these numbers between a couple of our favorite Boulder microwave sites. They were Flagstaff mountain and Legionaire's Hill. We have perfect line of sight rf path between the two sites. The distance is 8.9km (5.5 miles). Radio Mobile predicted the actual received signal strength would be -96dBm. i.e. No reception of our DVB-T signal over that distance, even using aggressive 1/2 FEC.

For more discussion on ATV propagation and the use of the free computer program, **Radio Mobile**, see my app. note, AN-33a (available at www.kh6htv.com)

Well, I hope in a future ATV newsletter to be able to report I have finally made a DVB-T contact on the 9cm band and can claim Worked All Bands.

73 de Jim Andrews, KH6HTV, Boulder, Colorado

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W0BTV Details:

Inputs: 23 cm Primary (CCARC co-ordinated) + 70 cm & 3 cm secondary all digital using European Broadcast TV standard, DVB-T with standard 6 MHz wide TV channels. Frequencies listed are the center frequency of the TV channel.
23 cm = 1243 MHz (primary), 70 cm = 441 MHz & 3 cm = 10.380 GHz
Outputs: 70 cm Primary (CCARC co-ordinated), Channel 57 -- 423 MHz with 6 MHz BW, DVB-T
Also, secondary analog, NTSC, FM-TV output on 5.905 GHz (24/7 microwave beacon).
Operational details in AN-51d Technical details in AN-53d. 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. 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 newsletter was started in 2018 and originally published under the title "*Boulder Amateur Television Club - TV Repeater's REPEATER*" Starting with issue #166, July, 2024, we have changed the title to "*Amateur Television Journal.*" This reflects the fact that it has grown from being simply a local club's newsletter to become the "de-facto" ATV newsletter for

the USA and overseas hams. This is a free ATV newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 800+, both in the USA and overseas. 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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