In this issue

Production Team

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Chris Leviston M0KPW
Mauro IV3WS
Ken Konechy W6HHC
Tony G4CBW
Thomas Black

Reader contributed articles welcome

Editorial

Welcome to CQ-DATV 57

The BATC have given advanced notice that CAT18 and the BATC General Meeting will be held at the Midland Air Museum on the weekend of September 15th and 16th 2018. we assume this is a press release and that they would like you to know as soon as possible, so we have put the legal team on standby and let the cat out of the bag.

Moving a little closer to home in this issue Trevor has extended his article in TV connectors and focused in on the advantages of HDMI and its associated switchers for PIP (Picture In Picture) on ATV repeaters and for simple seamless switching between video sources. These inexpensive HDMI units are often overlooked and have many uses providing you are switching HDMI sources.

We have Part 2 of Chris Leviston M0KPW's article on 5.6GHz and this time he is trying out some flat Panel antennas that have their origins in Wi-Fi and getting some very encouraging results running only 600mw, distances of up to 80 miles have been achieved. Chris has now purchased a linear amplifier, delivering 2 Watts as yet untested, but Chris please keep CQ-DATV readers in the loop when you get a chance to try it out.

Also in this issue we have a very smart VSWR meter from Thomas Black using the AD8318 module that John used in the last issue for plotting polar diagrams. This VSWR meter also has the option of a 3d printed box and with 3d printers now starting to appear at less than £200, we at CQ-DATV see a great future in these units for home constructors. There are a lot of small garage sized businesses, producing tool racks for Dyson vacuum cleaners, using 3d printers, we just need someone to focus on products for the ATV market as the custom case for this project really adds that upmarket touch and who would not buy one.

Sorry CQ-DATV is not in a position to purchase one and supply the market, one of the few disadvantages of being a free magazine, perhaps we should pass the hat round and make a start.

Many thanks to Mauro IV3WS, he has produced an update with more photos on his small portable ATV repeater which we covered in CQ-DATV 53, this clever unit now has a switchable input for 13 cms and 3 cms

Tony G4CBW reports on receiving GB3FB on 9cm for the first time at around 100km and as you would expect from digital its noise free.

Ken W6HHC reports on a reliability issue found with the MiniTiouner Express hardware, when testing units for extended temperature operations. The regulators would stop…the power LED would turn OFF. Some units would run three days at elevated temperatures then stop….and then start-up, not sure what the temperature is in California right now Ken, but it might not be so serious a problem in the frozen UK, at the moment, but then we are past the shortest day and on our way to the longest day and our summer, Terry please note, next month is the Equinox and the planet tips in favour of the northern hemisphere EG our turn for better weather (you're welcome to it, including the above average rainfall in some places - Terry).

So, as we always say, sit back and enjoy CQ-DATV 57.

CQ-DATV production team

Correction

Following on from a news item in issue 56, we have received the following correction from the BATC chairman.

I note on page 4 of this issue that you have re-printed a post I made on the BATC forum about the new BATC Web Site without asking for permission to do so and added an editorial comment which is in error and grossly misleading.

The new BATC site, contrary to your comments, can stream using either HTML5 or flash. The individual stream owner will have the choice of selecting Flash when they consider minimum time delay to be more critical, such as a repeater stream, than the ability to deliver a delayed HTML5 stream for easy viewing on mobile devices.

Also, it is not true to say Flash "is unusable on Apple and Android devices" as alternative browsers / viewers, such as Puffin or VLC, can be used on iOS devices to receive Flash streams such as the current BATC.TV channels.

Finally the new BATC site uses https, allowing flash to be enabled in browsers for the BATC site only, thus maintaining browser security.

Can you therefore either re-issue this edition or in the next issue, publish an apology for using the piece without permission and correct the technical inaccuracies so that your readers are not mislead as to the capabilities on the new BATC streamer.

And for the record, in the interest of "working together", we would have been pleased to give you a technically accurate description of the new site for publication – but you never asked....

I think that CQ-DATV reproduced a press release, that is devoid of any intellectual property and we would not normally ask for permission to relay these releases.

Both our publications CQ-TV and CQ-DATV have shared members and their own unique members, the latter would benefit from relayed press releases.

In this case we added some editorial comments which are still being checked out, as problems that used to be associated with this technology may have had some improvements, and as a result may be more suitable than they once were.

What we were trying to do was spark off some debate as to if this is the right way to go or not.

It would seem we have caused offence when non was intended and for this we apologise.

Please feel free to write up how the new site will work and what you hope it will achieve and we will be more than happy to publish this for you in the next CQ-DATV magazine. - ED

New books?

For the past few years, iBooks has been a bit of an afterthought for Apple. The app, which is available on iPhones, iPads and Macs, has a clunky interface and poor navigation for the ebook store.

But now, Apple is putting books front and center with a renamed app and a much-needed redesign, according to Bloomberg. We've reached out to Apple for comment on what the app refresh will entail.

Developers can download iOS 11.3 now (its final version will be available in the spring), and many have noticed that iBooks has been renamed, simply, "Books." It follows the example of the Apple Podcasts app, though that redesign hasn't been met with much praise. The new Books app design will includes a section called "Reading Now" and a dedicated audiobook tab, according to Bloomberg's sources.

Amazon has dominated the ebook market after the U.S. Department of Justice ruled that Apple conspired to raise ebook prices back in 2012. In 2016, Apple settled a class action lawsuit for $450 million. After these sanctions, Apple focused on other priorities.

In December, Apple hired Kashif Zafar, an SVP of Audible, which is the Amazon-owned ebook company, to turn the focus back to Books and lead the app refresh effort. It will certainly be interesting to see what it looks like, and whether the company can succeed in wresting some of the ebook market share away from Amazon.

Source: *https://www.engadget.com/2018/01/25/apple-ibooks-redesign/*

DVB Identifiers

To aid the unique identification of DVB broadcasts, DVB networks and MHP applications, DVB Services Sàrl acts as a registration authority for all DVB and MHP identifiers. All DVB broadcasts, whether over satellite, cable, terrestrial or IP networks, use DVB's Service Information (DVB-SI, EN 300 468) standard to help receivers automatically tune to available broadcasts.

Additional types of DVB Identifiers are available on request: *info@dvbservices.com*

A fee is charged for the allocation of DVB Identifiers. Click here to see the *fee structure*. To begin the process of applying to obtain an Identifier click the button below.

What is a DVB Identifier?

TS 101 162 defines the allocation of identifiers pertaining to different DVB specifications (e.g. MHP, SI, Data Broadcasting, etc). Each DVB Identifier has the following attributes:

1. It is defined in a DVB specification (e.g. DVB Service Information (EN 300 468)).

2. It is a binary number represented by its hexadecimal equivalent denoted by the prefix "0x". This avoids having to write lots of 1s and 0s. Therefore 0x0100 is the representation of binary 000 100 000 000 and decimal 257.

3. It has a text description. The tables of values and descriptions are published on this website.

4. It is allocated to an entity which is a company operating in the digital television space (e.g. ACME Digital Broadcasting, Inc.), or a grouping of such companies (e.g. a ACME – Association of Cable/MMDS Enterprises) or an institution acting in digital television, e.g. IEEE (Institute of Electrical and Electronic Engineers)

5. It may be allocated for a given region. For terrestrial broadcasting, this is typically a national territory; for satellite operations, this is typically a geographical region spanning many countries, but consistent with the footprint of the satellites owned by the operators.

Source: *http://www.dvbservices.com*

CAT 18 - Midlands Air Museum - September 15th/16th

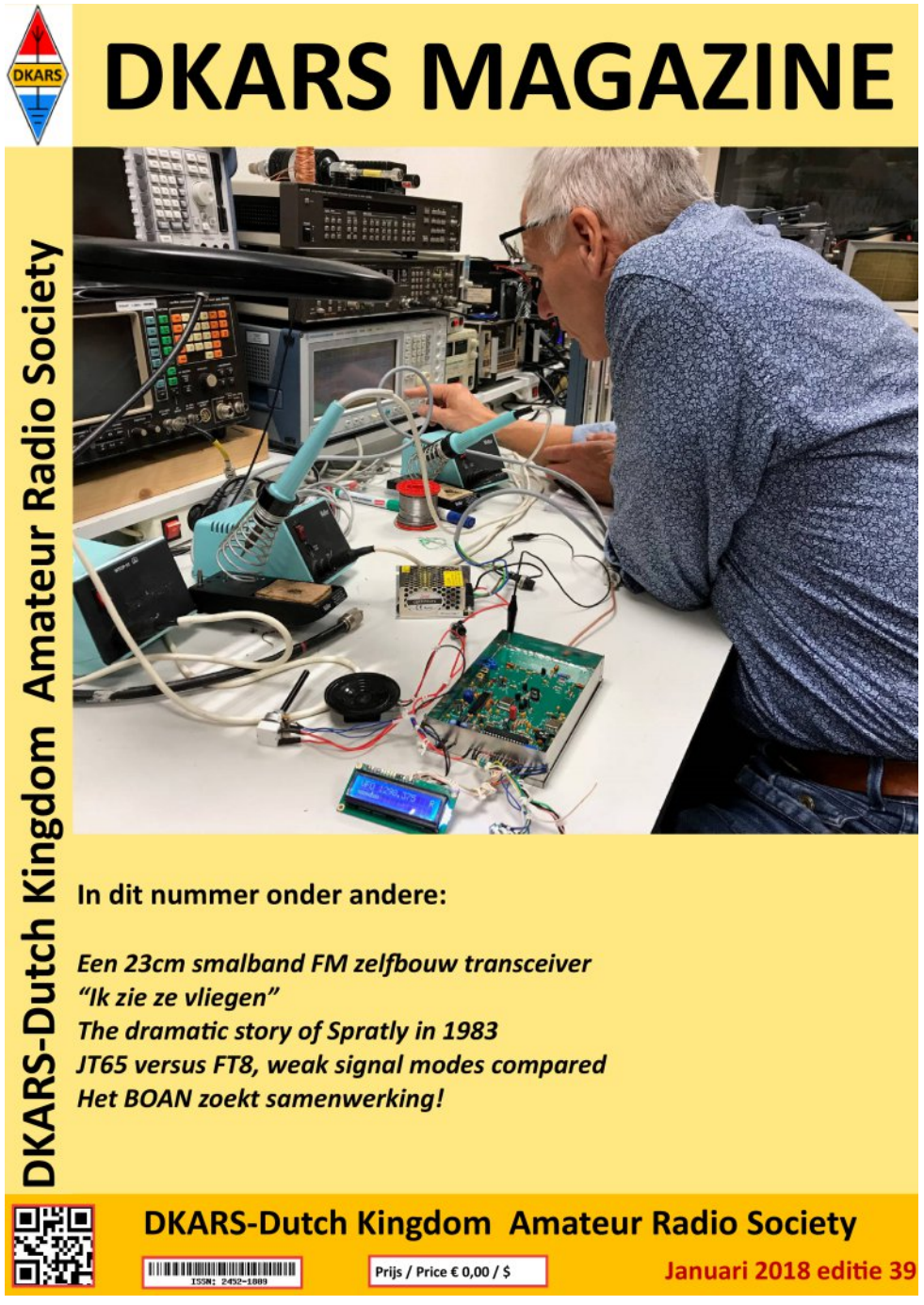
The BATC have given advanced notice that CAT18 and the BATC General Meeting will be held at the Midland Air Museum on the weekend of September 15th and 16th 2018.

The Midland Air Museum *http://www.midlandairmuseum.co.uk/about.php* is a small aircraft museum run by enthusiasts on the perimeter of Coventry Airport, where BATC will have exclusive use of the lecture room seating 60+ people and a small hanger where the demo area, test and fix it area, members bring and buy and a few trade stands will be held. There is plenty of car parking and access in to the site will be available for any special interest vehicles.

The full program will be published in due course and the BATC general meeting will be held at 2pm on the Sunday.
More details to follow, but put the date in your diary.

Source:
https://forum.batc.org.uk/viewtopic.php?t=5385&p=14997#p14997

Want to be notified when issues of CQ-DATV are published? Then join our *mailing list*.



Check out the DKARS website at:-
http://dkars.nl/

TV Amateur is a German Language ATV Magazine It is published 4 times a year and if you would like to subscribe go to *http://agaf-ev.org/*

TV Video Connections - Part 2

Written by Trevor Brown

In CQ-DATV 56 we had a look at all the video connections.

Most of them have analogue origins and although analogue has stood the test of time and is simple and easy to interconnect, it is perhaps time we were moving on.

Digital has its own advantages and disadvantages. If your cables were too long with analogue then the picture would degrade, but gracefully, the HF component will be attenuated and in an analogue colour world these will de-saturate and if you are in a monochrome world you are still not safe as the resolution of the picture (fine detail) will start to diminish.

In a digital world this is not the case as everything will remain good until you fall off the edge of the cliff and blocking or intermittent loss of picture or just plain no signal will result.

The problem is knowing how near to the cliff edge you are, which raises the question of how long can an HDMI cable be? Well, the HDMI specification does NOT specify cable design or cable length maximums (See CQ-DATV 45 for the full HDMI spec).

HDMI version 1.3 does establish two classes of cable assemblies called Category 1 and Category 2.

Version 1.3 outlines detailed electrical design and testing requirements for both categories with Category 1, or Standard, cables supporting HDMI clock frequencies to 74.25 MHz and data speeds to 2.23 Gbps whilst Category 2, or High Speed, cables support the entire specification through 340 MHz and 10.2 Gbps data speed.

HDMI cable length limitations are important in the HDMI world. If you want a Sky box in your living room and an HDMI connection to your bedroom for a second TV or if you are planning a vision switching arrangement for a small multi camera production, which is fairly easy to plug together as most camcorders and even some of the stills cameras that can shoot video have HDMI outputs, 20m max might be a good rule of thumb. HDMI switchers are not too expensive, unlike their cables (more later).

There are engineering ways of looking at the data called an eye test to try and ascertain how near to the cliff edge you are. But for amateur applications perhaps a coupler and add 10m length of cable.

If it still works then remove the 10m cable and you know it did not take you over the cliff. So you are at least 10m from the cliff edge.

A look on the internet and cables seem to limit at 20m, but couplers are available for those of you that want to push your luck.

0.5m (HD-910/0.5)	614 in stock	Qty: 1	£2.99 (inc VAT)	Add to Basket
1m (HD-910/1)	469 in stock	Qty: 1	£3.98 (inc VAT)	Add to Basket
2m (HD-910/2)	420 in stock	Qty: 1	£5.99 (inc VAT)	Add to Basket
3m (HD-910/3)	215 in stock	Qty: 1	£8.99 (inc VAT)	Add to Basket
5m (HD-910/5)	649 in stock	Qty: 1	£11.99 (inc VAT)	Add to Basket
7m (HD-910/7)	237 in stock	Qty: 1	£14.99 (inc VAT)	Add to Basket
10m (HD-910/10)	331 in stock	Qty: 1	£19.98 (inc VAT)	Add to Basket
15m (HD-910/15)	84 in stock	Qty: 1	£29.99 (inc VAT)	Add to Basket
20m (HD-910/20)	135 in stock	Qty: 1	£45.98 (inc VAT)	Add to Basket

HDMI Cables not cheap are they

Extending HDMI with cable adaptors when 20m just is not enough

And if 20m is not enough, there are converters that will convert to Cat5e and some of them are happy with a 300m cable run.

So, using two 20m cables and a HDMI switcher can I production switch between to sources? Well yes and no. In the digital world one of the problems from the analogue world still remains!

The video sources need to be in synchronisation. When one source is part way through line 27 and the other source is sending line one this is not good for production switching, or worse still, mixing and overlaying.

This has plagued broadcasters through the ages and a typical TV studio would have a TV sync generator sending pulses to all the cameras to lock them in sync.

Ok until you want to feed the studio from a remote source (not locked to your local syncs). The solution used to be strip the syncs from the remote source and feed it to the sync generator and ask it to synchronise or lock (Genlock).

It caused more problems than it ever fixed ie if the remote source had a disturbance so did all the studio cameras and any video recording, contribution or Telecine contribution would suffer. Some Telecine machines could even shred the film.

So a better fix was sort and found.(Field Store Syncroniser) The remote source was analogue to digital converted, clocked into a memory that could store at least one TV field of video, using a clock locked to the remote source.

Read the memory with a clock locked to the studio sync generator and digital to analogue convert it all back to video.

This was at a time when memory was expensive and well A to D and D to A and lot of other bits and bats plus you started down the path of picture delay and lip sync errors perhaps one synchroniser was ok but several for a complex production and you were in trouble.

Back to HDMI which is digital in and digital out, so no A to D or D to A. Two problems have gone and memory is not as expensive as it once was.

Users of Vmix will know all you need is in your PC and a set of video capture cards. Yes its brilliant but the demo software has limits so you might need to purchase the full software, plus the video cards which are not cheap and you need a PC.

So how about and alternative, could we save money?

Could I use an HDMI switcher, is the lack of synchronisation a problem, will I get picture disturbances on cuts. This depends on the switcher. If the switcher has the word seamless on it, then it must have some form of synchronisation and may be suitable for a small TV production.

Seamless HDMI switcher

The first link is to a You Tube video and it says it all, the switcher is $251 and there maybe others around that do the same for less, there is a link to one seamless switcher for sub $100.

The video is brutally honest and although it has a quad split which would provide an ideal preview it has only one output, so you would record or transmit the quad split and there are also sound latency problems.

It's a good start if you only wanted a recording in standard definition. You could record the quad split and expand the required sources and shift the sound into sync in the editing process.

The switcher has RS 232 (not sure what this does and remember HDMI also has I2C connections so is this supported, that I think is the $64,000 dollar question.

This would open up ATV repeater multi screen repeaters or the Picture in Picture could be used to show traffic at the other repeater inputs (once we reach true digital ATV, the point where all the RX's and TX's have HDMI connections and we consign the yellow and red phono connectors to the bin).

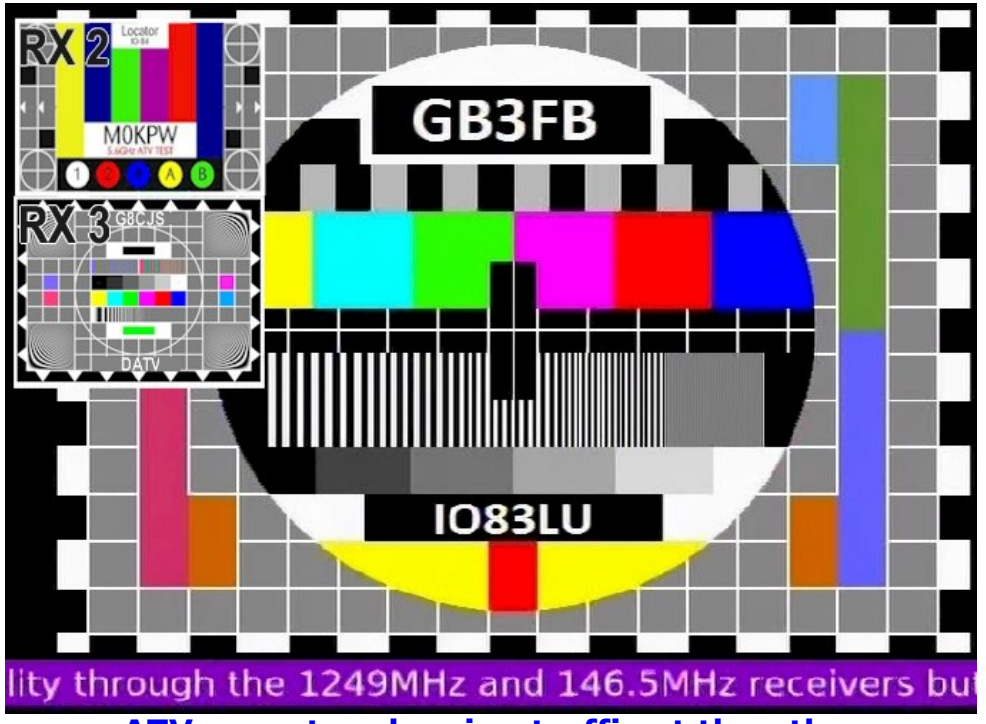
The links also take you to other HDMI seamless switchers. I think they are worth considering as they have uses in TV repeaters and small ATV multi camera productions. For the latter, just remember, short cables and cliff edges.

Article Links

https://www.youtube.com/watch?v=k7LQonewepM

https://www.amazon.com/dp/B0732XM1Q8/ref=psdc_172546_t1_B01GPVDDT2
-
https://www.amazon.com/dp/B01BV1XBIY/ref=psdc_172546_t3_B01GPVDDT2

https://www.amazon.co.uk/gp/product/B008I08G8C/ref=abs_brd_tag_dp?smid=A3P5ROKL5A1OLE



ATV repeater showing traffic at the other receivers...Maybe one day

M0KPW 5.6GHz ATV - Part 2

Written by Chris Leviston M0KPW *http://m0kpw.com/*

Continuing from last month....

Antennas

As mentioned I use separate antennas for RX and TX, thus removing the need for changeover relays. This does of course make for a more expensive system, but a sacrifice I was happy with.

Initially my plan was to try a panel antenna on TX and a yagi for RX. I had seen a 16dBi 5.8GHz yagi that covered the frequency in question, so thought I'd give it a go. Following some initial tests with Nick, G0HIK, it did not seem to perform very well, so the yagi was removed and swapped for a panel antenna instead – this vastly improved the system.

I use two slightly different panel antennas, as mentioned, more than anything to do with availability at time of purchase.

The TX antenna is a '5Ghz 24dBi HV WIFI RP-SMA Wireless Signal Booster' antenna obviously intended for WiFi use, but works perfectly for ATV. At a cost of £44 delivered, its pricey, but a price I felt worth paying.

It has a female N type connector on the back so the TX unit can be connected straight to it with no need for any coax that would start to introduce losses. The antenna is easy to mount with bracket that is attached to the back of the antenna, either horizontally or vernally, which will also determine the polarisation of the antenna. Even though this is an FM system, the antennas are horizontally polarised for ATV.

Specification:

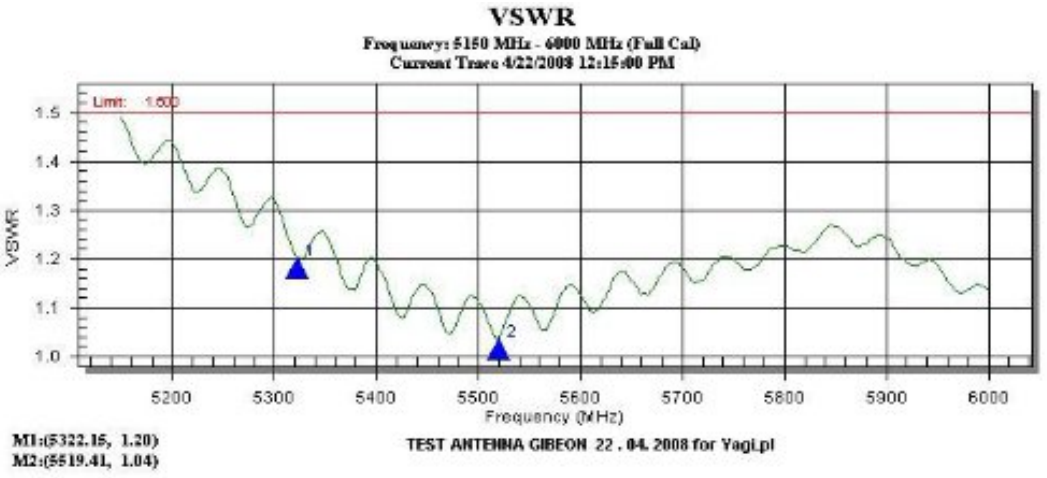
- *Gain : 24dBi*
- *Polarization : Horizontal or vertical*
- *Horizontal half power beam-width : 10.5°*
- *Vertical half power beam-width : 10.5°*
- *Connector : Female n type*
- *SWR : 1:2 (when intended for WiFi use)*
- *Impedance : 50 Ohm*
- *Dimensions : 330mm x 330mm x 20mm*
- *Weight : 1.3kg*

The antennas are where the majority of the weight in system comes from, but again, a sacrifice I am happy with – and it does not make the system exceptionally heavy.

Having 2 panel antennas means you need to be mindful of any wind resistance – or lack if it, if the wind is not in a favourable direction.

But there is little difference between these and say a satellite dish – both tend to act in the same way. So a weight on the tripod is advisable to prevent the system falling over in windy conditions.

Allot of research was done to ensure this would be a suitable antenna for ATV needs and an SWR plot was received from the manufacturer which shows the SWR at 5765MHz would be around 1:1 so ideal for use at this frequency.



There was a problem with stock, so the UK stockist I bought this antenna from arranged for one to be sent to me direct from the manufacturer in Poland, and it took about a week to arrive.

Due to the stock issue of the antenna above, the second, which is used for RX, is slightly different. Instead a TP Link TL-ANT5823B antenna was bought from Amazon at a cost of £55.00 (it was on offer at the time as these are currently retailing at over £80).

The TL-ANT5823B covers 5GHz and offers a gain of 23 dBi and is again intended for WiFi use but works perfectly for 6cm ATV.

Specification:

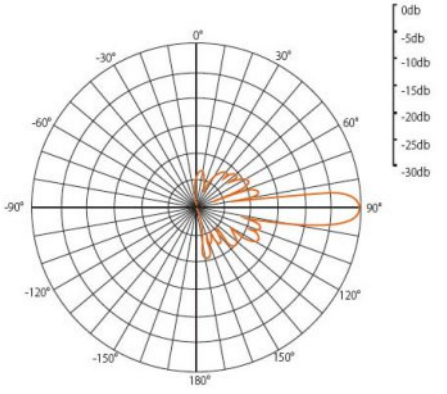
- *Gain : 23dBi*
- *Connector : Female n type*
- *Weight : 1.36 Kg*
- *Frequency : 5.15 to 5.85GHz*
- *Impedance : 50 Ohms*
- *VSWR(MAX.) : ≤1.5*
- *Polarization : Vertical or Horizontal*
- *Maximum Input Power 100W*
- *Dimension : 320×320×20(mm)*

Again, this antenna is a key contributor to the weight of the station. It is easily attached to the tripod boom by means of a bracket that is attached to the antenna (which determines the polarity) and the RX unit connects directly to the antenna via an N type / RP SMA connector.

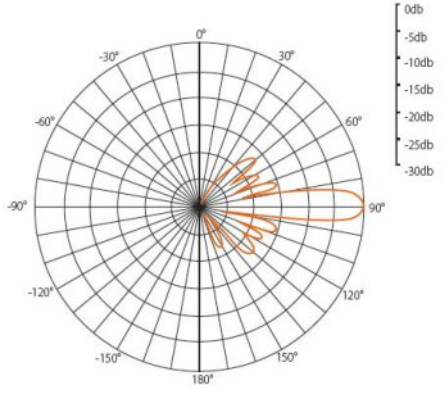
Ensuring this would have a low SWR on 5765HMz, I first checked with the manufacturer before purchase. As per the other panel antenna the SWR is around 1:1 on the required frequency.

Radiation patterns are shown below :

V-Plane Co-Polarization Pattern:



H-Plane Co-Polarization Pattern



Continued next page...

5Ghz 24dBi HV WIFI RP-SMA Wireless Signal Booster antenna by 'Gibeon'

Above: Connecting the TX unit to the antenna
Below: N type to RP SMA connector

Above: TP Link TL-ANT5823B antenna
Below: RX unit connected to the antenna

Fitting the antenna bracket to the boom for horizontal polarisation

12v Distribution Unit

TX unit and camera, RX unit and monitor all require power (conveniently 12v for all) so I decided to build a 12v distribution unit. Nothing fancy, just 12v in (with a fuse – just in case!) with multiple 12v out to supply all units.

A plastic project case from Maplin measuring 114.5mm x 184.5mm x 62.5mm was perfect for the job. And it would also allow room for some AV switching sockets and a 12v to 5v converter (which is used to power the 5v media card reader for displaying a test card).

Power is supplied from a lead from a 12v 26Ah battery which is connected to piece of choc block / terminal blocks. This is then fed to multiple 2.1mm DC sockets. 2 sockets are required for the RX side of things (RX unit and monitor) and

2 sockets are required for the TX side (TX unit and camera), both have switches which effectively switch on the RX or TX as required. An additional 2.1mm socket – not controlled by a switch - is added for an aux 12v supply should it be needed.

On the TX side of the case a 3 amp 12v DC to 5v DC Converter Regulator is added, which is switched, and is used to power the media card reader (more on that below).

Specification:

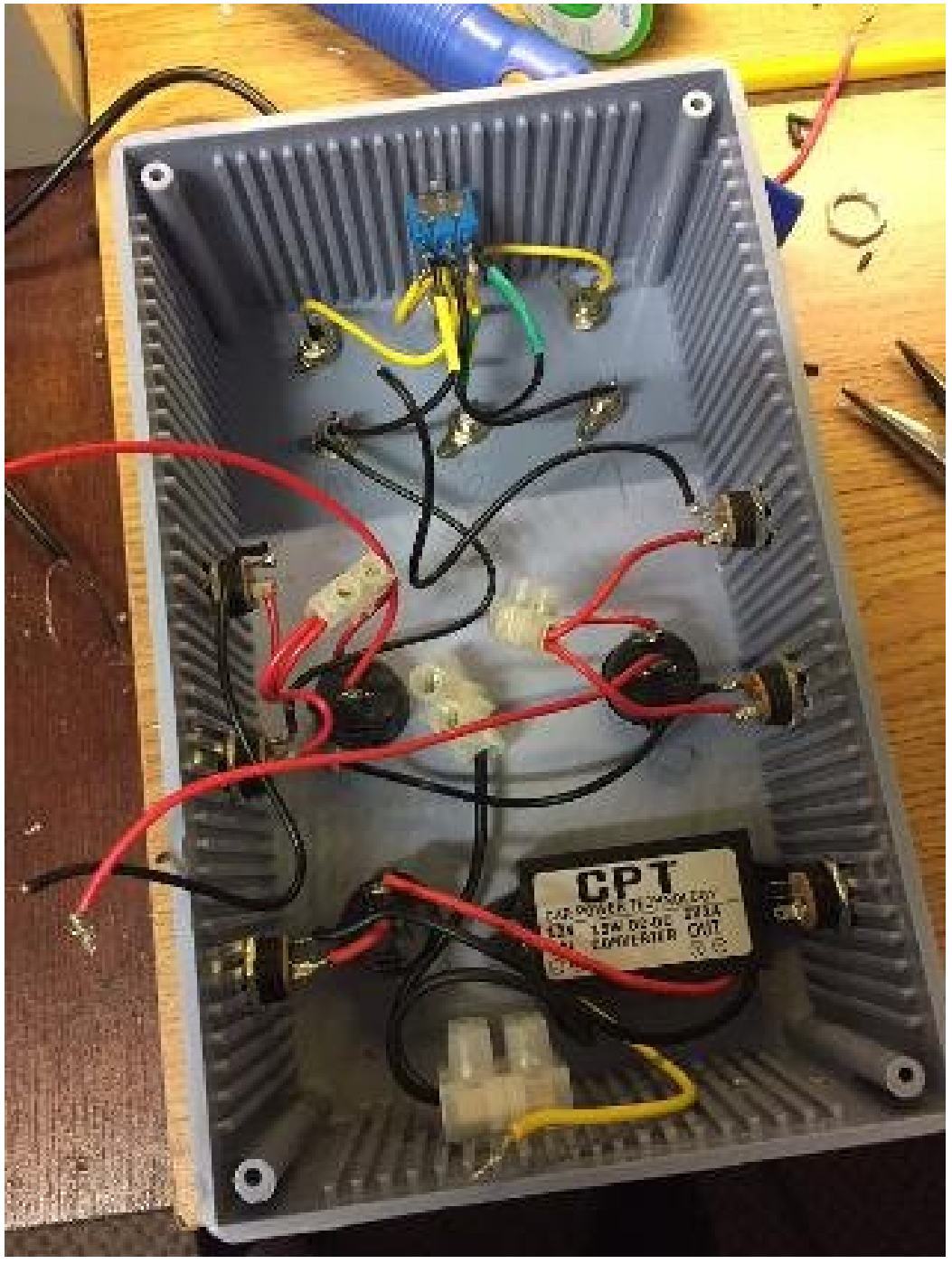
- *Input voltage: 12V(22V MAX)*
- *Output voltage: 5V*
- *Output current: 3A(MAX)*
- *Max power consumption: 15W*
- *Converter Size: 6.50 x 2.70 x 1.40cm*

Construction on the 12v distribution unit is very straight forwarded, and no major expertise is needed – just basic soldering and drilling of a few holes in the plastic project case. An LED is added to the TX switch so the users knows the system is in transmit, and it's also a good indicator that the unit is receiving power.

A 5 amp fuse it added to the main 12v in supply in case of any problems.

Although not difficult, the distribution unit was the most time consuming aspect of the project and went through 2 variations – with a more basic one created to start with, before building an 'improved version 2' which featured the 5v regulator (previously it was just an extra lead to carry around) and the addition of the AV switch which cut down on the need to swap leads over during a contact.

As all the various aspects all draw a low current, a 26Ah battery is plenty to run the station for a lengthy period of time.



Work in progress - the only real work involved in setting up the station.

Completed distribution unit

Test Card and displaying of call sign

A test card was created as a JPG file and a way of feeding this JPG file into the transmitter is needed. There are various options including using a Raspberry Pi, but I opted for the easiest way by using a Media Card Reader which I had in a drawer doing nothing.

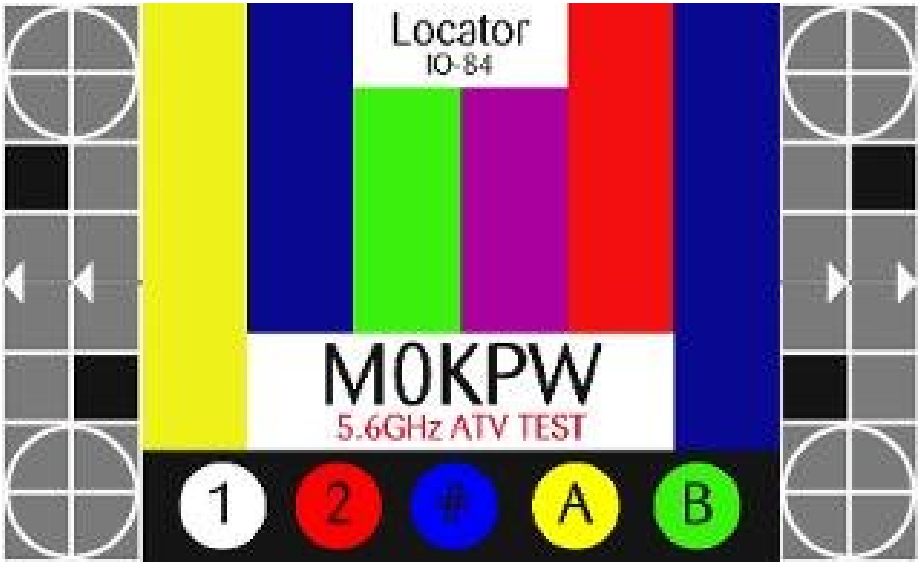
The reader in question is a ' Sandisk Photo Album & 8 in 1 Card Reader With Remote SDV2-C-E30' and takes media cards of various formats (SD, smart media, XD picture card etc) and also has a USB port.

Importantly there is an AV / composite output which can be fed into the TX unit allowing for the transmission of the JPG file.

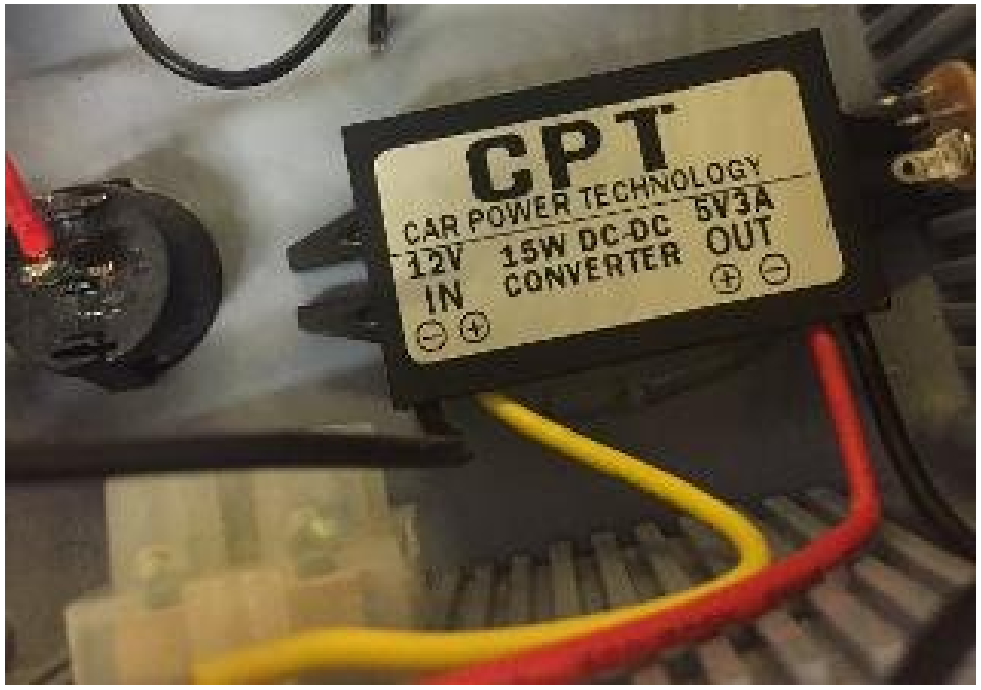
And as a way of complying with licence conditions, a call sign caption JPG file was created that can be transmitted at least every 15 minutes.

The Media Card Reader requires 5v and is powered by the 5v supply from the power distribution unit. As the TX unit requires 2 AV inputs (one for camera and one for Media Card Reader) an AV switch was built into the power distribution unit so that the video (and audio if required) sources can be switched in easily.

A simple on - off - on switch swaps the source from camera to test card / call sign as required.



M0KPW ATV Test card



12v to 5v DC converter

Fitting the station together

A club member donated a suitable tripod. It's a pretty standard tripod, the 3 legs can be adjusted easily in height and there is an adjustable centre column giving a bit of extra height (the maximum height I can achieve with this tripod is 144cm).

The camera mount came away from the tripod with very little encouragement with made it easier to attached a horizontal cross section which would hold all the elements that form the station.

The cross section is a boom from an old HB9CV 4m antenna, with a length of 80cm and 1.6cm x 1.6cm square. It is attached to the tripod with its antenna bracket using wing nuts so it can be removed by hand if needed.

Holes were drilled for attaching the antennas and monitor – but that was the sum total of 'metal work' required.

I decided on having the RX side of the station of the left, with the TX on the right – with the 12v distribution unit in the middle.

The RX antenna is bolted (horizontally polarised) to the boom with it's supplied right angle bracket using wing nuts – it fits very securely to the boom. The RX unit is connected directly to the RX antenna using an N type to RP SMA connector, next is the 7 inch monitor.

This has a stand which has been bolted to the boom (some plastic corner blocks have been added to the boom to give extra support) – the angle of the monitor can be adjusted, plus it can be taken off the bracket easily should the need arise.

As the monitor does not feature sound, a small set of amplifier speakers are added when needed. The audio out from the RX unit is simply fed into the speakers input socket.

In the middle (to the right of the mast clamp) is the 12v distribution unit. This is attached by gluing a piece of 16mm white plastic coupling (intended for use with 16mm by 16mm MK conduit trunking) to the back of the unit to act like a clip. This allows for the easy removal of the unit and is quite sturdy.

Next is the TX antenna - again attached horizontally with the supplied bracket and wing nuts - with the TX unit connected directly to it, again with an N type to RP SMA connector.

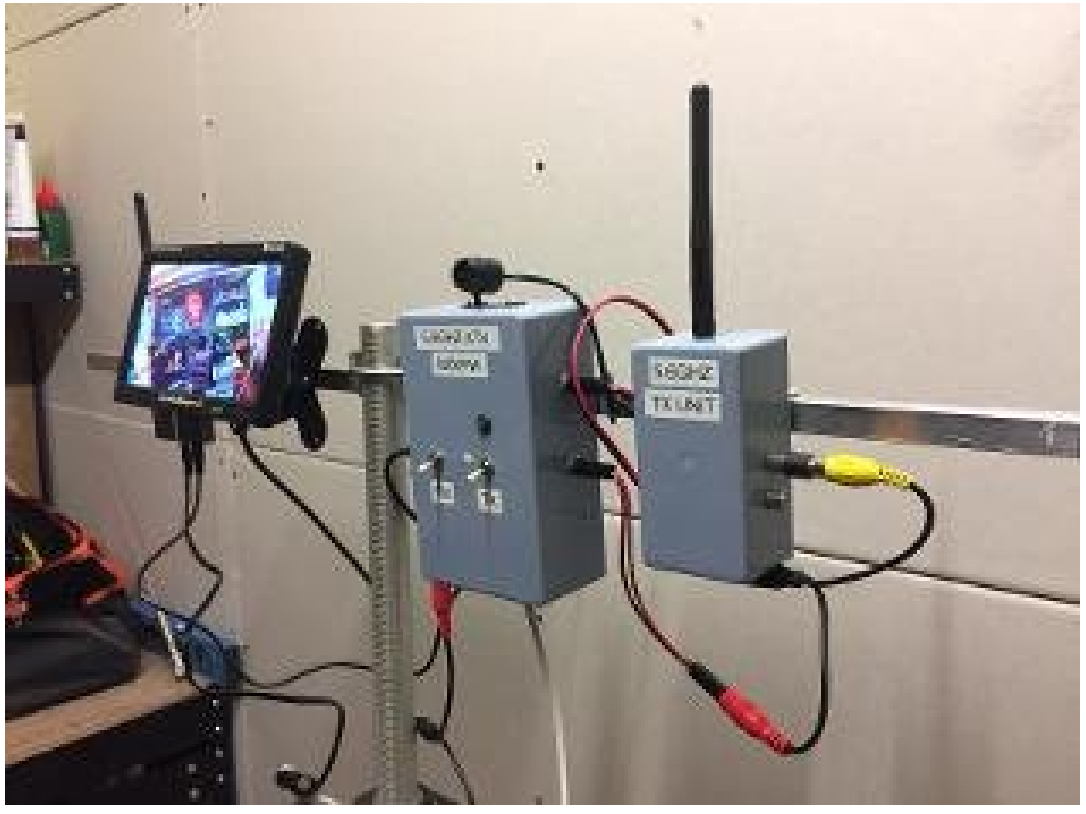
One of the 12v black and white cameras is attached to a piece of 16mm white plastic coupling and can be attached to any part of the boom.

The Media Card Reader has a 25mm white plastic coupling glued to the back, and this is clipped to one of the tripods legs to keep it securely out the way.

Power leads for all the units are just connected to the relevant socket on the distribution unit, whilst AV leads are run from the RX unit to the monitor for the receive side of the station, and from the camera and media card reader (via the AV switch) to the TX unit for transmission.

It may not be the most lightweight system in the world, but it is for from being unmanageable and it all folds down to fit into the car with out having to dismantle everything (I just remove the 12v distribution unit and camera).

N type to RP SMA connectors



Tripod and boom, with the units set up for initial testing

Completed station

TX beacon for testing

For testing purposes a TX beacon was built that could be used for testing the RX station, proving alignment and a host of other things.

The beacon is simply a TX unit (5.8GHz 600mW 32 Channels Mini Wireless 2dbm A/V Transmitter Video TX), again with heat sink glues to the back to help dissipate some heat.

Housed in a plastic project box, with an on/off switch (with LED to show power / TX is on) and fed from an 12v battery source. I use a smaller 7ah battery as there's very little consumption from the devices and the 7ah battery is physically smaller.

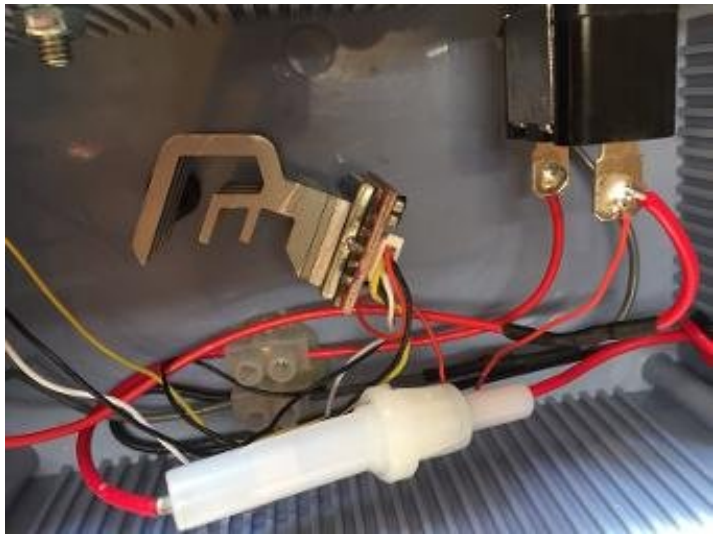
Antenna wise, I use a log periodic printed circuit board antenna (WA5VLB 2 – 11 G LPY).

This is the same antenna that Nick, G0HIK, uses on his dish ATV system. However I don't use a dish as with it only being a beacon it is not needed to transmit over particularly long distances – although it works at a distance of 10 miles and probably much further.

These log periodic printed circuit board antennas cover 2100 to 11000 MHz and are a perfect fit for 5.6GHz ATV, and cost around £5.00. A small length of microwave coax needs to be soldered the full length of the antenna, which is a job for a steady hand!

AV phono sockets were added to allow a video and/or audio source.

A 12v black and white camera was attached to the front of the beacon so a there is always a source, but any video/audio source can be used.



Above: Constructing the beacon
Below: Completed beacon with WA5VLB antenna

Linear Amplifier

As stated the TX power is only 600mw, but distances of up to 80 miles can be achieved with this power.

Once this has been achieved, or as long a distance that we can achieved, I have purchased a linear amplifier - '5.8Ghz FPV Transmitter RF Signal Amplifier' (again from eBay) to see what can be achieved with 2w.

Specification:

- *Frequency Range : 5.8G (5700MHz~6000MHz)*
- *Dimension: 60mm x 27mm 22mm*
- *Power Supply: 6V – 23V CD*
- *Input Power: -3dBm to 27dBm*
- *RF Output Power: 33dBm (2W)*
- *Weight: 45g*

Gain guide:
3dB-6dB @ 5.60GHz to 5.75GHz
5dB-8dB @ 5.75GHz to 5.85GHz
3dB-7dB @ 5.85GHz to 6.00GHz

As yet the station has not been run with the linear amplifier, but it will be during 2018 and it will be interesting to see what the results are like.

I hope you found this interesting and it shows that with some simple research and very little microwave know-how, the world of 5.6GHz ATV can be achieved.

Due to the project being started in November 2017, the furthest distance achieved so far is just under 12 miles, but we know that much greater distances can be achieved and this will be worked on in early 2018. Hopefully up to the dizzy heights of 80 miles plus.

If you have a line of sight to south Cumbria (IO-84 - Barrow in Furness / Ulverston area) and you would like to arrange a sked for 5.6GHZ ATV please drop me an email at *m0kpw@aol.com*

Testing and operating

This is a line of sight station, so when planning tests and activations it's good to check for LOS between the 2 stations before starting. A tool that I use is *https://www.solwise.co.uk/wireless-elevationtool.html* which will give an indication of line of sight paths and highlight any areas where LOS will not work – allowing both stations to find suitable operating positions.

It's proves to be very accurate, but just bear in mind it will not factor buildings, trees etc. into it's calculations, so be mindful of the terrain between your station and the one you're wanting to work.

With a relativity narrow beam-width, alignment is key so you need to have a bearing on the station you want to work. Shorter distances where you can see the area of the other station are relatively easy, simply have one station transmit and the receiving station can set up the antenna for best alignment – something that's relatively simply over a distance of 10 to 20 miles as you can set up pointing in the general direction (as long as you know your local geography).

See my website for more photo's and a video of an audio test with M0TEB carried out on a windy day in December 2017

More on testing and operating to follow shortly...

DiY RF Power / VSWR Meter. Low Cost!

Written by Thomas Black and reproduced here by kind permission.

(Text in blue italics are clickable web-links)

Measuring Video Transmitter (vTx) RF power and checking antenna performance are two things a lot of FPV'ers would like to do. ImmersionRC sells a nice *RF Power Meter* but its $150 USD price tag is a problem for most hobby budgets.

But I have low cost solution for you. How about a DiY digital RF Power meter for less than $30 USD? Its 433MHz to 5.8GHz frequency range means it can handle all your FPV devices. Max input level is 0dBm, but much higher RF power is acceptable with an *external attenuator* (budget $20). And it can measure antenna VSWR if you add a RF Directional Coupler (budget $65).

Here's what it looks like:

Here's an example of a *VSWR measurement*. Just a couple keypad presses is all it takes to measure the antenna:

The 3D printed plastic case shown above is not required, but looks fantastic. Inside is a Arduino Mega R3 board ($12), LCD/Keyboard shield ($3), and AD8318 RF power sensor board ($12).

These parts are available from from eBay and Banggood retailers.

Assembly involves soldering 3 wires, 2 resistors, and a capacitor. Then flash the firmware using the Arduino Mega's built-in USB port. Low cost and quick assembly, who doesn't love that?

This DiY build has a short parts list. You'll need:

- 1 each, Arduino Mega2570 R3 Microcontroller Board: eBay search

- 1 each, Arduino 1602 LCD / 6-button Keypad Shield: eBay search

- 1 each, Analog Devices AD8318 Log Detector/Controller Board: eBay search Banggood search

- 1 each, 470 ohm 1/8W or 1/4W Resistor: eBay search

- 1each, 3.3K ohm 1/8W or 1/4W Resistor: eBay search

- 1 each, 100pF 0603 SMD Ceramic Capacitor: eBay search

- 1 each, 10mm Toroid (optional, see instructions): eBay search

Plus about 1.5 feet of 28 to 32 AWG 3-conductor wire. You can get this from an old USB cable.

For measuring vTx power up to 1 Watt you'll need a fixed 30dB attenuator. I'm using the Mini-Circuits VAT-30W2+.

At $20 it is a good value since it has a predictable attenuation curve and supports all the FPV frequencies. You can measure more than 1W with a higher value attenuator. But wary of those cheap Chinese attenuators on eBay; Their low price is due to their sloppy variations in attenuation.

VSWR measurements will require a RF Directional Coupler. I'm using a Krytar 0955-0098 that I got off eBay for $50. It is rated for 2-8GHz applications, but I found that mine also handled 900 -1300MHz device measurements with good results too.

You can build the meter without a fancy enclosure. But if you have access to a 3D printer then I recommend making the custom plastic case.

The case was originally created/published by contributor Vector_Mayhem on Thingiverse:
https://www.thingiverse.com/thing:142282

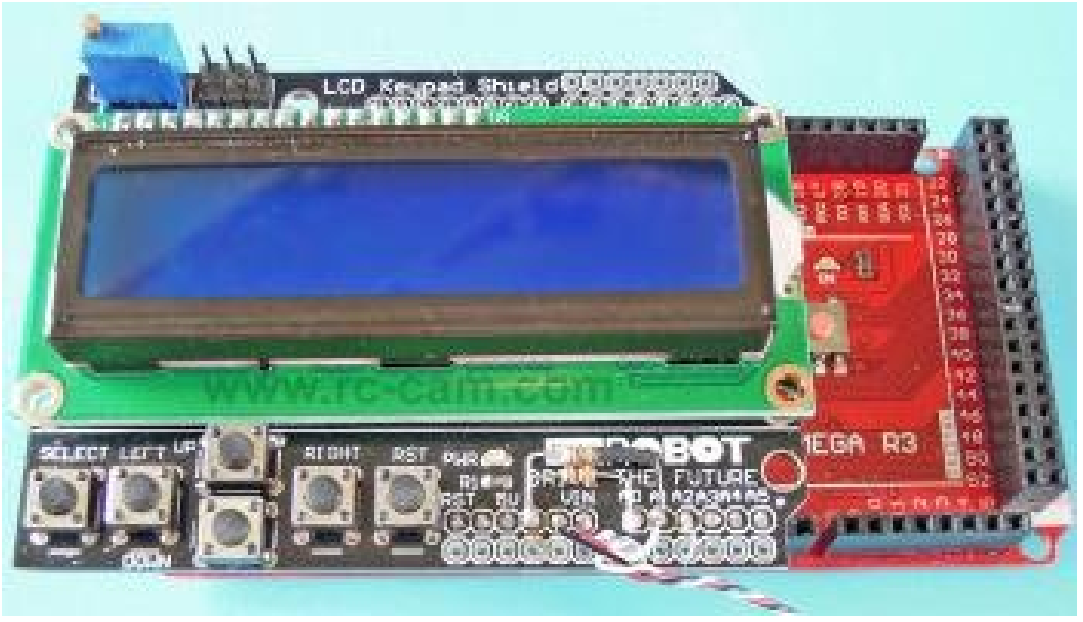
3D Printing Tips:

1. You can use PLA or ABS.

2. Be sure to scale the files to account for shrinkage of YOUR filament. For example, I used ABS and that requires 101% scaling.

3. I suggest 40% infill with 3 solid layers on the top, bottom, and perimeter.
4. Do NOT remove the tree that holds the Button Pad's keycaps together (be gentle when pulling the part from your print bed).

5. The five captive keycaps on the Button Pad must smoothly fit in the case top. Trim or file as needed to eliminate any binding.



Above: Photo 1

Electronic Assembly Instructions

Below: Photo 2

STEP 1:

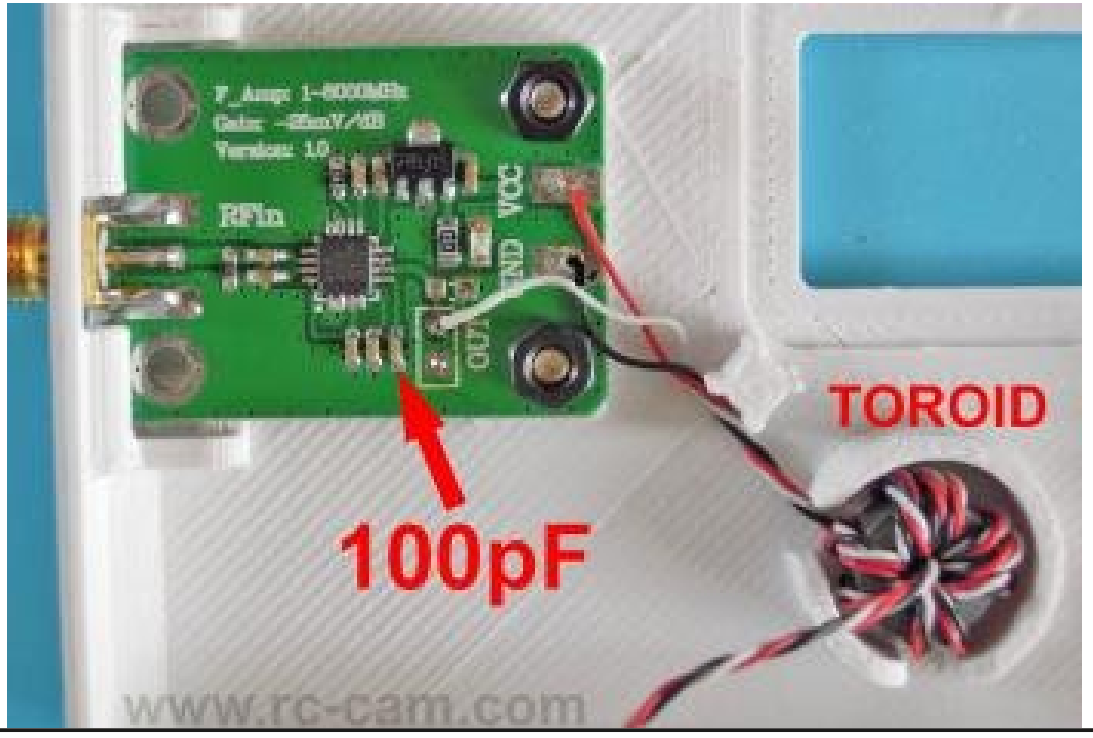
Begin assembly by plugging the LCD Keypad board into the Arduino Board. The LCD Keypad board goes on top and it must be carefully offset to the left side as in Photo 1.

Initially it may seem to be a mystery on how to correctly align the two boards. Fortunately the various connectors are silkscreened with pin-out labels.

I suggest finding "A5" on both boards and then plug them together so that the A5 positions match up. Double check your work!

STEP 2:

Solder the 100pF SMD cap to the empty component position on the RF Power board, as in Photo 2.



STEP 3:

Solder the two resistors to the Arduino Board as follows (see Photo 3).

470 ohm: A1 to GND

3.3K ohm: A0 to GND

Note: Use the GND solder pad that is located on the left side of the arrow pointer shown in Photo 3.

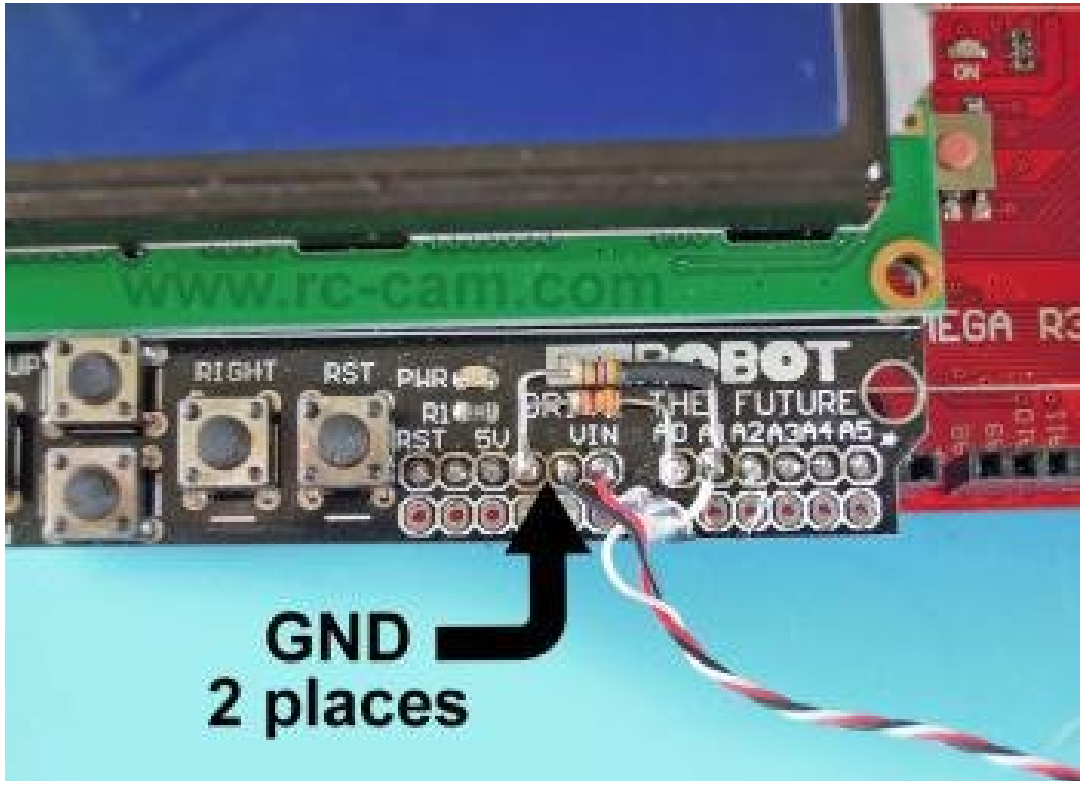


Photo 3

STEP 4:

Connect the RF Power board to the Arduino using small gauge (28-32AWG) 3-conductor twisted wire, as follows:

NOTE: The wire's length should be short as practical.

WHITE: RF Board OUT to Arduino A1

BLACK: RF Board GND to Arduino GND (right side of arrow pointer shown above)

RED: RF Board VCC to Arduino VIN

OPTIONAL: I wrapped the wires around a 10mm diameter Toroid to minimize any common mode noise from the RF sensor board. The Toroid wraps should have at least 10 turns.

The Toroid filter might not be necessary but provides a bit of insurance against unexpected problems.

If you've made the 3D printed enclosure then now is a good time to install everything in it.

Assembly is complete. All that remains is to flash the firmware.

The Arduino board has a built-in USB port for firmware flashing. The internet is full of How-To's that explain the flashing process, so I won't repeat the details here. If you are new to Arduino then be prepared to watch some YouTube videos and/or visit some web sites.

Note: This Arduino project will compile without any errors on Arduino IDE Version 1.8.1. To avoid compile failure frustrations I suggest you use this version too.

In the Arduino Tools menu choose these two settings before flashing the Arduino sketch file:

Board: Arduino/Genuino Mega or Mega 2570

Processor: ATmega2570 (Mega 2570)

1. Assuming you already have the Arduino IDE installed on your PC, begin by downloading the project's zipped firmware file set.

2. Unzip the files in a Arduino working directory named RF_Power_Meter.

3. Flash the Arduino and wait for the file transfer to end. A few seconds after flashing is complete you will see the power meter's boot messages, beginning with the "RF POWER METER" title. At the end of the boot sequence the meter will display "HARDWARE PROBLEM, RF SENSOR FAILS". Then a few seconds later it will display "OVERLOAD WARNING, DISCONNECT NOW!" Ignore these warnings for now, they occur whenever the meter's main battery power is missing. That is to say, the USB connection on its own doesn't provide voltage to the RF sensor so it will fail the start-up tests.

4. Disconnect the USB cable. Apply 2S-3S LiPO battery power (7.4V - 12V).

5. At the end of the boot sequence the meter should display the "NO RF Signal" message. Congrats, the meter is working!

At this point the meter should be functional. Go ahead and use the keypad to explore the menus to see the available functions and settings.

The AD8318 RF sensor's data sheet advises performing a board-level calibration to ensure measurement accuracy.

Calibrating the meter will ensure accurate RF power measurements. However, if you only intend to use the meter's VSWR function then calibration is NOT necessary. But no doubt you'll want to measure RF power too, so plan on performing the calibration procedure.

What does this all mean? Editing the calibration data in the Arduino source code is needed for each RF band you intend to measure. The Arduino config file has two data arrays that holds the sensor's Slope (signal gain) and Intercept (signal offset) calibration information.

The two data arrays are found in the config.h file, as follows:

slope data array: CAL_SLOPE [ ]

intercept data array: CAL_INTERCEPT [ ]

Each array has six values that relate to the meter's six supported RF bands. The data values are arranged in this order: 433, 900, 1200, 2400, 3300, 5800.

The calibration data began as values determined from the datasheet that were further optimized by using a trusted RF power meter and attenuator. Fortunately I have other RF power measuring equipment that is accurate, so I used it to determine the final calibration data for my DiY meter.

You'll need to do a similar meter measurement comparison to find the best calibration values. So plan on hunting down a FPV buddy that has a reliable (calibrated) RF meter and attenuator. Beg/bribe and borrow it. For example, the ImmersionRC's power meter is fine for this task.
As mentioned, each RF band that you intend to use will need to be calibrated. In this example we'll calibrate the meter's 900MHz band using a 910MHz FPV video transmitter (vTx).

PART 1: Slope Calibration (900MHz)

The items you'll need are as follows:

- *1 each, 910MHz vTx (100mw to 800mW).*
- *2 each, 30dB fixed attenuator. MiniCircuits' VAT-30W2+ is recommended.*
- *1 each SMA-SMA adapter or very short coax patch cable.*

1. Apply power to the meter and wait a few seconds for the main measurement screen to appear.

2. Press the Enter key. Use the Up/Down keys and set the meter to the 900MHz band.

3. Press Enter again. Use the Up/Down keys and set the meter's Atten Profile to match your attenuator's value.

For example, if using a VAT-30W2+ then select that entry. Otherwise use the Custom entry and set the correct dB value for your attenuator. Press Enter one more time to exit the setting mode.

4. Use the SMA-SMA adapter and connect the 900MHz vTx and one (1) attenuator to the meter.

5. Apply Power to vTx and confirm you see a dBm / mW value.

6. Now use the Up key and select the Relative RF Diff mode. Press the Enter key to zero the value. See Photo 4.

Photo 4

7. Remove power from the vTx and install the second attenuator. The second attenuator will be measured and used to calibrate the meter. Reapply vTx power. See Photo 5.

Photo 5

8. The measured attenuation value will be shown on the meter's display.

IMPORTANT: ALL attenuators have frequency dependent tolerances. That is to say, the actual dB value will vary depending on the measured frequency. In this example I am measuring a VAT-30W2+ attenuator and its datasheet shows that typical 900MHz attenuation will be 29.7dB to 29.8dB. The measurement in the photo example (see above) shows the correct value for my "30dB" attenuator.
That's because this is a calibrated meter.
If the measured value is incorrect then the RF sensor's 900MHz slope value will need adjustment. This requires editing / reflashing the Arduino code. I won't explain how to use the Arduino IDE to edit the code because there are endless YouTube tutorials that will do a better job of teaching you the basics.

9. Calibrating the slope measurement begins by opening the config.h file. Find the CAL_SLOPE array directly below the AD8318 SECTION BEGINS HERE text region. The six comma separated Slope values are ordered by RF band (433, 900, 1200, 2400, 3300, 5800). The second value is the 900MHz band's slope data.
Identify this value -- it is the one you will edit.

Now that the 900MHz slope value is calibrated we can move on to the RF sensor's Intercept calibration. These instructions are for the 900MHz band.

PART 2: Intercept Calibration (900MHz)

The items you'll need are as follows:

- 1 each, 910MHz vTx (100mw to 800mW).

- 1 each, trusted RF Power Meter (to be used as a Reference Meter). An ImmersionRC RF power meter is used in this example.

- 1 each, 30dB fixed attenuator. MiniCircuits' VAT-30W2+ is used in this example.

- 1 each SMA-SMA adapter or very short coax patch cable.

1. Connect the attenuator to the Reference Meter. In this example I used an *ImmersionRC Power meter* along with its included 5cm long SMA patch cable and 30dB attenuator.

2. Apply power to Reference Meter and configure it for the 900MHz band.
Set the Attn value to 29.7dB (nominal value for VAT-30W2+).

3. Connect the 900MHz vTx to the attenuator and apply power. Allow it to warm up for a few minutes. Do not allow the vTx to overheat (use a small fan if necessary).

4. Measure / record the vTx's mW and dBm values. Example shown in Photo 6.

Photo 6

5. Apply power to your DiY RF meter. Confirm that it is still set to the 900MHz band and Attn value is 29.7dB .

6. Remove power from the vTx and move it (with the attenuator) to your DiY RF meter. Apply Power to vTx and allow it to warm up again.

7. Measure / record the vTx's mW and dBm values. Example shown in Photo 7.

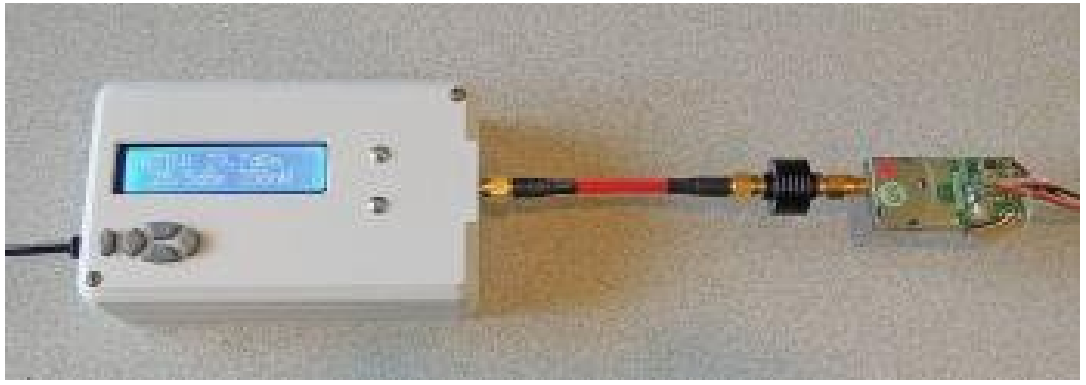


Photo 7

8. Using your recorded measurements, subtract the Reference Meter's dBm value from the DiY meter's measurement.

If the difference value is more than 0.1dBm then the RF sensor's 900MHz Intercept value will need adjustment. This requires editing / reflashing the Arduino code.

9. Calibrating the intercept value begins by opening the config.h file. Find the CAL_INTERCEPT array directly below the AD8318 SECTION BEGINS HERE text region. The six comma separated intercept values are ordered by RF band (433, 900, 1200, 2400, 3300, 5800). The second value is the 900MHz band's intercept data. Identify this value -- it is the one you will edit.

10. If the dBm measurement was too high then decrease the intercept array value by subtracting the difference value from it. If the value is too low then increase the intercept value by adding the difference value. After editing the value, save the file, then flash the Arduino board.

11. Confirm the DiY meter's 900MHz RF power measurement is now within 0.1dBm of the reference meter.

Your meter's 900MHz band is now fully calibrated.

Repeat the slope and intercept calibration steps for the other RF bands you intend to use.

The DiY RF Power Meter can measure antenna SWR (VSWR). A RF Directional Coupler is needed to use this feature. Mine is a Krytar 0955-0098 that is rated for 2-8GHz applications. Despite it's 2GHz rated lower end, I get good VSWR results down to the 900MHz band.

The VSWR function is simple to use.

Following is an example involving a 910MHz FPV antenna.

1. Apply power to your DiY meter. Select the appropriate RF band and ATTN setting for your equipment.

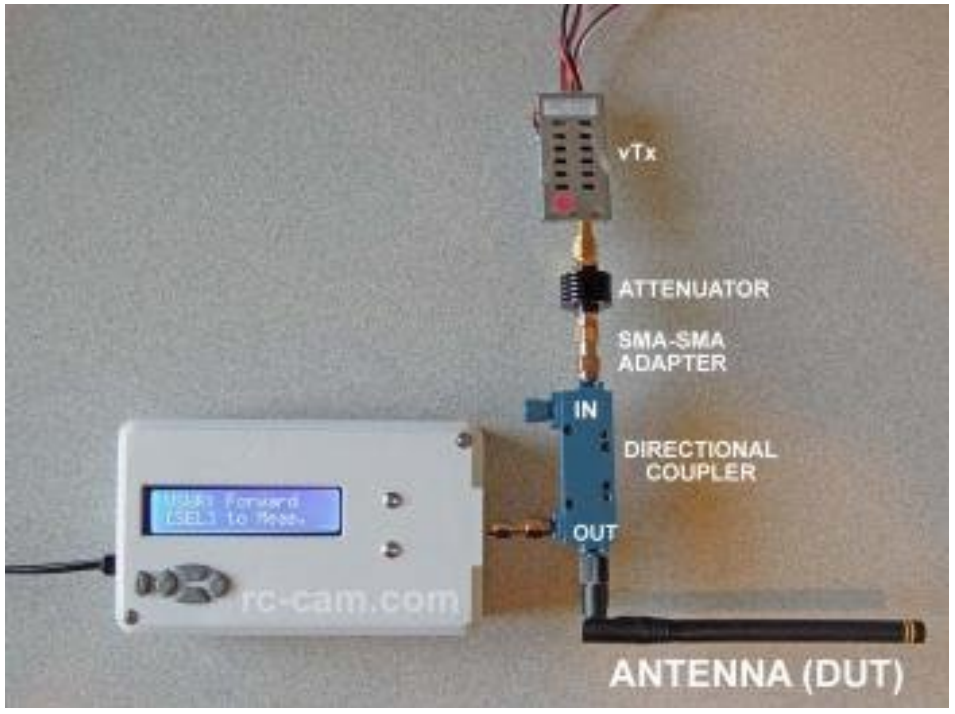
Then use the Up/Down keys until you see the VSWR: [SEL] TO START menu. Then Press the Enter (Select) Key to select the VSWR function.

2. Prepare to install the Directional Coupler, vTx (video transmitter), attenuator, and antenna (DUT). For best results do NOT use coax cables to connect them; SMA-SMA coupler adapters are recommended instead.

3. See Photo 8 (next page) for Forward measurement setup. When ready, press the Enter Key to perform the measurement.

4. See Photo 9 (next page) for Reverse measurement setup. When ready, press the Enter Key to perform the measurement.

5. The SWR measurement results will be automatically calculated and displayed. See Photo 10 (next page) for an example.



Above: Photo 8 Below: Photo 9

Photo 10

Go ahead and explore the menus to become acquainted with the meter's functions. The features are simple enough that I didn't feel it necessary to write a formal instruction manual.

But here's some basic tips:

[1] Menu navigation uses five context sensitive keypad buttons (see Photo 11 next page):
1 = Select / Enter / Change Freq Band & Attn / Reset Min & Max
2 = Left / Previous
3 = Up / Next
4 = Right / Next / Edit Attn Value
5 = Down / Previous

[2] You can change the Frequency and Attenuator settings by pressing the Select (Enter) key while in the main RF power mode.

Photo 11

This mode is identified by the toggling FREQ: and ATTN: status messages on the LCD's top line.

[3] The Attn. Profile menu includes some pre-defined attenuators that are characterized for all five RF bands. The *USER DEFINED* profile uses flashed data values that are defined (by you) in the config.h's SER_ATT_PROFILE[ ] array.

Lastly, the Custom profile allows you to manually enter a fixed attenuator value using the Keypad. To edit the Custom entry begin by pressing the Right (Edit Attn Value) Key. This will turn on the custom attenuator edit mode.

[4] The main RF power mode uses data averaging. It's the recommended mode for measuring analog RF power (typical FPV vTx). In case you are interested, data is sampled at 200Hz and 200 rolling values are collected for averaging.

[5] The Instant Power mode is for Instantaneous (non-averaged) measurements.

This is the recommended mode for measuring digitally modulated RF signals (Wi-Fi FPV and long range UHF R/C).

Keep in mind that digital signals aren't continuous RF so reliable measurements are difficult to achieve. The display is limited to a 5Hz update rate for legibility.

[6] The Min / Max Power measurements are held in a rolling buffer that automatically resets after 10 seconds. Or you can manually reset the buffer at any time by pressing the Enter Key.

Well, that about wraps this project up. I think you'll find it to be a good performing meter that can be built at a bargain price.

By the way, the meter project discussed here uses the AD8318 sensor (the AD8317 is supported, but is not used).

The AD8318 chip can tolerate a slightly higher input level than the AD8317.

For example, the -4dBm signal level from your 5.8G 400mW vTx would have ~0.2dB typical error on a AD8318.

So if your home brew meter is using the AD8318 then a high quality 30dB attenuator would be fine to use with the 400mw vTx.

Portable repeater update

Back in issue 53 we mentioned a portable ATV repeater and here are some more pictures of it.

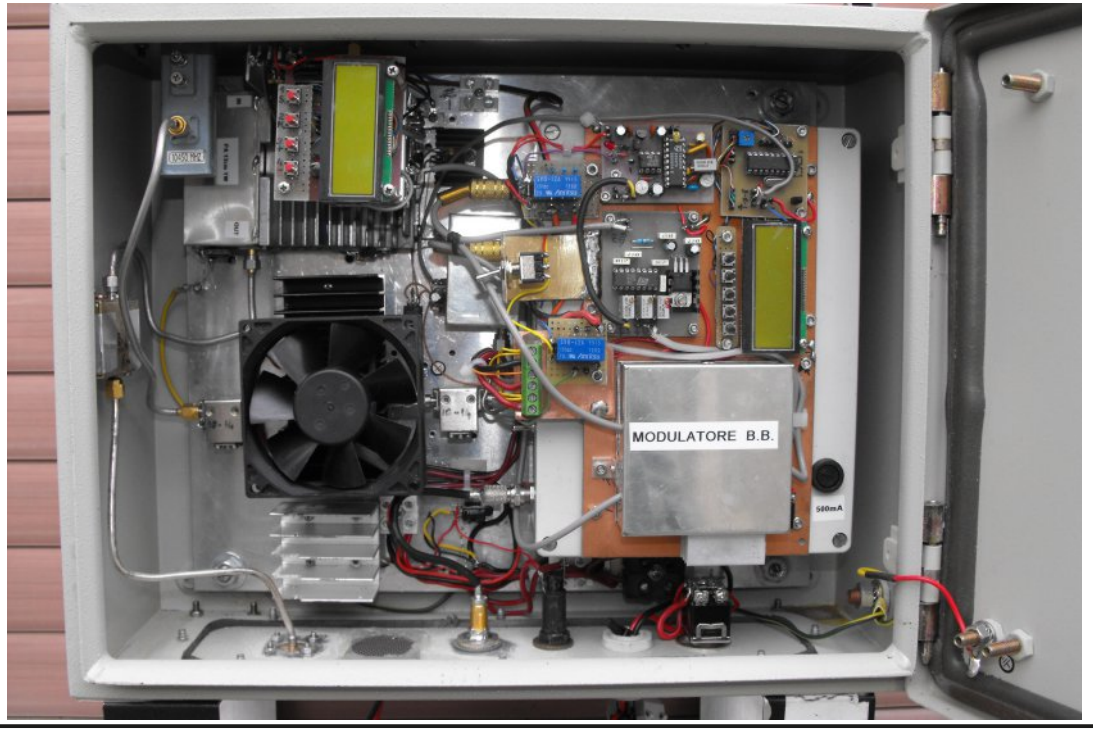
Many thanks to Mauro IV3WS for supplying them.

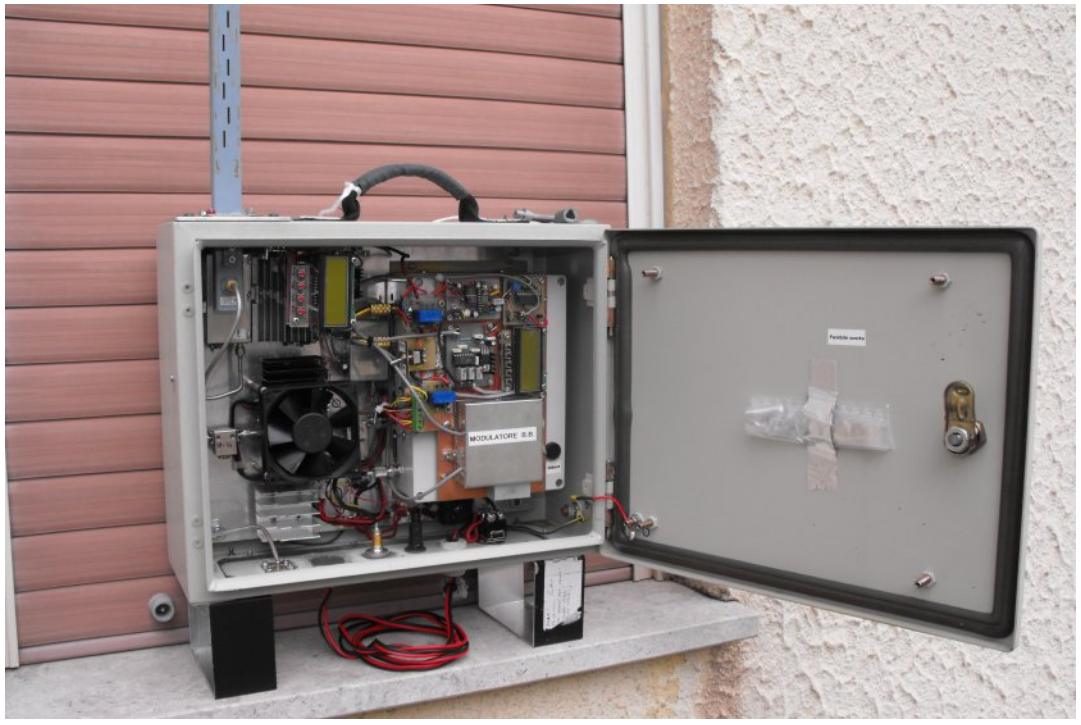
These are the current parameters:
- RX 23cm = 1240 MHz
- TX 13cm = 2390 MHz - power 1W
- TX 3cm = 10450 MHz - power 1W
- 13V power supply
- Maximum current 2.6A

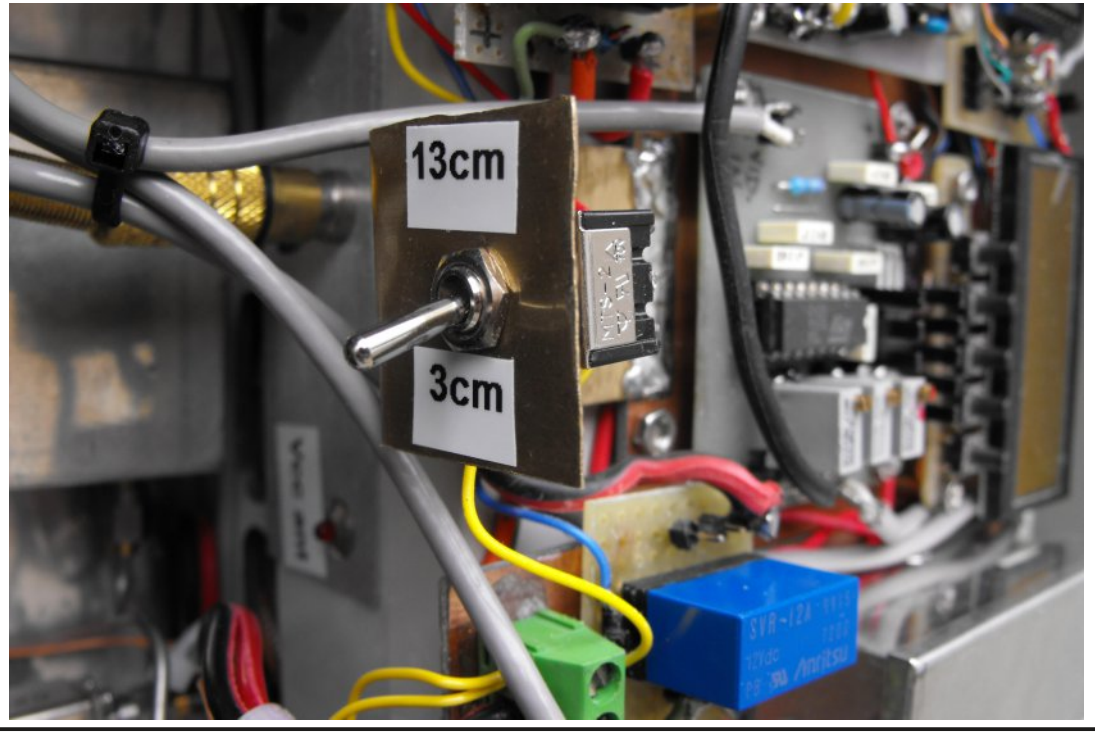
You can select which range you want to transmit, between 13cm and 3cm … not on both at the same time.

The transmission is activated by video-squelch after a carrier with a video signal is present at the input.

The receive frequency can be changed according to needs.



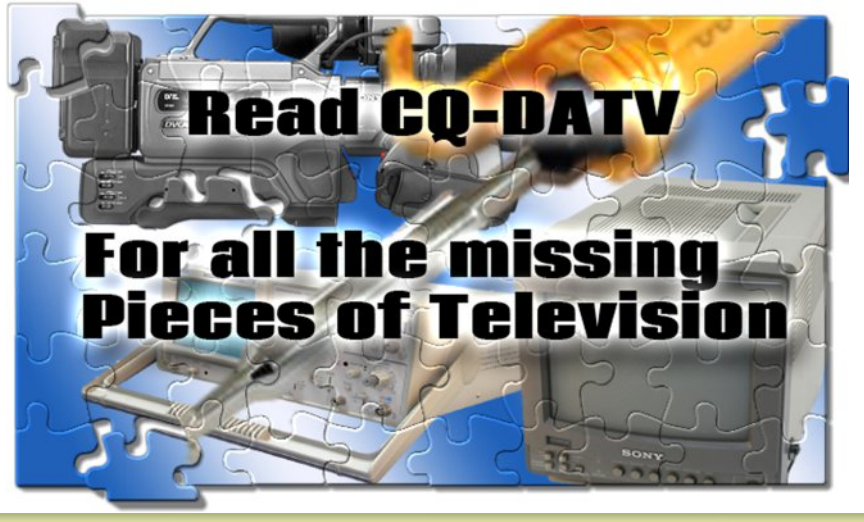


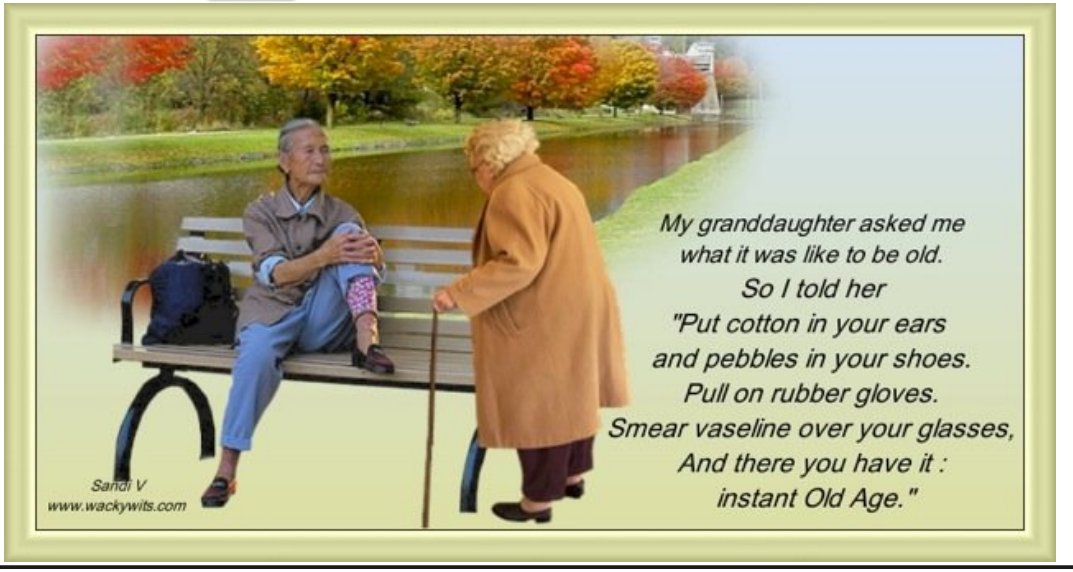


The transmission frequencies can be changed, but for the 3cm range the antenna that currently works at 10450 MHz must be recalibrated.

We cannot calibrate the 10GHz antenna because we do not have the instrumentation for that frequency.

All transmitters have the outgoing circulator for safeguarding the power amp … the 10GHz one has two, one at the inlet and one at the outlet, to avoid even possible self-oscillations.





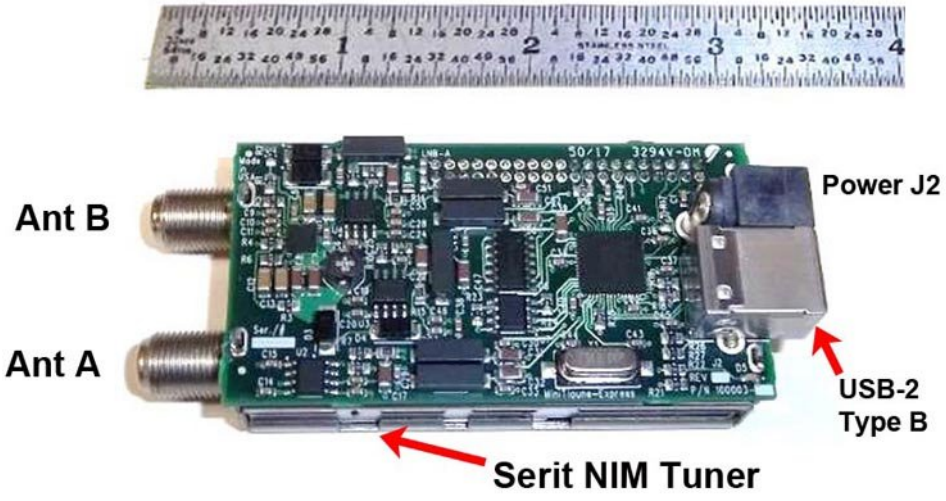
DATV-Express Project - December update report

Written by Ken W6HHC

Art WA8RMC continued to test the production batch of the MiniTiouner-Express hardware units.

A reliability issue was found when testing most units for extended temperature operations. The regulators would stop…the power LED would turn OFF. Some units would run three days at elevated temperatures then stop….and then start-up again after cooling down to room temp.

As you might expect, we suspected everything….first maybe a bad regulator IC lot, then maybe some wrong/mislabeled passive components surrounding the voltage regulator, and currently all bad units seem to run well again by "repairing by re-fluxing the IC and re-flowing the solder".



First production lot unit using robot-assembled MiniTiouner-Express PCBA with Serit NIM. The included cover is not shown

Art needs to confirm that this "poor soldering" really is the root-cause…but Art has a medical issue that will impact his efforts that will be delayed until he is back on his feet.

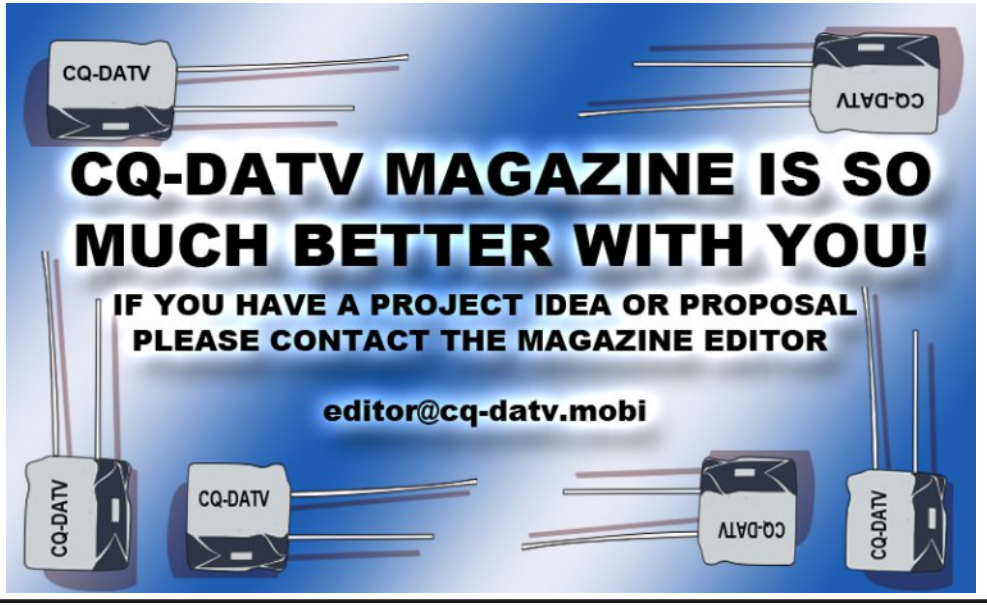
Ken W6HHC has been working on the MiniTiouner-Express User Guide since he received his first MiniTiouner-Express unit for testing. Ken has just finished sending out a draft for review by the project team.

When the project team has added corrections and suggestions, Ken will ask Jean Pierre F6DZP to review the User Guide for correctness and comments.

When Art WA8RMC is confident with the extended temperature operations of the MiniTiouner-Express units and Ken has incorporated the review comments of the User Guide…the FOR SALE announcement will be posted.

The only change is that USA shipping pricing was raised to $7.00 (instead of $6) at the beginning of 2018.

"Project speed set to slow" …. de Ken W6HHC



GB3FB at 9cm

Tony G4CBW reports:-

This morning I managed to receive GB3FB on 9cm for the first time at around 100km.

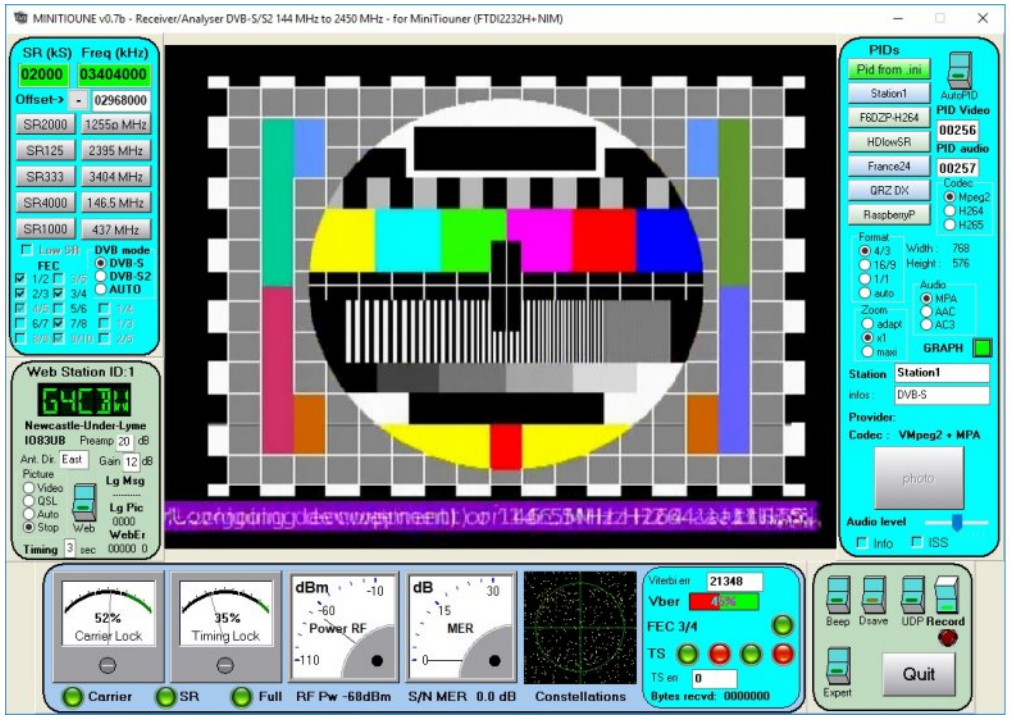
The signal was not strong, barely a few DBs above the noise floor on the analyser but with fluttery peaks or aircraft scatter up to 5-6 DBs.

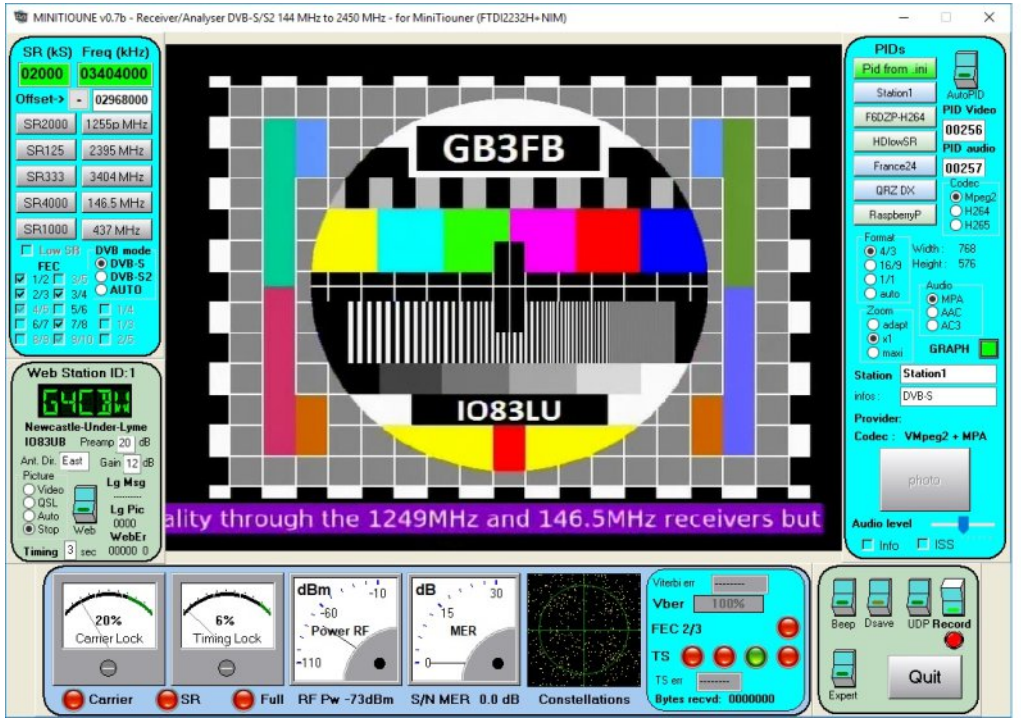
At that point Minitioune, which knew there was a signal present with meters and lock LEDs madly flickering, would lock-up to produce in most instances a perfect picture but sometime with errors.

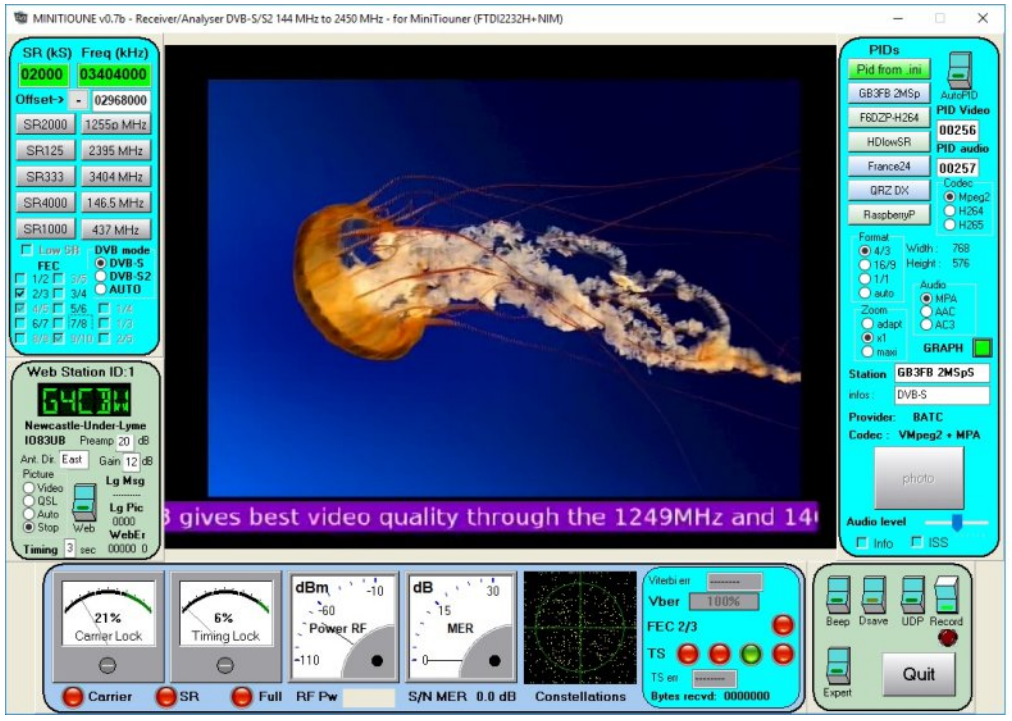
Have attached a number of screen grabs from earlier this morning.

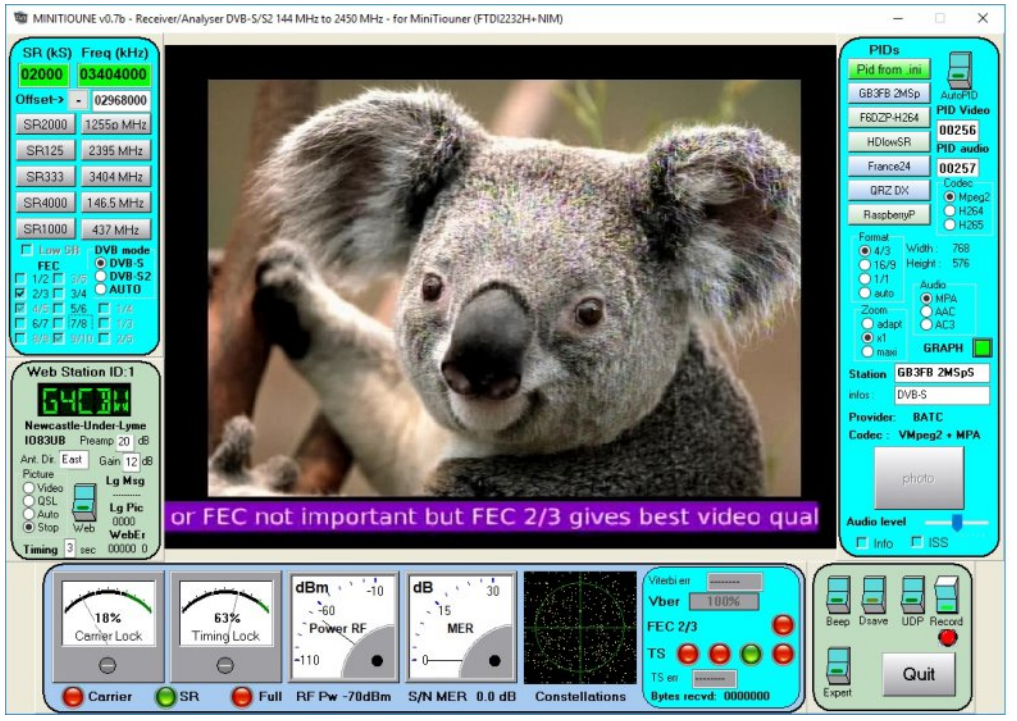
What is interesting is that to receive a signal it was necessary for me to raise the mast up a few feet, even though the dish has a clear take-off in FB's direction when down.

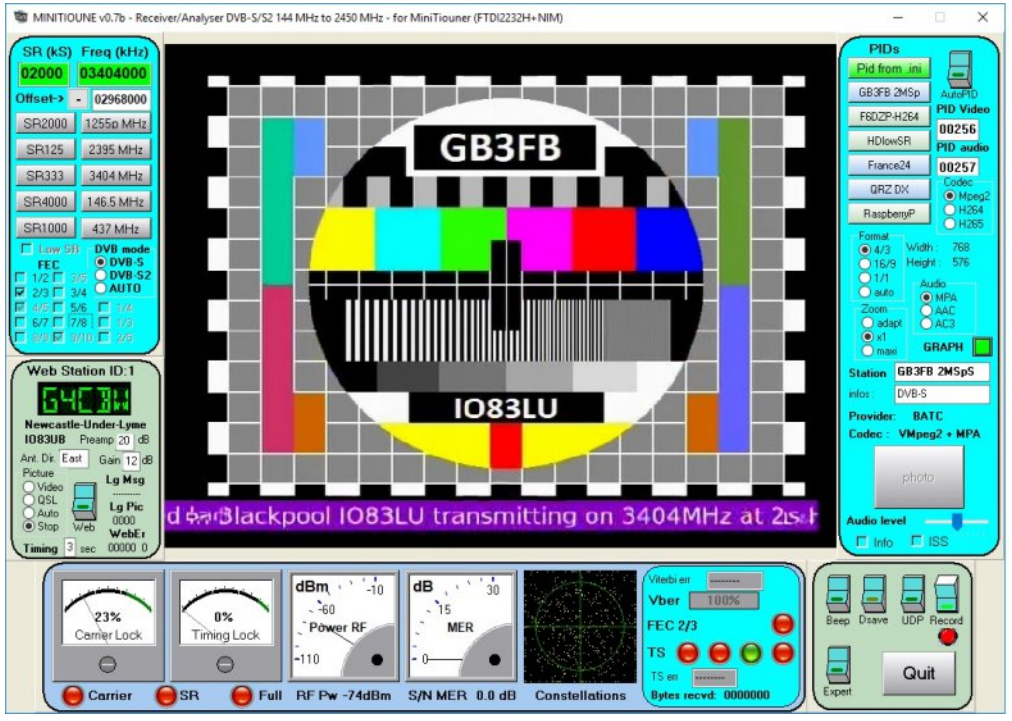
When we get a day without high winds I will raise the dish further up to see if there is any more signal to be had. I also need to replace my 9cm feed which is currently a ring-feed designed for a prime focus dish to something more suitable for the 1 metre offset dish in use.











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