

Amateur Television Journal

November, 2024
3rd edition, issue #176

BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com



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

Ham TV from Space - Not ISS ! But Our Own Rockets ! (part 2)

Editor's Note: After the interest shown in this article in the previous issue #175, I asked Mike for more details about the ATV equipment he designed and operated in the 1990s rocket. Here is Mike's reply.

The rocket ATV was 2.4 GHz using an FCC part 90 transmitter/receiver system I designed in the mid-90s for licensed video links; the output fed a one-watt amplifier into a circularly polarized patch antenna. A solid three-foot dish with a patch antenna feed was used on the receive side. The camera was a 500-line Sony XC777 CCD with a 6mm lens. I still have it! Antenna tracking was by hand and not too difficult, as most of the flight was straight up with the rocket antenna looking straight down. The recorder was Hi8 with aux video input.

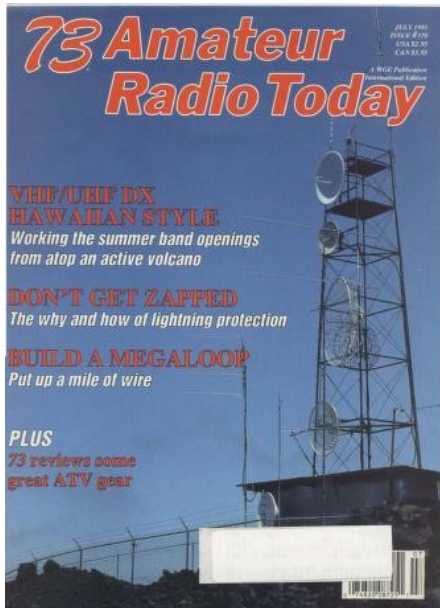
The first few Tomahawk flights used AM video transmission on 370 MHz; the exciter was an ATVM-70. I originally designed it for ham use (see the attached 73 mag article); Tom O'Hara sold hundreds of them through his PC Electronics company. It was modified to operate just below the 70 cm ham band, driving a Mitsubishi five-watt brick amplifier that I modified to operate on 370 MHz. The amplifier output fed a conformal dipole antenna made from copper tape on the leading edge of the lower fin. A PC Electronics receiver was used for reception in conjunction with high-gain M-squared antennas. The majority of follow-on flights were at 2210 MHz using a custom TX/RX system that Hughes contracted

me to design specific to the application. A grid dish antenna was used for ground-based reception; the P3 Orion chase plane used its own airframe-integrated antenna. I still have one of the receivers.

The 73 magazine article I referenced was too large to attach. Here is an archive link: 73 Magazine (July 1991) : Free Download, Borrow, and Streaming : Internet Archive <https://archive.org/details/73-magazine-1991-07/page/8/mode/2up>

The more recent 2210 MHZ flights were FM modulation, the difference in resolution can be seen in the video. The photo attachments are of the production ATVM-70 that Tom marketed and the original fin cam prototype using that product.

73 de Mike, KM7MH, Athol, Idaho



Micro ATV Transmitter

Can the Dick Tracy video wristwatch be far away?

by Mike Herzkoski KC6CCC

Ever think about going under those bushes with a TV from your store pocket? If so, here's a project that will enable you to do just that! Thanks to the availability of a new type of video camera, the Micro ATV Transmitter, the... (Mike Herzkoski, KC6CCC, Athol, Idaho, Texas, the above has some...)

Most wire-wound coils made in a factory are designed for VHF and above require the use of frequency matching inductors in conjunction with standard crystals. Physical limitations placed on the crystal are such that bandwidth of frequencies over 20 MHz are not practical due to the fragile nature of the quartz crystal.

There is, however, another way of getting higher modulation frequency using the same quartz material. The LSAW (Surface Acoustic Wave) resonator, a SAW resonator is formed by placing a series of metal electrodes on the surface of a quartz substrate. Using this method, modulation will occur at much higher frequencies than by conventional means, and you'll be able to achieve bandwidths of frequencies of more than 1 GHz. This resonator, when combined with matching technology, will provide a packaged module for capable of producing over 1 watt of continuous output in the UHF-VHF ATV band.

Normally, the cost to design and produce this type of device would be prohibitive for the amateur radio hobbyist. However, as both manufacturers, the ATV segment of our band in Germany is used for license-free devices which are also generally available, so by looking through the open door from RFM, I found that some of the transmitters they produce for the European market was very light on top of the LSAW video ATV frequency (see Photo B).

Because of the frequency involved, and the small size of the components used, the project may prove difficult for beginners. Use of SMD (Surface Mount Devices) helps to lessen the effects of wire inductance and capacitance, but the small overall size of the project may still be a real challenge. Some standard components were used to reconstruct mine. The primary goal was to end up with a stable and reproducible design.

A Few Tips About SMDs
You have to be able to use a tool with a size of a magnitude of some sort may be helpful. Sharp tweezers are a must. Use a small specialty soldering iron with about a 15 watt rating. Make sure the tip is both clean, and don't linger on the components too long.

When installing a component, its lead area lightly, position the component. Then tack one side into place. Check the position, then solder the other side. Apply gentle downward force to the component to insure proper fit. Note: Before you tack the second TV board, you may want to get a bit of SMD resistors from Radio Shack and try your hand at soldering a few discrete components on a scrap piece of PC board 1/4 inch copper trace. Fortunately, the parts used in this project are very high quality, so I expect the first one will be the only one. Remember that leadthrough pins are not all reflected in both halves; some are on one side, the remainder on the other. Don't let the holes indicated on both sides independently.

Photo A: The completed micro TV transmitter. Photo B: The RF Modulator, LSAW resonator. Photo courtesy of RFM.

What each coil lights on the front and back the back to change while it's still on the strip to avoid starting them.

Assembly
Install all SMD chip components first, tops and bottoms. Then install transistors Q1, making sure to position the heat sink. Leads only need to be about 1/8" long. The collector in the bridge of the leads. When assembling a case, use the collector as a hinge point to differentiate it from the other.

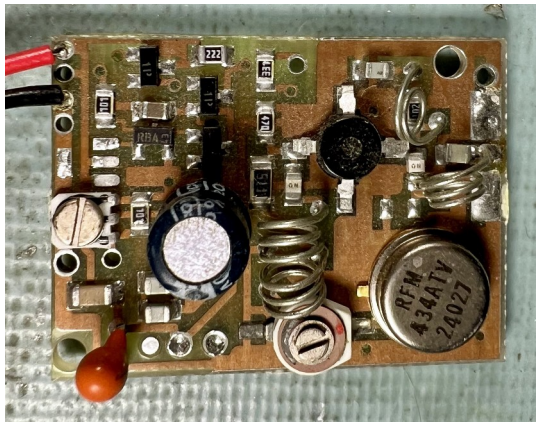
After profiling the transmitter into the board, place a small amount of heat-shrink compound over the board. This will insulate the board from the heat sink. Next, install all the coils, starting with L1, L2 and L3 and the ground plane on one side. Then C1 at the other. The final position of L2 should be such that L1 and L2 appear to be one continuous coil as viewed from directly above. If the two are too far apart, there may be enough coupling between them.

Install Diode D1, then transistor Q2. Note: All the remaining components can be installed. Solder the battery clip leads to the board, observing the proper polarity. Use wire cutters to connect the output to the antenna assembly resistor. Also use wire cutters to connect to the video on the board. Connect the other side to the BNC BCA.

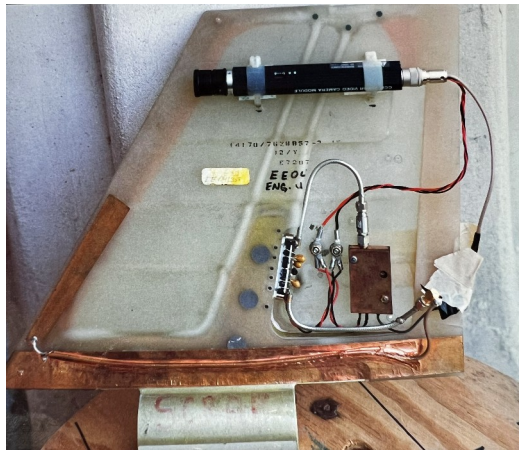
Test-Up
Now we are ready for the final test and tuning. But before continuing you should check the resistance of the circuit through the battery clip. It should be no less than 50 Ohms. If it is, you may need to check for shorts.

Coil Winding
Coil winding is simplified by using one thin wire across the proper size and thread as shown. The wire used may be other standard wire or you could use 34 gauge brass wire (available from Radio Shack) or steel because you don't have to strip the coating.

Photo 1: Schematic diagram of the micro TV transmitter. Photo 2: PC board pin headers. Photo 3: Parts placement on bottom side of top side. Photo 4: Coil winding details.



The 370 MHz Transmitter Board



Fin with Sony TV camera and copper foil tape dipole antenna.



Do the USB TV Tuner Dongles Work on Windows ?

Jim, KH6HTV

In our previous issue #175, we had an article from Wade, W7ITL, entitled "*Cheap RTL Dongle to Receive 23cm DVB-T*". In Wade's article, he showed how to use them with a Linux computer. So, the obvious question is "Will they also work on a Windows Computer ?" Searching thru our ATV newsletter archives, back in 2021, we had a couple of issues devoted to this question. In the January, 2021 issue #66, Jim, KH6HTV, had an article entitled "*USB TV Tuners -- Now Work on Windows 10 !*". It was followed in the next issue #67, by an article from Daniel, VE7LCG, entitled "*Software Drivers for RTL8232 Based SDR Dongles*". The key takeaway for those articles was to make these dongles work on Windows required installing a different driver from the one normally used for most ham SDR applications.

I recently purchased an RTL-SDR-V4 dongle prior to seeing Wade's article. I wanted to use it to receive our ATV, DVB-T signals on my HP Windows 11 laptop PC. Much to my disappointment, I was totally unable to get it to work. So, I went to the RTL-SDR.com web site and actually sent an email to their customer support. Much to my surprise, I actually got a useful reply back within 2 hours. This was their reply ---

Hi Jim,--- Unfortunately the V4 will not work for DVB-T. The architecture has changed too much towards enhancing SDR operation, and the old DVB-T drivers don't support the changes. Only the V3 will work with the old DVB-T drivers.

Regards, Carl Laufer RTL-SDR.com & krakenrf.com

OK, that didn't work. I wondered if any of the three dongles Wade endorsed would work on Windows 11? So I ordered from Amazon the Nooelec model NESDR Smart, V.5 (\$34). I dug out my old 2021 article and followed the procedure outlined in it. I was pleased to find that the key web site in Germany which had the correct, 2012 Windows, DVB-T driver was still functional. So I was able to down-load the Treiber2 driver package and installed it in my PC per my old instructions. Guess What ? It actually worked ! So, if you want to use your USB dongle for DVB-T reception check out issue #66. All 175 back issues of the ATV newsletter/journal are archived on the web site: www.kh6htv.com

I should however comment that with the old 2012 Windows driver, the full frequency range of the dongle (100kHz to 1.7GHz) is not possible for DVB-T reception. I tested mine on the 70cm, 33cm and 23cm bands using VLC as the media player. The dongle only worked on the 70cm band.

73 de Jim, KH6HTV, Boulder, Colorado



A Small Contribution From Germany: I bought some slot antennas for ATV and other GHz applications. Thanks Bert. One of the slot antennas is for 10 GHz. It has 24 slots on both sides. I was wondering if I could receive QO-100 with it ? To do this, the antenna must be aligned horizontally, as QO-100 transmits vertically polarized at 10 GHz. I am amazed at how well this works, see picture. The FT8 range is shown. With QO-100 as the signal source, I can now test the properties.

Best regards, Wilhelm, DG2YK, Gescher, Germany

NEW APPLICATION NOTES: KH6HTV Video has just posted an up-dated version of it's 2015 application note, AN-23, "DVB-T Television Repeater". The revised app. note contains new material. It tells how to build a basic DATV repeater. It is available as a free .pdf download from the web site: www.kh6htv.com

FEED-BACK --- ATV on Rockets:

I don't know if you watched the Tomahawk fin video but they used one of my transmitters - P.C. Electronics is listed in the credit crawl at the end. (www.hamtv.com)
Tom O'Hara, W6ORG

Want to read more about the New Mexico rocket folks and ATV. Check out our old issue #54, from August, 2020. See Ken, KD5HEH's article on "Amateur Rocket ATV Transmitter".

FEED-BACK --- ATV Journal:

Jim --- I have but one humble page to write a month and your newsletter is always an inspiration in quality of content! Thanks for all you do.

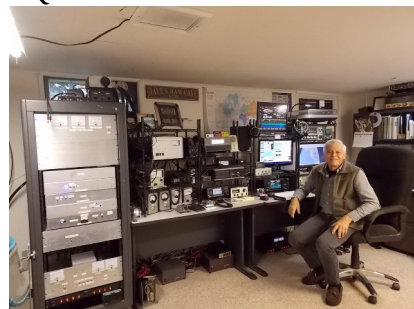
Very 73, David, NA2AA, ARRL CEO

David is right, Jim. Great newsletter. I have found useful tidbits for the World Above 50 MHz column, even in areas not directly involving ATV.

Jon, N0JK, ARRL QST WA50 editor

IC-905 -- QST:

The Dec. 2024 issue of QST has just come out. In the product review section of this issue, they review the new Icom IC-905 Microwave Transceiver. (see pages 36-41). It was tested and reviewed by Dave Halliday, K2DH.



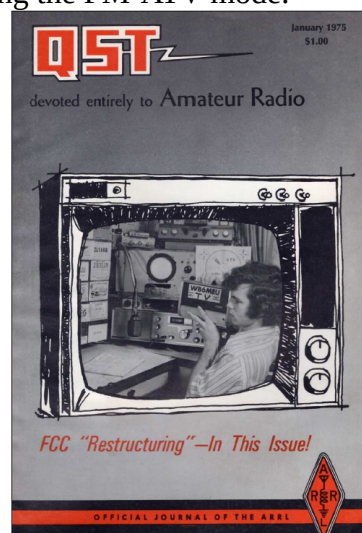
Dave has a lot of ham microwave experience working up as high as 122 GHz as part of the weak signal crowd. However, Dave's QST review did not include the ATV capability (or limitations) of the IC-905. He only mentioned that it was included as one of the available modes of operation. Likewise in the table of tests run by the ARRL lab, there is no mention at all of testing the FM-ATV mode.

Old Time - ATV !

The Dec. 2024 issue of QST looks back to 1975. The cover of that issue featured ATV. The main article for that issue was written by own old man of ATV, Tom O'Hara, W6ORG. His article was entitled "Practical Ideas for the ATV Enthusiast. part 1 Receivers and Antennas".



caption; ATV need not be all test patterns and tweaking. Here WB6MEU focuses on some choice DX QSLs from stations worked on the hf bands.



ALL-Star for ATV: Mario, KD6ILO, writes --- "There are many of us using ALLStar as a back channel [intercom] for a LIVE talk channel {batc uk/us-san diego ca} including me and it works well along with the chat. You might consider asking your repeater's membership about not using Echolink as a backhaul channel for the net. Instead go forward with AllStar as it can be integrated into the repeater as many have for [d]ATV, it has remote management.

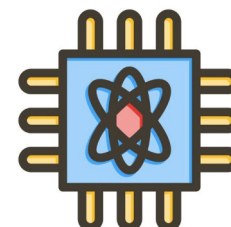


So just what is AllStar ? This is directly from their web site at: www.allstarlink.org AllStarLink is a network of Amateur Radio repeaters, remote base stations and hot spots accessible to each other via Voice over Internet Protocol. AllStarLink runs on a dedicated computer (including the Raspberry Pi) that you host at your home, radio site or computer center. It is based on the open source Asterisk PBX running our app_rpt application. App_rpt makes Asterisk a powerful system capable of controlling one or more radios. It provides linking of these radio "nodes" to other systems of similar construction anywhere in the world via VoIP. AllStarLink's primary use is as a dedicated computer node wired to your repeater or radio. Connections from Echolink, other VoIP clients and telephone calls are supported.

73 de Mario, KD6ILO

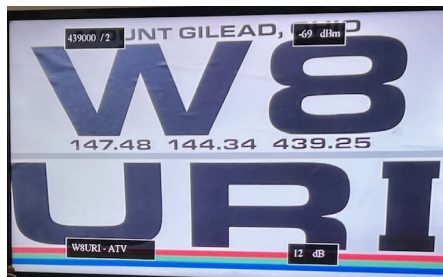
SAN DIEGO DVB SOCIETY: Our society has a weekly net each Sunday 7pm PDT, but it's an administration network meeting for members. Throughout the week the network supports STEM Program classes for our school districts in San Diego as an agreement we have with our grant funding supporters {i.e. NASA and NSF-National Science Foundation}. We also have a net for our local first responders as we support them with image communication support. We have members as young as 11 years old {Hams}, as old as 75. Total 76 very active members {students , grad-students, employed, retired}.

73 de Mario, KD6ILO



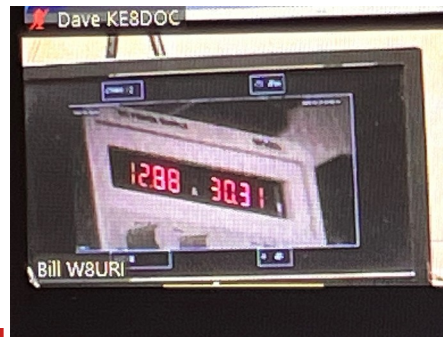
Check out what is happening on the other side of the globe with amateur television signals from space via the **QO-100** ATV satellite. You can watch their World-Wide ATV Net on their YouTube.

<https://www.youtube.com/watch?v=OO8-1zVmkrA>



90+ miles !

Excellent Occurrences During DARA/ATCO ATV Zoom Net!



W8CWM -->W8URI 90+ miles

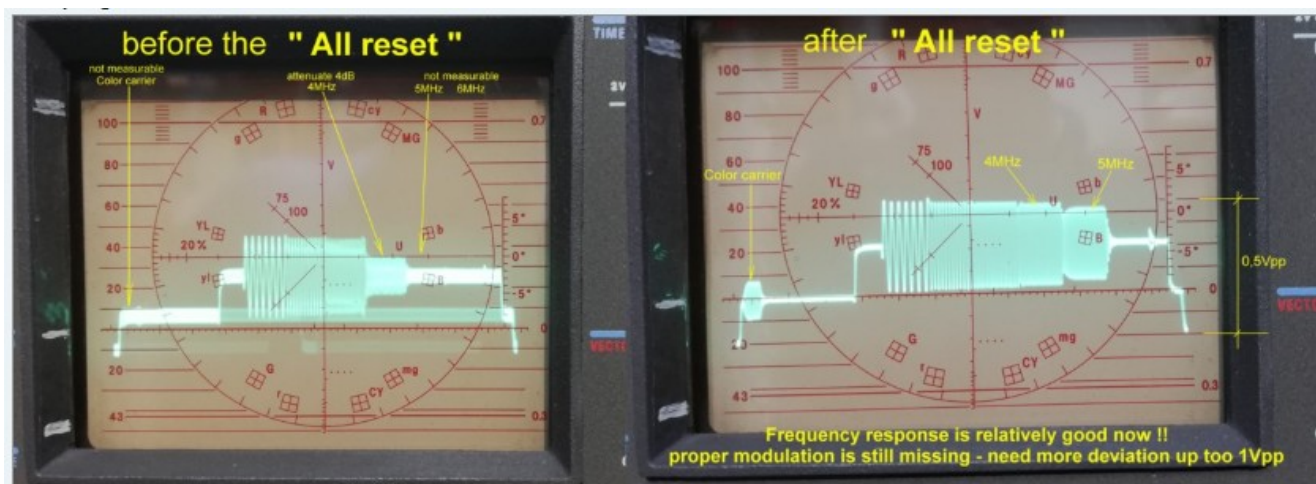
On 13 November 2024, several unexpected ATV-related events aligned during the 8:00 PM DARA/ATCO/ATN Zoom Net. The ATV net started at 8:00 pm and W8URI (Bill Heiden) checked in to try to see if there might possibly be a 70cm band opening. His hopes were granted with a 90 mile path that allowed a two-way link between Bill (Mt Gilead, Ohio) and W8CWM, Bill McCoy located in Englewood, Ohio. Their two-way contacts were highly successful on separate DVB-T and A5 ATV modes. Fifteen minutes later, Doc Schwab, KE8DOC, mentioned there was going to be an International Space Station pass as the ISS was celebrating 40 years of amateur radio in Space and would be transmitting some commemorative frames via SSTV on 2 meters. Fifteen net participants were treated to three frames of video from the ISS received by KE8DOC in Tipp City, Ohio. Unfortunately, Bruce Kobe, K8FIX, forgot to buy the Wednesday Night Lottery tickets for everybody!!!
(Dave, AH2AR Reports).



SSTV Commemorative ISS frames that the space station was transmitting as it made a pass over the Continental U.S. on 2 meters FM. Thanks to Doc Schwab for his impeccable timing!

IC-905 FM-TV ISSUES contd. Darko Banko, OE7DBH, has sent us notice, that some limited progress is being made on work arounds for the poor frequency response and low deviation for microwave FM-TV in the Icom IC905, microwave transceiver. He has sent us this forum link at the BATC.

<https://forum.batc.org.uk/viewtopic.php?f=2&t=8337&p=36884#p36880>



Reset Ergebniss x.jpg (137.15 KiB) Viewed 235 times

That is only 50% of the expected-necessary modulation according to the CCIR standard !!
 ICOM still has to do something if he wants to have satisfied customers in Europe or the PAL region.

IC-905 Improvement



Comparison of 70 cm Low Noise, Pre-Amplifiers

Jim Andrews, KH6THV

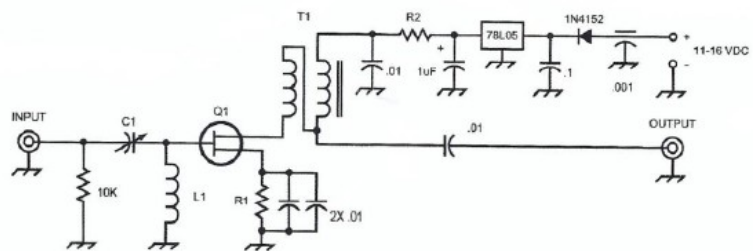
The Advanced Receiver Research, model P432VDG, preamp has been the "go to" workhorse for hams for at least 30+ years. The Boulder hams used them in our ATV repeater going way back to the 1990s. Their web site (www.advancedreceiver.com) doesn't give a whole lot of info about it. The total specs. listed there are: 0.5 dB noise figure, 18 dB gain, +12dBm (-1dB gain compression), 30 MHz BW, GaAsFET, BNC std., \$120. A Google search for this amplifier reveals an excellent review of it

by Matthias Bopp, DD1US. See his web site (www.dd1us.de) There he shows photos of the inside, the detailed manual with schematic and his test results.

While wondering what to put into this newsletter, I decided perhaps a comparison of the older discrete FET transistor preamps such as the ARR, P432VDG with the newer MMIC integrated IC preamps might be in order.

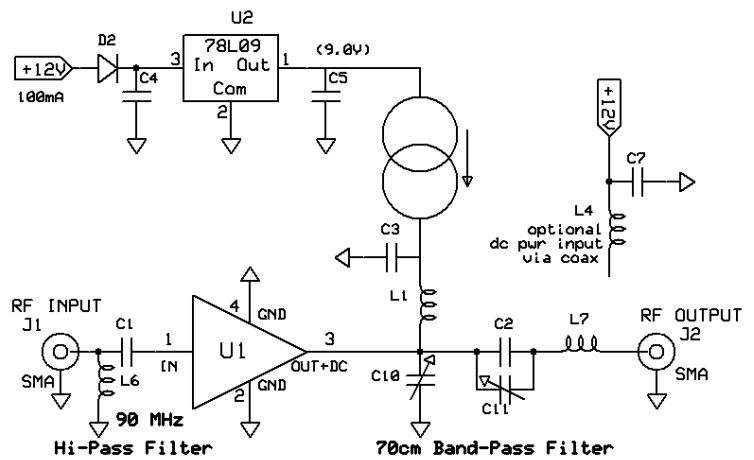
I had kicking around the ham shack one of those ARR preamps which we had used in years past, so I tested in on Don, N0YE's, Hewlett-Packard HP-8970A Noise Figure Meter with a NoiseCom NC-346N Noise Source head. I ran all my tests in the center of the 70 cm band at 435 MHz. I was quite disappointed in the noise figure I measured. It was in excess of 2 dB ! So I proceeded to try retuning it on the HP NF meter. I first retuned it for max. gain at 435 MHz, this still resulted in a 2.0 dB NF. I then carefully tweaked the only trimmer cap in the preamp for minimum noise figure. The best I was able to achieve was 1.14 dB. This was a far cry from the ARR spec. of 0.5 dB, but more constant with what Matthias measured on his ARR preamp. I then left the tuning at the best NF setting for the remaining tests.

Here is the schematic diagram for the ARR P432VDG preamp. Available from Matthias's article. It is a single FET transistor amplifier using an MGF-1302. It only has a single tuned circuit on the input consisting of the trimmer cap, C1 and L1. The output is an un-tuned transformer. So obviously only one degree of freedom for tuning and optimization of noise figure.



P432VDG schematic diagram

For the KH6HTV 70-LNA, this is the generic circuit diagram. Rather than just a simple FET transistor amplifier, it instead uses a more modern MMIC gain block module. The MMIC is extremely broadband, has low noise figure, and good input/output Z match.



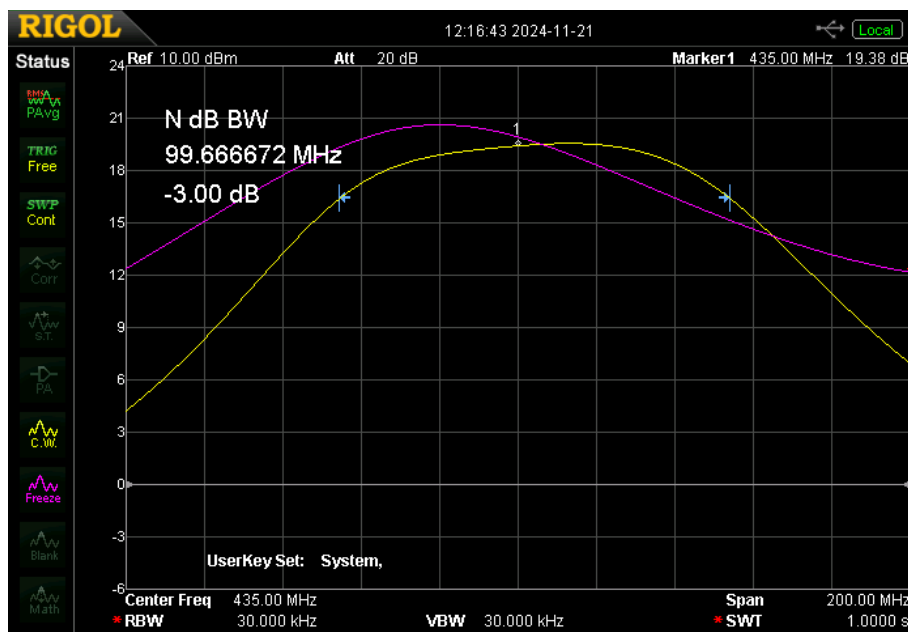
70-LNA schematic diagram

low frequencies, to avoid overload by those signals, a 90 MHz high-pass filter is on it's front end. On the output side, is a two pole, 70cm band-pass filter consisting of a parallel tuned and series tuned L-C filter.

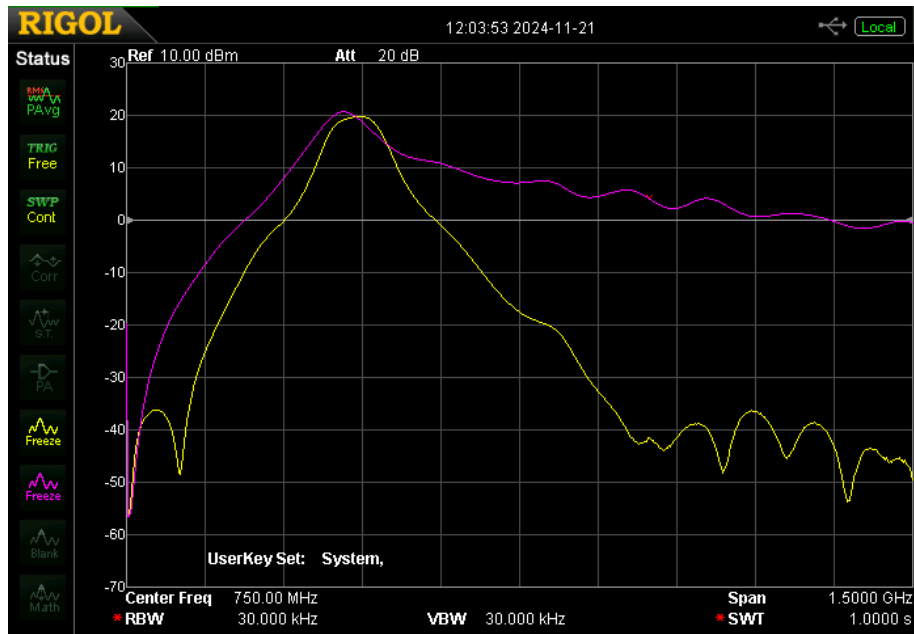
Measured Performance of 70 cm Pre-Amplifiers

(*) measured at 435 MHz unless noted

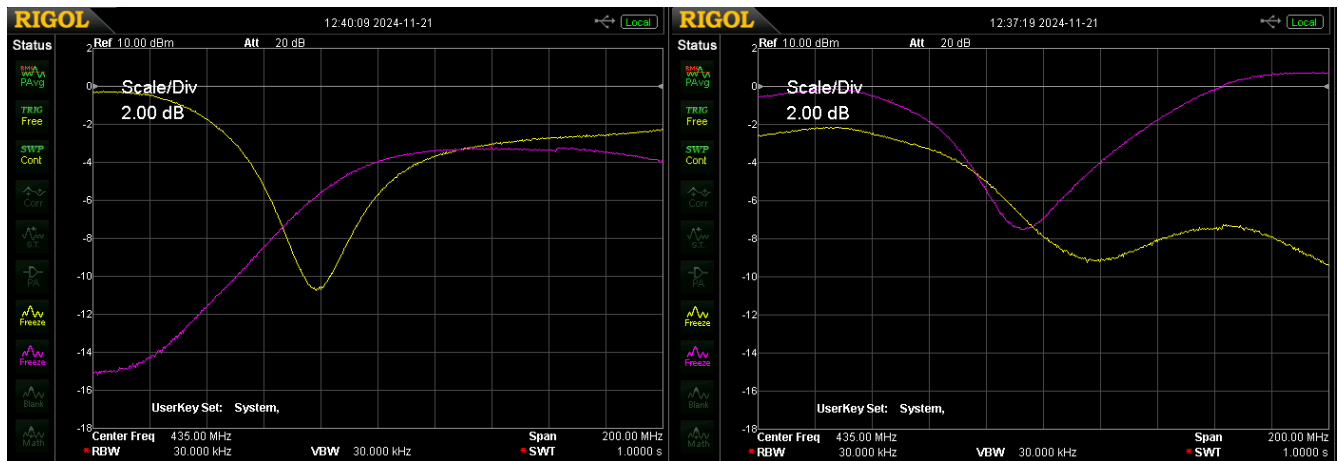
PARAMETER (*)	Advanced Receiver Research P432VDG s/n 1711	KH6HTV Video 70-LNA s/n 121
Noise Figure	1.14 dB	0.80 dB
S21 Forward Gain	19.7 dB	20.0 dB
S21 -3dB Band-Width	89 MHz	100 MHz
P(-1dB gain compression)	+12 dBm	+20 dBm
S21 isolation (150 MHz)	-9 dB	-25 dB
S21 isolation (915 MHz)	+5 dB	-35 dB
S21 isolation (1270 MHz)	+1 dB	-44 dB
S11 Input Return Loss	-6 dB	-8 dB
S22 Output Return Loss	-4 dB	-7 dB
S12 Reverse Gain	-30 dB	-30 dB
DC Power Requirement	30 mA @ 12Vdc	100 mA @ 12Vdc
Connectors	BNC	SMA
Price	\$120	\$90



S21 Gain in 70cm Pass-Band. 435MHz center frequency, 200 MHz span, 3dB/div & 20MHz/div.
Yellow trace is 70-LNA. Magenta trace is P423VDG.



S21 Gain 750 MHz center frequency, 1500 MHz span, 10dB/div & 150MHz/div.
 Yellow trace is 70-LNA. Magenta trace is P423VDG.



P432VDG

70-LNA

Return Loss Measurement in 70cm band: Yellow trace is S11, input RL. Magenta trace is S22, output RL. 435 MHz center frequency, 100 MHz span, 2dB/div & 10MHz/div

WOBTB 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/>

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. 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

FREE -- P.C. Electronics model TXA5-70S (but hand-written label on board of "33"). This was a \$1 mystery box Don, N0YE, picked up at the local BARC swap-fest. Nice hand made metal enclosure with two SMAs labeled as Video In & RF Out. Removing cover disclosed the pc board inside. Testing on Rigol spectrum analyzer revealed it to not be a 70 cm, but actually a 33cm transmitter board. Frequency synthesized on (4) channels: 910.25, 911.25, 913.25 & 923.25 MHz. Don is giving it away free to an interested ATV ham who is willing to give us \$15 cash for the \$11 priority mail postage and hassle of going to the post office during Xmas season. Interested? -- send email to kh6htv@arrl.net



**Items for Sale
or Give-Away
Lots more -- check out
our web site.**



ICOM HM-133V MICROPHONE



8" MITUTOYO DIAL CALIPER