Boulder Amateur Television Club
TV Repeater's REPEATER

May, 2024
issue #161

BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

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Spring Time is Microwave ATV Time !


Bob, WB0NRV, Flagstaff Mtn.


Pete, WB2DVS, at K0IHX's Davidson Mesa

On Wed. April 24th, the Boulder, Colorado ATV hams once again headed out into the field to make some ATV - DX contacts using their 5.8 GHz, FM-TV gear. Most all of us were using the Amazon $30 combo specials of the TS-832, 600mW transmitter and companion RC-832 receiver. Most were also using an L-Com, BBQ grill, dish antenna (model HG4958-22EG, +22dBi gain, 10/12º beamwidth, $100) on a camera tripod. Most all stations were in rf line-of-sight of the other stations and were able to exchange P5 pictures both directions. The best DX distance was 37 km (23 miles).

Larry, N8GGG's rig Legionaire's Hill

Don, N0YE's rig, NREL windmills

K0IHX's Davidson Mesa Gang

Bob, WB0NRV, Flagstaff Mtn.

Live ATV pictures received and recorded by Chris, K0CJG, Lookout Road

Jim, KH6HTV, net control

Lew, K0ANS

Chris, K0CJG

Larry, N8GGG, loves to edit and make video movies. He has posted a short video about the outing on You-Tube. See -- ***https://youtu.be/Z-4v-NEfFRc***

Jim, KH6HTV, and Bob, WB0NRV, set up on Flagstaff mountain on the west side of the city of Boulder, overlooking the city and the plains of eastern Colorado. Jim was ATV net control. Lew, K0ANS, set up to the north at Rabbit mountain, east of Lyons. Chris, K0CJG, was on Lookout Rd, north-east of the city. Larry, N0GGG, and Allen, K0ARK, were on Legionaire's Hill east of the Valmont power plant. Don was planning to set up to the south-east near the Jeffco airport on McCaslin & CO-128. When he got there he found construction going on and the site was unusable. So he QSYed west to the windmills near NREL. Roger, K0IHX, had lost his home two years ago in the Marshall fire. He had rebuilt and just moved in three weeks ago. He has a fantastic location on the top of Davidson Mesa to the south-east of the city. From there he sees the Continental Divide up to Long's Peak, Pikes' Peak to the south at Colorado Springs and to the north to Wyoming border. Roger hosted Debbie, WB2DVT, & hubby Pete, WB2DVS, to set up their rig on Davidson Mesa. YL & hubby, Doshia, KB0NAS, and George, N0RUX, also joined in the fun on Davidson Mesa.

Debbie taking photo of Lew

Prior to the event, a table was created to give each site the antenna bearings, distances and expected rf signal strength to all of the other sites. Most of the sites, had good rf paths between them with very strong, predicted signal strengths at the receivers of the order of -70 to -55dBm. The free, on-line, rf propagation program ***Radio Mobile*** was used to generate the table. For other ATV newsletter readers, we highly endorse this program as being a very accurate tool for predicting rf path performance for VHF/UHF/microwaves. For more details about it, we refer you to the KH6HTV app. note, AN-33a, "TV Propagation". (available at ***www.kh6htv.com***)

We used the ham only part of the 5.8 GHz band and transmitted on 5.685 GHz (ch 3-2). To minimize RFI from 5 GHz Wi-Fi, we used horizontal polarization. A controlled, 2 meter, FM voice net on the BCARES, 146.76 MHz repeater was used to coordinate. Net control told one site to start transmitting and where to point their antenna. All other sites, then pointed at the transmitting site. In several instances, the rf signals were so strong that some sites reported reception of good pictures, even off the side of the narrow beam from the transmitting station.

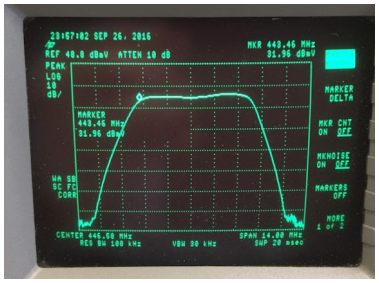
As usual, Dr. Murphy, of Murphy's infamous law fame, was an uninvited guest (?) to the microwave party. N0YE, had all sorts of grief keeping his gear going and finally gave up. K0ARK, never was able to get his to work, so back to the test bench for him. K0CJG also had some intermittants. For all the others, their gear worked flawlessly.

So what is next ? -- How about pushing the DX distance envelope the next time. We have some great mountains to work from plus the really wide open spaces of the eastern Colorado prairie to shoot our microwave beams over. We should be able to do better than 37 km next time. How about doubling it to 80km - or more ?

Can We Use a Cheap Chinese Duplexer in an ATV Repeater ?
Well, Yes & No

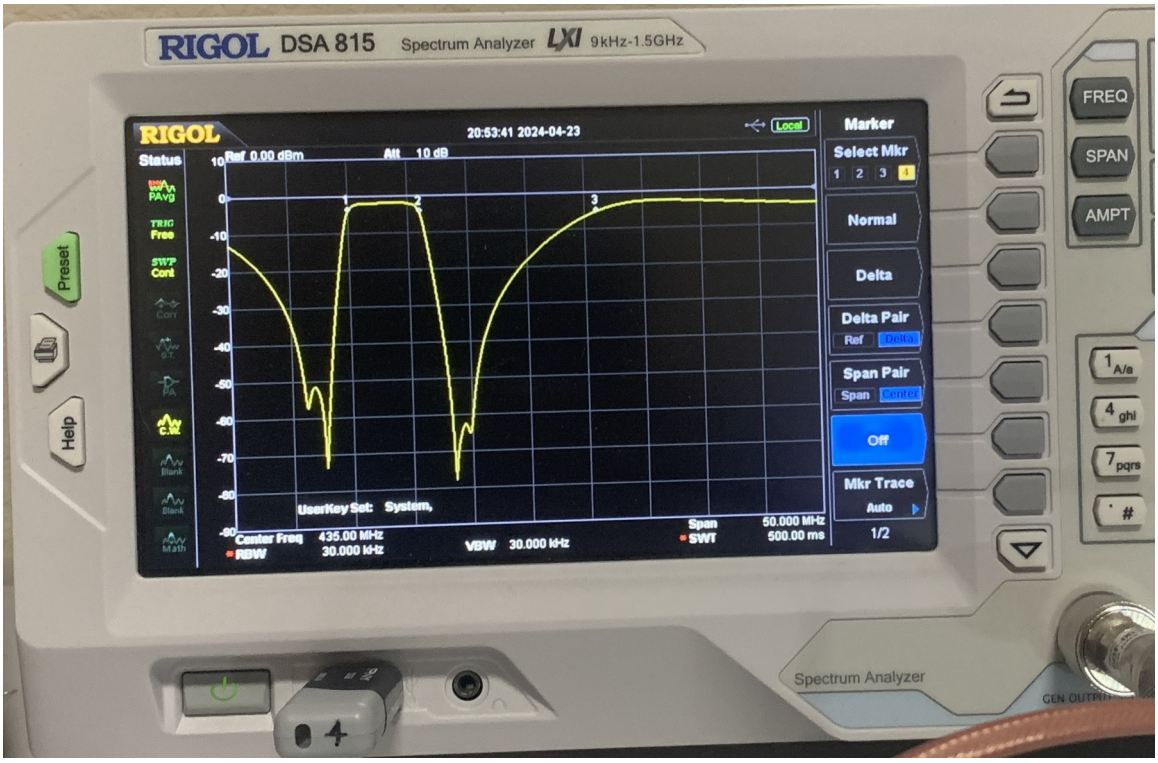
Jim, KH6HTV

In the previous issue (#160), we published an article by Drew, VK4ZXI, about how to use a cheap Chinese 450 MHz duplexer as an ATV filter. Drew's article included one HP network analyzer photo showing the S21 insertion loss plot after he tuned the filter to be a 7 MHz band-width band-pass filter rather than a narrow-band FM voice repeater duplexer. The span of his plot was 17 MHz and it showed some extremely steep channel edge skirts which dropped like a rock.



VK4ZXI's S21 plot

I found this to be really exciting news, so I promptly found the duplexers on Amazon for $120 and available for next day delivery from USA stock. I purchased two of them hoping to be able to use them in a 70cm DATV repeater. Well don't do it, before you read ***"The Rest of the Story!"*** Look at this photo !



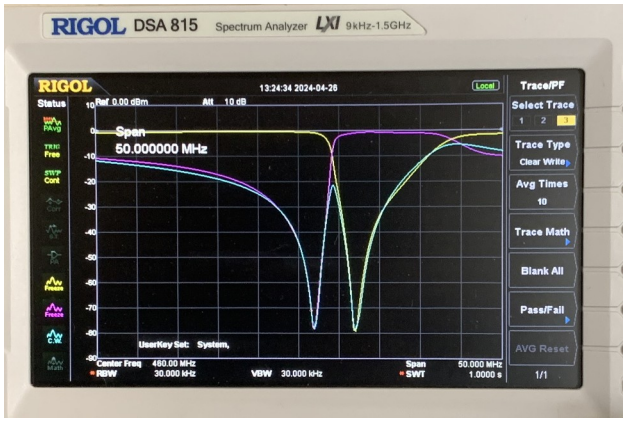
Duplexer tuned as Ch 57 (420-426MHz) ATV Band-Pass Filter 10 dB/div & 5 MHz/div

ATV BAND-PASS FILTER: Yes, it is a band-pass filter, with really steep skirts and deep rejection notches on either side of the pass-band. The in-band insertion loss was about -2 dB as reported by Drew. But, does it stay down ? NO ! The markers # 1 & 2 are for the Ch 57 edges of 420 & 426 of the intended repeater's transmitter. Marker #3 is at 441 MHz, the intended center frequency of the repeater's input. We have almost zero insertion loss there !

This next photo, again on a 50 MHz span, shows tuning the duplexer to Chs 57, 59 & 60. We would want to use the filter tuned to Ch 60 (438-444) as the input filter for our repeater's DVB-T receiver. Yes, it has fantastic skirts. But what about rejection of the Ch 57 signal from the repeater's transmitter ? None ! How about rejection of the multitude of other RF signals in the extremely busy 450-460 MHz business band? None ! Thus this is a totally unacceptable filter to be used for the repeater's receiver.

Duplexer tuned for Chs 57, 59 & 60
10dB/div & 5MHz/div

Is this Chinese Filter useful for anything ? Yes, it is useful for it's intended application as a duplexer for 450 MHz, FM voice repeaters using 5 MHz splits. This photo shows the duplexer as it arrived factory tuned for operation on 462 & 467 MHz. The yellow (LOW output) trace showed 0.7 dB loss at 462 and -77 dB loss at 467. The magenta (HIGH output) trace showed -76 dB loss at 462 and 0.7 dB loss at 467. This is what you would want for your 70cm FM voice repeater.



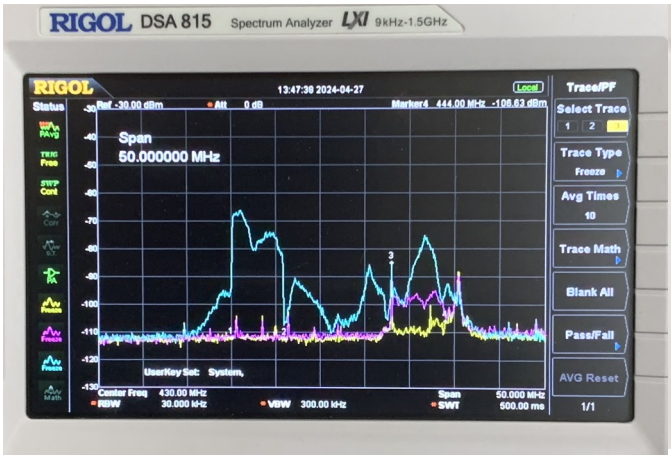
Duplexer factory tuned for 462 & 467 MHz
10dB/div & 5MHz/div

ATV DUPLEXER: OK, if we can't use this filter as an ATV band-pass filter, can we use it as an ATV repeater duplexer ? Maybe ? - it might work for this purpose. This photo now shows it being tuned as a Duplexer to pass Ch 57 (LOW output, magenta trace, S21) and Ch 60 (HIGH output, yellow trace, S31). Markers 1 & 2 are for Ch 57, while markers 3 & 4 are for Ch 60. The Ch 57 (LOW) insertion loss was only 0.2dB. The Ch 60 (HIGH) insertion loss was 0.7dB. The stop bands on the opposite channels were of the order of -30 to -40dB. Thus, this shows promise for an ATV repeater which only uses a single antenna for both receive and transmit.

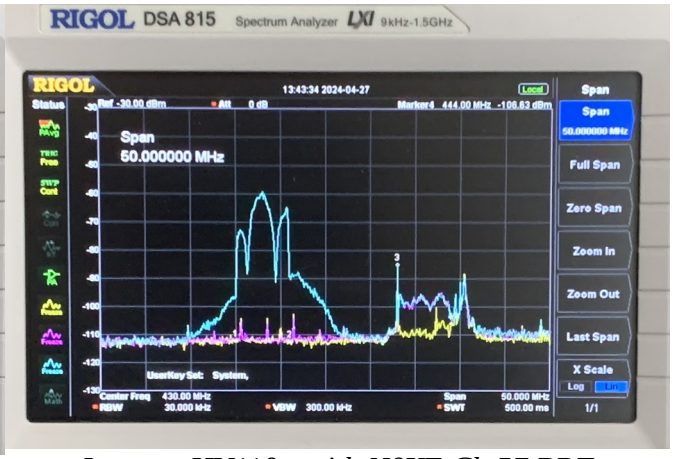
ATV Rptr Duplexer 10dB/div & 5MHz/div

OK, the next, real acid test -- Let's try to build a real world, 70cm DVB-T repeater with these Chinese filters. So, I lashed together on my test bench the various components needed. For the Ch 57 transmitter, I used a Hi-Des HV-320 modulator driving a KH6THV model 70-9B amplifier putting out 10 Watts (average) power. I tuned up one Chinese filter as the transmitter's Ch. 57 band-pass filter to be used as the "Mask" filter to clean up the out of channel skirts. For the receiver, I used a Hi-Des HV-110 along with a KH6HTV model 70-LNA, pre-amp (19dB gain. 0.9dB NF). In front of the pre-amp, I used a home-brew, inter-digital, band-pass filter (-2.1dB, 6.6 MHz BW) built by Don, N0YE. The HDMI output from the receiver was patched over as the A/V input to the modulator. I then used the second Chinese filter as an ATV Ch 57-60 Duplexer to combine the transmitter and receiver into a single 70cm antenna. The first tests were using a 150 Watt, dummy load in place of an antenna. For the second test, I used a real, out door, M-Squared yagi antenna which had a very flat, low vswr response across the entire 70cm band. As a test signal, I used a second HV-320 modulator (set to Ch 60, 441 MHz) and a step attenuator. I inserted this test signal into the antenna coax feed line with a 20dB directional coupler. I was thus able to insert known rf signal levels into the repeater's receiver to determine the sensitivity and also if there was desense when the transmitter was activated.

Did it Work ? NO ! & YES !



Input to HV110 - with Chinese Ch 57 BPF

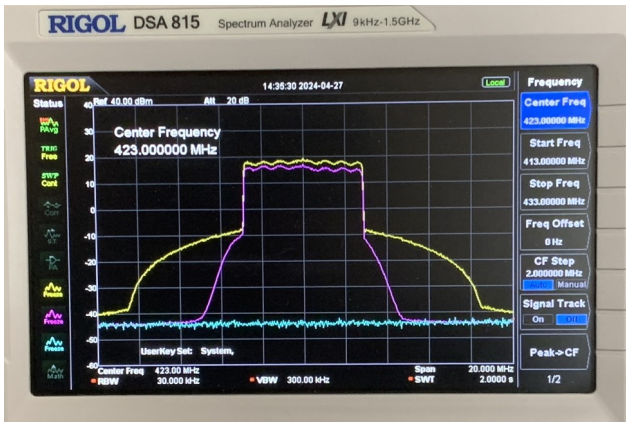


Input to HV110 - with N0YE Ch 57 BPF

There was way too much leakage of the out of channel spectrum shoulders into the Ch 60 receiver using the Chinese duplexer as a Ch 57 BPF. The above photos vividly demonstrate what was happening. I inserted a 3dB signal splitter on the output of the pre-amp. One arm went to the HV110 receiver. The other arm went to the Rigol spectrum analyzer. The markers 1 & 2 show Ch 57 band edges, while 3 & 4 show Ch 60 band edges. The yellow trace is the noise baseline with the yagi antenna connected, but no input DVB-T signal. The passband of the Ch 60 filter is obvious. Plus there are some other rf signals present. Especially troublesome was a ham's FM voice signal at the lower band edge at 438 MHz. The magenta trace is the same, but now a weak DVB-T signal was inserted which was just above the receiver threshold, showing a s/n of 10dB. Finally, the cyan trace is now with the 10 Watt, Ch 57 transmitter turned on. We now see the leakage of it's rf into the receiver. Note that the transmitter's out of channel spectrum landing within the Ch 60 passband is 20 dB stronger than the desired signal.

I next replaced the Chinese Ch 57 BPF filter with another one of Don's inter-digital BPFs. This time, the test bench repeater functioned normally with no desense when the transmitter was turned on. This is demonstated with the above photo on the right. The cyan trace now is no different than magenta trace inside the Ch 60 pass-band. There is still some leakage present at the bottom end of the band in Ch 57.

MASK FILTER: Although in the above, I dismissed using the Chinese duplexer as a BPF for an ATV repeater, it is still useful for the application which Drew, VK4ZXI, intended. The photo on the right shows the effect of using it as a "Mask" filter to clean up the out of channel, inter-mod, spectrum skirts created by amplifier non-linearities.



Mask Filter -- 10 dB/div & 2 MHz/div

The example shown here is a Hi-Des HV320 DVB-T modulator driving a KH6HTV model 70-9B, RF linear power amplifier (yellow trace). The magenta trace shows the dramatic improvement in the spectral skirts by adding the Chinese duplexer tuned as a Ch 57 BPF. The cyan trace is the measurement noise floor. The filter dropped the rf power from +40dBm (10 Watts average) down -1.85dB.

CONCLUSIONs: The Chinese 450 MHz duplexer is useable as a duplexer for a 70cm ATV repeater. It is not useable as band-pass filter for a repeater. However, it would be very useful as Mask Filter for DATV transmitters used for home, mobile, portable service -- just not useable in an ATV repeater.

73 de Jim Andrews, KH6HTV, Boulder, Colorado

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DCI Filters -- Still Available

In a previous issue (#159, p. 8), we said the DCI filter company in Canada had gone out of business. Mel, K0PFX, then sent us an email saying "DCI is still around under a different name." He referred me to a company in India at ***http://www.kavveritelecoms.com/*** Following his lead, I was finally able to connect with still another company in Canada called Til-Tek. This is what they told me. "Yes, DCI still very much exists." .... "Til-Tek Antennae and DCI are both owned by our parent company Kavveri Telecoms now." .... "We moved our website to the ***www.dcifilters.com*** domain."

However, there is still much confusion on the internet for DCI. Their sales literature and even the new home page still lists ***dci.ca*** as the web site and email address ! That web site now is a dead end with a notice it does not exist. e-mails to that address bounce as undeliverable. Which is why we had originally pronounced them to be dead and non-existant.

Back to the original issue of needing 70 cm, ATV channel, band-pass filters. The Til-Tek sales man did tell me they still make them and the price is $800 (USD) for their 8 pole filter and $1,000 (USD) for their 10 pole filter.

73, your editor, Jim, KH6HTV

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DAYTON ATV BOOTH CORRECTION: The ATV booths for the upcoming Dayton Hamvention are numbers 1003 & 1004 and are actually in building #1, not a tent as previously published. Thanks to Dave KC3AM for the correction.

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ICOM IC-905 Feed-Back:

Instant Feed-Back from Mike, WA6SVT -- we got a phone call from Mike as soon as he got his copy of the previous newsletter (#160). Mike said that early in the IC905 design phase, some Icom engineers contacted him and asked for a list of detailed requirements for including FM-TV in the 905. Mike said he told them that terrestrial FM-TV would use 4 MHz deviation (not the Uber Wide kind, Darko and Rudi want). He also told them about pre-emphasis / de-emphasis and the fact that there were different standards for the USA and Europe for NTSC vs. PAL. Plus he gave them a list of several sound sub-carrier frequencies typically used. Now that the IC-905, Mike said several of the ATN-California members have purchased them and are using them successfully on the ATN network repeaters. Mike also said as a result of the the complaints from Austria & Serbia, the ATN folks will try to do some more rigorous testing and report the results in the future.

From the U.K. Hi Jim --- I read the IC-905 articles with interest, as I reviewed the rig for RadCom and CQ-TV here in the UK. I've attached my CQ-TV article which you are welcome to take as much or as little as you want from for the next issue, but I think that the "Frequency Modulation" and "On-air testing" sections are probably all you need. I've also included hi-res versions of the relevant images.

73, Dave, G8GKQ, BATC,

Editor's Note: In several previous issues, we have included reviews of the IC-905. We will publish Dave's review in our next issue #162. Also of interest are some You-Tube videos reviewing the IC-905. In our May, 2023 issue #130, we said that Mike, WA6SVT, and Gary, W6KVC, had recently tested a new IC-905 and posted their tests on YouTube.

(***https://www.youtube.com/watch?v=4ymjoAxIpnw***)

In our June, 2023 issue #134, we mentioned that Dave, G8GKO, Noel, G8GTZ and Bob, G0FGX also posted a You-Tube video on the IC-905 (***https://www.youtube.com/watch?v=0yLnjeEGx2s***)

You also might want to re-read the article about deviation measurement of the drone, 5.8 GHz, FM-TV, transmitter, model TS-832. See issue #134, June, 2023, p.p. 8-10.

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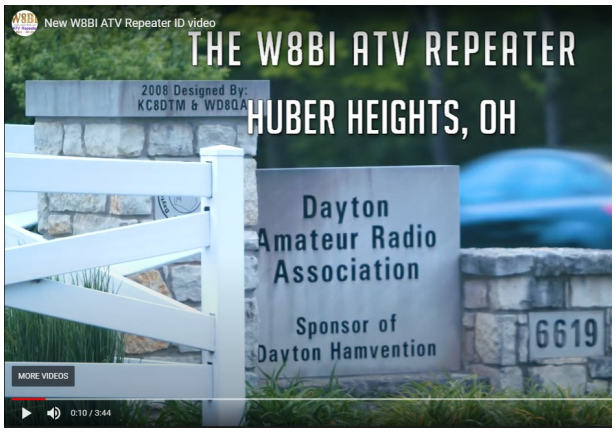
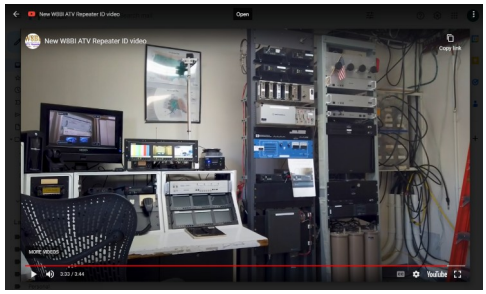
W 8 B I - ATV Repeater
Dayton, Ohio

Take a video tour of the new,W8BI, ATV repeater. They have just posted on You-Tube, the new video movie to be used to ID the repeater.

https://youtube.com/watch?v=jqNMTqNYDyg&feature=shared





More DATV News from San Diego

The SD DATV gang and I were playing with and experimenting with CVV/ H.266 compression algorithm on an encoder on 1550 and 1560nm IR spectrum with great success 4k. I will transmit a test feed on my BATC Stream soon KD6ILO-R

We saw first hand the outcome of atmospheric interference on the 1550nm transmissions today. But when we used the update compression codec to the optic modem, bamm! it was corrected for the lost data at the receiving end no problem. It's not like RF where it plexilates or just goes blue, it just slows the feed till it receives all the data stream..amazing! No lost video. We set the 1560nm transceivers optic modems with the CVV/H266 codec to, we test tomorrow.

Mario

73 de Mario, KD6ILO

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ISOLATION between ANTENNAS

When designing an ATV repeater, we often like to use two separate antennas. One for transmit and one for receive. The advantage is good isolation, if done properly. The most isolation is usually achieved by mounting the antennas vertically, one above the other on the same common axis.

COOMSCOPE has a useful, on-line, calculator to estimate the isolation for both vertical separation and horizontal separation. ***https://calc.commscope.com/qvisolation.aspx***
https://calc.commscope.com/qhisolation.aspx

Let's run some typical numbers for a 70cm ATV repeater with vertical separation.
5 ft. = -42dB, 10 ft. = -54dB, 20 ft. = -66dB
Now for horizontally spaced antennas, we also need to specify their respective gains, in addition to the separation distance. So, let's assume a pair of X-50 antennas with 7.2dBi gain.
50 ft. = -39dB, 100 ft. = -45dB, 200 ft. = -51dB
Thus to achieve about -40dB of isolation, we only need 5 ft. vertically, but 50 ft. if horizontal.

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News Bulletin -- MFJ Factory Closing !

The following just appeared on QRZ.com --- "Yesterday, MFJ Enterprises announced that they would be closing down their manufacturing facilities in Starkville, Mississippi effective May 17th, but would continue selling their wide selection of imported products including portable/mobile antennas, power supplies, clocks, and antenna switches. This closure also impacts all of their sub-brands: Ameritron, Hy-Gain, Cushcraft, Mirage and Vectronics. MFJ intends to continue to service and warranty these product lines for the foreseeable future." ------

Dear Fellow Hams and Friends, April 25, 2024

It is with a sad heart as I write this letter. As many of you have heard by now, **MFJ** is ceasing its on-site production in Starkville, Mississippi on May 17, 2024. This is also the same for our sister companies' Ameritron, Hygain, Cushcraft, Mirage and Vectronics. Times have changed since I started this business 52 years ago. Our product line grew and grew and prospered. Covid changed everything in businesses including ours. It was the hardest hit that we have ever had and we never fully recovered. I turned 80 this year. I had never really considered retirement but life is so short and my time with my family is so precious. I want to thank all of our employees who have helped build this company with me over the years. We have many employees who have made MFJ their career for 10, 20, 30, 40 and more years. We are going to continue to sell MFJ products past May 17, 2024. We have a lot of stock on hand. We will continue to offer repair service work for out-of-warranty and in-warranty units for the foreseeable future. Finally, a special thanks to all of our customers and our dealers who have made MFJ a worldwide name and a profitable business for so many years. You all are so much appreciated.

Sincerely Yours, 73s Martin F. Jue, K5FLU

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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 700+. 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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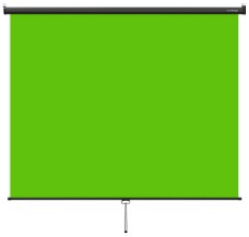
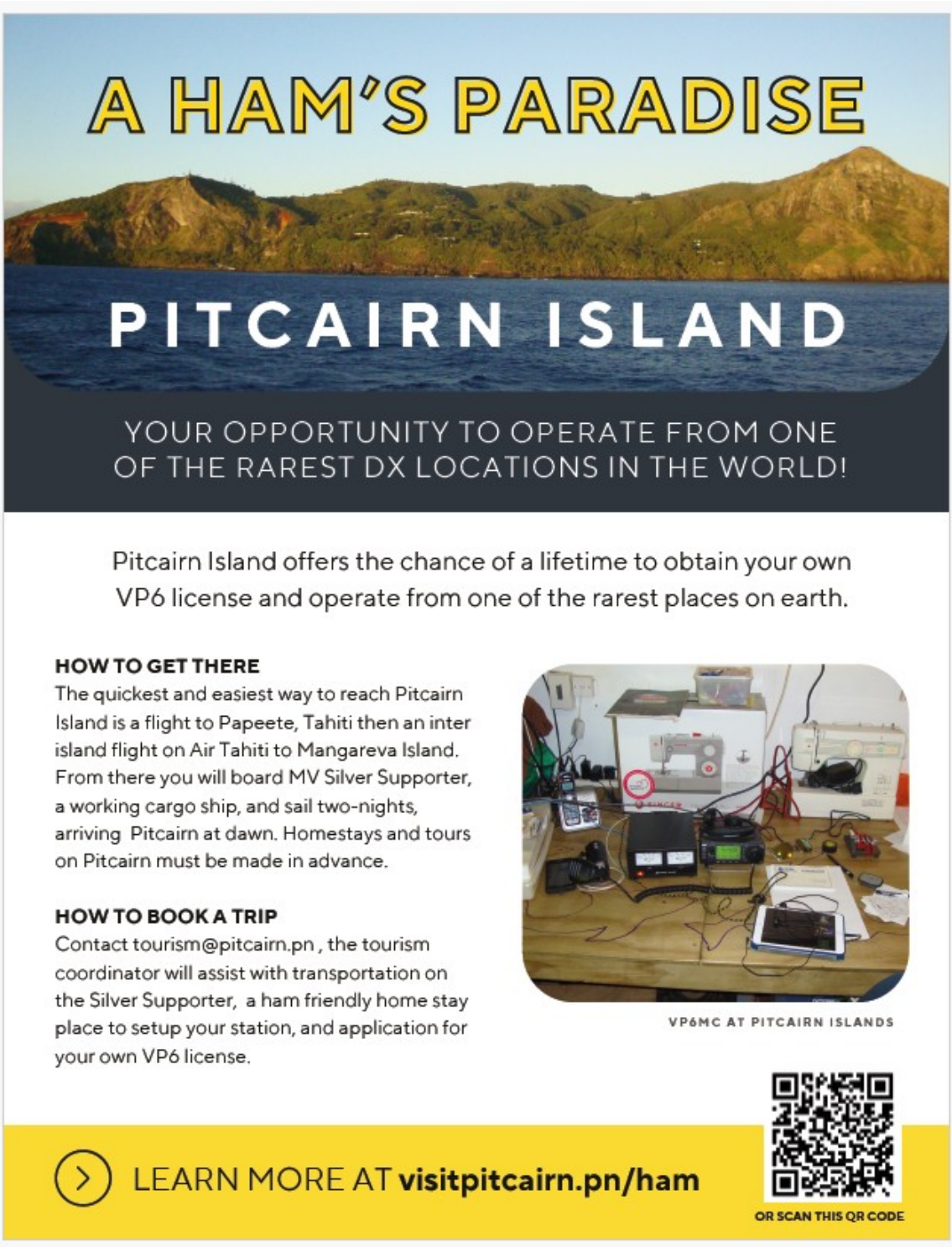


GREEN SCREEN – PULL DOWN 75" X 79"



Want more information ? -- contact Mike, WA6SVT, at wa6svt@gmail.com