Boulder Amateur Television Club
TV Repeater's REPEATER

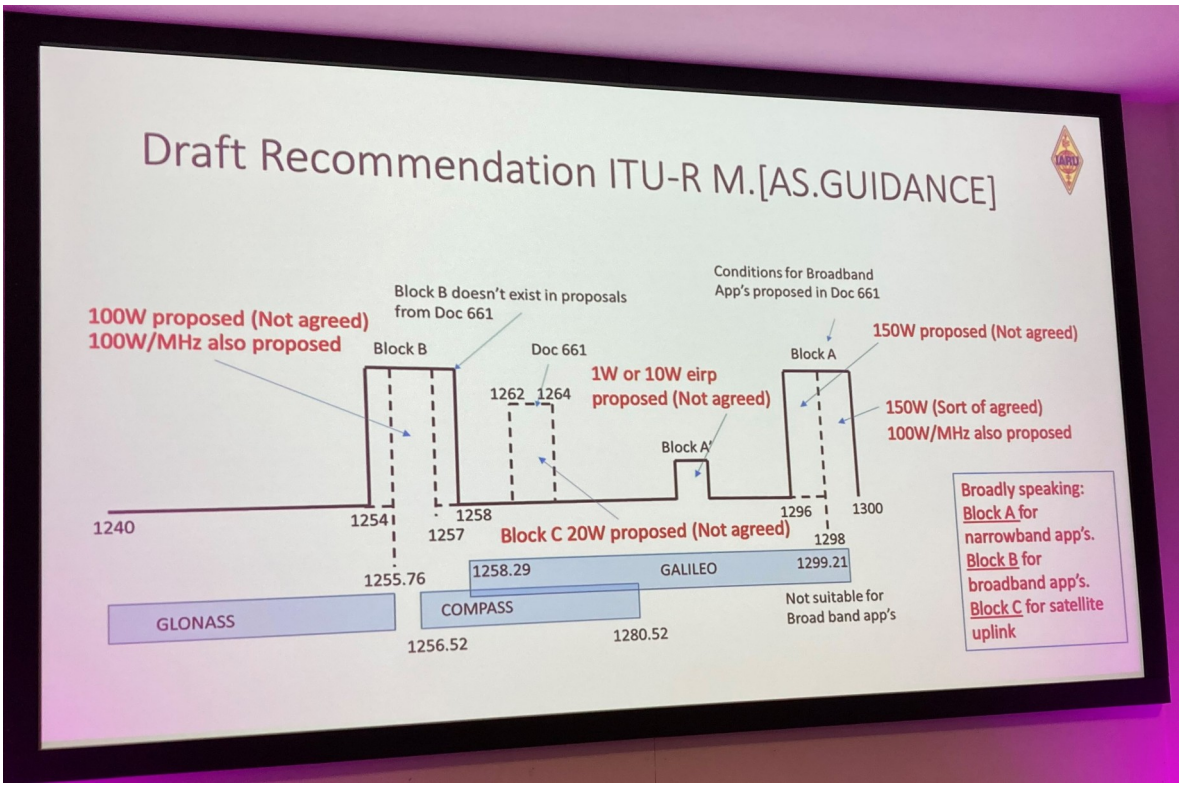
May, 2023
issue #130

BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

ATN
The Amateur Television Network

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



ROCKY ROAD AHEAD for 23 cm BAND !

Amateur use of 23 cm (1.2 GHz) band may become restricted soon

Burt Guillot, N7CS, Marysville, Washington has just alerted us to some very significant developments concerning our amateur 23cm band. Burt wrote -- "I found a discussion about the future of 23 cm (1.2 GHz) here:
https://forum.batc.org.uk/viewtopic.php?f=91&t=8436&sid=3f6fda9692e3edab3e39631a82744971

For background: Current amateur 23 cm allocation is on a secondary basis from 1240-1300 MHz and allows any emission type up to 1500 Watts. Amateur secondary usage of 23 cm band threatens GLONASS (Russia), Galileo (Europe), and Compass (China) satellite navigation systems. Rather than completely remove the 23 cm allocation from amateurs, the ITU-R appears to be making the following proposal for compromise (*which is not yet approved by any countries/entities*):

1. [Block B] Allow 1254-1258 MHz (4 MHz total bandwidth) to be used for “broadband” (video/DATV) amateur uses, restricting power to 100 Watts. This is not enough bandwidth for any analog ATV repeaters (FM, VSB, AM double sideband), nor standard 6 MHz wide, DVB-T digital channels (but would fit a lower bandwidth DVB-T channel).
2. [Block A] Allow 1296-1300 MHz (4 MHz total) to be used for narrowband applications (voice, narrowband data, EME, etc.) restricting power to 150 Watts.
3. [Block A'] Allow 1293-1294 MHz (slice for voice repeaters, with max power restricted to 1 Watt.
4. [Block C] Allow 1260-1262 MHz to be used for amateur satellite uplinks, restricting power to 20 Watts.
5. For any other frequencies in the band, max power would be limited to 500 mW.

This is still all in flux, but it sounds pretty disappointing (unfortunately, it’s the best-case scenario). This work is being done assuming a worldwide implementation, but ultimately the FCC would need to weigh in on how they would plan to implement it in the US. It’s also possible I may have misunderstood something from the video, so if anyone has additional clarity on this, feel free to reply with any corrections."

Information from ARRL on this topic can be found here:
https://www.arrl.org/news/iaru-holds-first-2023-meeting
https://www.iaru.org/wp-content/uploads/2022/11/R19-WP5A-C-0670MSW-E.docx
73, Burt Guillot, N7CS, Marysville, Washington

BATC 23cm VIDEO etc:

There is also more about this 23 cm topic on the BATC Forum web site. We are reproducing here, Noel, G8GTZ's comments from there.

Barry Lewis, G4SJH, gave an update at the Martlesham Round Table last weekend on the negotiations ahead of WRC23. A video of Barry's presentation is available here:

https://www.youtube.com/watch?v=0DnixRmJ0Hk

It should be noted that these are all proposals that might/maybe/could possibly be put to the WRC for approval and there is plenty of time for changes between now and the conference. What that means is this presentation should be taken as an indication of the way things are headed but it will probably change significantly (but probably not for the better) between now and the end of 2024 when it is envisaged OFCOM (*i.e. the U.K.s FCC*) will implement any changes.

It currently looks like we will lose access (we never actually owned it) to a large portion of 23cms below 1300MHz but potentially retain two, 4 MHz slots - one centered on 1256 and one at 1298 MHz. What this means is that FM ATV operation will no longer be possible below 1300 MHz, however, we would be able to operate Digital repeater inputs around 1256 MHz. UK repeater outputs above 1300 MHz are not affected by these changes, however there are other potential changes in the pipeline which may mean FM operation above 1300MHz will not be possible.

It would seem sensible for operators not to invest too much money in 23 cms equipment at this point. And UK ATV operators should be pleased that we are the only country that has access to 1300 to 1325 MHz - ATV operators in the rest of the world are in a far worse position. Repeater groups affected by any changes in the future would be able to apply to the BATC bursary fund for potential funding of equipment purchases to migrate to digital and move input receiver frequencies.

Before asking too many questions and to understand the complex background behind all this please watch Barry's video - and while we are at it we should give a big round of applause to Barry who is doing this entirely as a volunteer. His work and that of other members of the spectrum management team are funded by the RSGB - I think that's a good use of my RSGB subscription!!

73 de Noel - G8GTZ, Basingstoke, England

Editor's Note: *From our 23 cm band experience here in the Denver metro area of Colorado, ATV is not a factor causing local RFI. What really is the real BIGGIE here for creating really wide-band, high power RFI on the 23cm band is the presence within the 23 cm band of U.S. government, FAA radars. Granted they fall under the classifaction of "Radio Location" service and are the designated primary users. We are designated as "secondary" users and per regulations, may not cause harmful interference to primary users and must accept interference from stations in the primary service.*

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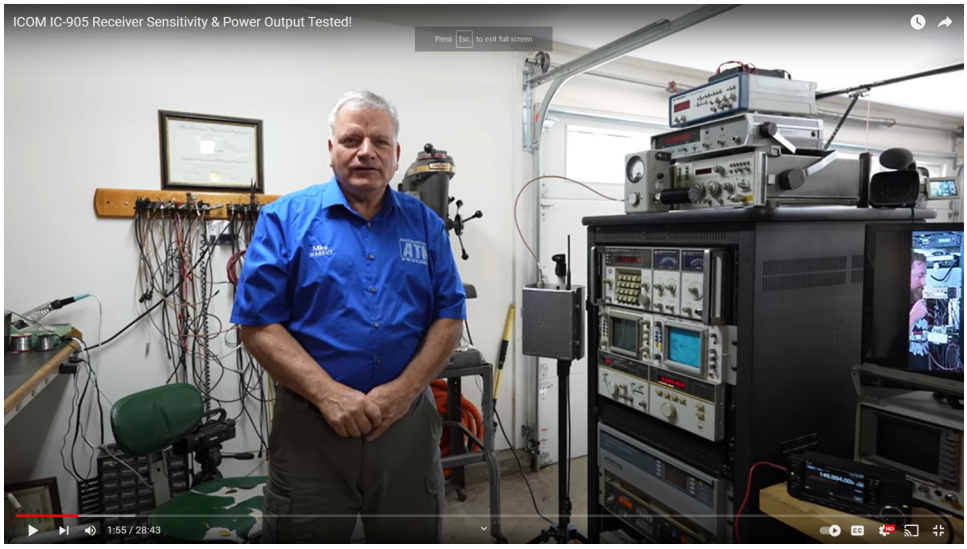
Who said 24 GHz TV QSOs were next to impossible on the sea?

Here is a one-way QSO made on the sea, with part of the route obstructed by a summit, with only 0.8 Watt, at the end of the afternoon and in the middle of April.

This is encouraging. Get to work buddies! To date, all DATV world records, from 430MHz to 24GHz are in the hands of the Italians. Description and profiles here, including other world ATV records: ***http://www.hb9afo.ch/records/default.htm#24_GHz***

73 de Michel, HB9AFO, Bussigny, Switzerland

Editor's Note: *Looking over Michel's tabulation of long distance ATV DX records we find the following: (70cm) 4041km (analog, 1994 Hawaii to California), 902km DATV, (23cm) 906km DATV, (13cm) 906km, (5cm) 902km DATV, (3cm) 906km DATV & 1564km analog*



ATN Stars on You-Tube with NEW IC-905

Mike, WA6SVT (photo above) & Gary, W6KVC wring out testing of the specs. on the NEW Icom IC-905, microwave transceiver. Check out this 1/2 hour You-Tube video showing them put it thru it's paces. ***https://www.youtube.com/watch?v=4ymjoAxIpnw***

Use the Icom IC-9700 as a DTV Receiver:

Justin, G8YTZ, sends a note --- Check out this You-Tube video. ***https://www.youtube.com/watch?v=dcIgPK6_qH4***
It shows how the PTRX-9700 installed in an ICOM IC-9700 solves all your digital TV reception problems. The video shows a demonstration with the BATC Minitiouner, plus this solution offers a sound method of receiving DVBT/T2 on 23cm. Skip to the end to see the demonstration, the first part of the video shows you how to install the board into an IC-9700. --- Justin is the trustee for the GB3JV ATV repeater for Petts Wood and south-east London.

Use IC-9700 or IC-705 as a 1.2 GHz Downconverter to Receive Analog or Digital ATV:

Check out this interesting mod from

RadioSpectral.compoll. RadioAnalog.com has a similar product. Whereas it was designed to provide an IF output for an SDR waterfall, it can also provide an IF output to a DATV receiver or analog TV. Some SDRs may allow DATV reception AND a waterfall capability. The 1.2 GHz IF frequency is 320 MHz on IC-9700. The unit also provides an on-frequency output on 2m and 70cm (for example, 434 MHz) for ATV reception. Cost is $228 for RadioSpecral version and $329 for RadioAnalog version. They are available on eBay and Amazon. I'm still investigating but will probably buy one of these for my IC-9700 soon.

https://github.com/radiospectral/ICOM-IC-9700-Panadapter
https://www.radioanalog.com/

It is highly likely they will come out with an IC-905 version at some point.

Regards, Rod Fritz, WB9KMO, Mesa, Arizona

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SMD Soldering - FEED-BACK:

Jim --- Tnx for your write-up in the latest ATV Newsletter. I agree that the article in May QST would be more of a deterrent to using SMD components the way he presented his technique using the smallest SMD units. Your approach with larger SMD units is friendlier.

73 de Cliff, W7CGA, Box Elder, S. Dakota

Jim --- I found it interesting that the procedure and tools you describe for SMB assembly was basically how I did it at work, at Bell Labs. We never used paste and a heat gun. The only difference is that we used 0603 parts almost exclusively. Thanks for the issue, as always! --

73 de Pete, WB2DVS, Boulder, Colorado

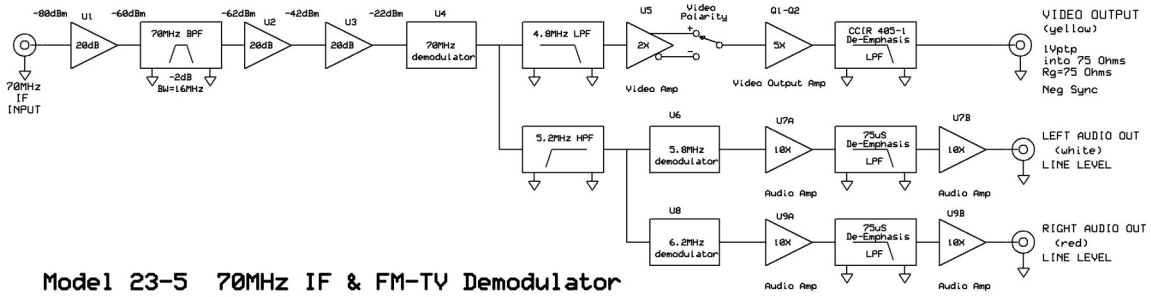
I agree with all of your comments regarding this. When I was working we had a fully automated PCB line in our manufacturing area and they, of course, used solder paste. In engineering we had manufacturing build our boards for us but we did all modifications and prototyping using the methods you described. We worked with 0402 parts and some 0201s but we had expensive stereo microscopes and expensive soldering irons (and younger technicians). To remove pars we had a large selection of special soldering iron tips that conformed to the ICs that we used. Our repair department had an expensive automated hot air rework station for replacing BGA or other large ICs. This is, of course, out of the reach for hams.

I use the methods you described, as well, here at home and have build quite a few and some very dense boards that way. I find I am able to work with parts to 0603 and ICs to TSSOP but usually use 0805 and SOP ICs when possible. I find the key is as much having small diameter solder for the smaller parts (0.4mm - not cheap) as well as a small soldering tip. To remove a 2 terminal part I use 2 soldering irons and simply lift the part off of the board. To remove a DIP IC I put a large tip on one soldering iron and coat one side with solder and lift (slightly bend) one side of the IC up a bit and then wick the excess solder up. I then repeat the process on the other side of the IC and lift it off of the board. I have never damaged and IC or PCB this way. I have also successfully soldered down some very small pitch ICs that have the ground pad that is hidden under the IC package. I do this by including some (or one) larger plated hole(s) under the IC and a ground pad on top, then solder the ground pad from the bottom of the board through the hole(s) after the pins of the IC have been soldered down.

I often find that the recommended PC pads on the data sheets for parts are usually intended for automated production and I frequently extend the pads out from the part a bit to make it easier to solder. I believe that KICAD has the option for these kind of shapes built in but don't use that program. I sometimes used patterns from a library but usually build my own patterns. I also print out the final Gerber files 1:1 and place any new parts on there to verify that the pattern is acceptable.

Another problem with using solder paste is that it has a fairly short shelf life (a few months). That will often mean having to purchase fresh solder paste for each new project and throwing a lot away.

73 de Steve, WA0TQG, Boulder, Colorado



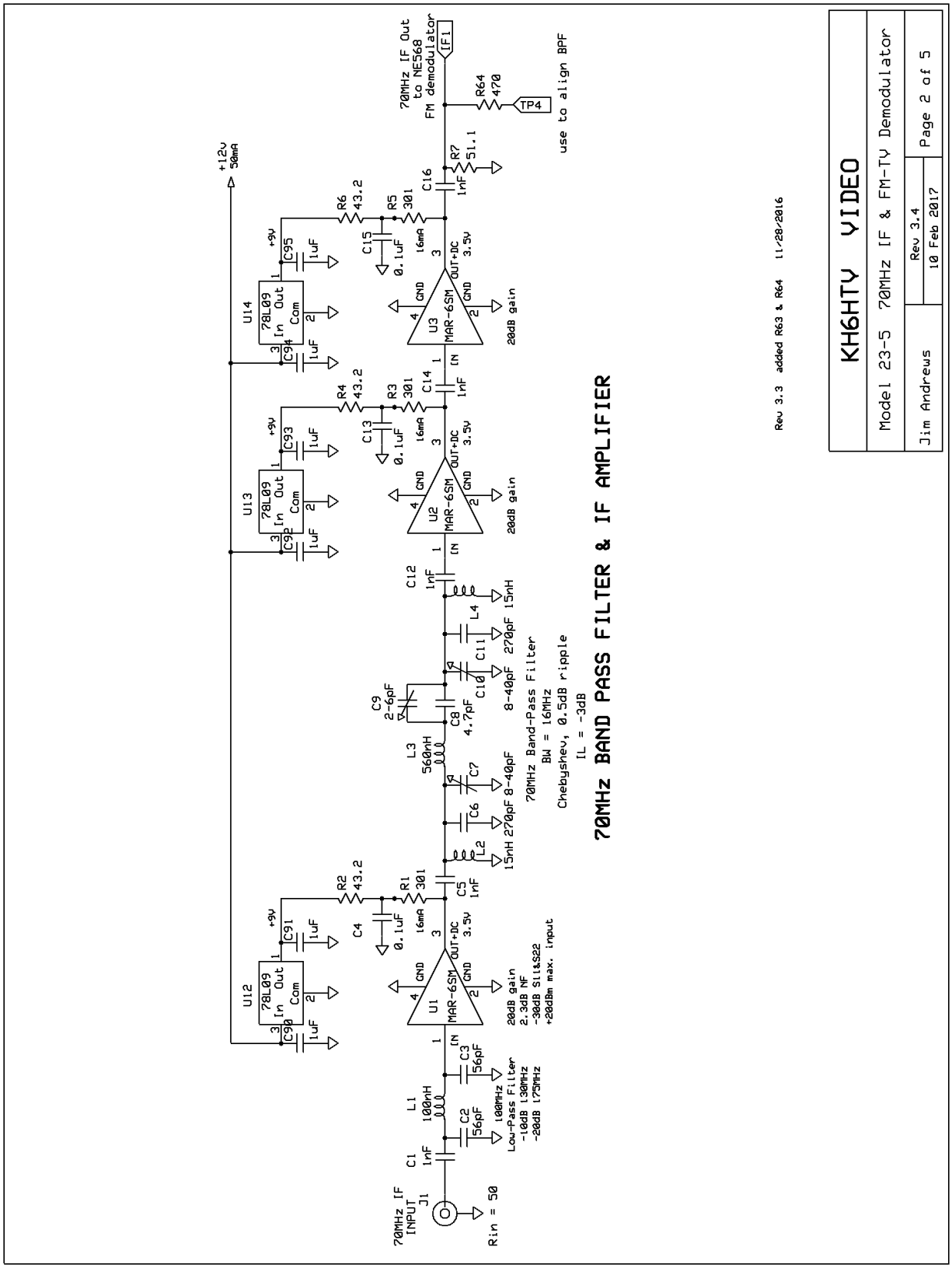
Model 23-5 70MHz IF & FM-TV Demodulator
BLOCK DIAGRAM

FM-TV Demodulator Circuit Details:

Back in March (issue #126), we discussed the overall design concepts of an FM-TV demodulator. We promised to provide more details in later newsletters.

The model 23-5 FM-TV demodulator consisted of a high gain, 70 MHz IF amplifier followed by a video FM demodulator and a pair of audio FM demodulators. It was intended to be used with a microwave down-converter with an IF output of 70 MHz.

For this newsletter issue, we will discuss the IF amplifier design. The schematic diagram is shown on the next page. For an FM receiver, we want a lot of IF gain to provide limiting on the output to strip off most of any residual AM on the incoming IF signal. This IF amplfier has about 60 dB of gain provided by three MMICs, each providing 20 dB gain.


70MHz BAND PASS FILTER & IF AMPLIFIER
70MHz IF INPUT J1
Rin = 50
Low-Pass Filter
-10dB 130MHz
-20dB 175MHz
20dB gain
2.3dB NF
-30dB S11&S22
+20dBm max. input
70MHz Band-Pass Filter
BW = 16MHz
Chebyshev, 0.5dB ripple
IL = -3dB
20dB gain
20dB gain
70MHz IF Out to NE568 FM demodulator
use to align BPF
+12V 50mA
Rev 3.3 added R63 & R64 11-28-2016
KH6HTV VIDEO
Model 23-5 70MHz IF & FM-TV Demodulator
Jim Andrews
Rev 3.4
10 Feb 2017
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70MHz IF Band-Pass Filter response. Center frequency is 70 MHz. Sweep from 45 to 95 MHz, 3dB/div & 5 MHz/div. Pin = -80dBm, IF amplifier gain = 59dB, -3dB bandwidth = 16.2 MHz.

For the MMICs, I used Mini-Circuits MAR-6SM. It is a popular device among hams. It is a broadband amp with 20 dB gain up to about 2 GHz. Excellant S11 & S22 return loss. Reasonable 2.3 dB noise figure. The device voltage / current is 3.5 V and 16 mA. It is intended for small signal applications as the max. rf output power (-1dB gain compression) is only about +4dBm.

The recommended power supply circuit for the MAR-6SM was to use a +9 Vdc supply and a 340 Ω series bias resistor to feed dc power to the output terminal. Rather than use a single +9 V voltage regulator, you will note in the schematic that I instead used three, 78L09 regulators. One for each MMIC. I did this to enhance the isolation on the power rail between the MMICs. Trying to power a 60 dB gain amplifier from one single power supply runs the risk of having an oscillator instead of an amplifier. Extra rf filtering was provided for each MMIC by breaking the 340 Ω into a 301 Ω and 43 Ω and using a 0.1 μF bypass capacitor.

The model 23-5 was designed to work with 4 MHz deviation FM-TV. Thus the required band-width was about 16 MHz. In the intitial design, I first tried to use a commecial 70 MHz band-pass filter from Mini-Circuits. But I was not happy with it's performance. I found that it's center frequency was not 70 MHz as advertised, but was 75 MHz. I got zero reply from Mini-Circuits when I complained about this. Thus, I designed my own 70 MHz, 16 MHz BW, Chebyshev band-pass filter. I found that it worked quite well and saved considerable $$ over buying the BPF from Mini-Circuits. To enhance the stop-band rejection, I also added a 100 MHz, low-pass filter to the input of U1. The above photo shows the resultant measured frequency response of the 70 MHz IF amplfier.

73 de Jim, KH6HTV, Boulder, Colorado

W0BTV Details: **Inputs:** 439.25 MHz, analog NTSC, VUSB-TV; 441MHz/6MHz BW, DVB-T & 1243 MHz/6MHz BW, DVB-T
Outputs: Channel 57 --- 423 MHz/6MHz BW, DVB-T, or optional 421.25 MHz, analog VUSB-TV. Also, secondary transmitter, FM-TV output on 5.905 GHz (24/7).
Operational details in AN-51a Technical details in AN-53a. 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*).

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