NERG NEWS

North East Radio Group Inc
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Incorporated 1985 Victoria Reg No A0006776V
Affiliated with the WIA
Editor – Greg VK3VT

Contents

DX Marathon

The NERG needs you to submit a log to the DX Marathon this year, we came 13th in the world last year. So if you worked some DX over the year them please submit a log, any score will help; point your browser to

www.dxmarathon.com for more details

If you are making a submission then make sure that you use QSO's that have been confirmed and check that the Zone matches the actual country the operation was from. Don't ask how I know!!

Log Deadline: January 5, 2025 (23:59Z)

December 2024

WHAT'S ON THIS MONTH?

Monthly meeting

Thursday 12th December - 6:30PM

NERG Christmas dinner – *At the hall, sorry bookings have closed.*

Every Thursday afternoon – Radio Café

At the hall – Commencing at 2:00pm

Come along and play with the radios, have a chat and a cuppa, bring your favourite nibbles. Last one for the year on Dec 19th.

Forth Tuesday of the month –

Gainfully Unemployed Group

Once again the group will be hosting our traditional Yum Cha lunch on 28th January 2025, partners welcome, venue to be advised - keep an eye out for the email with details. Note: this is a total cost divided by attendees affair!!

Kit Building and Testing plus Foundation Training and General Assessment Day

Saturday 22nd February 2025 Training commences at 9am, if you would like to attend or undertake an assessment for any licence class please let us know at :

training@nerg.asn.au

Kit day starts around 10am lunch will be available.

A Modular 6cm Transverter

Part 4 - LO Revisited Plus TX Chain.

By Paul McMahon VK3DIP

Bit of a bonus version this time as before moving on to the TX chain some changes necessitate a revisit of some of the earlier parts to account for a different ADF4350 module and the available pipe caps.

ADF4350 Module.

In part 2, I used one of the ADF4350 modules I had previously got. (see part 2, figure 1). Since then I happened to see another one available at an attractive price on AliExpress that appeared to use a considerably smaller PCB. The new version subsequently arrived (see Figure 1 - New Smaller ADF4350 Board.) and yes it was quite a bit smaller, and despite having ordered and paid for the ADF4350 version, the chip was clearly marked ADF4351. Bonus, the 4351 is a slightly improved 4350 same upper frequency but down to 35MHz rather than 135MHz, and with improved noise performance.

All was not however perfect, no data or schematic was provided, and even on the surface it had a 25MHz onboard crystal oscillator, and the power connection was via USB C. Closer inspection, and a search on the web for details, discovered other difficulties. Easily fixable once known was that the silk screening of the programming connector was incorrect with several pins swapped, not quite so easy was a strange setup with a switching transistor to I assume select power from the USB via the regulator, or directly via the 3.3V pin on the connector if present. The voltage drop across the transistor even when on made the 5V from the USB marginal for the 3.3V regulator, so the simplest solution is to just remove the transistor and replace it with a short on the C to E pads.

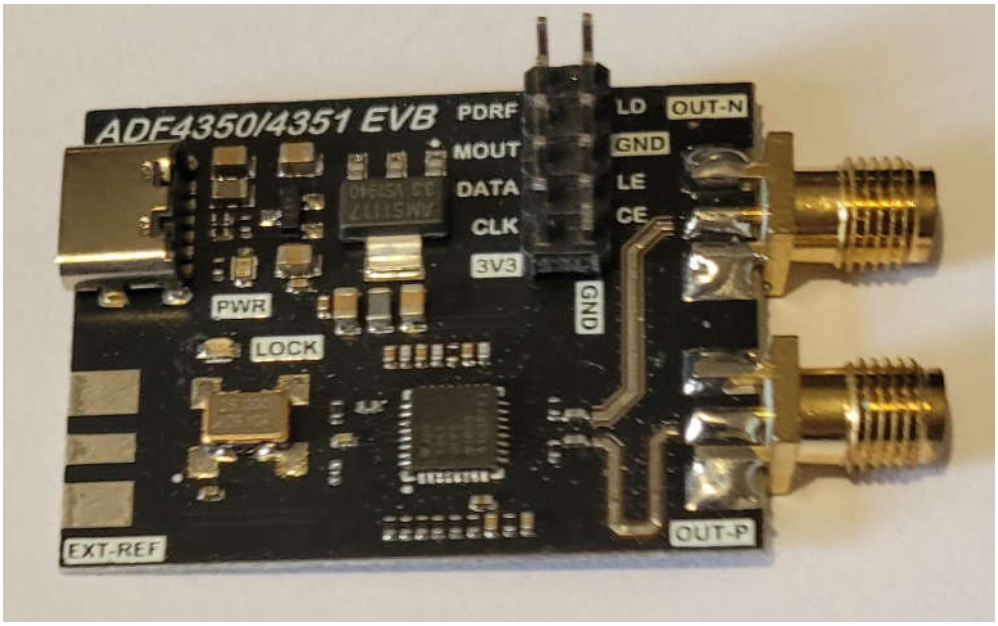

Figure 1 - New Smaller ADF4350 Board

So step one was to modify the board to remove the parts I didn't need, namely the 25MHz crystal, the switching transistor, the USB-C socket, and the Dupont header. I also removed the SMA connectors and replaced one with a longer thread version to assist with mounting in a box. Also done was a short from the C to E pads of the removed transistor, and provision of 49.9 Ohm resistors for the unused PLL output, and to terminate the reference input. The last change was to solder bridge the small (not present) resistor in the line in from the external reference. One of the steps along the way is shown in Figure 2 - Some mods done.

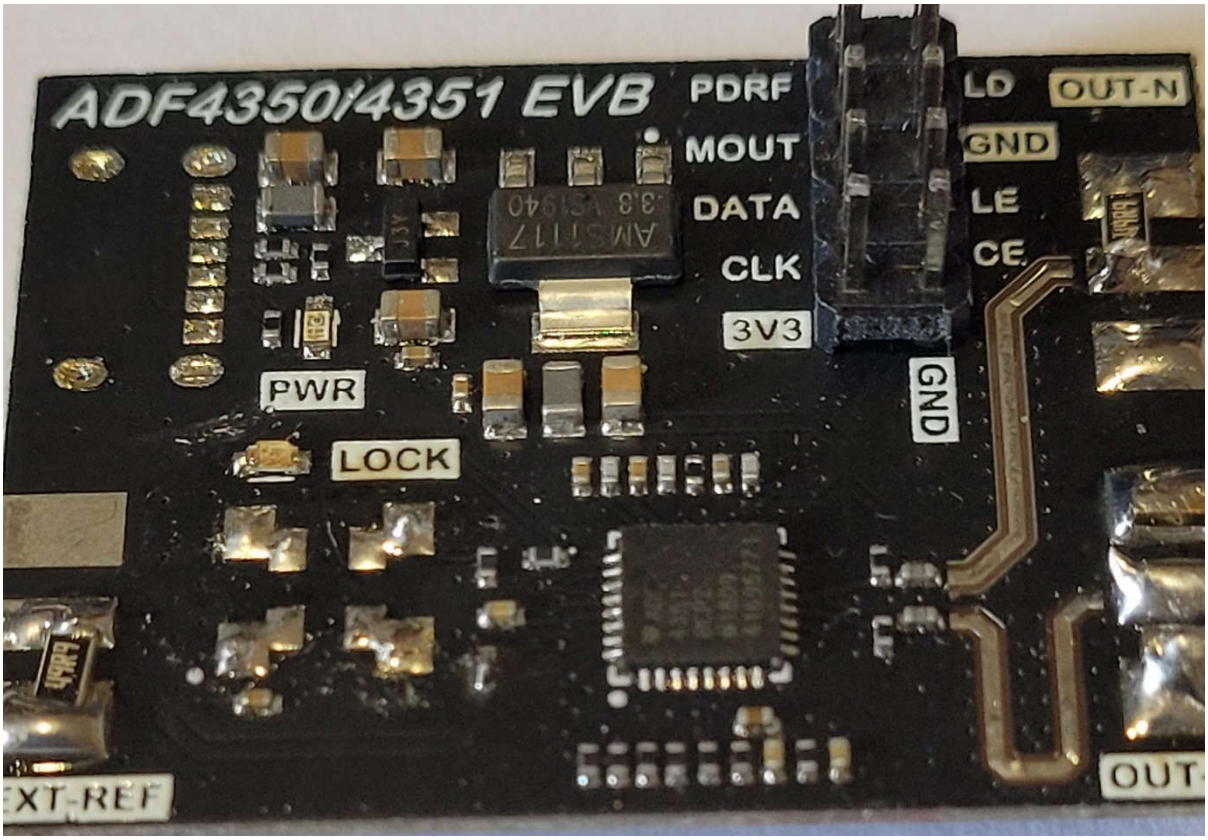

Figure 2 - Some mods done.

The final version after attaching the 12f629 programming board is shown in Figure 3 - Complete modification.

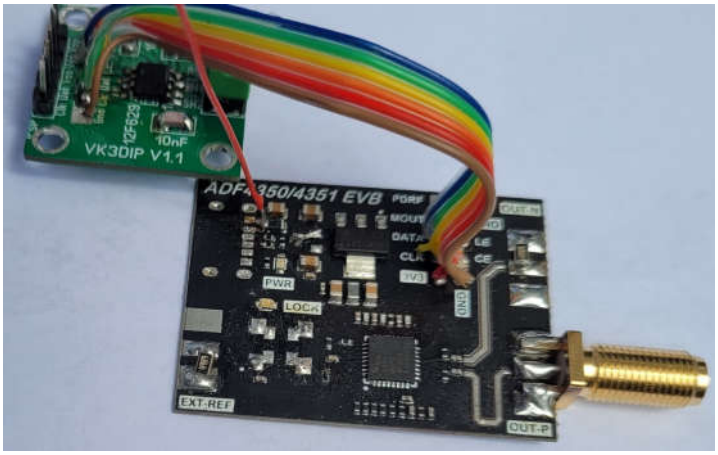

Figure 3 - Complete modification.

The main advantage of this version is that it fits nicely into one of the small square die-cast boxes available from Jaycar etc.. The empty box drilled and with some stand offs for the program board, and a feed-through etc. for power is shown in Figure 4 - Drilled Box.

Figure 4 - Drilled Box.

The finished unit all screwed in is shown in Figure 5 - Complete and in Box. Note: the external reference SMA connector was inserted after the board and soldered last in situ, otherwise it would be impossible to get the board in. The fact that the connector only just reaches is not a problem at the 10MHz reference frequency.

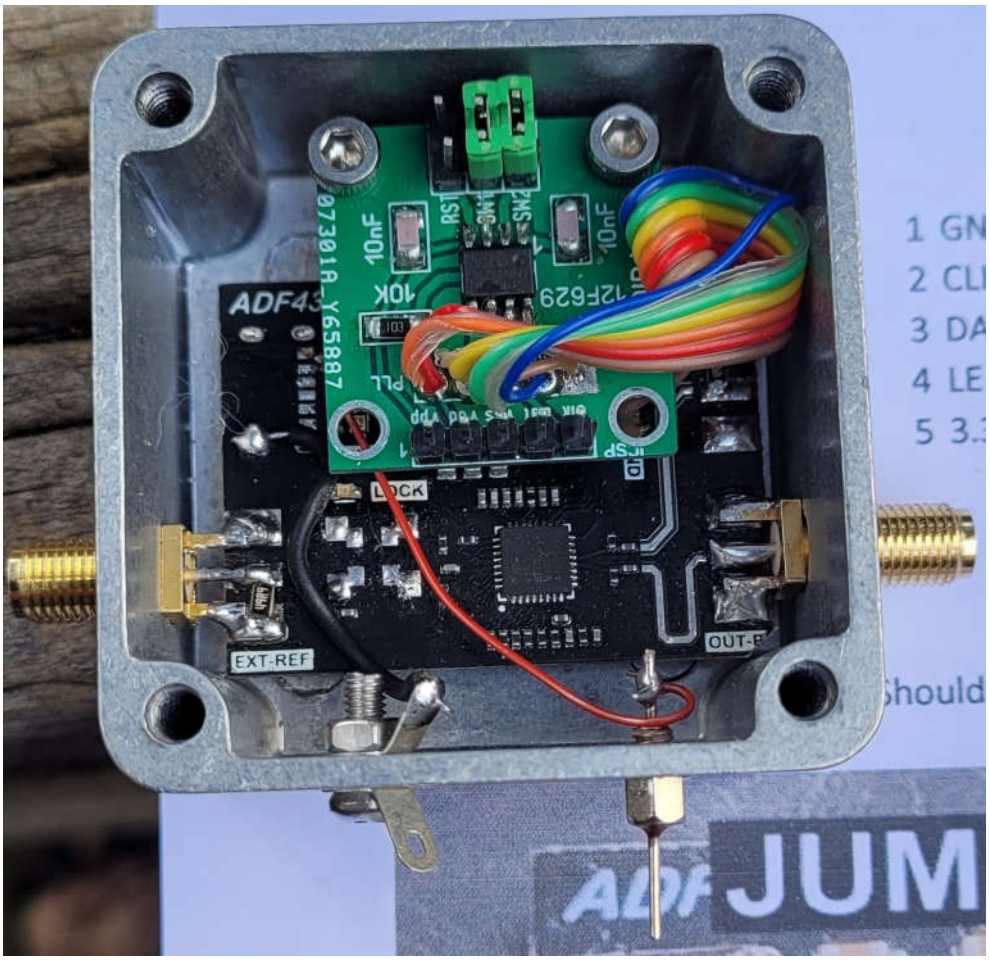

Figure 5 - Complete and in Box.

A quick test using another module being investigated (a cheap 10MHz OCXO board) is shown in Figure 6 - Testing new module., with all working fine. Note the blue lock LED, I could have left a hole in the box with perhaps a light pipe to display this with the lid on but didn't think it necessary.

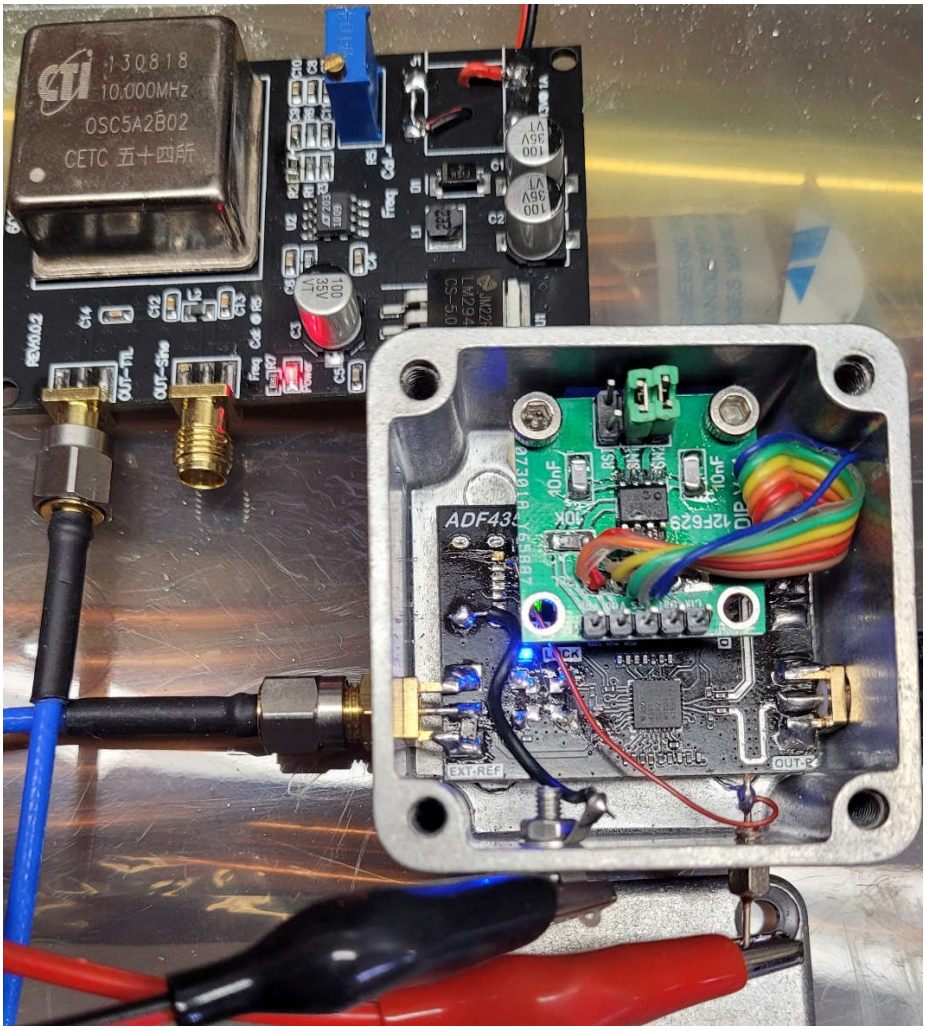

Figure 6 - Testing new module.

Basically, with the mentioned mods and changes, this smaller ADF435x module works very well for this application and the price was right. I would think that one of the reasons that it was relatively cheaper than the other versions was the previously mentioned problems and the number of people in the comments saying they didn't work as is. I don't know how long they will be available for, perhaps they are just clearing existing stocks. Note, the two jumpers on SW1 and SW2 on the programming board equate to 00 in the code which sets the ADF435x for 2665 MHz at maximum output.

Redoing the Pipe Caps.

As mentioned previously I had problems with obtaining suitable pipe caps from Bunnings. What I have ended up with doing is getting a jar of 50 of them from Amazon working out at about $2 each. The issue is however that these are from America so they are targeted at US Imperial pipe sizes. (See Figure 7 - US Pipe Caps.)

Figure 7 - US Pipe Caps

On the surface this shouldn't make much difference as both the old one and the new ones are nominally for what would have been called ¾ Inch pipe. However, while in the Australian case the ¾ Inch, or about 19mm, equates to the outer diameter of the pipe, and thus the inner diameter of the pipe cap, in the US case the ¾ inch is more for the inner diameter of the pipe so with different pipe wall thicknesses the outer diameter would nominally change. Obviously they don't want to have a large variety of different joiners for the same size pipe so at some stage someone obviously decided in the US case for nominally ¾ inch pipe to have an outer diameter of 0.875 inches. Bottom line for my new pipe caps the inner diameter is about the 0.875 inches or a shade over 22mm (exactly 22.3mm) which is significantly different from the 19mm in the previous Australian case.

To suit this larger diameter, we need to increase the diameter of the inner filter element to preserve the optimal impedance for highest "Q". (See Figure 8 - Cavity Description. from part 1).

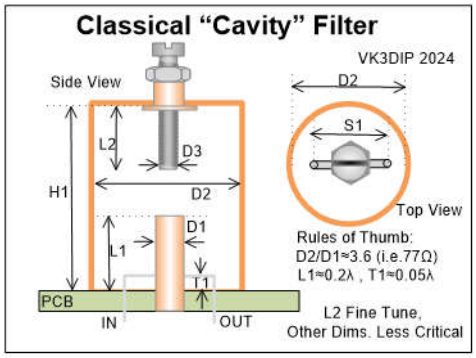

Figure 8 - Cavity Description

*You may have wondered in this figure where the 0.2λ came from for the length. You might have expected that the centre rod being in air would be a quarter wave (0.25λ) long to be resonant, but no there are significant end effects (capacitances etc.) which means that resonance will actually be obtained at somewhat less than 0.25λ. The 0.2λ came from tests on the first round of pipe cap filters where I experimentally found that I needed to make the rods some 20% shorter than the nominal free space quarter wave. Redoing the tests with the slightly larger newer pipe cap setup, I determined that the previous 20% may not be enough and a 25% factor would be safer (0.75 *0.25 or approximately 0.18λ, which still rounds up to the 0.2λ in the figure but remember it is actually 0.18λ). Note. As our tuning can only ever increase the end capacitance the frequency can only ever go lower so you need to have set the no screw frequency higher than you intend to tune it to.*

The changes necessary for both the 5330 MHz and 5760 case are summarised for the new pipe caps in the following table. (Table 1 - Filter dims..) The table values are pretty much the minimum you would need according to my tests but they should be reasonable. Feel free to make them a bit shorter if you want to be even safer.

Table 1 - Filter dims.

F (MHZ)	D2 (mm)	D1 (mm)	Zo	L1 (mm)	T1 (mm)	From Top (mm)	Total (mm)
5330	22	6.35(6.0)	75.08 (78.48)	10.55	2.62	7.93	11.55
5760	22	6.35(6.0)	75.08 (78.48)	9.76	2.42	7.34	10.76

You of course want to use as little capacitance as possible as more capacitances will effectively lower the "Q" however some will be unavoidable, but don't try and go too close as you could well end up having to open the filter and somehow shorten the centre rod. Put it another way, by increasing the capacitance (screwing the screw in) you can significantly lower the resonant frequency, but the filter response will also significantly broaden. Depending on the situation this may or may not be an issue, but whatever going higher and trimming down with the screw is the easiest way to go.

As a matter of interest, the actual data I used for the new pipe cap study is shown in the graph Figure 9 - Measured Resonances. As you will see the data is not perfect, so much depends on lack of sharp corners and other pointy bits, not to mention measuring the rod length after soldering in to even a tenth of a millimetre is tricky, so even if you are very careful you may well end up having to redo the filters.

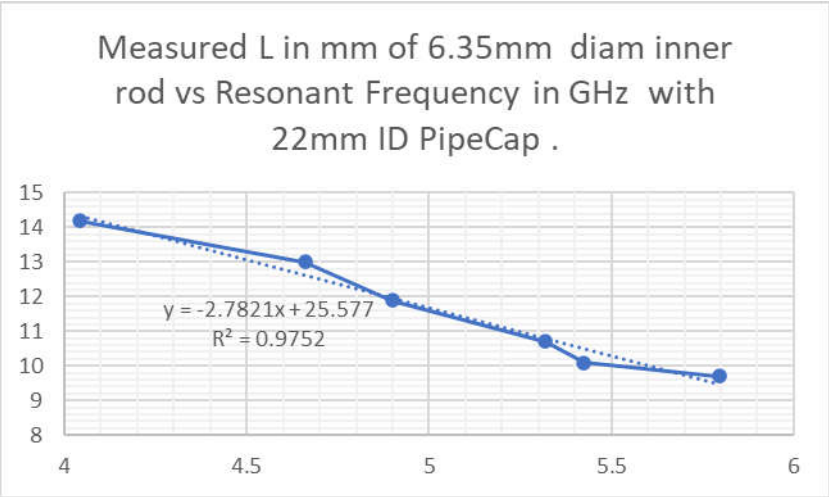

Figure 9 - Measured Resonances

Construction of the filters is best done by getting the centre resonator set first. Either cutting the length from a longer bit of ¼ inch pipe using a mini pipe cutter as seen in Figure 10 - Mini Pipe Cutter, or getting a bag from AliExpress of 100 copper wire joiners (see Figure 11 - Bag of Copper Tubes). The joiners are only 6mm diameter and 12mm long but this is enough even for the 5.33GHz filter.

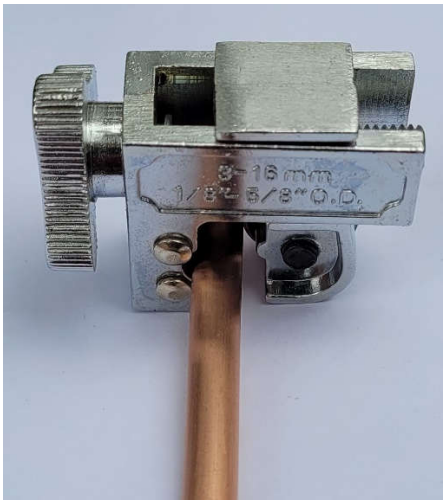

Figure 10 - Mini Pipe Cutter

Figure 11 - Bag of Copper Tubes

So long as the length is a bit greater or equal to the total length shown in Table 1 - Filter dims. the simplest method is to accurately measure down from the top to the tap point and mark it. Then using a drill press with say a 1mm drill bit, drill a hole through both sides for the tap. If you have some flux (not plumbers flux, the SMT repair type, I got some in a pen from Jaycar) coat the end that will be inserted in the board plus the tap holes. Then put a length of tinned wire through the tap holes. (see Figure 12 - Resonator centre.) The resonator is then inserted in the board far enough through so that the tap hole ends up the required distance above the board. The tap wire is bent down through the PCB holes and then the resonator is (carefully) heated with a small blow torch until touching it with some solder melts. The solder is then moved around the base and the tap wire carefully without moving the resonator position. Any extra resonator length will end up underneath the PCB where it doesn't matter.

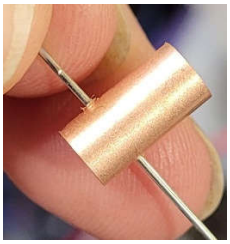
Figure 12 - Resonator centre.

The Pipe Cap has a 6mm hole drilled through the top centre and the thread insert is force fitted to this hole from the inside outwards. (See Figure 13 - Pipe Cap with Insert.)

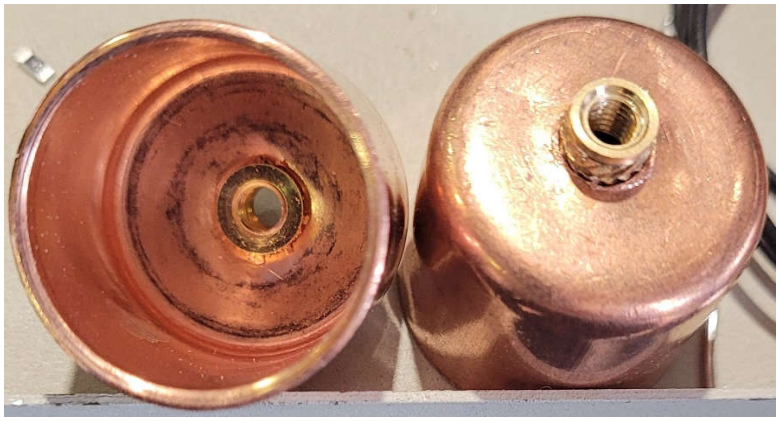

Figure 13 - Pipe Cap with Insert

The pipe cap is attached to the board once again using some flux and then the Blow Torch again. See Figure 14 - Using Blow Torch. Once the cap is hot enough to melt solder, solder is then applied both around the base/PCB joint and the cap/threaded insert joint. Don't keep heating the cap continuously or you will overheat it and possibly scorch/burn the PCB.

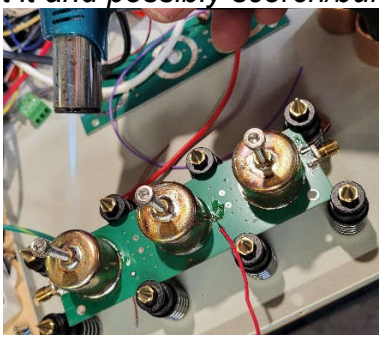

Figure 14 - Using Blow Torch

The FAFAF PCB.

The new slightly larger diameter Pipe Caps required a new PCB, and as I now knew from the previous part tests that I needed three filters separated by two amplifiers that's how I laid it out. Images of the board bottom and top are shown in Figure 15 - FAFAF Bottom,and Figure 16 - FAFAF Top.

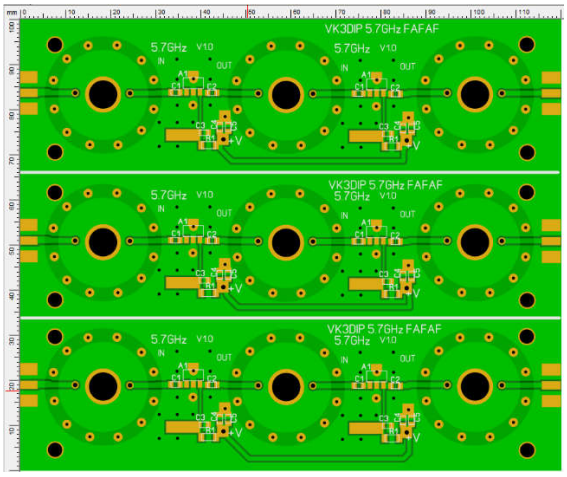

Figure 15 - FAFAF Bottom

As you will see I actually put three copies of the FAFAF (Filter Amplifier Filter Amplifier Filter) on the same 120x100mm PCB. As on the previous boards the pipe caps go on one side and the amplifiers go on the other, and the three copies are intended to be cut at the white lines and used separately.

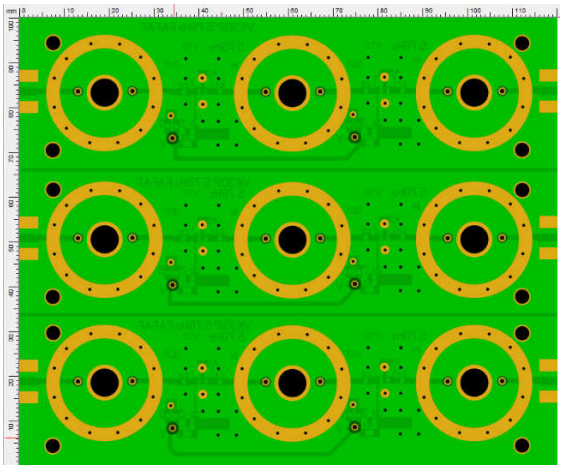

Figure 16 - FAFAF Top

In the typical transverter one FAFAF with 5.33GHz filters is for the LO, one with 5.76GHz filters is for the TX chain, and the final one also with 5.76GHz filters is for the RX chain.

Just for completeness's sake the schematic for each of the amplifiers is repeated here from part 1 (See Figure 17 - Amplifier schematic.)

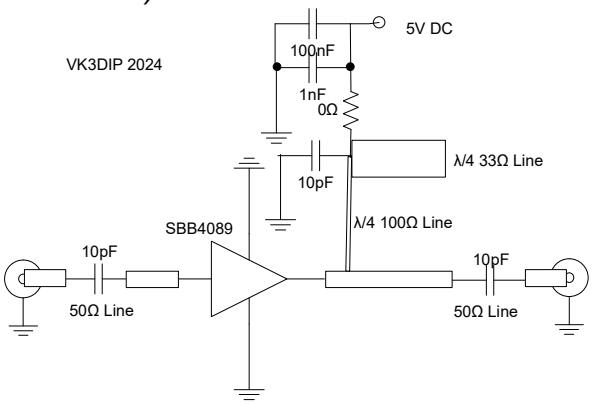

Figure 17 - Amplifier schematic

Figure 18 - Amplifier Close-Up shows a close-up of one of the amplifiers (all are the same). While the pads were laid out for 0805 size capacitors you can use larger sizes especially in the bypass case if that's what you have got. In the example shown I used a 1206 capacitor mounted on its edge for C5. The resistor R1 is 1206 and in the self-biasing SBB4089 MMIC case it is a 0 Ohm link.

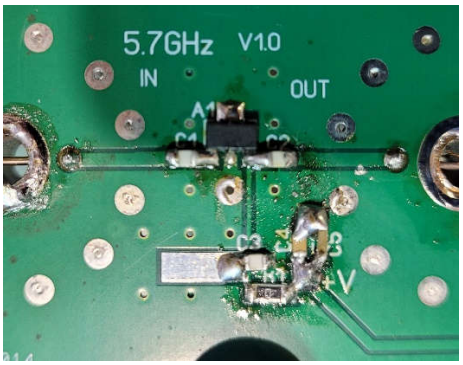

Figure 18 - Amplifier Close-Up

Before moving on to the TX chain proper Figure 19 - Testing the 5.33GHz FAFAF shows testing of the new 5.33GHz FAFAF. It easily provides the 13dBm needed by the mixer. Also shown is one of the older noticeably smaller filters.

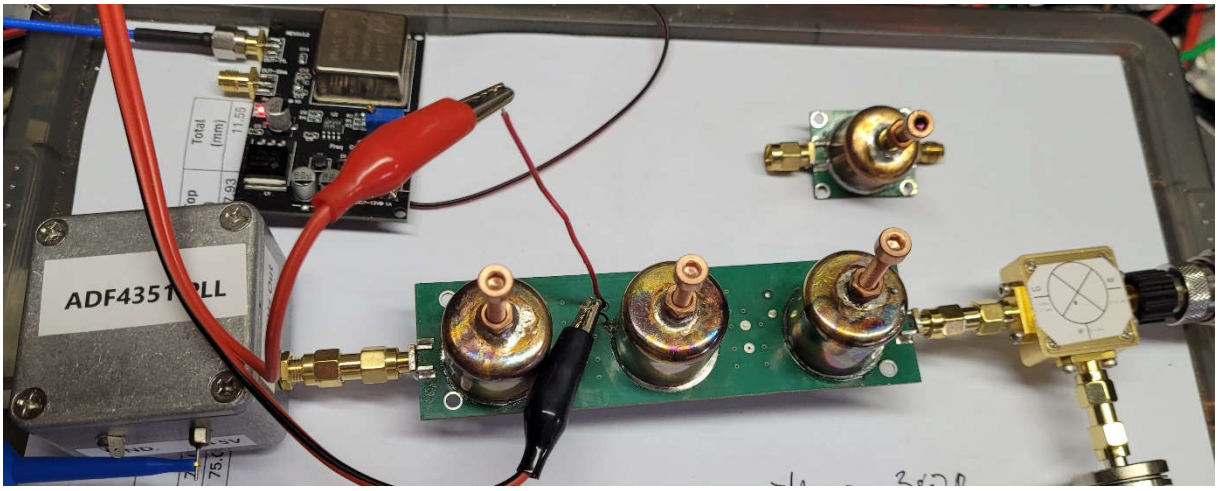

Figure 19 - Testing the 5.33GHz FAFAF

The TX Chain.

As mentioned above the TX chain uses another of the triple filter amplifier boards. This board is connected to the TX output of the switch and in turn feeds the power amplifier module. Construction of the FAFAF board is exactly as for the LO case except that the filters have slightly shorter central resonators as per Table 1 - Filter dims. before for 5760MHz.

Just to see the effect, this time I tried positioning the tap height down a bit, more like 1.5mm than the 2.5mm used previously. You can see this in the partially built version in Figure 20 - Partially Built Version with low Taps.

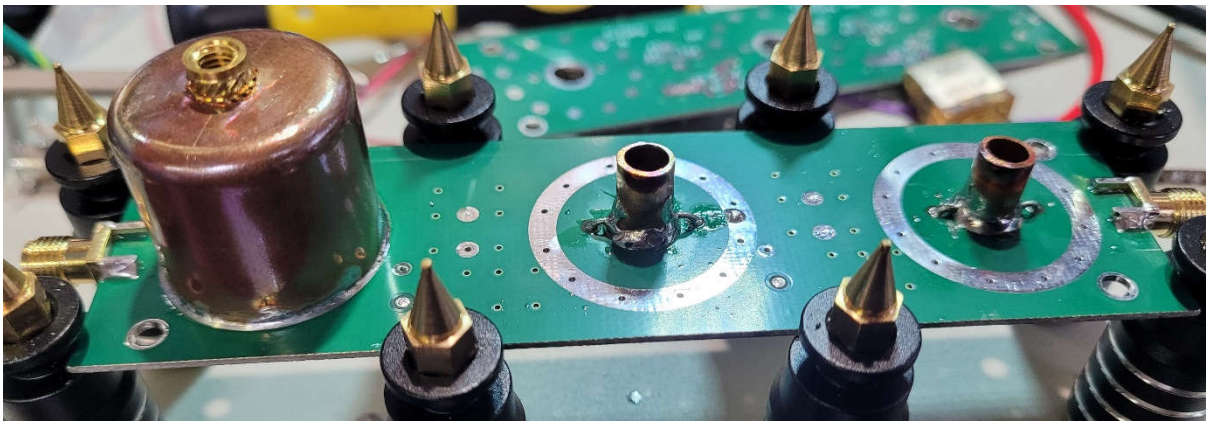

Figure 20 - Partially Built Version with low Taps

As would be expected the effect was to increase the filter losses while narrowing down the pass band. Figure 21 - FAFAF with Lower Taps shows the analyser response on the version tuned to 5.76GHz. You could of course stagger tune the three filters (i.e. have the three filters each tuned to slightly different frequencies) to produce a broader response with somewhat less mid gain.

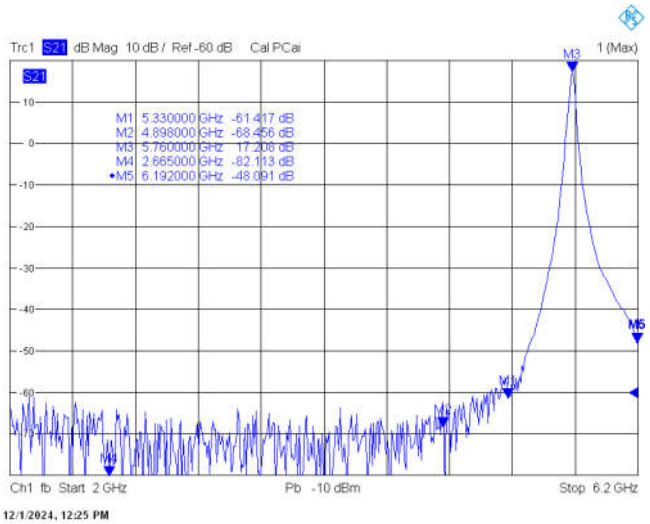

Figure 21 - FAFAF with Lower Taps

With this in the TX chain, all unwanted mixer products will be well down. It is also easily sharp enough for the RX case for rejecting the images in that case as well.

The power amplifier module to follow the FAFAF I used is a prebuilt one from AliExpress complete in a small die-cast box with SMA connectors. See Figure 22 - 5.7GHz 2 Watt PA. The instance I bought was around $24 including postage, search for "5.8Ghz 2W High Linear RF Power Amplifier"

Figure 22 - 5.7GHz 2 Watt PA

The PA is well made and internally consists of two stages, a SBB5089 (higher gain, not as flat over frequency, but only specified to 4GHz!, version of the SBB4089) and a Skyworks SE5004L. The SE5004L is intended for PA work in 5GHz WiFi so is very suited to the role here. The data sheet for the SE5004L headline output level is only 26dBm (slightly less than 500mW) for high speed/complex WiFi modulations. It does however list the P1dB level (for a CW signal) as 34dBm typical which is a shade over 2Watts so the claim on the box and advertising of 2W has some support. The inside of the box is shown in Figure 23 - PA Insides, the build quality appears good with the SBB5089 and the SE5004L both being marked as such. Two things to note are; the use of a USB C connector for DC power, and the small test point visible in the bottom right corner which is actually the output from a RF detector built into the SE5004L. The datasheet gives a curve for translating the voltage at this point into the power being outputted. This would be very useful for tune up etc. if you didn't have the appropriate test equipment for 5 and a bit GHz.

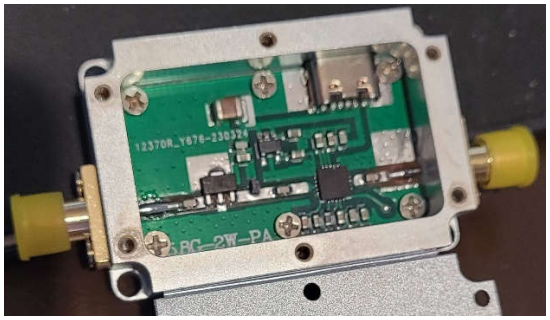

Figure 23 - PA Insides

Next Time.

I think that is probably enough for even this bumper issue. Next time I will look at the RX chain, no surprises it's the last of the three FAFAF boards with a prebuilt LNA module, and then bring the whole lot together and start fitting it into a box.

73 Paul VK3DIP.

Dec 2024 & Jan 2025 PLANNED DXPEDITIONS

Remember the NERG is trying to improve on our 13th place in the world club ranking in the DX marathon, we need your score to help us.

Start	End	Entity	Callsign
Nov 29	Dec 13	Marshall Is	V73WE
Nov 30	Dec 13	St Martin	TO9W
Dec 05	Dec 17	St Kitts & Nevis	V47NH
Dec 08	Dec 17	Belize	V31CN
Dec 08	Dec 18	Br Virgin Is	VP2VMM
Dec 09	Dec 17	Maldives	8Q7RL
Dec 10	Dec 15	Vanuatu	YJ0CA
Dec 11	Dec 18	St Kitts & Nevis	V47V
Dec 13	Dec 19	Bangladesh	S21DX
Dec 20	Dec 25	New Caledonia	TX24HAID
Dec 20	Dec 31	French Guiana	TO0J
Dec 26	Jan 04	Dominica	J75K
Dec 27	Dec 31	Vanuatu	YJ0GE
Dec 30	Jan 03	Mariana Is	KH0
Dec 31	Jan 06	St Kitts & Nevis	V4
Dec 31	Jan 07	FiJi	5W0GE
January			
Jan 04	Jan 05	Gambia	C5RK
Jan 10	Oct16	Palau	T8
Jan 10	Jan 31	Benin	TY5C
Jan 11	Jan 12	Senegal	6W1RD
Jan 09	Jan 12	American Samoa	KH8
Jan 12	Jan 27	Marquesas	TX7N
Jan 17	Feb 02	Mozambique	C8K
Jan 18	Jan 28	Aruba	P40AA
February			
Feb 02	Feb 28	Senegal	6W7

Thanks to http://www.ng3k.com/misc/adxo.html

Dec 2024 & Jan 2025 CONTESTS

*For RTTY contesters there are a number of contests coming up culminating with the **CQ WPX RTTY** on the 8th and 9th of February this is a great contest to snag a few rare countries as a lot of operators visit exotic places. N1MM+ is the logger for all of these.*

Contest	Times & Dates
ARRL 10-Meter	0000Z, Dec 14 to

Contest	2400Z, Dec 15
International Naval Contest	1600Z, Dec 14 to 1559Z, Dec 15
OK DX RTTY Contest	0000Z-2400Z, Dec 21
Croatian DX Contest	1400Z, Dec 21 to 1400Z, Dec 22
RAEM Contest	0000Z-1159Z, Dec 22
ARRL Rookie Roundup, CW	1800Z-2359Z, Dec 22
DARC Christmas Contest	0830Z-1059Z, Dec 26
RAC Winter Contest	0000Z-2359Z, Dec 28
Stew Perry Topband Challenge	1500Z, Dec 28 to 1500Z, Dec 29
YOTA Contest	1000Z-2159Z, Dec 30
January 2025	
SARTG New Year RTTY Contest	0800Z-1100Z, Jan 1
Marconi Club ARI Loano QSO Party Day	0700Z-2100Z, Jan 4
WW PMC Contest	1200Z, Jan 4 to 1200Z, Jan 5
RSGB AFS Contest, CW	1300Z-1700Z, Jan 4
ARRL Kids Day	1800Z-2359Z, Jan 4
ARRL RTTY Roundup	1800Z, Jan 4 to 2400Z, Jan 5
YB DX Contest	0000Z-2359Z, Jan 11
UBA PSK63 Prefix Contest	1200Z, Jan 11 to 1200Z, Jan 12
NRAU-Baltic Contest, SSB	0630Z-0830Z, Jan 12
DARC 10-Meter Contest	0900Z-1059Z, Jan 12
NRAU-Baltic Contest, CW	0900Z-1100Z, Jan 12
Hungarian DX Contest	1200Z, Jan 18 to 1159Z, Jan 19
CQ 160-Meter Contest, CW	2200Z, Jan 24 to 2200Z, Jan 26
REF Contest, CW	0600Z, Jan 25 to 1800Z, Jan 26
BARTG RTTY Sprint	1200Z, Jan 25 to 1200Z, Jan 26
UBA DX Contest,	1300Z, Jan 25 to
SSB	1300Z, Jan 26
Australia Day Contest	2200Z, Jan 25 to 1000Z, Jan 26
February	
CQ WPX RTTY	**0000Z, Feb 08 to 2359Z, Feb 09**

Many thanks to
http://www.contestcalendar.com/contestcal.html

Discounts from Suppliers

Club members can get discounts from two suppliers:

***Altronics. (Australia Wide)**, Mention you are from the North East Radio Group or give our customer no - 64429. Discount will be minus 10% up to 45% off depending on the item. (Actual discounts depend on the product type and quantity purchased). There is No Minimum Spend in store to receive the discount. For on-line or phone Sales there **IS** a Minimum spend of $25.00 inc GST but **NOT** including Freight. In the comments section put "64429" to receive the discount.*

We have discovered that David VK3UQ gets an email, that you may not get, detailing delivery of your order. So pop him an email when you order and he will be able to track which email belongs to you. We hope to have a method of dealing with this soon. President at nerg.asn.au

***Jaycar Electronics stores** by mentioning you are from the "NERG" no spaces quotes or dots etc, Account code is 44700493. You need to spend a min $25.00 to receive a 10% discount. http://www.jaycar.com.au/*

VK3CNE REMOTE STATION

Can be used for receive on all HF bands. Provides transmit on 160 metres using a dipole, 80 and 40 metres using a trapped dipole and a Spiderbeam for 20 through 10 metres. NO TX on 30M at this time.

This is available to members, you will need:

- *An Amateur Radio Licence – any grade – Remember you can only use the bands and power you are licenced to use.*
- *A windows computer with sound card connected to a speaker and a microphone. A PC headset is ideal.*
- *OR an android tablet or phone and are prepared to pay for the app (less than $20)*
- *Download the client from RemoteHams.com install it on your machine and register with RemoteHams.com using your **callsign**. The android app is called RCForb and is available on google play.*
- *The NERG station is "VK3CNE" Connect to it and request "club" membership and TX capability. Then wait until your membership is approved and away you go!*
- *Usage privileges are only available to financial NERG members with VK callsigns.*

VHF / UHF Remote

The VHF/UHF remote operates exactly the same as the HF version, the Station is "VK3CNE – 9700"

About the NERG

The NERG Inc. *Reg No A0006776V* http://nerg.asn.au *The North East Radio Group, Inc. is an amateur radio club devoted to encouraging members and others to enjoy the hobby of amateur radio. It tries not to hang on ceremony and endless reporting but rather participate in the fun aspects of this fascinating hobby.*

MEMBERSHIP FEES

Due in August: Full: $35 Family: $50 Remote Member: $50 Concession: $25 You will get a renewal notice please wait for this before you pay.

COMMITTEE

President	*Anthony VK3YH/BNR*
Vice President	*Greg VK3VT*
Secretary	*Peter VK3PCC*
Treasurer	*Mick VK3PRR*

Committee Members

Mark VK3BYY	Ash VK3HAG
Phil VK3RP/BOY	Chris VK3IK/AWG
David VK3UQ	

NERG NEWS ARTICLES

The NERG is always happy to receive news, articles, and member's wanted or for sale advertisements for inclusion in the newsletter. Please contact the editor at news{at}nerg.asn.au

NETS

NERG *NETS run on the club's 70cm repeater VK3RMH TX 438.325MHz and RX 433.325MHz both C4FM and analogue.* ***That means you RX on 438.325MHz and TX on 433.325MHz.*** *You will need a 91.5Hz CTCSS tone on your analogue FM TX and if you don't want to be bothered with listening to the C4FM digital signals on the output then set your radio to 91.5Hz CTCSS tone on RX as well.*

(8.30 – 9.30 pm Non-meeting Thursdays). Feel free to join the discussions.

146.575MHz is used as a general Net frequency by a number of NERG Members and is often used by the DX chasers in the club while hunting DX. Foxhunters use this channel for liaison as well on the third Friday of the month.

Club Sponsor

Margherita Pizza ph 9434 4980

89 Main Road, Lower Plenty, Vic 3093

web www.margherita.com.au

Margherita's Still Sponsor the NERG and provide the excellent suppers that we have come to enjoy. Order your next Pizza dinner from them and tell them you appreciate their support of the club.

Facebook

The NERG is on Facebook – A group has been established and can be found at

https://www.facebook.com/groups/nergamateur/

Members are encouraged to join this group