Amateur Television Journal

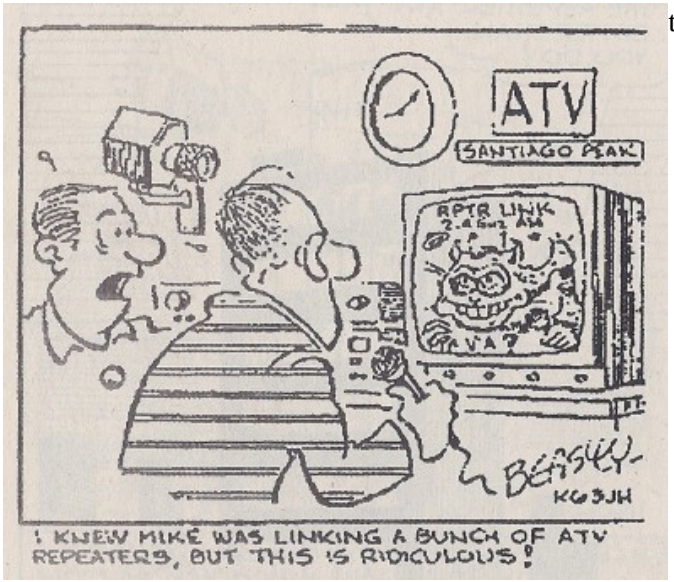
January, 2026
issue #200

BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

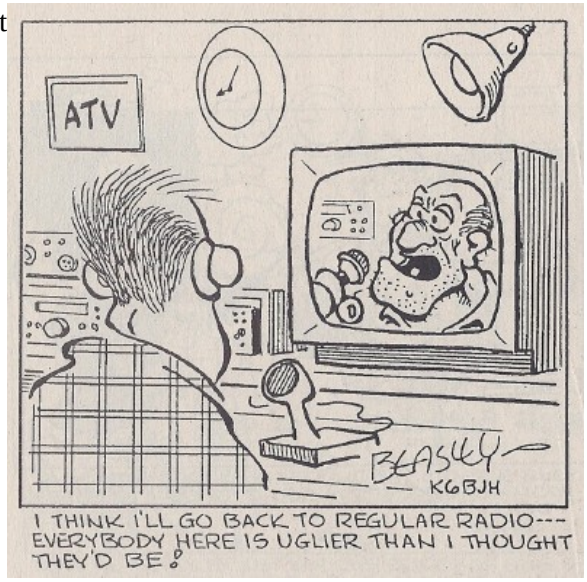
Jim Andrews, KH6HTV, editor - kh6htv@arrl.net www.kh6htv.com

Our 200th ISSUE !



remembering Mike, WA6SVT, now on Pitcairn

that



looks like KH6HTV on the monitor !

Application Note
AN-73

web = www.kh6htv.com email = kh6htv@arrl.net

Add Digital Television to Your ARES Tool Kit

Jim Andrews, KH6HTV

This is a TV success story for a local ARES group. The Boulder County, Colorado ARES group, BCARES, has experienced a lot of success working with our county's emergency services organizations, in particular, fire and law enforcement. BCARES's tool kit includes all of the ordinary ham services, including HF/VHF/UHF voice communications, repeaters and various digital modes on HF/VHF/UHF. PLUS high-definition (1080P) digital Television.

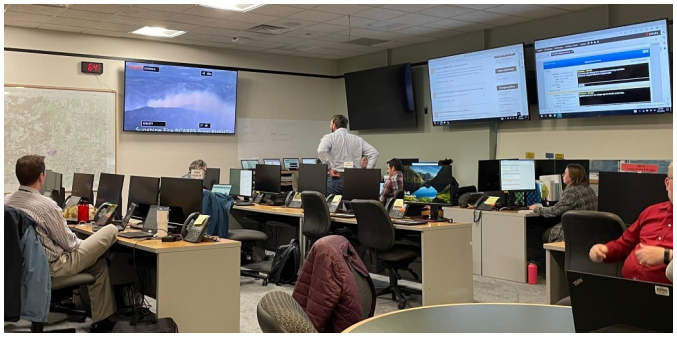


Fig. 1 (left) Officials in Boulder EOC watching BCARES TV coverage of a forest fire. (right) BCARES video of an air drop of slurry on a forest fire.

What Boulder County Public Safety lacked most and BCARES had to offer was --- TELEVISION. Ham television is the one BCARES capability that really excites our served public safety agencies. BCARES started offering analog TV services [1] about 35 years ago, when I was the chairman (E.C.) of BCARES. We added TV at the encouragement of Captain Bill McCaa, K0RZ. of the Boulder County Sherriff's Office. Bill was in charge of all of the Sheriff's communications and computer operations and the county regional 911 center. Over the past years

BCARES has received many more requests for assistance using TV than for all other communication modes.

TV offers “Public Safety” information in ways never imagined by us nor our served agencies. Television has come to be appreciated by our served public safety agencies because it provides what they refer to as “situational awareness”. It helps remove the need for many voice communication exchanges for information that is already contained in the video imagery. Television allows the incident commander at the Incident Command Post (ICP) to actually see what is happening at the scene(s) of the incident, be it a fire, flood, hazmat, riot, or SWAT operation. With this information, the incident commander is better able to make appropriate command decisions. Via our 2 meter, TV net controller, the Incident Commander is able to request BCARES cameras provide him with specific images and information. BCARES is able to routinely provide television and all of its other communication services in a completely infrastructure free manner.

Many times every year, BCARES is asked by our local law enforcement and fire departments to provide TV coverage of both real emergencies and also multi-agency training exercises. These have included situations such as large, multi-agency forest fires, flash floods, hazardous materials incidents, civil disturbances, large political demonstrations and protests, Halloween on the Pearl St. mall, University of Colorado football games and SWAT operations. Boulder County ranks as the leading flash flood threat zone in the state of Colorado and BCARES is specifically written into County emergency planning. BCARES also has an office (ham shack) in the 911 center EOC.

BCARES was organized and incorporated by Boulder County and the local ham clubs, in 1977 after the disastrous 1976 Big Thompson Canyon flash flood which claimed 144 lives. The official office of BCARES is in the Boulder City/County Disaster Management , in the county 911 center. BCARES is recognized by the county as being both the ARES and RACES organization for the county.

Fig. 2

BCARES' most shining moment occured in Sept. 2010 when one of the worst forest fires in Colorado history broke out in Boulder County. The Four Mile Canyon fire burned over 6,400 acres of forest and destroyed 166 homes. BCARES assisted firefighters providing live TV coverage from mountain tops back to the 911 center for a week. At the end BCARES was credited with saving several homes. More details are found in a paper published in the May, 2011 issue of QST [2]

Live TV - not Slow-Scan ! When most hams think of amateur TV (called ATV), they immediately assume slow-scan TV, as found on HF. This is not what BCARES does. Our TV is commercial broadcast grade, real-time, live, video with full color and stereo sound transmissions. It uses state-of-the-art, high definition (1080P) digital TV modulation. Now called for short, DATV. We transitioned from the old analog, NTSC, TV to modern digital TV ten years ago. On the 70 cm ham band, we run full 6 MHz band-width, DVB-T, TV transmissions. We also use the 23 cm band for ATV.

Multiple Channels: There are four ATV channels available on the 70 cm band (Channels 57, 58, 59 & 60). BCARES has the capability of using all four channels simultaneously. Using a quad processor, all four channels are displayed simultaneously in the Emergency Operations Center (EOC) situation room on a large screen video monitor.

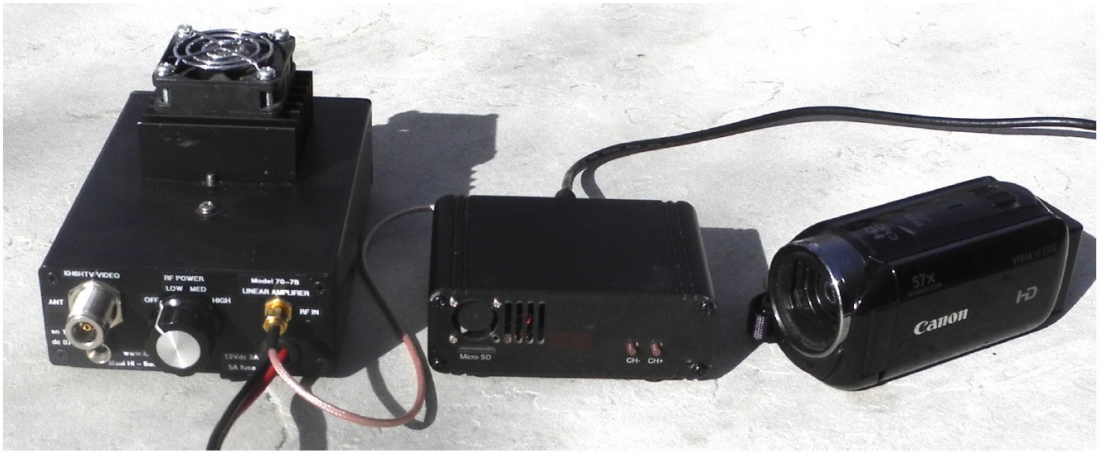


Fig. 3 Typical 70 cm Amateur digital TV transmitter with camcorder

Equipment Required & Cost Considerations:

DATV Transmitter: The cost for a typical amateur TV transmitter is comparable to that of an entry level HF transceiver. Fig. 3 shows the minimal equipment required. We use low cost camcorders as our TV cameras. The box in the middle is a digital TV modulator. It takes the HDMI A/V input from the camera and puts it into the correct DVB-T broadcast format. It also includes a frequency synthesizer covering from 170 MHz to 2.6 GHz. The box on the left is an RF linear power amplifier to boost the milliwatt level signal from the modulator up to 3 Watts. For typical BCARES field deployment, we use a 70 cm rubber duck antenna mounted directly on the camera tripod, plus an LiFePO4 battery. The battery is capable of running the transmitter in 100% duty cycle for several hours.

DATV Receiver: A DVB-T receiver is quite simple and low cost. All that is required is a consumer grade, set-top box receiver and an HDMI video monitor. The set-top receivers are available for less than $50.

DATV Antennas: We use normal 70 cm band antennas as with other ham rigs. The only key requirement is band-width. The antennas used must be capable of operating over the entire 70 cm ham band.

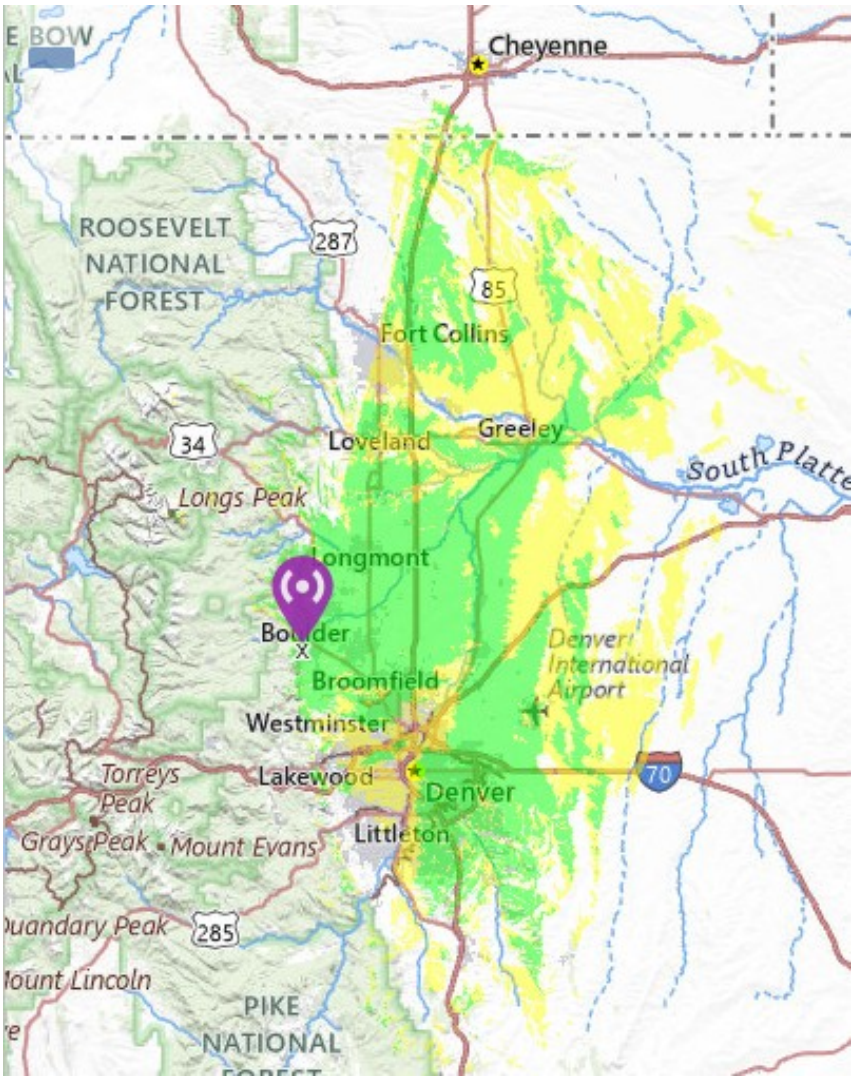


Fig. 4 Coverage map for W0BTV, Boulder, Colorado, 70 cm repeater. Yellow shaded areas are weak signal. Green shaded areas are for strong signals.

DATV Repeaters: Repeaters are also available for digital amateur TV. Their cost is comparable to building a conventional 70 cm FM voice repeater. Boulder has had a TV repeater since the late 1970s. In the early days, it was an analog, NTSC, repeater. Today, it is a digital repeater using the DVB-T format. The W0BTV-TV repeater is located on a high mesa south-west of the city of Boulder. It is 900 ft. above the city and gives coverage over the eastern prairies from Denver north almost to Cheyenne, Wyoming. It does not provide coverage into the mountains. The 70 cm output is on channel 57 (423 MHz). We use vertical polarization.

As evidence of the importance that Boulder sees in having ATV coverage for public safety, BCARES recently received a grant of $30,000 from Boulder County to enhance it's communications networks, including ATV. BCARES has recently purchased two additional DATV repeaters to enhance it's TV

coverage of the mountainous western portion of the county. They have not yet been installed in permanent sites.

Additional Reading and Resources: To find out more about ATV and DATV in particular, the first place to go is the "ATV Handbook" [3]. In addition, I am available to give talks with power-point slides and live demonstrations of DATV equipment to amateur radio clubs and ARES groups. Either as an in-person presentation or via zoom.

REFERENCES:

1. "Add Television To Your ARES Tool Kit", Jim Andrews, KH6HTV Video application note AN-9, Oct. 2011, 5 pages

2. "Boulder Hams Fight Forest Fires With Video", Jim Andrews, KH6HTV, QST, May, 2011, pp. 76-77.

3. "ATV Handbook - an Introduction to Amateur TV", Jim Andrews, KH6HTV Video application note, AN-55a, Feb. 2021, 44 pages.

4. KH6HTV Video web site, ***www.kh6htv.com*** many application notes on ATV including the above are all available in .pdf format to be down-loaded. Also a supplier of DATV equipment, including transmitters, receivers, and repeaters.

==========

100 mph Wind Storms - BCARES After Action Report:

(Wed-Fri, Dec. 17-19th, 2026)

Allen Bishop, K0ARK, BCARES E.C.

R1-D3 ARES (Boulder & Broomfield Counties) was activated by the Boulder County Office of Disaster Management and provided ARES operators in the EOC and at two remote locations. The mission of R1D3 ARES operators was to improve situational awareness in the EOC by logging reports of power outages, fallen trees, and down power lines as well as establishing **live video streams** that helped OEM personnel establish if reports of smoke were fire or dust clouds caused by the high winds. Reports were posted by ARES operators to County's instance of WebEOC, which helped to create a directory of significant events.

R1-D3 ARES provides robust **ATV** and video streaming services to their served agencies. In addition to Winlink and Video communications, R1D3 operators maintained a net to receive reports from the mountain emergency radio network (MERN). MERN is a program that was developed following the 2010 Left Hand Canyon fire that impacted mountain communities within Boulder County's boundaries. To establish MERN, ham radio licensing classes were offered to mountain residents, and repurposed VHF public safety radios programmed with amateur frequencies were provided to licensed residents. During this week's severe weather event, R1-D3 ARES members served approximately 168 man-hours.

==========

Hi-Des News

Darko OE7DBH

Hi Jim -- I wish you a healthy and happy new year.

Hi-Des Info for your readers: This year, over New Year's, I visited Hides in Taiwan for the fifth time, this time specifically for ATV-related matters, to discuss new products. If peace prevails, a new ATV product should be available by the end of the year or at the latest by Ham Radio 2027 in Germany.
God willing and if everyone's health holds up, HiDes will be attending Hamvention 2026 in Dayton, represented by OE7DBH. I hope to make good contacts and have productive discussions about ATVs there.

As you've probably already heard, HV122 receivers will no longer be available in large quantities. The chips used in them are no longer in stock and are no longer being manufactured by ITE.

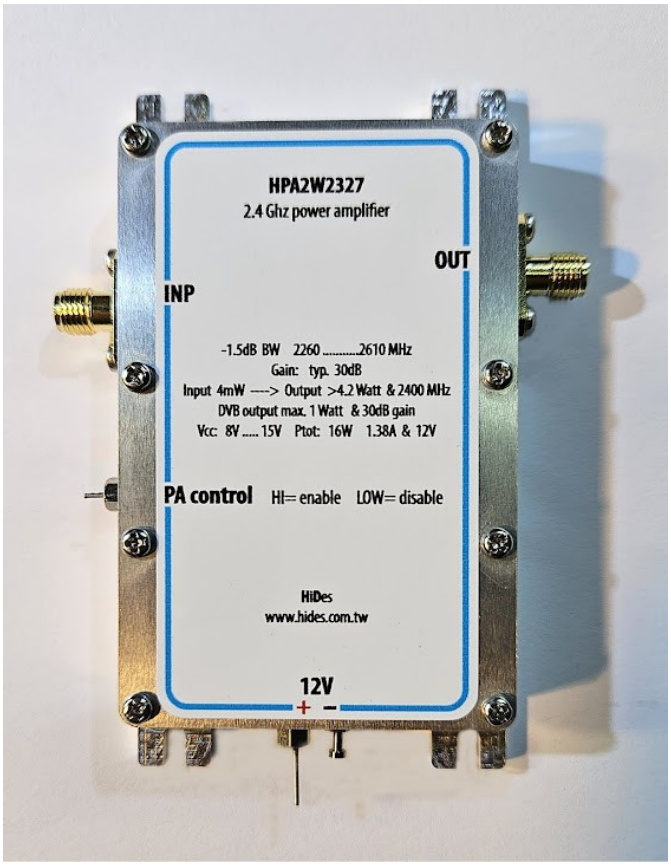
HiDes is doing well and is growing. Our ATV products probably only account for 1% of our revenue, so we shouldn't have overly high expectations.

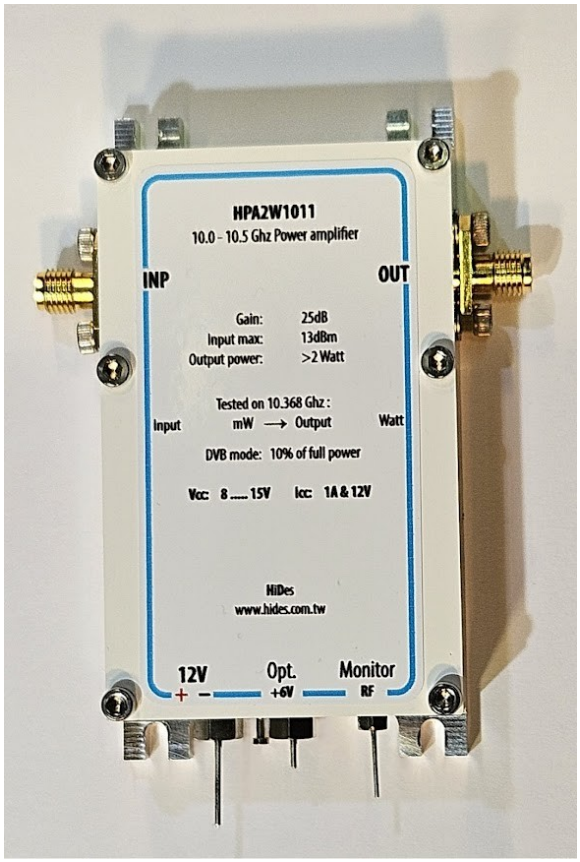
More info here.... ***https://oe7dbh.blogspot.com/2025/06/hides-2025-microwave-news.html***

Vy 73 de OE7DBH, Darko

Left to right: Calvin Yang (Hi-Des), Darko (OE7DBH) & Jeff (Hi-Des)

Editor's note: checking out Darko's above URL link to his web site, we find some really exciting new products being developed for Hi-Des to sell. They include a 30dB, 4.2 Watt, 2.4 GHz amplifier and a 25dB, 2 Watt, 10 GHz amplifier. These should be a great interest to all microwave hams.





Nice Surplus Find:

I recently got my hands on a very nice **UHF-TV** amplifier designed for the low power TV, translator market. It was made by the Canadian company LARCAN. It is their model MXD5U. It was built in 2012. It is labeled as a 5 Watt DATV amplifier.

My tests show it to be very broad-band covering from about 300 MHz to 925 MHz. Nominal gain is about 36 dB. P(-1dB) was 20 Watts on the 70 cm band. I found it to be useful for both the amateur 70 cm and 33 cm band. It has a built-in ALC circuit which limits the digital TV average power output very smoothly without added distortion. The amplifier is quite linear as evidenced by a minimal

growth in the out of channel spectrum skirts being quite low even at the higher drive levels. On the 70 cm band, I got a max. of 7 Watts average DATV power output with spectrum skirts break-point at about -35 dB. At a lower 5 Watts output, the shirt's break-point was a low -40 dB. On the 33 cm band, the max. power I got was 1.6 Watts out with skirts break-point at a very low -43 dB. The amp is built around an MRF374A, 300 W, N channel MOSFET. The amplifier includes built-in VSWR protection. It also includes external PTT control along with RS-232 and Ethernet ports. The amplifier is not small, nor light weight, nor power efficient. It is designed for 19" rack mounting. Dimensions are: 19"x18"x3.5" It is powered by 120 Vac. In stand-by it draws about 100 W. When transmitting 7 Watts, it draws 120 Watts.

73 de Jim Andrews, KH6HTV, Boulder, Colorado

==========

70 cm Band RFI Noise

The only good thing that came about from the recent, long, one month shut-down of the Federal govt. was the attendant disappearance of the broad-band noise on the 70cm band which had rendered our 70cm input to the W0BTV-TV repeater useless. Our repeater is located on the top of a government building on a mesa to the south-west of the city of Boulder, Colorado. We always suspected the RFI noise source was localized there. It was so serious that to input a DVB-T signal into the repeater on the Ch 60 (441 MHz) input, the signal strength at the receiver's antenna input port had to be at least -60dBm to have a freeze frame free video picture. Shortly after the govt. shut-down, this noise suddenly disappeared. Fortunately, to date, it has not come back. Keep your fingers crossed that it will not. So suddenly our repeater once again is no longer blind, but has telescopic vision on the 70cm band.

Our local ARES group, BCARES, has recently purchased two, new, additional 70cm DVB-T repeaters. They plan to locate them in other areas of Boulder County to enhance the coverage for areas not reached presently by the W0BTV repeater. BCARES has not yet gotten permission for any particular site. It is still a work in progress.

This past week, I did a field survey of several potential new TV repeater sites. I made measurements of the background RFI noise on the 70cm input frequency of channel 60 (438-444 MHz). The key data was to determine the minimum signal strength required to initially open squelch (with lots of freeze framing), and the higher minimum signal strength for perfect, video free from any freeze frames.

The RF test set consisted of a receiver identical to that which we use in our repeaters. It is a model 70-LNA low noise preamp, then a UHF-TV Ch 60 band-pass filter, and then a Hi-Des model HV-110 receiver. Using extremely aggressive digital encoding with 1/2 Forward Error Correction, the digital threshold sensitivity of the test set with no freeze frames is -99 dBm with s/n of 5 dB. This is as measured on a test bench with a 50 Ω dummy load for an antenna.

I made measurements at five test sites, plus for our W0BTV repeater. For W0BTV, it's sensitivity for F/F free video, was -87dBm. For the other sites, it ranged from -90 to -94dBm. It should be noted that all of these values were obtained when there was no amateur radio FM signals on the air on Ch 60. I used a TinySA spectrum analyzer to simultaneously monitor the Ch 60 spectrum. When an occasional amateur signal did appear in Ch 60, if it was strong enough, it would cause blocking of the video receiver. The design of DVB-T does a good job of rejecting in-channel interference from a narrow-band FM signal. The FM signal needs to be at least 20 dB stronger than the TV signal to cause blocking.

73 de Jim Andrews, KH6HTV, Boulder, Colorado

==========

Reply to 10 m DATV Feed-Back:

Hi Jim --- Nice newsletter again, thanks. Reference Trevor's comments on the use of 29.4 MHz for my DATV tests. I have informed him that based on my monitoring of the 10 meter band since many months, that this was the only frequency with the lowest risk of interference because nobody is using it. Plus the only ham satellite, OSCAR 7, capable of using this frequency has been crippled since 1982, only appearing every now and than and now called the “zombie” satellite.

73 de Frans, ON4VVV

==========

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/

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