



The British Amateur Television Club

CQ-TV

No. 249 – Autumn 2015

vMix using FFmpeg to create the Transport Stream

Outside Broadcast with the BATC

146MHz RD70HVF1 Amp

24GHz building blocks

2 watt driver amplifiers for 1296 and 2304MHz

HD TV news from Germany

Slow Scan TV with a Raspberry Pi

Out and about with the BATC

CAT 15 - A weekend of technical presentations

Video Fundamentals - Part4: The Camera's Eye



... and all the regular features

BATC DTX1 Digital TV Transmitter



MPEG-2 encoder and DVB-S modulator

- ▶ Self contained unit - computer not required.
- ▶ Composite and S-video input
- ▶ 2 audio channels
- ▶ Single PCB design
- ▶ Plug in option for 2nd video & audio channels
- ▶ Size: 165mm wide; 120mm deep; 55mm high
- ▶ Tunes the 70cm and 23cm bands. Tuning range from 150Mhz - 2Ghz
- ▶ -5 dBm output
- ▶ Power 500mA at 12 volts
- ▶ LCD front panel and keypad control
- ▶ RS232 control port



Available from BATC shop

- ▶ DTX1 DATV transmitter PCB complete with case and front panel
£459 including postage

Specification subject to change without notice

ATV Activity Weekend

12 - 13 December 2015



- ▶ **Not a Contest - just a weekend of ATV Activity**
- ▶ **All bands from 50MHz to 24 GHz**
- ▶ **Digital and Analogue modes**
- ▶ **Repeater and Simplex contacts**
- ▶ **Coincides with International Activity Weekend**
- ▶ **BATC Certificates for:**
 - **Repeater Group with most QSOs**
 - **Best DX contact on any band**
 - **Best DX contact on RB-TV (800Khz or less)**
- ▶ **See the BATC Forum for more information**



Time to blow the cobwebs off all that gear and get on air!



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Spring - Please submit by February 28th
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Autumn - Please submit by August 31st
Winter - Please submit November 30th

Please send your contributions in as soon as you can prior to this date. Don't wait for the deadline if you have something to publish as the longer we have your article, the easier it is for us to prepare the page layouts. If you have pictures that you want including in your article, please send them, in the highest possible quality, as separate files. Pictures already embedded in a page are difficult to extract at high quality but if you want to demonstrate your preferred layout, a sample of your finished work with pictures in place is welcomed. Please note the implications of submitting an article which are detailed on the contents page.

From the Chairman...

Noel Matthews - G8GTZ



It was great to see so many members and friends at CAT15 in early September and a big thank you to Kevin G3AAF and the members of Finningley Radio Club for making us feel so welcome. As usual we had an interesting program of talks including the theory behind the Tutuione software by F6DZP and an update on RB-TV technologies from Brian G4EWJ and Laurence M0LDZ.

But it was not all transmission topics and Chris MW0LLK gave two very interesting talks on ffmpeg and Vmix – we can expect to see much more interesting shack videos in the future, particularly using green back clothes! All the sessions from the CAT15 were recorded using the club's new HD equipment, based around the ATEM TVstudio, which has made a significant difference in the quality of both the streaming and recording from such events. The videos are available on the BATC Online channel on Youtube at <https://goo.gl/l1m4Xh> – for more details see the Social media news in this edition of CQ-TV.

So why Youtube rather than the batc.tv archive? As was explained at CAT15 we are looking to redevelop our web presence including the streaming portal, but have decided that there is little point in maintaining our own archive when Youtube do an excellent job and do not consume our storage or bandwidth capacity. Whilst you'll be pleased to know we have ticked the "no pre-roll adverts" box, what we are investigating is the use of software which will enable us to build a gallery on our website with our own look and feel but embed the videos which will stay on Youtube - this will enable us to build a library with good search facilities and no adverts. We will be gradually transferring all the assets over from the batc.tv archive and have already transferred all the previous CAT presentations and a couple of ATV on the air videos which include our current President and Secretary in their youth.

We have absolutely NO plans to move any other facilities over to other platforms - we will continue to run the live streamer for repeaters, members streams and live events are in the process of beta testing a new platform which was used for both AMSAT and CAT15.

The migration to Youtube is just one aspect of the work we are doing to update the BATC on line presence and I'm pleased to say we are finally making some progress towards a system which a number of discrete modules with a central LDAP server to give common log in across the various facilities. If you watched either the streaming from the AMSAT conference or CAT15 you will have seen the beta

release of the new live streaming service which we hope to roll out initially for repeaters in the near future.

This has been a very busy summer for the BATC and we attended a number of UK rallies and the very successful HAMRADIO conference in Friedrichaven. BATC recruited over 20 new members and helped organise the ATV conference where there was a lot of interest in the RB-TV developments and particularly in the UK 146 MHz allocation.

Congratulations to Terry G1LPS and Rob M0DTS who not only won the awards for first 146 MHz QSOs over 10 Km and 100 Kms but also won the RB-TV sections in the June contest. There has been a lot of activity with RB-TV and Brian G4EWJ and Jean Pierre F6DZP completed the design of the USB minituner and kit which we released in to the shop – unfortunately we were victims of own success and the first set of kits sold out in less than 30 minutes! The subsequent 2 batches also sold out within 24 hours but unfortunately it is unlikely we will stock any more complete kits unless we can find volunteers who are willing to purchase the components and make up the kits – thanks to Brian and Colin G4KLB for doing the first 70 kits. The work of Jean Pierre, Brian and Colin in developing the USB DATV receive solution was recognised at CAT15 and they were jointly awarded a BATC grant for the work – congratulations and a big vote of thanks goes out to them.

In September we held the first ATV activity weekend - an informal arrangement to encourage you all to get on-air and 15 stations were on air with at least 2 members going out portable. It is not intended to be a contest, but the aim is to give a focus of activity and perhaps something for you to aim for with that project that has been on the bench for a long time! We will be holding an activity weekend every 3 months and timed to coincide with the European activity days – the next one is in December and it will be interesting to see if anyone braves the elements to go out portable then!

Don't forget you can keep right up to date with all the latest developments in the ATV community by reading the BATC forum – the easiest way to do this is to save the RSS feed at <http://www.batc.org.uk/forum/feed.php> in your favourites and this will give you a list of the most recent posts.

Amateur Television in the UK is in pretty good shape and BATC will continue to drive the initiatives and support all the activities which move the ATV community forward, we just need to get the word out to the wider amateur radio community to ensure our hobby continues to thrive. 🗣️



Members News

Dave Mann – G8ADM

Television History

In the days of digital transmission and RB-TV this subject is less fashionable these days. At the BATC Convention in September Brian Summers showed a working Philips LDK5 Plumbicon Broadcast Colour Camera, picture below. This camera was sold ~1980 for about £60,000 including the lens. I guess this would be about £180,000 at today's prices. We are very fortunate that Brian and others devote their time to maintaining historic collections of television equipment.

See: <http://www.tvcameramuseum.org/> and refer to the link page for a list of similar organisations.



► Philips LDK5 Camera shown by Brian with Jean-Pierre F6DZP and John GW3JGA looking on.



Activity

There was a fair amount of dx worked during the summer from southern stations into France. Most of the contacts were on 70cm RB-TV with path lengths up to 185Km. Peter G3PYB, Colin G4KLB, Noel G8GTZ/P, Rolf F9ZG, Christian F6BGR, F3YX in Paris were very active. Stations in the Luton area, Yorkshire and the NE Coast were also very active. See the BATC Forum for more details.



► Image received by Rolf F9ZG, from Colin, G4KLB

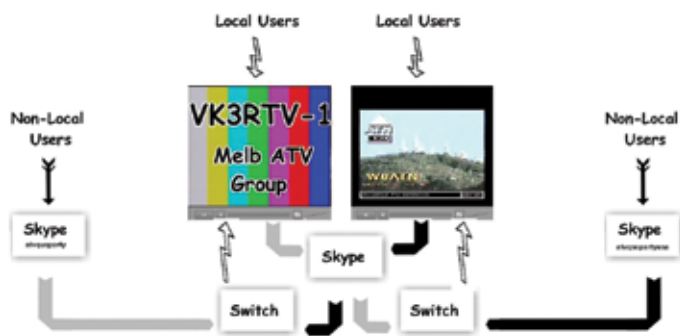
Australian annual World ATV QSO Party

This was held on August 21-22 and was sponsored by Amateur Radio Victoria and the Melbourne ATV Group. The convenor was Peter VK3BFG with the event centred on the Melbourne-Geelong Digital ATV repeater VK3RTV. Those in the USA, UK and elsewhere could join



► Don Hill, KE6BXT (small picture) checking Skype with Peter Cossins, VK3BFG (large picture)

in through a local television repeater or by Skype. The VK3RTV transmissions were streamed worldwide via high quality YouTube, courtesy Ralph VK3LL and via the BATC



streaming service. Friday night concentrated mainly on Australian amateurs. Saturday morning, Australian time, concentrated on the USA with UK contacts later in the day. In the UK the GB3HV repeater was linked to the network via Skype. Amateurs could also link direct via Skype. I joined in with about another 5 UK amateurs via GB3HV and chatted to several Australians in vision and sound. Worldwide there must have been 100 or more on over the two days. All this was great fun so look out for next year's party here: <https://www.amateurradio.com.au/>

ISS Update

Major Tim Peak, we previously reported that he was very keen to get the digital ATV transmitter on the ISS operational. He is now scheduled to join the ISS in December. Listen out on the RSGB news for updates.

Several stations will be streaming the pictures when the ISS is in range. Click the ISS button on the BATC streaming service. Those with a big dish and the ability to track the ISS will be able to receive the digital ATV transmissions. If you do manage to receive the station, please send us a report!



Repeaters

GB3YT is located in Mirfield West Yorkshire was licenced last May and is now operational on 23cms. This new digital repeater continues to evolve and is managed by G8NZR and G8POK.



A new 23cm repeater has been proposed for near Banbury, central southern England, GB3ET. This will be managed by M1CNJ. For progress on this application check the repeater information site:

<http://www.ukrepeater.net/repeaterlist5.htm>

Peter, G8DKC is experimenting by adding a 2m RBTV input to the GB3GV repeater, 8km North West of Leicester. This is currently working by request only but he hopes to get automatic change over operational soon. For DX stations it is useful to monitor GB3GV on the BATC streaming service to see if the repeater receives your signal. Pictures and more information are available on the BATC forum. More repeaters are expected to be adding an RB-TV input soon.



Links

This is a very comprehensive list of hundreds of ATV sites around the world: <http://atv-tv.org/>
 For worldwide ATV news from Australia see: <http://www2.vk7ax.id.au/spectrum/>
 Subscribe for regular emails.



Please send any news for CQ-TV 250 to me by the end of November secretary@batc.org.uk



Contest News

Dave Crump – G8GKQ

Change of Format – Contest or Activity Day?

Our first activity weekend was on 12/13 September and seems to have been a success – a full report is below. Activity during these weekends is not limited to simplex contacts; repeater contacts are encouraged as well. So, for future activity weekends, I'll simply ask that you send me a brief e-mail with details of your activity – or post the details on DXSpot.TV My aim in running the BATC Contests has always been to promote ATV activity, and it seems that "Activity Weekends" are now a better way to do this.

BATC Repeater Contest March 2015

The only activity was through GB3HV which, although receiving normally, was not transmitting except on the batc.tv streamer. There were 3 entries:

Pos	Call	Points	Contacts	Repeater
1	G8ADM	245	3	GB3HV
2	G0EID	238	3	GB3HV
3	VK2CRJ	130	3	GB3HV

Thanks to the 5 stations that took part (G8GTZ and G8DGR were also active) and congratulations to Dave, G8ADM.

In future the Repeater Contests will become part of the Activity Weekends.

International ATV Contest 13/14 June 2015

There were 2 sections to the ATV Contest on 13/14 June: The International Section on 432 MHz and above, and the separate UK-only RB-TV Section.

The International Section in the UK was won by Terry, G1LPS, although Rob, M0DTS, scored more points but from 2 different sites:

Pos	Call	Points	Best DX	QTH	Distance kms
1	M0DTS/P (2)	272	G1LPS/P	IO85XF	116
2	G1LPS/P	232	M0DTS/P	IO94MJ	116
3	G4CPE	109	G8GTZ/P	IO91GI	95
4=	M0DTS/P (1)	102	G1LPS	IO94DF	51
4=	G1LPS	102	M0DTS/P	IO94EQ	51
6	G8GTZ/P	95	G4CPE	IO91SW	95

Congratulations to Terry and Rob who were active on all bands below 24 GHz:

Pos	Call	IARU points
1	G1LPS	2424
2	M0DTS/P (1)	2388
3	G4KLB	912
4	G8GTZ/P	650
5	G4CPE	424
6	G8ADM	378
7	M0DTS/P (2)	294
8	G3KKD	175
9	G8GKQ/P	130
10=	G3UEQ	10
10=	G4GUO	10

The International results are at http://www.iaru-ri.org/images/VHF/atv/IARU_ATV_results_2015a.pdf and show 47 participants including 11 from the UK. A really good effort! Please see full UK results table on the next page.

UK RB-TV Contest 13/14 June 2015

The BATC Committee offered 2 awards for the participants in the best DX contact using RB-TV during the time period of the International ATV Contest. The RB-TV results for 146 MHz are shown below:

Congratulations to Rob and Terry; their prize of a £50 Amazon Voucher each was announced at CAT 15 and forwarded to them shortly afterwards.

Contest and Activity Weekend Calendar

1200 UTC 12 December 2015 – 1800 UTC 13 December 2015: *ATV Activity Weekend*

1200 UTC 12 March 2016 – 1200 UTC 13 March 2016: *ATV Activity Weekend*

1200 UTC 11 June 2016 – 1800 UTC 12 June 2016: *IARU International ATV Contest*

1200 UTC 10 September 2016 – 1200 UTC 11 September 2016: *ATV Activity Weekend*

International ATV Contest 13/14 June 2015 UK Results

Pos	Call	Points	Best DX	QTH	Distance kms
70cm					
1	G4CPE	424	G8GTZ/P	IO91GI	95
2	G8ADM	378	G8GTZ/P	IO91GI	80
3	G8GTZ/P	350	G8ADM	IO91SW	95
4	G4KLB	324	G8LES	IO91LC	72
5	G3KKD	175	M0SKM	IO91RV	63
6	G8GKQ/P	130	G4KLB	IO90BR	60
7=	G1LPS	102	M0DTS/P	IO94DF	51
7=	M0DTS/P	102	G1LPS	IO94EQ	51
9=	G4GUO	10	G3UEQ	IO90TU	5
9=	G3UEQ	10	G4GUO	IO90ST	5
23cm					
1	G4KLB	588	G8GTZ/P	IO91GI	75
2	G8GTZ/P	300	G4KLB	IO90BR	75
3	M0DTS/P (2)	294	G7AVU	IO93OJ	112
4	G1LPS	282	M0DTS/P	IO94DF	51
5	M0DTS/P (1)	246	G1LPS	IO94EQ	51
13cm					
1=	G1LPS	510	M0DTS/P	IO94DF	51
1=	M0DTS/P (1)	510	G1LPS	IO94EQ	51
9cm					
1=	G1LPS	510	M0DTS/P	IO94DF	51
1=	M0DTS/P (1)	510	G1LPS	IO94EQ	51
6cm					
1=	G1LPS	510	M0DTS/P	IO94DF	51
1=	M0DTS/P (1)	510	G1LPS	IO94EQ	51
3cm					
1=	G1LPS	510	M0DTS/P	IO94DF	51
1=	M0DTS/P (1)	510	G1LPS	IO94EQ	51

ATV Activity Weekend 12/13 September

A reasonable number of UK stations were active during the activity weekend on 12/13 September, including 4 portables: G8GTZ/P near East Dereham in Norfolk, G8GKQ/P on Walbury Hill in Berkshire, M0DTS/P on the North Yorkshire Moors and 2E0XAY/P near Markfield in Leicestershire. There were 3 certificates offered for this Activity Weekend:

- ▶ Repeater Group with most QSOs
- ▶ Best DX Contact on any band
- ▶ Best DX Contact on RB-TV (<800 KHz)

I have yet to receive all the reports for the activity, but I know that the following stations were on-air:




▶ G8GTZ/P near East Dereham in Norfolk.
Photo credit G3ZIG

Call	Location	Locator
M0DTS/P	North York Moors	IO94MJ
G1LPS	Spennymoor, Co Dur	IO94EQ
G4CPE	Upper Sundon, Beds	IO91SW
G8GKQ/P	Walbury Hill, Berks	IO91GI
2E0XAY/P	Markfield, Leics	
G8GTZ/P	East Dereham, Norfolk	JO02KP
G8GTZ/P	Dunstable Downs, Beds	
G8ADM	Pinner, Middx	IO91TO
G8LES	Alton, Hants	IO91LC
G0MJW		
M0IKB		
G7AVU		
MINAS		
M0SKM	Dunstable, Beds	IO91RV
G0WFT		IO91RW

Next Event

The next planned event is the activity weekend on 12/13 December. The aim is simple – to generate as much ATV simplex and repeater activity as possible. Please try to get on the air and then send me an e-mail with details of what you did!

Latest News

Remember that you can always find the latest Contest and Activity Weekend News on the BATC Forum. There are links to the rules and the entry spreadsheets there and on the BATC website. 




I also had reports of activity through GB3GV and GB3TN.

► G8GKQ/P on Walbury Hill with M0DNY using DXSpot.TV.
Photo credit: G8GKQ

Outside Broadcast with the BATC

Frank – M0AEU

In July members of the BATC attended the AMSAT Colloquium in Guildford to stream the presentations live to the BATC server. This was the first outing for the new BATC Blackmagic Design ATEM Television Studio - an HD broadcast quality switcher in a 1u 19" rack module. It was also the first stream of an event to the new server being trialled at the moment. The ATEM supports up to 6 HD cameras, and outputs to either HDMI or SDI. All the inputs, plus the preview and the program are viewed on one multiview HDMI monitor. Switching is achieved through use of a software Control Desk. This also includes 2 media players for any captions & graphics, as well as 1 upstream & 2 downstream keyers.

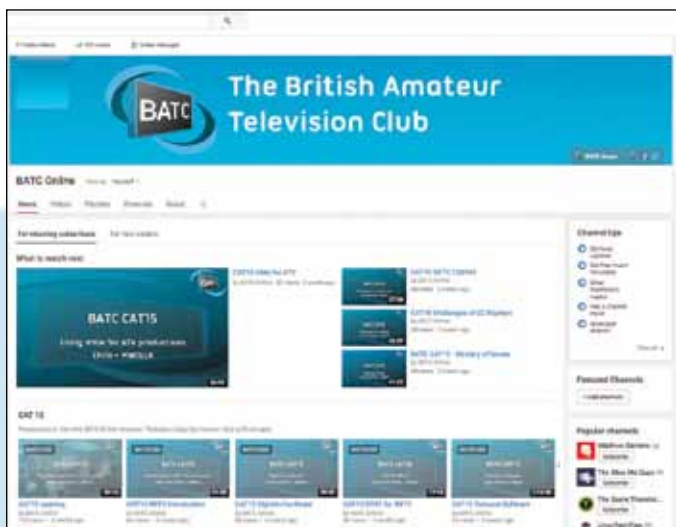
The new server supports HD streaming and doesn't rely on Flash, making it ideal for viewing on any device. Early tests look promising, with some very encouraging comments from viewers. It's hoped to roll the server out to members and repeaters very soon. 



Social Media



Ian Parker – G8XZD



Since the last edition of CQ-TV the BATC now has its own YouTube channel.

We've included most of the lectures from CAT 15 and have uploaded many others from previous year.



Have a look at them, you'll find the quality from this year is very good as they've been recorded and uploaded in 720p quality.

But what I think is more striking is how much the hobby has moved on in the past year. For example watch the Digithin lecture from 2014. - then compare it with this year's offering.

You'll see the project has gone from a theoretical concept with lots of "ifs and buts" to something very real with pcbs and short kits stocked in the BATC shop.

Twitter: <https://twitter.com/BATCOnline>

Facebook: <https://www.facebook.com/groups/BATCOnline/>

YouTube: <https://goo.gl/llm4Xh>

People are now on-air with RB-TV and already some quite respectable dx has been worked on 146.5MHz.

And all the problems of how to receive DATV at low symbol rates have disappeared thanks to Jean-Pierre's (F6DZP), hugely popular Minitioune software and Brian's (G4EWJ) work on the hardware side of things.

Hopefully widening the reach of this valuable resource will help encourage more people around the world into the ATV fraternity.



In other social media news both our Facebook and Twitter audiences continue to grow and the levels of engagement with members increasing. Facebook in particular has been very busy with people posting comments and pictures about equipment they've made and which hilltops they're taking their new toys.

Indeed we've even seen it used in an attempt to mobilise people to try to bring some of the RB-TV dx records "down south"

And if you are stuck and need some help the club's Twitter account is a good place to ask questions.





146MHz RD70HVF1 Amp

Rob Swinbank M0DTS

Recently I built another 2m Amplifier using the RD70HVF1, it is a relatively cheap device but only available on eBay from the Far East. I ordered two for £36 inc shipping to experiment with.

The device is rated at 70W CW so was a good candidate for getting more 'clean' power on 146MHz Digital ATV.

Initial tests show very good results and shows -55dB IMD3 at 5W output. I can get about -58dB with a fair amount of fine tuning but that is not very repeatable! Using the amplitude only pre-distortion in the DATV Express I can manage 6W output at -60dB IMD3.

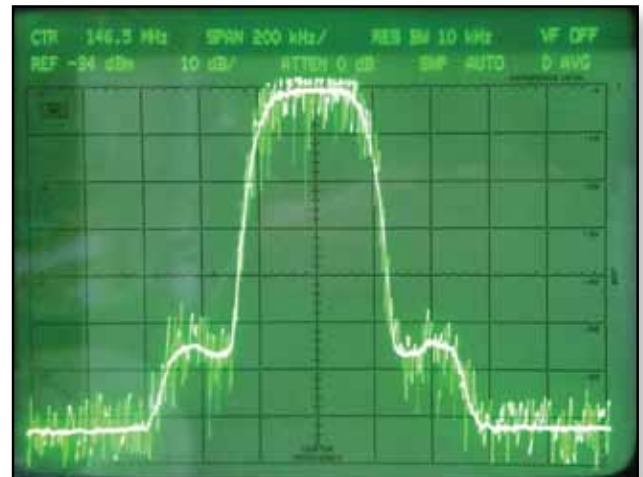
The design is extremely close to the RD06 and RD15 devices but with a couple of value changes in L/C.

I originally used trimmers for a few caps during testing but I have now included the fixed value capacitors in the schematic. Note C7 should be a good quality high voltage 22pf capacitor but I am currently using it with two regular 50v 10pf ceramics in parallel and got the same results.

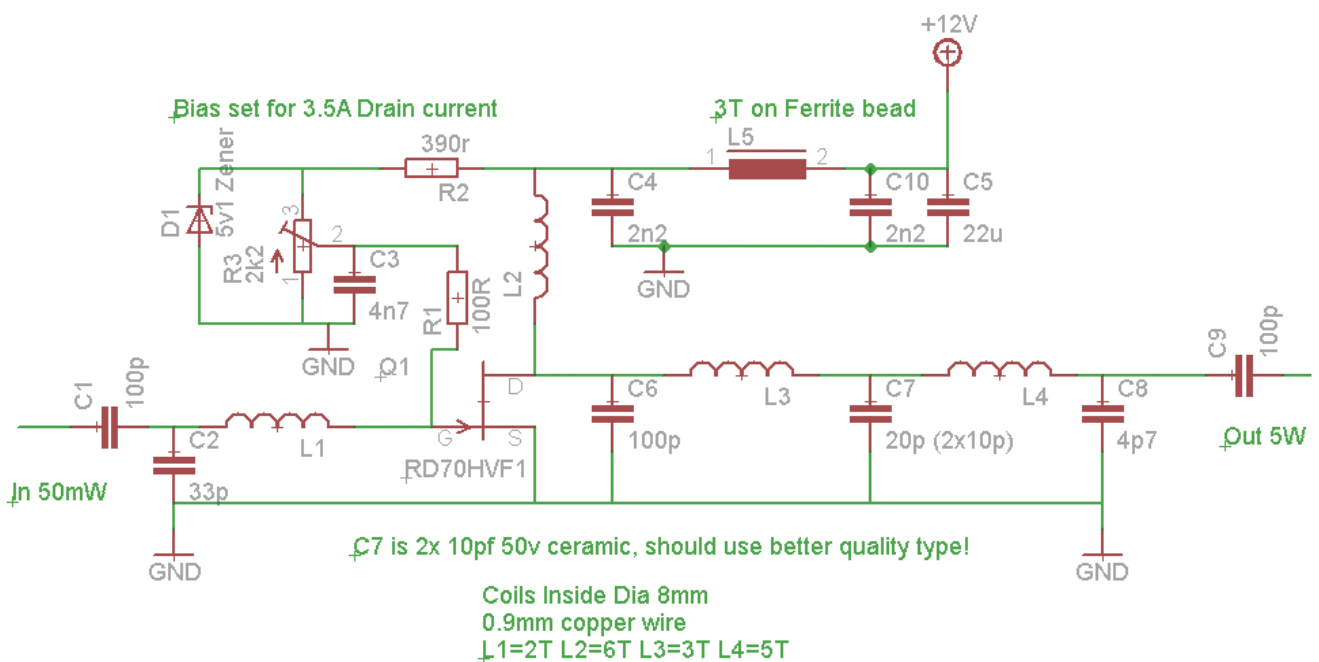
The PCB is double sided and the tracks/pads are cut out with a dremel and 1mm cutting disc. I used 6mm stand offs from the heat sink to support the outer ends of the PCB.

The device is biased up well (3.5A idle current) so you do need to get the heat away from the device efficiently. I used a copper spreader (50x35x8mm) to move the heat and it works very well – a fan is a must on 5"x4"x1" heat-sink.

The amplifier is best driven with the RD06HVF1 amplifier previously published in CQ-TV 247. The line up of these two amplifiers gives 5W output for 1mW input at 146.5MHz.



► The RD70HVF1 Spectrum @ 5W



24GHz building blocks



Terry Roxby – GILPS

Recently Rob, MODTS, and myself have been experimenting with 24GHz with good results. Rob had built a transverter for the band from surplus equipment and I began with a solfan type head from a security motion detector giving 5mw output power. This was driven with a Bob Platt gunmod 2 board modified for 5v to the gun diode and a horn antenna.

With the horn antenna on my mast Rob could receive my TV signals both at home 28km away and at his portable site 54km away at P5!

This low power experimentation encouraged me to look for a transverter with more power output and RX capability. A search for the unit Rob had used drew a blank. We then found on eBay a plentiful and cheap supply of units from Israel operating on 27 – 29GHz. made by Broadern.



► Broadern-RF-Microwave-Transceiver-ED-0612-2
27.35-29.45GHz TX-RX WR28-SMA

We both purchased one to play with not knowing if they could be easily converted. They have a 2x multiplier and we planned to use 23cm as the IF.

Rob - the RF guru in our group - did some investigation and came up with the following solution to drop the frequency in to the amateur band.

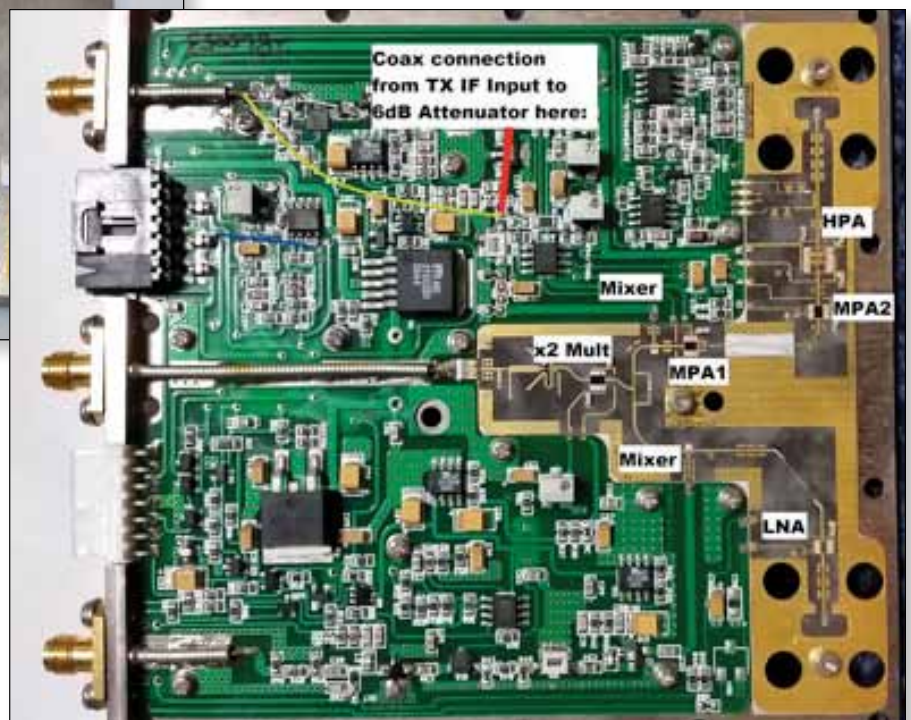
TX Modification

One layer of Kapton tape on the Ceramic Tx Filter, then a smaller length of sticky copper tape on top of that. Tuning for max output was achieved with a copper tab on output of the device before the filter.

Transmit power was measured using a diode detector rated at 18GHz. It was confirmed that the power was in the correct band with a filter tuned to 24GHz. Expect >300mW without tweaking.

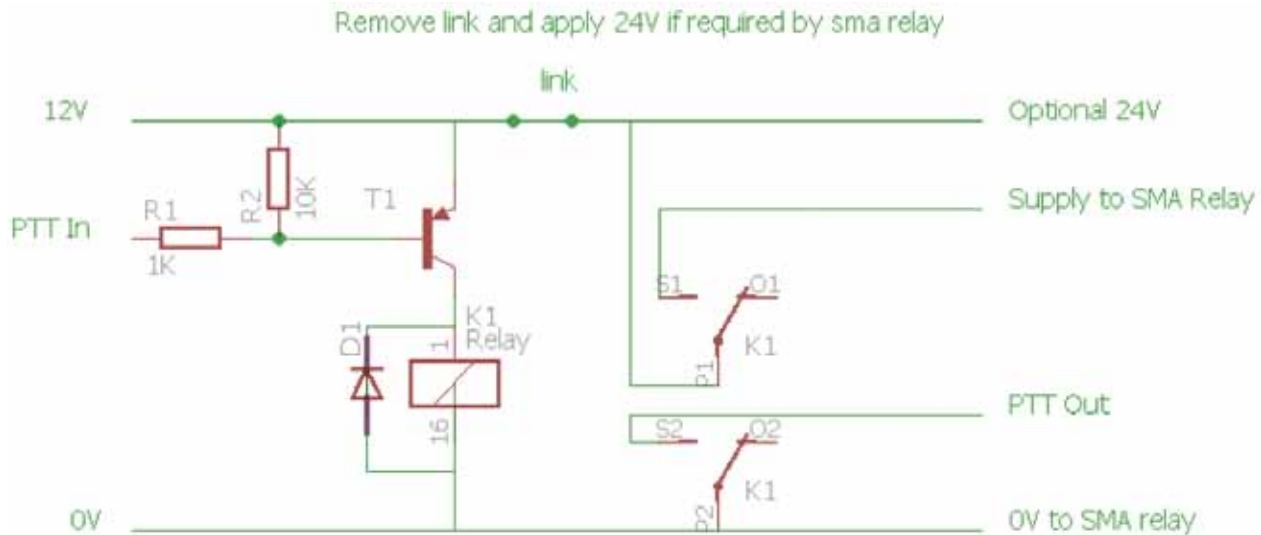
These units require the tiniest sniff of RF to drive to full power which is not very practical in operation. We have removed all TX drive stages apart from the 6dB attenuator right before the mixer. This was done by connecting the the tx in sma with coaxial cable directly to the attenuator; 10mW input = 500mW output on our units. There is a pi attenuator immediately after the 6db attenuator that can be bypassed if you are low on drive.

This came about by accident on the first unit because a driver stage was killed in the mod process with +8v instead of +5v supply rail as some other information suggests on the internet. But 10mw drive really is more comfortable to operate and is a good match for many of our TV transmitters both analogue and digital.



► Connection to mixer to allow 10mw drive (yellow connection)

PTT Sequencing



► Ground the PTT line to key TX

Power supplies

Cheap DC-DC stepup and step down converters were used to provide the various voltages required for the transceiver unit. +12v, +10v, +5v (and in my case +24v as a 24v sma relay was used) The -12v negative voltage was generated using a LMC7660IN. DC-DC converters can also be modified to give negative voltage. See <http://www.m0dts.co.uk/?tag=Mods> for how to do this.

Boxing and plumbing it together

The two units were mounted either side of a 12mm thick block of aluminium for heatsinking and fitted into a diecast box. Wave guide transitions to sma were used (wr28 for the tx and rx ports and wr42 for the antenna port). All interconnections were made in hardline. For switching an sma relay rated to 26GHz, an XLR connector was used to connect power, PTT and power detect cables.



DC Power connections

1. Not Connected
2. +10v
3. -12v
4. GND
5. +5V
6. Not Connected

Control Data

1. PTT
6. Power Detect (second from opposite end)

Wave guide transitions to sma for these frequencies can be expensive. Both Rob and myself had to resort to making some after weeks of searching for cheap ones. This was simple to do - I used a hot plate (cooker ring) to get the heat in and soldered a copper plate on the open end of a flanged straight waveguide cut to length. The plate was wired to keep it in place while soldering. It was then filed and dressed up after cooling. Drill the hole for the sma before soldering so that it can be dressed clean on both sides of the hole. SMA center pin protrudes 2.2mm into the waveguide and is 2.5mm from the end wall.

This is not presented as a finished project but more for information about what we have been doing and the cheap building blocks we used to achieve access to the 24GHz band.

I have also just found a very similar solution to the one we created. This can be found here

<http://www.sydneystormcity.com/24GHz.htm> using a similar harder to find transceiver and the Elcom oscillator.

Have fun experimenting! - Terry, G1LPS 🗣️



2 watt driver amplifiers for 1296 and 2304MHz

Updated by Clive G3GJA from an original article published by Chuck Steer WA3IAC



Background

Whilst looking on the Internet and eBay for suitable driver amplifiers for the Digilite project I found the eBay shop RF Basic Store. This is the eBay outlet of the U.S. company RF Bay Inc. (www.rfbayinc.com) that specializes in providing low-cost, high-performance RF and microwave products for military and commercial applications. The eBay shop (stores.ebay.com/RF-Basic-store) has a wealth of components of great interest to Amateurs. In particular, this shop stocks a wide range of the newer MMICs designed for use in cellular radio systems that have output powers up to watts and all matched to around 50ohms. Even better still, the shop also stocks suitable PCBs and housing kits to match the MMICs so that it's possible to order all you need from once source to make driver amplifiers for various output levels. Some circuit and component detail is also available from the RF Basic Store but not enough to make a 23cm or 13cm amplifier that would perform to its best capability without experimentation.

I then came across an article on the Internet by Chuck Steer, WA3IAC, that used the same components. Chuck at one time stocked kits from RF Bay Inc. for the amplifiers and he had matched the input and output making the chances of getting the MMIC amplifier working to its rated performance at the frequencies of interest much more likely, so I ordered 2 MMICs, PCBs and suitable housing unit with heatsink from the RF Basic Store on eBay.

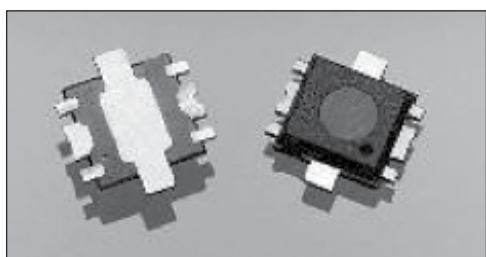
The cost is currently about £25 for housing and heatsink, £6 for 2 MMICs and £8 for 2 PCBs. Be prepared to pay VAT and the £8 Royal Mail handling charge when you receive the parts. Usefully, the RF Basic Store also stocks the chip capacitor and components needed to complete the parts list, but the inductor L2 can be sourced from Farnell. The following is based on Chuck's article and is reproduced with his permission:

About MMICs in general

Micro monolithic integrated circuits have been with us for some time now. Low power ones work up to 8 or 10GHz. with only 10 or 15 mW of output power in a '086 package. The gain of most of the MMICs became lower as frequency increased about 1000MHz. The major advantage was that little or no tuning was needed. Add to this the lower cost and MMICs became very popular with most builders. The main drawback was that the quiescent current was a bit higher than when using a FET for the same power output. Even so, MMICs still found their way into most projects and most were matched to about 50 Ohms in and out. As the years moved on so did MMIC's performance and we saw power increase and noise figures decrease. Now, finding one watt at 2 or 3GHz is not uncommon. Most of these devices now are +5 volt and come in new packages ('089, SOIC-8, SOF-26). With very little tuning it was possible to use MMIC amplifiers that were easy to build and test.

About the SPB-2026Z device

The SPB-2026Z is a high linearity 0.7 to 2.2GHz 2W single stage Class AB Hetero junction Bipolar Transistor (HBT) amplifier housed in a proprietary surface-mountable plastic encapsulated package. The HBT amplifier is made with InGaP on GaAs device technology and fabricated with MOCVD for an ideal combination of low cost and high reliability. Unlike the lower power MMICs the SPB-2026Z is pre-matched to approximately 50 ohms on the input for broadband performance and ease of matching at the board level. It features an input power detector, on/off power control, ESD protection, excellent overall robustness, and a proprietary hand re-workable and thermally enhanced SOF-26 package.



► Top and bottom views of the MMIC

General Specifications:

- Frequency Range: 700MHz to 2200MHz
- Gain: 13.6dB at 1842MHz; 13.7dB at 1960MHz; 13.6dB at 2140MHz
- Noise Figure: 5.2dB at 1960MHz
- P1 dB: +33.9dBm at 1842MHz, +33.8dBm at 1960MHz; +32.8dBm at 2140MHz
- IMD3: -49dBc at 1842MHz; -45dBc at 1960MHz; -48dBc at 2140MHz (+22dBm per tone at 1MHz spacing)
- In/Out Return Loss: -14dB/-12dB at 1960MHz

SOF-26 Package pin out:

1. active bias circuit
2. RF input, and has a DC voltage present
3. power up/down. This voltage should be at but not over +5 volts at pin 1 and limited to less than 10mA
4. power detector. Voltage samples the power at the input of the amplifiers not the output.
5. RF output and Vcc.
6. n/c

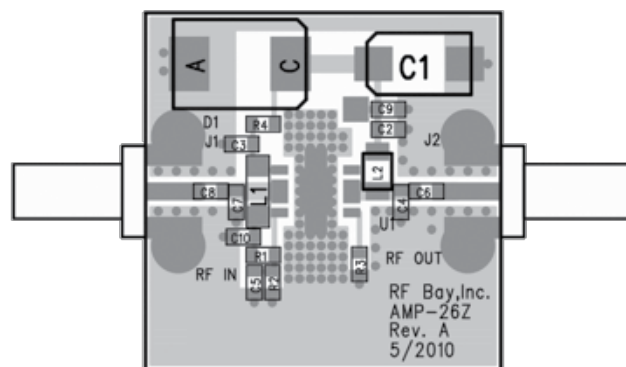
Unlike the first generation of low power MMICs, this one requires a bias line (pin 1). This isn't a problem because in this amplifier the bias is +5 volts. The power up/down (pin 3) must be at or less than +5 volts so just adding a simple resistor divider works fine. Pin 4; power detector voltage samples the power at the input of the amplifier not the output. All that is needed is some by passing capacitors. One note: on the board layout, L1 was omitted and a jumper was used to connect to +5volts (figure 5b).

Assembling components on the printed circuit board

Mount the SPB-2026z device by first tinning the bottom then heating the board to between 180 and 190deg C to flow the solder. If you have access to a SMD rework PCB heater such as the cheap Tenma one from Farnell it makes this much easier. Having done that, solder the body of the device to the board leads to the pads. A good ground connection is essential not only for the RF return but for the device to disperse the heat within.

The board layout is for a 0402 size components but I used 0603 parts that just fit on the pads. The 10pf capacitors used in the RF path were ATC600S found on eBay, although 0402 ceramic capacitors seem to work OK at 1296 and 2304MHz. All other capacitors were 0603 and the choke was 0805 size.

As for soldering, use the three-second rule. That is not to apply heat for more than three seconds. If retouching is needed, let the component cool down before re-soldering. Use thin 24SWG solder as well as thin solder wick.

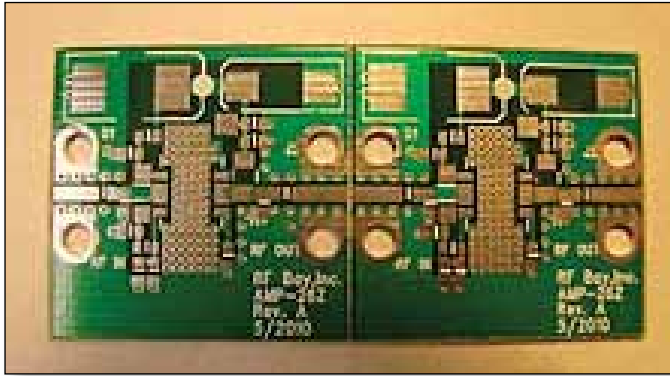


► Figure 1: PCB layout from RF Bay Inc.

Further assembly notes from G3GJA

After mounting all chip components on the PCB, put a thin smear of heatsink compound on the underside of the PCB opposite where the MMIC is soldered. You should also place a thin smear of compound between the housing and the heatsink when you come to mount that. With the PCB secured with the screws supplied, fit the SMA

connector and tighten the Allen screws.
 Solder the SMA connector spills and then fit the lead through and ground wiring pin. Note that the board layout in Fig1 shows L1 as the link to get +5v from the junction of R4/C4 to the junction of R1/C5; this is replaced by a wire link from the +5v supply lead-through capacitor. L1 in the circuit diagram is placed to bridge a cut in the track under L1 shown in the layout as described above.



► Figure 2: PCB from RF Bay Inc.

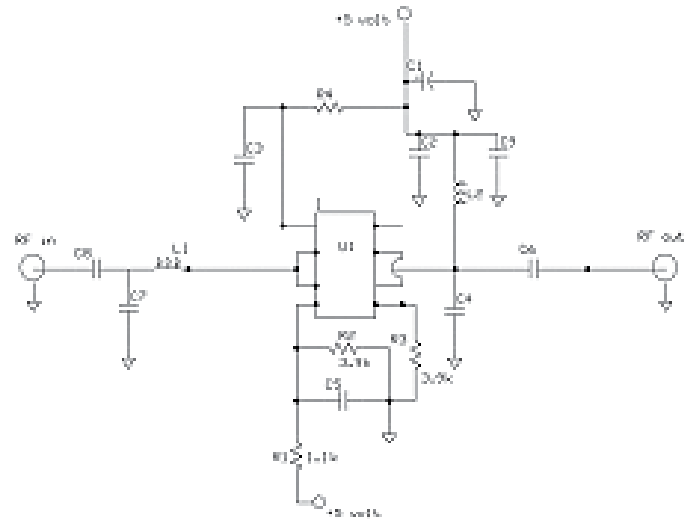
2304 test and tune up:

Note: Do not exceed 5.5v supply. The SPB-2026z is rated from 700 to 2200MHz. I decided to try and tune it up at 2304MHz and see just how well it would work. With +5 volts the quiescent current (Idq) should be between 320 and 420mA. I used a network analyzer to get the best S11 and S22 before applying RF drive. With +21 dBm input (125mW) I tuned for 2-watt (33dbm) output.

Parts list

	1296MHz	2304MHz	
C1	10uF @ 25v	10uF @ 25v	Size "C", "D", 1206, 1008 Tantalum
C2	27pf	27pf	0402 or 0603 ceramic
C3	.1uF	.1uF	0402 or 0603 ceramic
C4	5.6 +0.7pf	1.2pf	0402 or 0603 ATC 600s or ceramic
C5	.1uF	.1uF	0402 or 0603 ceramic
C6	10pf	1.5pf	0402 or 0603 ATC 600s or ceramic
C7	2.7 + 3.3pf	1.5pf	0402 or 0603 ATC 600s or ceramic
C8	10pf	1.0pf	0402 or 0603 ATC 600s or ceramic
C9	.1uf	.1uf	0402 or 0603 ceramic
L1	1.2nH	n/a	0402 or 0603 Can use 0.2 inch long, #30AWG, hair pin
L2	33nH	33nH	Coilcraft See below
R1	1.1K	1.1K	0402 or 0603
R2	3.9K	3.9K	0402 or 0603
R3	3.9K	3.9K	0402 or 0603
R4	0 Ohm	0 Ohm	0402 or 0603
U1	SPB-2026z	SPB-2026z	See text

That was saturated power, not linear. At full drive the current was just under 1.0 Amp. The values in the parts list were the values used, but could vary a little having only built one. In my case I did not have the ideal values and so I paralleled two capacitors. I used 0603 size, but 0402s would make an easy fit.



► Fig 3

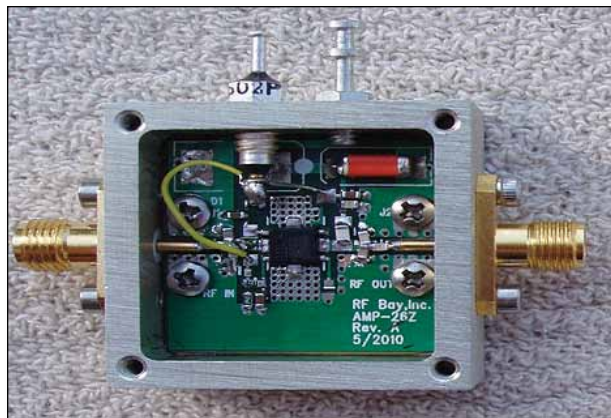
1296 test and tune up:

The approach was the same as with the 2304 version. Quiescent current was in the same range as well as gain. However, a small inductor was needed in the input line to improve the match.

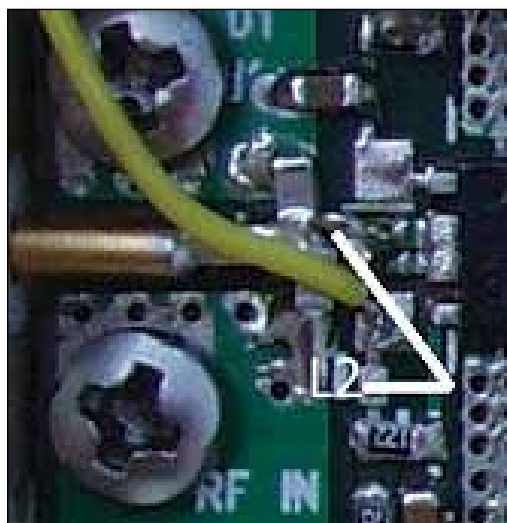
I used a hair pin wire about 0.2 inches long of #30 wire, but an SMT 0805 inductor of 1.2 to 1.8nH could be used and reselect the capacitors (G3GJA: I used a 1.2nH chip component). In order to do this, the input line was cut just after C7, C8 junction and the solder mask was removed. As in the 2304 version, the capacitor I needed was between the preferred values to hand so another capacitor was added in parallel. The match on the output was fine without adding an inductor.

You will also need:

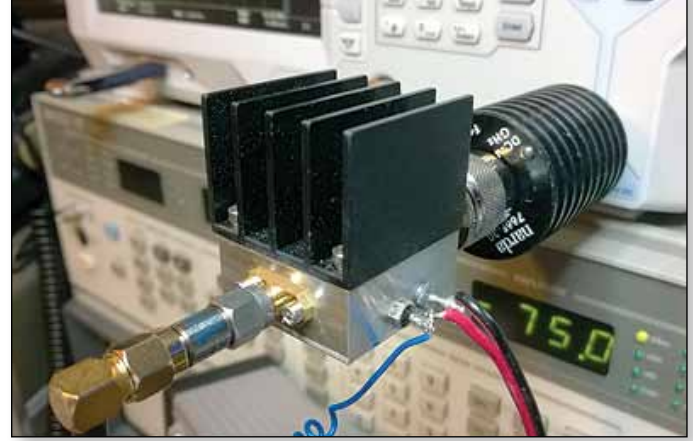
- I x eBay item no. I50203338277 RF MMIC Amplifier Housing Kit with Heatsink
- I x eBay item no. I60391561412 RFMD 0.7-2.2GHz 2W InGap MMIC, SPB-2026Z
- I x eBay item no. I60445927901 PCB for RFMD/Sirenza SOF-26 RF MMIC Power Amp
- I x Farnell stock no. 2285904 Coilcraft 33nH 0603 1.9A



► Figure 5a: Chuck's 1296 MHz unit



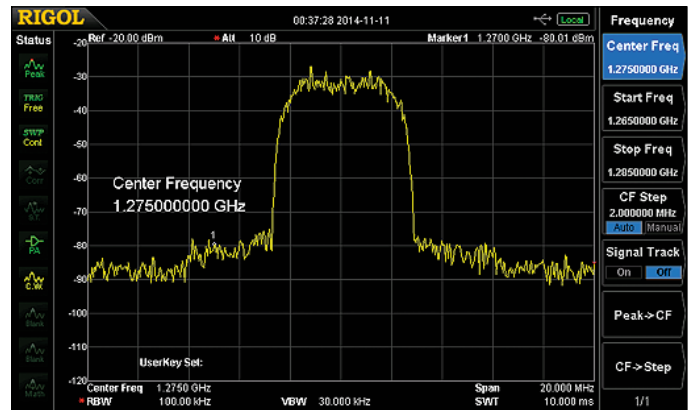
► Figure 5b: detail of the 1296 MHz unit's loop at L1 (G3GJA: I used a 1.2nH chip inductor)



► Figure 6: The completed amplifier on test

Performance

Although rated at 2 watts for the onset of compression (1dB) I found that I could get a good 0.5w average out of DVB-S at 1275MHz before regrowth started to appear at -50dBc as shown in the spectrum analyser plot Figure 6. This would suggest that the saturated output is around 5w but don't try it; the thermal design won't cope and the MMIC will be destroyed. For the test the amplifier was driven by a DTX-1 running at 4MS/s, FEC 3/4, 100% RF output fed with a testcard J image. The modulator was followed by a G4DDK SPF5043Z driver which then fed the SPB-2026Z amplifier under test via a 3dB SMA attenuator. The output of the amplifier was connected to the analyser via a 30dB power attenuator so the -30dB graticule in Figure 7 equates to +30dBm or 1 watt.



► Figure 7: Marker 1 shows regrowth at -50dBc

Conclusion

This design, although not cheap, is a good performer and has a complete set of mechanical parts available that don't require any drilling at all. Having that grief removed is well worth the cost in my view. With careful adjustment of the levels it's possible to get a clean output that can be used to power amplifiers to several watts. I've managed to 'recycle' my M57762 brick amplifier that was used for FM ATV and when driven by the amplifier described here it's possible to get 5 or 6 watts of DVB-S with acceptable regrowth. ☺

HD TV news from Germany

From the pages of TV-Amateur 175

translations by Klaus, DL4KCK

DVB-T2 tests with HEVC

Media Broadcast started a pilot project for DVB-T2 tests in Berlin in September 2014. As a "first" in Germany there are four sets of parameters tested together with the new HEVC/H.265 codec. This allows to expand the data rate of one UHDTV channel from 13 Mbit/s (DVB-T, MPEG-2) to max. 26,5 Mbit/s. That would enclose up to 7 HD- or 16 SD programmes in one multiplex. Private TV channels will be encrypted, while public service broadcasting programmes are free. Presently there are "DasErste", ZDF and Arte in 720p on test, later on Pro7 and RTL together with a VPRT demo channel in 1080i will follow. Modern UHD TV sets with DVB-T2 tuner and HEVC (i.e. Samsung) are able to receive the DVB-T2 test transmissions, as well as DVB-T2 USB sticks plugged into UHD TV sets like TX55AXW904 (Panasonic) and 55UB850V (LG). A PCTV 292e USB stick plugged into a modern Windows PC will show the test transmissions on the monitor; if HEVC capable receiving software (like DVBCViewerPro) is used. From autumn 2015 on (IFA Berlin exhibition) several HDTV sets as well as set-top boxes are expected to show up for DVB-T2 trailblazers.

From August 2015 another DVB-T2 testing region will be the area around Bonn and Cologne. With 20 kW each from the Venusberg TV station (WDR Bonn) and the Colonia tower (Media Broadcast Cologne) the WDR (public broadcast service) will show free TV programmes in one multiplex, a second one is planned for encrypted private TV channels. Final configurations from 2019 on will inhibit 3 public TV multiplexes and 3 encrypted private TV multiplexes.

First free UHD TV live concert

On 19.11.2014 SES Astra demonstrated the rapid 4k TV developments with a live transmission in UHD from the "LinkinPark" concert in Berlin. The 2 Astra UHD demo



channels on 19 degr. east can be received by any DVB-S2 satellite tv receivers with HEVC codec. In Berlin 12 UHD TV cameras (11 Sony F55 and a new Toshiba) gave their video signals over 4 SDI cables (4x1080/50p) each into a Sony RAID complex in the OB unit, where the director produced live a final UHD mixing signal. This was coded in HEVC/H.265 as 2160/50p video and was sent via fiber optic cable from Berlin to the Astra satellite uplink station in Munich. There the data rate was reduced from original 12 Gbit/s to 35 Mbit/s for distribution on the UHD satellite transponder.

Sky Germany experience with UHD

"It is possible that we are going to set our main focus on sport in a future UHD programme. Our first official 4k production is the "Fanta4" concert on 20.12.2014 in Stuttgart", said the Head of of Innovations&Standards / Product&Operations-Technology at Sky Germany, Stephan Heimbecher. (Sky produced the live concert of "Fanta4" in UHD, but only 4 testing domestic homes and a 4k cinema were able to receive the encrypted signal from Astra satellite. In parallel an HD version was distributed to Sky pay TV subscribers.)

"Streaming hosts (like Netflix) are distributing first fictional UHD content - that is technically feasible, but the question is, if that gives a real excess value to the viewers. For us, in addition to good sport programming in UHD, that is imaginable", Heimbecher said.

Will Stereo 3D TV die with the introduction of UHD programmes? Heimbecher says no and believes in more power for 3D TV through UHD transmissions, because the higher resolution will enable a better 3D quality (DL4KCK: especially for passive 3D displays with polarizing 3D glasses). Furthermore developments of glasses free 3D displays would benefit from that. He notes an early market presence of UHD for customers, which had a negative impact on a sound development of 4k technologies. "Display makers produced expectations that were too high for the present UHD quality (DL4KCK: the same applies to 3D-TV ads where animals are jumping out of the screen...). Normally the TV viewer is sitting too far away from the display and cannot realize the UHD resolution. We want to avoid that disappointment now!"

Philips-TPVision

Recent TV sets rating below 2000 Euro are displaying more and more pixels while overall picture quality is declining because of bad background lighting. The new UHD TV line 9809 by Philips-TPVision is making an exclamation point using a real Direct-LED BL with Local Dimming. This is able to produce nearly double brightness against the usual Edge-LED-LCD screens, and the special Philips video processing enacts the brightness only when it benefits the contrast ratio. As chief developer Danny Tack (Philips-TPVision Gent, Belgium) stated, the present TV and cinema productions are still using the old video signal specification (Rec.709 with 8-bit color) devised for CRT displays, so usual video sources are not able to provide such extreme contrast ratios.



Right hand display:
9809 with Direct-LED, left hand improved Edge-LED-LCD,
middle display usual Edge-LED-LCD.

Also on the OLED display development segment Philips-TPVision is trying to push brightness levels, but Danny Track emphasized that OLED is showing its potency only in dark rooms. More and more manufacturers are presenting improved LED-LCD displays with double or more peak brightness, HDR video processing (and min. 10-bit color), expanded color gamut and native 200-Hz-panels ready for the next step of UHD TV.

Latest news from CES 2015: SUHD

Samsung's flagship television was on display showing off short clips of "Life of Pi" and Ridley Scott's "Exodus", both of which had been specially mastered in 4K UHD with 10-bit color and in High Dynamic Range (HDR). Both 10-bit color and High Dynamic Range are reportedly part of the new 4K UHD Blu-ray spec, as designated by the newly-formed UHD alliance. High Dynamic Range allows for brighter images with even greater contrast between dark and light.

(DL4KCK: citing Wikipedia "For consumer video standards, such as High Efficiency Video Coding (H.265), the bit depth specifies the number of bits used for each color component. 8-bits per sample allows for 256 shades per primary color (HDTV and Blu-ray standard) while 10-bits per sample allows for 1024 shades per primary color (UHD Blu-ray standard). HEVC defines the Main 10 profile which allows for a bit depth of 8-bits to 10-bits per sample with 4:2:0 chroma subsampling.")

Sources offering 10-bit color and HDR are not available yet, but when 4K UHD Blu-ray discs arrive, we'll get both and from what we've seen so far, it is going to be spectacular in the literal sense of the term. 🗣️

<http://www.digitaltrends.com>
www.agaf.de



DTX1 - STOP PRESS!!

Antennair have now released a new Transport Stream Dock PCB, which in addition to the 34 way header for input, has a 26 way header which is pinned so as to link 1:1 via a simple 26 way ribbon cable to the Raspberry Pi. This eliminates any inter-wiring issues connecting 34 to 26 way headers! The new board (issue 1.1) was successfully launched at CAT15 by Laurence MOLDZ, and at the time of writing the BATC shop still has stock.

Amendment to circuit in CQ-TV 248 pp25

Please note: - You also have to connect 0V on the Pi (26 way header pin 6) to 0V on the TS Dock (34 pin header pin 1) to ensure proper operation. 🗣️



Treasurer's Report and Accounts 2014

Brian Summers – G8GQS

Preamble

This is a short report for publication in CQ-TV. Any member requiring more information may contact me and make an appointment to inspect the accounts and records.

Financial strategy

At the club's recent general meeting, it was agreed by the membership that our capital reserves were too high and that the club should use those funds for the good of ATV. Even taking this into account it was felt prudent to increase our membership subscription fees from 2015. This will take some time to take full effect as many members are "paid in advance".

The Balance Sheet

It has been the practice, for many years, to publish a simple condensed set of figures derived from a more detailed analysis of income and expenditure. This has always been satisfactory and full details have always been available at a G.M. or for any member who might enquire.

Turnover

Our total expenditure for 2014 was £25,458 including purchase of stock for the shop. The total income for 2014 was £26,735 including shop sales (before PayPal fees). These gross figures take no account of the stock levels and are included for information only.

General outlook

One line in the accounts that is worth a mention is the "subscriptions in advance" figure of £5,552 for 2014. I view this as a mark of the confidence that our members have in the club.

PayPal

Most of the club's income comes in via PayPal. They charge a percentage plus a fixed fee of 20p. Over a number of transactions this mounts up to the substantial figure as shown in the accounts. The only realistic way to deal with this is to total the charges and put it as a charge against income, as it is deducted at source before we receive the income.

The Shop

The BATC has made a significant investment in digital ATV with the DTX1 unit together with the Digilite and the DATV Express which we have made available to members to help promote activity. It is now the policy of the BATC to make items available to members at the lowest cost, not to make a large surplus or profit as we run the shop for the mutual benefit of our members. The shop returned a gross overall surplus of £1,901 less PayPal fees of an estimated £500 gives £1,400 on a turnover of £19,891 or 7%. We consider this to be nicely balanced - according to our policy.

Web services

This is the cost of our web presence and includes, software upgrades & purchases, domain charges, hosting, bandwidth charges & developments.

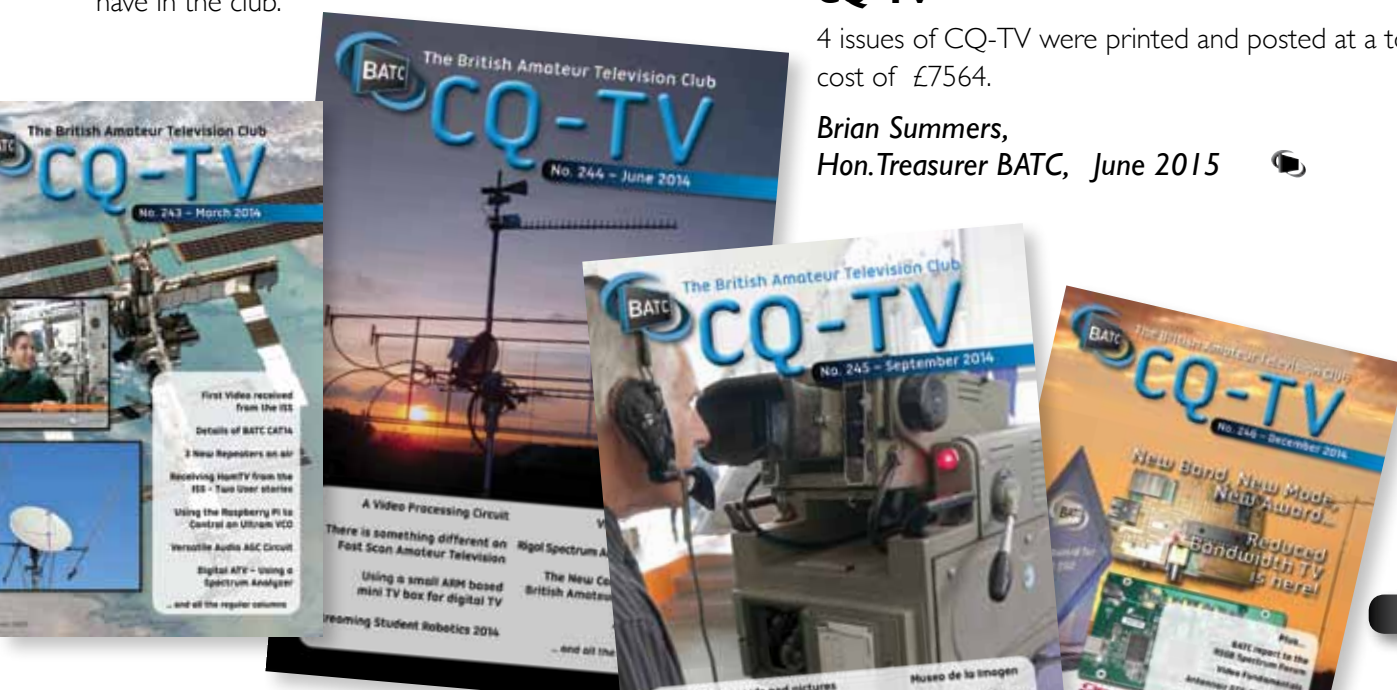
Stock, Plant & Assets

The capital expenditure for 2014 was £83.19 for a replacement video capture USB unit and a software purchase for the website.

CQ-TV

4 issues of CQ-TV were printed and posted at a total cost of £7564.

Brian Summers,
Hon. Treasurer BATC, June 2015



British Amateur Television Club

Income & expenditure account at 31 December 2014

Income account	2014	Expend account	2014
Subscriptions	£6,311.02	CQ-TV Printing	£5,548.00
BATC Shop surplus (1)	£1,901.99	CQ-TV Postage	£2,016.22
Donations received	£100.68	Office expenses	£74.01
Interest received	£270.07	Committee expenses	£538.63
Miscellaneous Items	£2.20	RSGB affiliation fee	£51.00
Convention & BGM	£464.50	Web services	£3,392.93
Less PayPal commission (2)	<u>£800.05</u>	Convention & BGM	£530.73
	<u>£8,250.41</u>	Awards & Prizes	<u>£191.00</u>
			<u>£12,342.52</u>

Balance sheet at 31 December 2014

Assets	2014
Stock, BATC shop	£2,749.65
HSBC account	£10,614.41
PayPal account	£3,183.87
Teachers building society	£38,926.79
Less Current liabilities	
Subscriptions received in advance	<u>£5,552.56</u>
	£49,922.16
Represented by Accumulated fund	
Balance brought forward	£54,014.27
Surplus or Deficit	<u>£4,092.11</u>
Balance carried forward	<u>£49,922.16</u>

Petty cash held = €30

Equipment was purchased to the value of £83.19

I have examined the books and records of the British Amateur Television Club and confirm that the balance sheet and the income and expenditure account are in accordance with those books and records.



Member Tony Hornby G1HBD



Brian Summers, Hon Treasurer July 2015

Notes to the accounts

The comparison figures for 2013 are available on page 24 of CQ-TV 244.

(1) This is the net amount raised by the sales in the club's shop, but before allowing for the PayPal commission of some £500.00. The shop turnover was £19,891.00

(2) The PayPal commission is included in income as a deduction as it is deducted at source.

Slow Scan TV with a Raspberry Pi

from the website by Gerrit PA3BYA - edited by Frank, MOAEU

Although the BATC is mostly noted for ATV activity, there are some other interesting modes involving 'television'. The concept of Slow Scan TV (SSTV) was introduced by Copthorne Macdonald in 1957–1958. He developed the first SSTV system using an electrostatic monitor and a vidicon tube. In those days it seemed sufficient to use 120 lines and about 120 pixels per line to transmit a black-and-white still picture within a 3 kHz voice channel. Today hi-resolution colour images can be transmitted taking up to 400 seconds to send a single frame. The popular modes on HF include Martin I (114 seconds) and Scottie I (110 seconds).

In a project by Gerrit, PA3BYA, the Raspberry Pi with the PiCam is used as a wireless camera which can transmit images over long distances using sstv on the 2 meter band (144.5 MHz). Since the Pi can generate the HF FM signal itself, no additional electronics are needed for low power transmissions. For a little bit more power, a one or two transistor amplifier will be suitable (See the update by Rob, MODTS, on the PA for the experimental work on 2 meter RB-TV - Editor). Furthermore a low pass filter is recommended to filter out higher harmonics of the signal. This project also contains a python script which detects movement. Using this script the Raspberry Pi can be used as a wireless security cam at distances far outside the range of normal WiFi networks.

Capturing the image:

First thing to do is to capture the image we want to transmit. This can easily be done with 'raspistill':

```
raspistill -t 1 --width 320 --height 256 -e png -o /tmp/image.png
```



► SSTV image received from the International Space Station on 145Mhz by Frank, MOAEU

For sstv we need a small image, of 320 x 256, it is saved into the /tmp directory as a png file.

Converting the image to a SSTV sound file

Next we need to convert the image to a sound file which can be transmitted over the air. There are several SSTV implementations available for the Raspberry Pi.

PySSTV

First to try is 'PySSTV', a Python implementation which can be installed using 'pip':




```
pi@rpicamera ~/sstv $ sudo apt-get
install python-setuptools
pi@rpicamera ~/sstv $ sudo apt-get
install python-imaging
pi@rpicamera ~/sstv $ sudo easy_
install pip
pi@rpicamera ~/sstv $ sudo pip install
setuptools --no-use-wheel
--upgrade
pi@rpicamera ~/sstv $ sudo pip install
PySSTV
```

This works, but it is very sloooooooooooooow, it takes many minutes to convert a single image. So the search was on for another option.

C implementation

Next a plain C implementation found here:

<https://sites.google.com/site/ki4mcw/Home/sstv-via-uc>

Unfortunately there were some errors in the preamble tones, but those were easy to fix. It has also been modified to be a little bit more flexible so that you can set the audio sample rate from the command line. The source code of the implementation can be found on GitHub:

<https://github.com/AgriVision/pisstv>

To compile the source code:

```
pi@rpicamera ~/sstv $ sudo apt-get
install libgd2-xpm-dev
pi@rpicamera ~/sstv $ sudo apt-get
install libmagic-dev
pi@rpicamera ~/sstv $ gcc -lm -lgd
-lmagic -o pisstv pisstv.c
```

To run the program:

```
pi@rpicamera ~/pisstv $ ./pisstv /tmp/
image.png 22050
```

Response from the Pi:

Constants check:

```
rate = 22050
BITS = 16
VOLPCT = 20
scale = 6553
us/samp = 45.351474
2p/rate = 0.000285
```

Checking filetype for file [/tmp/image.png]

File is a PNG image.

Input file is [/tmp/image.png].

Output file is [/tmp/image.png.wav].

Writing audio data to file.

Got a total of [2589556] samples.

Done writing to audio file.

Created soundfile in 4 seconds.

As you can see the SSTV sound file is created in just 4 seconds. So far so good, next step, how to transmit the audio over the air.

Transmitting the sound file with PiFm:

You can add a radio transmitter, but its much more fun to let the Pi itself generate the high frequency signal. Thanks to the work of Oliver Mattos and Oskar Weigl this is possible. You can find their code here:

'Turning the Raspberry Pi Into an FM Transmitter - Imperial College Robotics Society Wiki'

http://www.icrobotics.co.uk/wiki/index.php/Turning_the_Raspberry_Pi_Into_an_FM_Transmitter

Their code has evolved considerably. The first version was very simple, but used all cpu cycles, and the signal was hampered by glitches when other processes were active. The last version uses dma and works pretty well, without eating up all cpu cycles. Nevertheless the code is much more complex now. Oliver and Oskar did a very good job, but out of the box the software is not suitable for SSTV. There are two main problems. First the bandwidth is too high and secondly the timing, which is very important for SSTV, was a little bit off.

Reducing the bandwidth

Reducing the bandwidth appeared to be very simple. As every ham knows, for frequency modulation the bandwidth can be set with the modulation index, which is equal to the volume of the audio signal which modulates the hf carrier. In the source code there is just one value that can be found in the consume function of the Outputter class. Here is the original code:

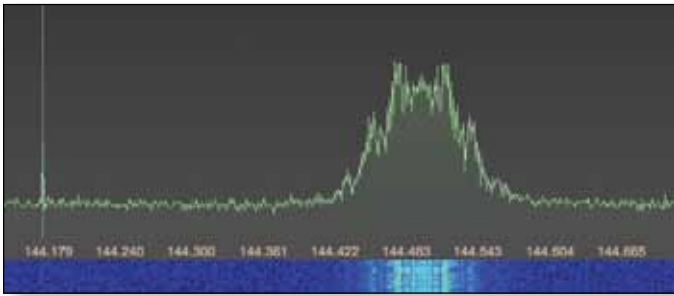
```
void consume(float* data, int num) {
    for (int i=0; i<num;i++){
        float value = data[i]*8;
        // modulation index (AKA volume!)
```

With a command line parameter for this value, the new code looks like this:

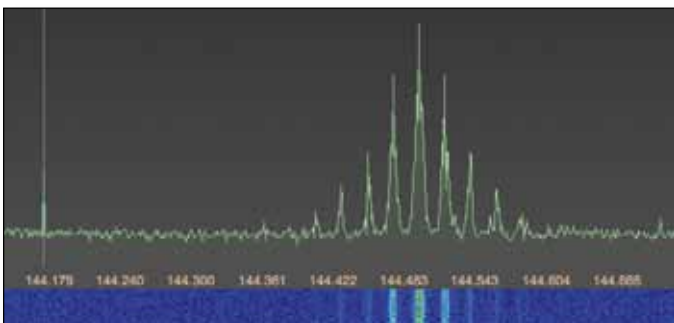
```
void consume(float* data, int num) {
    float value = data[i]*modulation_
        index;
    //modulation index (AKA volume!)
```

Unfortunately this does not work very well, very strong sidebands persist, so this needs some focus in future versions of the software.

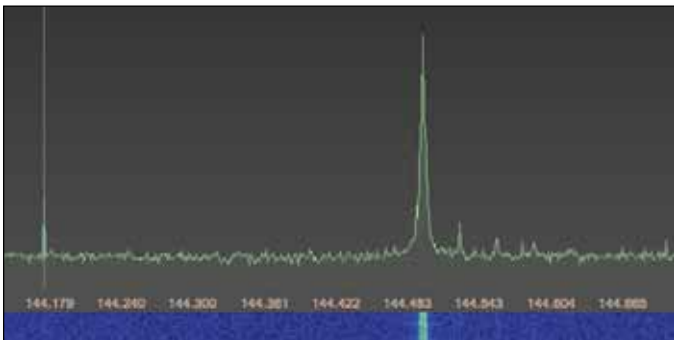
This figure shows a spectral plot of the full bandwidth FM signal.



The second spectrum is the reduced bandwidth, tuning on the peak in the middle shows a nice and clean signal, but we need to get rid of the sidebands.



The last one is the reduced bandwidth signal of the first version of PiFm, nice bandwidth, but the signal is hampered by clicks due to cpu activity in other processes.



Fixing the timing

When the sample rate of the audio transmitted by PiFm is slightly larger or smaller, a listener will hardly notice any difference. For SSTV this is not the case – SSTV timing has to be very precise. A slightly off sample rate results in slanted images, as can be seen below. The second image is the same sound file properly sampled.

Fixing the timing appeared to be straight forward.

```
//clocksPerSample = 22500.0 / rate *
1373.5;
//for timing, determined by experiment

clocksPerSample = 22050.0 / rate *
timing_correction;
//for timing, determined by experiment
```

As you can see the timing constant (1373.5) in the code is replaced with the variable 'timing_correction' which can be set from the command line. This will be a different value for each individual Rpi. In the case of the Pi during the tests the value was 1414.0. To compile your new version of pifm type:

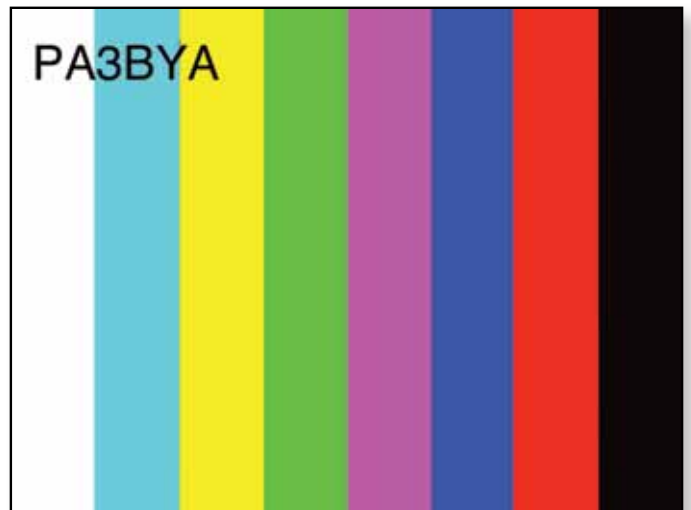
```
gcc -lm -std=c99 -g -xc pifm.c -o pifm
```

For all other adaptations to the code, see the source file at GitHub.

<https://github.com/AgriVision/pisstv>



► With an incorrect sampling rate, the result is a slanted picture.



► The same file, with corrected sampling rate

Adding call-sign:

When you start transmitting SSTV signals using your ham radio license, you are required to transmit your callsign in every transmission, so we need to add this information to the image. This can easily be done either from the command line using 'imagemagick', or from python using the *python image library (PIL)*. Both are used in this project. In 'sstvcam.sh' *mogrify* is used - which is part of *imagemagick*. 'sstvcam.sh' is a simple shell script used to just capture and transmit an image. In 'sstvcatch.py' *PIL* is used.

Catching movement:

Now we are able to grab an image and send it properly over the air using PiFm. We now need to focus on triggering the image capture when something interesting happens in front of the camera. This is implemented in python, using *PIL*. The code can be found in *sstvcatch.py*. It works in a quite straight forward manner – it just compares the pixels of the previous image with the current one. When the difference is too large, the current image is transmitted. Here is a code snippet:

```
#loop forever while (True):
#grab comparison image
imgnew, bufnew = captureImage()
#Count changed pixel
changedPixels = 0
for x in xrange(0, 320):
for y in xrange(0, 256):
#Just check red channel as it's
dominant for PiCam NoIR
pixdiff = abs(buf[x,y][0] -
bufnew[x,y][0])
if pixdiff > threshold:
changedPixels += 1
#Transmit an image if
pixels changed
if changedPixels > sensitivity:
#Swap comparison buffers
img = imgnew
buf = bufnew
transmitImage(img.copy())
```

The full code can be found on GitHub

<https://github.com/AgriVision/pisstv>

More projects can be found at: www.agri-vision.nl



Out and about with the BATC

This is the BATC Stand on Friday 25th and Saturday 26th September at the RSGB Hamfest in Newark just off of the A1 in Nottinghamshire. Clive Reynolds joined me on the Friday and Dave Crump on the Saturday. This help was very welcome as we could share the chat with the visitors and it also provided the occasional break. There were a large number of BATC members there who we met as well as others interested in become a BATC member.

We showed videos of various ATV transmissions and events, and provided 'Getting Started' leaflet, Repeater Maps, Membership

Application forms, back copies of CQ-TV, BATC Pin Badges, DTXI and other items from the shop.

We had a very good 4G internet connection so we could show the streaming site and show members their details on the BATC web site if required.

Six new members joined the BATC, quite good for a rally, sold one DTXI, sold various badges, blank PCB's and up converters.



Bob G7AVU was one of the organisers he also runs the GB3VL ATV repeater and was very helpful to us. He also ran a junk sale with great success to get funds for the site rental of his repeater.

The RSGB were there in force with a separate area for each of their activities. Giles Read who publishes our ATV column was there.

This event is held each year and they are very keen for us to attend. It's a long way for me to go, 120 miles, 3

hour drive there due to some holdups, 2 hour drive home. This is my 3rd year. I hope next year that we may be able to find someone nearer to Newark to run our stand as it's getting a bit much for me!



Dave Mann, G8ADM
Membership Secretary.



vMix using FFmpeg to generate the Transport Stream

Chris Tanner - MWOLLK



Out of the box DATV Express runs only with very specific hardware - typically Hauppauge capture cards with hardware MPEG2 encoders on board. Since I didn't have a suitable card available I researched various ways to use the transmitter - the hard part being to create a suitable transport stream.

The choice of vMix was made because I've been using this software for a few months now on FM ATV and have found it to be a really useful way to generate a very slick feed from one or more cameras with useful additional features like text and graphics overlays, transitions and blends, desktop capture, green screen / chroma key and virtual sets - all done in real time. The free version of vMix is limited to just four inputs but that is sufficient for my purposes at present.

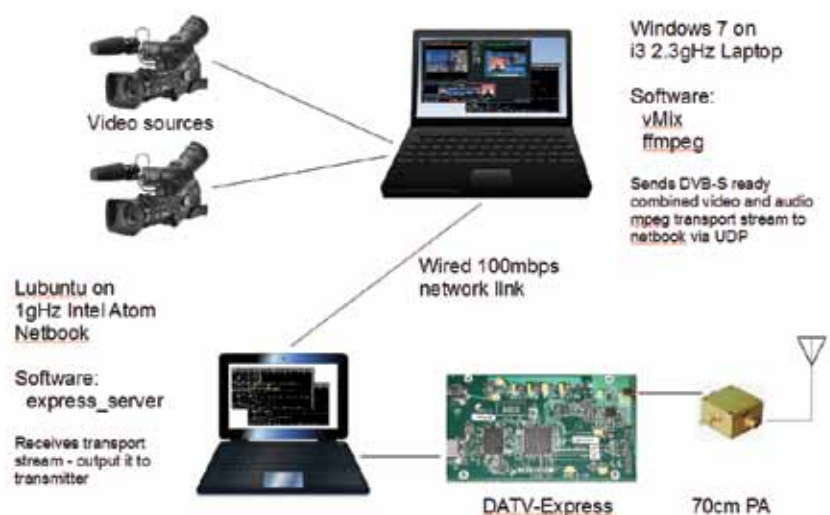
vMix does however require a half decent PC running Windows 7 or later, and DATV Express requires a Linux box running Ubuntu.

Here's one of the recipes that I have found works reasonably well:

Ingredients:

- ▶ i3 based laptop running Windows 7, vMix and FFmpeg
- ▶ Netbook running Lubuntu and DATV Express server
- ▶ DATV Express card

Note: You can use any suitable machines - these work for me!



- ▶ vMix based video mixing and streaming system for DATV-Express

Prerequisites:

The two computers need to be connected, ideally using a wired network, preferably not too busy. If they're already on a wired network leave well alone - just make a note of their IP addresses for use later. Note that you can use a wireless network or a shared wired network but may suffer from picture break up if the network gets busy.

If you're using wireless currently you can probably just hook the two machines together and set their wired network ports to fixed IP addresses on the same subnet e.g 192.168.2.1 for the Windows box and 192.168.2.2 for Linux. I will use these addresses throughout this article - you will need to substitute whatever addresses you choose for the two machines.

Leave them connected to the wireless network for internet access - the wired connection will then only be used for DATV Express.

Make sure you're using a different subnet to that used by your wireless network or there will be problems! Make a note of the IP address for your linux box as we'll need that later. Check the machines can ping each other:

On the Windows box:
ping 192.168.2.2

On the Linux box:
ping 192.168.2.1

Both of these should result in replies being reported. Firewalls may complain - allow access from the wired network!

Main laptop / vMix:

1. Install and configure vMix if you haven't already got it. There's some great video introductions on YouTube which will help with this.
Note - if you don't want to use vMix you can use any other directShow camera or video capture device and audio input device - you'll need to change the FFmpeg command below.
2. Provide some input e.g. from a camera or a colour - choose colour bars to get the vMix test card.
3. Set the external output (Settings / External Output) to PAL 25p 640x480 (or 720x576 different resolutions may or may not work with your receiver).
4. Enable the external output (Click External at bottom centre of the window - it should turn red)
5. Install FFmpeg from <http://ffmpeg.zeranoe.com/builds/> - I'm using the 32 bit static build - choose 64 bit if you're running a 64-bit version of Windows.
6. Create a batch file e.g. vmix2tx.bat - put the following in it:

```
@echo off
rem vMix to Transport Stream for DATV
Express
rem by Chris mw0llk January 2015.
rem with thanks to Rob m0dts for the
linux shell script on which this was
based.
echo Enter the following values to
start the Tx, Press Enter for default
(previous) values
if X%SR%==X set SR=2000
set defSR=%SR%
set /p SR=Enter SR in KS (%SR%):
if X%SR%==X set SR=%defSR%

if X%FEC%==X set FEC=5/6
set defFEC=%FEC%
set /p FEC=Enter FEC in KS (%FEC%):
if X%FEC%==X set FEC=%defFEC%

rem Save values for next time
rem If these lines cause errors your
system may not support SETX
rem If so just comment them out
if not %SR%==%defSR% setx SR "%SR%"
if not %FEC%==%defFEC% setx FEC
"%FEC%"

echo Symbol rate: %SR%, FEC: %FEC%.
Calculating bitrates...

rem Calculate Video bit rate value for
current SR/FEC
set /a DSR=2*%SR%
echo DSR is %DSR%

set /a DECFEC=1000*%FEC%
set /a RS=188000/204
set /a TS=%DSR% * %RS% / 1000 *
%DECFEC% / 1000
set /a TSMAUD=%TS%-128
set /a VIDRATE=%TSMAUD% * 75 / 100
set /a BUFSIZE=%VIDRATE% * 7 / 10

echo Transport Stream rate for current
SR/FEC is: %TS%
echo Video bit-rate: %VIDRATE%

start "Video feed to DATV Express" /
high c:\ffmpeg\bin\ffmpeg ^
-f dshow -i video="vMix Video" ^
-f dshow -i audio="vMix Audio" ^
-f mpeg2video -pix_fmt yuv420p -r 25
-s 720x576 -aspect 4:3 ^
-qmin 2 -qmax 35 ^
-b:v %VIDRATE%k -minrate %VIDRATE%k
-maxrate %VIDRATE%k ^
-buffersize %BUFSIZE%k ^
-acodec mp2 -ab 128k -ac 2 ^
-f mpegts ^
-mpegts_original_network_id 1 ^
```

```
-mpegs_transport_stream_id 1 ^
-mpegs_service_id 1 ^
-mpegs_pmt_start_pid 4096 ^
-streamid 0:289 ^
-streamid 1:337 ^
-metadata service_provider="MYCALL" ^
-metadata service_name="My Station
      ID" ^
-y ^
udp://192.168.2.2:1234?pkt_size=1316
```

(The ^ characters are important - they are used as line continuation characters by windows command shell)

The start command is used to set the priority for FFmpeg to high - this helps ensure it gets sufficient cpu attention on my i3 - you may not need to do this - experiment once things are working using task manager - right click on FFmpeg in the processes tab and choose Set Priority.

You may need to change the path to FFmpeg depending where you installed it.

You will need to change the metadata tags to your own call sign and station ID, and change the IP address and port to suit your chosen linux box - see next step:

You may need to change one or more of the transport stream IDs depending upon your receiver settings and abilities. If you've not already got the receiver working with DATV Express leave the values as they are - when you tune your receiver it will pick up these values. If you're sending to a repeater you may well need to change some of the IDs to suit.

That's it for now on the Windows box. Next we have to set up the Linux box to deliver the transport stream to the DATV Express card.

Netbook

My netbook happens to run Lubuntu 14.04 - it could probably have been any Ubuntu variety though I have noticed that different distros either still have ffmpeg or have migrated to avconv. Either way both commands accept the same options so can be used interchangeably. We're not going to use ffmpeg/avconv unless extra buffering is needed in this particular recipe.

All my tests with sending a UDP stream to the DATV Express software from the main web site have failed. I'm not sure what the problem is but the only way I've found to get it working for now is to use the DATV Express Server software which Charles G4GUO has published via github. This does mean a little more work but it is straightforward and should work on most systems.

To date I've built it on an old Pentium 4 running Ubuntu 14.04, my netbook running Lubuntu 14.04 and my i3 laptop running Ubuntu Studio 12.10. I've also built it on two raspberry pi's - a model b /512 and a new V2 pi. All have worked insofar as the software compiled successfully and ran.

In order to use the Express Server you'll need to build it using make. Use Lubuntu Software Centre, Synaptic Package Manager or apt to install gcc, make, git and libusb-dev which is also needed.

```
sudo apt-get install gcc make git
      libusb-dev
```

Create a suitable directory under your home:

```
mkdir datv
cd datv
```

Grab the latest git repository for Express Server

```
git clone https://github.com/G4GUO/
      express_server.git
```

This will create another sub-folder: express_server; and will populate it with the source code.

Navigate to the folder and build the application:

```
cd express_server
make
```

Assuming no errors occurred you should now have a file express_server - you can see it in this screenshot.

```
chris@netbook-lubuntu:~/datv/express_server$ ls
datvexpress.rules  express.cpp          express.h          expressudp.o      main.o
buffers.cpp        expressmain.cpp     expressmain.o     main.o            Makefile
buffers.o          expressmain.h       express.o          narrowbandDVBIS.rbf
cli.cpp           express_server.h    express_server    null.o
cli.h             express_server.pro  express_server.pro-user  si570.o
cli.o             express_server.pro-user  si570.cpp         si570.h
clitypes.h       express_server.pro-user.12525ef  si570.o
commands.txt     express_server.cpp
datvexpressdb.rbf
datvexpress.txt
```

You could run this but first we need to set up it's operating parameters. These are held in a text file datvexpress.txt.

Edit datvexpress.txt to the desired values for frequency, FEC etc. Ensure that you set the tsock value to match the port number in the FFmpeg command line on the Windows machine (1234).

Connect DATV Express, power it up and start the server:
`./express_server`

The server should start up and initialise the card by sending the various firmwares to it. After a pause you should see “UDP sockets and process threads are running”.

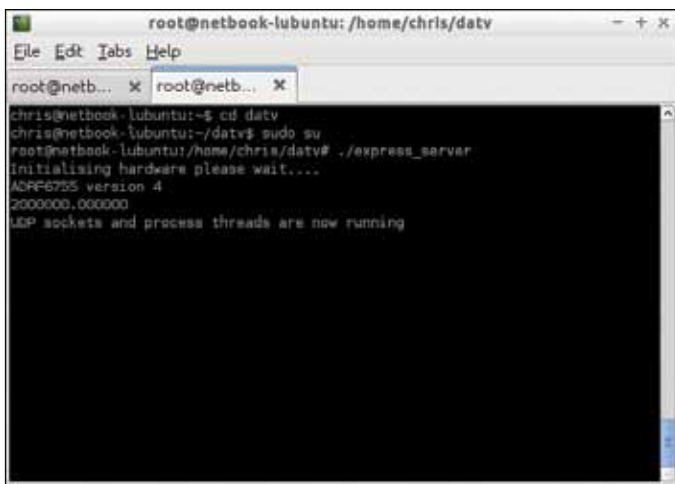
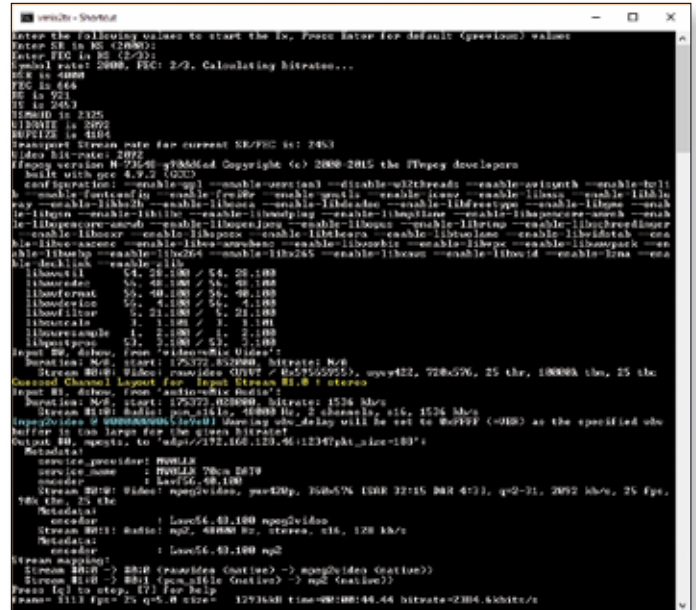
If your receiver is correctly tuned you'll see a blank screen rather than no signal - this shows all is well!

If Express server says it cannot find the DATV Express hardware you need to read the manual from the DATV Express web site - you'll need to set the permissions by modifying a udev file.

Alternatively just run it as root:

`sudo su`
`./express_server`

can communicate to each other (ping works). Also look for overzealous firewalls and other communication problems.



Sending the transport stream:

Go back to the Windows machine and launch the batch file we created earlier. Choose symbol rate and FEC to match the settings in datvexpress.txt on the linux box.

FFmpeg will launch in a new window and display something like:

```
Press [q] to stop, [?] for help
frame= 167 fps= 25 q=3.0
size= 1288kB time=00:00:06.60
bitrate=1599.0kbits/s dup=1 drop=0
```

The numbers will keep changing! If instead you get lots of error messages or buffer overflow warnings check and re-check the various IP addresses etc. and that the machines

The sharp eyed will notice that I have set my resolution to 360x576 rather than 720x576. This is chosen because I am using a symbol rate of 2000 kbps which is insufficient to send a full image leading to image breakup when too much changes at once. You'll also see I'm on a different subnet.

If everything works, whatever vMix is sending to it's external output should now be transmitted in DVB-S mode by DATV Express.

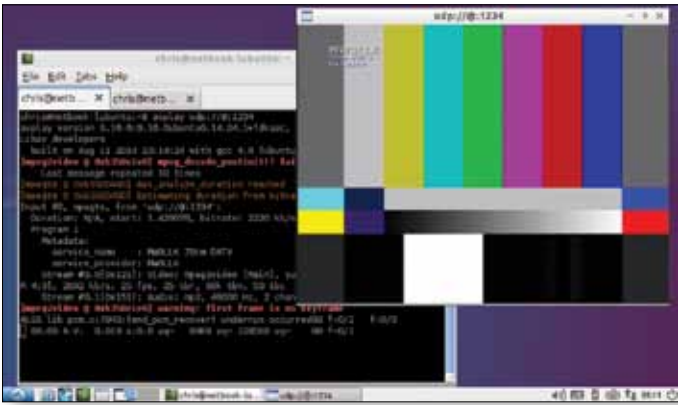
Debugging the stream

If you are struggling you can check that the stream is arriving on the Linux box by shutting down Express Server and running:

```
ffplay udp://@:1234
or
avplay udp://@:1234
```

If all is well after a few seconds a window will pop up and display the video being sent from vMix. If not look for firewalls blocking things, check and double check IP addresses and port numbers, try sending to localhost / 127.0.0.1 and viewing with VLC etc.

Note that you can't view the stream while Express server is running as the UDP stream is a point to point protocol so supports only one client at a time - kill Express Server first (see below).



If you've not already tuned in, now is the time to figure out your receiver. I use a 5.5cm length of wire at transmitter and receiver for benchtop testing at 23cm frequencies. These can be directly received by most free to air satellite receivers.

You'll need to set up the receiver with a transponder on the corresponding frequency and symbol rate then scan for channels. On my receiver the transponder is set to 11030 MHz which when used with a 9750 LNB gives an IF of 1280MHz. Polarisation is irrelevant.

Controlling DATV Express

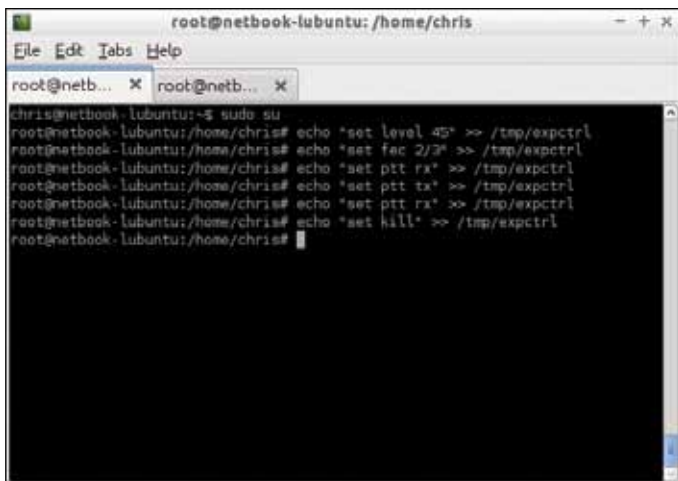
You can switch DATV Express ptt on and off by writing to a temporary file. Details on how to do this are in commands.txt in the source code directory on the Linux box.

I usually run a second terminal window or, if using Linux without XWindows running I switch between consoles (ctrl-alt-F1 ctrl-alt-F2 etc.) in order to issue commands.

Useful commands include:

```
echo "set freq 437000000" >> /tmp/expc
echo "set ptt rx" >> /tmp/expc
echo "set ptt tx" >> /tmp/expc
echo "set kill" >> /tmp/expc
```

...many more are documented.



You can change things like FEC on the fly. If you do so you will need to stop and restart FFmpeg with the new value. Express server will sit there transmitting a black screen while you do so. In the FFmpeg window hit 'q' and it will safely terminate. Launch it again and set the new values for FEC or symbol rate.

Note that if you cheated and are running express server as root you'll need to do

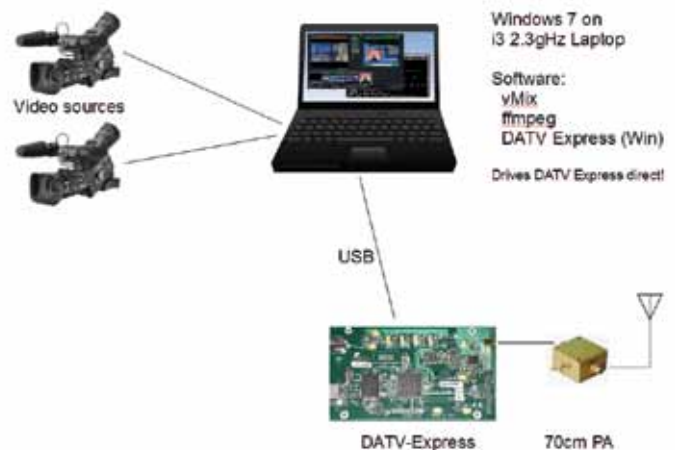
```
sudo su
```

(as I have) before sending any of these commands. Doing "sudo echo" won't work because of the redirected output! (The sudo applies to the echo but not to the >> which is confusing)

The last command (set kill) is important - this gracefully shuts down the software and hardware - if you terminate it using ctrl-c or similar the board will continue transmitting which is undesirable!

Why do we have to use Linux?

Those who attended CAT15 in September may have noticed that I had a Windows version of Express Server running. Prior to CAT15 I was unaware that Charles G4GUO had made this available via the BATC forum so I was being a little circumspect however it is now available - look at the thread DATV Express Server on Pipo X8.

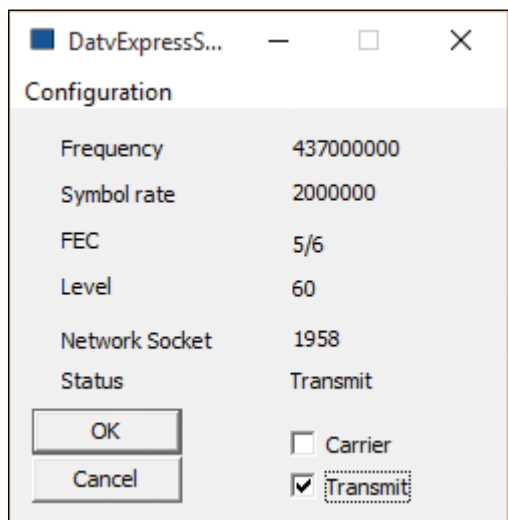


Express server on Windows simplifies things considerably. We no longer need the Linux box as we are now able to use FFmpeg to grab the vMix output or other source, encode it into a dvb-s compliant mpeg transport stream and send it to the Windows version of Express server all on the one machine.

To do this you need only change the last line of the batch file on the Windows box to:

```
udp://127.0.0.1:1234?pkt_size=1316
```

This will send the transport stream to UDP port 1234 on the built in localhost virtual network interface - from which Express server then reads its input data.



(Note that I'm using port number 1958 in this screenshot)

You can start the programs in any order - and again if you wish you can view the output from FFmpeg using FFplay from a command window on the Windows machine - FFplay is included in Zeranox FFmpeg distributions.

In this article I have demonstrated how to use FFmpeg to generate a dvb-s compliant transport stream for use with the DATV Express card. An important point to note here is that (depending upon your camera hardware) the whole signal chain is now digital - as we are no longer reliant upon an analogue video capture card to do the MPEG2 encoding for us.

Next time I'll enhance the FFmpeg batch file to overlay call signs and other information on your picture. I'll also break down the FFmpeg command into its constituent parts and (try to) explain what they all do.

Have fun! 🎧

Resources

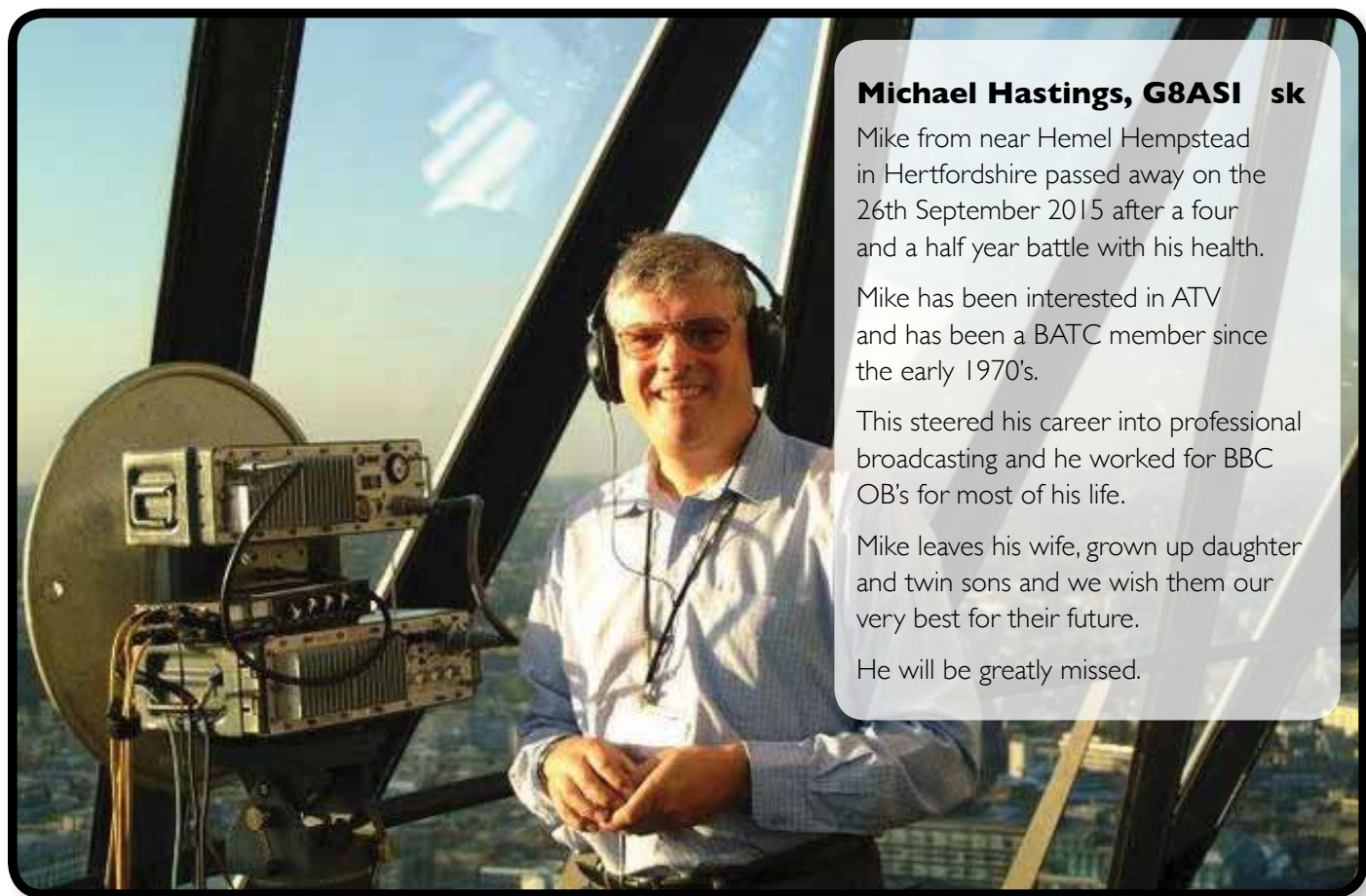
vMix is available from: www.vmixhd.com

FFmpeg is provided with many Linux distros or from: www.ffmpeg.org

Note that Libav (avconv & avplay), which is included with newer Linux distros, whilst pretty compatible with FFmpeg I have found it does not generate a dvb-s compatible mpeg transport stream. I have not explored the reasons for this.

Express Server is available from: github.com/G4GUO/express_server

The Windows version of Express Server from the link on: <http://www.batc.org.uk/forum/viewtopic.php?f=15&t=4231&p=9505&hilit=express+server#p9505>



Michael Hastings, G8ASL sk

Mike from near Hemel Hempstead in Hertfordshire passed away on the 26th September 2015 after a four and a half year battle with his health.

Mike has been interested in ATV and has been a BATC member since the early 1970's.

This steered his career into professional broadcasting and he worked for BBC OB's for most of his life.

Mike leaves his wife, grown up daughter and twin sons and we wish them our very best for their future.

He will be greatly missed.

CAT 15 - A weekend of technical presentations

Frank Heritage - MOAEU



The ex-World War II buildings of the Finningley Radio Club, located at Sandtoft, Doncaster. The buildings accommodate different shacks in the various rooms, as well as a main hall for the presentations and a kitchen for the refreshments!



Rob, M0DTS and Terry, G1LPS were presented with BATC awards for the first contacts over 10 km and over 100 km using RB-TV on 146Mhz. The award for the first contact over 250 km is still up for grabs!



Specialist suppliers and members bring and buy stalls in the second building.



The extensive 'permanent' junk sale at the Finningley Radio Club.



▶ Two days of presentations for a receptive audience were also streamed to the new BATC server in HD. Following requests from previous years, more time was set aside for meeting and networking with the other delegates.



▶ Jean-Pierre, F6DZP and Brian G4EWJ are presented with awards by BATC President Peter, G3PYB, for their services to the development of RB-TV



▶ The main workshop proved to be a popular place to demonstrate your latest technical development as Noel G8GTZ, above, and Rob MODTS, right, demonstrate.



▶ A greenscreen studio set up by Chris, MWOLLK to demonstrate vMix in action - and right, one of the many operating rooms at the Finningley club suitably equipped with test equipment.





Video Fundamentals - Part4

The Camera's Eye

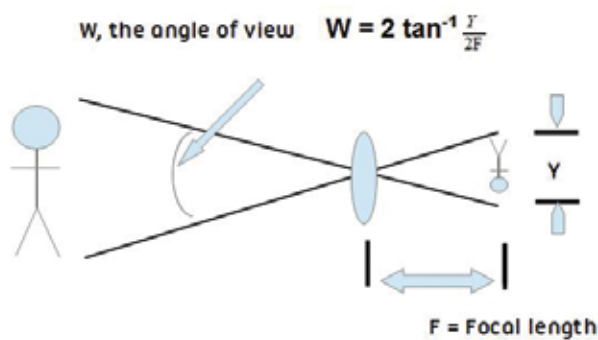
Brian Summers – G8GQS

Lenses and optics are a big subject and often neglected - after all we want our pictures to look good. In previous issues we looked at how to measure and view our pictures, today we look at the start of it all with the lens.

This is the first step in the process of television and here are a few terms used about lenses with short explanations. There can be a lot of formula describing optics, but only a few here!

Focal length

This is the distance from the principle point of the lens to the focal point and it is expressed as length in inches or mm. From this comes the angle of view offered up to the camera's CCD. Larger format sensors require a longer focal length for the same angle of view.



This formulae describes the relationship between Focal length and the angle of view.

You can see as "F" becomes smaller the angle of view increases. "Y" also plays a part and is why very small sensors have small lenses for comparable fields of view.

Aperture

This is a measure of the light gathering power of the lens - the larger the aperture the more light is focused on to the sensor. It is calibrated in "f" numbers typically f1.4 to f22 in the ratio of $\sqrt{2}$ each stop increase, halves the light. e.g. the bigger the f number the less light.

Confusingly F is the focal length and f is the aperture. They are related by this formulae:-

$$f = \frac{F}{D}$$

where f is the aperture, F is the focal length and D is the effective diameter.

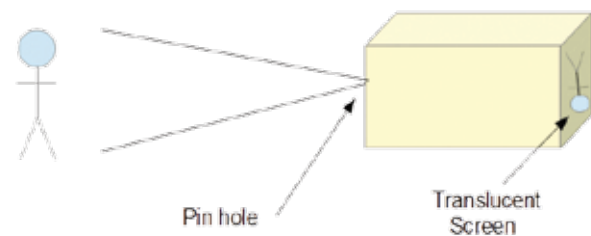
The Iris control adjusts the lens aperture, by means of a ring around the lens body.

Focus:

adjusted to bring the subject in the picture into sharp display. In a fixed focal length lens by altering the distance of the lens from the sensor. In a zoom lens the front, and other, elements move independently to focus the image.

Depth of field:

the distance in front and behind an optimally focused subject that is still in sharp focus. Many parameters affect this distance, the Iris setting has the most effect. The wider open the iris is the shorter the depth of field and conversely a "pin hole" lens is completely sharp.

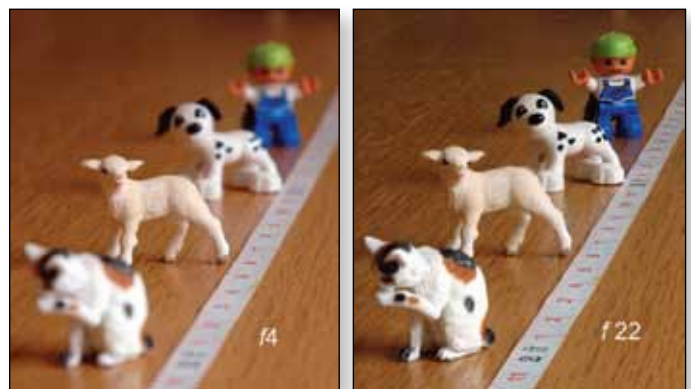


If we consider a pinhole camera, here we have a very small aperture, literally a pinhole.

The effect is the subject is in focus on the screen at whatever distance from the camera.

The depth of field is near infinite.

With a real Lens of the type we use, the depth of field depends on both the Iris aperture and the Focal length.

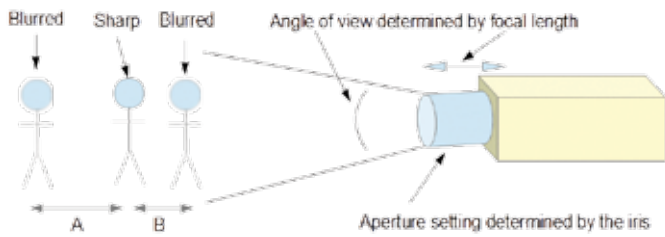


► This picture with the lens at f 4 shows a short depth of field, note that Felix is more defocussed than Fido

► With the lens set at f 22 all are within the depth of field and appear sharp

Example of depth of field differences

The key things here are:- as the aperture gets larger and the angle of view smaller; by zooming in, the depth of field reduces.

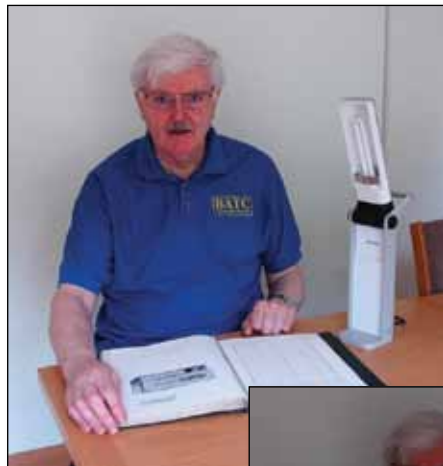


Of note is the distance "B" is shorter than "A" which can be infinite, this is called the hyperfocal distance.

Apart from artistic effects, most of us would want a large depth of field and this can be obtained by having sufficient light available so the the iris can be closed to perhaps f11 or f16

Iris and auto iris

Very often cameras are left in auto iris with, for the most part, acceptable exposure results.



▶ Although the light source is off, the subject is better exposed as the auto iris is not compensating for the bright light source.



▶ With the light source on, our subject is actually under exposed as the iris is compensating for the bright light.

However it is not perfect, we have all seen the result when the camera pans and a bright object is then in the background and the auto closes the iris and the subject, now looks very dark.

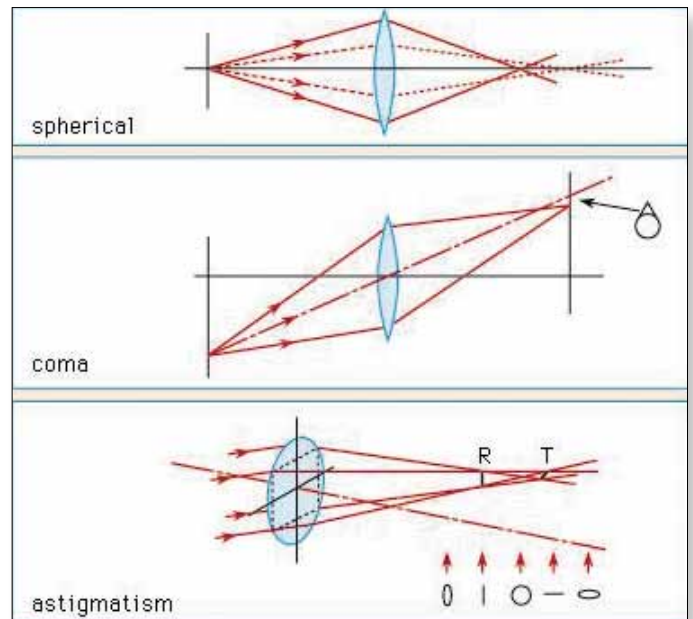
A good cameras auto iris setup may allow the choice the part of the picture used, exclude the sky or just use the centre part. Setting the exposure is a bit of an art, aim for the faces looking correct!

Lens Hoods, a good thing!



Lenses are not perfect and bright light from an "out of shot" lamp or window can cause, Flare, internal reflections, and ghost images. Hoods are easy to do for fixed or prime lenses and hoods for zooms often need to be adapted on the fly to shield the offending light source. These are sometimes called "french flags."

Lens Aberrations



There are many lens aberrations, to name a few:- Poor resolving power or MTF, Port-holing & Shading, Chromatic Aberration, Barrel distortion, Pincushion distortion, Flare, Unwanted UV or infra red transmission, Coma, astigmatism, spherical aberrations.

For further reading, I can recommend "Television Engineering Handbook" by K.Blair Benson, it's 1000+ pages cover almost everything including lenses, and there's always Google!



Turning Back the Pages

A dip into the archives of CQ-TV, looking at the issue of 48 years ago.

Peter Delaney - G8KZG

CQ-TV 62

The cover of CQTV 62 has a photograph of the newly appointed Club chairman, Ian Waters, and the magazine introduced him to the wiser membership, noting that he had 'held a leading position in the field of amateur television including any notable "firsts" in twenty years or so during which he has been dabbling in the art'.

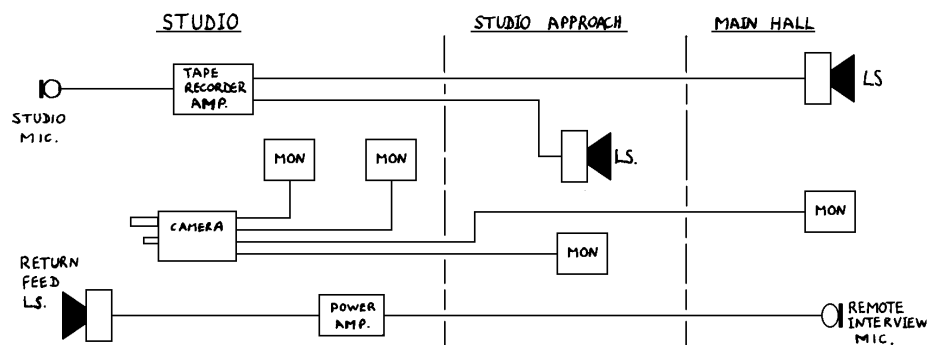


Ian himself added that his interest in television had begun in 1945 when he started reading pre-war magazine articles and saw television sets in dealers windows showing programmes such as the Victory Parade. He joined Pye as a radio engineer apprentice at the age of 15, and by the mid 1960s was working there as a professional TV transmissions engineer. His amateur activities had included making his first tv set (in 1949) and then a monoscope picture generator. A camera was then built - starting in 1951 and taking him about 3 years, using a 'Photicon' image iconoscope tube (made by Cathodeon, who were part of the Pye group) - and said at the time to be only the second such amateur camera built in the UK. Joining BATC in March 1952, Ian gained a /T licence in 1955, and the following year became interested in the BBC's experimental colour transmissions. As a member of the East Anglian TV net, he ran two transmitters on 70cm - one of 150 W for vision and another at 40 W for audio, the two being combined to feed the aerial system.

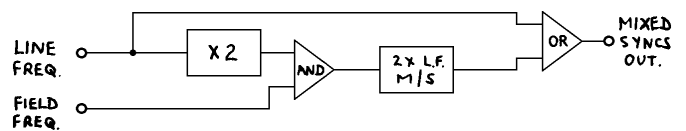
(Is Ian currently the longest-serving member of BATC ?)

Demonstrations of amateur television to members of the public were still popular attractions. One held in December 1966 at Bishop Douglass School in Finchley used a 2-way audio system linking the main hall with a studio elsewhere in the building - the picture from the latter being displayed both in the main hall and the approach to the studio. The person in the studio was

interviewed remotely from the main hall. To be 'seen on tv' was still quite novel, and one parent wanted to know how her son had got 'up there' on the television screen, whilst another lady was surprised to see her young daughter - supposedly at home - appear on the screen. She was then able to find out just how and why the girl had arrived there !! Care had been taken in the placement of the microphones relative to the loudspeakers, to prevent howlround feedback - in the studio placing them in opposite corners of the room, with the microphone pointing away from the speaker, whilst in the hall the monitor had a 'daylight viewing hood' to keep direct light from the screen which also acted as an efficient baffle between the interviewer's microphone and the monitor loudspeaker.

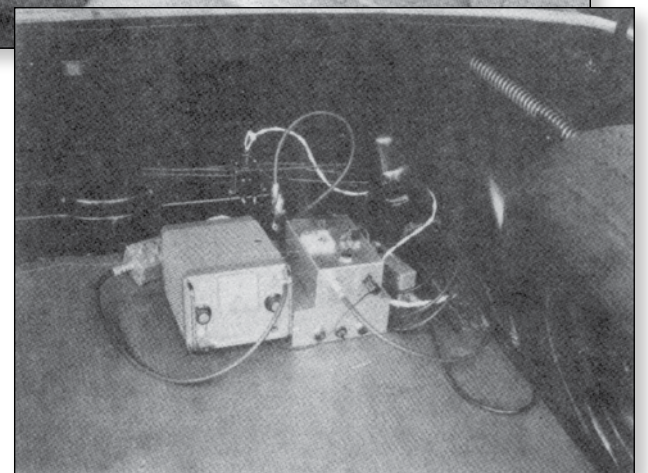
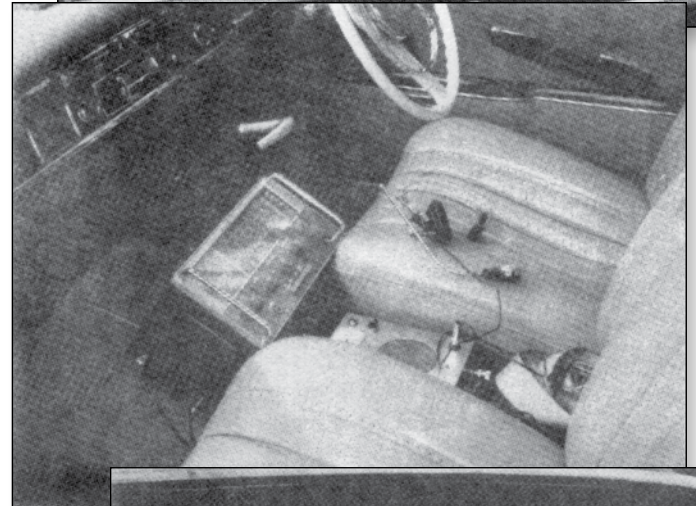
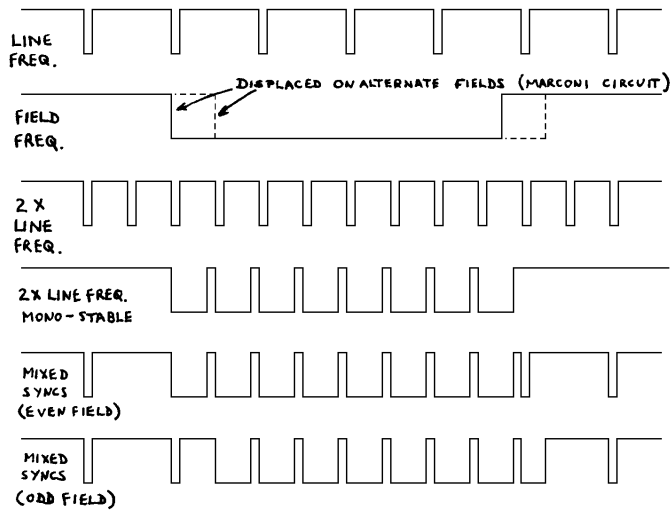


Generating a set of field interlaced synchronising continued to produce new ideas and Dave Brigden, then in the Falkland Islands, suggested a technique shown in the block diagram.

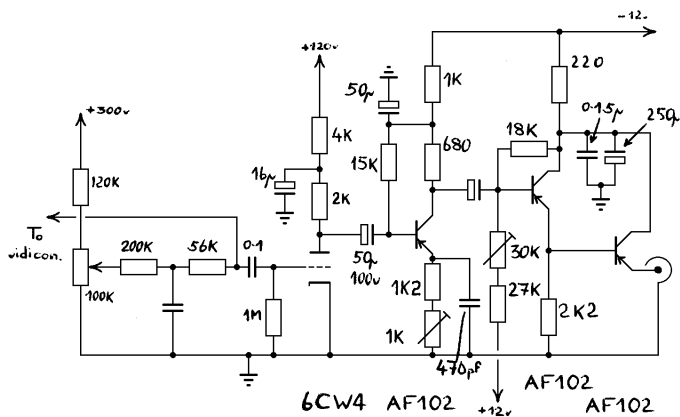


The twice line frequency monostable was triggered during the field pulse by the twice line frequency pulses, by means of the AND gate. The process was illustrated by the set of timing diagrams - see next page.

Building vidicon cameras was also creating some interest. The signal current from a vidicon target is extremely low, so considerable amplification was called for in the head amplifier to raise this to the standard 1V p-p level. A Belgian amateur, Willy van Marck, described a method using a device called a nuvistor. This was a miniature (thimble sized) valve made by RCA, the 6CW4 being a



high gain triode. Although a transistor could have been used for the first stage, it was said that the nuvistor was much less expensive, and gave much higher gain. The 6CW4's cathode was connected directly to the earth line to minimise hum pick-up. The output from the valve's anode then passed to a transistor stage that had a large value emitter resistor, by-passed by the 470pF capacitor, to boost the high frequency response. This was needed, as stray capacity around the vidicon and nuvistor etc would limit the high frequency response (ie detail in the picture signal), so the first AF102 stage compensated for these inevitable losses. The 2nd and 3rd AF102's provided a low impedance output to feed a co-ax cable to the camera control unit.



The transmitting aspect of the hobby was illustrated by the arrangement used by then Club treasurer Malcolm Sparrow, G6KQJ/T, to operate mobile on 70cm. A clover leaf aerial was clipped to the rear window. The transmitter, which comprised a 2m 10W unit followed by a varactor tripler to produce a signal on 70cm, together with an aerial change-over relay, power supplies and a transistor converter for the received signals were all housed in the boot of the car, whilst a receiver used as a tunable if to the converter was placed in the front of the car,

between the seats. News from members included several in Yorkshire and Cambridgeshire, Yorkshire and Lancashire, as well as others in Sweden, France and Belgium.

On the same page, the editors thanked those who had contributed articles, but added that they would be pleased to receive more on other topics, as "there must be some new ideas which have appeared since we last dealt with these subjects" and that there were probably people who would say "I would build it if only I had a little more information"..... so "if you feel you have something useful or just different we will find a space for it". Even if vidicons and nuvistors no longer apply to what BATC members are doing, the comments in this paragraph certainly do!



The British Amateur Television Club

The logo for the British Amateur Television Club (BATC) is a dark blue trapezoidal shape with the letters 'BATC' in white, bold, sans-serif font. It is set against a background of three concentric, light blue curved lines that sweep around it from the top right towards the bottom left.

The club provides the following for its members:

- ▶ A colour magazine, CQ-TV, produced for members in paper or .pdf (cyber membership) formats.
- ▶ **Web site** – where you can find our online shop stocking hard to get components, software downloads for published projects and much more.



- ▶ A **members forum** at www.batc.org.uk/forum/ for help, information and the interchange of ideas.
- ▶ A **video streaming facility** at www.batc.tv which enables repeaters and individual members to be seen worldwide.
- ▶ An **annual Convention** held in the UK where you can meet other members, visit demonstrations and listen to lectures.
- ▶ **Meet other club members** at the BATC stand at local rallies across the country.



www.batc.org.uk



BATC

Out and About

RadioFairs



You will be able to see the BATC stand at the following forthcoming rallies and events in 2015/6. Come and say hello!

8 November – West London Rally – Kempton Park, Surrey

See: www.radiofairs.co.uk

2016 - (more dates once they are known)

17 April – West London Rally – Kempton Park, Surrey

See: www.radiofairs.co.uk

4/5 June – Sussex Electronics and Radio Fair, Eastbourne.

See: www.serf.org.uk

19 June – Newbury Radio Rally – Berkshire

See: www.nadars.org.uk

17 July – McMichael Rally – Near Reading, Berkshire

See: www.McMichaelRally.org.uk

6 November – West London Rally – Kempton Park, Surrey

See: www.radiofairs.co.uk

More volunteers are needed to run the BATC stand at rallies, especially in the North and West. If you are able to help, please contact the membership secretary.