

# Boulder Amateur Television Club TV Repeater's REPEATER

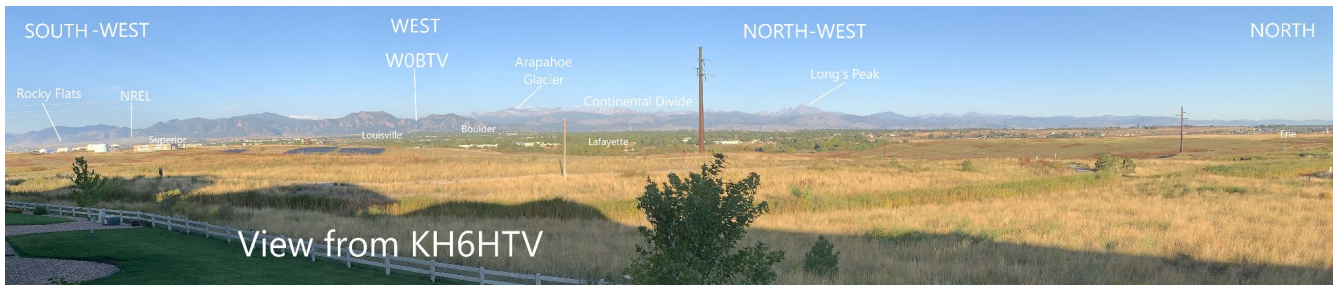
October, 2023  
2ed edition, issue #144

BATVC web site: [www.kh6htv.com](http://www.kh6htv.com)

ATN web site: [www.atn-tv.com](http://www.atn-tv.com)



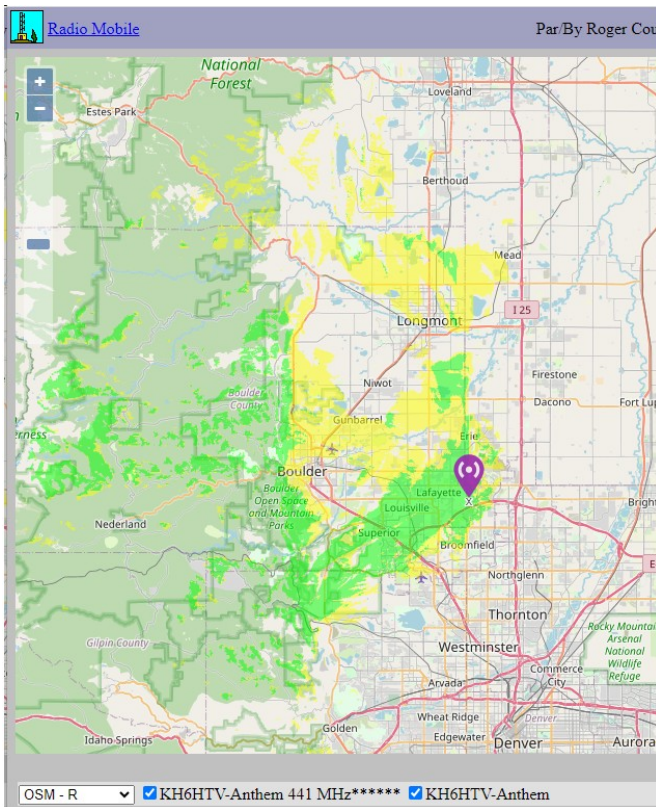
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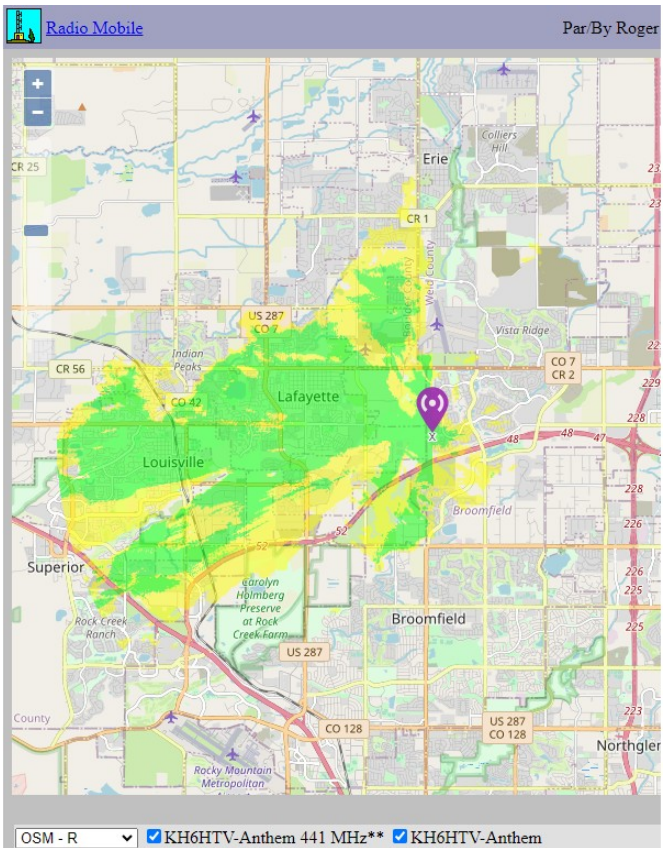
## A Remote 70cm Receive Site for W0BTV- DATV Repeater



The KH6HTV DATV Video Studio, 70cm Receivers & 23cm Transmitter



70cm Receive Coverage areas in Boulder County (assumed 10 W transmitter & 11dBi yagi antenna on 20ft mast) (yellow shaded areas are weak signal, green are strong)



70cm Receive Coverage areas in shadowed cities of Louisville & Lafayette

Our previous issue #143 of this newsletter discussed the need for some remote receive sites to enhance the coverage area of our W0BTV, DATV repeater for ARES operations.

The first such site is now operational. Jim, KH6HTV's QTH east of the city of Lafayette has a commanding view of the south-east part of Boulder County, plus the Rocky mountains up to the Continental Divide in the western part of the county. He also has a line-of-sight rf path to the W0BTV repeater in the city of Boulder.

The cities of Superior, Louisville and Lafayette are all located in the Coal Creek valley. Davidson Mesa is the dividing geographic feature separating Coal Creek and Boulder Creek valleys. The W0BTV repeater has excellent coverage of Boulder Creek valley, but is shielded by Davidson Mesa from Coal Creek. Jim's home is on one of the highest hills just over the east county line and overlooks a large Boulder County open space in the Coal Creek valley. Jim's lives in a CC&R restricted, 55+ retirement community. Thus, no antennas on tall towers, nor mounted on the top of roofs. His ATV antennas are instead simply mounted on an antenna tripod and set up on his covered back deck. Fortunately, not easily visible by the neighbors. The photos above show the antennas however have a commanding view of a lot of Boulder County. The top 70cm yagi antenna is an M-Squared model



70cm & 23cm Yagi Antennas

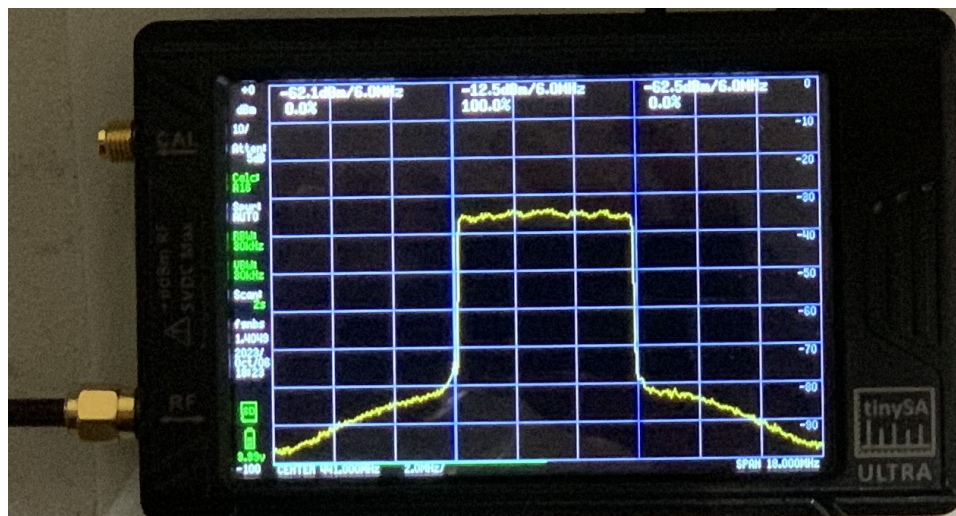
440-6SS with +11dBi gain. The bottom 23cm loop yagi antenna is a Directive Systems & Engineering model DSE2414LYRM with +15dBi gain.

The free, on-line, computer program called "Radio Mobile" was used to compute predicted RF coverage maps for receiving 70cm, DVB-T signals from remote ARES TV transmitters. The map above on the left was calculated based upon the assumption that the remote 70cm transmitter was running 10 Watts to a 6 element, 11dBi gain, yagi antenna on a 20ft. mast. This map shows the entire county, including the mountains in the western half. The map on the right shows the close-in coverage area in the Coal Creek valley of the cities of Lafayette and Louisville. This map was calculated for a mobile operation. The assumption was again a 10 W transmitter to a +6dBi mobile whip antenna on an automobile at a height of 2 m.

At the receive site, is a receiver tuned to 441 MHz. It's HDMI output is connected to the input of a 23cm transmitter on 1243 MHz. A DVB-T signal coming in on 441 will automatically key up the 23cm transmitter and relay the video on to the Boulder W0BTV repeater. Recently Jim, KH6HTV, and Don, N0YE, have run a set of mobile TV coverage experiments. Jim drove around Louisville and Lafayette with a mobile DVB-T transmitter running continuously while Don monitored the W0BTV repeater. They were able to verify the coverage map shown above.

The photo on page 1 shows the KH6HTV ham shack ATV equipment. The 70cm receiver consists of a 70-LNA pre-amp with a 3dB power splitter feeding two DVB-T receivers. The GT-Media receiver is tuned to the W0BTV repeater on 423MHz. The other is a PanteSat tuned to 441MHz. The PanteSat was modified to add a "Valid Signal" logic output to drive a PTT line on the 23cm transmitter. The 23cm, 3 Watt transmitter is a Hi-Des HV-320 modulator driving a 23-11A rf power amplifier for 3 Watts of rf power. The other equipment seen in the photo is the 13.8Vdc power supply, and video production DVD player, Quad Viewer, monitors, etc.

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**Measure DVB-T RF Power with Tiny-SA Ultra**

On a recent Boulder ATV Net, Pete, WB2DVS, was discussing his new Tiny-SA Ultra spectrum analyzer. He was very impressed with all that he was able to do with it. He surprised us all when he said that he had discovered that he could also use it to measure the average power in a digital TV signal. We all immediately asked "How can you do that ? !" Pete's answer was it is buried way down in the menu structure. OK, so here is how to do it.

### **Tiny SA - Ultra Setup for DVB-T Power Measurement:**

Step 1 Go back and re-read our ATV newsletter, July issue #135. There we discuss the approved ITU spectrum analyzer settings for properly measuring DVB-T signals. Key SA settings included: 20 MHz span, 30kHz resolution band-width, 2 second sweep time, plus using signal averaging.

Step 2 Initial Settings: Set the TinySA to 20 MHz span and set the center frequency to your DTV signal's center frequency. Make sure the signal level is not too strong to either overload the mixer - or burn it out ! Connect the DVB-T signal to be measured to the Tiny SA. You should see a display similar to the above photo.

Step 3 On the main menu, select "Measure"

Step 4 On the Measure sub-menu, select "More" to move down to an even lower level menu.

Step 5 On the Measure-More sub-menu, select "Channel Power"

Step 6 The SA then presents a data entry screen and asks for the "Channel Center Frequency" of the signal to be measured. Enter your center frequency.

Step 7 The SA then presents a second data entry screen and asks for the "Channel Width". If you are using USA standard TV channel signals, enter "6M" ( i.e. 6 MHz).

Step 8 At this point, the SA will now display the results of it's channel power measurement. Note in the above photo that it actually shows the measurement in three regions. The center region is the desired signal. The left and right regions are the measurements for the out of channel powers.

*Note: I found that at this point in the set-up, the power measurement was not accurate. I had previously measured my test signal with my HP 432 power meter, so I knew the answer was incorrect. The Tiny SA had automatically selected an RBW (resolution band-width) of 100 kHz.*

Step 9 Now, go back to the menus on the TinySA and set the RBW to 30 kHz (the ITU spec), the VBW to 1:1 ratio, the scan to 2 seconds, and turn on the signal averager. You should note the channel power measurement value change as a result. The photo above was taken at this point.

**Accuracy ?** -- So how accurate is the Tiny SA - Ultra ? For my experiment, I used a Hi-Des, model HV-320 modulator. I set it up on 441 MHz with 6 MHz BW, and QPSK modulation with the internal attenuator set to 0dB. I used an external 20dB attenuator to set a safe input level to the Tiny SA. I used my HP-432 rms power meter with a thermistor power sensor head and found my test signal to be -13.0dBm. See the above photo - the Tiny SA measured -12.5dBm ! Whow ! that was darn close. Only a 1/2 dB difference in the two measurements. Certainly close enough for ham TV work.

73 de Jim, KH6HTV, Boulder, Colorado

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Jerry, N0OUW -- Pete, WB2DVS -- & E.C., Allen, K0ARK -- operate net control for SET

## BCARES - in National ARRL - SET

The Boulder, Colorado ARES group (BCARES) participated in the national Simulated Emergency Test (SET) held on the first Saturday of October. The BCARES station in the Boulder Emergency Operations Center was activated. Other BCARES members worked from their home stations acting as virtual emergency evac. centers, hospitals, etc. Communications links were established around the county, plus to the state EOC in Denver. 2 meter FM, D-Star, and Win-Link were all used.



**ATV:** This year, E.C. Allen, wanted to also incorporate ATV into the SET. BCARES had recently installed a bank of four new, DVB-T receivers and Allen wanted to give them a good test. The receivers are set to channels 57, 58, 59 & 60. The HDMI outputs from the four receivers are input to a Quad Viewer. Its output is then connected into the building's video distribution network where it can be displayed on very large screen monitors in the EOC's operations center. Three ATV channels were activated plus the W0BTV repeater (Ch 57). The EOC video was also streamed over the inter-net via the BATC server in the U.K. BATC viewer reports showed about a dozen viewers. Allen had earlier alerted other ARES groups in Colorado what we would be doing with ATV.

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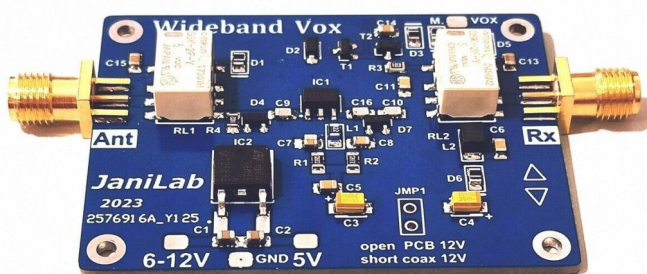
## BATVC at BARC Swap-Fest

The Boulder Amateur Radio Club (BARC) holds an annual swap-fest on the first weekend in October. Our own ATV YL, Debbie, WB2DVT, has been the chair-lady of it for the past couple of years. Once again, she did a great job. There were about 75 display tables and close to 400 attendees.

BATVC had a table again this year to demo amateur TV (ATV). It was quite busy for most of the morning demoing and explaining ATV to other hams. A supply of pre-programmed GT-Media, DVB-T receivers were available for sale. Three receivers were sold to interested hams and more could have been sold, but we sold out. Definitely need to take more to swap-fest next year.

## AH2AR Finds a New, Low Cost, Pre-Amp

An interesting and very inexpensive (\$50 = \$40+ \$10 shipping), T/R relay-equipped preamp suitable for 70cm ATV use has become available on E-Bay.



It allows for in-line insertion in front of a transceiver. The documentation states that it can pass up to 100 watts RF. The preamp is manufactured by JaniLab located in Hungary. 70cm gain of the preamp was measured at 19.7 dB with a measured noise figure of .75 dB (Thanks N8ZM). When used in the hamshack, it improves both the MER and the Signal Strength of the received DVB-T ATV repeater signal on 421.250 MHz. It also raises the received signal level of a weak, 70cm A5 signal well over 1 P Unit.

The pre-amp uses a PGA-103A MiniCircuits monolithic amplifier. It is equipped with diode limiters on the input and output. Insertion loss, when the preamp is unpowered measured at 0.5 dB. This is relatively remarkable as it uses two relays which are not expected to be optimum for RF at 70cm. It will also allow for either a 13.8 vdc or 5 vdc power source.

Several things to keep in mind: There are a number of tradeoffs with this preamp, (no filter circuit and the relays are not designed for RF... but surprisingly works for this application) but the "proof is in the pudding" as insertion of the preamp, either in front of a TC-70 Series transceiver or a DVB-T, ATV transceiver shows a marked improvement of the incoming ATV signal. Additionally, finding a very cheap preamp with a T/R relay configuration that exhibits low insertion loss is somewhat unheard of... and it does not come out of China....until now.

Cheers, Dave AH2AR, DARA, Dayton, Ohio

**Editor's Notes:** Contact Dave for info on several other 70cm pre-amps they have tested. The Mini-Circuits PGA-103+ is billed as a replacement for the RFMD SPF-5189Z. JaniLab Electronics has an interesting web site (<https://www.janilab.hu/>) with quite a few other products of interest to hams.

## Use a Tiny-SA Spectrum Analyzer for Antenna Siteing

QST last spring had a product review of the **TinySA - Ultra**, hand-held, spectrum analyzer. Whow ! What a powerful little tool for hams. The price at R&L Electronics has gone up a small amount, but at \$140 it is still a Great Buy ! We have found still another use for this handy instrument. Finding the proper site to maximize our antenna performance with our ATV repeater.

Recently on our ATV net, Larry, N8GGG, had been complaining he could no longer receive the W0BTV signals. As a result, he was seriously considering throwing in the towel and quitting ATV. The repeater's signals were just tickling the S meter bar graph on his combo receiver. So Drs. Don, N0YE, & Jim, KH6HTV, made a "Doctor's House Call" to help Larry diagnose his problem. What we found was the signal Larry was receiving was at best just above digital threshold, and oftentimes when losing only 1dB of signal strength, it was gone forever. Setting up our TinySA-Ultra to the ITU standard settings and looking at the signal coming in from Larry's yagi antenna, we found that the displayed DVB-T signal was only about 3dB above background noise. Really marginal.

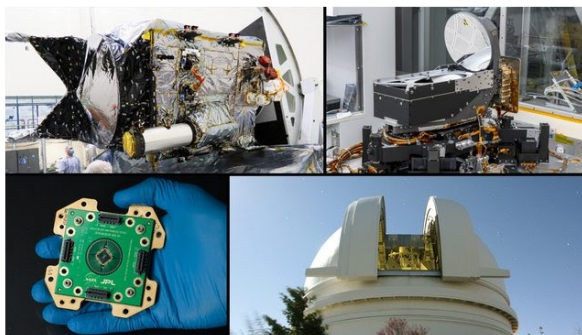
So, we went out into his back yard with a known good, portable yagi antenna on a pole. We connected the coax directly to our TinySA-Ultra. Nothing else. Then walking around Larry's yard and watching the SA's display, we were easily able to find some "hot spots". We soon found an alternate location for Larry's antenna where the SA showed a signal at least 20dB above background noise. A great signal for excellent reception. Larry was thrilled and decided then and there to stay with ATV and relocate his antenna system and make other improvements.

## What Has Mario Been Up To This Last Year ?

The head ATV guru of the San Diego, California group is Mario Badua, KD6ILO. He spent the last year in Spain working on a NASA project for JPL. He just sent us this brief note -- "One of the many things I worked on this year in Europe." Check out this interesting press release from JPL.

[https://www.jpl.nasa.gov/news/5-things-to-know-about-nasas-deep-space-optical-communications?utm\\_source=iContact&utm\\_medium=email&utm\\_campaign=nasajpl&utm\\_content=dsoc20231010](https://www.jpl.nasa.gov/news/5-things-to-know-about-nasas-deep-space-optical-communications?utm_source=iContact&utm_medium=email&utm_campaign=nasajpl&utm_content=dsoc20231010)

### 5 Things to Know About NASA's Deep Space Optical Communications





<https://www.youtube.com/watch?v=UNvYta4sANU>

**DATV - ITALIA:** Check out what the ATV Hams in Italy are doing. They have a DVB-S net on the geo-synchronous ham satellite QO-100. They post the net on YouTube.

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**NEWS from the BATC - U.K.** Firstly an urgent appeal for help! --- BATC has now run out of the Serit 4334 NIM used in the MiniTiouner and we desperately need help from the skilled hardware / software developers to engineer a new solution based around other hardware for the ATV community - if you can help please get in touch [secretary@batc.tv](mailto:secretary@batc.tv)

Finally don't forget the Thursday evening BATC net on Oscar-100 – more details on the forum. Please join us if you have transmit capability and if not you can watch all the action on the BATC streamer: <https://batc.org.uk/live/oscar100net>

**CQ-TV issue #281:** The Fall edition of the BATC's quarterly magazine, CQ-TV is now out. It includes several interesting articles. First is a full review of the new ICOM IC-905 microwave transceiver by Dave, G8GKQ. Definitely worth reading by anyone considering buying the 905. Dave covers both the good and the bad of the 905. Grant, VE3XTV, has an article entitled "A New Hybrid Television Transmission System". It documents his on-going R&D project to come up with a new, very narrow-band ( i.e. SSB bandwidth ), ATV system for use on the HF bands. The BATC also reprinted our own ATV newsletter's article from Fumio, JA0RUZ, about his recent success in Japan of transmitting DATV on 5.7GHz for 358km across the Sea of Japan. The results of the 2023, IARU region 1 ATV contest are in. There were 62 reporting stations from nine countries and they used bands ranging from 50 MHz up to 47 GHz (1000 :1 spread ! ) The best DX reported was 454 km on both 70cm & 23cm bands by M0DTS & PE1CVJ. Best distances were 237km on 3cm, 128km on 1.2cm & 29km on 0.6cm bands

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## CORRESPONDENCE:

**6 Meter News:** Jon Jones, N0JK, has shared with us a report on the **Six Meter BBQ** conference just held in September in Austin, Texas. ( <https://w6jvk5andbbq.com/> ) Some of the tech talks



included: EME on the Microwave Bands, by Al Ward, W5LUA. WSJT: a Brief History, by Joe Taylor, K1JT. World Above 50 MHz by Jon Jones, N0JK. Bouvet Island, by Mike, AB5EB. Cycle 25 & 6m Propagation by Carl, K9LA.

**Hi-Des:** Calvin Yang, at Hi-Des writes -- "The modulator IC of HV-320, DVB-T modulator was phased out. We use a new modulator instead. HV-320B is the new model name and performance is the same. The f/w version is v3.5.50.

**DATV Co-Channel Interference ?** --- Clyde, KB0AMJ, inquires --- "What happens when more than one remote repeater receives/repeats the same signal (i.e. doubles?) ? "

**Editor's Reply** -- *Way back in 2014, BCARES had the same question. So I ran a set of experiments then which I documented in my app. note AN-19 "Analog & Digital TV Co-Channel & Adjacent Channel RFI Measurements". For Clyde's specific question, I found --- "Co-Channel RFI - No picture was received whenever the signal strengths from both DVB-T transmitters were within  $\pm 6$ dB of each other. Which ever transmitter's signal strength was +8dB stronger than the other one would capture the DVB-T receiver and give a perfect P5 picture."* (app. notes are available in .pdf format at [www.kh6htv.com](http://www.kh6htv.com) )

**ATN-California News:** Mike, WA6SVT, writes -- "We will be moving Mt. Wilson's ATV repeater's output from 1265.25 MHz to 1267 MHz DVB-T. Santiago Peak at 1253.25 MHz will be the next repeater that will switch to DVB-T, perhaps next year sometime."

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**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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Check it out. New items listed every week

[WWW.SLATSATN.NET](http://WWW.SLATSATN.NET)



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