



The British Amateur Television Club

# CQ-TV

No. 252 – Summer 2016

## Summer ATV Contesting fun!



Summer Contest Results  
Dual Filter Board for DigiLite  
New super tuner design  
for dvb-s and s2

HAMPADS: HAM-Portable  
Affordable Dish for  
Satellites

Video Fundamentals

The Matilda Story

My Station - Peter Yarde

Turning Back the Pages

The Treasurer's Report 2015

... and all the regular features

# BATC DTX1 Digital TV Transmitter



## MPEG-2 encoder and DVB-S modulator

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



## Available from BATC shop

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

*Specification subject to change without notice*

## CAT16 and BATC GM 24/25 September



- 2 day program including talks and demos
- Members bring and buy
- Test equipment area
- Free access to museum
- Saturday evening dinner
- Museum guided tour



RAF Cosford Museum - TF11 8UP  
Just off M54 Junction 3



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# CQ-TV 252

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Printed in Great Britain. ISSN 1466-6790

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## Contributions

The preferred method of communication is by email, all email addresses are shown above.

Alternatively you can write to us at:  
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We aim to publish CQ-TV quarterly in  
March, June, September and December.

The deadlines for each issue are:  
Spring - Please submit by February 28th  
Summer - Please submit by May 31st  
Autumn - Please submit by August 31st  
Winter - Please submit November 30th

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

## From the Chairman...



Noel Matthews - G8GTZ



You may not know it from the weather in the UK but Summer is here again, and the more hardy of us have been braving the elements to take part in the IARU contest held in the middle of June which did see a small increase in UK activity over last year. However, it is a sobering thought that we have more people subscribed to the BATC Facebook page than submitted an entry in to the contest!

Hamradio 2016 took place as usual at the end of June and although BATC did not have a stand there this year, we did send a paper giving an overview of UK ATV to be presented at the ATV conference. In general the UK ATV community is in a good state but we really do need more people on the air if we are to continue to have access to all the bands we have and we need to show we are active on air but not interfering with the primary user by running excessive power. Gaining new repeater licenses is a continual battle and we need to make sure where licenses are issued we get the repeaters on air as soon as possible.

The launch of the first geosynchronous amateur radio satellite is hitting the headlines at the moment and this is very interesting to ATVers as it is the first amateur satellite capable of carrying ATV signals. The BATC has been providing help and support to AMSAT-DL on how the 8MHz wide transponder could be used and has proposed a possible framework on how to co-ordinate activity on the transponder which covers 8 time zones!

I am very pleased to welcome a new member to the BATC committee – Robert G8NXG, has agreed to take on the role of membership secretary, taking over from Dave G8ADM who will continue as general secretary.

We owe Dave a big 'thank you' for his work in the membership secretary role and wish Robert well as he takes it over. The changeover should be transparent to members but we are looking to reduce the workload of the role and ask members who currently pay by cheque if they can look at using either BACs or credit card / paypal when their subscriptions come up for renewal.

Those of you who don't know Robert can meet him at the BGM and CAT I 6 which are being held at the RAF Museum at Cosford. This is a new venue for us and looks to be a great place to meet other ATVers and enjoy a great weekend of ATV. Ideally we would like to know how many people will be coming and so we have added two no charge items for both CAT I 6 and the museum tour in the shop which we would like you to "buy" before the event - note that you will not pay anything in advance but admission to CAT I 6 will be charged at the door. Please also note that there is no charge for members to attend the BGM held on Sunday afternoon.

It will great to see as many members as possible at CAT I 6 and we all look forward to meeting members and friends old and new. 🗨️



### **Formal notice of Biennial General Meeting of the British Amateur Television Club**

***This is to advise that the Biennial General Meeting of the British Amateur Television Club will be held on the 25th September 2016 at 1:30 pm in the Conference Room of the RAF Museum, Cosford. In order to comply with paragraph 6 of the constitution, the agenda will be published on the BATC website and BATC forum before 28th August. Members of the BATC who wish to include any items on the agenda, or to nominate prospective Committee Members, must forward details to the secretary before 27th July 2016.***

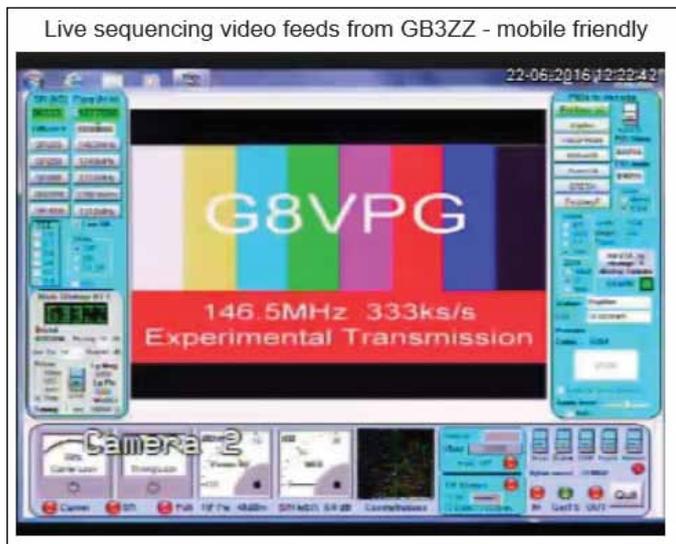


## Members News

Dave Mann – G8ADM

### Members

**Shaun G8VPG**, Bristol, reports that he and the local group have been experimenting with the 146 – 147 MHz band using the DATV Express board with Windows operating system. They need to use several Mitsubishi modules with intervening bandpass filters to generate some power. They use the Minitioune receiver. They have been to the South Wales hill tops during the May and June activity weekends. Their latest QSO was 121 Km and is now listed as No.3 in the best known DX list compiled by W6HHC. They have also been working with the GB3ZZ repeater; see below.

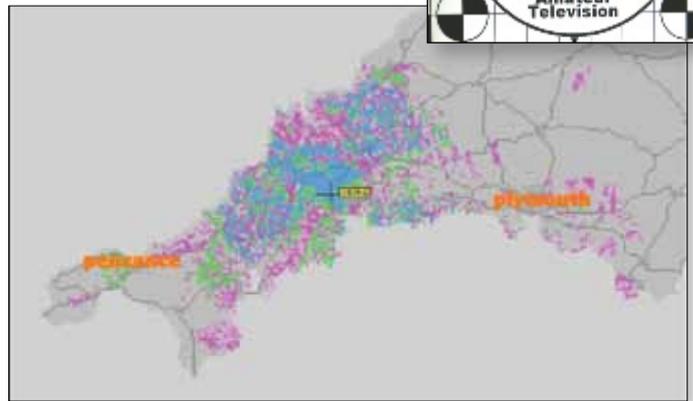


**Dave G8GKQ** and **Noel G8GTZ** have been working RB-TV on the 10 GHz band to extend the range of this microwave band using 333KS 7/8 and H264. The first proof of concept test was from Lane End to Hannington, 32 Km over a slightly obstructed path. This is the first time that I have heard of RB-TV on the 10 GHz band. More tests are planned over greater distances.

**Henry F4WBG**, JN26AO, is testing RB-TV on the 6m band. So far 200 Km has been worked over an obstructed path using an SR of 333 KHz. These distances were not possible on other bands. More tests are planned during the summer to extend the range. With the right conditions worldwide coverage may even be possible. In most countries the 6m band is from 50.0 to 52.0 MHz. The lower part of the band can be quite busy with CW and SSB but the top 1 MHz is barely used so it's very suitable for RB-TV.

### REPEATERS

**GB3NQ** in Cornwall has had an improvement to its 70cm digital receiver input. It had been suffering from interference from the local 70cm beacon. By adding a new 5 pole interdigital filter on the input the interference has been eliminated. The 70cm antenna is omni directional, horizontally polarised and at 1000 ft asl so we should now see some real dx stations getting in. GB3NQ transmits on 1,316 MHz analogue and it can also be monitored via the BATC streaming service.



**GB3ZZ** near Bristol, Shaun G8VPG reports that they have been experimenting with adding a RB-DATV 2m input to the repeater. Send a horizontally polarised signal on 146.5MHz, 333ks/s, FEC7/8, video PID 256, audio disabled but you must use an audio PID of 4095 to get the picture to lock. Work is still going on to optimise the antenna and feeder. The output can be seen on GB3ZZ channel 2. See: <http://www.stvg.co.uk>

### Es'hail 2 geostationary satellite

AMSAT are now reporting that this satellite fitted with transponders for amateur use will now be launched in the first quarter of 2017 into a location of 26 degrees east.

#### Details:

- ▶ Wideband digital transponder suitable for 2 or more channels of DATV.
- ▶ 2401.500 - 2409.500 MHz Uplink Right Hand Circular Polarization



- ▶ 10491.000 - 10499.000 MHz Downlink Horizontal Polarization

They are suggesting 100W into a 2mtr dish for the uplink which seems on the high side to me.

**Narrowband Linear transponder suitable for talkback:**

- ▶ 2400.050 - 2400.300 MHz Uplink Right Hand Circular Polarization
- ▶ 10489.550 - 10489.800 MHz Downlink Vertical Polarization

For more details see this leaflet:

<https://ukamsat.files.wordpress.com/2016/06/eshail-2-p4-a-amateur-radio-leaflet-2016-06-24.pdf>

**LIME SDR**

This is a new open source digital programmable transceiver board. It may be tuned from 100 kHz – 3.8 GHz.

It has four antenna connections and is therefore suitable for diversity DATV reception. (It's what the FI car mobile DATV systems use).



Various apps are available to download or for members who have a head for programming, all the information is provided to allow you to write your own software for this product. There are various options available the most common selling for about £220.00. For more information see: <https://www.crowdsupply.com/lime-micro/limesdr>

Please send any news for CQ-TV 253 to me by the end of August [secretary@batc.org.uk](mailto:secretary@batc.org.uk)

## Biennial General Meeting – Postal Votes

*Brian Summers Hon Treasurer BATC.*

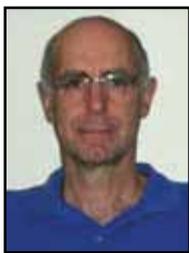
The BATC is a democratic club and the club's General Meeting is where the voting takes place. The BATC is aware that many of its members are unable to be present at the General Meetings and in an effort to widen the scope for voting the following clause, 6.(f) was added to the clubs constitution:-

6.(f) The Committee may institute a system of postal voting at a G.M. or E.G.M. Such paper votes are to be sent by post to the secretary on the form provided and signed by the member. They will be properly recorded and presented to the meeting and count as if the member was present at that meeting. For clarity other forms of proxy votes are not valid at a G.M. or E.G.M.

**Procedure**

To apply for a postal vote, email the BATC's general secretary, who will then reply by email with an attached voting form for you to print out, fill in and POST the printed hard copy back to the general secretary. He will then check the details are correct and your vote(s) will be read out at the meeting and count as if you were present. This form will have on it the items published on the agenda for the meeting, excepting any nominations for committee members that come from the floor of the meeting. Rule 6.(e) applies.





# Contest and Activity Day News

Dave Crump – G8GKQ

## ATV Activity Weekend 7/8 May

Much of the reported activity on 7/8 May was 146.5 MHz RB-TV testing, with some good results in slightly enhanced tropo conditions. Among others, the following stations were active on 146.5 MHz:

Call	Location	Locator
GW8VPG/P	Chepstow, Gwent	IO8IPQ
G4CPE	Upper Sundon, Beds	IO9ISW
G0MJW	Harwell, Oxon	IO9IIO
G8GTZ/P	Dunkery Beacon, Soms	IO8IFD
M0DTS/P (7 May)	North York Moors	IO94MJ
M0DTS (8 May)	Yarm, Cleveland	IO94IL
G8LES	Alton, Hants	IO9ILC
G8GKQ/P (7 May)	Walbury Hill, Berks	IO9IGI
G8GKQ/P (8 May)	Portsmouth Hill, Hants	IO90LU
GW4EWJ/P	Anchor, Salop	IO82JL

Highlights of the day were a 2-way contact between G8GTZ/P and G8GKQ/P at 137 km, and GW4EWJ/P receiving pictures from G8GKQ/P at 175 km.

The higher bands were also busy as well, with activity including:

Call	Location	Locator
G8GTZ/P	Dunkery Beacon, Soms	IO8IFD
G8ADM	Pinner, Middx	IO9ITO
G8GKQ/P (7 May)	Walbury Hill, Berks	IO9IGI
G8GKQ/P (8 May)	Portsmouth Hill, Hants	IO90LU
M0DTS/P (7 May)	North York Moors	IO94MJ
M0DTS (8 May)	Yarm, Cleveland	IO94IL
G4CPE	Upper Sundon, Beds	IO9ISW
G0MJW	Harwell, Oxon	IO9IIO
M0SKM	Dunstable, Beds	IO9IRV
G3KKD	Cambridge	JO02CF
G4KLB	Bournemouth, Dorset	IO90BR
G4GUO	Worthing, Sussex	IO90ST
G8LES	Alton, Hants	IO9ILC
GW0KAX	Bridgend, Mid Glamorgan	IO8IEM
M0IKB	Scarborough, N Yorks	IO94SG
PA9RON	Amsterdam, NL	



Kudos must go to Brian, G4EWJ, who found his primary choice of portable site inaccessible, and so drove over one hundred miles further to a secondary site.

## Contest and Activity Weekend Calendar

1200 UTC 9 July 2016 - 1800 UTC 10 July 2016:

*ATV Activity Weekend*

1200 UTC 13 August 2016 - 1800 UTC 14 August 2016:

*ATV Activity Weekend*

1200 UTC 10 September 2016 - 1800 UTC 11 September 2016:

*ATV Activity Weekend*

1200 UTC 10 December 2016 - 1800 UTC 11 December 2016:

*ATV Activity Weekend*

1200 UTC 11 March 2017 - 1800 UTC 12 March 2017

*ATV Activity Weekend*

1200 UTC 6 May 2017 - 1800 UTC 7 May 2017:

*ATV Activity Weekend*

1200 UTC 10 June 2017 - 1800 UTC 11 June 2017:

*IARU International ATV Contest*

**BATC 146 MHz TV Contest June 2016**

Pos	Call	Locator	Points	Stns	Best DX	QTH	Dist
1	G8GKQ/P	IO91GI	274	2	GW8VPG/P	IO81LS	119
	G8GKQ/P	IO90LU	28	1	G8LES	IO91LC	28
2	M0DTS/P	IO94MJ	188	2	G1LPS	IO94EQ	54
	M0DTS/P	IO94DF	102	1	G1LPS	IO94EQ	51
3	G1LPS	IO94EQ	248	3	M0DTS/P	IO94MJ	54
4	GW8VPG/P	IO81LS	238	1	G8GKQ/P	IO91GI	119
5	G8GTZ/P	IO91JH	36	1	G8GKQ/P	IO91GI	18
6	G8LES	IO91LC	28	1	G8GKQ/P	IO90LU	28

**International ATV Contest 11/12 June**

There was a good level of activity during the International Contest, both on 70 cms and above, and also on 146.5 MHz in the BATC low band section. The complete results are listed here.

Congratulations to Rob, M0DTS, who not only managed to win on points, but was also active on every band from 146 MHz to 24 GHz! Praise must also go to Terry, G1LPS, who was also active on all bands and came second.

After very good tropo conditions during the preceding week, propagation during the Contest seems to have been flat or worse. Terry, G1LPS reported:

*We had fantastic conditions from the 5th to the 8th of June; on the 5th and 6th I had Dutch stations PA0OLD and PE1DWQ on 13cm and 23cm accessing GB3KM. Dutch ATV repeaters PI6JOU on 23cm and PI6ZDM 3cm were constant for 24hrs. What did surprise me was tuning across 10 GHz at one point I had 5 stations - the band seems very popular in Holland for local links. Two callsigns I noted on 10ghz were PE3KTV and PE1KYC.*

*The good tropo conditions unfortunately came during the time I had allotted for contest preparation. I had the mast over working on it and when I went to the shack for a spanner saw PI6JOU accessing GB3KM on 1280MHz. That was the end of the prep work and the mast was raised. This left me a little under-prepared for the contest weekend.*

*I still managed to activate and work all bands from 146.5MHz to 24GHz. With some amazing results, even though conditions were terrible for the contest weekend. Thanks to Rob, Brian and Clive - M0DTS, G3KJX and G4FVP respectively for the contacts.*

*5GHz worked very well this year I used a sky mini dish with a TX and RX patch antenna offset either side of a 10GHz LNB with about 2w output. Rob M0DTS was a massive signal back. 24GHz was worked for the first time by us in the contest. Due to weight and space restrictions on the mast I didn't use the*

*transverter but Rob aired his (see our recent article in CQTV for the transverter). Instead I used a horn and a 3mw gunn diode driven by a modified Gunnmod 2 board. Rob received this at his Sunday location 51km. P5 My colour was missing though due to a 20 meter poor quality video lead. 10GHz was my last and the most impressive contact of the day and I still can't get over it. I received Rob first and when it was my turn to transmit I hadn't got-around to putting the TX on the mast due to the tropo earlier in the week. So the plan was to connect it all up in the shack check it, then climb on the roof and strap it to the chimney. I had my TX on the indoor shack chair screwing wires to it, when Rob waiting the 51km away said on talkback I have you. At this point I was still busy fitting the wires and said out-loud 'I don't think so.' I was stunned when he gave me my number score. Thank Rob for saving the climb on to the roof. ;-) magic reflections on 3cm! A very enjoyable weekend.*

Both myself (G8GKQ) and Noel G8GTZ went out portable on the South Coast on the Sunday and managed to work into France on 70 cm. Noel also managed some one-way contacts to the Netherlands. Noel wins the RB-TV Prize award for his contact with F9ZG at 231 km (but, being a committee member, is excluded from receiving the £50 Amazon Voucher!).

The Dutch results have also been published, and show how much more activity there is in the Netherlands. You can find them here: <https://vhf-uhf.veron.nl/wp-content/uploads/2015/08/ATV-uitslag-juni-2016.pdf>

**Activity Weekends**

There are 4 Activity Weekends planned before the end of the year – in July, August, September and December. Keep an eye on the BATC Forum for other stations planning to go out portable – or just activate their home station – so you know what's going on. During the weekends, talkback tends to be on 144.75 MHz FM, 144.17 MHz SSB or <https://www.dxspot.tv/>

## IARU International ATV Contest June 2016 - UK Results

## Overall

Pos	Call	Location	Total	70 cm	23 cm	13 cm	9 cm	6 cm	3 cm	1.2 cm
1	M0DTS/P	IO94MJ	3310	108	1852	540	270	540		
	M0DTS/P	IO94DF	3140	170	340	510	675	510	680	255
2	G1LPS	IO94EQ	4764	248	576	1050	1075	1050	510	255
3	G8GTZ/P	IO91JH	108	36	72					
	G8GTZ/P	JO00HU	2498	1434	1064					
4	G8GKQ/P	IO91GI	608	536	72					
	G8GKQ/P	IO90LU	804	528	276					
5	G3NWR/P	IO93AD	1005	61	944					
6	G8VDP	IO93GM	412		412					
7	G3KJX/P	IO94HI	410		80		330			
8	G4GUO	IO90ST	398	234	164					
9	G3KKD	JO02CF	394	394						
10	G4CPE/P	IO91RU	192	192						
11	G8ADM	IO91TO	190	190						
12	G8LES	IO91LC	168	56	112					

## 70cm

Pos	Call	Locator	Points	Stns	Best DX	QTH	Dist
1	G8GTZ/P	IO91JH	36	1	G8GKQ/P	IO91GI	18
	G8GTZ/P	JO00HU	1434	4	PA3WEG	JO21EX	288
2	G8GKQ/P	IO91GI	536	4	G3KKD	JO02CF	150
	G8GKQ/P	IO90LU	528	4	F9ZG	IN99KC	195
3	G3KKD	JO02CF	394	3	G8GKQ/P	IO91GI	150
4	M0DTS/P	IO94MJ	108	1	G1LPS	IO94EQ	54
	M0DTS/P	IO94DF	170	2	G1LPS	IO94EQ	51
5	G1LPS	IO94EQ	248	3	M0DTS/P	IO94MJ	54
6	G4GUO	IO90ST	234	2	G8GTZ/P	JO00HU	76
7	G4CPE/P	IO91RU	192	2	G3KKD	JO02CF	66
8	G8ADM	IO91TO	190	2	G8GKQ/P	IO91GI	80
9	G3NWR/P	IO93AD	61	1	G8DKC/A	IO92GQ	61
10	G8LES	IO91LC	56	1	G8GKQ/P	IO90LU	28



► G8GKQ/P at Portsdown Hill  
Equipped for 4 Bands



► G1LPS  
contest  
antennas



◀ G8GKQ/P's 70 cm RB-TV  
picture received at F9ZG.  
195 km



► F9ZG at G8GKQ/P

**23cm**

Pos	Call	Locator	Points	Stns	Best DX	QTH	Dist
1	M0DTS/P	IO94MJ	1852	5	G3NWR/P	IO93AD	154
	M0DTS/P	IO94DF	340	2	G1LPS	IO94EQ	51
2	G8GTZ/P	IO91JH	72	1	G8GKQ/P	IO91GI	18
	G8GTZ/P	JO00HU	1064	1	F3YX	JN18AP	266
3	G3NWR/P	IO93AD	944	2	M0DTS/P	IO94MJ	154
4	G1LPS	IO94EQ	576	4	M0DTS/P	IO94MJ	54
5	G8VDP	IO93GM	412	1	M0DTS/P	IO94MJ	103
6	G8GKQ/P	IO91GI	72	1	G8GTZ/P	IO91JH	18
	G8GKQ/P	IO90LU	276	2	G4GUO	IO90ST	41
7	G4GUO	IO90ST	164	1	G8GKQ/P	IO90LU	41
8	G8LES	IO91LC	112	1	G8GKQ/P	IO90LU	28
9	G3KJX/P	IO94HI	80	1	G1LPS	IO94EQ	40

**13cm**

Pos	Call	Locator	Points	Stns	Best DX	QTH	Dist
1=	G1LPS	IO94EQ	1050	2	M0DTS/P	IO94MJ	54
1=	M0DTS/P	IO94MJ	540	1	G1LPS	IO94EQ	54
	M0DTS/P	IO94DF	510	1	G1LPS	IO94EQ	51

**9cm**

Pos	Call	Locator	Points	Stns	Best DX	QTH	Dist
1	G1LPS	IO94EQ	1075	4	M0DTS/P	IO94MJ	54
2	M0DTS/P	IO94MJ	270	1	G1LPS	IO94EQ	54
	M0DTS/P	IO94DF	675	2	G1LPS	IO94EQ	51
3	G3KJX/P	IO94HI	330	2	G1LPS	IO94EQ	40

**6cm**

Pos	Call	Locator	Points	Stns	Best DX	QTH	Dist
1=	G1LPS	IO94EQ	1050	2	M0DTS/P	IO94MJ	54
1=	M0DTS/P	IO94MJ	540	1	G1LPS	IO94EQ	54
	M0DTS/P	IO94DF	510	1	G1LPS	IO94EQ	51

**3cm**

Pos	Call	Locator	Points	Stns	Best DX	QTH	Dist
1	M0DTS/P	IO94DF	680	2	G1LPS	IO94EQ	51
2	G1LPS	IO94EQ	510	1	M0DTS/P	IO94MJ	54

**1.2cm**

Pos	Call	Locator	Points	Stns	Best DX	QTH	Dist
1=	G1LPS	IO94EQ	255	1	M0DTS/P	IO94MJ	54
1=	M0DTS/P	IO94DF	255	1	G1LPS	IO94EQ	51

All distances in kilometres





# CAT 16 and BATC BGM

## 24/25 September 2016 at Cosford



The Convention for Amateur Television 2016 (CAT 16) and the club's Biennial General Meeting will be held in the Conference Room of the Royal Air Force Museum at Cosford, near Telford, Shropshire on 24 and 25 September.

In addition to a very interesting BATC lecture programme, visitors to CAT 16 will have the free access to the RAF Museum. Parking for CAT 16 visitors will also be free of charge. We also hope to be able to offer members a free guided tour.

There will be plenty of opportunity to chat with other members and find out about their latest projects. Some test equipment will be available if required – but please make a prior request on the BATC Forum, so that we can make sure that we have the right kit. There will be a "Show and Tell" area set aside for members to demonstrate their latest projects, and Kevin, G3AAF will be exhibiting his RFDesign products.

Please register for attendance in the BATC online shop. Note that places for the guided tour can **ONLY** be booked through the BATC online shop! <https://batc.org.uk/shop/cat16> There is no charge at this stage – please just sign up (and use the pay cash option).

Entry to CAT 16 will be charged at £10 per day (payable at the Conference Room Door). This covers the cost of unlimited Tea and Coffee for attendees in the Conference Room throughout the event. There will be no charge for attendance at the BGM (only).

The RAF Museum is located near Junction 3 of the M54, halfway between Wolverhampton and Telford. Members are advised to book accommodation in Telford; a list of possible Hotels is on the BATC Forum at <http://batc.org.uk/forum/viewtopic.php?f=99&t=4505>. We plan to meet for dinner at 7:30 pm on the Saturday at Ramada Telford Ironbridge Hotel.

So, put it in your diary today, and prepare for a very interesting weeked!

### OUTLINE AGENDA

#### Saturday

- 1000 Museum and Conference Room open to CAT 16 Attendees
- 1300 CAT 16 Talks begin
  - New BATC Streamer and Internet Presence – Phil Crump M0DNY
  - Receiving and Presenting HamTV from the ISS – Noel Matthews G8GTZ
  - MiniTioune and SuperTioune – Jean-Pierre F6DZP
  - Further Speakers tbc
- 1700 End of Talks; Museum closes.
- 1930 Meet for Dinner in Telford

#### Sunday

- 1000 Museum and Conference Room open to CAT 16 Attendees
- 1015 CAT 16 Talks begin
  - Es'hail-2: Geostationary transponder for DATV – Graham Shirville G3VZV
  - DATV Express and Future Developments – Charles Brain G4GUO
- 1230 Break for Lunch
- 1330 BATC BGM
- 1430 Museum Guided Tour
- 1600 CAT 16 closes

### CATERING

In addition to the Tea and coffee which will be available throughout Saturday afternoon and Sunday morning, snacks and lunch will be available for purchase at the "Refuel" Restaurant, in the same building as the conference room.



# Treasurers Report for 2015



## Financial strategy

At the club's 2014 general meeting, it was agreed by the membership that our capital reserves were too high and that the club should use those funds for the good of ATV and we are continuing with that policy. Last years subscription increase is starting to have some effect on the clubs income. We will work towards a balancing our income and expenditure account.

## The Balance Sheet

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

## Turnover

Our total expenditure for 2015 was £36,910 including purchase of stock for the shop. The total income for 2015 was £30,638 including shop sales (before PayPal fees). These gross figures take no account of the stock levels and are included for information only.

## General outlook

One line in the accounts that is worth a mention is the "subscriptions in advance" figure of £6,250 for 2015. I view this as a mark of the confidence that our members have in the club.

## The Shop (1)

The BATC continues to make a significant investment in digital ATV with the development of the reduced bandwidth systems (RBTV) we also continued to sell the DTX1 units. It is the policy of the BATC to make items available to members at the lowest cost, not to make a large surplus as we run the shop to promote activity for the mutual benefit of our members. The shop returned a gross overall surplus of £2271 less the shops proportion of the PayPal fees, an estimated £700, gives £1571 on a turnover of £21006 or 7.5%. We consider this to be nicely balanced - according to our policy.

## PayPal (2)

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

## Committee expenses (3)

This includes the cost of attendance at the HamRadio event and this is why it is more than normal.

## Web services (4)

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

## Awards & Prizes (5)

This included contest competition prizes, to increase activity, and awards to members for exceptional project development work.

## Plant & Assets

We have made a significant investment in new equipment for the club of some £1475. Some of this equipment was first used for the Ham Radio event at Friedrichshafen and then at a number of other UK events including CAT 15. Latterly the equipment was used as part of the video link from the space station to schools. At CAT 15, items of old or non working equipment were sold off to members for £188.

## CQ-TV

4 issues of CQ-TV were produced and the paper copies were printed and posted. The cost of these and postage continues to be of concern. 🗨️

*Brian Summers,  
Hon. Treasurer BATC, June 2016*

## British Amateur Television Club

### Income & expenditure account, year ending 31 Decem2015

<b>Income account</b>	<b>2015</b>	<b>Expend account</b>	<b>2015</b>
Subscriptions	£6,887.89	CQ-TV Printing	£5,118.00
BATC Shop surplus (1)	£2,271.48	CQ-TV Postage	£2,194.81
Donations received	£141.00	Operational expenses	£658.88
Interest received	£176.34	Committee expenses (3)	£1,399.50
Miscellaneous Items	£188.00	RSGB affiliation fee	£47.00
Convention & BGM	£0.00	Web services (4)	£4,029.19
Less PayPal commission (2)	<u><del>£918.60</del></u>	Convention & BGM	£25.00
	<u>£8,746.11</u>	Awards & Prizes (5)	<u>£788.08</u>
			<u>£14,260.46</u>

### Balance sheet at 31 December 2015

<b>Assets</b>	<b>2015</b>
Stock, BATC shop	£4,947.20
HSBC account	£5,879.35
PayPal account	£3,728.43
Teachers building society	£36,103.13
<b>Less Current liabilities</b>	
Subscriptions received in advance	<u><del>£6,250.30</del></u>
	£44,407.81
<b>Represented by Accumulated fund</b>	
Balance brought forward	£49,922.16
Surplus or <b>Deficit</b>	<u><del>£5,514.35</del></u>
Balance carried forward	<u>£44,407.81</u>

Petty cash held = €10

Equipment was purchased to the value of £1475.75

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



**Richard Harris**  
Member 19 June 2016



**Brian Summers**  
Hon. Treasurer 19 June 2016

The notes (x) for these accounts are in the Treasurers Report

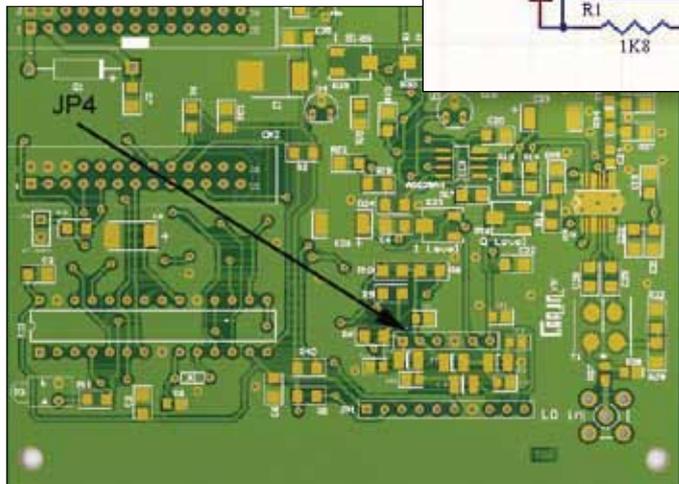
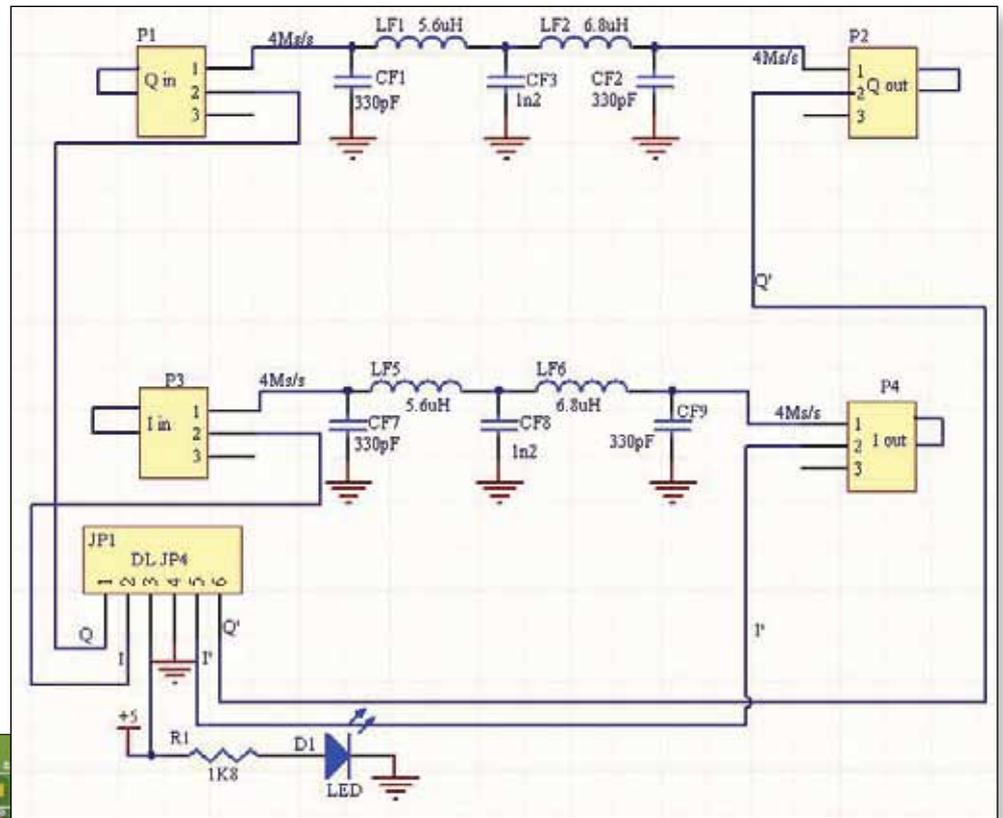


# Dual Filter Board for DigiLite 5.9

Dave Kenward - G8AJN

The 6 way header JP4 on the DigiLite board is intended to allow the quick changing of Nyquist filters to suit different data rates. This tiny pcb allows a quick change of symbol rate and allows for either a single Ms/s option or for a switchable dual choice, for example 4Ms/s and 2Ms/s. Located near JP1 on the main DigiLite board the socket was included to allow for this sub-panel to be employed.

The selection can be either by moveable links like the ones used on a computer motherboard or can be run out onto a four-way two-pole switch on a front panel.



► The circuit of the SINGLE symbol Rate board

If you are using a boxed version a four pole two-way toggle or rotary style switch can be used. Two adjacently mounted 2 pole switches could perhaps be used, one for I and one for Q switching, keeping the cost down.

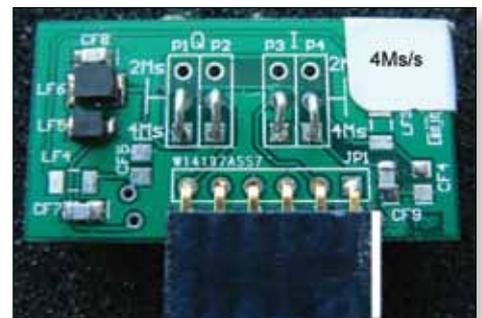


At the low cost of these boards it is tempting to use one pcb per Ms/s option and simply plug them in as required. In this case the links can be permanently wired. This option is not ideal however if the equipment is mounted inside a box.



► Top and Bottom views of the bare Filter board.

► Both sides of a filter board wired for a single symbol rate.

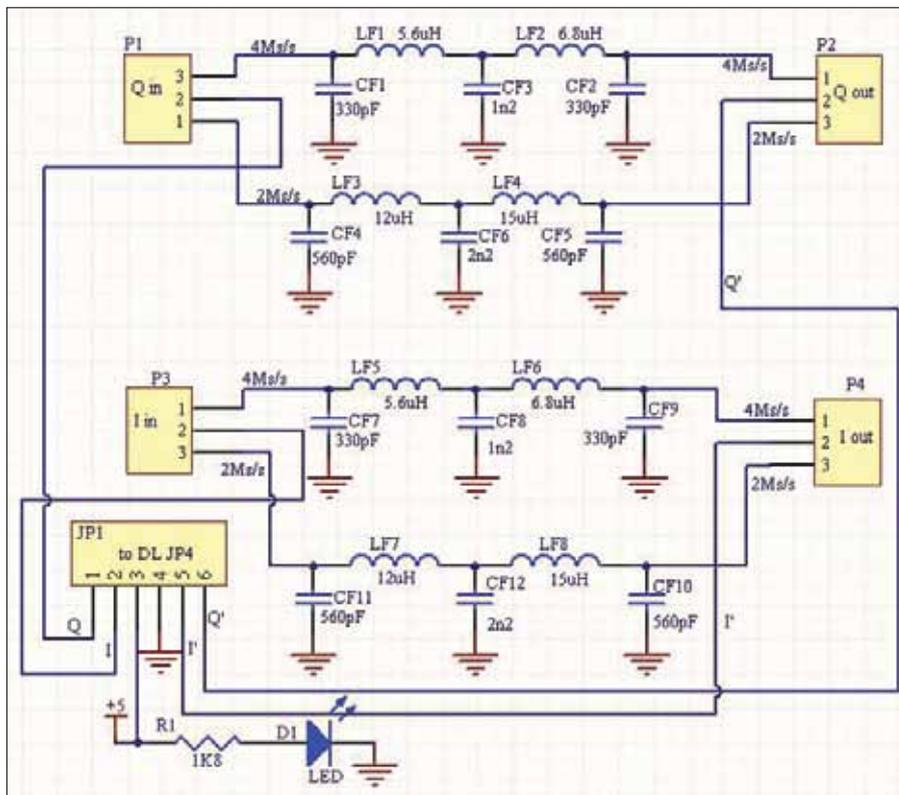
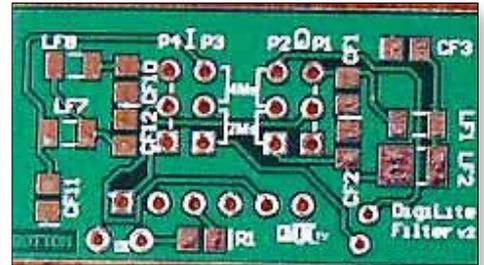


The difference between the various versions is only in the actual component values, the circuit does not change. The circuit of the single symbol rate is the same as the that used on the DigiLite board. If you choose to use one individual pcb for each data rate. a colour coded dot on the corner of each panel could indicate quickly for which symbol rate it is intended to be used, Yellow for 4Ms/s , Red for 2Ms/s and Brown for 1Ms/s. In the single option you can hard-wire the links on the filter board.

In order to offer two options on the same pcb the following circuit is used...

If you have already fitted JP4 header on to your DigiLite board you will need to find a suitable connector to fit to the Filter Board that will connect to JP4. As there is a chance that you have already fitted JP4 as a reversible header I have allowed for the optional fitting of a small LED to indicate correct orientation of the sub-panel. Incorrect fitting of the filter board will not do any harm but you will get no modulation and so the LED is there to show that you have fitted the filter board correctly. If you have used a polarised header then the LED is not required.

► Bottom view



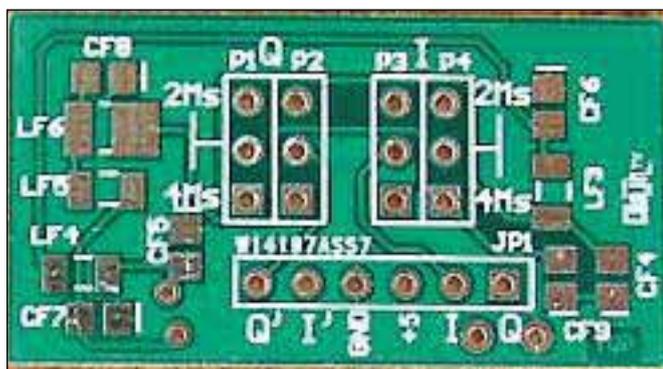
Here is a table of the different values needed if using a SINGLE PCB for each symbol rate.

Values	4Ms/s	2Ms/s	1Ms/s
LF1	5.6uH	12uH	27uH
LF2	6.8uH	15uH	33uH
LF5	5.6uH	12uH	27uH
LF6	6.8uH	15uH	33uH
CF1	330pF	560pF	1n2pF
CF2	330pF	560pF	1n2pF
CF3	1n2pF	2n2pF	3n9pF
CF7	330pF	560pF	1n2pF
CF8	1n2pF	2n2pF	3n9pF
CF9	330pF	560pF	1n2pF

► The circuit of the DUAL symbol rate board.

The values shown in this circuit are for 4Ms/s and 2Ms/s.

Here is a table for DUAL 4Ms/s and 2Ms/s on the same board.



► Top view 18mm x 35mm

LF1	5.6uH	CF1	330pF
LF2	6.8uH	CF2	330pF
LF3	12uH	CF3	1n2pF
LF4	15uH	CF4	560pF
LF5	5.6uH	CF5	560pF
LF6	6.8uH	CF6	2n2pF
LF7	12uH	CF7	330pF
LF8	15uH	CF8	1n2pF
		CF9	330pF
		CF10	560pF
		CF11	560pF
		CF12	2n2pF

The pin spacing on the 6 way header JP4 is the usual 2.54mm (0.1") and ideally it should be a shrouded or polarised type to ensure correct fitting. The 'plug' on the filter board can be a right-angle type to allow the board to lay flat over the DigiLite board, or a straight plug to let the filter board sit up vertically. As it is only 18mm tall it should not present a space problem in most builds.

As with all my articles I have had some professionally manufactured PCBs produced and they are available from my website, along with a number of more hard-to-find components. However the layout is not critical and veroboard or home-etched boards should work fine. Keep any wires to panel switches as short as possible.

If you have already made the DigiLite 5.9 and have fitted the inductors and capacitors onto the main pcb they will need to be removed if you wish to use the plug-in filter board. The SMD inductors should be re-useable on the filter board, always assuming you do not destroy them in the removal process!

As the values are fixed there is no set-up needed but do use the best quality lowest tolerance capacitors possible, 5% or better is good, never mix types, the balance of I and Q could be upset and affect the digital modulation waveform.

## CONSTRUCTION NOTES:

The 6 way connector JPI should be selected carefully to fit the type of header(socket) JP4 on the DigiLite main board. It can be fitted to either side of the filter board, note that pin 1 is the square solder pad.

The I and Q links can also be mounted on either side of the filter board as desired, depending mainly on the orientation of the JPI/PL4 connector. Take a careful look at which side the links will be best before soldering up. All vias are through-hole plated so they can be soldered on only one side satisfactorily.

If you are intending to use the optional LED make sure that the JPI connector is fitted before the LED as it may be difficult to fit JPI flat afterwards.

It would also be possible to permanently mount the filter board using hard-wired links to the main DigiLite board instead of connectors.

## BILL OF MATERIALS:

There may be other suppliers but these are the ones I have found and used for initial tests. Some of the inductors are becoming difficult to find except in large quantities. I plan to hold a small stock of inductors and perhaps a kit of inductors for 4Ms/s and 2Ms/s. See my website for details. 

LF1,LF5	5.6uH 1008		F 2455259
LF2,LF6	6.8uH 1210		M 70-ISC1210ER6R8K
LF3,LF7	12uH 1008		F 2455241
LF4,LF8	15uH 1008.		F 2455242
CF1,CF2,CF7,CF9	330pF 0805		F 2332768 R 464-6616
CF3,CF8	1n2pF 0805		R 741-4554
CF4,CF5,CF10,CF11	560pF 0805		R 723-6316
CF6,CF12	2n2pF 0805		R 766-1043
RI (to suit LED used)	1k8 to 2k7 0805	Optional	
DI (optional)	Miniature LED	Optional	Miniature wired or SMD
I0 way header strip (x5)	Snap for 3 pins	Links	R 673-7486
JPI 6 way Socket	MOLEX 4455	Various	F 9731296 (or Right Angle: F 1668357)
2 Way 4Pole Switch	Multicomp	Optional	CPC: SW02871

F = Farnell      R = RS Components      M = Mouser      CPC = CPC.Farnell.com

Check for any mods and updates on my website

[www.G8AJN.tv](http://www.G8AJN.tv) before commencing construction (see PROJECTS page and STORE page).

# New super tuner design for dvb-s and s2

Art Towslee – WA8RMC

## New DVB-S/S2 receiver design concept

I'm Art Towslee, WA8RMC, hardware designer of the DATV-Express DVB-S transmitter PCB. Jean-Pierre, F6DZP and I propose we design and build a DVB-S/S2 receiver module that connects to the USB computer port for use with his Minitioune PC software program. It will be basically an enhancement of his existing MiniTiouner receive module kit. The design is in the concept stage now while we decide on needed features and see if there is sufficient interest to go into production. We would like to hear comments on the proposal as well as ideas for additional features.

The product would be a small assembled and tested module that converts a DVB-S/S2 signal into a serial transport stream for connection directly to a Windows PC USB port. We selected special tuner/demodulator IC's to eliminate the need for a NIM tuner. The guaranteed operation is from 250MHz to 2.1GHz but will still operate 144MHz to 2.4GHz. The 2.4GHz upper frequency limit allows ISS reception directly eliminating the need for a downconverter; at 70cm it becomes a highly sensitive DVB-S receiver and at 144MHz it can be used for experimental low symbol rate operation in Europe.

The finished product will consist of a small PCB approximately 2" x 5" (50mm x 125mm) completely assembled, tested and optionally mounted in an enclosure.

### The main features are:

1. RF input: 144MHz to 2400MHz.
2. 4 inputs multiplexed into 2 independent receivers. SMA connectors on first 2 inputs.
3. Input sensitivity: -65dBm minimum. (It is expected that an external preamp will be used at antenna).
4. Power requirements: +10 to +20VDC (~0.7A @ 12vdc). (Cannot source power from USB port).
5. Output: USB type B connector to go to Windows USB2 port. (Should a type A connector be used here?)
6. Parallel transport stream PC pads from demodulator IC for optional connections bypassing USB port.
7. Custom low pass filters to optimize low symbol rate and for better S/N operation.
8. LNB power: 12 to 18vdc current limited for external preamp on input connectors. The voltage is controlled by input voltage selection.
9. Jumper to disable DC power on input connectors.
10. Logic output for "signal present" or "signal locked". Signal also carried through to PC.
11. DiSEqC not supported. Chip set supports this but adds \$10 to board cost. PC pads to add this circuit externally will be provided.
12. Target selling price is ~\$120 USD. (This is a not-for-profit effort).
13. Plastic enclosure is option. Extra SMA input connectors are option.

*Let us know what you think of the idea. We need feedback about features and expected volume. If we cannot justify builds of at least 100 units at a time, we question it as a worthwhile project. Please report suggestions on the BATC forum.* 🗣️



# HAMPADS: HAM-Portable Affordable Dish for Satellites

Pascal Brisset, F4DAV



*A shoulder-mounted dish, tracking system and SDR receiver for amateur radio communications, originally designed for receiving HamTV digital video transmissions from the International Space Station.*

## Introduction

On February 11th, 2016 the amateur radio community made history by establishing the first direct high-bandwidth amateur video link between the International Space Station and pupils at a British school as part of an educational outreach program. Getting such a system designed, funded, approved by space agencies, built, tested, sent into orbit and installed on the ISS must have been a massive effort spanning more than a decade. Setting up a temporary ground station on school premises for a reliable, highly-publicized direct contact with the ISS is

obviously also a huge endeavour involving highly qualified volunteers, sophisticated equipment and careful planning.

On the one hand, such achievements highlight the power of international collaboration and teamwork. On the other hand, they detract from a certain old-school image of amateur radio operators as self-reliant polymaths who can communicate with the whole world with only their knowledge, skills and (preferably self-built) equipment. Hence, after first hearing about HamTV in mid-2015 and seeing the bill of materials for a typical ground station, I began investigating ways to bring this new amateur mode to a wider audience, including students with an interest in science and technology but limited financial resources and no real estate for permanent antennas. My experiments are chronicled in [SOFTDATV] and the present project is their latest outcome.

	Traditional ground station		Minimum configuration		Tested configuration		Work in progress	
<b>Reflector</b>	90-120 cm dish		Scrap satellite TV dish (nonmagnetic)		TP-Link TL-ANT2424B (100x60 cm, 24 dBi)	\$50	DIY reflector	
<b>LNB</b>	Custom downconverter	\$65	BOTE BT-281B	\$12	BOTE BT-281B	\$12	BOTE BT-281B	\$12
<b>Feed</b>	Helical feed		Integrated dipole of BT-281B		Integrated dipole of BT-281B		DIY helical feed	
<b>RF cable 1</b>			50 cm F-type cable	\$6	Right-angle F-type adapter, 50 cm F-type cable	\$10	Right-angle F-type adapter, 50 cm F-type cable	\$10
<b>Bias tee</b>	Built into DVB-S card		BT-288K	\$5	Satellite TV Line Power Inserter	\$15	Satellite TV Line Power Inserter	\$15
<b>LNB power supply</b>	Built into DVB-S card		Mains adapter supplied with BT-288K		14.4V NiMH battery pack		14.4V NiMH battery pack	
<b>RF cable 2</b>			F-to-MCX cable	\$6	F-to-SMA adapter	\$5	F-to-SMA adapter	\$5
<b>Receiver</b>	TechnoTrend PCI card	\$100 ?	RTL-SDR R820T2, MCX, plastic	\$10-\$15	RTL-SDR R820T2, TCXO, SMA	\$25	RTL-SDR R820T2, TCXO, SMA, aluminium	\$25
<b>Receiver power supply</b>	From PC		USB from tablet/laptop		Powered USB hub or splitter cable		USB Accessory Charger Adapter ?	
<b>Tracking and pointing</b>	Az/El antenna rotator	\$800 ?	Smartphone with satellite tracking app		Linux tablet with custom software		Android phone with HAMPADS app	
<b>Signal acquisition</b>	Windows PC		Linux laptop with gqrx		Linux tablet with gqrx, USB OTG cable		Android phone with HAMPADS app	
<b>Phone/tablet psu</b>			Built-in battery only		Built-in battery only		USB Accessory Charger Adapter	

► Table 1. HamTV ground station Bill of Materials

HAMPADS is a shoulder-mounted, manually-operated LEO satellite tracker and HamTV receiver assembled from inexpensive, mass-produced, off-the-shelf components. While it cannot compete with traditional solutions in terms of sensitivity, reliability and power consumption, it might be useful as a low-cost gateway to modern amateur radio and signal processing techniques.

With modifications it could also be used for other applications such as:

- Digital Amateur TV communications between mobile ground stations
- Receiving low-power telemetry from amateur high-altitude balloons and amateur rockets
- Receiving live HD video from remote-controlled aircraft in crowded situations such as drone racing events
- Fingerprinting trespassing UAVs (a highly directional antenna can reliably match RF recordings with a specific aircraft) and triangulating their trajectories (using multiple cooperating ground stations).

### A Word of Caution...

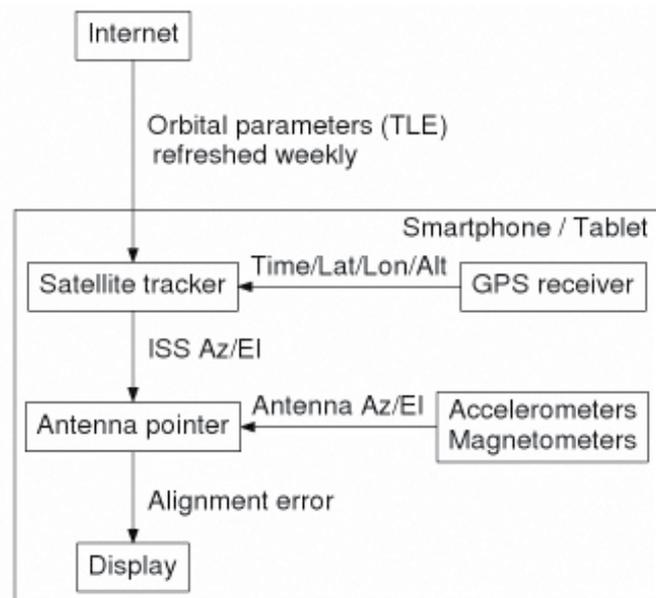
The acronym “HAMPADS” is a play on “MANPADS” i.e. shoulder-fired surface-to-air missile systems (which look somewhat similar, unfortunately). It serves as a reminder that in this day and age, operating unusual equipment in public places may cause unnecessary disturbance. Should law enforcement officers catch me aiming this contraption at unidentified targets in the sky, my plan is to keep calm and refrain from pointing the scary end toward passers-by.

Of course, the device is completely harmless. It is merely a satellite TV receiver adapted for fast-moving low-earth-orbit transmitters instead of geostationary satellites.

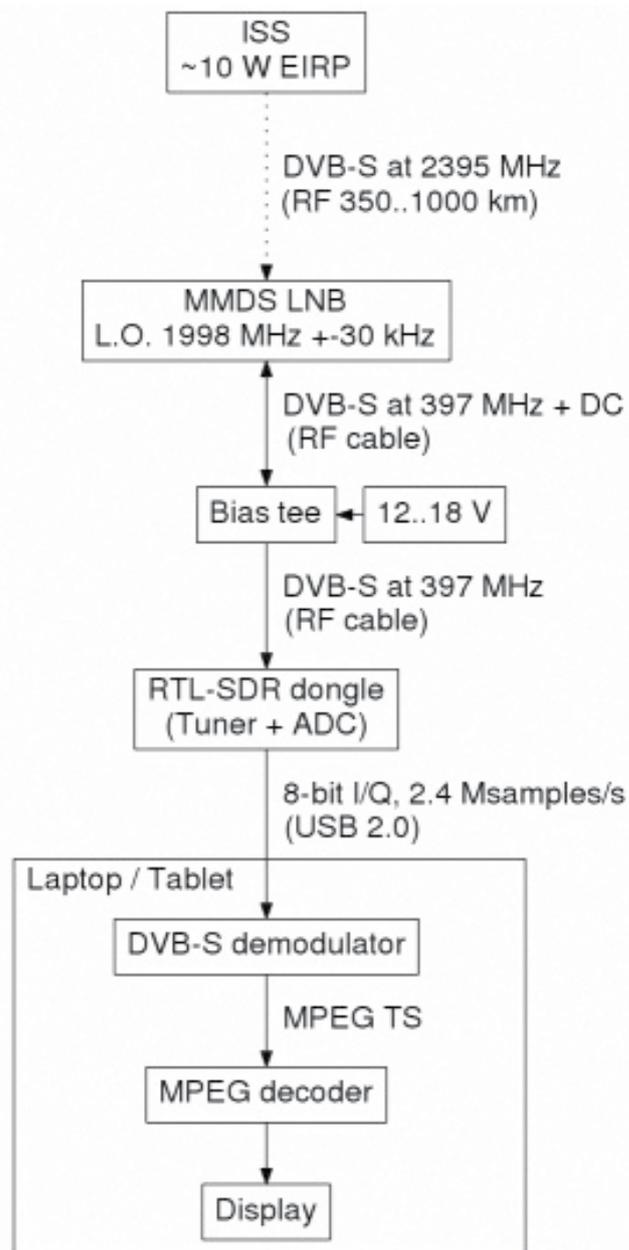
### Description

The ISS usually transmits a 10 W EIRP DVB-S signal modulated in QPSK at 2 Msymbols/s with FEC 1/2 on 2395 MHz (see [SOFTDATV] for details and references).

A typical ground station for HamTV comprises a computer-controlled motorized azimuth/elevation rotator capable of slewing 5°/s with 2° accuracy, a 90 - 120 cm dish with circularly-polarized feed, a custom LNB which brings the signal into the L band, a TechnoTrend DVB-S PCI card in a Windows computer; and the popular Tutioune software by F6DZP. This section reviews the hardware and software functions required, and explains how costs can be reduced.



► Figure 1. Antenna pointing overview



► Figure 2. DVB-S receiver overview

### Satellite tracker

Satellite tracking is a well-known topic in amateur radio and astronomy circles. Algorithms, free software and up-to-date orbital parameters are easily found online.

### Antenna pointing system

The Az/EI antenna rotator is the most expensive item in a traditional HamTV ground station. A DIY rotator may turn out to be less expensive than commercial offerings, but that is beyond the scope of this project. An obvious alternative is to aim the antenna manually. After all, many amateurs enjoy working satellites on 2 m and 70 cm with hand-held Yagi antennas. Unfortunately the link budget for HamTV requires antennas with much higher gain. Pointing must be accurate to a few degrees.

Note that a fixed antenna, properly positioned in advance, can provide good reception for 10-20 seconds during overhead passes. See [Z8YRR] and [SOFTDATV]. This is enough to get started and addicted to the thrill of seeing the signal rise from the noise floor at the exact time predicted by orbit simulations.

My solution relies on mobile apps which display an “augmented reality” view of the sky. Using the GPS receiver, tilt sensor and magnetic compass found in modern smartphones, these applications allow any non-technical user to locate satellites (and a variety of celestial objects) by holding their phone in the air and following visual cues. If an antenna is attached to the phone and aligned with its frame of reference, it will also point toward the selected satellite. Note that this is not a new idea; for example, see this 2012 video by HB9EYY featuring an app called “Satellite AR”.

Eventually I wrote my own satellite pointing program for Linux. Orbit prediction relies on the Python PyEphem package, which is derived from the well-known XEphem software by WB0OEW. Unfortunately the pointing functionality runs only on a specific tablet (Lenovo Yoga Tab 2 modified to run Linux) because it uses dedicated drivers for the inertial and magnetic sensors.

### High-gain antenna

Instead of a dedicated satellite dish, I used a 24 dBi linearly-polarized prime focus grid parabolic WiFi antenna which is relatively inexpensive and widely available worldwide.

With the sideways orientation shown in the pictures, the beam pattern is spread horizontally. This matches the error pattern of the pointing system: Azimuth, which is determined magnetically, is typically less accurate than elevation, which is measured by inertial sensors.

After a few iterations of the project, this antenna has become the most expensive component, and I am not even using its 2.4 GHz dipole feed. So it is now worth exploring alternatives. Any sufficiently large scrap satellite TV dish should work, but those are usually offset designs. This makes mechanical assembly and aiming more complicated. Note that non-ferrous materials are preferred because the pointing system relies on magnetic sensors mounted near the antenna.

### Feed, LNA and downconverter

While investigating amateur radio activities in the S band, I found articles by M0DTS, G0ORY and JN1GKZ about inexpensive MMDS downconverters.

The BOTE BT-281B turned out to be suitable for HamTV reception, except that its output is near 400 MHz, i.e. well below the tuning range of standard DVB-S receivers. But this can be received by inexpensive SDR front-ends (see below).

Another problem is that the BT-281B comes with a built-in linear dipole. Experienced hobbyists may want to replace it with a helical feed to improve reception by 3 dB. In that case, a solid dish should be used instead of a grid-parabolic reflector.



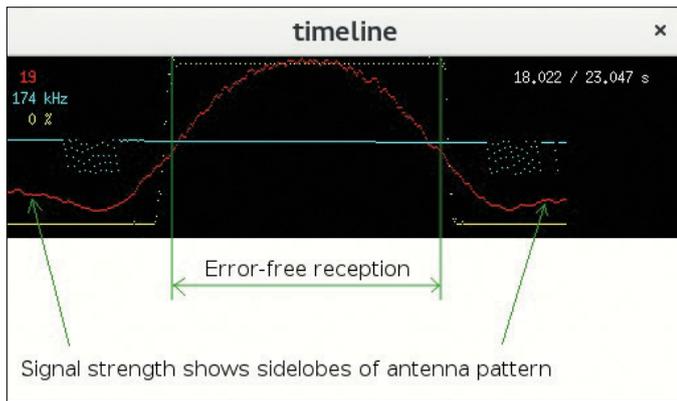
► Figure 3. MMDS LNB attached to grid-parabolic Wi-Fi reflector

### DVB-S receiver

A digital satellite TV receiver comprises an analog front-end, a DVB-S demodulator and a MPEG decoder. It turned out that the incredibly inexpensive “RTL-SDR” USB dongles can capture downconverted HamTV signals. Baseband I/Q samples can then be fed into a free software-defined demodulator (see [SOFTDATV] and [LEANDVB]). The resulting MPEG Transport Stream can be decoded and displayed with a variety of applications.

Alternatively, I/Q samples can be recorded to disk and demodulated later. One of the benefits of SDR is that the fun does not end when the ISS goes below the horizon. Video quality can be improved afterward by tweaking demodulator parameters, filtering spurious signals manually, etc. Besides, as with many digital transmissions, data fragments from multiple receive chains (or even from multiple ground stations) can be combined to reconstruct an error-free video stream.

RTL-SDR dongles can reliably sample I/Q signals up to 2.4 MHz (higher rates cause data loss). Besides, anti-aliasing filters cause attenuation near band edges; this reduces the usable bandwidth DVB-S signals from the ISS occupy 2.7 MHz of spectrum. Fortunately the actual modulation uses only 2 MHz and the rest is roll-off. It is quite remarkable that digital signal processing techniques can successfully demodulate a QPSK signal with just a bit more than one I/Q sample per symbol.



► Figure 4. 23 seconds from an overhead pass with a fixed antenna

## Cables and connectors

RTL-SDR dongles typically ship with MCX connectors. Some variants have a F-type connector instead. Models advertised for SDR often have a SMA connector.

In this application the signal is amplified by the MMDS LNB, so the choice of connector or cable type is unlikely to affect performance.

## Power supplies

### MMDS LNB

Some RTL-SDR dongles can be easily modified to inject 5 V into the RF cable. This is suitable for active DVB-T and GPS antennas. Unfortunately satellite and MMDS LNBs expect 13 V or 18 V. The BT-288K bias tee ships with an attached 18 V 300 mA mains adapter. The MMDS LNB contains a 8 V, 500 mA linear regulator (78M08), so any voltage between 12 V and 18 V would probably work.

For wire-free operation I added twelve NiMH AA batteries (1.4 V 2500 mAh). The battery pack is mounted at the rear of the boom to help balance the weight of the device.

### RTL-SDR dongle

RTL-SDR dongles are usually powered by their USB host. My dongle typically draws 70 mA when idle and 270 mA while active. To reduce the load on the USB host, the dongle can be connected via a powered USB hub, and the hub can be powered from the same battery pack as the LNB.

I also tested a USB OTG “splitter” cable which has a type-A plug in addition to the expected micro-B plug and type-A receptacle. The type-A end plugs into a 12..24 V automotive USB adapter. I do not recommend this solution because the design of this specific cable does not appear to be electrically sound.

## Smartphone / tablet

Digital signal processing puts a heavy load on the CPU, and the display will typically be set to maximum brightness for outdoor use. Therefore it would be useful to plug the device into an external power supply. Unfortunately most smartphones and tablets have only one USB port, and therefore they cannot charge while a RTL-SDR dongle is connected.

In theory the USB Accessory Charger Adapter standard allows a device to simultaneously charge and act as a USB OTG Host, but it is unclear which smartphones and tablets support it.

Wireless (i.e. inductive) charging pads near magnetic sensors and radio equipment do not sound appealing, but this might work in practice.

## Results

At the time of writing, all HamTV contacts have occurred with poor elevation from my location, or without video, or while I was away. I did record the very first ARISS HamTV contact on February 11th, 2016 at 47° elevation with my shoulder-mounted 24 dBi antenna, MMDS downconverter and RTL-SDR dongle. SNR was not good enough for real-time demodulation with leandvb, but I was able to recover 11 MB of MPEG Transport Stream afterward with a more sophisticated software demodulator (gr-dvb).



## What about two-way contacts ?

Amateur radio is about two-way communication, not just receiving TV broadcasts (be they from a space station). Right now the ISS cannot receive amateur video from the ground. But why not add a VHF voice uplink by attaching a mobile transceiver and directional antenna to the dish ?

**Note:** The tripod mount is not part of the system. The dish must still be held at shoulder height and swept across the sky. A three meter long VHF Yagi antenna balanced at that height will swivel freely in a vertical plane. Total weight is about 10 kg.



## Perspectives

Can we make HamTV reception even simpler and less expensive ?

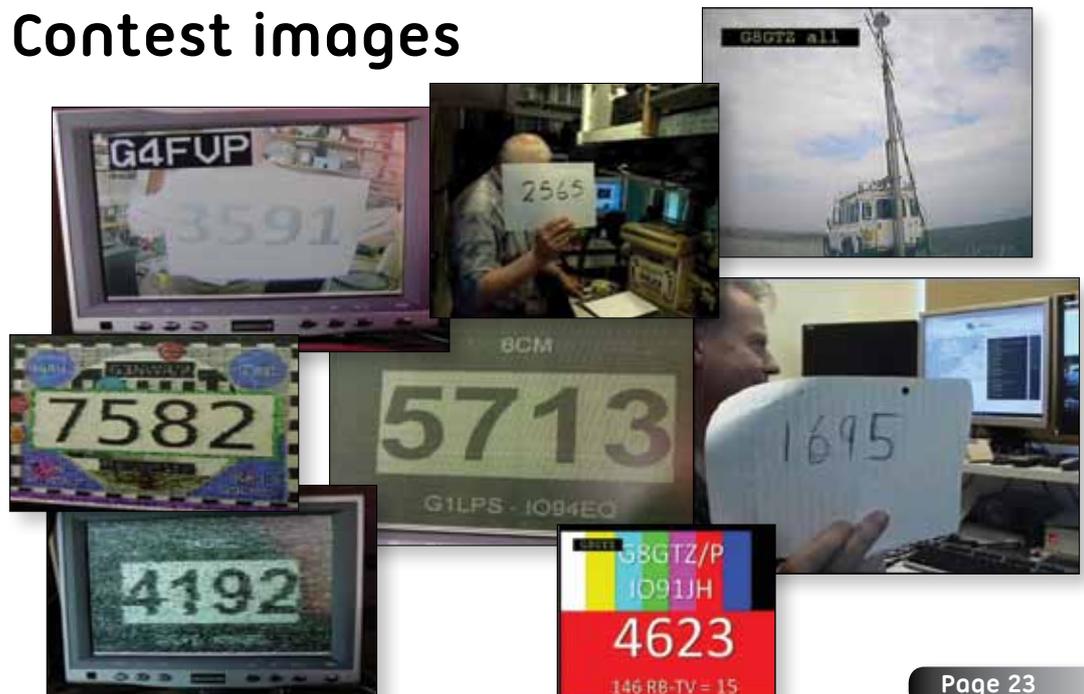
- ▶ First, we could package all the software (tracking, pointing, DVB-S demodulation and MPEG decoding) into a single easy-to-use smartphone app.
- ▶ Then, we could build inexpensive reflectors out of aluminium foil.
- ▶ Finally, note that modern smartphones contain a variety of radios (FM, GSM, 3G, LTE, Bluetooth, Wi-Fi, GPS). Manufacturers are reluctant to publish datasheets for their chipsets but we can reasonably assume that in theory, some of them could be reprogrammed to serve as SDR receivers. Then we could receive HamTV by positioning a smartphone at the focus of a parabolic reflector. 📱

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- ▶ [SOFTDATV] SDR reception of Digital Amateur TV from the ISS . <http://www.pabr.org/radio/softdatv/softdatv.en.html>
- ▶ [LEANDVB] leandvb: A lightweight software DVB-S demodulator . <http://www.pabr.org/radio/leandvb/leandvb.en.html>

## Summer ATV Contest images

This collection of off-air pictures shows the variety and level of activity, both during the Activity Weekends and in the recent Contest. Some Contest numbers are on electronic caption generators, while others have been hastily scribbled on card. Transmitting station set-ups range from 2-room shacks, through vans, Land Rovers down to a humble Toyota Yaris (see cover) 📱





# Video Fundamentals 7

## Camera Signal Processing

Last time we had a look at how many lines were desirable and what shape the picture should be. This month we will look into the camera. There is quite a lot going on, unnoticed, there. The same processes that were used in the old analog days, still happen but this time with numbers. In some ways this is easier, a lot less adjustments and setting up for a start!

### Amplification and Digitisation

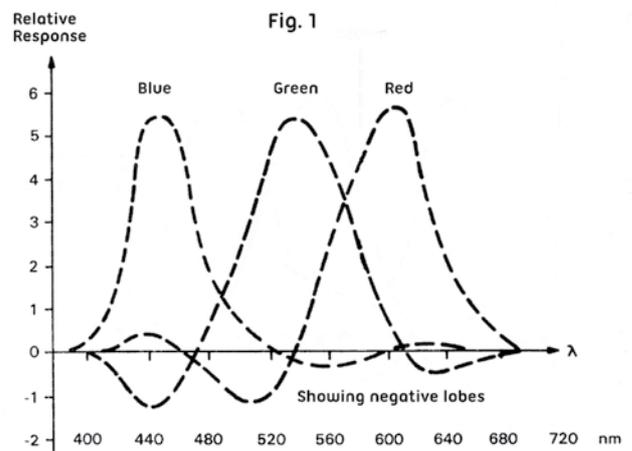
The first point to appreciate is that ALL camera sensors are analog. A certain number of photons arrive at a pixel and a corresponding number of electrons are clocked out. This small signal is then amplified to a reasonable level and passed to the A to D converter. The signals at this point are RGB for 3 chip cameras or a single interleaved RGB stream for single chip cameras. The older cameras used 8 bit words for each colour and newer cameras 10,12 or even 16 bit words. The need for more bits will become clear later.

It's worth pointing out that the normal proportions of R, G & B apply and for a white signal, R = 30%, G = 59% and B = 11%. For convenience in processing these are amplified to be the same level, and then to however many bits the camera uses.

### Matrixing

We need first to consider the response of human eye to colour stimuli. If we are to have good pictures that correctly convey the colours to the eye we need to do some processing. This is a complex field and whole text

Brian Summers – G8GQS



books have been written on just this. Considering fig. 1 you can see the red, green & blue responses. The tricky bit is that these response curves have negative lobes! It is also quite tricky to make CCD's or LCD's that have negative output! The way to do it is to have a Matrix where the RGB signals and their inverse signals are added together in a way that improves the colour fidelity. This attempts to take account of the characteristics of the optical system, light splitter, CCD response and so on. See fig. 2 for a block outline of a matrix.

### Gamma correction

In a perfect system, light in = light out, but due to the non linear signal response of the display cathode Ray tube, CRT, with a typical gamma of 2.2 – 2.8 cameras have the complimentary gamma of 0.45 applied to the signal.

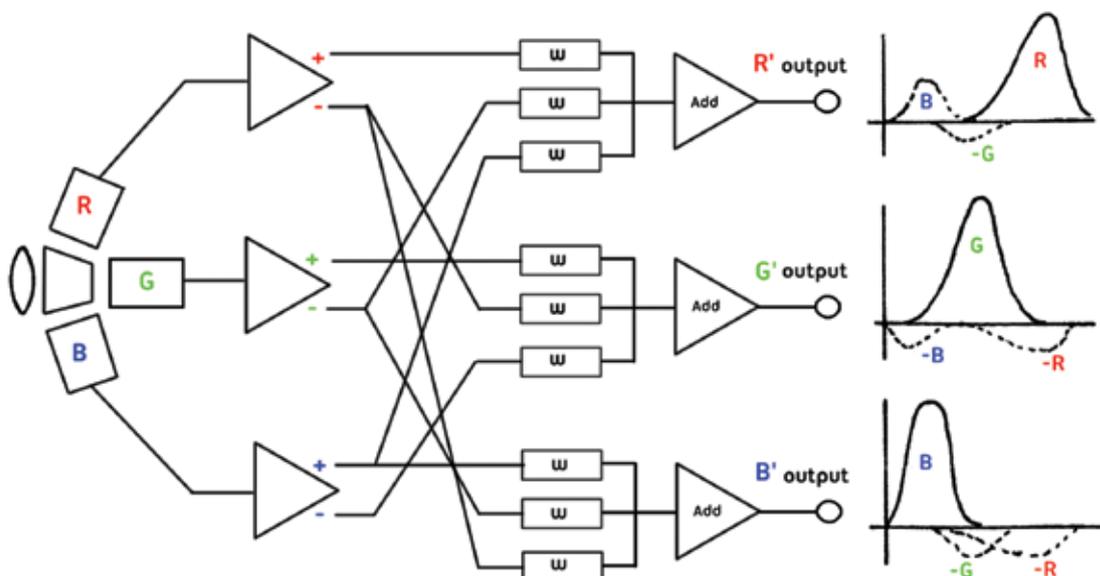


Fig. 2 Simplified Matrix diagram showing the creation of negative lobes and the weighting factor w

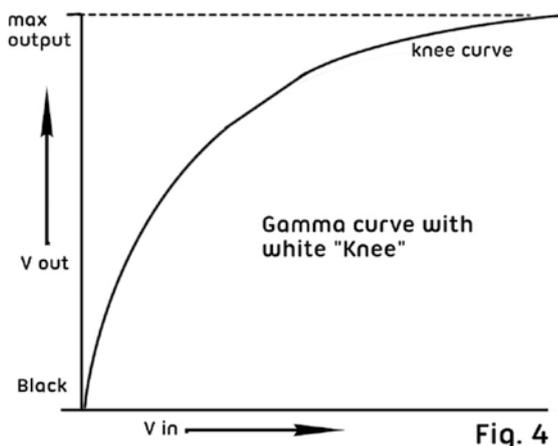
There is usually some choice in the exact gamma value applied (3.5-4.5). Some artistic licence and company policy comes into play. See fig. 3. It is worth noting that modern LCD displays, which are linear, have CRT type gamma built into them to maintain compatibility.

## Black

It should be a statement of the obvious that there should be no “blacker than black” part of the picture, so it’s clipped off! The setting of the Black Level control has a big effect on the picture and it can be lifted (blacks look grey) or crushed (grey parts are black). Sometimes done for “aesthetic effect”??

## White clipping and the white “knee”

Again you can’t have “whiter than white”. Whatever the digital range of your camera, max output is max output. However there is a way of soft clipping that allows some detail through, referred to as the Knee or white Knee. See fig 4. With powerful digital processing this can be very effective in extending the dynamic range and showing detail in the clouds say, that would otherwise be lost. Different manufacturer’s have their own approaches in this area.

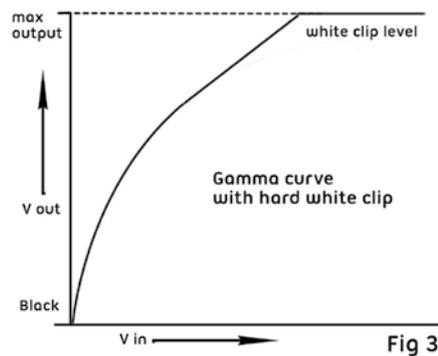


## Shading

Not used in the old sense of fixing tube errors, CCD’s and CMOS sensors have essentially flat outputs, but it can be employed to fix lens errors like port-holeing.

## Aperture correction

Originally used to correct for the loss of fine detail in camera tubes. There were two types:- horizontal correction and vertical (VAK). In analog processing horizontal along



the line was easy to do, but vertical much harder as 2 one line stores were needed. Now easy to do in digits, but there is less need for it as the resolution of sensors is determined by how many pixels are used. However some sharpening of the edges in pictures can be beneficial as it helps with the loss in the optics.

## Flare correction

Again correction of a lens defect. Flare is caused by internal reflections in the optical system causing black level changes. An algorithm for this will look at the lens zoom, focus and iris positions and attempt to correct.

## Colour Balance

Is achieved by adjusting the gain and black level of the Red and Blue signals relative to Green. It can be done manually, automatically on demand, or continuously. Again the algorithms are very clever, but can be caught out. Use with care.

## Digital arithmetic

Once the signals are digitised the old linear way of processing no longer applies and several processes can be carried out at the same point in the processing. Specially developed processing chips are used containing proprietary software and little can be changed by the user. Modern cameras claim up to 600% dynamic range and up to 38 bit internal processing. The reason for such big digital numbers is that if you multiply two 10 bit numbers you get a 20 bit answer. Do it again and you have 40 bits! The answers have to be truncated in some way and the lower order bits discarded. This can be a problem with small 8 or 10 bit numbers and if this is not done well it can lead to visible artifacts in the picture.

## Output arrangements

The broadcast SDI (serial digital interface) is a good choice. Normally 10 bit and uncompressed. I shall be looking at outputs and cable formats in the next issue.

## Postscript

This consideration is a general one. It applies to no camera in particular, but all cameras to a greater or lesser extent. Different manufacturers have their own ways of achieving the same ends. 🗨️

The spec for a high end camera with 16 bit processing can be viewed here:- <http://www.ikegami.co.jp/hchd300/feature/index.html>

# The Matilda Story

Arthur W. Critchley



## Introduction

Now that more than fifty years has passed since I was a Graduate Apprentice at Pye Ltd. in Cambridge from 1957, I thought I might feel safe to tell the story of Matilda, the old London Taxi that several of us apprentices made into a television 'Roving Eye'. It all sounds to be a very long time ago but in some respects could have happened yesterday. As a Graduate Apprentice, I had to serve two years, spending three months in each of several departments.

I started off in Test Equipment Department where test equipment was designed and built for the factory. This was upstairs at the main laboratories and every body wore white coats with detachable buttons and the coats were laundered every week. In those days, hairdressers and barbers used to wear similar white coats and the standard joke when a new face appeared at Pye's in a white coat was to sit down in a chair and say, "Short Back and Sides, Please".

There, I built a Ratiometer used to check the ratios of transformer windings. I had the use of the Model Shop to make all the bits and pieces and made most of the metalwork myself, including the knurled thumbscrews for the front panel.

My next place was in Transformer Design to use the unit I had just made. After that I went to Life Test and other boring places.

## TV Club Hut

Meanwhile, Pye's kindly let us apprentices have the use of a small hut beneath their aerial mast. There, we had built a TV camera using a Staticon pick-up tube and all the gear necessary to run it as well as 70cm and 2m transmitters. We had the use of a spare low-loss feeder up

the mast and installed a rotatable aerial system. One day, we decided that we would install the TV gear into an old London taxi and see how it would work as a mobile.

At Pye's, I met several other Ordinary (five-year) Apprentices who were doing the rounds of the Factory Departments. Among them were David Neech, John Jull, Roger Oldfield, Peter Bendall and Mike Soames. David and John used to work in Camera Test on Image Orthicon cameras.



All these apprentices, and others, belonged to the Pye Amateur Radio Club that met in a small wooden hut at the foot of the Pye mast. They were members of the British Amateur Television Club<sup>1</sup> (BATC) as I was so I joined in with them. We used to listen enthralled to the BBC Radio Goon Shows on Thursday evenings and go around imitating Henry Crun, Bluebottle, Eccles and the rest of the characters in the 'plot'. In this hut they were building all kinds of radio and television gear that included the camera, which was already working. It turned out to be part of a 'Roving Eye' that they fitted into an old London taxi called 'Matilda II' that was kept on the Pye car park near Cathodeon Ltd. (where camera tubes were made). It was owned by the 'Matilda Resurrection Group' and had cost all of £5 from a scrapyards in Linton, just south of Cambridge.

## Matilda

Matilda II was a 1935 Heavy Twelve London Taxicab, named after the World War 2 tank, and had been fitted out with every sort of instrument imaginable by the lads — everything, in fact, except a speedometer, which it did

<sup>1</sup> It was originally going to be called the British Amateur Television Society (BATS), but they decided against that!



not need to have, being pre-1936. Most of these devices were ex-surplus altimeters and things that worked off the vacuum line. One was calibrated in Accles-per-Cringe (Goon Show talk) and had three sections — Doesn't, Does and Bale Out! Of course, all this extra suction messed up the vacuum-operated wipers which ceased to wipe the moment one put one's foot down on the accelerator. The radiator cap was made from an old soda syphon top.

There was a battery of sorts (little better than a capacitor) but the engine had a magneto and a permanently-installed starting handle so a battery was not essential. It was almost impossible to get up enough revs to start it by hand so it was always pushstarted. The lads took it in turns to own and insure Matilda II and it was always being pulled to pieces to fix something or other. Some things just could not be fixed properly, such as the brakes that were always pretty useless, mainly due to oil leaking from the axles. Every now and again petrol would be poured over the brake shoes and set alight to burn off the oil and grease.

The petrol tank was beneath the driver's seat — truly a 'hot' seat — and had a four-inch cap. It was referred to as 'The Drain'.

The transmission system had a four-speed 'crash' gearbox with no synchromesh and a huge gear lever with a big round ball on it. It was a work of art to drive it without crunching the gears as it involved double-declutching both up and down. The engine had a great big flywheel so that the change of revs was quite slow and that did help. In fact, it made it possible to drive it without touching the clutch at all! One could simply ram it into first gear (ignoring the noise) and the wheels would spin on the cinders until the cab took off, the flywheel keeping the engine going. Then it was just a matter of letting it build up speed and moving the gear lever into the next gear, waiting in neutral for the engine speed to adjust. The gear lever required only a slight touch with the finger to drop neatly into gear.

Incidentally, the engine was unusual in that the block was bolted to the crankcase. Most engines have them in one piece. This was very useful when decoking the engine. Another unusual feature was that the timing adjustment was accomplished by means of a rubber coupling that had 20 teeth on one side and nineteen on the other. By moving this coupling one way and adjusting the driven side the other way, the timing could be altered in steps of 1/380th. of a revolution.

Matilda II had been repainted in Delphinium blue with all manner of strange inscriptions on it — 'Don't Laugh Madam, Your Daughter May Be Inside', 'For First Class Passengers Only', 'Remains Live When Switched Off', 'Accident Black Spot', 'Please Do Not Use the Lavatory in the Station', and many more. There was a shop dummy's hand mounted palm uppermost on the left side of the bonnet. The lads came back to it one day after a visit to a pub in Silver Street to find 1/3d in it. The other hand was fastened to the end of a broomstick and was used to give hand signals out of the open back. Most of the time the occupants gave royal waves with the back of the hand.

There was a sign on the back — 400 mpg, which meant 400 miles per gasket! The engine had a warped cylinder head and used to blow the gasket regularly. There was a stock of head gaskets under the back seat and everybody was trained to do a certain job when it went. One would empty the water, another would undo the pipes, another would undo the cylinder head bolts, and so on. When the engine was apart, it would be quickly decoked and then put together again in less than an hour altogether. This was frequently done out on the road when on long trips.

Matilda II had replaced Matilda I just before I arrived. Apparently, the latter had suffered a broken half-shaft and had to be scrapped. It was being towed away by a breakdown truck through Cambridge when, in the Market square, a rear wheel came off and rolled around in the road.

The lads used to take Matilda II on trips around the country for television experiments and for holidays. Matilda II had been taken by them to John O'Groats in furthest Scotland during the summer of 1957. Before that, in 1956, Matilda I had reached land's End in Cornwall.

One of the first trips I went on was to Shelford where we took part in a village fête with our TV camera. This was probably organised through George Balmforth, another apprentice, who lived at Shelford.

## David Neech

David Neech was another stalwart enthusiast in the club and the usual driver of Matilda. He had a permanent girl friend, Joan Marr, who went around everywhere with him

in his Austin Ten car, which had aerials all over it, but his main claim to fame was that he was a Cinema Organ nut. He could not play a note but had a magnificent collection of records.

David and I got on well, as I was also an organ nut but one who could play, and we used to spend lots of time going to the local cinemas to hear visiting organists give their recitals. On one such occasion, at the Regal cinema, we were not interested in the film. We paid the admission fee, listened to Arthur Lord and left immediately. Years later, when cinemas were cut back and their organs were sold off, David bought that very organ, a 3-manual, 8-rank Compton, with a view to preserving it, and had it in storage in his garden shed at Cromwell Road. His attempts to keep it local to Cambridge came to naught and after some years he parted with it to somebody in Wales.

One day in 1959 Joan threw David over and some while after that I took her out a few times. It ended when I was waiting in her house for her to get dressed so we could go out (she was not undressed, you understand!) so I passed the time swatting flies with a rolled up newspaper. There were loads of them, despite several curly and sticky flypapers (remember those things?), and I must have got about ten by the time she appeared. She was aghast at my prowess with the scrunched up and blood-stained paper, which had not yet been read by her father and there was a row. I had thought it was the least I could do to rid the place of flies and it also offered some aspect of sport.

## TV Camera

Mike Soames was another television enthusiast and came from March, near Ely. He worked in the Industrial TV Laboratory in the final year of his apprenticeship and was the brains behind the camera. He made the Synchronising Pulse Generator that was necessary to run the whole system. It used blocking oscillators in a divider chain and they needed constant tweaking to stay on frequency. John Jull made the camera which was painted Pye blue. Being made from scrap odds and ends it only cost 1/3d in total and that was for some spring-loaded ball catches from Woolworth's to 'snap' the lens turret into place. This turret had three positions (for three lenses). The handle which turned them at the back of the camera came from Dagenham.

It seems that they were having trouble finding a decent three-handled knob to put on the shaft (most electronic stuff being four-way). In 1957 (before I arrived on the scene) they had gone to the Dagenham Town show with Matilda I and there in a public toilet they had seen just the thing on a washbasin — a most unusual three-handled tap.



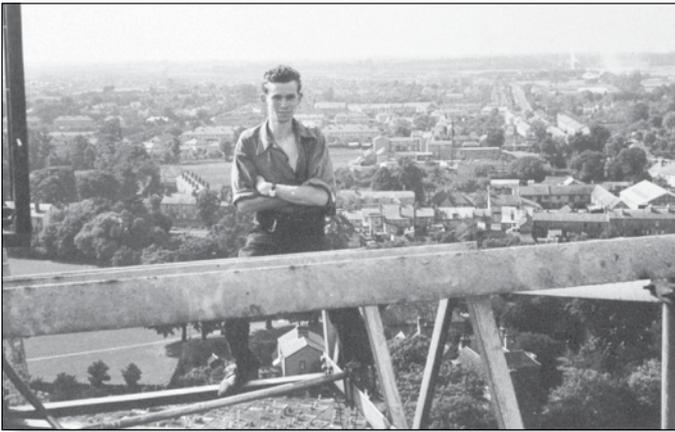
It was quickly appropriated, leaving a jet of water in the air, and fitted beautifully.

## Pye's Mast

Pye's mast was a 180 ft. steel lattice affair with a cross arm near the top and a little hut at the junction. It was used to experiment with aerials and feeders for the transmitter department. The radio club (G8PY/T) had its aerial up there fed by a spare low-loss, coaxial feeder pressurised with nitrogen. Their aerial had an old propeller-pitch motor<sup>2</sup> adapted to rotate it and was a sixteen-element array with a netting reflector. It was capable of transmitting and receiving signals on 70 cm (432 MHz) some 40 miles to and from Matilda II and did so on several occasions. Above it was a two meter Yagi array which was used for the sound channel and other amateur communications. Normal contact was only a few miles due to low-level aerials and line-of-sight frequencies. The vision transmitter used a 6J6 as the output stage that gave all of one Watt on 70 cm, so a 40-mile reception was respectable when we tried it out on Matilda II.

John Jull and Roger Oldfield used to be licensed to climb the mast to attend to things up there. John was a bit of a nut, though, he used to stand with his arms folded, right on the end of the cross arm! Roger had a photograph of him taken from higher up the mast and all that could be seen in the background was the local graveyard at Chesterton Parish Church.

<sup>2</sup>The propeller pitch motor is still going strong as part of Ian Waters' aerial system.



John was called up into the Army for National Service in the Royal Electrical and Mechanical Engineers (R.E.M.E) in mid-1958 and on the day he left, he decorated the Pye mast with an old bicycle, a Walls Ice Cream sign and a huge 'Jolly Roger' flag. Pictures appeared in the local paper and caused some excitement around Pye's. Of course, nobody knew anything about it as John had left. He served some of his army time in Baghdad (Iraq).

As part of his apprenticeship, he had worked at Cathodeon helping to make Staticon camera tubes. There was a high rejection rate and the apprentices used to line the duds up against the wall and throw stones at them. It seems criminal when one found out how much they sold for and realised how many amateur television types could have made use of some of the marginally-defective 'Spoticons'.

### **Birmingham**

Matilda II was taken on a weekend trip to Birmingham and Coventry when we went to stay at John and Roger's homes. We got lost in the oneway streets in the centre of Birmingham and went up the same one-way street several times the wrong way. A policeman stopped us and said, "You must be strangers here! Don't you know where you are going?" "No", replied John, "we feed a map into it and it finds its own way, only it seems to have gone wrong." We got away with it and the bobby sent us on our way without any bother. Matilda seemed to have a magical effect on people!

### **Baldock**

We took a trip to Stotfold, near Baldock, to see Ivan Howard, G2DUS/T, who was a very early member of the British Amateur Television Club (BATC) and had built the first amateur TV camera in 1948. (Ian Waters built the second one). Not having a car, Ivan used to wheel his television gear about in an old pram to demonstrations. He was wheeling it along late one night in the darkness of the countryside when confronted by an officer of the law.

"Hello, Hello, what's all this then? What have you got in there?" "It's a television camera, Constable." "A likely story. You come along with me." But it was!

Ivan did tests with the RAF to prove that transmissions on 70cm did not upset radio altimeters. Consequently, the Post Office permitted Amateur TV transmissions.

Ivan and Ian won the RSGB Courtney Price Trophy for a regular 70cm ATV link of 39 miles from Ely to Stotfold.

### **BATC Convention**

Matilda I had made its first public appearance as a 'Roving Eye' at the Third BATC Convention in 1956. This was held at the Bonnington Hotel in Southampton Row, near Russell Square, London, and the mobile television pictures were a real hit as it roamed around the district. At one point, an equally old London Taxi was seen being towed by a breakdown truck and pursued several times round a roundabout in Queens Square with horns blazing.



### **Dagenham Town Shows**

In 1957, Matilda I took part in the BATC event at the Dagenham Town Show. There were five amateur TV cameras and the Outside Broadcast Unit (Matilda I) all hooked together on twelve receivers for the public to watch in a large marquee. It was the largest such event that had been done by amateurs to that time. Mike Barlow was there and Ian Waters had his Photicon camera too. David Neech was stuck up the aerial mast tracking Matilda I as it ran around the district sending back pictures.

In 1958, Matilda II was taken to the same show, complete with camera gear and petrol-electric generator on the running board, and participated with the Chelmsford BATC Group in a TV play put on by the Valence Theatre

<sup>3</sup> BBC Lime Grove was demolished in 1992. Studio-D was where the earliest Dr:Who programs were made. The first was the pilot for An Unearthly Child'.



Group. I was the cameraman and it went quite well. The pictures were sent to a bank of monitors for all to view — there were no video recorders in those days.

The weekend was marred slightly when Mike Soames drove Matilda II into a Morris Minor. The driver, a Vicar, got out, examined what remained of the flattened boot and then looked at Matilda II in disbelief for there was not a mark on it due to the springy front bumper.

Matilda's brakes were almost totally useless and it frequently took two people to stop it, the driver standing on the brake pedal while the passenger heaved on the handbrake. Mind you, it had four separate horns, including a very raucous klaxon (modified to get two types of noise) so that liberal doses of these usually obviated the necessity for hard braking. No doubt the sight of Matilda II bearing down on one was rather daunting, for most cars seemed to magically get out of the way.

The Dagenham Town Show became an annual event for the BATC and Matilda II was taken again in 1959. Alas, in 1960, Matilda II was no more and I was in the RAF doing National Service.

Matilda II ended its days as scrap at the end of 1959 when it was vandalised on the car park at Pye's. We had just got round to boring out the engine and fixing the head gasket problems by shaving the head. It had just been put back together prior to taking it out on the road again when somebody slashed all the tyres, stole the battery

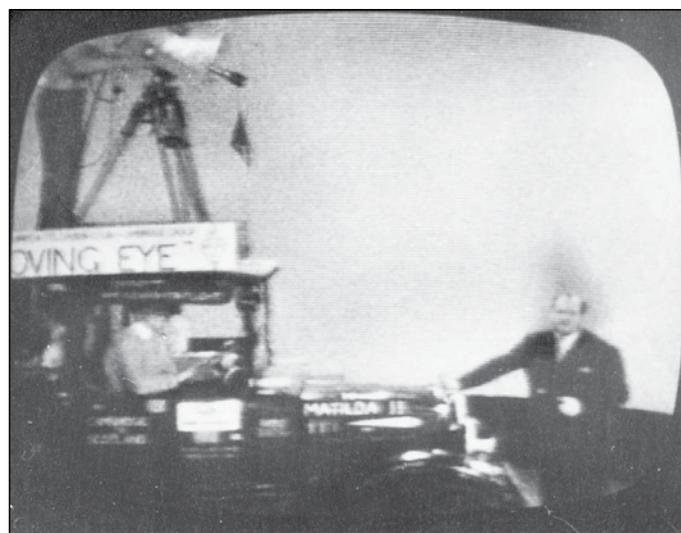
and smashed all the windows and instruments. It was simply not worth trying to repair it all so we had it towed away for scrap.

### Traction Engine

In the summer of 1958, a Model Engineering Exhibition was held in downtown Cambridge and the Cambridge Group put on a display in the form of a television receiver and monitors with a two-way sound system on 2 Metres to their hut at Pye's. There we had two cameras and various modellers brought their exhibits up to Pye's to be shown on the exhibition receivers while they were interviewed by people at the show via the two-way radio. One such model was a beautiful working traction engine which was being driven around outside the hut.

### Panorama

Matilda II was taken to the Fourth BATC Convention in the Conway hall, Red Lion Square, London, on September 6 1958, and roamed up and down the streets sending mobile television pictures back to the show. The BBC saw it and invited the Cambridge group to take it to their TV studios a week or two later to appear on 'Panorama', in the first of a new series of that magazine/current affairs programme.



It was decided that David Neech would be the driver, Mike Soames the inside controller and I would be the camera man up on top. So we set out from Cambridge early on Monday, September 22 1958 for London. We had got as far as Trumpington Street near the Backs when smoke came from under the dashboard — the wiring had set alight. The battery was hurriedly switched off, wires loosened and we carried on without the battery.

<sup>4</sup>The red, green and blue filters (two of each) were changed at frame speed to match the vertical scan of fifty frames per second.

Arriving at Lime Grove Studios in Shepherds Bush about lunchtime, we were told to completely empty the petrol tank for safety reasons and the taxicab was pushed into the freight elevator, taken up to the top floor and into Studio-D<sup>3</sup>. There, the BBC staff provided colour-coded coaxial cables with Syncs, etc., and connected the camera output back to their system. As it happened, the Studio Engineer was Jack Wacey, whom I would work with at the BBC some years later.

In the afternoon, we were taken on a short tour of the new TV Centre under construction at White City, just up the road and alongside the ex-Olympic Stadium.



We all went to meet Richard Dimbleby in his dressing room for lunch and rehearsals were held for the performance that evening. He was not a bit like his widely-held image of pomposity and was very friendly and interesting. He asked some intelligent questions until he found out what he wanted and then wrote out a little reminder note (of names and things) which he attached to Matilda's window frame out of camera shot.

On the show, he interviewed David and Mike while I was largely ignored, being out of the way up on the roof operating the camera. I was wearing BBC headphones so that the BBC could direct my aim for camera angles. The pictures from our Stacion camera were better than the BBC had expected so the lighting was deliberately reduced so that they would not seem to be as good as those from the BBC's old CPS Emitron cameras. Altogether, we had a six-minute live spot (no video recording in those days) of which 2 1/2 minutes was film from the recent BATC Convention. During the film, the camera was brought down from the roof to floor level and used to finish off the program with Richard Dimbleby in close up. We were each paid 15 guineas (£15/15/-d).

A 16mm teleciné film of this Panorama episode was made by the BATC group at Marconi's in Chelmsford and is in

the archives of the BATC somewhere (if anybody knows where, please inform me, I would love to see it again). Bob Moore at Pye's made an audio tape recording and several people (including Ian Waters) took photographs off their receivers. The episode was reported in the papers as being the brightest spot in an otherwise dull program. The Post Office later contacted Mike Soames for him to explain to them how it was they managed to transmit under the G8PY/T call sign when it was not licensed to do so! He managed to explain it all away as artistic licence for the purposes of the program.

John Jull, as the builder of the camera, should have been on the trip but had not long since been called up into the army for National Service. He apparently saw the show in his local NAAFI. After the BBC event, Matilda II sported a new sign — 'As Shown on BBC Panorama'.

### Chelmsford

During the summer of 1958, we took a trip to Marconi's in Chelmsford to see the BATC types over there. John Tanner was one of them as was Jack Terry. Jack had an old Bedford truck which had been a mobile shop and they used to cart their television stuff about in. I got to drive it somewhere locally and, as the battery was almost useless, it had to be started with the handle which was no joke with a six cylinder lorry.

The lads had a clubhouse in some sort of an old barn and they spent the night there in sleeping bags on the floor. This was alright except that there was a large pear tree overhead and every now and again a hard pear would fall off, hit the roof with a bang and roll all the way down the roof to land on the ground with a thump. 'Bang, rumble, rumble, ....., thump', it went all night!

Jack had built a frame-sequential colour monitor with a 14-inch tube inside a two-foot diameter drum with six coloured gelatine filters that whirled round at some eight or nine revolutions per second<sup>4</sup>. It worked quite well until the filters broke up at those high speeds and the pieces would stick edge-on in the wooden cabinet. The vibration was tremendous and the whole thing used to creep across the floor. It was shown at the Convention working with Grant Dixon's colour camera — another first for the BATC.

### Ross-on-Wye

Another epic trip, at Easter 1959, was to Peterstow, near Ross-on-Wye, to see Grant Dixon, the BATC librarian and colour-TV experimenter par excellence. This trip was made in a Pye Telecommunications van which Roger Oldfield was driving (he worked for them on mobile radios). Grant had made a frame-sequential colour TV

camera from almost nothing, winding all his own coils (with 22,000 turns of 56 gauge wire). It worked quite well and this was years before commercial colour television. He was a true amateur Amateur, being a school teacher of Physics, unlike professional amateurs who worked in the business and could often get parts, Grant made most of his own.



John Tanner happened to be there for the weekend from Marconi's. He was then the Editor of the BATC's magazine, CQ-TV.

Also visiting Ross-on-Wye was Malcolm Sparrow, the BATC Treasurer, who owned a steel company near Coventry. Roger, Mike and myself had taken the Cambridge Group's camera and equipment and set it up in town to send pictures to Grant at home. (See the cover of CQ-TV 39, Spring 1959). The weekend was marred only by the clutch burning out in the van on the way back when Roger held it down too long at some traffic lights on a hill.

## Sign

Mike Soames got a surprise at work on April 1st, 1959. A great long parcel was delivered to him at the Lab in Pye's. It was 12 feet long by two feet wide but only a couple of inches thick. What on earth could it be? The postmark said Chelmsford. Everybody gathered around as he unwrapped it. Inside was a thick plywood signboard with raised wooden letters in blue that said 'Marconi's Wireless Telegraph Co Ltd.' and had been sent as an All Fool's day joke by the Chelmsford BATC group. We could hardly send it back to Marconi's. Pye's did not want it around and neither did Mike, so it ended its days as the new floor of my Austin 10 van.

<sup>5</sup> This tube ended up with John Tanner for a museum.

<sup>6</sup> RAF Finningley is now known as Robin Hood Airport and all trace of the RAF base has vanished except for the hangars and runways.

## The Squire

A trip was made to the Wagon and Horses public house (now the Tickell Arms) at Whittlesford, near Duxford, in Matilda II. John Jull crawled out along the bonnet to fill up the radiator while Matilda II was being driven along. Afterwards he decided to stand on the roof. A policeman saw him and caught up with the taxicab. When he saw what he had got he became more friendly. He asked if he had just seen somebody on the roof while motoring along or was he simply adjusting his dress? "Adjusting my dress, constable." So he gave him a ticking off for adjusting his dress in public (a dressing down, so to speak!).

When John went in the army he left from Cambridge so Mike Soames and I took him to the station in Matilda II. After he had departed, we had trouble starting it and asked a passing policeman to help push, which he did, being enveloped in smoke when it started. Luckily, he did not seem to mind.

## Radio Receiver Laboratory

A department that I went to later was where radio receivers were developed. That was more like it and I enjoyed myself there messing about with Frequency Modulation (FM) receivers. I made one for myself out of some scrap parts.

## Industrial Television Laboratory

For the penultimate department of my two-year Graduate Apprenticeship, I was placed in the Industrial TV Laboratory under Ian Waters. This would be about March 1959, and one of the first things that happened there was hearing that the Russians had launched a 'Sputnik' satellite. Mike Soames worked in this place too.

I learned a lot in this department and for my final department in the Graduate Apprenticeship scheme opted to stay there (the final place was optional). I was established as a Junior Engineer on August 31 1959, and put to work designing parts of cameras, Sync Generators, RF Sender units and a host of other things. At last I could put my amateur TV background to use. One thing I did was to build an all-aluminium camera that was to go inside a reactor at Harwell (Aluminium has a short half-life of about three weeks). It was a challenge to learn how to solder aluminium wire with special solder and flux.

Ian Waters, G3KKD/T, was a BATC member who had a camera and transmitter at his home in Ely and had been instrumental with Matilda I during its earlier days. However, he now kept himself somewhat aloof from the rest of the lads since that he had become Chief Engineer of the Industrial TV Laboratory. In later years Ian put his knowledge of transmitters to use as Product Manager,

Transmitters, for Pye TVT (which later became part of Philips and then of Varian) and used to travel around the world to industry shows. I would see him each year at the NAB in Las Vegas and Dallas.

During my time in this department some photographers came round looking for suitable subjects for an advertisement to be placed in the Daily Mirror and other papers. They looked at me and decided I was what they wanted. Fame at last I thought, put on my white coat and combed my hair. I was placed in front of a Studio Staticon camera and told to use an AVO meter to measure something while they took photographs. When the advertisement came out all one could see were my hands!

The studio equipment was designed next door and I got to know many of the engineers there, Fred Steed who designed scan coils, Mike Nurse who designed precision monitors, Peter Bärtschi in the small camera area. Peter was a Swiss student who was also a pilot in the Swiss Army and I met up with him and his wife in Zurich during 1961 while there on holiday. There was also a teleciné department and all kinds of interesting things.

I discovered a large box of junk in the lab one day and managed to purchase it cheaply through staff sales. It contained a lot of parts that had been used to make the Frame Sequential Colour system that Pye's had built in 1953 when they televised the Queen's Coronation in colour to several hospitals in London on June 2nd. In particular was a filter wheel driven by a 90-volt synchronous motor in which the outside went round while the spindle stayed put. This stuff was going to form the basis of an amateur colour TV camera some years later.

One day, while I was working in the Industrial TV Laboratory, I was told to go into the Demonstration Studio (downstairs at the front) and make a table out of Dexion angles and a large piece of plywood. I took a brace and bit with me and started to make fixing holes in the wood. This is taking a long time to get through, I thought while cranking away, when I noticed some bits of copper wire in the drillings. Strange, I thought, then it hit me — the wood was on top of a camera cable and I was drilling right through it as well (with the power on, too). As a penance, I was given the job of making the cable into two shorter ones by putting new connectors on the ends.

On September 3 1959, my two-year Graduate Apprenticeship came to an end and I was offered a permanent job as a Junior Engineer in the Industrial Television Department of the Research Laboratories, which I accepted. My pay was increased to £12/10/-d per week. That is probably an hourly rate these days!

*And so ends the tale of Matilda.*

## Call Up

On September 23 1959, I went for a medical at Brooklands Avenue in Cambridge and passed A.I. This was to do with my possible National Service. I wrote to the Air Ministry requesting a possible commission in view of my age (having been deferred for some years) and qualifications and on Wednesday, 28 October, drove down to RAF Biggin Hill in Kent for a three-day Officer Selection course. There, I underwent all kinds of interviews and exercises, scrambling under tarpaulins, building bridges with insufficient planks and bits of rope, intelligence tests, etc. At the end of it they offered me a post as a Pilot Officer provided that I would sign on for five years. I told them, National Service only, two years or nothing. So it was nothing.

On January 17 1960, I received my call-up papers to report for National Service in the Royal Air Force at Cardington, Bedfordshire, on February 2 1960. I took all my clobber home, including a surplus 3-inch Image Orthicon camera tube<sup>5</sup> that I had plans for. On February 1 1960 I sold my Austin 10 van to Peter Bendall for £30 (I had just fitted a new tyre on a rear wheel) and the following morning set off, suitcase in hand, by train for Cardington and horrors unknown. My last day at Pye Ltd. was January 27 1960.

### Acknowledgements:

- ▶ Some Information extracted from 'The Story of Pye TVT' by Richard Ellis.
- ▶ Ian Waters G3KKD/T.
- ▶ Some Photographs from John Jull, Roger Oldfield.

## Epilogue

What did I do in National Service? Because I was already qualified as an Engineer, I was made a Scientist and put into Bomber Command Development Unit. After some initial playing about trying to program the RAF's computer at High Wycombe, which had all of 2K of memory on a rotating drum, I was posted to RAF Finningley<sup>6</sup> in Yorkshire to do scientific calculations on V-bombers. The job involved all sorts of things from surveying runways to using 20-digit mechanical calculators that could do square roots. We also flew in the aircraft to log instruments every few minutes. For a month I was stationed in Stornoway to measure jammer radiation patterns from Vulcan bombers flying some 50,000 feet overhead. I had only heard of Stornoway on the shipping forecast and quickly found out that it was about as far away from civilisation as one could get in the British Isles!

However, it was not all graft, for I was asked what I might do to put on a display at the Battle-of-Britain Open Day when the RAF base was open to the public. I mentioned flashing neons and similar things then had a brainwave

—“I have a TV camera”. “Good, we will use that”. “But it is not finished”. “Finish it then, the RAF will help”. They did and provided a room in the RAF cinema to keep my stuff in. I finished the camera in my spare time and gave demonstrations to the public in one of the hangars. The event went over well and I did the same again the next year. This camera used a Staticon bought through the BATC in 1954 while I was at college. It had taken me some six years to finish it. Ian Waters had done the same sort of thing at RAF Henlow in 1954.

After National Service I went back to Pye TVT, as it had been renamed, and worked in the Special Products Department building custom items.

At the end of 1962, I saw a job opportunity with the BBC as they were embarking on Colour TV and needed engineers. I got the job and after a few weeks in their Training School at Evesham was let loose as a Studio Engineer in Studio TC4 at the TV Centre.

Another opportunity soon arose in the Studio Unit of Planning & Installation Department (known as StuPID!). This was better than maintaining TV gear, and I spent six years there designing camera equipment such as control desks and monitoring panels.

One of my first jobs in P&ID was to go with Jack Wacey to Pye's to accept some MkV Image Orthicon cameras for Riverside Studios and the TV Theatre. It was funny to have the Pye people jump to my command instead of me jumping to theirs — well, not exactly jumping, but it was a strange feeling. I also did camera acceptance tests at Marconi's and EMI's as well as other places such as Peto Scott for monitors. Eventually I helped with BBC camera and caption installations at most of the major BBC studios all over the British Isles.

In 1969, I was invited to join EMI in their TV Development Laboratories at Hayes to work with their colour cameras and switchers. I worked on the new 2005 three-tube camera and on systems for a 2006 that was never made. As I had once worked at Marconi's as a Summer student, I had actually then worked for all three of the major TV camera manufacturers (Link was formed just before I left EMI). Now, no British companies make TV cameras and most of the ones that did no longer exist.

After a while at EMI, I became involved with their auto-centering system, which I redesigned and for which I received a patent. Four were sold to Granada TV for use on their EMI 2001C cameras on Coronation Street and had a problem that I went up to fix, meeting up with some BATC types there. After that came a new special effects system and sync pulse generators, and all sorts of TV equipment. The first 16 special effects systems went to South Africa and all their panels were engraved in

Afrikaans script. The BBC bought some too and they were used on Dr. Who and Top of the Pops. It all came to an end in 1975 when the EMI TV division was closed down. I was made redundant, along with 600 others. At that time I had just joined the BATC committee.

After dallying with the Radar Division and CAT Scanners at EMI, I was offered a job in Scarborough, Canada, with Richmond Hill Laboratories (RHL), that made Broadcast TV equipment, at a salary that I could not refuse. I decided to emigrate as there were almost no job opportunities in England. There was one offer, but it meant moving house anyway and RHL had offered to pay for my removal.

I was put to work on ancillary equipment such as Unipulse as well as switchers, but nothing much came of it all and RHL was closed down three years later in 1978. I then joined Image Video Ltd. to work on a digital Field Store but there was a financial crisis and a third of the staff was laid off after only nine weeks.

On the principle that if you can't join them, beat them, I started my own company, Key Video Ltd., to make audio-video routing switchers. It went well for 21 years and I used to supply many TV companies, including the Canadian Broadcasting Corporation (CBC) where I again came across Mike Barlow, the Founder of the BATC.

I used to travel to some of the bigger international shows such as the NAB and IBC, meeting up with former colleagues such as Les Germany, Ian Waters, Roger Fenton and many others, in places like Montreux, Brighton, Las Vegas, Washington, Chicago and Atlanta.

Eventually, I closed the business because everything was going digital and I had neither the expertise nor the capital to pursue this. Instead, I set up a small business converting video tapes from one standard to another and copying 8mm films to tape and DVD on equipment that I had made myself. Business was slow so I did some part-time design work for an organ company to create electronic control systems for pipe organs, eventually being employed by them.

I stayed with the organ company for 13 years until a downturn in worldwide business forced them to cut back. At that point I virtually retired. I still do the odd design job for them but mainly play a theatre organ that I built for myself.

I am very pleased at how the CQ-TV magazine has blossomed in recent years and proud to have been a part of it in the early days. I learned an awful lot from it and had a lot of fun too. 🗨️

**Arthur W. Critchley**  
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Markham, Ontario, Canada



## My Station

Peter Yarde – G8DKC

### I Digress from the Station.

I was born and brought up on the Mendip Hills in the village of Priddy - 876ft, 267m above sea level - what a location! Then my parents moved... why? They settled in a village one mile from Longleat House in Wiltshire, at 184m - not too bad, now we see where this is going.

In the late 60's I obtained my licence and not long after this found a local chap who did ATV. I was hooked from day one, as I was an apprentice in the domestic TV trade like many of us, and yes, down to many mobile rallies at Longleat. I made my first attempt at an AM ATV transmission, I think as G6AGB/T, to Mike G8CPF at a rally one year.

Moving on to the 90's Mike looked after GB3UT at Bath University and by then I lived a few miles south of UT. He had just fitted a FM satellite receiver, and the education in ATV continued.

Coming up to to date, I moved to the Midlands, and later heard about the GB3GV keeper wishing to retire and hence my continued immersion.

### My Station Afloat.

The station is very similar to those that many of us have, but a few years ago it was from a narrowboat, having spent many years travelling the UK Waterways - now based on the Ashby canal.

The best signals into GB3GV were anything but 'best' from the home mooring, until 437Mhz happened; then things improved from there.

### My Station in last Few Years

I still have the boat as a /A location, but have moved to bricks and mortar, so power is no problem, and there's more space!

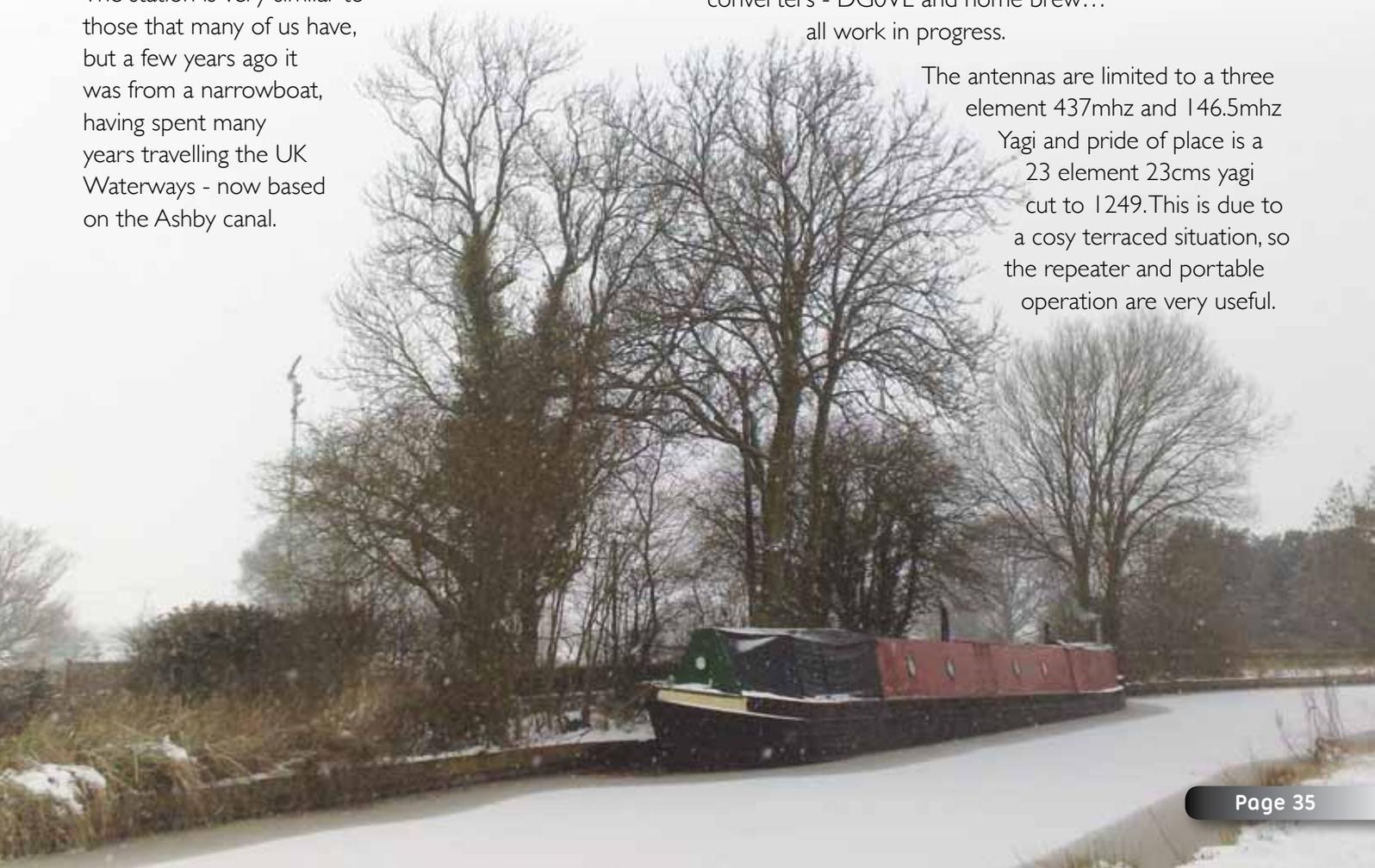
A quick list of my station equipment: my introduction to the Rigol - an affordable spectrum analyser - was the best equipment upgrade ever; the DTX-1, and DATV-Express transmitters and I have more mini computers (Raspberry, Banana Pi and Odroid) than is healthy.

There are two Pcs - one running a TT300 Card and the other running a TT1600 Card with Tutuoune; an Odroid powers the DATV-Express and also one of the others with windows software.

Most of the station normally runs low power as I'm line of sight at 2.5 miles from GB3GV, but can muster 100W on 437mhz and 18W on 23cms, if required. A Spectrian type 23cms 60W power amplifier needs a heat sink.

I have a range of 146.5mhz receivers, front ends and up converters - DGOVE and home brew...  
all work in progress.

The antennas are limited to a three element 437mhz and 146.5mhz Yagi and pride of place is a 23 element 23cms yagi cut to 1249. This is due to a cosy terraced situation, so the repeater and portable operation are very useful.





As many of you know I looked after GB3GV for several years and have now stepped down and moved on to working at the GB3ET site, near Banbury with John M1CNJ.

I have had a few weeks off from ATV playing with the main DV modes: D-STAR, Fusion-C4FM and DMR and I have installed a temporary Fusion WIRES-X node / Internet gateway at home to help the local narrowband FM users tackle the change towards digital as the local voice repeater is going dual mode - as we have in the ATV world.

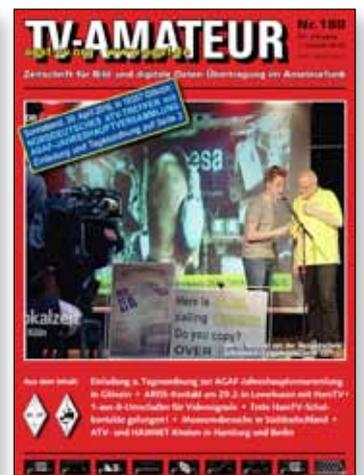
I also have a dish and LNB set aside for the new Es Hail Geosat as and when it becomes available.

73 de Peter 



**CQ-DATV  
Free ATV  
Magazine**

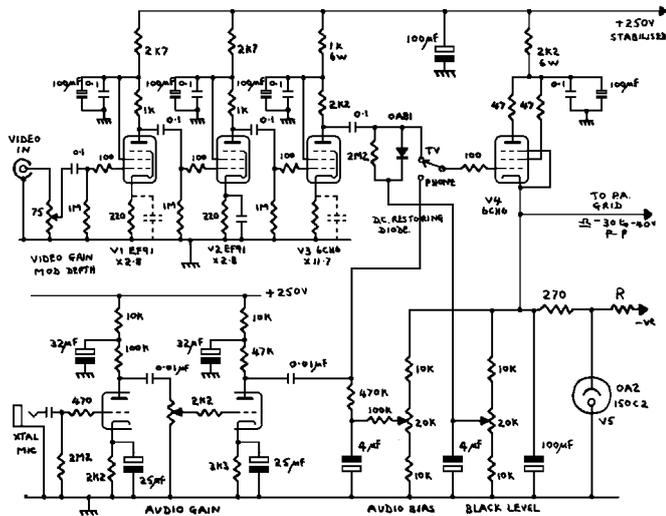
**[www.cq-datv.mobi](http://www.cq-datv.mobi)**



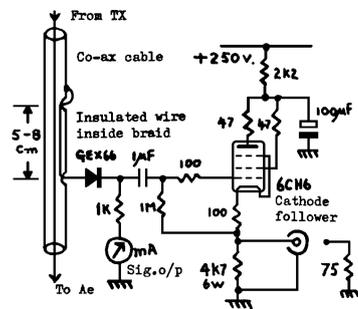
**Other ATV  
Magazines  
are available!**



PA valve with around a 30 - 40 volt signal. A 'simple' one was shown, which catered for both the audio and video signals (one or the other - there was no intercarrier sound



channel as on a broadcast tv signal, as there was not sufficient space in the 70cm band to allow for that with a simple transmitter). It was designed for a 625 line negative modulation signal. 100 pF capacitors could be added across the cathode resistors of V1, V2 and V3 to improve the high frequency response (ie the fine definition), 2 of them being shown 'dotted' on the diagram. A good



system for monitoring the outgoing waveform was considered essential, and a suitable circuit was shown, taking a 'sample' of the signal from the transmitter to the aerial by a wire fed inside the coax cable, passing it through a detector diode

and a cathode follower stage to feed a picture monitor and (or, it said) display the waveform on an oscilloscope. Detailed instructions were also given on how to set up a transmitter for television working.

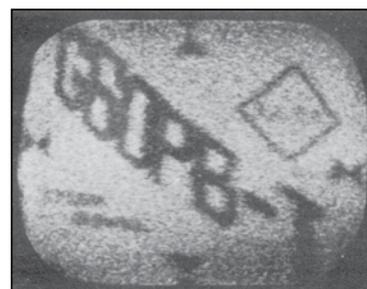
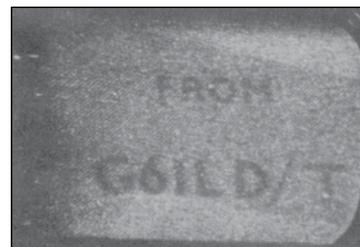


BATC had been able to give various demonstrations of amateur television. G6ACY/T was able to transmit pictures to an audience at Trowbridge Town

Hall, in Wiltshire, whilst the Club had demonstrated various aspects of amateur television at the RSGB International Radio Engineering Exhibition held

in London. Home made colour equipment was able to display either off-air signals from the BBC or locally generated test signals. A camera on the stand mounted on a pan and tilt head that could be controlled by visitors proved popular; its 10:1 zoom lens (again, a novel feature at the time) enabling it to cover the entire length of the exhibition hall. In addition, live amateur television signals were received on 70cm in the exhibition hall from a station at Wembley.

News from BATC members included photographs of record breaking amateur television transmissions on 70cm. The picture from G6ILD/T, north of Darlington, had been taken by G6OUO/T (Now G8ADM!) 216 miles away in Wembley Park, whilst the other photograph was taken 12 days later of the signal received from G6OPB/T in Darlington over a similar distance.



The magazine also commented that if members who only received 3 issues in the previous year thought they had missed one, they had not - only 3 were produced. Cost was one reason, but

there was "no point in printing a magazine without plenty of interesting articles". It added that "some members complain that we do not print enough about what the other man is doing. But if you don't let us know what you are up to, we can't print it".

That is as true today as it was when it first appeared.



# The British Amateur Television Club

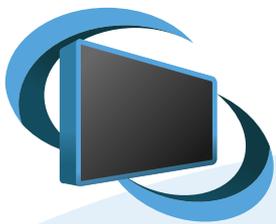
The logo for the British Amateur Television Club (BATC) features the letters 'BATC' in a white, sans-serif font inside a dark blue trapezoidal shape. This shape is set against a background of three concentric, light blue curved lines that suggest motion or a signal path.

## The club provides the following for its members:

- ▶ A colour magazine, CQ-TV, produced for members in paper or .pdf (cyber membership) formats.
- ▶ Web site – where you can find our online shop stocking hard to get components, software downloads for published projects and much more.
- ▶ A members forum at [www.batc.org.uk/forum/](http://www.batc.org.uk/forum/) for help, information and the interchange of ideas.
- ▶ A video streaming facility at [www.batc.tv](http://www.batc.tv) which enables repeaters and individual members to be seen worldwide.
- ▶ An annual Convention held in the UK where you can meet other members, visit demonstrations and listen to lectures.
- ▶ Meet other club members at the BATC stand at local rallies across the country.
- ▶ The new **BATC Wiki** for all the details of systems and projects for all things ATV. <https://wiki.batc.tv/>



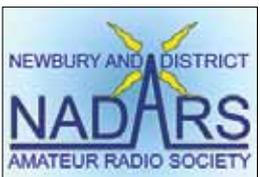
[www.batc.org.uk](http://www.batc.org.uk)



# BATC

## Out and About

RadioFairs



**You will be able to see the BATC stand at the following forthcoming rallies and events in 2016. Come and say hello!**

**17 July** – McMichael Rally, Near Reading.

[www.McMichaelRally.org.uk](http://www.McMichaelRally.org.uk)

**24-25 September** – BATC Convention.

[www.batc.org.uk](http://www.batc.org.uk)

**30 Sept. & 1 Oct** – National Hamfest, Lincoln.

[www.nationalhamfest.org.uk](http://www.nationalhamfest.org.uk)

**6 November** – West London Radio & Electronics Show, Kempton Park, Surrey.

[www.radiofairs.co.uk](http://www.radiofairs.co.uk)

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

batc.org.uk