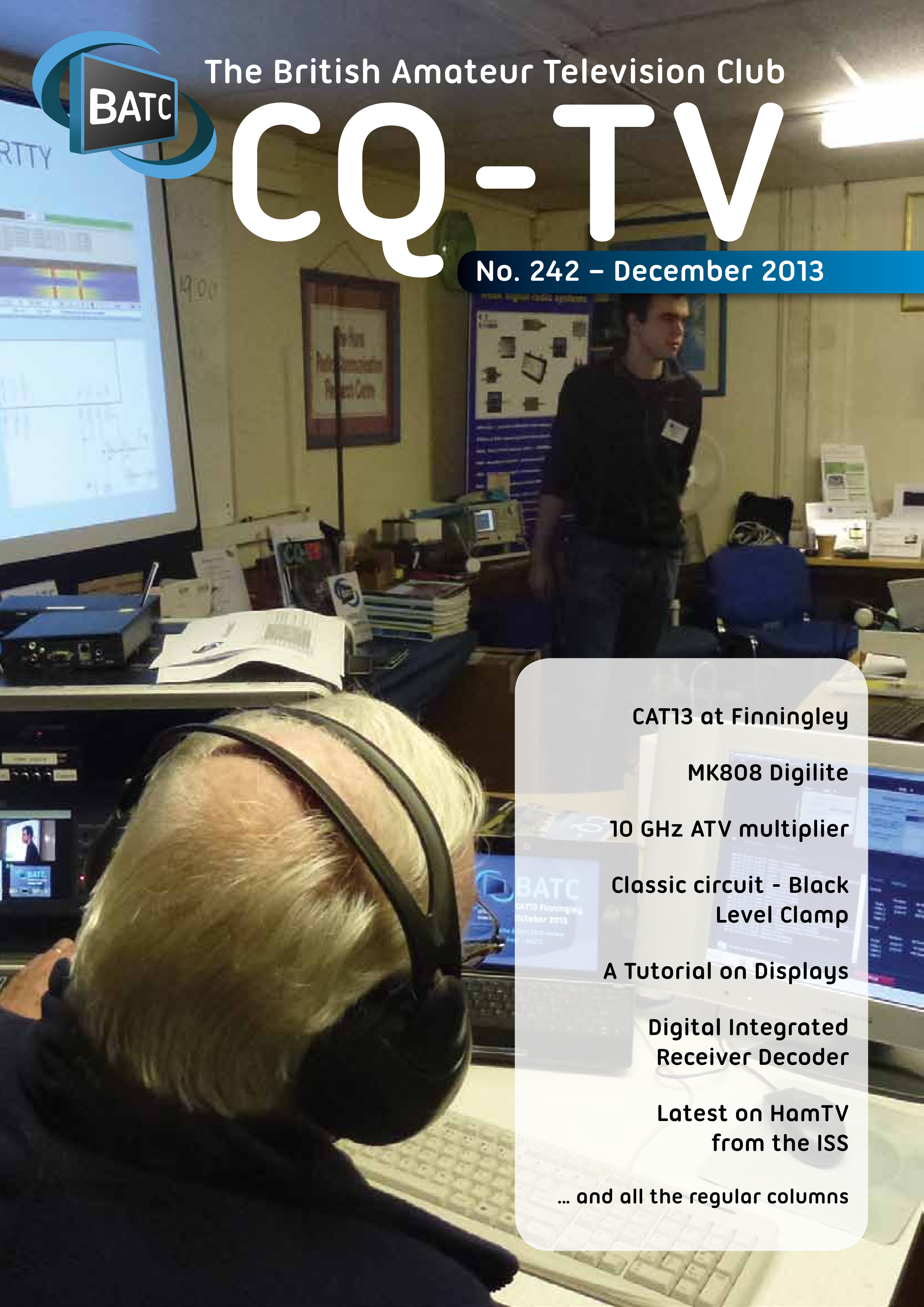
The British Amateur Television Club

CQ-TV

No. 242 – December 2013



CAT13 at Finningley

MK808 Digilite

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A Tutorial on Displays

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… and all the regular columns

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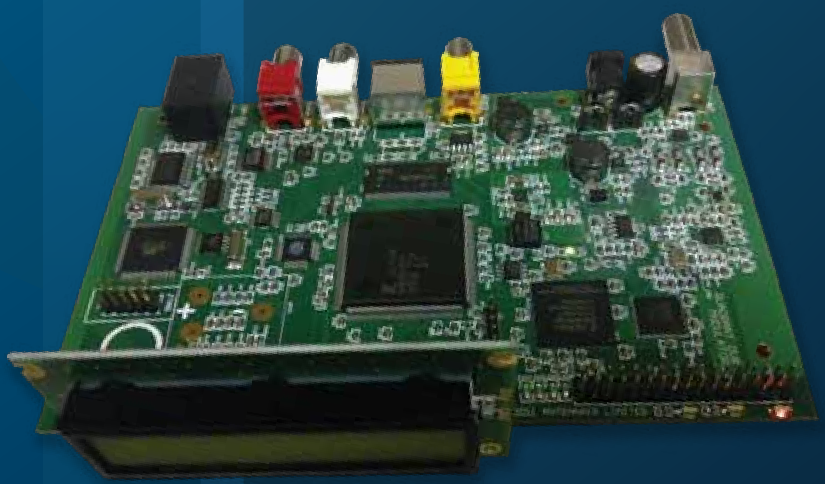

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CQ-TV 242

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You can also telephone 01400 414 243 You will then hear a menu that will allow you to be connected to the correct person if they are available.

Alternatively you can write to us at:
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We aim to publish CQ-TV quarterly in February, May, August and November.

The deadlines for each issue are:
March - Please submit by January 31st
June - Please submit by April 30th
September - Please submit by July 31st
December - Please submit October 31st

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

Welcome to CQ-TV 242, the 3rd edition of 2013 and the new look for CQ-TV!

It's unfortunate we missed the first edition of the year due out last March but the great news is that we have now got a new editor on board with experience of producing print and electronic magazines. I'll let him introduce himself, but we do hope you like the new look of the magazine and please send any feedback to Frank at **editor@batc.org.uk** .

As well as the revamped CQ-TV we have got some new roll up banners printed and also a BATC handout based on the recent "Getting Started in ATV" article which appeared in September's edition of Radcom. The banners are available to loan to any groups or members who are promoting ATV at a rally or exhibition and have already been used at CAT13, the Kempton Park rally and the RSGB/IET lecture which we streamed live on **www.batc.tv**. The "Getting Started in ATV" leaflet is available as a PDF so just email me if you require a copy.

It was great to see so many of you at CAT13 at the end of October and there was a real buzz around the place with many new ideas being generated both by the presenters of the talks and the conversations over tea and biscuits! May I say a big thank you for the resounding vote of confidence in your new committee and chairman which you gave when the opportunity came to grill us live on Saturday afternoon! There's a full report and pictures on CAT13 in this CQ-TV but we now need your input as to where we should hold CAT14!

The other big success has been the DTX1 launch – this was a risk which the committee felt we had to take to enable more of the ATV community to move towards a digital future. However, we clearly got it right because we soon sold out of the first batch of 25 units and have just received another batch, some of which have already sold.

Our on-line presence continues to grow and the BATC forum is getting more traffic than ever before. We have now implemented an RSS feed so that you can monitor the posts in your browser or even Outlook without visiting the web page. www.batc.tv is getting more widespread use and is becoming known as the place to watch live amateur radio related events.

As well as the RAF Scampton special event station, AMSAT colloquium and CAT13 it was has been used to cover the Funcube 1 launch control (well done Graham and team!) and the RSGB/IET lecture in early December. If you have an event which you think would be worthwhile streaming, just drop us a note and we can set up a live channel for you – how about JOTA stations next year Frank? We are continuing to look at rebuilding the streamer and our website and have had a couple of members volunteer to help with the work - watch this space.

There's a lot going on at BATC, which is so much more than just a magazine, to help and support the worldwide ATV community. We hope you enjoy reading this copy of CQ-TV and in the meantime for all the latest and up to date ATV news don't forget to visit the BATC forum.

A new editor for CQ-TV...

Hello, my name is Frank Heritage and my callsign is M0AEU

My interests in amateur radio are many and varied, and I've been licenced since 1982, when as a Scout, I was introduced to amateur radio for the 'Jamboree on the Air' at Gilwell Park, GB2GP. The following year I had my own callsign, G6OLK, and I was running my own JOTA station.

My main interests are on the HF bands, and the digital modes, but as a graphic designer, I have an interest in all things pictorial - so SSTV and ATV are a natural interest! Although I am not currently active on ATV it's on my list of 'things-to-do'. We've also just been given a 23cm transceiver at GB2GP, so I'm hoping to get the Scouts active from the campsite soon.

As I mentioned, professionally I am a freelance graphic designer so when I read that a new editor was required I thought I'd step forward and volunteer! I hope you like the new style - and if you have any comments on CQ-TV, please don't hesitate to contact me and let me know!

Overseas News

Dave Crump – G8GKQ

USA

The USA does not have a single ATV Society comparable to BATC, but they do have the "Amateur Television Network" (***http://atn-tv.org***) which is very active in 17 States. Some activity in other States is listed on the website http://atv-tv.org/index.php, although many of the links are out of date.

Activity in the USA is still predominantly Analogue with Amplitude Modulation used on both 70 cm and 23 cm. There is also some FM activity on 23 cm and 10 GHz, with a few stations now running DATV using DVB-S on 23 cm. I note that some of their 70 cm in-band repeaters (for example W4ATV) are actually linear transponders designed for AM with just 18 MHz transmit-receive spacing.

The major development anticipated in the USA is the availability of DATV-Express, which will provide a home-grown alternative to the import of SR Systems or Digilite hardware.

The Netherlands

The availability of the TVSharp software for the RTL USB Dongles seems to have encouraged more AM ATV activity on 70 cm in The Netherlands. The video bandwidth is typically filtered to 1 MHz before transmission so that the signal only occupies 2 MHz of bandwidth. I note that there were 16 Dutch entries in the 70 cm Section of the September IARU Contest.

Italy

Activity in the September ATV Contest was mainly in 23 cm and 3 cm, although both 6 cm and 9 cm were activated.

Ireland

The Chairman of the Irish Amateur Television Club attended CAT 13 and mentioned his Club's website ***http://www.iatc.ie***, which has lots of information about ATV activity in Ireland. They have a number of repeaters including EI8LLT using 23 cm, 13 cm and 3 cm FM.

*Please send any information about what's going on in your country to **contests@batc.org.uk**.*

CAT13 - Finningley

A few images from the weekend

Members News

Dave Mann – G8ADM

GB3GV

First as mentioned elsewhere we should wish happy birthday to the first UK ATV repeater GB3GV in Leicester. The repeater will be 30 years old next February. The repeater keeper was Paul G4MQS, others who helped were Paul G8JFD, Deryk G3XKX, Mike G4SIX, George G4EUF. There was an article by John Wood about the first ATV repeater licences in CQ-TV 126. I remember it well. Geoff G4AJF reports that the repeater has recently had some antennas replaced and is working well.

GB3TG

Another repeater that has been upgraded is GB3TG near Milton Keynes. This repeater's output is on 10.240 GHz and it provides an off air link to GB3TV at Dunstable downs. Milton Keynes is in a valley so 'TG offers a welcome link to more distant stations. Arthur G4CPE has been working on the repeater at home and with the help of a new PA donated by Bob G6OUA has increased the power output from +24dBm to +37dBm. Arthur now gets a P5 signal from the repeater at his home in Luton. Other improvements included a new LNB, updated control logic and a new slide show generator.

GB3TZ

Also managed by the Dunstable Downs Radio Club is GB3TZ. This has a digital output on 13 cms and normally provides a strong signal in Bedfordshire and Hertfordshire. This repeater has recently been subject to malicious damage and is currently off the air. The team are working hard to repair the damage and it may well be back on by the time you read this.

G8CPF

Mike G8CPF reports from Minehead, Somerset that he is now operational using a Digilite transmitter with an output of 40W on 437 MHz, Symbol rate 2 MS/s and 25 W on 1249 or 1255 MHz at 4 MS/s. His location is at sea level so he occasionally operates from portable locations. He can often be seen via the GB3ZZ repeater in Bristol and he regularly monitors 144.750 MHz the ATV talkback channel.

Digilite

It's good to hear that Mike is using a Digilite transmitter. The BATC has sold hundreds of Digilite kits but we very rarely hear of them in use. So if you are using a Digilite kit please let us know.

70cm dx

Interest in 70cm digital TV continues to grow with more stations using the band and existing users fine tuning their equipment with surprising results. From Harrow in Middlesex I can now get to Mike G8LES near Alton Hampshire, 90 KM path, with just 0.1 W of transmitter power. Noel G8GTZ has recently worked stations in Paris and elsewhere in France over a 600 KM path.

Peter G3PYB reports from Portsmouth that on Monday 23rd September he had 70cm DATV contacts with Mark F3YX North of Paris, J18AP and F5AGO, JN06DP over a 447 Km path. He also had a reception report from F4AGC, JN17NQ, 463 Km. The following morning he was received by F6ANO JN18JR, north of Paris and James F1HKT JK19CB at 305 Km. and had a two way contact with F3YX again. Peter mentions that French stations use a variety of Symbol Rates like 1.024, 1.500, 1.667 as well as 2.000 MS/sec. Not all receivers will go down to the lower symbol rates.

▷ *A received screen shot from Peter, G3PYB*

QPSK modulation with error correction, DVB-S, is a very powerful method of modulation that provides very good results over long distances. If you are active on 70cm please send us a report.

I would welcome more news about all aspects of our hobby from camera to antenna. Please email to:
secretary@batc.org.uk

Contest News

Dave Crump – G8GKQ

BATC Summer Fun Contest 7 – 8 June 2014

Now that there are a good number of stations with digital ATV capabilities, both on 70 cm and 23 cm, the BATC Committee have decided to offer a prize for digital ATV contacts during the Summer Fun Contest next year. The exact rules for the award of the prize have yet to be determined, but the one sure thing is that you will have to be in it to win it! Eligibility will be limited to BATC members.

So, think about how you could get on the air with digital (on 70 cm or 23 cm) next June and start building or buying. Remember there are lots of options: the BATC DTX1, Digilite, SR Systems or ex-commercial gear. Just try it – you'll be surprised how easy it is!

BATC Repeater Contest 7 – 8 December 2013

The one question I always get asked about the BATC Repeater Contests is "How are they scored?". The simple answer to this is that each contact participant can claim for the RF paths at each end. So, if one station transmits to the repeater on 13 cm, he uses the distance to the repeater and the 13 cm multiplier; and if the receiving station is using 23 cm, points calculated from the receiver's distance from the repeater and the 23 cm multiplier are added. It is not permissible to claim points for the internet (batc.tv) sections of the path or links between repeaters. I am currently redrafting the rules and will publish them on the forum and the website.

IARU Region 1 International ATV Contest 14 and 15 September

Sadly, only one UK entry for the IARU contest in September.

Band	Pos	Call	Locator	QSOs	Points	Best DX	QTH	QRB
70cm	1	M0DTS/P	IO94MJ	1	108	G1LPS	IO94EQ	54
Band	Pos	Call	Locator	QSOs	Points	Best DX	QTH	QRB
23cm	1	M0DTS/P	IO94MJ	1	216	G1LPS	IO94EQ	54
Band	Pos	Call	Locator	QSOs	Points	Best DX	QTH	QRB
13cm	1	M0DTS/P	IO94MJ	1	540	G1LPS	IO94EQ	54
Band	Pos	Call	Locator	QSOs	Points	Best DX	QTH	QRB
3cm	1	M0DTS/P	IO94MJ	1	540	G1LPS	IO94EQ	54

I am still waiting for the International Results to be published.

Contest Information

I will be posting information about upcoming contests (and initial results) on the BATC Forum. Please take a look before the contest and post if you're going to be active. The more people know that you are likely to be on-air, the more contacts you'll make!

Contact

I can be contacted through e-mail (**contests@batc.org.uk**), or through my BFPO address:

Wg Cdr D G Crump,
Defence Section, British Embassy Abu Dhabi,
BFPO 5413, London.

Contest Calendar

1200 UTC 7 December 2013 – 1200 UTC 8 December 2013: *BATC Repeater Contest*

1200 UTC 22 March 2014 – 1200 UTC 23 March 2014: *BATC Repeater Contest*

1200 UTC 7 June 2014 – 1200 UTC 8 June 2014: *BATC Summer Fun Contest*

1800 UTC 13 September 2014 – 1200 UTC 14 September 2014: *International ATV Contest*

Known DATV DX Records

Ken Konechy – W6HHC

I really enjoyed the CAT13 conference this year from my QTH in far-away USA. The good folks at BATC had their video-streaming operational and, more importantly, archived the video files of the presentations on their web site. That allowed me to watch entire conference at my leisure. While watching the Video Archives of the BATC CAT13 conference presentation on "DATV Practices", I heard Noel G8GTZ list some recent DATV DX QSOs on 70 CM. The longest receptions involved G8GTZ and F1FY for 696 KM over the two day period of the International ATV Contest, last September

▷ *Received 70 CM DATV signals at G8GTZ QTH (Courtesy of Noel G8GTZ)*

I am still in the process of researching some of the longer 23 CM DATV QSOs that may have occurred during the same IARU ATV contest. My current updated list of known DX DATV Records is shown below. See more details (including some analog-ATV records) at **www.von-info.ch/hb9afo/records/recordse.htm**

If anyone knows of other DX DATV QSOs please contact me directly at ***W6HHC@ARRL.net***

Known Digital-ATV DX Records

updated 2013-12-01

24 GHz

124 KM	JA6DME & JA6EES	2011-11-12
Locations: Mont Ten-Zan and Mont Ge-Zan		

10 GHz

450 KM	HB9JBC & F4CXQ	2005-06-21
Locations: JN40CT (Sardinia) and JN12OH (Spain)		

5.7 GHz

341 KM	JL1BLF & JH1GED	2011-08-06
Locations: Mont Chokai-san and Mont Kashimayari-gatake)		

2.4 GHz

252 KM	JA6SPI & JA5MFY	2009-11-03
Locations: ??		

1.2 GHz

440 KM	G4KLB & G1LPS	2010-10-11
Locations: IO90BR and IO94EQ (tropospheric ducting - one-way DATV)		
419 KM	G4KLB & MØDTS	2010-10-11
Locations: Bournemouth, England and Yarm, England (tropospheric ducting)		
379 KM	VK3RTV(RPTR) & VK7EM	2011-02-23
Locations: Mount Dandenong, Victoria and Penguin, Tasmania (operators VK3BFG, VK3DQ , VK3WWW and VK3TRX)		
252 KM	JA5GYU & JA6JNR	2009-11-03
(1 Watt)		

70 CM

696 KM	F1FY to G8GTZ	2013-09-24
(DVB-S 2MS/sec FEC=1/2 - - one way reception)		
696 KM	G8GTZ to F1FY	2013-09-25
(DVB-S 2MS/sec FEC=1/2 - - one way reception reported by FM) **Locations:** IO91KH (near Basingstoke) and JN16VB (near Roanne, France)		
528 KM	G3PYB & F5AGO	2013-09-24
(DVB-S 2MS/sec) **Locations:** near W YORKSHIRE and JN06DP (near Poitiers, France)		
373 KM	G8GTZ & F3YX	2013-09-25
(DVB-S 2MS/sec FEC=1/2) **Locations:** IO91KH (near Basingstoke) and JN18AP (near Limours, France)		
121 KM	KH6HTV & KØRZ	2011-11-21
(video resolution HDTV 1080i - protocol ITU-T/J.38 QAM-64 - one-way DATV) **Locations:** Cheyenne, Wyoming and Boulder, Colorado		

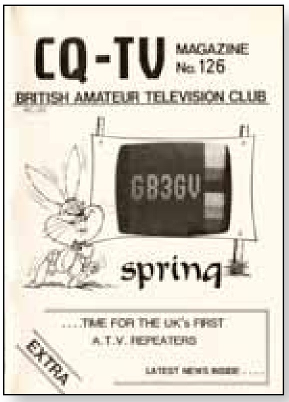
30 Years of GB3GV

Peter Yarde – G8DKC

On the 16th of February 1984 the UK's first five repeaters were licensed, GB3GV, GB3UT, GB3TV, GB3UD & GB3VR,.This story is about GB3GV.

GB3GV

GB3GV was first on the air – the switch on date was Sunday the 26th of February 1984. Although due to a receiver fault, it was not put into repeater mode until a couple of weeks later.



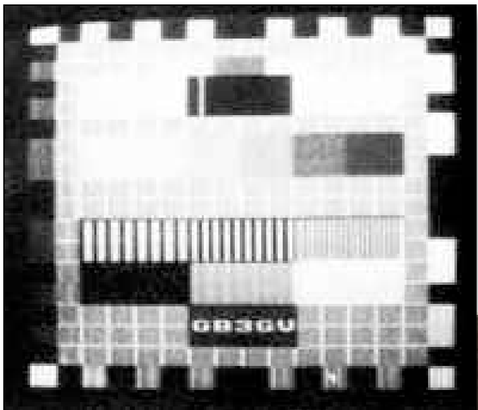
It started out at a temporary location at Glenfield North West Leicester, Paul Elliot G4MQS QTH, the builder and first keeper. Hence the call sign GB3GV, its first frequency allocation was Input. 1276.5 MHz Output. 1311.5. 25w Erp and a pair of Alford Slots.

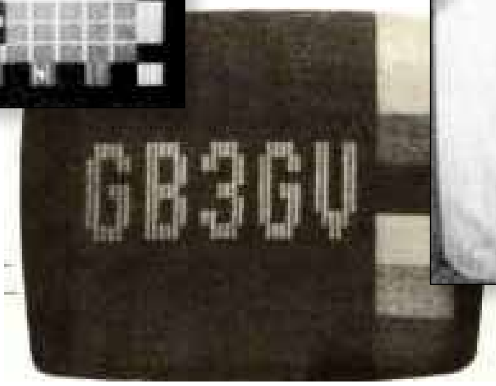
FM input and AM output, and 6 mhz intercarrier sound, FM out was available, but not yet commissioned,

Access was obtained by receipt of valid 625-line transmission; it had CW ident, "Teletext Style" pages, test cards and computer graphics.

Coverage was limited by the temporary location, but the repeater was seen in Nottingham some 23 miles away.

The photographs were taken off screen by Deryk Wills G3XKX, on the 2nd day of GB3GVs operation, about 12km from GV, 15/15 yagi Fortop converter and Rigonda Tv, they are believed to be the first ever pictures of a British amateur TV repeater transmission.





The good news is that in early May of the same year GV was moved to its new and present site, at Markfield. George Mayo G4EUF told me, "I was involved with Paul, G4MQS fitting the original aerials when it moved to Markfield."

"I should remember it as it was extremely windy that day and the ladders had to be lashed to the mast, and I took the precaution of wearing an ex Post Office linesman's safety belt!"

He also said, he had built an up a converter in order to receive GV, "had to drive to the repeater site to tune the damn thing up!"
I don't think he will be the last man to do that sort of thing!

The first problem was the AM output, as the group said at the time it was not "up to scratch", as an experiment the FM modulator was tried, and it was so successful all agreed it should stay.

The second problem was a disaster; the first ATV repeater is now a stationary blip on the screen of the CAA's air traffic radar station at Clee Hill.

With the request of CAA and then DTI 'Radio Interference Service', GB3GV was immediately closed down.

Judging by the time-line it appears that talks had taken place between the various parties and within a couple of weeks or so GV was back on the air on its present frequency.

It was found that by moving the repeater up to 1318.5, this solved the problem and the repeater was no longer causing interference. Other groups were now feeling a little nervous when they first switched on.

GV was off air on another occasion, when the power was cut during a storm, and when the supply returned the PA valve had full 'HT' before the heaters had come up. Later PSU protection was fitted, plus GVs first receive pre-amp. someone noted "the valve didn't like that one little bit".

Including local use, the repeater was seen and being accessed from Birmingham, Rugby, Nottingham, and reports from Northampton.

As for some of the original team – Paul, G4MQS, some time later was involved in his own satellite TV business, and as a result John Wood, G3YQC, became interested and worked on GV, alongside George, G4EUF.

It has been difficult to follow all the changes over the years. David, G8OBP, told me, "I took over as repeater keeper in the eighties when GV had been off air for a few months due to the main aerial mast having collapsed."

David was repeater keeper from then till now – probably 25 of the 30 years! He did say that the original aerials had their first full rebuild by Nigel, M1NAS, somewhere around 2008, and the feeders were replaced with an LDF450 type of cable

I took over from David last winter, at the present time he is making a long recovery from a major operation, but we are still in contact and he has helped me out with various suggestions and written changes to his original GV control software, which I'm always asking him to modify, with my latest 'ideas'.

That takes us to the present day more or less, many users have come and gone over the years, but those early days and the start of GB3GV is what this is all about.

I would like to thank the BATC team for their archive, which has allowed me access to the first steps of GV, also Graham, G3VZV; George, G4EUF; David, G8OBP; and Dave, G8TNE for answering my emails with odd snippets of history.

▷ Nigel, M1NAS on 23cm analogue

▷ GB3GV today

▷ ...and on 23cm digital

CAT13 at Finningley

Noel Matthews – G8GTZ

During the last weekend of October more than 50 members of the BATC gathered at Finningley Amateur Radio Club site near Doncaster for the annual BATC convention.

Several of us arrived on Friday afternoon to help Kevin, G3AAF, get the site ready and also to see if there was enough 3G coverage to enable us to stream the talks live on ***www.batc.tv***. Luckily the site is very close to the M180 and there was a 3 mast in the same field, which provided very robust connectivity all weekend.

On Friday evening we retreated to the Reindeer at Sandtoft where we had a very sociable evening with dinner, a few beers and good company.

▷ *Reading hard copies of CQ-TV over a beer – something you can't do with an epub!*

On Saturday, the weather was unseasonably warm and several traders set up an outside flea market whilst Martyn, G8FEK, set up the RF test lab and Kevin made sure everything was ready for the SMD workshop and member demos.

The presentations

The talks started at 10am on Saturday with a review of the past year for BATC by Noel, G8GTZ, who was followed by Bryan Harper, G8DKK, giving a very interesting presentation on the history and future developments of satellite LNBs. Phil Crump, M0DNY, then presented an introduction to High Altitude ballooning (HAB), but unfortunately the planned launch could not go ahead due to the very high winds forecasted later in the day!

▷ *Peter, G3PYB, drives the streamer during Phil, M0DNY's HAB talk*

After coffee Brian Summers, G8GQS, talked about the challenges facing early colour camera designers and Kevin, G3AAF, gave a very enlightening presentation on the challenges of SMD soldering. This was the lead in to the SMD practical workshop held over lunch time when 10 people actually built themselves a PGA103 amplifier (as described in CQ-TV 241).

▷ *G3AAF showing the intricacies of SMD soldering*

After lunch Laurence, M6TTX, from Antennair gave us an introduction to the BATC DTX1 DATV system and then Noel, G8GTZ, went on to talk about DATV in practice on the 70cms, 23cms and 9cms bands. Murray, G6JYB, rounded off the day with an update on the latest news on spectrum negotiations and the amateur licensing review with Ofcom.

Peter, G3PYB, kicked off proceedings on Sunday morning with a talk on a 13cms to 10 GHz transmit multiplier which is featured in this edition of CQ-TV and was followed by 2 talks from Brian, G4EWJ, and G3AAF on locking and using the latest generation PLL LNBs on 10 GHz.

Graham, G3VZV, then gave a fascinating insight to the ISS HAMTV project, also featured in this edition of CQ-TV, and after lunch Mark, M0UFC, gave a great presentation, including several videos, on the portable activities of ATVers in the Bolton area. Hopefully this will be an inspiration to the rest of us to get out more next year and take part in the BATC summer fun contest!

▷ *Standing room only during Brian, G4EWJ's presentation*

Charles, G4GUO, gave an update, via mobile phone, on the DATV express and then seeded some ideas for the new narrow band modes and technologies we could adopt for the potential VHF spectrum release and the weekend rounded off with Brian, G4EWJ, updating us on the Digilite project.

A big thanks to all the presenters who put in a lot of hard work to make the weekend a big success.

▷ *M0DTS and M0DNY deep in conversation in the demo area*

Demonstrations and other activities

The Finningley club house has several rooms and all of these were in use over the weekend by members who brought along brought demonstrations and displays.

A lot interest was generated by a very simple display of TerraHz television brought along by John, G0ATW. Quite a few people felt this had great potential as an outreach and educational project as it demonstrates the basic principles of radio in a very simple but visual effective way.

All these sessions were streamed live – we used approximately 7 Gbytes to stream the 10 hours of talks – and recorded using the refurbished BATC streaming equipment. They are available in the archive section of www.batc.tv as follows:

BATC review	http://www.batc.tv/streams/cat1301
LNB developments	http://www.batc.tv/streams/cat1302
HAB introduction	http://www.batc.tv/streams/cat1303
Early colour cameras	http://www.batc.tv/streams/cat1304
SMD techniques	http://www.batc.tv/streams/cat1305
DTX1	http://www.batc.tv/streams/cat1306
DATV in practice	http://www.batc.tv/streams/cat1307
Spectrum matters	http://www.batc.tv/streams/cat1308
10 GHz Tx multipliers	http://www.batc.tv/streams/cat1309
10GHz PLL LNBs Archive	http://www.batc.tv/streams/cat1310
ISS HAMTV	http://www.batc.tv/streams/cat1311
ATV operation in the North West	http://www.batc.tv/streams/cat1312
DATV express update	http://www.batc.tv/streams/cat1313
Potential new Narrow Band ATV modes	http://www.batc.tv/streams/cat1314
Digilite update	http://www.batc.tv/streams/cat1315

Rob, M0DTS, was showing the 3.4 GHz transmitter system for GB3KM based around his new MK808 controller for the Digilite and a modified Airspan AS4000 unit. Phil, M0DNY, had a live demo of SSTV from a Raspberry PI mounted as a HAB payload and Brian, G4EWJ, brought along the latest Digilite hardware and software.

G8FEK provided a comprehensive set of RF test equipment up to 22 GHz and several people took advantage of this to check out their station equipment, including those who had built the PGA103 amplifier over the weekend – thank you Martyn.

A big thanks must also go to David Wrigley, G6GXK, set up and ran an antennae test range on Sunday morning and despite the increasingly windy conditions got a good set of results on 70cms, 23cms and 10 GHz.

As well as all the activities, there was plenty of time to meet friends, old and new and we were particularly pleased to see Ronnie, EI9ED, president of the Irish Amateur TV Club at the event. Ronnie tells us there is renewed interest in ATV in Eire and several members are building 437 MHz equipment and at least one repeater in the Dublin area will have a 437 MHz reciever installed in the near future. Hopefully, there will be some G/EI ATV contacts again in the near future!

▷ *Presidential meeting! G3PYB and EI9ED*

And so on to CAT14!

But where should we hold it? We are interested in your views and particularly if you can help find a suitable venue – please email us directly or reply to the topic set up on the BATC forum at ***http://www.batc.org.uk/forum/viewtopic.php?f=74&t=3655***

Everyone who attended CAT13 said it was a very successful and enjoyable weekend and proved yet again that the BATC is so much more than just a magazine! We would like to say a big thank you to everyone who helped to make it a success, particularly Kevin and Martin and the Finningley club members for the use of their premises and for keeping us well fed and watered throughout the weekend.

Antenna range tests BATC - 27 Oct 2013

10GHz Measurements

				Relative To Ref	Gain
Antenna description	**Reading**	**Range**	**Total**	**dB**	**dBi**
Reference Horn	-2.2	-40	-42.2	0.0	17.2
G7CKX Long Horn	-9.0	-30	-39.0	3.2	20.4
G3OAD Horn	-6.5	-30	-36.5	5.7	22.9
G7CKX Log Periodic	-10.0	-40	-50.0	-7.8	9.4
Small Professional Dish	-0.2	-30	-30.2	12.0	29.2
Sectorial Horn (Approx 60deg)	-7.0	-40	-47.0	-4.8	12.4

1.296GHz Measurements

				Relative To Ref	Gain
Antenna description	**Reading**	**Range**	**Total**	**dB**	**dBi**
Reference Antenna	-5.5	-30	-35.5	0.0	10.0
JVL Loop yagi- 25 element	-7	-20	-27.0	8.5	18.5
Tonna 18 Element Yagi	-0.7	-30	-30.7	4.8	14.8
WA5VJB Log Periodic	-8	-30	-38.0	-2.5	7.5
G3REH stacked Yagi	-0.9	-30	-30.9	4.6	14.6
G3WEK 19 Element Yagi	-0.8	-30	-30.8	4.7	14.7
Corner reflector	-3	-30	-33.0	2.5	12.5

435MHz Measurements

				Relative To Ref	Gain
Antenna description	**Reading**	**Range**	**Total**	**dB**	**dBi**
Reference Antenna	-7.5	-30	-37.5	0.0	9.0
G8GTZ Turnstyle - max	-2	-40	-42.0	-4.5	4.5
- min	-7.5	-40	-47.5	-10.0	-1.0
10 element Yagi	-4.5	-30	-34.5	3.0	12.0
BCX 5 element yagi	-5.5	-30	-35.5	2.0	11.0

A 2.5 Watt LDMOS Driver for the 1.3GHz band

John C Worsnop. PhD CEng MIET – G4BAO

Following the PGA103 amplifier in CQ-TV 241 this article by John Worsnop G4BAO, which was first published in the Scatterpoint Microwave Newsletter, describes a driver stage capable of producing up to 2.3 watts on 23cms.

This, plus the PGA103 amplifier, is a good compliment to the DTX1, Digilite and other DATV transmit drivers. John will be selling kits and component parts including the PCB through **www.g4bao.com.**

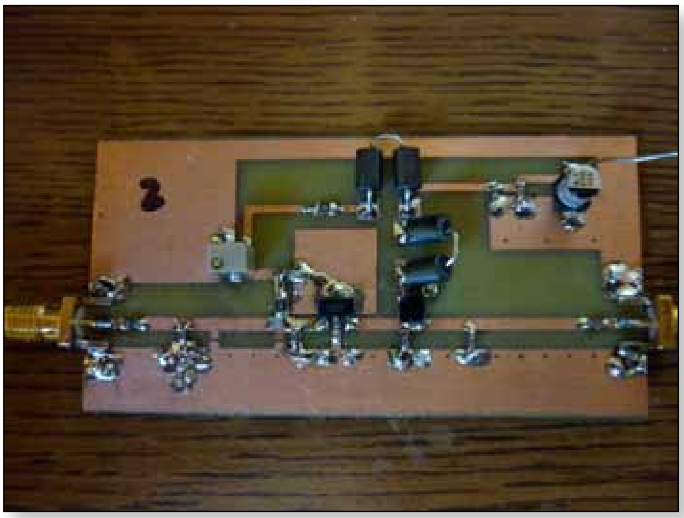
Introduction

Since I published the design for the 35 Watt LDMOS PA back in June 2009 RadCom a number of people have asked me if I had a driver circuit to go up from a few tens of mW up to a level sufficient to drive it. Then the two combined amplifiers could become a replacement for the "brick" modules that were popular a number of years ago.

This article describes a simple 2.5 Watt driver amplifier covering the 1.3GHz band requiring around 50-100mW of drive for full output. It can be added after low power transverter designs such as that by G4DDK [1] to boost the power output to a couple of Watts, sufficient to drive a larger PA device if necessary.

The design is very simple and based around a single cheap SOT-89 plastic PD85004 13.8V LDMOS device from ST [2]. The device is rated to give 17dB gain and 4 watts out at 870MHz but it performs well with reduced gain of 15-16dB and output power of up to 2.5 Watts at 1.3GHz.

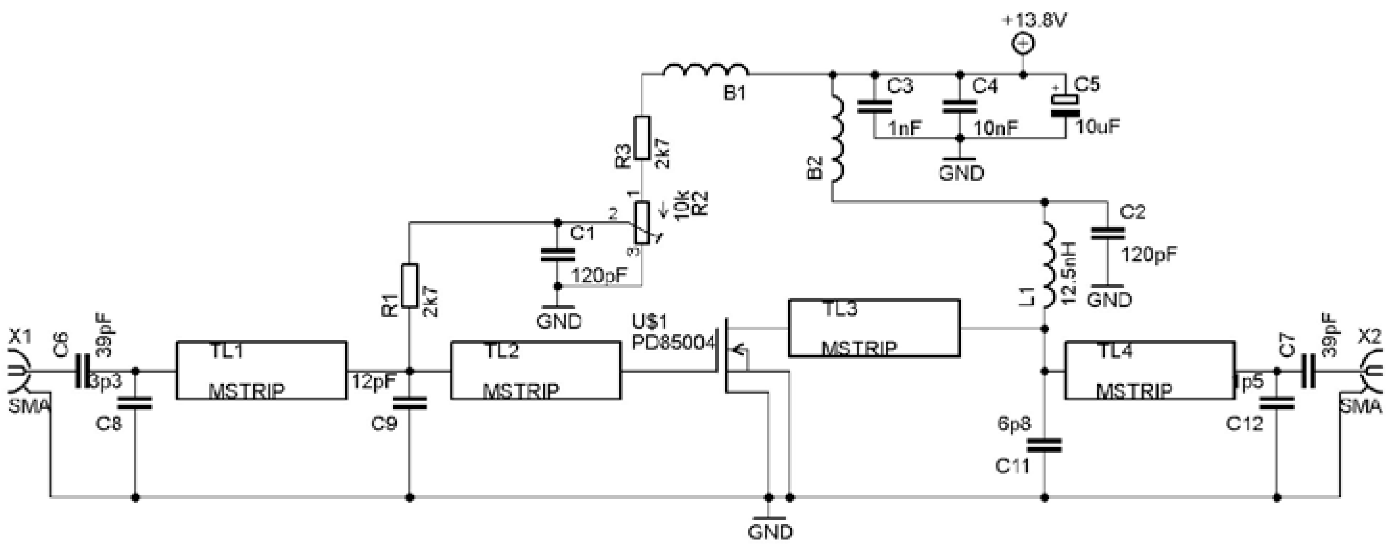
The PCB is designed to fit in to a readily available 37 x 74 x 30mm tinplate box [3], and if the PCB design is copied should need no heatsink



Circuit description

The amplifier uses 50 ohm microstrips and capacitor matching and requires no adjustment. Two big advantages of using just 50 ohm lines during development is that a PCB with a single width of matching line is required and capacitors can be moved up and down the line for trimming. Secondly the PCB becomes a general purpose board for SOT-89 50 ohm in/out modamps

In this amplifier, device input and output impedances are matched to 50 ohms using low pass networks consisting of series, lines, TRL 1-4, and C8, 9, 11 and 12.



The 13.8 volt supply is connected to the drain via a network of two chokes and a 120pF capacitor to ground, and is decoupled over a wide range of frequencies by C3, C4 and C5.

Positive gate bias is also fed via a choke B1 from the 13.8 supply and potential divider to set the standing drain current to 50mA. The gate supply is decoupled by C1. Without gate bias the amplifier takes very little current so that switching the gate supply from the press to talk (PTT) line is a convenient way to switch the amplifier out of standby.

Note that the 13.8 supply to the board must be regulated unless a separate regulated supply is provided for the gate bias!

Construction

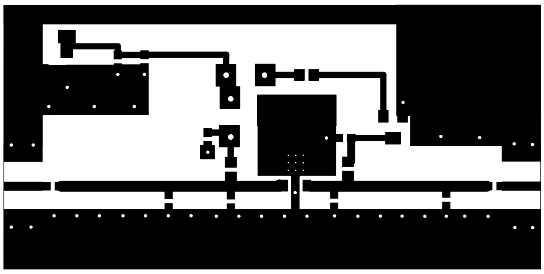
The PA is built on 0.8mm thick standard FR4 PCB material. The PD85004 used in the design is in a SOT-89 solder-down plastic package which is now becoming more popular and eliminates the need for hazardous Beryllium Oxide. Under the device tab there must be either six plated through holes to connect the tab both thermally and electrically to the ground plane underneath, which then acts as a heatsink for the device. An alternative to the plated through holes for a home made PCB is to use 5 subminiature copper rivets. [4]. The other grounding holes can be made up with either rivets or hand soldered copper wire vias.

Checking the completed PCB

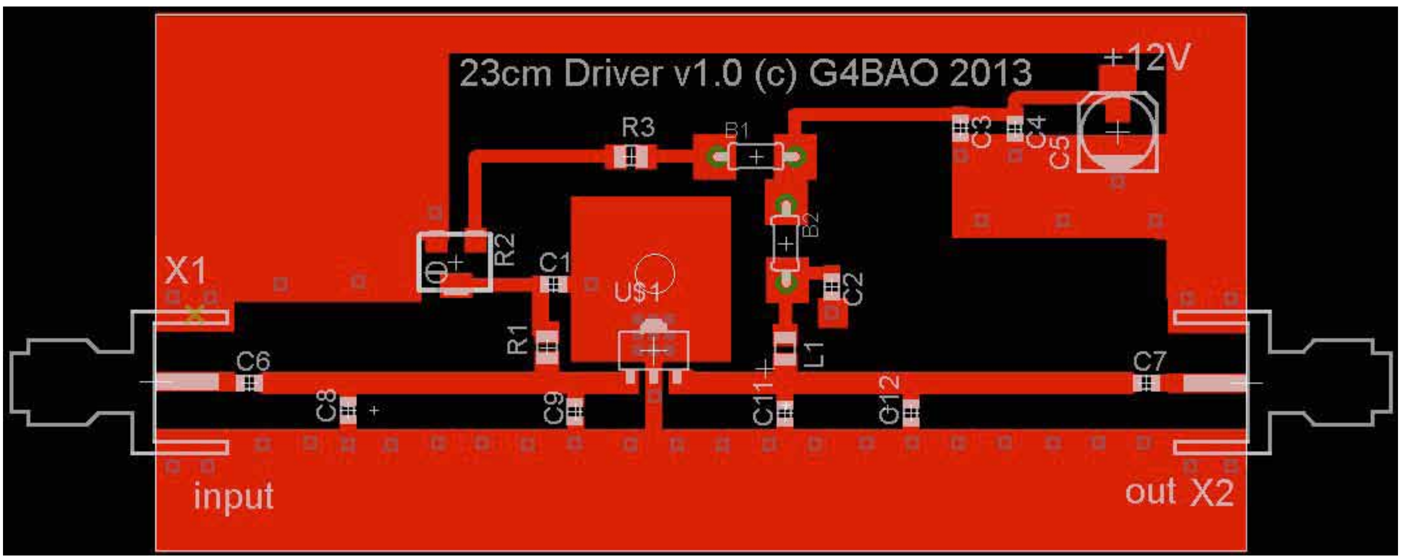
Connect the output from your low power 1.3GHz transverter to the amplifier input after first ensuring that the input power does not exceed 100mW (+20dBm).

Connect the amplifier output to a power meter/dummy load capable of dissipating at least 3 Watts.

Connect the drain to 13.8 volts via an ammeter on the 100mA amp range. Connect the gate bias supply, starting with minimum volts on the gate and VERY carefully increase the gate voltage until the device begins to take current. This onset is very sharp, so be very careful, as the drain current can easily swing up to many amperes if you are not careful. Set the drain current to 50mA. Switch off and then switch the ammeter to the 1 Amp range. Switch back on. Apply drive and check that the output power is in the order of 2 Watts depending on drive level. Typical test results for my prototype amplifier are shown in Figure 4 and Figure 5.



▷ *PCB Actual size*



Conclusions

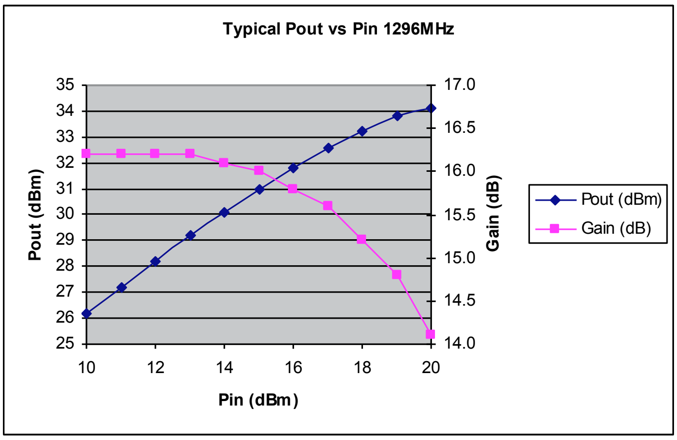
This inexpensive driver is relatively easy to build, with readily available components and produces a useful increase in output power for low power transverters such as those based on modamps. It covers the whole of the 1.3GHz narrow band section, and could be adapted to cover the ATV band or the 1240MHz section of the band if band planning eventually forces a move of 1.3GHz narrowband lower in the band.

On request, I will make the PCB mask available on my website [5]

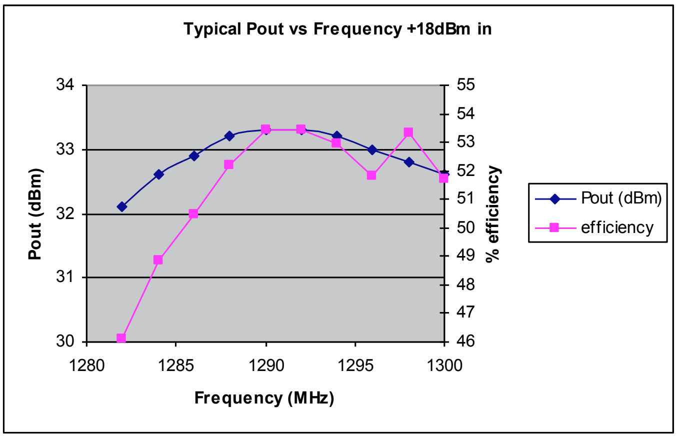
Table 1 - Component list

Component	Value	Type
R1, R3	2k7	SMD 0805
R2	10k	SMD preset
C1, C2	120pF	Murata ceramic 0603
C3	1nF	Murata ceramic 0603
C4	10nF	Murata Ceramic 0805
C5	10uF 35V	SMD electrolytic
C6,C7	39pF	Murata ceramic 0603
C8	3p3	Murata ceramic 0603
C9	6p8	Murata ceramic 0603
C11	4p7	Murata ceramic 0603
C12	1p5	Murata ceramic 0603
U$1	PD85004	LDMOS power
L1	12.5nH	Coilcraft 0805 air core
B1, B2	Dual ferrite bead	Panasonic EXCELDRC35C
TL1	50 1.43 mm x 15mm	Microstrip line, matching
TL2	50 1.43 mm x 4mm	Microstrip line, matching
TL3	50 1.43 mm x 7.6mm	Microstrip line, matching
TL4	50 1.43 mm x 8.2mm	Microstrip line, matching

Results



▷ *Figure 4 Prototype Amplifier Gain and Power out vs Power in*



▷ *Figure 5 Prototype Amplifier Gain and Efficiency*

References

[1] "A Modern 1.3GHz transverter Module" Sam Jewell G4DDK. , International Microwave Handbook, 2nd Ed. Chapter 9 p305. **http://www.arrl.org/shop/International-Microwave-Handbook**

[2] PD85004 Datasheet **http://www.mouser.com/ds/1/389/CD00178461-55263.pdf**

[3] Tinplate boxes can be obtained from Alan Melia G3NYK at **http://g3nyk.ham-radio-op.net/componen.htm**

[4] Copper rivets from www.megauk.com part number 700-025-4

[5] **www.g4bao.com**

A Beginner's Guide to Field Programmable Gate Arays (FPGAs) Part 2

Charles Brain – G4GUO

In part one in CQTV 241 Charles gave us an introduction to FGAs – in part 2 he describes a practical example using code which is available from the BATC web site.

"In part two of the series I am going to work my way through a very simple FPGA program. The project files for this program are available for download from **http://www.batc.org.uk/cq-tv/software/index.html**

This article is not a complete reference to the entire Verilog 2001 language as that would fill an entire book. I hope to present a simple program that flashes some leds, something to get you started. The project file contains all the required pin and device configuration that you will need to use the inexpensive Altera development board that was mentioned in the first part of this series.

So let's start:

```
//
// Blinker demo module
//
module CQTVBlinkerVerilogDemo( input
clk50mhz, input button,
       output LED1, output LED2,
output LED3 );

reg [31:0]counter_r;
reg [2:0]led_r;

always @(posedge clk50mhz)
begin
  counter_r <= counter_r + 32'd1;
       case({button,counter_r[25:24]})
        0: led_r <= 3'b001;
        1: led_r <= 3'b010;
        2: led_r <= 3'b100;
        3: led_r <= 3'b000;
        4: led_r <= 3'b100;
        5: led_r <= 3'b010;
        6: led_r <= 3'b001;
        7: led_r <= 3'b000;
       default: led_r <= 3'b000;
       endcase;
end

assign LED1 = !led_r[0];
assign LED2 = !led_r[1];
assign LED3 = !led_r[2];

endmodule
```

The first couple of lines of the program are the module definition, a Verilog program is made up of a number of modules that have inputs and outputs.

```
module CQTVBlinkerVerilogDemo( input
clk50mhz, input button,
      output LED1, output LED2, output
LED3 );
```

The module name is CQTVBlinkerVerilogDemo, this in fact a top level module and the input and outputs are pins on the FPGA. The mapping of the pins is stored within a configuration file and can be viewed using the pin assignment editor in Quartus II. In this example we have an input for the 50 Mhz clock, an input for the push button on the board and three outputs that connect to the leds on the board.

We now need to specify the registers we are using

```
reg [31:0]counter_r;
reg [2:0]led_r;
```

counter_r is the name we have given to the register we are going to use as a counter, it is 32 bits in size, bit 31 through to bit 0, the next register led_r is 3 bits in length and is used to store the status of the leds.

Now we need to make it do something

```
always @(posedge clk50mhz)
```

This is called an "Event Control Statement", the statement inside the brackets is called the sensitivities and there can be more than one. What we are saying in the above line is that whenever we see the positive edge of clk50mhz we must do the following actions. The actions are surrounded by the 'begin' and 'end' keywords, they are a bit like the curly brackets in C.

First we need to increment the 32 bit counter

```
counter_r <= counter_r + 32'd1;
```

The above statement is fundamental to how this works, it is an non blocking equate. There are two types of equates in Verilog a blocking equate a = b and a non blocking equate a <= b . To give an example of the difference.

If 'a' has a value of 1 and 'b' has a value of 2 then after the following two statements have executed

```
a = b
c = a
```

'a' will have a value of 2 and 'c' will have a value of 2, this is because the first statement has to complete before the second. This is the same as a conventional programming language. Now

```
a <= b
c <= a
```

With the same starting values when these two lines have executed 'a' will have a value of 2 and 'c' will have a value of 1. This is because the two lines execute simultaneously. Another way of looking at this is that after the clock edge the values on the left equal the values that the variables on the right had before the clock edge. This is the most import statement in the entire article and is what makes FPGA programming so different from conventional programming.

The non blocking operators have a fundamental effect on what you can do, you cannot set the same variable to two different values. The example below should demonstrate this.

```
always @(posedge clk1 )  a <=
button_0;
always @(posedge clk2 )  a <=
button_1;
```

Here you are trying to set variable 'a' to the value of button_0 on the positive edge of clk1 and to the value of button_1 on the positive edge of clk2. This is illegal as the compiler has no way of knowing when the clock edges occur, they may occur at the same time in which case you are trying to set 'a' to two different values which is impossible.

Now going back to our original statement

```
counter_r <= counter_r + 32'd1;
```

32'd1 means a 32 bit constant with a decimal value of 1, other formats available are 8'hff an 8 bit constant of hex FF, 2'b10 is a 2 bit constant of 10 in binary. It is also possible to specify unknown values, for example 2'bx1 or high impedance values 2'bz1. The unknown value maybe used in a logic statement as a don't care. The original statement increments the 32 bit register counter_r by 1, when it reaches all 1s it will roll over to zero.

The next line is the start of a conditional statement which selects one particular outcome depending on what the statement evaluates to.

```
case({button,counter_r[25:24]})
```

Here we are concatenating two items with the use of {} The first item is the 1 bit wide input line from the button on the PCB, this forms the (most significant bit) MSB of the value, the lower 2 bits are taken from bits 25 and 24 of the 32 bit counter. When this statement is evaluated, if for example it's value is 3 then the case item on line 3: led_r <= 3'b000; is executed. Here the value of the register led_r is set to zero using a non blocking statement. If the evaluation in the case does not match any of the values listed then the default statement is executed. This is the case for a single statement, if you want to do multiple statements in a case item then you need to use the begin end structure, for example

```
3: begin
     a <= b;
     c <= a;
end
4:
```

The statement endcase; indicates the end of the case statement, the C equivalent to this structure would be the switch statement.

The next 'end' terminates the entire statement, see below

```
always @(posedge clk50mhz)
begin
     ...
     ...
end
```

Finally we come to the assignment statements

```
assign LED1 = !led_r[0];
assign LED2 = !led_r[1];
assign LED3 = !led_r[2];
```

here LED1 is set to the inverse of bit 0 of the led_r register, LED2 to bit one etc. This is effectively permanently wiring the LED1 line to the register bit 0 via an inverter. Only the blocking = can be used in an assignment statement.

Another useful operator to use is the '?' operator, for example

```
assign LED1 = led_r[0] ? 1'b0 : 1'b1;
```

In this example LED1 is set to the value 0 if led_r[0] is logic 1 and to 1 if led_r[0] is logic 0.

This statement can also be nested, for example

```
assign LED1 = led_r[0] ? 1'b0 :
led_r[1] ? 1'b0 : 1'b1;
```

The module is finally delineated by the use of the 'endmodule' statement.

The example given above is a top level module (in that it talks directly to the FPGA's I/O pins). However you can define other modules then include them inside a module. For example

```
//
// First module, a simple 8 bit
counter
//
module counter( input clk, output reg
[7:0]count );

always @(posedge clk) count <= count +
8'd1;

endmodule

//
// Main module that instantiates the
first module
//
module main( input clkin, output [1:0]
out );

wire [7:0]outval_w; // 8 bit wire bus

counter count( .clk(clkin),
.count(outval_w) );

assign out = outval_w[7:6];// 2 MSBs
of the wire bus only are used

endmodule
```

There are some subtleties in the example about when you have to use a 'reg' and when you can use a 'wire' a 'wire' is a connection with no memory, so if some result needs to be stored you must use a 'reg'. It is also possible to specify a module output as a 'reg' but you can't do that for an input.

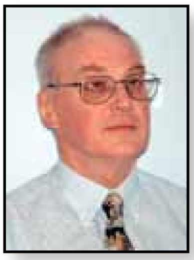
There are many other features of the language like functions and macro expansions, logic expressions to name a few that I have not covered but a quick search of the internet will find plenty of tutorials on how to use these. The Quartus-II programming manual is also a good place to look as it has examples of good coding styles, what features of the language are supported and how to force the compiler to generate things like flip-flops and RAM structures.

Probably the most confusing thing for the beginner is that Verilog is much more than a synthesis language for FPGAs it is also a simulation language, the simulation parts of the language can be used to generate test benches to test a design but they cannot be used to generate FPGA code. A good design will consist of two parts, the FPGA code and it's test bench.

I have kept this article fairly simple because I don't want to frighten people off. The example shown can be downloaded from the BATC website as can an identical design written in VHDL. I encourage you all to have a go, if you get stuck you can contact me.

References

- As a programming reference I use "Thomas and Moorby's, The Verilog Hardware Description Language, 5th edition, ISBN 1-4020-7089-6"



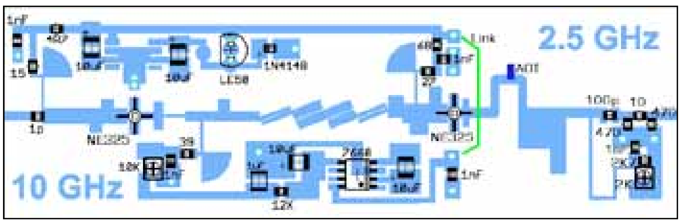
10 GHz Synthesised ATV FM TX

Peter Blakeborough - G3PYB

The use of modified satellite LNBs, particularly the new generation PLL controlled units means that receiving 10GHz ATV is a relatively easy task. However providing a 10 GHz ATV transmitter running a reasonable level of power is more difficult.

This article describes a x4 multiplier to work with the cost effective Comtech 13cm Tx to provide an accurate synthesized generator with a filtered driver amplifier delivering 25 mW across the 10GHz band.

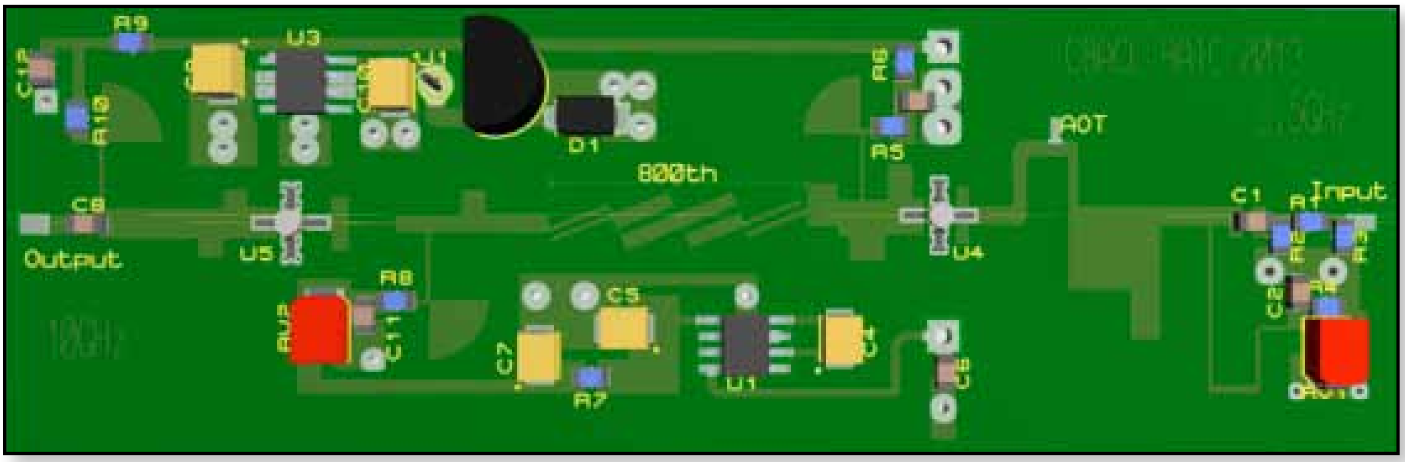
The aim was to make the Tx unit as small as possible to allow the complete Tx to be mounted on a mast or building. The Comtech module is already quite small and the multiplier module is a similar length.



The multiplier is designed by John G8ACE and the internal filter allows operation from 10.00 to 10.45GHz. The signal flow on the above printed circuit layout is from right to left and the rf path runs through the centre of the pcb tracks drawing above.

12v enters the circuit connected to the via top centre and connects to the 1N4148 polarity protection diode. The via is connected on the reverse side of the pcb to a feedthrough capacitor in the RF output end of the box housing for dc volts connection. A 5v regulator LE50 (78L05) decoupled with 10uF capacitors on both input and output provides the supply for both gaasfets and the negative bias generator 7660 for the second Gaasfet gate. The 5v supply to the 7660 is linked on the underside shown by the link in green to avoid crossing the RF circuitry path.

The 13cm incoming signal (maximum recommended level to avoid damaging the gaasfet - 10mW) is first connected to a pi attenuator of 2db before joining the 13cm stripline tuned circuit feeding the gaasfet gate. The tuned circuit has stub matching components and will function without further adjustment but can be 'tweaked' for best operation either at the lower or upper end of 3 cms by adjusting the snowflake tab marked 'AOT'. The tab may be positioned on the inside or outside of the track including the corners. Multiplication is achieved in this first gaasfet which is rf drive biased. Bias is adjusted with the 2K ohm pot for optimum multiplication efficiency. Typical dc voltage at the bias adjustment pot with drive will be in the range -0.7 to -1.0 volts but may be slightly outside those values depending on the gaasfet and drive. With no drive the voltage at the first gaasfet drain will be low, no more than +0.5v but will be dependent on the gaasfet parameters. DC is connected to the gaasfet drain via a quarter wave choke and de-coupled with a quarter wave quadrant stub.



The fourth harmonic output is filtered via the stripline filter similar to those found in satellite LNB. Matching sections before and after the filter couple the signal to the second gaasfet, the amplifier. Negative bias is applied to the gate of the second gaasfet adjusted by the 10K ohm pot produced by the 7660 generator. Dependent on the gaasfet the -ve bias will typically be in the range -0.1 to -0.4 volts, adjust for best output. DC connections are again by quarter wave choke with decoupling to this gaasfet.

Output is matched via the transmission line with its stubs to the 50 ohm output track for the sma connection through the box. Snowflake tabs may optionally be added to the 3cm transmission lines to pick up small increases of power at the desired operating frequency. Source connections of both gaasfets are connected through the pcb substrate with 2mm wide copper straps. These are important not only for effective rf grounding but also to conduct heat away from the gaasfet to the copper ground plane. The second gaasfet operating here at maximum specified dissipation for the device. Drain voltage will normally be in the range +4 to +4.3v

The box housing dimensions allow it to propagate frequencies around 10 GHz and resonances may occur such that oscillations take place. Microwave absorber is applied to the box lid to suppress these unwanted resonances and provide for predictable operation. It is essential the top lid with absorber is not transposed after internal inspection with the bottom lid covering the void below the pcb ground plane.

The shortest rigid coax sma cable possible should be used to connect to the antenna to minimise losses. The use of a waveguide 17 transition to the antenna horn is preferable to WG16 as its cut-off frequency will provide as a high pass filter to further suppress lower multiplication harmonics including the third.

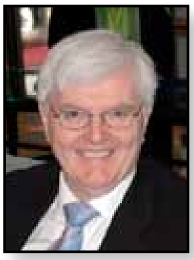
Note that the standard PIC controller in the Comtech Tx cannot be used. Dave G0GMK (SK) produced an alternative PIC for use in the Comtech 13cm Tx to cover the part of the band required to multiply into 10GHz. The PIC has two modes:

a. all the typical UK TX and RX channels which can be selected by a simple rotary switch.

b. a wider range of channels using binary switch selection.

This PIC and the NE325 Gaasfets will be made available from the BATC shop. Kevin, G3AAH, has re-laid out the PCB to enable it to be manufactured easily and we are currently investigating stocking this and / or completed units in the BATC shop.

▷ *Items from The Museum of the Broadcast Television Camera at Finningley*



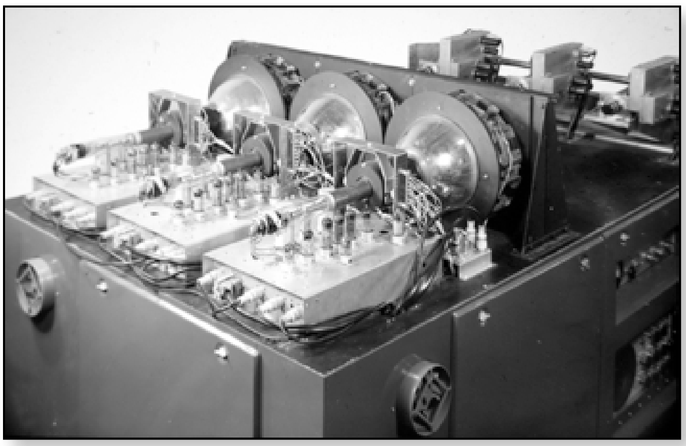
Early Colour Cameras and their problems- Part 1.

Brian Summers – G8GQS

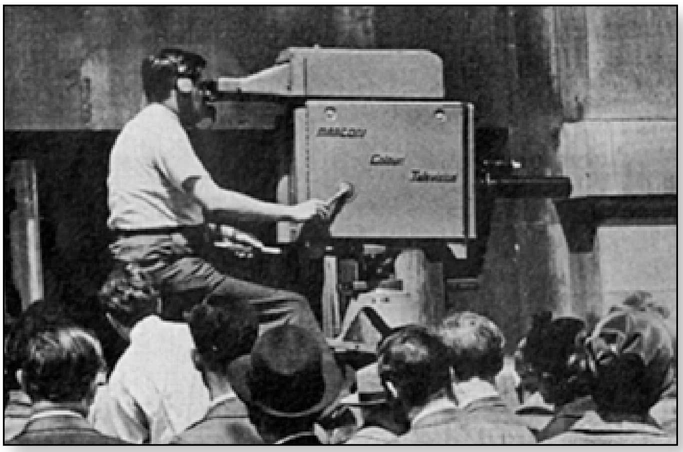
This short article is developed from the lecture I gave at CAT13 about the early difficulties making colour cameras. As with most TV firsts, John Logie Baird was there with a colour demo in 1928, mechanical television, true but it was colour. It was not long after the birth of electronic television before the first attempts at colour happened. These harked back to the mechanical systems as they used a rotating coloured filter in front of the camera and TV monitor. CBS (Columbian Broadcasting system) was first off the blocks with their 1940 camera - using a rotating filter drum at the camera and a rotating disc at the receiver. The camera operated at 202½lines with 3 times interlace at 72 frames per sec.

▷ *The CBS colour camera*

After WW2 was over thoughts returned to TV and colour. In the UK EMI and Pye both had a go at colour cameras with rotating filters. These cameras were known as sequential colour, i.e. you got a green picture, then red followed by blue, hence the need for the high frame rate to reduce colour flicker. This was the Achilles heel of the sequential colour cameras, they did not offer a picture that was compatible with black and white TV sets. The advantage of this type of camera was it was not much more complex than a monochrome camera and it was relatively inexpensive, the problem was how could this type of camera be made compatible. The answer was a kind on optical standards converter. It had 3 CRTs one for each colour with 3 monochrome cameras looking at them. This fixed the frame rate and converted the signal from sequential to simultaneous. It was not without its problems, this was like a 3 tube camera, registration and all. What was a simple system was now complex. Marconi watched all this with interest and they had a go at what must be the first example of a camera with a colour striped tube. This was a 2 tube camera with a luminance tube and a striped tube for the colour. The colour tube was of lower resolution than the luminance tube easing the difficulties of registration. [1] It was demonstrated at Marconi House, The Strand, London on the 11 May 1954.



▷ *The Pye optical sequential to simultaneous converter*



▷ *The Marconi 2 tube colour camera*

Back in the USA, RCA had taken the view that using 3 tubes was the best way. They chose the 3 inch Image Orthicon tube, this had advantages and disadvantages. It was a BIG camera, expensive, hard to set up and operate, but on the other hand once the RGB output was coded (NTSC) it was compatible with monochrome sets, and the signals could pass though most studio systems. The pictures were considered to be the best available in the middle 1950s.

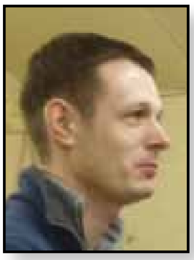
...to be continued

Notes:

1. A technical description was published in the Journal of the Television Society, 1954 page 241.

The original lecture can be viewed at the BATC Streamer "Film Archive" CAT13/04
More information early colour cameras can be found at the Museum of the Broadcast TV Camera

Stand Alone DigiLite with an MK808



Rob Swinbank – M0DTS

Recent developments with the software side of DATV in the UK have now made it possible to generate a working DVB-S Transport Stream from Linux as well as windows using lower spec processors, this lets us experiment with less powerful Linux computers to replace the need to use the shack pc when sending DATV with the DigiLite and before long the DATV Express too.

The Raspberry Pi was the first candidate and then the MK808 Android TV dongle came to light which is faster and Linux can now be installed on it. The MK808 has a dual core 1.6GHz Processor so lots of power for generating the DVB-S stream for the DigiLite.

Thanks to Charles G4GUO and Brian G4EWJ we now have a release of software to install on the MK808 in Linux, these grab the MPEG2 video from a PVR-USB2 device and convert it to the required format to send to the DigiLite across the FT2232 USB interface. Most of the software tools used are from the DATV Express project, the transport stream to DVB-S program is from Brian which reduces CPU load significantly as it's written in low level assembly code.

Initial tests were done by manually adjusting config files on the MK808 but we all like a nice LCD screen on a project box don't we?... This lead into work on a replacement PIC controller which allows adjustment of the Digital settings as well as the Ultram VCO Frequency, this new controller connects in-between the PIC on the DigiLite and the FTT2232 USB module allowing control of both.

The controller allows the user to set these parameters:

- Channel Name(Callsign)
- Symbol Rate (most DigiLite Standard values)
- Programme Name(EPG)
- Programme Text (EPG)
- FEC
- Video PID
- Audio PID
- Frequency (Only with Ultram 23cm VCO)
- Source – SD card, Live video or one of the Test Modes on the DigiLite.
- PVR Video Source (Composite/S-Video)

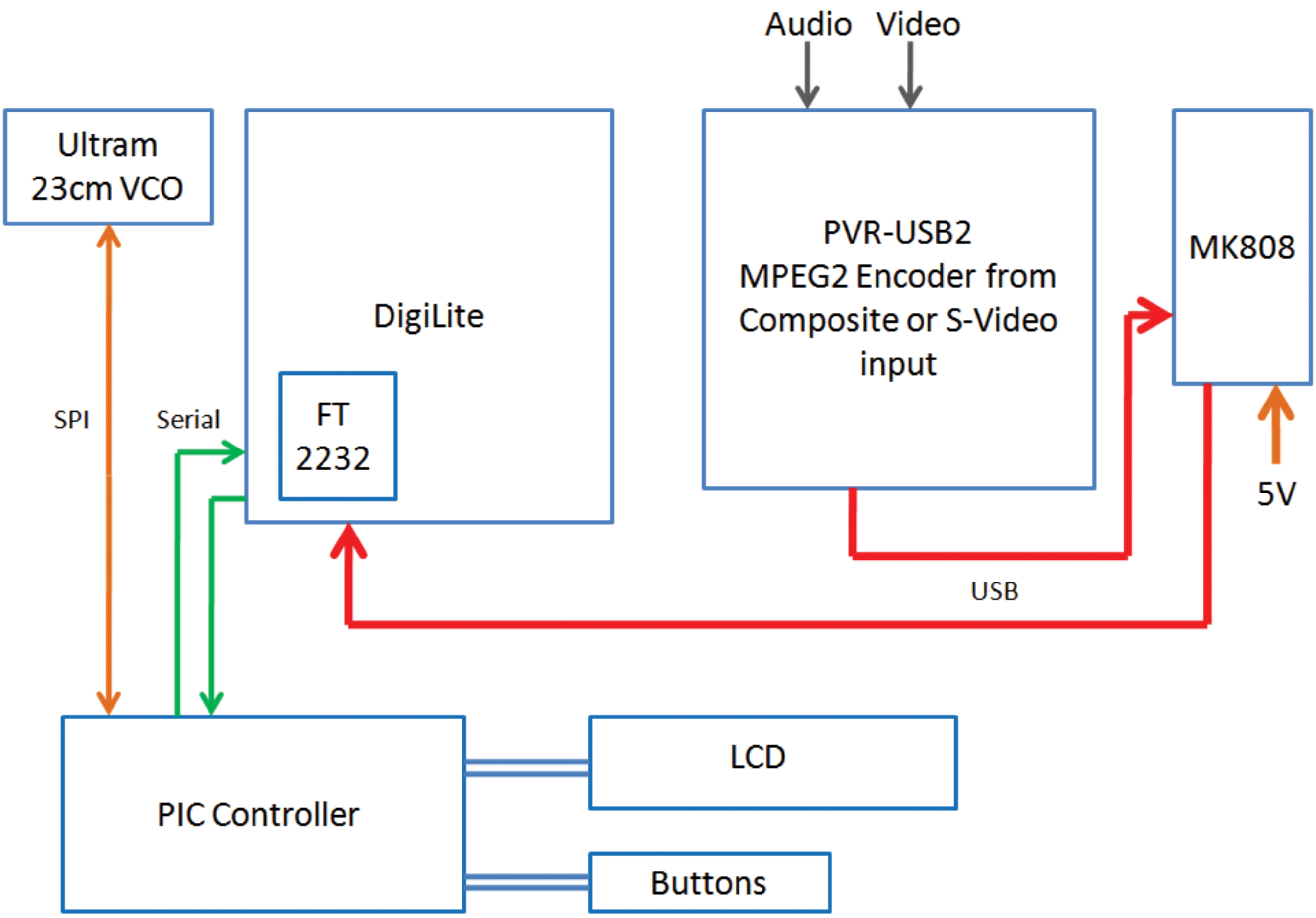
Hardware required:

- An MK808 Mini PC, I used one marked 'ipegtop' off ebay but there are hundreds of similar items, the MK808B and MK802 can also be used. They are Dual Core 1.6GHz RK3066 CPU with MicroSD slot and OTG port.
- One of the following USB Capture devices:
  1. Hauppauge WinTV PVR-USB2 Model 24xxx (29xxx model does not work yet)
  2. WinTV HVR-1950
  3. WinTV HVR-1900
  4. WinTV-PVR-USB2 Model 99016 (US NTSC version)
- A windows PC with SD Card slot (Micro SD or standard SD slot with adaptor), a Linux option is available but not tested yet.
- A Micro SD card 2GB or more – make sure the SD Card reader is capable as many do not accept more than 2GB cards.
- Controller Parts:
  1. PIC16F876A (20MHz Version)
  2. A few R,C components, 20MHz crystal
  3. LCD display - 16x2 minimum size
  4. Some veroboard, there is an Eagle schematic but no board/layout is available at the moment.

Software:

- Win32 Disk imager – This is used to write the Linux operating system files to the SD Card.
- RK_Android_Tool_v1.35 - This is used to write the new Linux kernel over the Android one on the MK808.

For a how-to guide on installing the SD card files and the Linux Kernel onto the MK808 then please visit the link at the end of the article. There are also links to all software and other files required.



System Overview

Here is a block diagram of where the MK808 and Controller fit into the DigiLite system, most of the connections are very much the same as using the DigiLite with a regular PC, just the controller connections which are different.

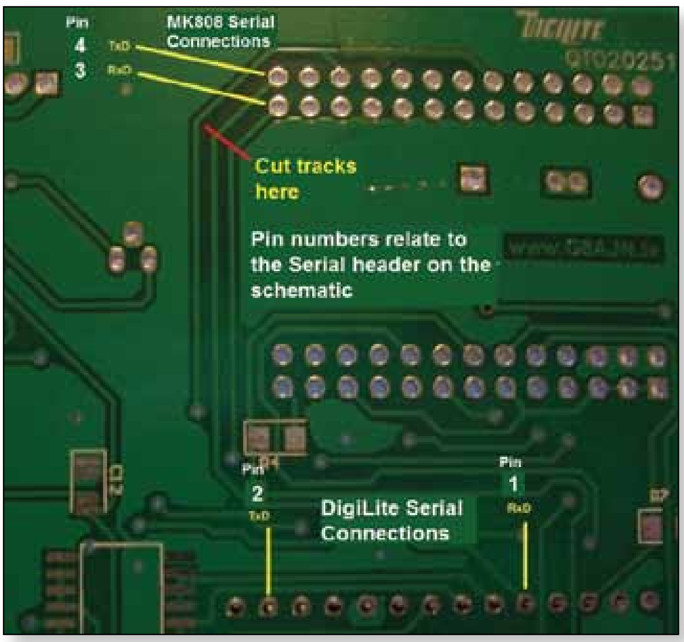
DigiLite Connections

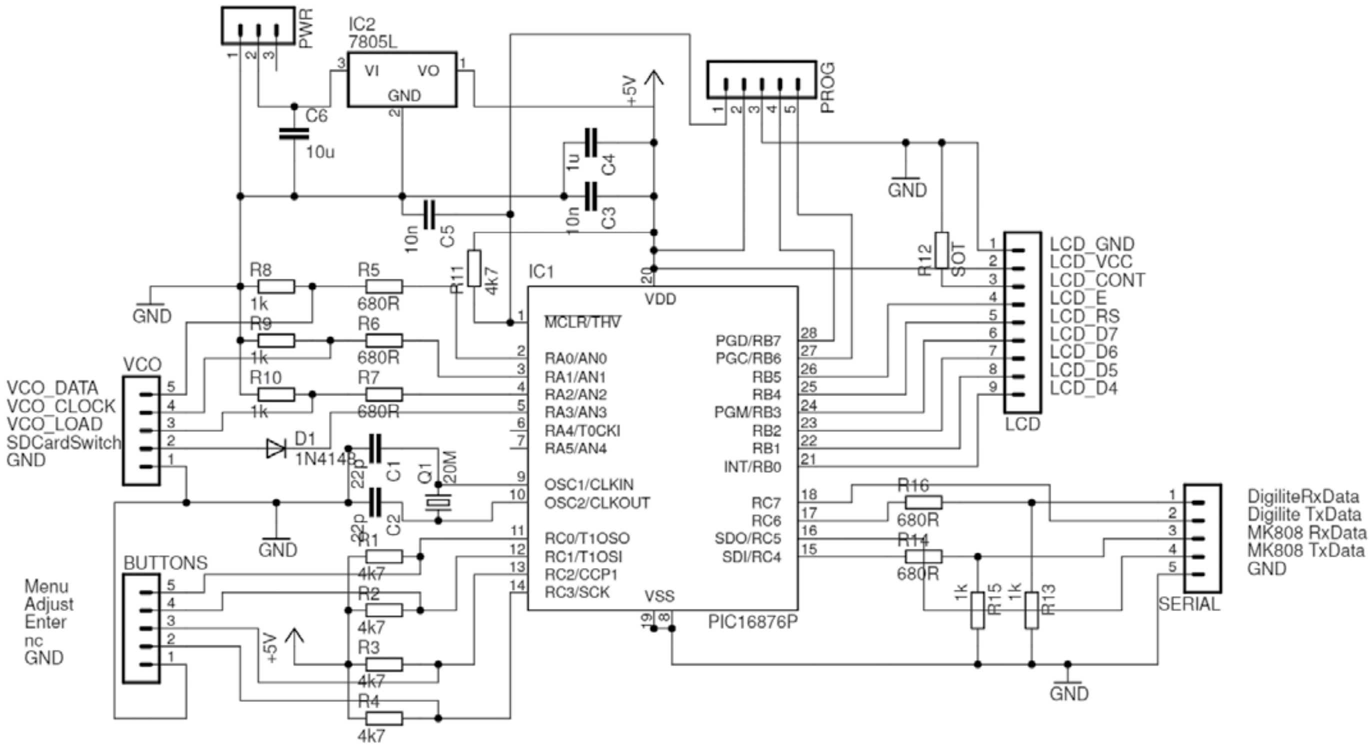
The controller communicates with the DigiLite through the serial port on the dsPIC and through the FT2232 module (2nd port) to the MK808.

A simple mod is required on the DigiLite board where the two serial data tracks from the FT2232 and the PIC are cut to allow connection of the controller; you can see this in the image below:

The tracks need to be cut somewhere near the red line, be careful not to damage the other track nearby.

The four pins from the Serial header on the controller circuit need to connect to the DigiLite board as shown above.





Controller Schematic

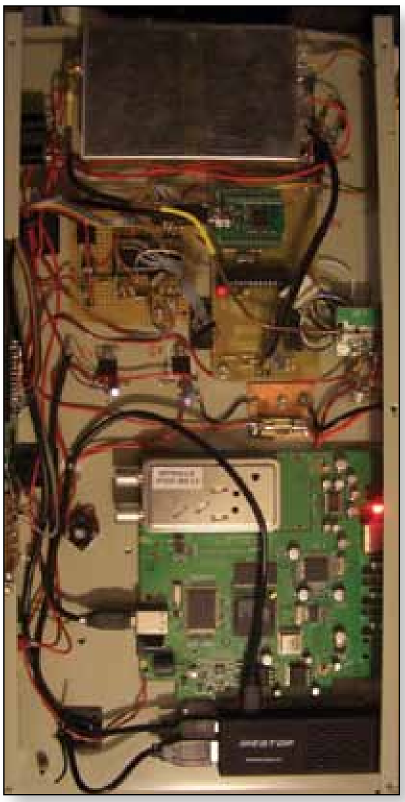
I'm sure someone will come up with a neat pcb but there's not much to it, mostly wiring to other boards. The hex file for the Controller pic is available on the website.

If you are testing with a receiver, please let us know about your results on the batc forum.

GB3KM will be using this setup on its new 3.4GHz output, check it out the improved stream on **www.batc.tv** soon!

In Use

The Stand Alone DigiLite works well in practise from my use through GB3KM and testing on most of my receivers. This is the initial release of software/configuration and there are some issues with the transport stream timing, currently it's not known if there will be a fix. Fortunately most receivers are not too fussy and the video works well but some are not so good notably the older Porty and Comag SL65 where some frame jumps are noticed and some sound issues. Tests into GB3KM using its Comag SL45 receiver show very good results and also works very well with my Technomate TM-1500 and Comag SL100HD.



Website

Here you can find all of the related documents about the project.

http://www.m0dts.co.uk
Look on the DATV pages

There is also now the option to run the Stand Alone DigiLite without the controller if you do not need to change the settings very often i.e. for use on 70cm with fixed SR/FEC.

Any questions? Email: ***rob@m0dts.co.uk*** *or visit the batc forum and ask questions there.*

Classic circuits

In "classic circuits" we are re-publishing circuits and projects which have previously appeared in CQTV but people are still using today. If you have a favourite past article or circuit which you keep referring to, let us know and we will reprint it.

Albert, G4DHO, says "I think a circuit well worth revisiting is the black level clamp by John Lawrence in CQ -TV 198 circuit notebook 72. I have built several and they work very well indeed and do what they say on the packet. They are a really useful thing to have around the shack."

By John Lawrence GW3JGA

Black (Blanking) Level Clamps

This subject has arisen because of the problems some local ATV Amateurs have experienced when receiving signals from 24 cms FM ATV transmitters that use an oscillator controlled by a phase-locked loop circuit.

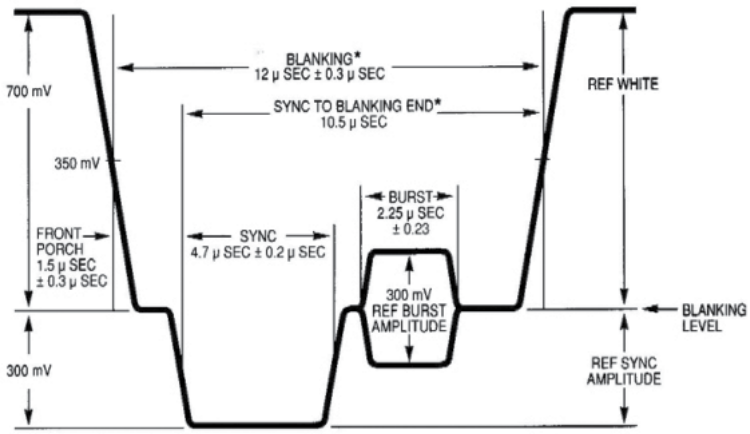


Figure 1, Line sync and blanking waveform

It was particularly noticeable with some early transmitter modules [1], where their restricted low frequency response resulted in variations in the black level with picture content, causing some monitors and receivers to display poor frame lock and picture roll.

By examining the received waveform on a 'scope, locked to the field rate, it can be seen that a period of peak white video causes the black level and the sync pulses to be depressed. But, during the field blanking where no video is present, the black level rises. The field sync separator circuit in some monitors cannot cope with this change of level and the result is poor frame lock. I have two different monitors, a Philips HCS 31, which is unaffected and a Matsui 1436 TV that rolls uncontrollably.

The answer is, I suppose, to correct the problem at the transmitter. You will have seen suitable modifications and read various discussions about this in CQ-TV. However, the symptoms can be eliminated at the receiver by 'clamping' the video signal before it reaches the monitor. Some satellite receivers have a built in 'clamp' for this purpose.

Method of Operation

The principle is to repetitively stabilise one point of the video waveform to a reference voltage, e.g. 0 volts. To do this, we need to arrange for an electronic switch, to switch on for a short period at a precise point on the video waveform and connect the signal to 0 volts. The point chosen is at 'blanking level' on the line blanking waveform (where the colour burst sits). The 'text book' line sync and blanking waveform is shown in Figure 1.

Experimental 'Clamp' Circuit

The circuit is shown in Figure 2. The input signal is fed through C5 to the output amplifier IC2. The input video signal is also fed to the sync separator IC1, LM 1881. This generates several output pulse signals one of which, from pin 5, is correctly timed to coincide with the point at which we want to clamp the video signal.

This pulse is inverted by TR1 and fed to TR2. TR2 operates as a switch which clamps the signal line to 0 volts at the correct point on the video waveform. An inductor is included in the circuit to avoid shorting out the colour burst. The video waveform and associated 'clamp' pulse waveform is shown in Figure 3.

How it works

Consider then, at the end of one line the switch operates and clamps the video blanking level to 0 volts at that instant. Because of poor low frequency response, hum or other disturbance, the blanking level may no longer be at 0 volts by the end of the next line. When the clamp operates again any error voltage, which may be present, drives a current back through C5 until the resultant stored

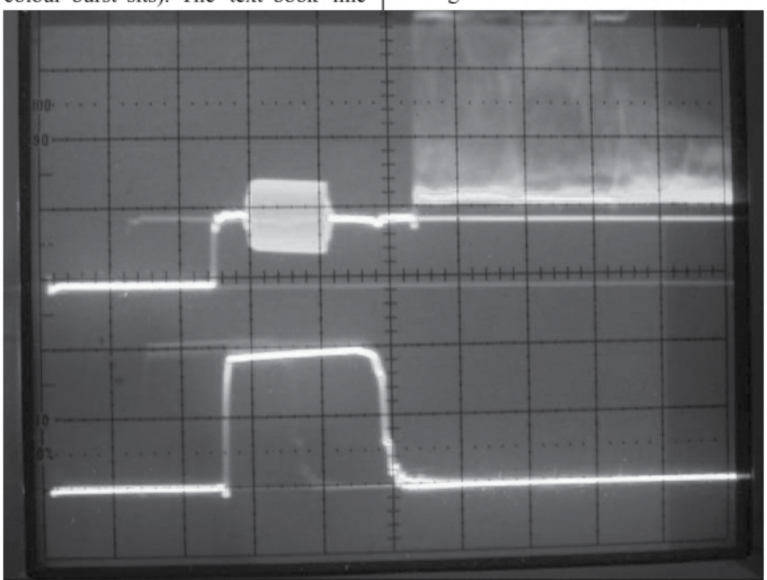


Figure 3, Video waveform and 'clamp' pulse

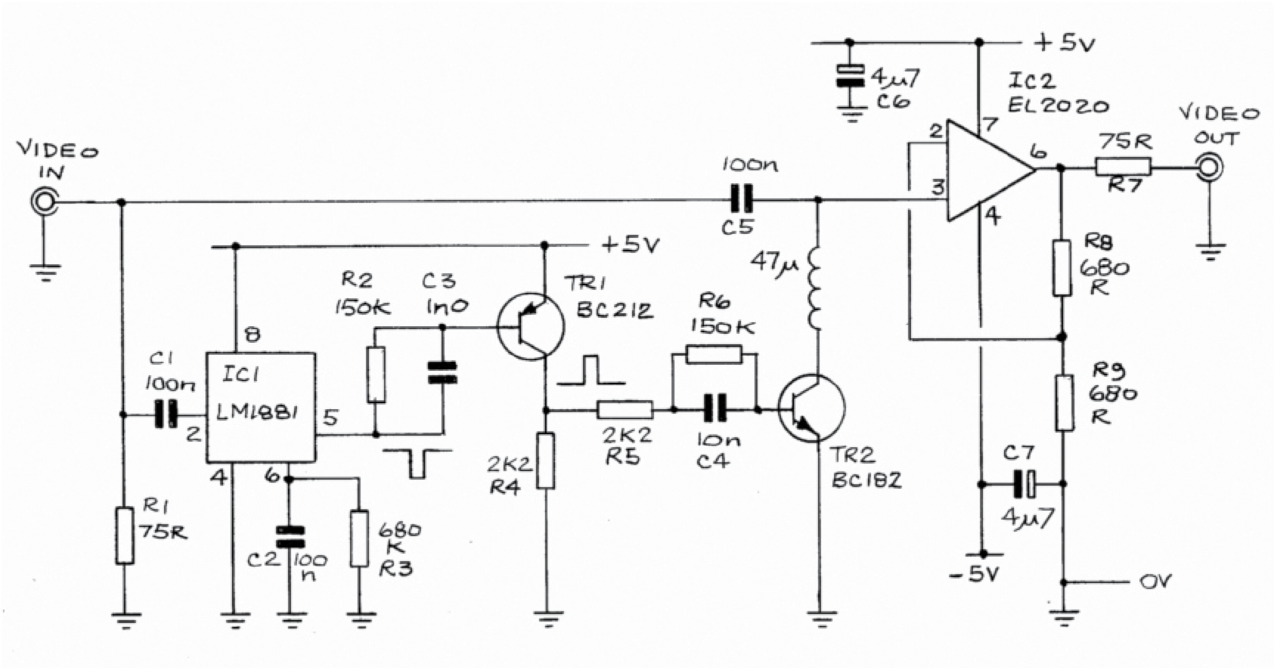


Figure2, Experimental black level 'clamp' circuit

voltage cancels the error. Thus, any error occurring during a line period is automatically corrected at the end of that line and provides a clean video output signal with the blanking (black) level clamped to 0 volts.

The upper trace, in Figure 4, shows an input video signal suffering from poor low frequency response and the lower trace shows the same signal after passing through the 'clamp' circuit.

The question we are asking ourselves is, should an ATV repeater contain a 'clamp' to clean up incoming signals or should the incoming signals be repeated warts and all?

References

[1] G1MFG's ATV Modules Reviewed Brian Kelly GW6BWX - CQ-TV 192, pages 9 -11

[2[A Processing AmplifierBryan Dandy G4YPB - CQ-TV 136, pages 74 - 76

[3] Processing & Distribution Amplifier John Goode - Best of CQ-TV, page 79

[4] D.C. Clamp Circuits S. W. Amos & D. C. Birkinshaw - Television Engineering, Vol. 4, Pages 75 - 80

[5] Television Measurements Margaret Craig, Engineering - Manager, Tektronix Inc.

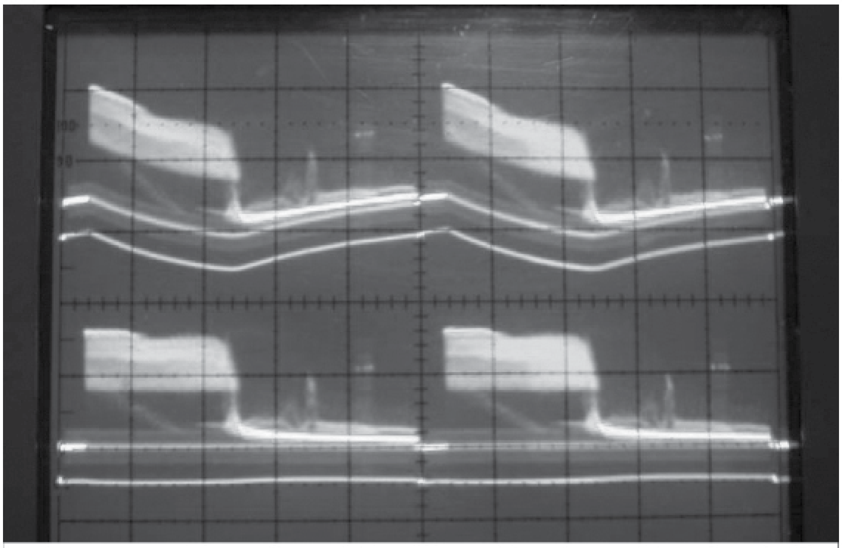


Figure 4, Video input and 'clamped' output signals

A Tutorial on Displays

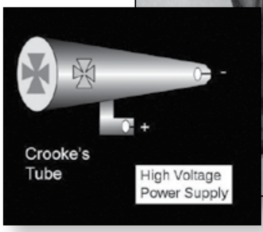
Mike Cox

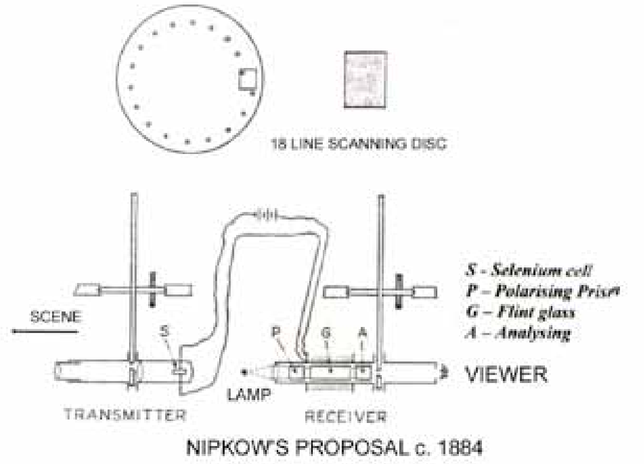
From the very beginning, experiments in television were useless without a display. I can imagine the thought going through John Logie Baird's head when he had punched the holes in his first scanning disc – "Oh no, I've got to do it all again for the display!"

Most of us who started in ATV after the war will have wired up display units with 6" green VCR97 cathode ray tubes (available relatively cheaply on the surplus market.)

But where did it begin?

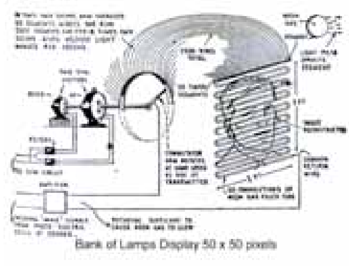
Late in the 19th century, Sir William Crooke came up with the forerunner to the Cathode Ray Tube. This vacuum device, when fed with a very high voltage (100KV+), produced a glow on the glass end wall, and an object just behind cast a shadow on the display. Not a very practical device as yet, but it showed that magnetic fields could deflect the beam. However many developers were working on the idea of scanning, and Nipkow in 1884 showed a diagram of a scanning disc system .





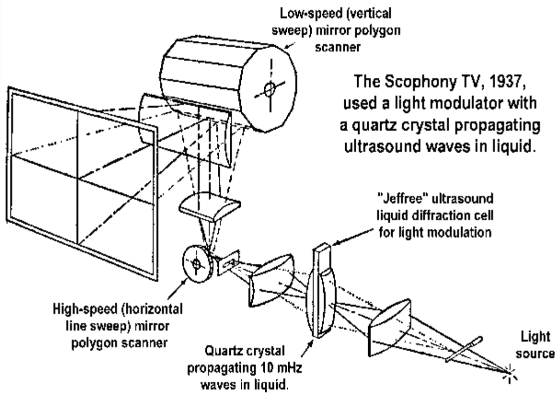
In the 1920s more practical cathode ray tubes were developed, and the growing television community were producing tubes with high vacuum allowing them to be deflected rapidly (early tubes had residual gas which limited deflection speed). Although Baird's efforts were mechanical at this time, in the USA and at EMI in Hayes, both imaging and display devices were based on vacuum technology.

Before we move on further, mention should be made of Baird's Lamp Panel display, which might be thought of a precursor of an OLED display today.

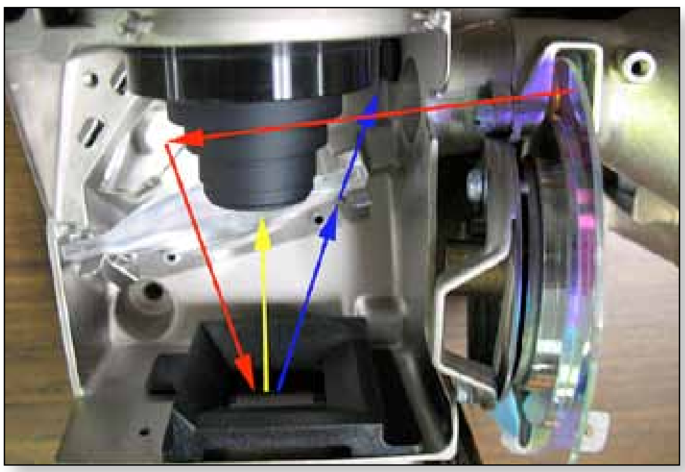


This panel was used to show the 1931 Derby at a London cinema. A similar technology was also developed in the USA by Bell Labs.

A successful mechanical imaging system was that developed by Scophony. This used mirror drum scanning and a light valve modulator. For large screen use, light was provided by an arc lamp.



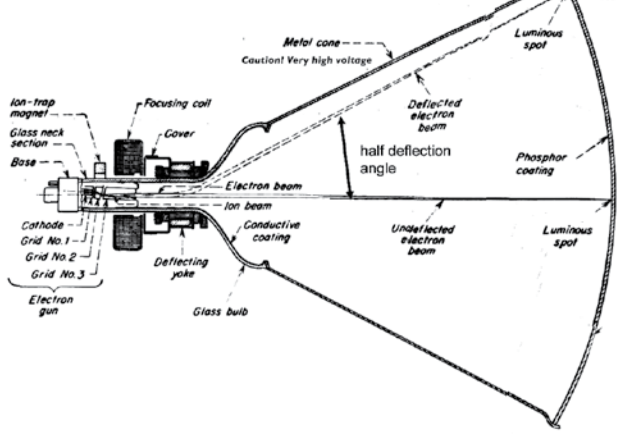
The modern equivalent of this technique is the moving mirror device pioneered by Texas Instruments as Digital Light Processing (DLP), and used in millions of projectors. Digital Cinema would not be where it is today without the DLP. Each pixel in the image has a mirror element. The element is pivoted so that it can move about 12 degrees either side of the rest position.



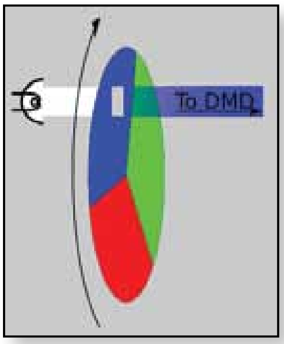
So light is reflected to one direction – the screen, or to another direction – the sink. The mirror is part of a memory chip with the number of pixels corresponding to the resolution of the display; 1920 x 1080 for an HD projector for example.

A further refinement, to allow use of higher EHT voltages, was an aluminium layer behind the phosphor, which will reflect light from the phosphor back to the viewer. It also helps prevent ion burn, should there be any left. Flyback EHT from the Line Output Transformer was an economical solution, which became universal.

▷ *Early Monochrome CRT c.1950*



The light source can be any – quartz lamps, arc lamps, LEDs, or lasers depending on the size of screen and brightness needed. Small DLP projectors usually have a single DLP, with a rotating colour filter wheel to change the primary colour at least three times during each frame.



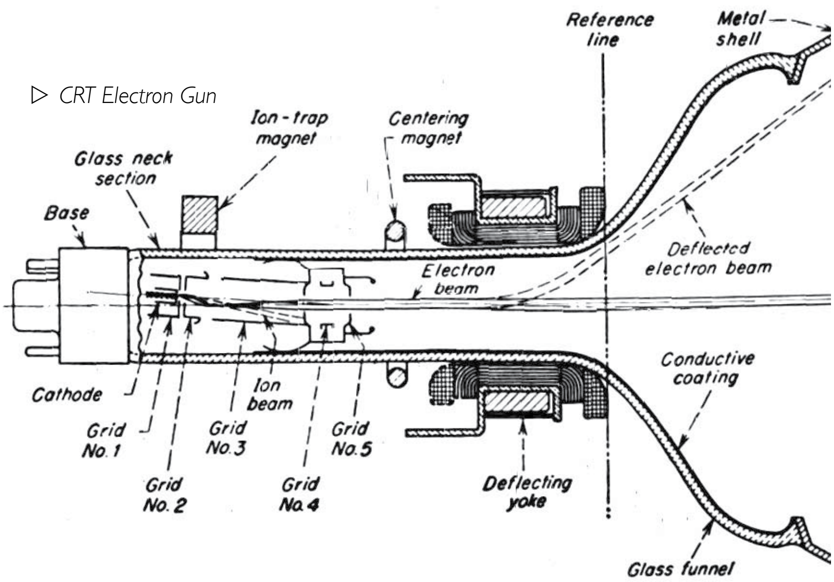
The filter wheel rotation is synchronised to the DLP drive. Recently, hand held LED driven DLP projectors have become available suitable for use with mobile phones. Their brightness is of course limited to a few hundred ANSI Lumens, compared with a modest fixed projector that will produce 2 - 3000 ANSI Lumens.

Amateurs tended to build monitors from electrostatically deflected ex radar tubes such as the 6" VCR97, but around mid 1950s, domestic TVs were becoming available second-hand as people traded up to larger screens. I remember buying a 10" Cossor for £5 in 1956, which became my parent's TV for many years, until colour started in East Anglia. Some of these second hand sets were lethal, with EHT direct from the mains transformer.

Development of CRT technology continued during World War 2, although the driver was radar displays. After WW2, the UK TV service started again in 1946 for the Victory Parade, and TV sets that had been put away in 1939 were got out, and some even worked!

Peacetime work on CRTs continued apace, with refinements such as ion traps, to obviate the burn that appeared on the faceplate after long use. The electron gun is offset so the heavy ions go to the tube wall, and the light electrons are easily brought back down the tube axis.

▷ *CRT Electron Gun*



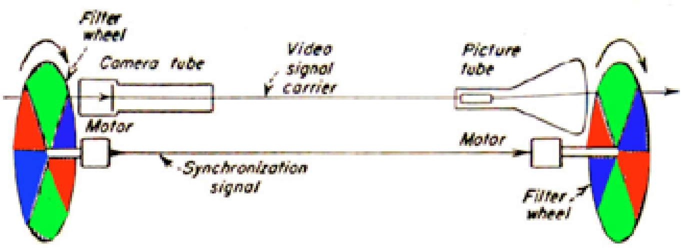
Three BATC members were given space in Mike Barlow's garage on condition that they supplied him with pictures to transmit. One damp day, Brian Partridge and I found our direct EHT monitors had failed.The overwinds on the mains transformer had burned out!

Work was done on small CRTs (60 – 70 mm diameter) designed to run at 25 – 30 KV, using a Schmidt optical system to project onto a screen. However this was short-lived as larger CRTs became available. Early picture CRTs had deflection angles of around 50 degrees, and consequently were quite long.

Improvements in scanning circuits and tubes increased this angle to around 70 degrees, and ultimately to around 114 degrees.

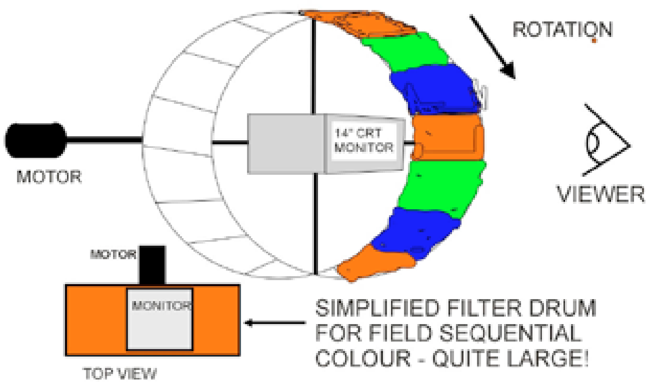
What about colour, you ask?

As early as 1955, various BATC members were experimenting with it. Grant Dixon built a field sequential system, using a tri-colour filter wheel rotating in front of a monochrome CRT.

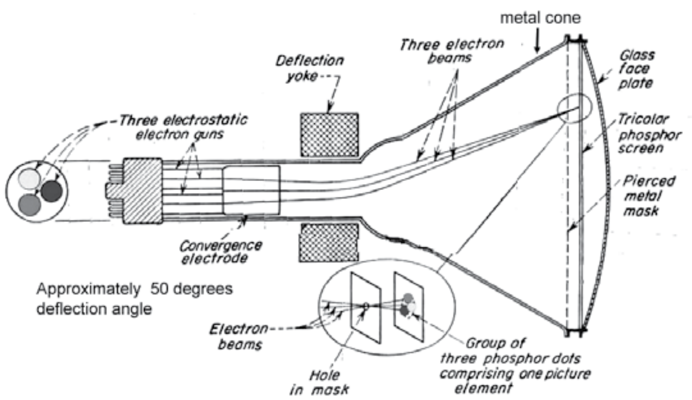


▷ *Field sequential colour television system using filter wheels at the transmitter and receiver*

There are apocryphal stories of a member who built a colour filter drum around a 14" CRT that ran amok and chased him round the room.

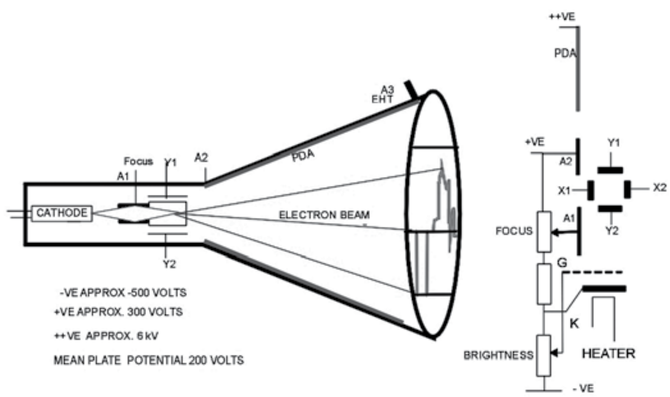


Another member, John Ware, was an architect, who built factories for Mullard.They gave him an experimental 21" round shadow mask tube, which he built into a magnificent receiver to receive the BBC's experimental 405-line NTSC transmissions after hours from Alexandra Palace. This tube had myriad convergence adjustments, including magnets around the edge of the tube. Most recent colour tubes had no convergence adjustments at all, the coils being fixed to the tube neck on manufacture.



In the beginning of colour transmission, NTSC or PAL encoded systems were all there were. Later computer colour monitors had RGB and sync inputs, latterly with a VGA or DVI connector. While we are on the subjects of CRTs, it is as well to remember that to get a bright picture, the electron beam has to be dense, and hence produces a large spot on the screen. Thus the resolution is brightness dependent.

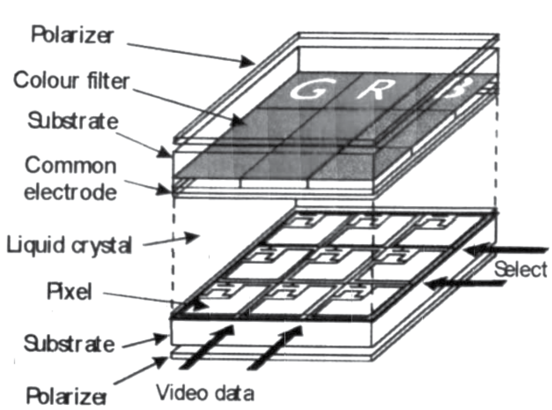
Also, as there are still CRT Waveform Monitors/ Oscilloscopes about, there are some differences between picture and oscilloscope tubes. For an oscilloscope, the important factor is deflection sensitivity. This is dependent on the EHT voltage. oscilloscope tubes are electrostatically deflected, and there is a trick that can be used. If the deflection plates are towards the cathode end of the electron gun, lower deflection voltages are needed (1 –2 volts per cm deflection), because the accelerating voltage at that part of the tube is relatively low – a few hundred volts. Beyond the plates is the Post Deflection Accelerator (PDA) section, fed with a few kilovolts. This produces a fine spot with adequate brightness.



▷ *Waveform Monitor/Oscilloscope Tube*

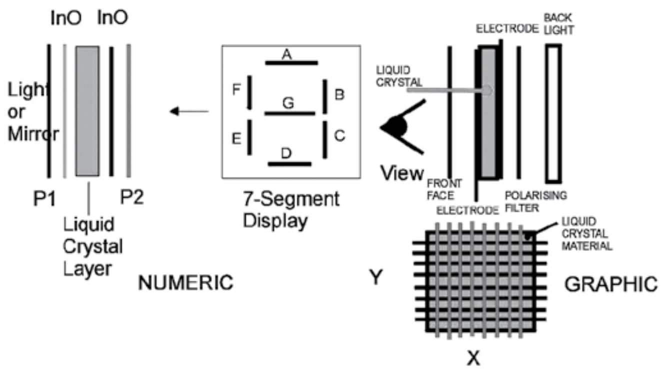
PDAs were introduced in the late 1950s and enabled oscilloscopes with high bandwidth to be produced relatively cheaply, as they did not require plate-driving amplifiers to swing such a high voltage. Thus bandwidth was extended very considerably.

While the CRT was in universal use as an imaging device, a new technology came into view. Certain liquid compounds have the property of changing the polarisation of light passing through when a voltage is applied across the cell.



If light is polarised before it passes through, and then passes through a second polarising filter on the way out, the voltage applied can modulate the light passing through. We have seen this type of modulator before, with the Scophony mirror drum projector.

This technology was originally used for calculators and similar numeric displays as the electrodes in the cells could be formed into sections such as a 7-segment numeric display. These had the advantage of very low power, as they could work from the ambient light falling on them. This is the basis of the Liquid Crystal Display. These displays show either ON or OFF segments depending on the voltage between the electrodes. These electrodes use Indium-Tin Oxide as this is transparent. There are other organic compounds being used, as they do not depend on rare minerals. The diagram shows a 7-segment numeric display, driven by a driver IC; and a simplified graphic



display with X and Y electrodes. The latter is driven by scanning counters for X and Y. The LCD in simple displays relies on ambient light, but for use in bright locations will have some form of backlight. Originally these were cold cathode fluorescent tubes, but are nearly all LED (see below)

Around the same time, it was found that certain semiconducting compounds such as Gallium Arsenide would emit light (Red) when current is passed through them. This is the Light Emitting Diode (LED). Further work found other compounds that emit light of other colours such as green, yellow, and blue as well as infrared and ultra-violet.

These compounds could also be formed into 7-segment displays, and became very popular for clocks, timer displays etc. Not so useful for watches however, because the current draw is considerable, and there is not a lot of room for a battery.

However, as the technology improved, LEDS were laid out in graphic type arrangements as regular arrays in rows and columns. The arrival of Organic Light Emitting Diodes (OLEDs) has given a new twist to direct viewing. Indeed, many Smartphone displays use OLED technology.

Large displays using conventional LEDs have been use for large displays for a number of years and the diode pitch has reduced somewhat so that High resolution LED panels are now in use at many sports grounds and similar locations.

▷ *LED Display with close up of pixels c. 2004*

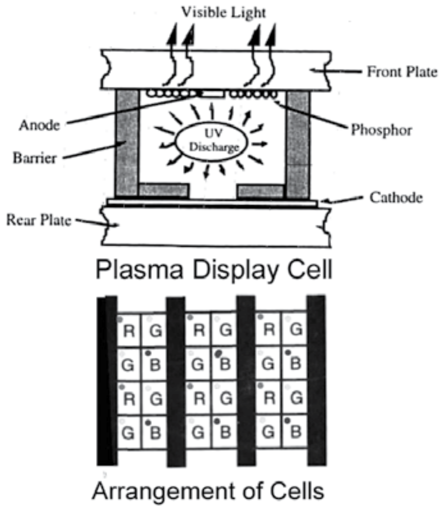
A rogue LED tends to show up, or a group of devices with poor light output will spoil the effect, so close matching of LEDs used is necessary. Power on a larger panel is considerable, so cooling is necessary. One of the advantages of LED/OLED technology is that of direct viewing with little angle effect.

A combination of LED and LCD technology is now well established in monitors and domestic TVs. In this case, the LED serves as a back light in place of the earlier cold cathode tubes. LEDS are more efficient, and in the more costly displays such as for studio monitoring, RGB LEDs are used to define the display White Point correctly.

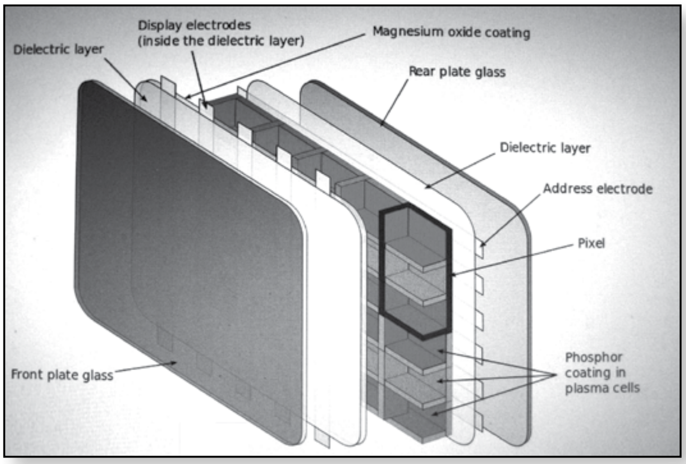
Another advantage of LED back lighting is to define black level more precisely by modulating the backlight. This will save power as the back light need not be on during blanking intervals, and in dark areas, back light can also be turned down.

Another display technology that has risen up over the last 25 years, but is somewhat in decline now is Plasma. (Plasma Display Panel, PDP)

This is based on ultra-violet light from a discharge transformed into visible light by falling on a phosphor layer. Each pixel in the display is a cell carrying an electrode and appropriate colour phosphor, with a transparent window.



The cell is filled with a mixture of rare gases (Neon, Argon etc), and a priming electrode sets up a small discharge. Main discharge is initiated when the anode is taken positive with respect to the cathode. Row and column addressing is used in a panel and the cells are arranged in quad formation, not unlike the Bayer layout for imaging devices (CCD, CMOS).



The PDP gives a bright image, but has a high power consumption. Typically a 42" PDP will draw 200 – 300 watts, whereas an LED backlit LCD panel will consume 65 watts.

Today, I went to a well known electrical goods store (Currys, since you ask), and they did not have a single Plasma TV on show – they were all LED/LCD displays.

In my time in television, I have moved from electrostatically deflected CRTs through LCDs to DLPs; and I wonder what is next in display technology. My strange vision is for wallpaper printed with OLEDs so that a wall can be covered in them, but they would be grouped, so that for normal viewing, an area would be used, but for serious viewing, the whole wall would be used, perhaps at UHDTV2 resolution 7680 x 4320 pixels. It would appear to be do-able!

HamTV Bulletin 3

Gaston Bertels – ON4WF
ARISS-Europe Chairman

In part 3 of our exclusive articles from ARISS, Gaston Bertels (ON4WF) looks at setting up a simple station to receive the ISS HAM TV transmissions. If you planning to receive the ISS transmissions, let us know and we will set up a separate streaming channel for you under the ISS heading - we are also hoping that BATC members will become involved in developing the real time aggregation and voting network to enable automatic selection of the best received stream for use by schools and other viewers of the ISS HAMTV project.

Ham Video Campaign 2013

The ARISS DATV transmitter, dubbed 'Ham Video', already on board the International Space Station, will soon be installed in the Columbus module and commissioned.

Commissioning will be done in several steps, each during a full pass of the ISS over the Matera ground station (see Bulletin 2). It is not yet known if these passes will be chosen in close succession, or if they will cover several weeks. ARISS proposes ESA to operate so called "blank" transmissions during the commissioning period. If this is accepted, it means that Ham Video will transmit permanently without camera. The camera will not be used because it is fed on batteries and servicing it would need prohibitive crew time. Transmitting recordings is part of a future project, but not available presently.

Although ground stations will receive a black image without audio, "blank" transmissions contain all information needed for the setting up and the fine tuning of the station. Moreover, collected data will be used for a performance study of the ARISS L/S-band antennas as well as for an evaluation of the global system.

For this launch campaign, ARISS addresses a call for collaboration to the amateur radio community, especially to the operators interested in space communications. Several satellite operators have shown interest.

Ham Video technical characteristics are available at ***www.ariss-eu.org***. Look for the "Ham Video" link in the left sidebar. Suggestions and useful addresses for the setting up of a Ham Video ground station are also provided.

Among the components of a satellite ground station, the antenna system is the most expensive. High gain antennas are needed, moved by azimuth and elevation motors and driven by an appropriate computer program. For Ham Video reception, a 1.2m dish with precision tracking is recommended. A station compliant with the recommendations provided in the aforementioned reference text should be capable of 3 to 4 minutes of DATV reception during a pass of the ISS. AO-40 operators who still have an S-band dish can now use it for Ham Video.

On the other hand, interesting data can be gathered by stations with a much simpler setup. A dish with a self made helix feed could be used without motors. This antenna could be positioned in a fixed direction, determined before a pass of the ISS, pointing to the position of the ISS at closest approach, which corresponds to the maximum elevation of the space station during the pass. With the setup as described hereunder, 1 to 2 minutes of solid reception of the Ham Video signal should be possible.

Call for participation to the Ham Video launch campaign

ARISS addresses a call to amateur radio experimenters who would like to participate to the Ham Video launch campaign.

Data gathering during the initial "blank" transmissions is important and the help of volunteering operators will be most appreciated. More details to follow.

It is to be noted that builders of the hereunder proposed "Simple Station" could later update their equipment and add tracking motors. Chained stations will be needed for ARISS Ham TV school contacts. Video and audio from the ISS will be web streamed to the schools over the Internet.

We will keep you informed of these developments. For the time being, as a starter, let us concentrate on receiving "blank" transmissions.

Simple Station for the Ham Video launch campaign

We propose the following setup :

- a selfmade helix fed parabola dish
- a low noise downconverter, such as the KU LNC 23 TM
- a DVB-S receiver on a computer card, such as the Techno Trend S2-1600
- the free Tutioune software developed by Jean Pierre Courjaud, F6DZP.

With this setup, Ham Video from Columbus can be received, decoded and visioned on a computer screen. Moreover, the Tutioune software visualizes the characteristics of the received signal. These data are saved in a file that can be forwarded to ARISS for analysis.

Helix fed Ham Video dish:

- ***http://helix.remco.tk/***
- ***http://www.amsat.org/amsat/articles/g3ruh/117.html***

More details in the next Bulletin.

Low noise Downconverter:

- Kuhne Electronic (EU)
- KU LNC 23 TM (centered 2385 MHz) – specific DATV
- Frequency range: 2320 – 2450 MHz
- IF : 1404 – 1534 MHz
- Gain : 40 dB
- ***http://www.kuhne-electronic.de/en/products/down-converters/mku-lnc-23-tm.html***

- High Sierra Microwave (USA)
- Model 2400-HAMTV-DC
- Frequency range: 2320 – 2450 MHz
- IF : 1433.5 to 1533.5 MHz
- Gain : 40 dB min 42 dB typical
- ***http://www.hsmicrowave.com/hamtvconverter.html***

- Satellite S band digital HD LNBF (China)
- Frequency range: 2.3 to 2.7Ghz
- IF : 3650 MHz
- Gain : 50 dB
- ***http://www.aliexpress.com/store/product/satellite-S-band-3650MHz-digital-HD-LNBF-for-project-use-for-USA-market/402505_708948984.html***

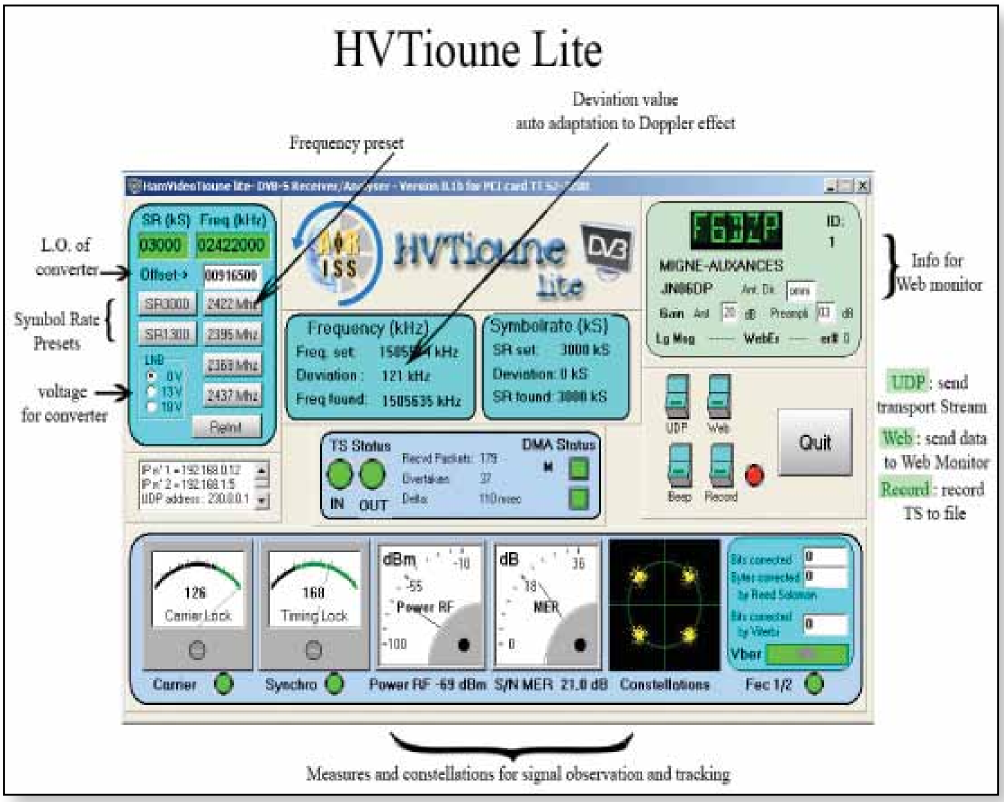
DVB-S receiver card:

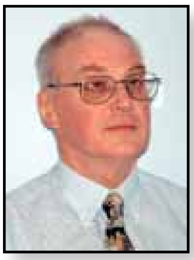
- Techno Trend card S2-1600
- Fits in a PCI computer slot and supports HD TV (MPEG2 and MPEG4/ H.264)
- Computer OS : Windows XP, Vista, Windows 7, Windows 8
- CPU for SDTV: at least 800 MHz
- 512MB main storage (1024MB recommended) at least 1GB free hard disc storage
- Graphics card with at least 64MB and DirectX 9 support
- Sound card with DirectX 9 support
- Fits also in a PCI express computer slot using a PCIExpress to PCI slot adaptor like Startech PEX1PCI1
- ***http://www.technotrend.eu/2920/TT-budget__S2-1600.html***

- Tutioune 1600 V0.1 software for use with the TT S2-1600 card:

A new version with specific features for HamVideo project will be available for download in a few days.

http://www.vivadatv.org/viewtopic.php?f=60&t=214





Digital Integrated Receiver Decoder(IRD) for use on repeaters.

Peter Blakeborough – G3PYB

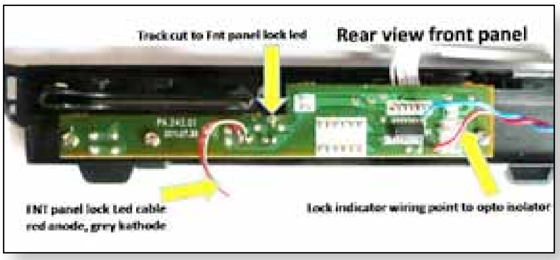
Including a review of the Big Sat 1CR IRD and associated modifications for automatic operation at repeaters.

With the increasing use of 70cm for DATV the need for a receiver for demodulating the narrower 2MS/s signal, plus a simple arrangement for detecting a successful RF lock, has become a key issue.

IRDs with older domestic chipsets have at times proved inadequate in terms of rapid signal lock possibly due to AFC issues, local oscillator jitter or the associated internal software that controls the lock process .The 70cm DATV single channel (SCPC) signals are only slightly larger than 2MHz, a typical domestic satellite using several signals in a multiplex may be 27MHz wide. The front end tuner needs to be more accurate to set the centre of the signal, and then provide a positive lock on signals with small C/noise levels.

Lock indicators.

It was common practice on earlier receivers to have LED indicator derived from the de-modulator it provided a simple way to trigger the repeater logic to place the signal on air. This lock indicator has almost disappeared on later receivers.



Shared band issues.

The centre of activity on 70cm is 437MHz, it is shared band with repeater outputs and inputs to LF side, plus licence free telemetry, key fobs etc. Filtering out the largest signals is usually the best option, but quite a number of short duration transmissions can be seen near or in the receiver pass band.

Some IRD cope with these short term unwanted signal better than others. To this we must add effects due to propagation fading.

Review.

From a conversation with Paul G0MNY, he mentioned a low cost receiver from Germany the BigSat CR1.
I acquired a receiver from Rockdale (Norfolk) which arrived within 3 days and can report the following findings.

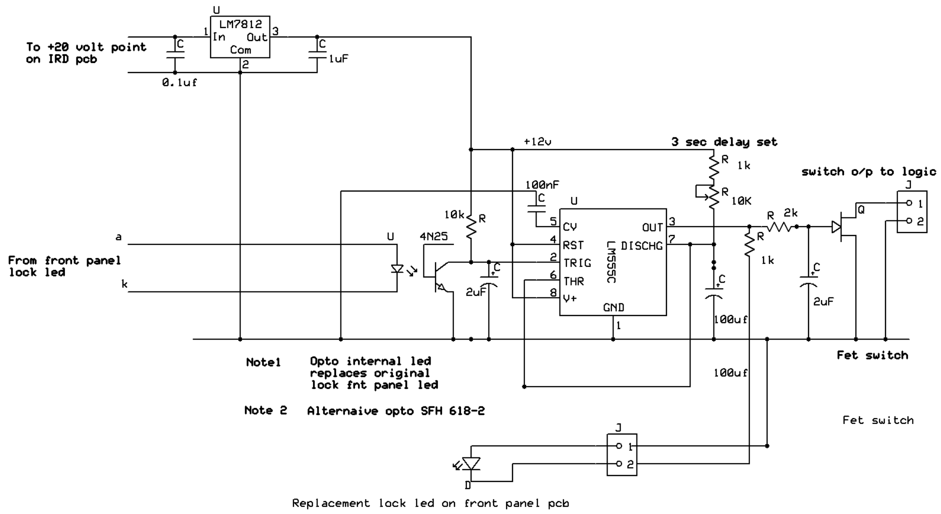
BiGSat

1CR is a small receiver 200 x 95 x 35 mm mains powered only (20W), front panel channel 7 segment display, lock and "power on" leds. Rear panel has the usual RCA phono sockets for video and stereo sound, plus a SCART socket. RF input is by a single F connector (no loop through,) and the normal L band frequency range of 950-2150MHz.

The control interface is quite basic but more than adequate for the fixed channel use needed for a repeater. LNB local oscillator can be set to 10GHz to make frequency entry relatively simple (ie.add 10000).Channel renaming and "move" functions allow simple channel numbers to be set. Symbol rate range is 1 to 45Ms/s and signal acquisition time, and time to decode rapid and positive at 2MS/s.

Signal input range was quoted as -65 to -25dbm, my receiver was slightly better than -65. Additional preamp will be needed for direct antenna connection. The info page produced a useful bar indicator for quality and signal level, update rate looked reasonable. No EPG is available if you plan to use the Rx for domestic satellite use. The IRD is designed for SD MPEG 2 operation only.

Image quality on my 4MS/s looked excellent. The IRD is a basic no frills device but well suited for repeater use and at £29 plus shipping, a good buy for DATV at 2 & 4 MS/s



Lock indicator interface.

My normal practice for an interface to the repeater logic, is to measure the DC level change on the front panel led, add some DC level circuitry to give a ground for "locked". My experience with short time interference, and propagation changes produce rather annoying rapid switching states in the repeater logic. I now add a re-triggerable monostable driven from an opto-isolator across the front panel led circuitry to add an adjustable 3 sec delay to feed the repeater logic return signal.

The front panel lock indicator led looked a little "dim", but its indication was accurate . Further investigation revealed it was driven by some form of panel multiplexing circuit and the led was only switched on for about 5uS every 15uS when locked. DC high when not locked. Definitely, not a candidate for a simple level shifting circuit.

After a pause for thought (and a cup of tea) I replaced the original front panel led, with an led in an opto isolator. Then coupled to the trigger input on a 555 timer set to give 3 sec delay. R-C filtering was added plus an N channel fet switch to give a low impedance earth finding switch to feed the repeater logic. I restored the front panel led position with led driven from the 555 output .

The interface component count was quite low, and the small pcb could be mounted on the plastic support for the discarded 'Conditional Access' module.

On air test.

A field test at RNARS Collingwood Fareham site, with the help of a 70cm signal from Mike G8LES gave 6db improvement on the threshold compared to the installed Comag SL65 IRD. Signal lock stability was much improved no disturbances were seen over a 45min contact, compared to the older Comag RX which lost lock regularly.

I measured the threshold performance of a number or receiver, using the Toutiune software and Tren TTS2-3200 PCI card IRD as a reference. Common cables and connector were used to maintain small interconnect losses.

Results for L band on 1280Mhz QPSK modulation FEC 1/2 at 4 MS/s and 2 MS/s

	Near to threshold	
	4MS/s	2MS/s
Ref .IRD Trend TTS2-3200 PCI card	-79dbm MER 5.6	-77dbm MER 8.0
BigSat Golden SD CR1	-84dbm	-84dbm
Techomate 1550C	-81dbm	-84dbm
DreamBox DM800 SE	-81dbm Reporting C/N 6.7 db	-78dbm Reporting C/N 5.5db

▷ *The Reference IRD had no uncorrected RS errors and <1% errors on Viterbi @4MS/s and 1% errors@2MS/s.*

Many factors impinge on the small signal threshold lock point often found with amateur DATV working, manufactures operating specification will normal be quoted as -65dm.

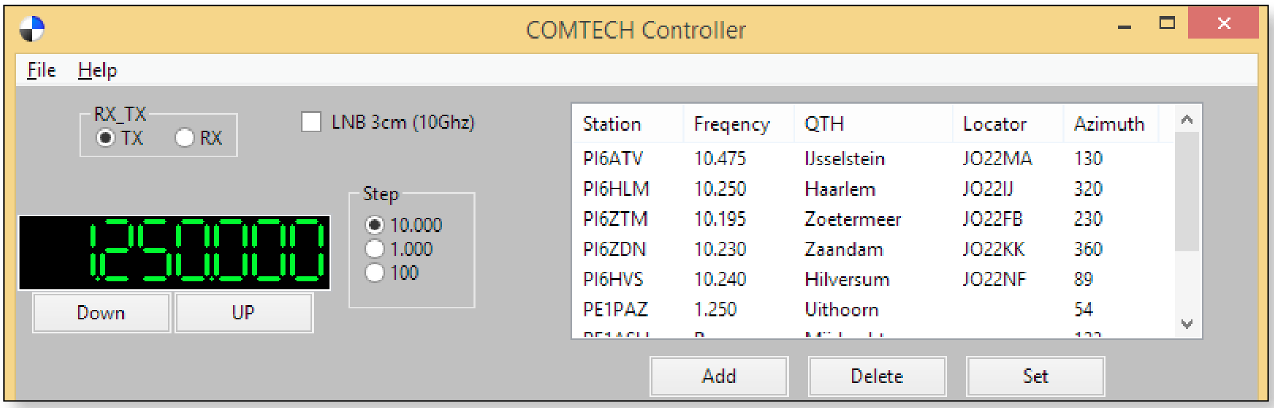
References

- BiGSat Golden 1CR IRD from Rockdal, Gorleston, Norfolk
- Toutiune software from F6DZP **www.vivadatv.org**

PC control of Comtech modules

Koert Wilmink - PA1KW

This article, first published in the Dutch Electron magazine, describes a PC based controller for the Comtech Tx and Rx ATV modules.



Control of Comtech is I2C and this project is based around using the 'enhanced-usb-to-i2c-module' from Antratek (***http://www.antratek.nl/enhanced-usb-to-i2c-module***) (I see also USB to I2C modules on ebay much cheaper, however, I am not sure they are operating the same way, I have lack of information).

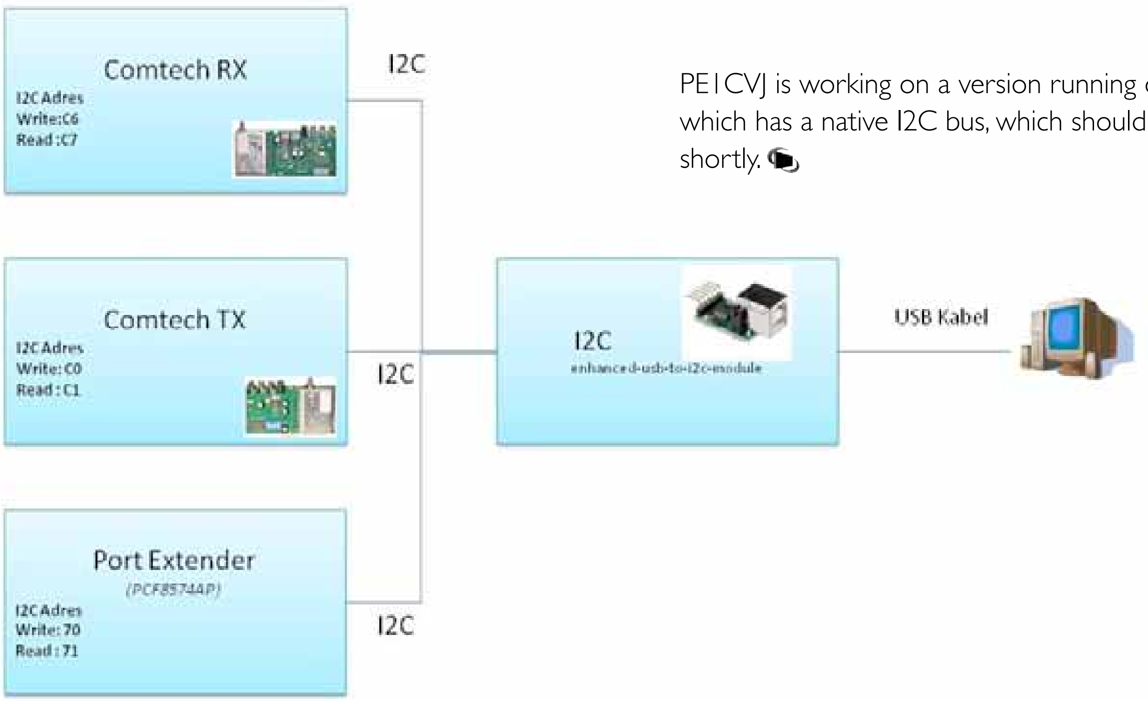
It was wanted to have the receiver and transmitter controlled from the same PC program but the problem was the I2C addresses are the same. A pull-up resistor of 4K7 (to +12V) on pin 10 of the 5055 of the transmitter to change the I2C address solved this.

You can still use the common address commands (C2 for writing and C3 for reading) to change both the transmit and receive frequencies at the same time.

A tick box to add an offset to the display means the correct frequency readout is possible when using using a 3 cm LNB with the Comtech receiver,.

The program is written in Python and the latest version is available on Koert's website at ***http://www.wilmink.com/home/Hamradio/comtech-python-controller*** . You will also need to install Python-2.7.3 (***http://www.python.org/***), and wxPython2.8 en pyserial-2.6 from (***http://www.wxpython.org/***).

PE1CVJ is working on a version running on the RaspPI, which has a native I2C bus, which should be available shortly.



Low Cost DVB-S Receivers Suitable For HAMTV Reception

Bill Ress – N6GHZ

Introduction

This article describes testing that was performed on three DVB-S receivers costing less that $32 that can be used to receive the HAMTV signal from the International Space Station (ISS)

Now that the HAMTV video transmitter has been successfully launched to the ISS and is waiting commissioning, the attention is now focused on the equipment needed by Amateurs to receive this new Amateur digital TV signal from space. One key component is the DVB-S receiver. The receiver needs to receive and demodulate the DVB-S QPSK signal format (data rate) of 1.3 MegaSamples/second (Ms/s) with a forward error correction (FEC) of ½.

The DVB-S QPSK signal format is also used by the free-to-air (FTA) satellite signals currently transmitted from several Ku band geostationary satellites. The direct-to-home (DTH) satellite industry has spawned many receivers available throughout the web. Most of the receivers have "specified" receive modulation capabilities of 2 to 45 Ms/s. This begs the question whether they will work at 1.3 Ms/s. By the way 1.3 Ms/s was chosen because it has a "narrower" bandwidth of approximately 1.4 MHz compared to higher data rates which have higher signal bandwidths. So the key criteria for the choosing a receiver is will it lock onto (receive) the data rate from HAMTV at 1.3 Ms/s.

In addition to determining if the receiver you chose from the many options out there receives the HAMTV data rate, you also need to determine the "form factor" for your choice. There are three; a) USB, b) plug-in PC cards (none exist for the Mac - to my knowledge) and c) standalone. For testing, I choose a USB and a standalone receiver purchased on eBay and the legacy high end receiver I have been using for years for my FTA receiving.

▷ The ViewSat VS2000 Ultra

Why not evaluate a DVB-S PC plug-in card receiver?

While there are several good ones on the market, they tend to be $80 and higher, and frankly I'm cheap. Additionally they require that you get into your PC, install the card and then the software/drivers. For many (me included) this can become frustrating if it doesn't go right, and also as noted above, they exclude the Mac user.

A word about the DVB-S receiver testing.

One of the problems that will be encountered is testing the HAMTV receiving setup in the absence of the HAMTV signal from the ISS. A low cost 2.4 GHz QPSK test source doesn't currently exist. I was fortunate to get the loan of the "pricey" 2.4 GHz, 1.3 Ms/s test source build by Kerry Blanke, N6IZW, using the Digilite PCB, a PLL up converter to 2.4 GHz and a video test pattern.

Using a DVB-S receiver intended for the FTA applications for HAMTV at 2.4 GHz.

All FTA/DTH DVB-S receivers expect to work with a Ku band satellite block down converter (LNB) which converts the Ku band satellite signal (like 11.7 to 12.2 GHz) to a frequency in the 950 to 2150 MHz (L band) region. This is the input frequency for the DVB-S receivers. So when configuring your receiver you need to know the L band "IF" frequency of your 2.4 GHz down converter. You should note that HAMTV can transmit on one of four possible frequencies. We will use 2.422 GHZ in our example. Some 2.4 GHz converters on the market, using a 916.5 MHz LO, (Kuhne and High Sierra Microwave) will output the 2.422 MHz HAMTV signal at 1.5055 GHz. Your DVB-S receiver is then configured, using its software, to expect a signal from the "phantom" Ku band LNB at 1.5055 GHz.

An example would be to configure the DVB-S receiver to be working with a Ku band LNB that uses a 10.6 GHz LO. The Ku band satellite transponder that would give you an L band output of 1.5055 GHz would be 12.1055 GHz. 12.1055 GHz would be the transponder frequency you would configure when setting up the receiver software. The software will also allow you to input the modulation which, for HAMTV, is 1.3 Ms/s with a FEC of ½. Each receiver will accomplish this differently depending on the software it uses. Since the Banke HAMTV test source outputs a 2.400 GHz signal, the L band IF output for the 2.4 GHz down converter used is 1.4835 GHz since the down converter I used in the tests had an LO at 916.5 MHz.

The USB DVB-S Receiver Tested

This receiver is available from several eBay vendors for around $32. Some offer free or low cost shipping. Just search "DVB-S USB TV Receiver" in the eBay "Satellite TV Receivers" category. Like all receivers in this category, it is intended for the FTA/DTH satellite market.

The receiver was run from my Dell notebook using Windows 7. It comes with a version of BlazeDTV 6.0 software which is used to control the receiver. This software can also capture an image or record the streaming video. Software/driver installation was uneventful. I used the "phantom" Ku band setup described above to "trick" the receiver to work with the 2.4 GHz down converter's IF output.

This USB receiver will allow "complete portable" operation since it runs from the notebook and the USB DVB-S receiver can also supply 13 to 18 volts (on its LNB port) to power your 2.4 GHz down converter, assuming it draws less than 400 mA. This the configuration I prefer.

The test results looked good. While the specification for this receiver is for a minimum signal of -65 dBm and a minimum data rate of 2 Ms/s, using the Banke HAMTV 2.4 GHz test source, this receiver locked onto the L band IF signal around -70 dBm. The 2.4 GHz down converter I used (High Sierra Microwave) had 40 dB conversion gain so this was a -110 dBm signal at 2.4 GHz.

The Standalone DVB-S Receiver

This category of receiver requires connection to the AC mains and outputs the video/audio signal to a separate monitor, but does not require a PC to just view the HAMTV signal. To capture HAMTV video, it will require a piece of hardware/software like the USB EasyCAP connected in place of the monitor to record the video/audio on the PC or Mac. The receiver I obtained on eBay was the X2-FTA DVB-S Mini Digital Satellite Receiver available for around $24.00 and free shipping.

The setup/control software for the receiver is internal firmware and using an external monitor, setup went without issues. I also installed the USB EasyCAP in place of the monitor and ran the HAMTV video to my PC where it was captured and stored.

RF testing was done the same way as with the USB receiver. This receiver also provided an L band sensitivity of approximately -70 dBm and locked to the 1.3 Ms/s HAMTV signal without issues even though it also has a minimum data rate specification of 2 Ms/s.

The Legacy Standalone FTA Receivers

For years I have been using a "full featured" FTA receiver, the Viewsat VS2000 Ultra, in my FTA satellite setup and since it was produced some years back, I wondered how it would configure and perform for HAMTV. These receivers, and many like it, are often available used on eBay at very attractive prices. At the time of this writing, several of these models were available for under $20 on eBay.

Again using the 2.4 GHz HAMTV test source, it locked to the 1.3 Ms/s signal at just under -65 dBm and the internal setup software allowed the required "phantom" transponder and HAMTV modulation to be configured.

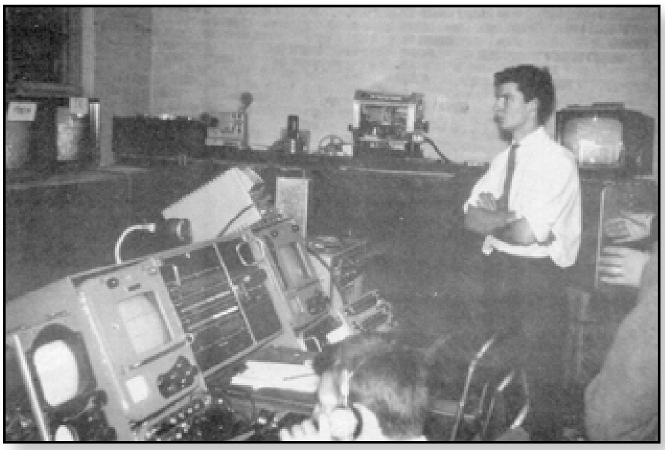
Summary

Receiving the HAMTV signal from the ISS will provide the Amateur with interesting new technical challenges. For many it will be their introduction to Amateur digital TV, a format being used on more and more "TV repeaters" throughout the world. Tracking the fast moving ISS with a 2.4 GHz antenna will also provide challenges. So with this brief introduction to your "low cost" DVB-S receiver options, your receiver choice might be made easier allowing you to concentrate on the other blocks needed in your HAMTV receiving system.

Turning Back the Pages

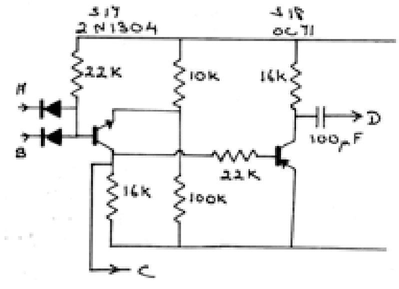
A dip into the archives of CQ-TV, looking at the issue of 48 years ago.

CQ-TV 55



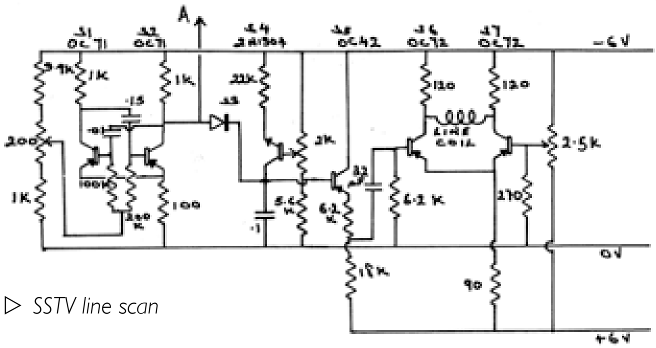
CQ-TV reported on an experiment that had taken place in November 1964, when **a community television demonstration was set up at Loughton Hall**, in Essex, by BATC members. Three image orthicon cameras were set up in a studio, and a vidicon telecine and a flying spot slide scanner in the control room, with the output being displayed on 27" monitors around the building. The event took place over 3 days, with programmes each afternoon and evening, with an ex-Rediffusion director and an ex-professional vision mixer handling the 'creative' aspects of the demonstration. Part of the programme was recorded onto a video tape machine for showing in later performances. The "sound system was in the hands of the local radio club and was technically the least successful part of the system in comparison with the vision equipment which operated faultlessly for the full three days"! The photograph of the demonstration control room was featured on the front cover of the magazine.

The main technical article was a **description of a slow-scan vidicon camera** designed by Grant Dixon. This was made to enable pictures to be recorded onto tape, and so used different standards to those in use by SSTVers in the USA. The line frequency was 50Hz, and the 'read out time' was about 3.5 seconds. The scanning circuits each used a multivibrator to discharge a capacitor that had was charged via a constant current source (S4 or S11), so giving a very linear sawtooth waveform. An emitter follower then fed the appropriate output stage in each case. The video circuits used 'ordinary low frequency' type transistors - at slow scan speeds, the signals were like audio waveforms.



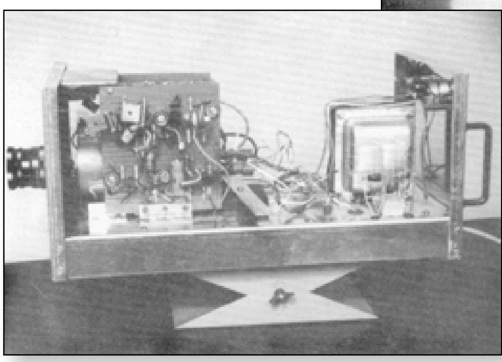
▷ *SSTV sync and clamp circuit*

A DC clamp was used at S22, to compensate for the lack of flyback blanking on the vidicon, sync pulses were added at S23, and the resultant signal at Z was used to frequency modulate the oscillator (S24 and S25) which provided the output. The camera used a vidicon with a special high resistance target, to enable it to give a reasonable output at the slow scan speeds. Grant added that "an ordinary vidicon plugged into this camera will perform … but only just!"



▷ *SSTV line scan*

▷ *SSTV Image*

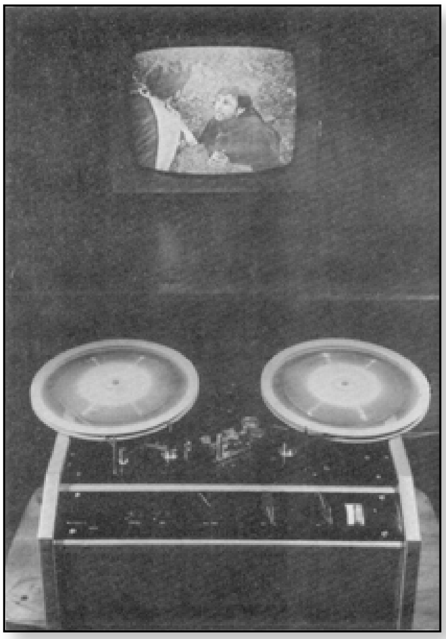


▷ *SSTV Camera*

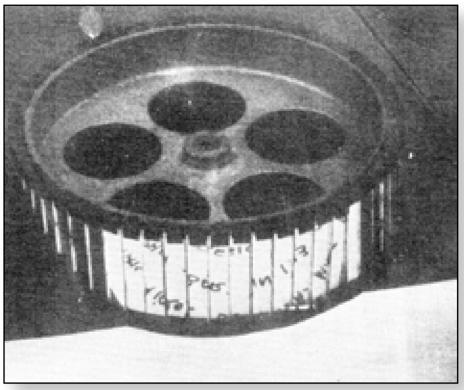
'S' meter	Ratio of peak noise voltage to peak signal voltage	Subjective assessment of picture quality
Less than S7	peak noise greater than peak signal	No picture resolved by normal receiver
S7	80%	Picture may just lock - unviewable
S8	40%	Very noisy pictures of bold objects just viewable.
		Resolution limited by noise less than 100 lines.
S9	20%	Noisy but viewable. Resolution limited by noise to about 300 lines
S9 + 10dB	6%	Some noise - acceptable quality
S9 + 20dB	2%	Noise only just discernable. Good quality
S9 plus more than 20dB	Difficult to measure with average equipment	Noise free - excellent quality

Ian Waters had prepared a chart to compare S meter readings, signal to noise ratio and an assessment of picture quality. In doing so he assumed that one 'S' point equalled 6dB, S9 was just noise free on a communications receiver with a 4kHz bandwidth with gain set for comfortable listening to a 100% modulated phone signal, and a 405 line television was uses with an ssb if response -3dB at 2.5MHz..

The **VKR500 video tape recorder** was the subject of a review by Grant Dixon. Marketed by Wesgrove Electrics as a kit of parts for £97.10s.0d, it was much less than the cheapest video machine available otherwise (at around £1000), and so Grant anticipated that the results would 'be considerably below standard'. He was 'pleasantly surprised' at the picture quality on the demonstration tape, which appeared to have a frequency response of 2MHz. The machine recorded the video onto a 70 mil track towards the edge of the tape , and a 20 mil track near the centre carried the audio - as this used half the tape width, it could be 'turned over' and a second recording made (in 'conventional' half track style).



The video signal was 'pre-distorted' before recording, and the reverse distortion applied on playback, with 'a special technique of sync pulse recovery and reinsertion' giving a very stable picture. The machine was 'entirely transistorised', having 22 silicon transistors, 2 germanium transistors and 6 diodes. Audio tape recorders at the time typically ran 3¾" per sec, but this ran a bit faster - 12.5 ft / sec ***(no, that is not a mistake - 12 and a half feet per second !).*** The 11½" diameter spools could hold 10,000 feet of triple play tape - which gave a playing time of just 13½ minutes on each 'side' of the tape. Grant added that 'the wear on the video head is considerable, and heads have a life of about 100 hours'. (The electronics was designed by an engineer previously working on the BBC's VERA project (Vision Electronic Recording Apparatus), which ran even faster!!).



Lastly, '**Puzzle Picture**' in the previous issue (as in CQTV 240) had posed the question "What is it?" The answer, provided by Gordon Sharpley, was that it was one of a pair of Baird scanning drums which were on semi-permanent loan to the Club from G2UF in Manchester. One was used for transmitting, the other for receiving. G2UF was the first amateur given permission to transmit television (on the 30 line system) on the 10m band - in 1928. The drum was a 60 line type made by Baird's company at Long Acre, London, in about 1934. The drum was milled in individual flats, with differing angles for each mirror. The latter were held on by 240 6BA screws into tapped holes. The Baird 60 line system was fairly quickly changed to 90, 120, and eventually 180 lines, so the drum probably had little use before G2UF obtained it.

BATC Out and About

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

13th April - West London Radio & Electronics Fair, Kempton Park
See: www.radiofairs.co.uk

29th June - West of England Radio Rally - Bridge St, Frome, Somerset,
See: www.westrally.org.uk

15th June - Newbury Radio Rally - Newbury Showground.
See: www.nadars.org.uk

13th July - Next McMichael Rally - Reading Rugby Football Club
See: www.McMichaelRally.org.uk

10th August - Flight Refuelling Hamfest - Wimbourne, Dorset
See: www.frars.org.uk

30th Sept. & 1st Oct. - National Hamfest - Newark, Lincoln.
See: www.nationalhamfest.org.uk

October 2014 - RSGB Convention - Details to be announced.
See: www.rsgb.org.uk

October 2014 - BATC CAT14 and AGM - Details to be announced.
See: www.batc.org.uk

November 2014 - West London Radio & Electronics Fair - Details to be announced.
See: www.radiofairs.co.uk

If you would like BATC support at an event you are organising, please contact the membership secretary.