The British Amateur Television Club

CQ-TV

No. 260 – Summer 2018

DATV on 71 MHz

71 MHz Transmitter Low Pass Filter

71 MHz Receive Upconverter

18W 5GHz band FM-ATV TX

76GHz tests June 2018

The BATC Bursary scheme

The Royal Wedding in High Dynamic Range

A 3 Watt LDMOS Driver for the 432MHz band

Portsdown Newsletter

5.6 GHz ATV – the record DX chase

Discovering the joys of 5.6GHz ATV

... and all the regular features

BATC Out and About

The Kempton Park, West London Rally
Photos by Rob Burn - G8NXG

▶ *Tony G1HBD (right) showing off his ATV van to a visitor*

▶ *(left) Dave G8ADM in charge of the BATC stand*

▶ *(right) Brian G8GQS with Richard M0TUW looking after the stand.*

Railways on the air – Sept 22nd / 23rd

"This celebration is not a contest - organised so that radio amateurs have a good time and promote Amateur Radio while helping to celebrate the unique position railways hold in our national heritage." https://rota.barac.org.uk

What could be better - a weekend of radios and railways offering some great technical challenges and video opportunities.

Why not team up with your local radio club and show them what ATV is all about?

CQ-TV 260

Contents:

Contributions

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

Alternatively you can write to us at:
BATC, Silverwood, South View Road, Pinner, HA5 3YA, United Kingdom

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.

BATC

BATC Online

Website: http://www.batc.org.uk
BATC Wiki: https://wiki.batc.tv
Forum: http://www.batc.org.uk/forum/
Stream: https://batc.org.uk/live/
Dxspot: https://www.dxspot.tv/

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The BATC 2018 General Meeting

The official notice to members that the next BATC General Meeting will be held after CAT18 on Sunday afternoon at 2pm was published in CQ-TV 259 and this article sets out to answer a few questions members may have. The club constitution is available on the website and members should refer to that document for further information.

How often does BATC hold a general meeting?

Our constitution does not specify exactly how often, but it has become custom for us to hold them once every 2 years – hence why it is not called an AGM!

What happens at the GM and how long does it last?

Normally there will be a Chairman's report outlining what has happened to the club since the last GM and the treasurer will give an update on the financial state of the club. Then any BATC awards and contests certificates / awards will be presented and finally there will be the committee member elections. The meeting will typically last an hour.

Who can be a committee member?

Any member - BATC can have up to 8 committee members, including officers, who can serve up to 2 terms and then need to be re-elected. (The president is not officially on the committee).

This year Brian G8GQS, Dave G8GKQ, Frank M0AEU and Clive G3GJA will need to stand for re-election and Phil M0DNY will also need to stand for election following his co-option on to the Committee during the year – they have all said they will stand for re-election. Noel G8GTZ, Ian G8XZD and Rob G8NXG can continue without re-election, but Dave G8ADM will be retiring from the committee

This means there will be an election for 5 places this year – if you fancy serving the club and would like to stand for election, please let us know preferably 60 days before the meeting and you must have the support of at least 2 other members.

Who chooses the officers?

After the GM, the new committee elects the chairman, secretary and treasurer. Note that G8GTZ will not be eligible to continue as Chairman as he has served 3 continuous terms and Dave G8ADM will be retiring as secretary.

Can I get an item discussed at the meeting?

Yes, but as this is a formal meeting for important club business, you must send it to the secretary 60 days before the meeting and it needs to have the support of at least 20 members of the club.

When is the meeting agenda published?

The meeting agenda is published 28 days before the meeting and will be sent to all members by email.

Why should I bother to attend?

Firstly, we try to make it an interesting meeting and give out information to our members. Secondly it is important that you show support for the committee and direction the club is taking. Thirdly, It's not a long meeting and should be great finish to the CAT18 weekend!

Can I get a vote even if I'm not there?

Yes , once the agenda has been published you can download or apply for a postal voting form – you should then return the form by post to the secretary and it will be counted as if you were there at the meeting.

CAT18 – Sept 9th and 10th

- 2 day program including talks and demos
- Fix it, test and measurement area
- Members flea market and traders
- Free access to air museum
- BATC GM on Sunday PM

Midland Air Museum Coventry
- Just off M69 / M6

Tickets on sale NOW at the BATC shop

New and renewing members

Rob Burn – G8NXG

As you will read elsewhere, the introduction of the new website has focussed much effort in ensuring that a smooth transition took place! Membership levels are now running in excess of 1100 for each month; the appeal of DATV plus the availability of new bands to use continues to provide inspiration for new members. It is also great to note worldwide interest from ATV enthusiasts – all are welcome.

In terms of the quarterly listing which follows, all members joining and renewing continued to be captured from the old website and those members who joined in the final week of May via the new website have been added afterwards. This listing then covers the period March to May 2018 with the usual caveat that as it is manually created mistakes do creep in. Please let me know if you were expecting to see your details!

The format is the same as in previous editions: by country and post-town and I hope that this continues to be an easy way to locate a local ATV enthusiast.

On the separate subject of the issue of reminders to members for membership renewals: please note that all members who have an e-mail address will only receive reminders by e-mail in future; the practice of also 'snail mailing' a reminder is not really valid these days as most members pay for subscriptions via PayPal. For those who prefer to send a cheque it is a straightforward task to print the reminder and post it together with your cheque.

Members who do not have an e-mail address will continue to be advised via the post.

Australia		
Charles Cutler	VK3CAC	Berwick
Peter Cossins	VK3BFG	Melbourne
Wayne Stringer	VK5BI	Seaton
Anthony Bedelph	VK7AX	Ulverstone
New Zealand		
Keith McRoberts	ZL2TKM	Nelson
Japan		
Nobuo Katsuma	JF1WKX	Niiza
Mitsuhiro Matsumoto	JA6MQT	Oita
Satoshi Yasuda	7M3TJZ	Sayama
Austria		
Gerhard Burian	OE3GBB	Wartmannstetten
Belgium		
Vandewalle Yves	ON4YV	Brussels
Krist Perneel	ON4API	Roeselare
Michel De Cock-Perreman	ON4DCP	Sint-Lievens-Houtem
Bulgaria		
Stefan-Konstantin Dimitrov		Sofia
France		
Patrice Boyer	F1NSU	Aulnay Sous Bois
Francis Picq	F6DES	Breugnon
Roger Noyon	F1AEA	Escolives Ste Camille
Auvray Michel	F1ETU	Izy
Dominique Metayer	F1EJP	Le Grand Quevilly
Pierre Binggeli	HB9IAM	Lent
Keller Denis	F6GXI	Marseille
Bernard Calmels	F1NST	Marseille
Jacques Rambaud	F6BKI	Merignac
Gérard Didier	F5LRX	Montmort-Lucy
Roland Etienne	F8CHK	Pabu
Michel Pacquelin	F1CHM	Pasly
Rolf Collette	F9ZG	Saint Gilles
Jean-Marie Vallet	F6HBW	Veretz
Germany		
Rolf Gerhardt	DG8AR	Bruchsal
Thomas Ehrhart	DF7PZ	Hoehr-Grenzhausen
Mennicken Claus	DK1UP	Neresheim
Andres Justus	DK2ER	Niederkassel
Guernsey		
Keith Le Boutillier	GU6EFB	St Andrews
Ireland		
Stephen Ormondroyd	G8RHQ	New Ross
Malta		
Dominic Azzopardi	9H1M	Birkirkara
Netherlands		
Chris Van den Berg	PA3CRX	3813CX Amersfoort
Fred Marinus	PE1EXM	5467 Hk Veghel

Rob Engberts	PA0RWE	Alphen a/d Rijn
Jelle Meintema	PE1AEE	Drachten
Marco Geels	PE1BR	Enschede
Gerrit Nieuwpoort	PD0RZJ	Hillegom
Portugal		
Jorge Amarante	CT1XV	Parede
Slovenia		
Stefan Lebar	S51L	9240 Ljutomer
Spain		
Francisco Haro	EA7GLU	04001 Almeria
Pablo Cruz corona	EA8HZ	El Rosario
Lorenzo Manso	EB3CKD	El Vendrell
Juan García Dolz	EA3EDK	Sant Fost de Campsentelles
Switzerland		
Pierre André Gossweiler	HB9AKP	1121 Bremblens
United Kingdom		
Chris Tanner	MW0LLK	Amlwch
Steve Haseldine	G8EBM	Ashbourne
Joe Bingham	GI4TAJ	Ballyclare
Alan Rishworth	G8UHN	Banstead
Gary Whittaker	M1EGI	Barnsley
Philip Hardiman	G6HSS	Basildon
Ian Gordon	G8IFT	Birmingham
David Andrews		Blackburn
John Morris	G3PHA	Bolton
Elliot Riddle		Braintree
Terence Taylor	G8DQD	Bristol
Roger Jones	G7RGR	Burnham on Crouch
R Beech	G1BXG	Chandlers Ford
John Houldridge	G6KYD	Chessington
Brian Corker	G8FBQ	Chester-le-Street
Bob Kerby	G0CHK	Chichester
Bob Johnson	G7JHW	Church Gresley
Jack McKinney	GI3TZB	Co Down
Philip Richardson	G8MLA	Coldham
Anthony Hodgkinson	GW1SAM	Colwyn Bay
Juan-Carlos Berrio	2E0EJZ	Countesthorpe
Jack Darby	G4TVC	Crawley
Graham Jefferies	M1ASR	Driffield
David Harbour	G0EID	East Grinstead
Bob O'Callaghan	G1EPL	Fleetwood
Anthony Parker	G4AXN	Great Yarmouth
John Ferrier	G0ATW	Grimsby
Mark David	G4MEM	Harrogate
Michael Groves	G4DME	Heanor
Robin Ridge	M0RRX	Helston
Raymond Brooks	G8KPS	Hook
Bob McDermott	G6TDR	Ilkley
Graham Leighton	G8FXB	Ingatestone
Tim Fardell	G7LRJ	Ipswich
Jeremy Harmer	M6IGP	Leeds
Tony Krvszelnicai		Lincoln
Simon Clark	2E0DXE	Lincoln
Peter McFarland	GW7BZY	Llangefni
Scouts, Gilwell Park	GB2GP	London
Roger Glover	G8IUC	London
Andrew Coulthurst		London
Steven Turner	G6LPF	London
J Kirkham	M1DGK	London
Paul Lister		London
Daphne Neal	G7ENA	Louth
Patrick White	G6CJB	Maidenhead
Christopher Hall	G6HTH	Maidstone
David Robinson	G4FRE	Malvern
Frank Beesley	G8CZE	Manchester
Adrian Hope	G0ACZ	Matlock
Anthony Pearce	G0AZQ	Nafferton
Michael Featherstone		Newcastle on Tyne
Jenny Bailey	G0VQH	Newmarket
Torbay Amateur Radio Society	G3NJA	Newton Abbot
Anthony Nicholson	G8FLV	Northallerton
David Gell		Nottingham
Graham Denton	G8VAT	Nr Goole
Stephen Catlin	G8HLM	Oakham
Geoff Oliver	G0BJR	Oldham
Alan Bowness	2E0GYO	Ormskirk
Ian Marsh	G4EXD	Penrith
Brett Johnson	G6URM	Plymouth
Marcus Bowman	GM4LVW	Prestwick
Peter Martin	G0GIR	Rochester
Ray Hill	G6TSL/ G0IMV	Ross on Wye
Ray Burlingame-Goff	G4FON	Saffron Walden
William Ricketts	G8LJO	Salisbury
Ian Tickle	G4ZJH	Saxmundham
Stephen Webster	M1ERS	Sheffield
G Chaplin		Southampton
Chris Bryant	G3WIE	Southampton

Henry Neale	G3REH	Spalding
John Newman	G0VDU	St Austell
Warren Dibden	G6OXW	Stockport
Martin Keyte		Stoke on Trent
John Pedley	G1YBM	Swadlincote
David Hazell		Swindon
Ray Gathergood	G4LUA	Tadley.
Dave Hall	G8ZVT	Telford
Lee Layland	M0LGL	Warrington
Chris Foote	G8IPN	Weybridge
Ashley Booth	G8DPH	Windsor
Colin Durbridge	G4EML	Woking
Andrew Hearn	G3UEQ	Worthing

United States		
Bob Helling	K9PQ	Bothell
Henry Cantrell	W4HTB	Bowling Green, KY
Stephen Ralph	W6SKR	Flagstaff
Lee Weitzel	K0CCU	Glendale
Bill Scott	K6PKL	Manteca
Charles Yurek	KD2HNS	Pennsauken
James Edelen	KA3KIU	Pennsylvania
Ed Mellnik	WB2QHS	Portland
Jaroslav Rosicky	KB6T	San Leandro
Kevin Hempson	KK6JPN	Sutter Creek
Bob Miller	WB6KWT	Tracy
Art Towslee	WA8RMC	Westerhill

Chairman's Waffle

Noel Matthews – G8GTZ

Well – as I write this, I've just realised this will be my last Chairman's column as my run as chairman comes to an end at CAT18. Looking back I think we have achieved a great deal and brought BATC back from what was starting to look like a terminal decline. In the last 5 years we have increased membership from just over 800 to ~1150, improved look and feel of CQ-TV, increased contest and activity day involvement to record levels and through the Portsdown project we have made DATV something where all can get involved. We have launched DX-spot.tv, the new BATC web site and streamer and have a very active ATV community on the forum – overall the UK ATV scene is in a much healthier state than it was, but all this has been made possible because of the groups of people behind the scenes – the BATC committee, DATVexpress team, the digilite/digithin team plus F6DZP and the MiniTiouner team.

In order to continue to stimulate the ideas and initiatives for our great hobby, the BATC committee has decided to introduce the BATC Bursary award – this will enable grants of money to be given to individuals and groups who are driving projects to benefit the ATV community in their local area, nationally or internationally. For more details see the guidelines in this CQ-TV.

Also in this issue we are featuring 71MHz DATV as we now have an easy on-line NoV process similar to the 146MHz process – the band offers great potential but it will be interesting to see how well single carrier DVB-S works over the longer paths where multi-path may well affect propagation.

There is also a page explaining exactly what happens at the BATC GM and how you can get involved by standing for committee. The GM is only one part of the CAT18 weekend and we are looking forward to see as many members as possible at the event – if you are intending to come please buy your tickets in advance from the BATC shop – if you can't be there, the article also describes how you can register for postal votes

Finally we have successfully launched the new website! This went far more smoothly than we could have hoped (perhaps the 4 years of planning did pay off) and initial reactions have been very good – if you have not already logged in to the new site you will have to do a password reset first – full instructions are available on the BATC wiki.

And so to my final (as they say on 80mts) I just want to say thanks all the members, but particularly the committee, for all the support over the last 5 years, we couldn't have done it without you and I look forward to an exciting future for the worldwide ATV community and seeing as many members as possible at CAT18 in September.

73, Noel – G8GTZ

Contest and Activity Weekend News

Dave Crump – G8GKQ

IARU International ATV Contest June 9/10

The International Contest weekend saw the highest activity levels across the UK for many years. I know of 41 stations who participated, many from more than one location. I was particularly pleased to see activity in Northern Ireland – we just need to get Scotland on the air next year!

The results are not yet finalized, but the provisional UK results for the IARU Contest are here:

Position	Call	IARU Points
1	M0DTS	10000
2	G8GTZ	9601
3	G8GKQ	8616
4	G1LPS	7269
5	GW4CBW	6940
6	G3NWR	5650
7	M1EGI	3764
8	G8AGN	3150
9	G7AVU	2588
10	G0ATW	1830
11=	G0HIK	1650
11=	M0KPW	1650
13	G3KJX	1358
14	G4FVP	1272
15	G4LDR	920
16	G4BVK	768
17=	G6OXW	330
17=	G8AFC	330
19	G4GUO	328
20	G4KLB	326
21	G8EOP	316
22	G7JTT	278
23	G6AUR	216
24	GI3VAF	210
25	GI7UGV	160
26	2E0XAY	35
27	M0YDH	30
28	G7MEG	15

The provisional results for the BATC 146 MHz contest are:

Position	Call	BATC Points
1	G8GKQ	354
2	G8GTZ	317
3=	G3NWR	308
3=	GW4CBW	308
5	G4BVK	188
6	G4KLB	105
7	G7JTT	76
8	G3KKD	32
9=	G4NKV	22
9=	M0DTS	22
11	G4HJW	14

Space permitting, we will be able to publish the league tables for each band, and the International results, in the next issue. Thanks to all of you who made the effort to make this contest such a success.

May

I missed the May activity weekend, but it provided a good opportunity for a number of stations to check their gear prior to the contest. I saw reports of activity on 146 MHz and 5665 MHz, but despite the marvelous weather there seemed to be very few DX Contacts.

April

In contrast, the April activity day was very lively with the GW3NWR/P team of G4EWJ, G6NOI and M0LCR out near Flint. They worked G3ZGZ, G3RFL and G4WIM on 23 cm and 146 (not G3RFL). They also managed to work M0KPW/P and G0HIK/P in Cumbria at 120 km on 5665 MHz.

On the Saturday, there was lots of activity on 5665 MHz in the South West with GW8VPG/P working G4UVZ/P, G8GTZ/P and myself with a best DX of 109 km. Not to be outdone, M0DTS/P worked G0RPH/P, G4PDF/P, G8AGN/P and M1EGI/P all at about 100 km on 5665 MHz.

▶*Pictures Received by M0DTS/P*

Further Activity Weekends

We have activity weekends planned for the second weekend of July, August and September. So please try to get on the air and keep the activity levels high.

Contest and Activity Day Manager Position

I am pleased to report that Clive G3GJA has volunteered to take over the Contest Manager position. I have enjoyed running BATC contests and activity days for the past 10 years, but the time has come for a change and I am sure that Clive will bring new enthusiasm to the post. Please support him by getting on the air at every opportunity.

Contest and Activity Weekend Calendar

Activity Weekends - all operation commences at 1200 UTC on the first day and finishes at 1800 UTC on the second day:

14 and 15 July 2018

11 and 12 August 2018

8 and 9 September 2018

20 and 21 October 2018

17 and 18 November 2018

8 and 9 December 2018

12 and 13 January 2019

9 and 10 February 2019

9 and 10 March 2019

6 and 7 April 2019

4 and 5 May 2019

International ATV Contest - operation commences at 1200 UTC on the first day and finishes at 1800 UTC on the second day:

8 and 9 June 2019 - IARU International ATV Contest

A potted history of the new BATC website

Rob Burn - G8NXG

For some while, in fact years, BATC committee members had come to the view that the website had reached the end of it's design life. Although providing a valuable service over many years, like many things in life it had become overtaken by time; its dated style did not endear itself to new members and it had become difficult to maintain – some sections had in fact had become unreliable. Members who could not initially access the site until a member of committee did a manual password reset will know! In parallel with this the streamer side of the site was also stuck in a time-warp and could benefit from an update.

The committee was then faced with a dilemma – how and what to do about it. It was obvious that a cost-effective solution was needed, to move the BATC's on-line presence to something that would look modern, be straight-forward to update and remain so for some years. Would it be possible to integrate all of our other sites into one portal – and what do we want a new website to achieve?

The old website was developed to provide a portal for interested people to find out about the BATC; for current members to renew, buy parts and download CQ-TV and for anyone to see who the current committee members are, the constitution etc. A one-stop shop for ATV enthusiasts to find information about the current art of ATV.

The original site was developed by a club member, Chris G1FEF who has undertaken a sterling job over the years. However, because of the demands of development, introduction and continuing support required of a new site it was considered that it was not reasonable to expect that a club member should continue to undertake this task. Most members of the BATC prefer to experiment with ATV and not websites! Accordingly the search was on for something that could be 'easily' used for the BATC site – to include all of the present functionality and include the streamer, forum and maybe even dxspot.tv. So the first job to do was to document all of this and other additional features that we wanted to see. After much discussion a Version 1 requirements document was completed.

In the later months of 2016 Noel G8GTZ started to experiment with open-source solutions and since there are only three major players, elected to go for Wordpress, as this appeared to offer most potential to achieve the outline goals plus there are a wide range of plug-ins available to extend functionality. Although some valuable experience was gained (in fact Noel had the first version of the new website running by January 2017) it became apparent that without specialist assistance it was not possible to move forward to provide all the functionality that you see now see in the new site. Thereby we meet another dilemma: do you attempt to get a website built from scratch, or do you carry on with open-source solutions? The decision became obvious; using open-source software, despite the ramifications in some cases of poor or no documentation, became the choice because of affordability!

With that decision taken we could all get stuck in; after taking soundings a developer was appointed and briefed as to what we required. By February 2017 agreed working documents were in the hands of the developer with a proposed completion date of April 2017. With the benefit of hindsight that proved to be very optimistic!

There followed many months of testing and retesting. Keep in mind that what we wished to do was to provide the database for member records, the online shop, facilities to purchase subscriptions and parts from the online shop, automatic e-mail reminders, bulk e-mail facility to make announcements, the updated streamer linked to member accounts and an integrated forum. The vision and drive for all of this came from Noel G8GTZ and Dave G8GKQ and it has to be said that without their focus on the project we would still be waiting for a new web presence today.

By January 2018 a migration plan had been formed: Phase One was to be the transition of shop and member database; Phase Two was to add-in and integrate the new streamer; Phase Three was to have been the integration of the Forum after about 3 months of successful operation. By then the Forum had already been transferred to a new server and continues to work well, so there is perhaps no sense in fixing something that isn't broken! Accordingly the plan was revised to leave the Forum as it is.

Up to this point a very small version of the database had been imported; the task now was to test the behaviour of the new site using the then current, 1000+ member database plus the shop with all it's parts. This cautious approach paid off. The test website had been made available to committee members plus a few ordinary members for comment and feedback. This approach revealed more bugs to be squashed but with the added bonus that the new streamer could be made available from the outset; not as a separate phase.

With sufficient testing and bug eradication out of the way another milestone had been reached and another major decision was made – the go live date!

May 27th was selected, preceded by a week of final tests and activity involving data imports, Mailchimp synchronisation and a myriad of other things required to be in place before the Big Day. Noel G8GTZ arranged for a bulk mailing of the announcement to members that the site was now live and the committee stood by to deal with any issues arising.

Thus far, the fall-out from users of the new site has been negligible; due in no doubt to the long hours, care and attention to the project by Noel G8GTZ, Dave G8GKQ and Phil M0DNY. It is still early days and the committee continue to be on the lookout for possible problems. As time goes on the odd glitch will be revealed and I would ask for your patience in advance if you become embroiled in a website problem. Meanwhile, please do become acquainted by the site and take a look at your membership summary for errors. It has been designed to be easy to get around and anyone who is familiar with the internet should have no trouble in negotiating it.

The launch of the new website is the culmination of many hours of discussion, planning, experiments and testing. It meets the goal of providing BATC members with a modern and straight-forward interface to the facilities on the site; I would hope that this adds to your interest of being a member of the BATC.

DATV on 71 MHz

Noel Matthews – G8GTZ

ATV operators in the UK have, for the last 2 years, had access to 1MHz of spectrum centred on 71MHz. However, they have had to apply for a special research permit using a manual paper process and a number of operators reported problems with application getting stuck and never receiving the permit.

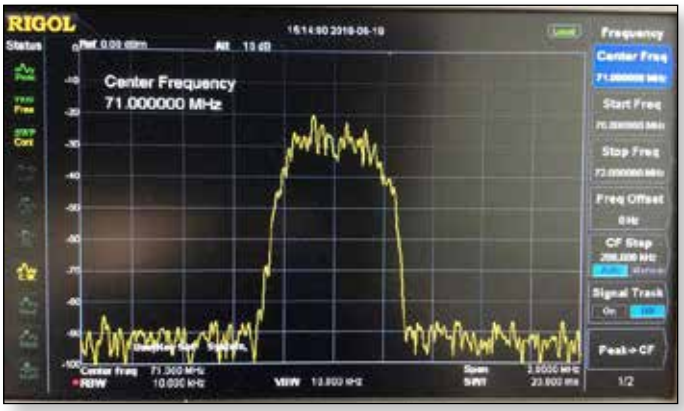
Last week the RSGB announced that the licensing conditions have been changed and the spectrum is now available to as an NoV available to holders of the full UK license. Applications are now done on-line in a similar process to the 146MHz NoV and result in an NoV being issued immediately. See ***http://rsgb.org/main/operating/licensing-novs-visitors/online-nov-application/70-5mhz-and-71-5mhz-nov/*** for more details. The NoV allows operation with a maximum of 100W ERP, but prohibits operation within 40 km of the coast or border of Scotland.

Shaun G8VPG, and Noel G8GTZ have compiled this list of equipment to get started on 71 MHz DATV.

Transmitter

The Portsdown will provide approximately 10mW output on 71 MHz. It should be noted that the QPSK constellation is not perfect because the modulator is operating out-of-specification (lower limit 100 MHz); however, this has very little effect on its usability. Note also that the Portsdown will work in Ugly mode at 71 MHz for cross-shack testing. The Lean DVB receiver in the Portsdown will also work (for H264 signals) at 71 MHz.

The DATV Express works well at 71 MHz whether driven by a PC or by the Portsdown.



Power Amplifiers

Anglia Live list a Mitsubishi black brick module type RA30H0608M-101 with a frequency range of 68-88MHz. This gives 30W out for 50mW drive, maximum output 45W at a supply voltage of 12.5V although the numbers for DATV will be significantly lower.

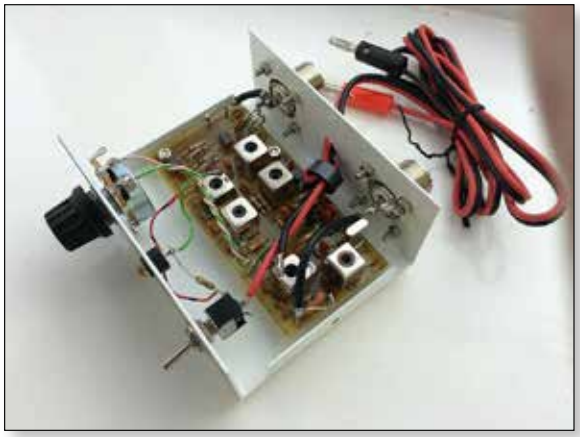
It looks similar to the types we already use for 2m, 70 & 23cm and can be biased for linear operation. GM3SEK has produced an excellent application note for these modules, including values for a 4m version with low pass output filter; ***http://www.g4ddk.com/AN4.pdf***

Receivers

The receiver for 71MHz is slightly more difficult as tuners do not cover 71 MHz natively. So just like 70cms in the early days where we used the SUP2400, we need an upconverter to convert the signals to a frequency covered by our standard DATV tuners.

Mike G0MJW has designed such a board and is published in the following articles – the design needs an external oscillator which can be any good source such as an ADF4351 – note if the oscillator is set to 366 MHz the output frequency will be 437MHz allowing the use of standard presets on the MiniTiouner software. For Portsdown users, Dave G8GKQ is planning an update to the software to allow the ADF4351 LO in the system to run during receive on a frequency chosen in the band setup menu – the 2nd output on the ADF4351 can then be routed to the receive converter, avoiding the use of a 2nd board.

Spectrum Communications produce a range of receive up converters, 10, 6 or 4m up to 2m. They feature a MOSFET front end with some filtering, crystal controlled LO and mixer. They are available as kits or ready built.



Filters

Band pass filters are going to be crucial on receive. Ex-equipment low band PMR filters are readily available at most rallies and there are a large number of published designs in publications such as the RSGB VHF-UHF manual.

For transmit, Charles, G4GUO, has used the Elsie program to design a 7th order Chebyshev filter with a return loss at 71 MHz of -18 dB. This is easy to construct in a die-cast box (old or new!) and details are included here.

Aerials

For those used to operating on higher frequencies, the aerial size is a little daunting!

Sandpiper produce a 3 and 4 element beam for 4m. Boom length is 2.2m, element length 2m and it is gamma matched. Moonraker produce a similar 5 element beam and a smaller 2 element HB9CV.

First tests

Mike, G0MJW has had Tx capability for some time but Arthur G4CPE and Steve M0SKM achieved the first 2 way QSO on the band on June 22nd 2018.

Both stations were using ex commercial converters originally 1GHz in and 70MHz out with an 930MHz oscillator and vertical aerials.

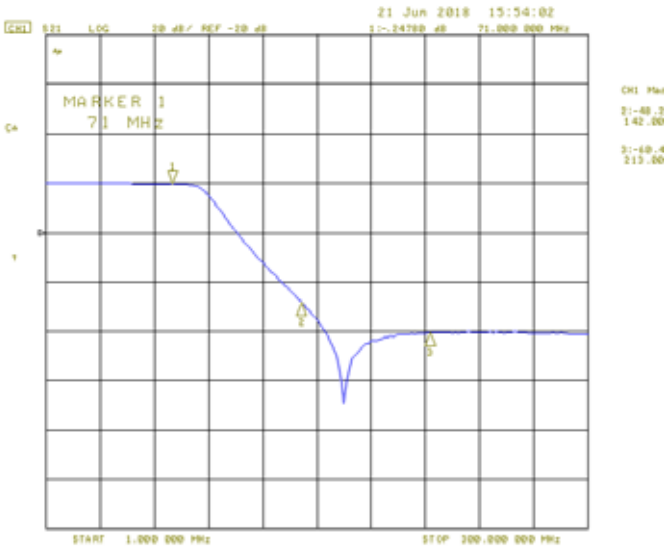
Summary

71MHz DATV offers some interesting challenges and the prospect of working some "real DX" although it will be interesting to understand whether DVB-S is resilient to the multi-path that maybe experienced on the longer paths.

71 MHz Transmitter Low Pass Filter

Charles Brain, G4GUO

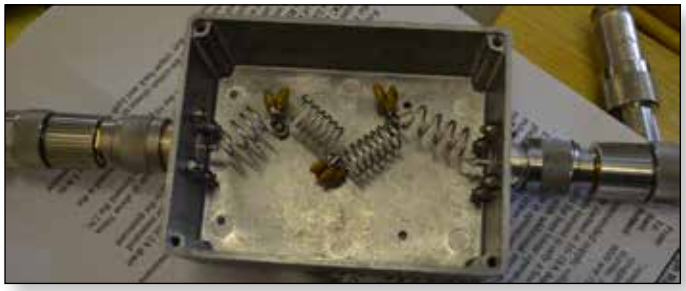
This simple low pass filter can be built into a standard die-cast box with N or BNC connectors for the input and output. It is a 7th order Chebshev design.



All the coils are wound using 1.2 mm silver plated wire, and the capacitors were 500v silva mica obtained from Farnell.

- L1 4 turns wound on an 8.5mm drill. Length approx 2cm.
- C2 27pf and 18 pf capacitors in parallel.
- L3 7 turns wound on an 8.5mm drill. Length approx 2cm.
- C4 27pf and 33 pf capacitors in parallel.
- L5 7 turns wound on an 8.5mm drill. Length approx 2cm.
- C6 27pf and 18 pf capacitors in parallel.
- C7 4 turns wound on an 8.5mm drill. Length approx 2cm.

The measured return loss at 71 MHz was 18dB.



71 MHz Receive Upconverter

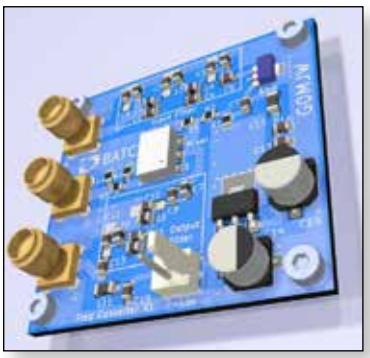
Mike Willis - G0MJW

A while ago I applied for a special research permit to transmit 100W ERP in the 70.5-71.5MHz band. The intent was to use it for reduced bandwidth DATV, similar to 2m. It took a while but it was granted last October, with a maximum bandwidth of 500 kHz and not within 40km of Scotland.

Transmitting DATV on 71 MHz is pretty simple, the Portsdown can do it with the right LO module, as can the DATV Express, Pluto and LIME SDR. All you need is an amplifier, appropriate filtering and an antenna. Getting a clean 10W or so of RF power is easy enough with a 500W LDMOS PA module as long as it is appropriately biased.

Receiving is more of a problem, as the MiniTiouner does not work below 144 MHz. LeanDVB is an option but, at the moment, it is not as sensitive as the MiniTiouner. Other software demodulators require a lot of processing power. My solution was to up-convert to a frequency some 400 MHz higher, where my MiniTiouner could receive.

Requirements were for tight filtering, to provide some immunity against the large number of strong signals, in particular FM broadcast, and sufficient gain to overcome the losses. I chose a 400MHz LO and a bandwidth to just cover 6m and 4m. Therefore 50-70MHz is converted to 450-470MHz. The frequency converter board shown in fig 1. The schematic is shown in fig 2. Note that, to allow for flexibility in use of this board, not all L/C/R components are fitted.

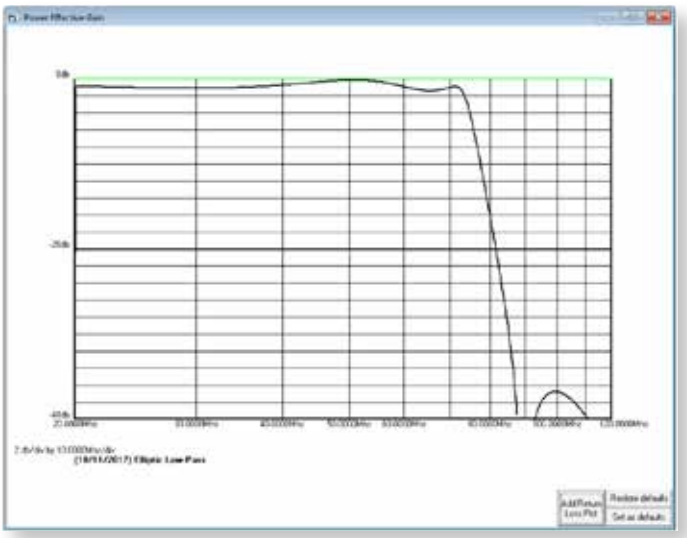


▶ *Figure 1- General purpose up/down converter board*

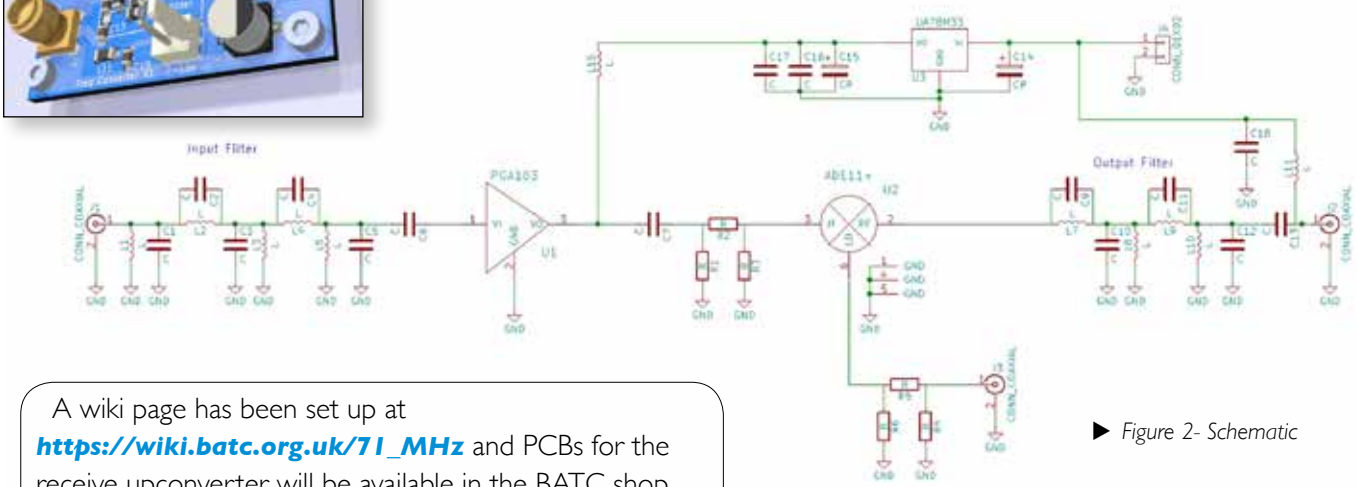
The input signal is first filtered, then amplified, then mixed up to the IF, and filtered again before being output. There is provision on the board for different filter types, tuning components, attenuation etc. You could use this board for many different things. There is no on-board LO, that is because it is much easier to use an AD4351 board or even the one in the Portsdown.

Input Filter

This filter is a low pass elliptic, mainly designed to get rid of Broadcast FM from above 88MHz – with the intended characteristics in 3. We are sacrificing ripple for cut-off and there is some in-band loss, but it really doesn't matter on these bands.



▶ *Figure 3- Input Filter*



▶ *Figure 2- Schematic*

A wiki page has been set up at **https://wiki.batc.org.uk/71_MHz** and PCBs for the receive upconverter will be available in the BATC shop

Pre-amplifier

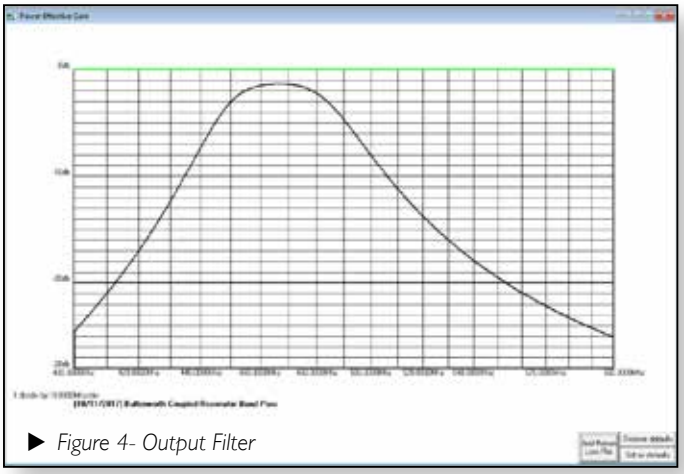
I settled on a PGA 103+ modamp from Mini-circuits. This has a gain of a little over 20 dB at these frequencies. The noise figure is well below 1 dB and the dynamic range is pretty good. It is also cheap, stable and easy to use. It can be run from 3.3V or 5V, though at 5V it tends to get warm. A low value attenuator follows this amplifier to help provide a good match and aid stability.

Mixer

The mixer is an ADE-11X+ from Mini-circuits. This mixer covers up to 2 GHz, is available in small quantities. It requires a 7 dBm LO. There are pads for an attenuator should the available LO be higher than this. The conversion loss is about 7 dB.

Output Filter

The output filter is a band-pass Butterworth coupled resonator design to set the overall bandwidth and avoid hitting the MiniTiouner with unwanted mixing products. The characteristic is shown in 4. The filter is tuned with two 30pF variable capacitors, the only adjustments required. If you choose a different LO, this filter will tune, within reason, without changing the parts.



▶ *Figure 4- Output Filter*

The overall conversion gain depends on the pre-mixer attenuator and how the filter is tuned. My prototype was around 10dB.

Building it is straight forward. Just fit all the parts in order of their height, colour, age or personal preference. Measure your LO power and chose suitable values for the LO attenuator so that the mixer sees 7 dBm. Power it up, via a current limited supply and verify the non-emanation of smoke.

Tuning it up is easiest using a signal generator. Failing that the low power output from your TX or maybe the Portsdown sig generator function. Measure the output at 450-470MHz. A spectrum analyser is best, but you can use a receiver, diode detector etc. Tweak the output filter so that it covers both 450 and 470 MHz. If you only want one band you can optimise for that, otherwise it is a compromise.

Parts List

Part	Value	Package	Notes
C1	82p	805	
C2	16p	805	
C3	91p	805	
C4	51p	805	
C5	62p	805	
C6	1n	805	
C7	1n	805	
C8	Not fitted		
C9	4.7p	805	
C10	30pF trimmer	805	
C11	2.2p	805	
C12	30pF trimmer	805	
C13	4.7p	805	
C14	10u	SMD:CP_Elec_6.3x5.8	
C15	10u	SMD:CP_Elec_6.3x5.8	
C16	10n	805	
C17	100p	805	
C18	100n	805	
L1	Not fitted		
L2	91nH	805	
L3	Not fitted		
L4	62nH	805	
L5	Not fitted		
L6	Not fitted		
L7	Not fitted		
L8	3.3nH	805	
L9	Not fitted		
L10	3.3nH	805	
L11	1uH	1206	Bias on coax
L15	1uH	1206	Only fit if using cable DC feed for Modamp
R1	290R	805	Note – R1, 2, 3 are the pre-mixer attenuator. These values give 3 dB attenuation
R2	18R	805	
R3	290R	805	
R4	Not fitted		Note – R4, 5, 6 are the LO attenuator. Choose values for 7 dBm at the mixer. E.g. 150, 150, 39 would give 6 dB attenuation
R5	0R	805	
R6	Not fitted		
U1	PGA-103+		
U2	ADE-11X+		
U3	UA78M33	3.3V or 5V depending on your views on IP3 vs dissipation	
J1, J2, J3	SMA PCB mount		
J4	2 pin 0.1" Header		

18W 5GHz band FM-ATV TX (5.645 - 5.945GHz)

Achille Galliena - I2GLI

The idea was to build a 5GHz FM-ATV TX starting from existing drone TV transmitters, skipping some of the many technical problems related.

1 - Selection of the device

A big variety of commercial devices –generally of Chinese production- are available on the market. A total of eight rigs have been tested as to Pout (value and decay), operating frequencies, video to audio subcarriers ratio, cost.

▶ *Fig. 1 –Some of the FM-TV transmitters tested.*

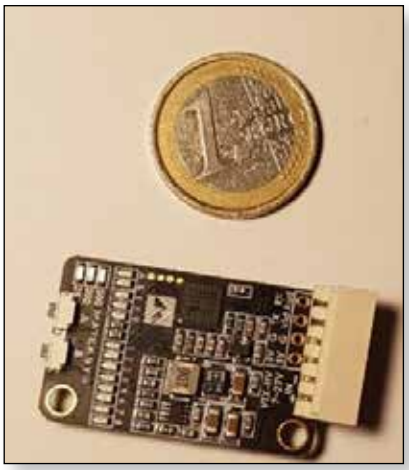
Three basic issues came up and had to be considered.

a. Pre-emphasis. As all these devices work with specifically designed receivers –like RC832 or similar ones-, they don't make use of any pre-emphasis. The most serious consequence is that, as any FM-TV demodulator is originally equipped with a standard de-emphasis circuit, FM-TV transmission without a corresponding pre-emphasis results in a very poor reproduction of higher video frequencies (washed out, blurred images, major loss of details). Besides, the use of video pre-emphasis and de-emphasis results in substantial improvement in the received signal-to-noise ratio.

b. Audio subcarrier level. All these devices are based on highly sophisticated chips –like RTC6705, for the most recent ones- whose two modulated audio subcarriers (if present, at 6MHz and 6.5MHz respectively) are way too low and, unfortunately, not adjustable (-25dBc video carrier to audio carrier ratio with no video and audio signal in). Experience clearly shows instead that the ideal level of a(mono) audio subcarrier is around -15/-17dBc, as it ensures an understandable audio even with a "grainy" video.

c. Most of these devices produce an output power which is unacceptably lower than that declared. Furthermore, their cases get very hot (a drone cannot carry a proper heat sink because of its weight) and Pout decays to 50% or even less in a short time.

Eventually, at the end of this process of evaluation, the choice fell on Mateksys (***http://www.mateksys.com***) VIDEO TRANSMITTER 5.8G VTX-HV, the most modern device in the lot:

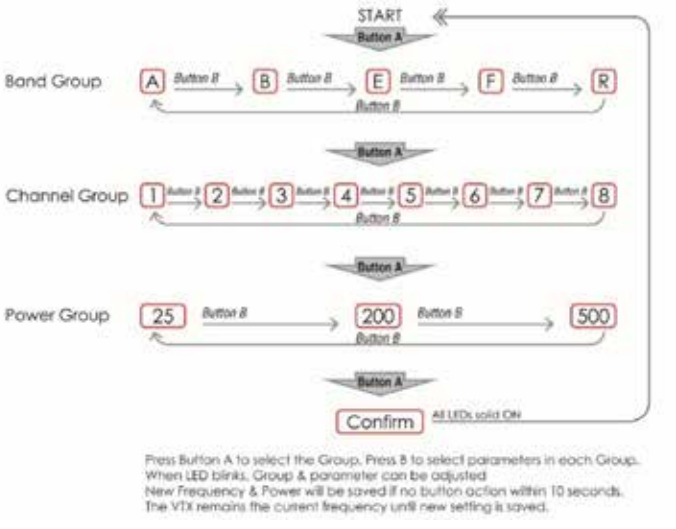


▶ *Fig. 3 – VTX-HV –the real size*

Mateksys has many distributors in several countries, besides being available on on-line stores, Amazon, eBay and so on, at a very reasonable price.

Frequency Table (MHz)

BFOSD	LED	1	2	3	4	5	6	7	8
BOSCAM A	A	5865	5845	5825	5805	5785	5765	5745	5725
BOSCAM B	B	5733	5752	5771	5790	5809	5828	5847	5866
BOSCAM E	E	5705	5685	5665	5645	5885	5905	5925	5945
FatShark	F	5740	5760	5780	5800	5820	5840	5860	5880
Raceband	R	5658	5695	5732	5769	5806	5843	5880	5917



▶ *Fig. 4 – VTX-HV - Operating frequencies and menu*

2 - 5.8Ghz fm-tv signal generation and modulation

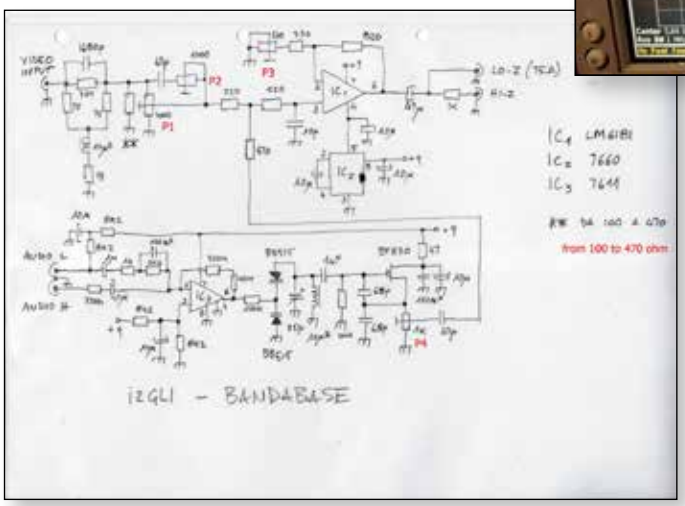
Issues A) and B) have been solved by means of a radical two-step solution: the strategy is to kill the two native audio subcarriers (by removing two tiny capacitors) and to replace these subcarriers with a brand new one, properly adjustable, mixed with the duly pre-emphasized video signal.

Step 1.A no-frills 6.5MHz-audio, 75uS pre-emphasis PAL, low cost video modulator has been developed (certainly not a revolutionary design, hundreds of similar schematics can be found on the web).

Step 2.A simple, yet delicate modification to VTX-HV is necessary in order to kill the two audio subcarriers, to replace them with the one purposely produced.

Step 1

Below, the no-frills 6.5MHz-audio, PAL 75uS pre-emphasis, low cost video modulator "BANDABASE", as it goes in Italian.



▶ *Fig. 5 – BANDABASE circuit diagram*

In the upper left corner, the 75uS pre-emphasis, immediately after video input.

P1 adjusts the video level only.

P2 nudges the video higher frequencies.

P3 adjusts the whole envelope (audio and video together).

P4 adjusts the audio subcarrier level only.

Video input level is the standard 1Vpp video signal.

Audio L(ow) accepts electret microphones.

Audio H(igh) accepts 0.5Vpp audio, typically from video-cam or other sources.

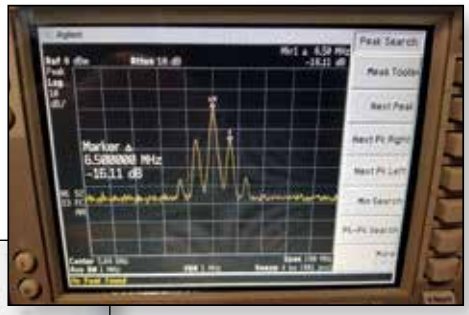
Lo-Z output goes to MatekVTX-HV video input (which is, actually, video and audio together), or any similar drone FM-TV Tx.

Hi-Z has been designed to go to a PLL VCO control line. Not used, in this case.

Adjustments

Set P3 at around half-way. Adjust P1 and P4 so that the modulated output at 5GHz (no input video signal, no input audio signal!) shows the audio subcarrier 15-17dB below the video carrier. In order to adjust the correct video-audio level (to obtain the desired FM deviation) from now adjust P3 only.

Adjust P2 for a maximally flat passband. If it is not possible to obtain a satisfactorily flat band, increase R** step by step, up to 500ohm.



▶ *Fig. 6 - 16dBc video carrier to audio carrier ratio, with no video and audio signal in.*

Should 6 MHz be the preferred choice for the audio subcarrier, the small 25pF variable capacitor can be trimmed accordingly.

IC1 -LM6181- is a 100MHz wide band amplifier (great, inexpensive device).

In order to fully exploit its characteristics, a dual supply voltage must be used. The easiest solution to generate a negative voltage –given the low current needed- is to use an ICL7660.

The supply voltage is 9 volts (ICL7660 max operating supply voltage is 10.5 volts).

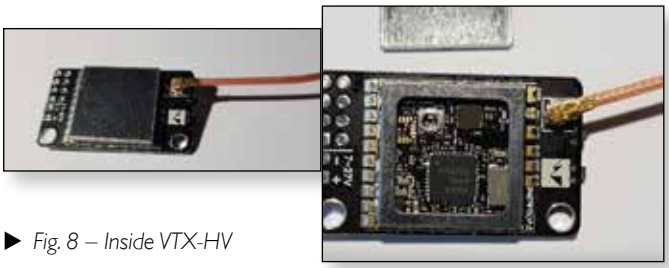
The local 6.5 MHz oscillator, despite not being phase locked, is stable enough to keep its frequency without any necessity to retune it.

▶ *Fig. 7- BANDABASE SMD pcb (layout by IW2FYT). Here it was used as a modulator of a 10GHz FM-TV exciter, firmly lodged in the rear.*

Step 2

A simple, yet delicate, modification is necessary.

Take the device, just remove the lid.

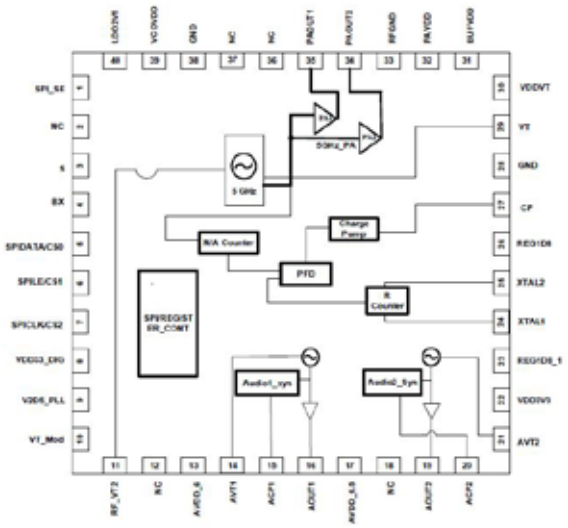


▶ *Fig. 8 – Inside VTX-HV*

Everything in there is minuscule, tiny, minute, microscopic, almost infinitesimal and very important. Great care is required, together with a powerful magnifier or better still watchmaker's glasses.

The modification consists in the removal of two –almost hidden- capacitors, the ones in the red circles.

▶ *Fig. 9 – Inside the VTX-HV. The two capacitors to be removed.*



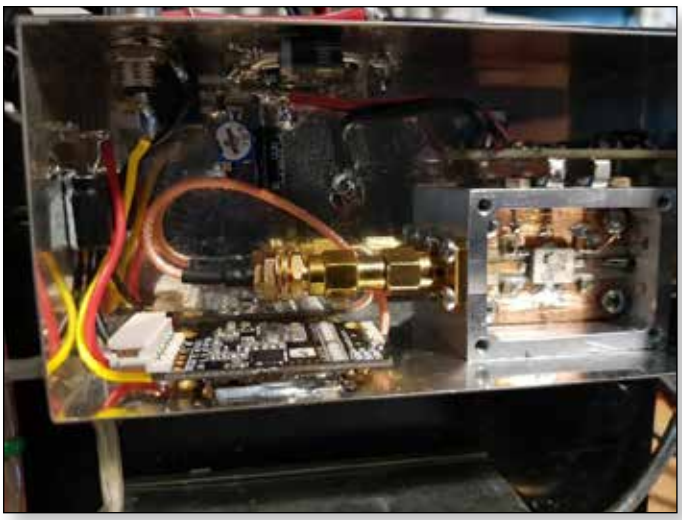
▶ *Fig. 10 – RTC6705 Block Diagram*

These two capacitors are connected to pins 16 and 19. By removing them, the two subcarriers are physically eliminated.

In order to remove these two capacitors, a very thin and rigid pin must be used. Gently push on the side of these two capacitors, they will offer a very weak resistance and will come off without leaving any visible scar.

An extra thin soldering iron, too, could be used, but at a much higher risk of killing other essential components nearby, out of "friendly fire".

As to Issue C), the three selectable output powers reasonably reflect what declared in the datasheet. Its small case can be efficiently soldered to a metal surface to dissipate the heat produced.

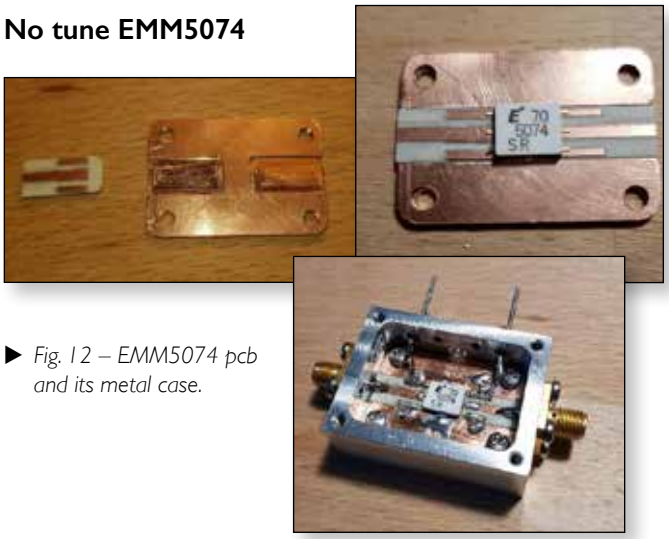


▶ *Fig. 11 –The lid can be soldered to the metal box to dissipate the heat produced*

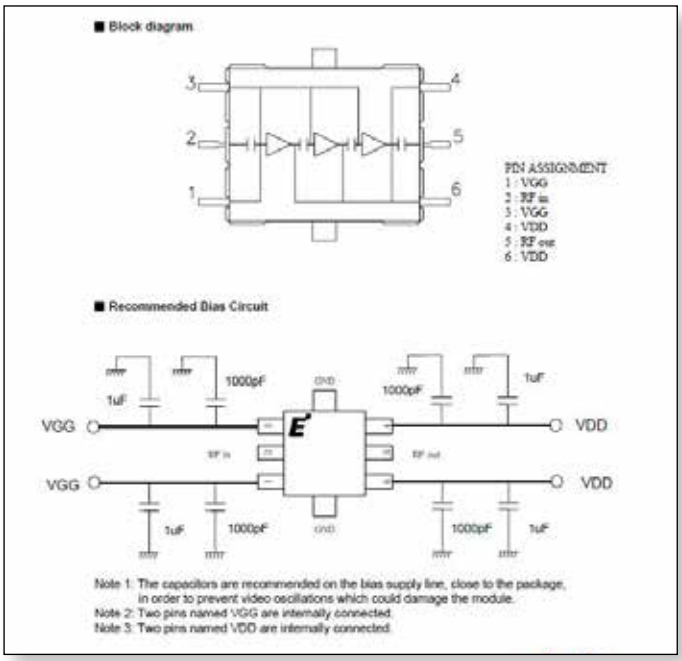
3 - Increase the output power: the boosters

Two boosters increase the output power to 2.5W (by using a MMIC EMM5074) and, finally, up to 18-20W (with a FLM5964-18F).

No tune EMM5074



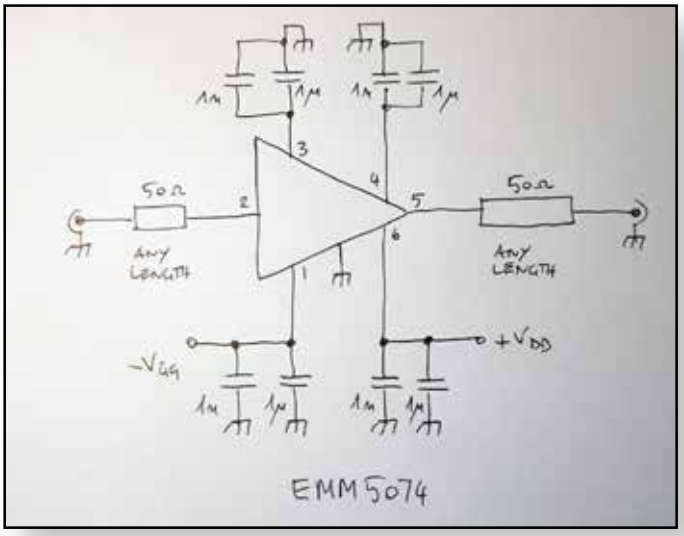
▶ *Fig. 12 – EMM5074 pcb and its metal case.*



▶ *Fig. 13 – EMM5074 Block Diagram*

The EMM5074VU is a low cost wide band power amplifier MMIC that contains a three stage amplifier, internally matched, for standard communications band in 5.8 to 8.5GHz frequency range. It shows a gain of 26dB and an output power of 34dBm at 5.8GHz. Therefore, an input power of roughly 8/10dBm is sufficient to produce an output power of 2.5W.

The VTX-HV output power must be set at 25mW (the lowest level). The small piece of semi-rigid cable, the SMA adapters and other minor inevitable imperfections realize a suitable power match. Obviously this GaAs FetMMIC requires a negative voltage Vgg in the range of -1 to -2volts (for instance by means of another ICL7660), adjusted to ensure a quiescent 1200mA drain current, at 6volt drain voltage, Vdd. Usual precaution: apply negative voltage first, positive drain voltage only afterwards.



▶ *Fig. 14 – EMM5074 2.5W booster circuit diagram*

The EMM5074 booster requires a good quality pcb laminate. At 5.8GHzthe standard FR4 is not good enough. The circuit shown in Fig. 11 is realized on Rogers RO4003 1oz, 32mil thick. Should through-hole technology be available, 20mils of thickness would certainly be better, helping heat dissipation. Besides, the complicated milled copper radiator and its two pcb inserts (shown in fig. 11) wouldn't be necessary (in a few weeks a proper through-hole pcb will be available, should anybody be interested).

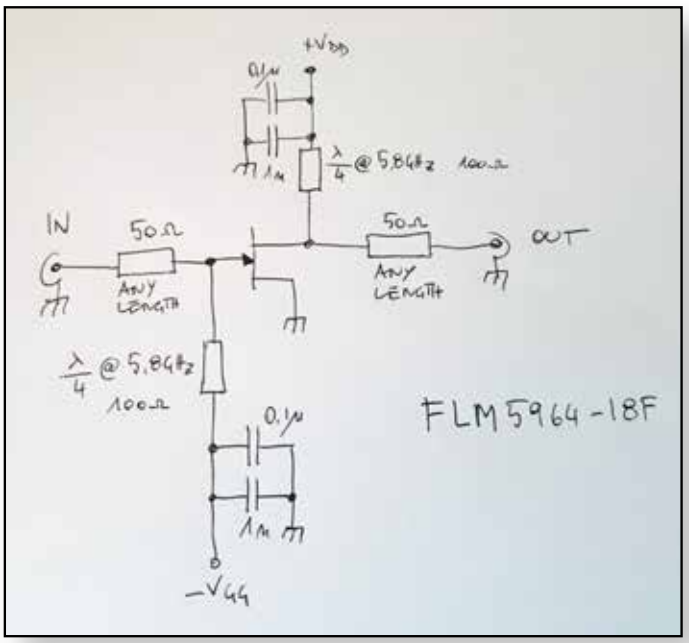
No tune FLM5964-18F

The FLM5964-18F is a power GaAs FET that is internally matched for standard communication bands to provide optimum power and gain in a 50ohm system.

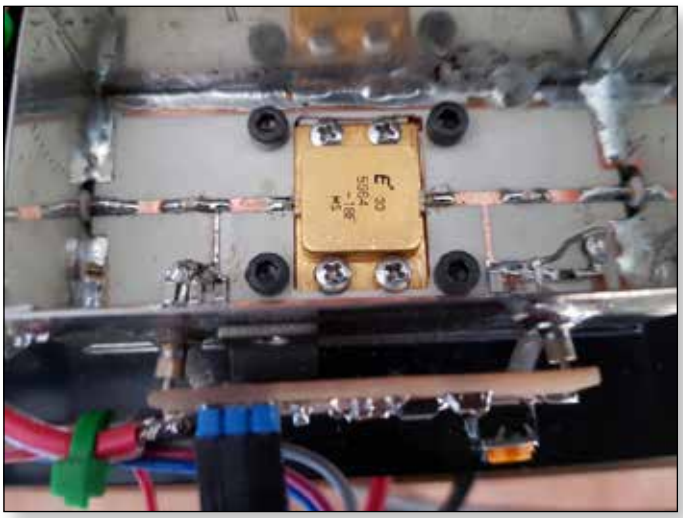
It exhibits high Pout (43.0dBm @P1dB), a gain of 10dB, a broad band from less than 5.9 up to 6.4GHz and, last but not least, an impedance matched Zin/Zout of 50ohm.

Therefore, an input power of roughly 33/34dBm has proven sufficient to produce an average output power of 20W. Actually, at around 5.7GHz 22W have been measured and at 5.9GHz as low as 18W. Probably the tolerances in the pcb line dimensions play a role in the impedance matching. A Vgg -1.5 to -2.5Volts (for instance by means of another ICL7660), adjusted to ensure a quiescent 5000mA drain current, at 10.5volt drain voltage. Again, usual precaution: apply negative voltage first, positive drain voltage only afterwards.

Strictly speaking, as the input and output impedance of the device are 50ohm matched, a pcb is not essential to mount the FLM5964-XX. Input, output and bias lines can be easily obtained by pieces of semi-rigid cable.



▶ *Fig. 15 – FLM5964-18F 18W booster circuit diagram*

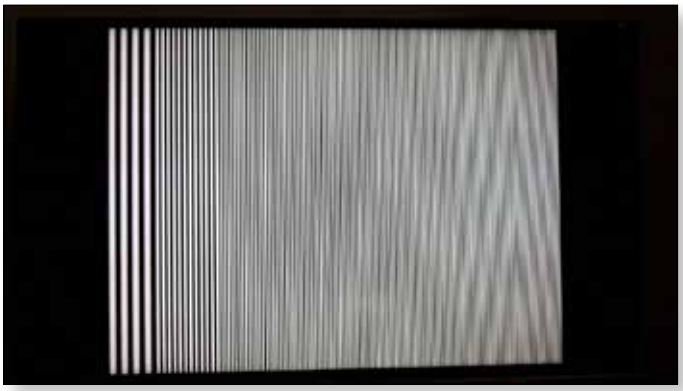


▶ *Fig. 16 – FLM5964-18F 18W booster pcb*

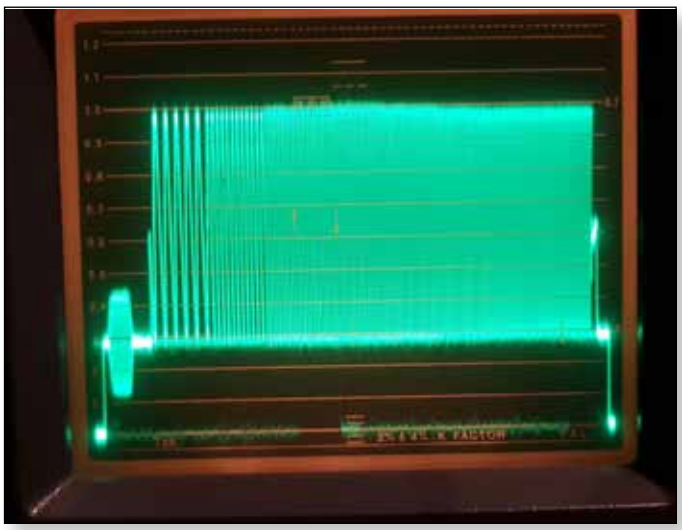
4 - The final results

Four figures to summarize the job done.

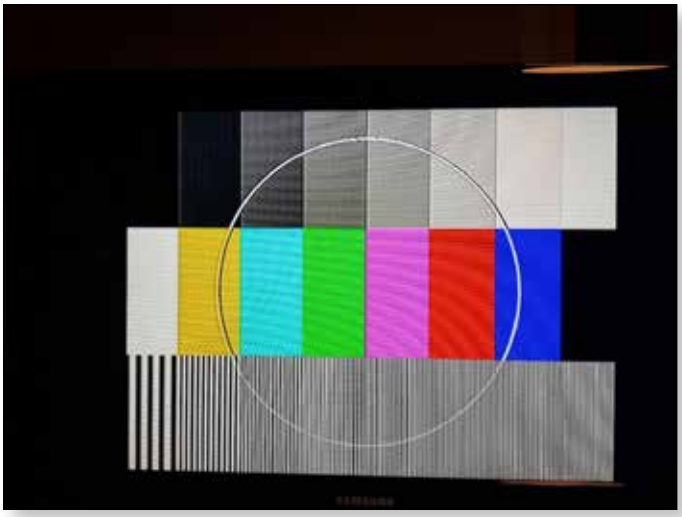
▶ *Fig. 17 – Total Pout @5.840GHz*



▶ *Fig. 18 – Demodulated bars. The leftmost bars represent a signal at 800KHz, the rightmost ones 5.5MHz (some moire effect due to the picture resolution). The receiver used is a RO.VE.R SAT SR 900R professional receiver preceded by a DG0VE downconverter.*



▶ *Fig. 19 – The corresponding demodulated band flatness. The leftmost bars are 800KHz, the rightmost ones 5.5MHz, as it appears on a Tektronix 1731 Waveform monitor.*



▶ *Fig. 20 – Composite test pattern, 18W @5.840GHz*

5 - Final considerations

The only adjustments required concern BANDABASE. The Matek VTX-HV does not require any retuning. The two boosters require only a simple adjustment of their quiescent currents. No other difficult or critical tuning. A pretty attractive advantage.

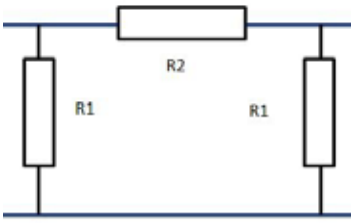
BANDABASE has been used in a variety of FM-TV exciters (on 10GHz, 2.3GHz) and it has proven to be easy to build, not critical at all, and flexible.

I2GLI
Achille Galliena
i2gli.ag@gmail.com

A piece of Pi

Barry Chambers - G8AGN

Many readers will have used or even designed and built a Pi attenuator whose circuit configuration is shown in Figure 1.



▶ *Figure 1 Pi attenuator*

To produce a given attenuation A, the required values of R1 and R2 may be calculated from

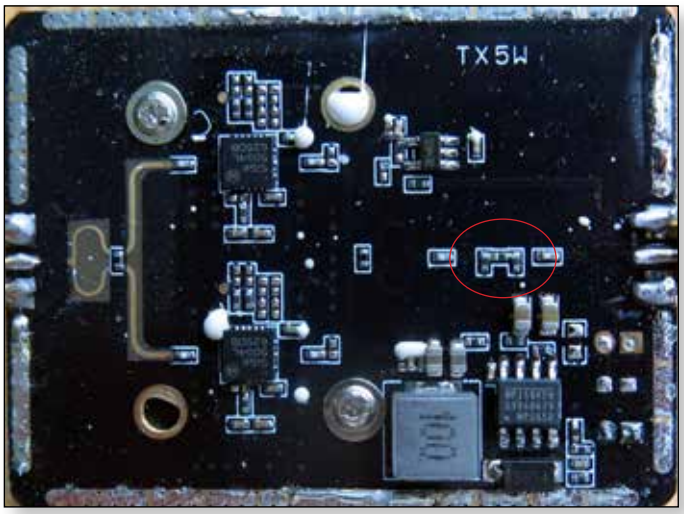
$$R_1 = Z_o\left[\frac{10^{\frac{A_{dB}}{20}}+1}{10^{\frac{A_{dB}}{20}}-1}\right];\ R_2 = \frac{Z_o}{2}\left[10^{\frac{A_{dB}}{20}} - \frac{1}{10^{\frac{A_{dB}}{20}}}\right]$$

where Z_0 is the input and output impedance. To save tedious calculation, there are several good design calculators on the WWW and we will make use of one later in this discussion [1].

In a bid to increase the output power from my 5.6GHz ATV transmitter, I recently obtained a TXPA58002W5 PA module, shown in Photo 1.

▶ *Photo 1 TXPA58002W5 PA module for 5.8GHz*

In common with many electronic items manufactured in China, the quoted specification is probably rather "flexible" and a number of people have found that this particular module is rather "fragile"; accordingly, I decided to proceed with caution before applying power. My first step was to try and establish which r.f. devices were used and to examine the r.f. circuit layout. The latter is covered by a tin-plate shield which is easily removed to reveal the PCB layout shown in Photo 2.

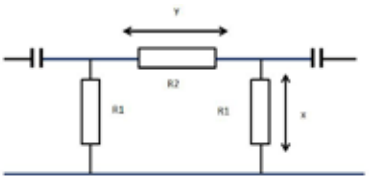


▶ *Photo 2 TXPA58002W5 PA module PCB showing input attenuator*

The amplifier consists of two SiGe5004L devices in parallel together with associated input Pi attenuator, power splitter and combiner. The device data sheet quotes a maximum r.f. input drive power of 6dBm and the module specification suggests a maximum r.f. input power of 600mw (27.8dBm). This implies that the module input Pi attenuator must have an attenuation of around 15 – 18 dB but I thought it would be useful to confirm this, especially as I wanted to use a drive level of around 200mw and so might need to change the attenuator resistor values accordingly.

Since the resistors making up the Pi attenuator are easily accessible on the module PCB, it was a simple process to measure the resistance of each component. The values were: series resistance = 68.8 ohms and shunt resistance = 49.6 ohms. These values could then be entered into an attenuator calculator on the WWW and hey presto we get the attenuation, right? WRONG!

If the attenuator configuration was a Tee, then the above procedure would be valid but a look at the circuit diagram for a Pi attenuator shows that we have overlooked something.



▶ *Figure 2 The Pi attenuator and the measured resistances x and y*

As shown in Fig 2, we have measured resistance values x and y whereas the actual values are R1 and R2, which are different since

x = R1 in parallel with (R1 + R2)

y = R2 in parallel with 2R1

Hence

$$x = \frac{R1(R1+R2)}{2R1+R2} \qquad (1)$$

$$y = \frac{2R1R2}{2R1+R2} \qquad (2)$$

It is straightforward to solve these equations for R1 and R2 when x and y are known but here I will just take some representative values of R1 and R2 which give particular values of attenuation and then calculate the values of x and y which would be measured in practice. Table 1 shows some typical results using preferred values of R1 and R2.

Two points can be made about the results. The first is that there are large differences between the measured values x and y and the actual values R1 and R2; the second is that this technique could be useful for checking the "health" of unknown coaxial attenuators.

Attenuation dB	R1 ohms	Measured x	R2 ohms	Measured y
0.97	820	411.3	5.1	5.08
2.99	300	154.4	18	17.5
5.66	150	82.4	33	29.7
9.6	100	62.7	68	50.7
14.6	68	49.9	120	63.8
21.3	56	47.8	270	79.2
25.4	56	50.6	470	90.4
29.9	56	52.6	820	98.5

▶ *Table 1 Measured and actual values of R1 and R2 for various Pi attenuators*

Returning now to the case of the attenuator in the TXPA58002W5 module, I estimated the actual values of R1 and R2 by solving equations 1 and 2 using an iterative procedure. This gave R1 = 64.8 ohms and R2 = 146.7 ohms which indicates an attenuation of about 16.1dB. Hence if I want to drive the PA module using 200mw instead of the original 600mw, a new attenuator of about 11dB is required (16.1 – 4.8). This could be realised with a series resistance of 82 ohms and shunt resistances of 90 ohms (two 180 ohms in parallel).

[1] http://chemandy.com/calculators/matching-pi-attenuator-calculator.htm

76GHz tests June 2018

Noel Matthews - G8GTZ

During the IARU ATV contest in June, Neil G4LDR and Noel, G8GTZ completed a successful 2 way DATV QSO on 76GHz over 12Kms – this is believed to be a world first on that band. This success follows several narrow band QSOs and a way one way DATV contact over 29Kms.

The equipment in use is standard narrow band equipment driven by Portsdown at 144 MHz and received by MiniTiouner, also at 144 MHz IF. G8GTZ used the UK microwave group loan equipment with a harmonic mixer and no LNA on receive and approximately 5 milliwatts on transmit. G4LDR used a homebuilt transverter with a reversible amplifier used on transmit and receive (7mW out and 6dB NF).

The path used during the contest was a short clear line of sight path to guarantee the contact but it is planned to do more tests during the summer over much longer paths.

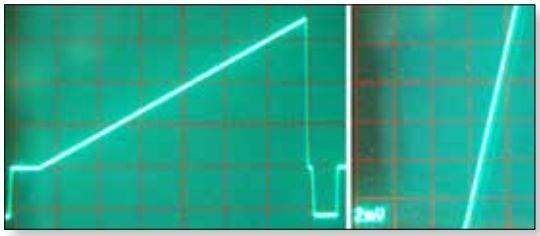
Video Fundamentals 14
Digital Quantisation Noise

Brian Summers G8GQS

This is a little discussed topic, after all digit's are perfect, aren't they? Well perhaps not.

Analogue

When you consider an analogue signal, it is considered to be indefinitely variable. That is, over time, the voltage level changes smoothly from one value to the next value and setting aside the effects of noise, there are as many different voltage levels as you care to measure. Except, perhaps if you have a very good magic voltmeter that can measure the arrival of individual electrons.

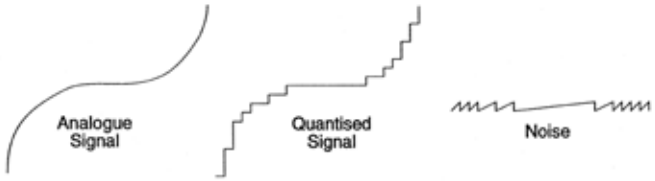


▶ *Fig.1: Analogue sawtooth & same sawtooth expanded by 100 times at 2mV cm.*

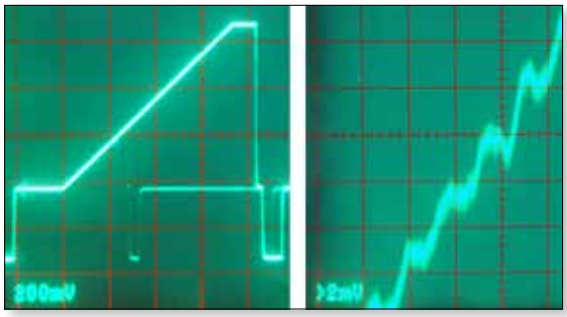
Digital (video)

Now when we come to digitise an analogue signal or create one from scratch, we have to choose how many bits to use. Until recent times 8 bits was the choice, it fits well with hardware and for video gave acceptable results. Latterly 10, 12 or more bits are used especially in camera and other processing systems.

Returning to 8 bit systems, you have to define what number represents each part of your video waveform. The ITU REC. 601 specification defines 16 as black level and 235 as peak white. So there are 220 steps in the picture 700mV signal. This equates to 3.196mV per quantisation step. It does not sound much but it is there as you can see in the figure were the digits try to follow the curve of the analogue signal.



This happens every time you go from analogue to digital or vice-versa. So best to say in digital once achieved. This small step of 3.196mV is supposable less then a "Just Noticeable Difference" as decreed by the standards authority. It is, however, more noticeable after the pictures have been though a hard compression and can often be seen in the gradual level changes in clouds or the sky being a series of "bands" but that is another story.



▶ *Fig.2: This sawtooth is from a digital 8 bit test signal generator. However when you expand the gain by 100 times the quantization steps can be seen.*

In right of these two waveform pictures I have increased the oscilloscope Y gain (approx 2mV.) to the same value so, comparing the two, in the second waveform you can see that the sawtooth is actually a series of small steps of voltage increases. For each extra bit used the "step" value is halved. A 10 bit signal quantisation step is 0.8mV a quarter of the 8 bit value.

Like analogue video, there are lots of potential for distortions, just different ones for digital. A few things to consider are the number of bits in each sample and the sample rate. A function of increasing these two parameters is the bit rate. This leads to the staggeringly large size of the uncompressed video signal. 270Mbs for 10 bit SD video and 4 times this for HD and so on.

This short monograph, like it's predecessors, is a light and simplistic look at the subject. More serious descriptions can be found on the internet :-

https://en.wikipedia.org/wiki/Quantization_(signal_processing)

https://classes.engineering.wustl.edu/ese488/Lectures/Lecture5a_QNoise.pdf

https://www.princeton.edu/~cuff/ele201/kulkarni_text/digitizn.pdf

Elsewhere in this issue is an article about the Royal wedding and UHD HDR, (Ultra High Definition and High Dynamic Range) the sharp leading edge of TV development.

Treasurer's Report for 2016-2017

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. During 2016 we continued this and a small reduction in our reserves can be seen. In 2017 the situation changed and the shop turnover increased and a significant surplus was generated canceling out the losses in recent years.

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. As this is a General Meeting year figures for 2016 and 2017 are presented with 2015 as a comparison. Full details are available at a G.M. or by arrangement for any member who might enquire.

Turnover

Our total expenditure for 2017 was £53,456 including purchase of stock for the shop. The total income for 2017 was £62,025 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 £9,607 for 2017. This is an increase over 2016 and is due, in part, to the large increase in membership during 2017. 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 (RB-TV). We continued to sell the DTX1 units during 2016 and in 2017 the Portsdown and MiniTiouner components. It is the policy of the BATC to make items available to members at the lowest cost. We run the shop to promote activity for the mutual benefit of our members and any surplus is used to help fund the BATC.

Donations (2)

In addition to the use of the donations channel for "top-up" payments we had a large donation of redundant TV equipment which was sold to members increasing the donations total. In particular thanks are due to Tinopolis TV.

PayPal (3)

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.

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. The New wordpress based website launched in May 2018 and if all goes well there will be a reduction in our web services cost.

Awards & Prizes

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

Membership

As treasurer, over the years, I have seen membership numbers increase and decrease. Today I am able to state with some satisfaction that our current membership is at a high point of some 1100+ members. These members of Our BATC are spread around the world, truly an international club. (but there are no plans to remove "British" from our name)

Brian Summers,
Hon. Treasurer BATC, June 2018

British Amateur Television Club

Income & expenditure account, year ending 31 December 2017

Income account	2015	2016	2017
Subscriptions	£6,887.89	£7,496.05	£9,737.17
Shop surplus (1)	£2,271.48	£2,428.08	£14,027.28
Publications surplus	£0.00	£0.00	£32.00
Interest received	£176.34	£180.52	£246.29
Donations received (2)	£141.00	£117.58	£588.19
Miscellaneous Items	£188.00	£6.00	£36.00
Convention & BGM	£0.00	£681.00	£0.00
Less PayPal fees (3)	-£918.60	-£702.44	-£2,044.72
	£8,746.11	£10,206.79	£22,622.21

Expend account	2015	2016	2017
CQ-TV Printing	£5,118.00	£6,191.00	£4,498.00
CQ-TV Postage	£2,194.81	£2,665.10	£2,045.21
Office expenses	£658.88	£98.06	£114.40
Committee meetings	£0.00	£0.00	£0.00
Members services	£1,399.50	£0.00	£1,672.65
RSGB affiliation fee	£47.00	£47.00	£47.00
Web services (4)	£4,029.19	£2,367.03	£6,306.92
Convention & BGM	£25.00	£1,452.00	£25.00
Awards & Prizes	£788.08	£144.33	£169.98
	£14,260.46	£12,964.52	£14,879.16

Balance sheet at 31 December 2017

Assets	2015	2016	2017
Stock, BATC shop	£4,947.20	£4,403.36	£8,060.39
HSBC account	£5,879.35	£6,352.45	£14,218.39
PayPal account	£3,728.43	£1,534.37	£4,196.38
Teachers Building Society	£36,103.13	£36,283.65	£32,525.94
Less Current liabilities			
Subscriptions RX in advance	-£6,250.30	-£6,923.75	-£9,607.97
	£44,407.81	£41,650.08	£49,393.13
Represented by Accumulated fund			
Balance brought forward	£49,922.16	£44,407.81	£41,650.08
Surplus or Deficit	-£5,514.35	-£2,757.73	£7,743.05
Balance carried forward	£44,407.81	£41,650.08	£49,393.13

Equipment was purchased in 2016-2017 to the value of £285.82

Notes to the accounts

(1) This is the net amount raised by the sales in the club's shop, but before allowing for the PayPal fees of approx 3.5%. The shops turnover in 2017 was £48,986.00

(2) The donations figure (2017) includes some members subscription “top Ups” were there was a shortfall in payment.

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

(4) The 2017 figure includes an advance payment for the new website template.

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.

P A Bicknell

PAUL A BICKNELL

Member Paul A. Bicknell

20, MAY, 2018

B Summers

Brian Summers
Hon. Treasurer

The BATC Bursary scheme

BATC has in the past occasionally supported ATV related projects with a grant of funding. In order to continue to stimulate the ideas and initiatives for our hobby, the BATC committee has decided to introduce the BATC Bursary award – this will enable grants of money to be given to individuals and groups who are initiating projects to benefit the ATV community in their local area, nationally or internationally.

The ideas below give some guidance on the types of projects that might attract funding.

- Pump priming for development projects to fund things such as development tools / hardware, prototype PCBs manufacturer and s/w license costs.
- One off funding for repeater groups - this can be used for whatever the group needs but should be towards one off costs such as rebuilds or legal fees. We will not accept applications to fund ongoing annual fees such as site rent and electricity costs.
- ATV infrastructure – a typical example could be the Es'hail-2 ground station project which BATC has committed to build.
- Funding for Dxpeditions with an ATV interest.
- Outreach support for ATV groups and funding for demo kit and sponsoring Radio Clubs to buy ATV equipment for use by their members.

Groups and individuals should send an email or fill in the form on the BATC website describing the project, the amount required, the reasons why it should attract BATC funding and how it will benefit the ATV community. The applicants should be prepared to have a telephone call with committee members to provide more details and answer any questions before the application is considered. A condition of the award will be to submit an article to CQ-TV detailing the project and its success or failure.

Whilst the grant application can be made at any point in the project, funding will only be paid out retrospectively upon receipt of proof of the expenditure. It should not be assumed that just because the application has been made, that funding will be granted.

Each case will be considered by the committee whose decision will be final and a unanimous committee vote will be required to attract funding.

The maximum amount per application is £500 but this can be increased up to £1000 at Committee discretion for exceptional projects of national or international significance.

Member's Projects

This edition: F1SSF

"Thank you very much at BATC for the quality of this group, activity and CQ-TV magazine. I send to you some pictures of my DATV Station - fully operational on 437Mhz - if you'd like to publish them in your next CQ-TV.

TX is Portsdown with 65W HF power
RX is Minitioune V2 USB Updated

Actually, 4 QSO about 110 Km in accidental relief in low SR 250 with French station F1FY, and good quality video.

I hope many French operators join this activity."

Best 73 Franck F1SSF

HamRadio 2018 Friedrichshafen

A visitor's view from Jen Easdown G4HIZ

I was pleased to be able to visit HamRadio in Germany again this year, this time accompanied by my wife Joan 2E0HIZ and travelling by car. The annual event is held at the Friedrichshafen Messe (fair). This year being from Friday 1st June until Sunday 3rd June. There were two very large halls full of second-hand radio bits and pieces covering all bands and test equipment, with another hall hosting national radio societies (BATC and RSGB included) and vendors of new equipment.

▶ *Dave G8GKQ and Phil M0DNY manning the BATC stand.*

This year as last year, the event may have coincided with another and the number of second-hand halls was less than three years ago. Then, there were four large halls. In any case, next year the event will be held on 21-23rd June, a few weeks later and it will possibly be up to the four halls of second-hand goods status again. But the halls were so big, that it took me half a day to cover one properly. If you fancy going, I recommend having a two day stay, say Friday-Saturday. I noticed that some vendors were packing up Saturday, so perhaps the Sunday is a little less worth visiting.

We had two main objectives this year, as well as looking at the vast number of stalls selling various radio bits, one objective was to visit the Amateur TV symposium hosted this year by the BATC and the other was to look at possible test equipment additions.

The journey wasn't too bad. Landing with the car at Calais on Wednesday morning, we headed for Strasbourg where we stayed one night. This was a 620km journey and took 5 ½ hours plus stops (with about 50 Euros in motorway tolls each way). Thursday morning, we headed for Friedrichshafen, where we stayed about 20km out, this part took about 3 hours and was a nice easy drive. The idea was to get there on Thursday and to visit the event Friday morning nice and fresh. If you're thinking of going and staying overnight, it is advisable to book the hotel well in advance. We only stayed so far out because we booked within the week before. We spent two days visiting the event, returning to Strasbourg Saturday evening and back home via the ferry on Sunday afternoon.

We attended most of the BATC hosted Amateur TV sessions and rubbed shoulders with many European operators. It was apparent that the BATC is an important player on the European scene. The talks given covered a variety of topics including updates on Portsdown by Dave G8GKQ and Ham TV from the ISS by Phil M0DNY, with Noel G8GTZ doing his bit. A couple of points noted from this, it's worth updating your Portsdown software for the latest features. Also, concerning ISS, they are having a bit of bother with the Ham gear onboard which means currently (for ATV at least) they are off-air. Pierre-Andre HB9AZN spoke of ATV operators in Europe and mentioned a survey that can be found on his website. Someone raised the question as to the need for an ATV equivalent of the microwave chat website ON4KST for arranging contacts, Noel pointed out that in effect one exists already, this being dxspot.tv – check it out !

▶ *Dave G8GKQ giving an update on the latest Portsdown capabilities, with Phil M0DNY and Noel G8GTZ seated.*

One interesting demo was given by Ewe DJ8DW. This was a DATV setup using the GMSK modulation scheme. The benefit of GMSK, being a constant envelope scheme, is that it doesn't suffer from the need for a highly linear amplifier to avoid spectral re-growth. Generating GMSK was not too difficult, the receiver side was more so. However, this was overcome by a GMSK to DBS

converter which then used a DBS TV receiver. Watch this space, perhaps GMSK is worth investigating in the UK ?

There were a number of other talks which unfortunately I did not attend due to the need to shop !

Over the two days spent there, we bumped into a number of other UK amateurs, including John G4BAO and a bunch from the GQRP club. All-in-all, it was an event well worth visiting, with my second objective being satisfied with the purchase of a spectrum analyser to replace the old one.

▶ *Jen G4HIZ chatting to Ewe DJ8DW about the GMSK demo. It turned out that Ewe, spent an exchange visit as a lad in Chatham, HIZ's original home town !*

▶ *Jen G4HIZ in one of the halls getting interested in some of the test equipment on sale from Sebastien of MET in Paris.*

Aligning offset dishes

John - G7JTT

This article shows how a laser pointer can be used to set the correct horizontal alignment of an offset dish – great care should be taken when using the laser and never look at the laser or reflections from the dish.

After picking up yet another satellite dish at the RAL microwave round table, I needed a way to work out what the offset angle was. The dish was not the usual oval type dish, it was much wider than high. So I need a nice simple way of finding the offset angle to find what angle I needed for it to be looking horizontal. A quick look on the internet found a way of checking this with a laser pointer. First thing to do is attach a laser pointer at the focal point of the dish by any means possible. In my case I used folded kitchen paper wrapped around the pointer and clamped it in the LNB holder.

The next thing to do is stick a small square of foil or silver foil tape (type used in air ducting industry) in the centre of the dish.

You then need somewhere dark, in my case my corridor to set up the dish. Next measure the height from the floor to the centre of the dish and then at the end of the corridor place a mark at that height. Now turn the laser on (taking the necessary precautions) and make sure the laser is pointing to the centre of the dish on the foil.

Lights off and adjust the dishes elevation until the reflected light is centered on the mark at the end of the corridor.

And just for fun if you sprinkle a little talc across the beam you can see the reflected beam is indeed horizontal.

The Royal Wedding in High Dynamic Range

Andrew Cotton

This article was originally published on the BBC R&D blog (bbc.co.uk/rd/blog)

It's been a while since our last blog describing how we made Blue Planet II available on BBC iPlayer in UHD Hybrid Log-Gamma (HLG) HDR. But that doesn't mean we've not been busy with UHD HDR - in fact, far from it. Since then we have been working hard with our colleagues in BBC Media Services to add UHD HDR encoding capability to their existing iPlayer encoding platform. Some of you may have seen or read about the recent trials of live UHD HDR streaming in BBC iPlayer, which are all part of that work. To produce those signals, we have also been working with the outside broadcast providers to develop live HLG HDR production workflows for BBC use.

The challenges are much harder for live production than non-live production, which is now well understood. Not only is there just one chance to get things right with live, live production must also handle a whole host of different sources (e.g. graphics, HDR cameras, SDR cameras, pre-recorded inserts, slow-motion replays), all available in different signal formats, and blend them together seamlessly into a single programme. That might sound straightforward with HDR format conversion technology now widely available, but in fact it's fraught with difficulty, which I shall explain later.

As part of our mission to facilitate HDR production, we have been working hard within the ITU-R's Rapporteur Group on HDR Television to document current best practice for HDR television production. Last October the ITU-R published their findings in its Report BT.2408, "Operational Practices in HDR Television Production". The report draws on the experience and expertise of broadcast engineers, colour scientists and colourists from around the world. As well as specifying signal parameters, camera line-up levels and methods for SDR/HDR format conversion, it documents BBC R&D's findings on monitoring image brightness to ensure comfortable viewing of HDR images in the home, our work adapting the HLG "system gamma" (as noted in ITU-R BT.2100) to ensure the highest image consistency outside of the reference viewing environment, and in the most recent revision (BT.2408-1), our work on signal levels for skin tones.

So, when we were asked to support BBC Television Events in the HDR production of the Royal Wedding, we leapt at the opportunity to put all those learnings into practice.

The Royal Wedding

Following a series of tests with our production partners (hosted by our OB provider for this event, NEP UK) we finally got the go ahead to configure all 76 of the BBC's UHD cameras (including 3 UHD radio cameras) to capture the wedding of the Duke and Duchess of Sussex in UHD wide colour gamut, BT.2100 Hybrid Log-Gamma (HLG) HDR. Even though we did not transmit the programme in UHD HDR, we were able to test some important parts of our system during the Royal wedding and preserve it for the archives. With such good weather on the day, the HDR images from both inside and outside the chapel are truly spectacular, and amongst the best I have ever seen.

HLG to SDR Conversion

An important requirement for this production was that the UHD HLG HDR signal had to be converted to conventional standard dynamic range (SDR) BT.709 for onward distribution. As so many viewers would be watching the conversion, it needed to look identical to the SDR signal that would be available from a conventional SDR camera. The SDR signal could not be compromised in any way through having been derived from the HLG HDR signal.

That type of conversion had so far proved particularly difficult to achieve. The majority of HDR down-converters on the market, including our own licensed down-conversions, are based on "display-light" conversion technology. That means the conversions calculate the light emitted by a reference monitor being fed the input signal, and then convert that signal to one that would cause exactly the same light to be emitted by a reference monitor operating in the desired output signal format. They may apply some adjustments, for example to make an SDR image appear brighter when shown on an HDR

display, but the principle remains the same. By doing so, a "display-light" conversion maintains the artistic "look" of the original production format when converting the signal to the new format.

Display-light conversions work well for non-live graded programmes, but they are not generally suitable for live TV production. In live production we frequently need to convert between SDR BT.709 and the HDR production format, whichever is being used. But each format has a different "look". By that we mean that the overall image brightness, and the reproduction of tones and colours within a scene are different for each image format.

By an accident of its design, standard dynamic range BT.709 images tend to be more colourful than nature. That was a useful feature when we viewed them on dim CRT displays, as the eye is less sensitive to colour at low luminance levels. A good example of this could be seen at the Royal Wedding where in SDR BT.709, the walls of Windsor Castle appeared to be built of a yellowish sandstone, rather than the real paler Clipsham limestone. By contrast BT.2100 HLG HDR images are, by design, remarkably natural in appearance. We no longer need that colour boost as HDR images are intended to be viewed on more modern brighter displays, and the way in which the natural "look" of HLG is achieved makes it easier to deliver consistent looking pictures across a range of displays of different peak luminance.

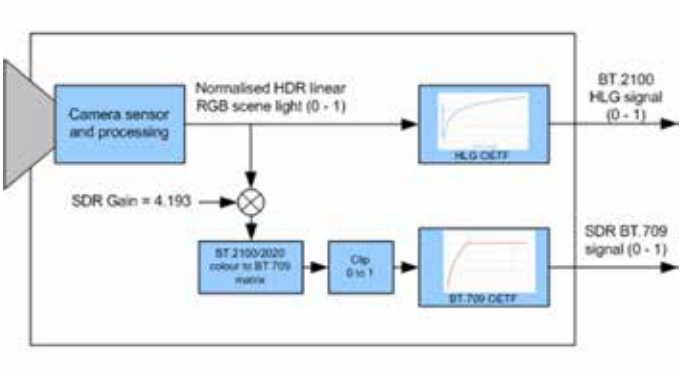
So, converting between SDR BT.709 and HLG using a conventional display-light technology, that preserves the look of the original format, does not necessarily deliver what's required for live production. A display-light conversion of a BT.709 camera to HLG would look more saturated than a native HLG camera when cutting between them. Similarly, a display light conversion from an HLG HDR camera to BT.709 would tend to look less saturated than the SDR BT.709 signal from a camera pointing at the same scene.

The differences arise because each format has a different relationship between the light in the scene falling on the camera sensor, and the light emitted by the display. That relationship is known as the OOTF (opto-optical transfer function). The OOTF is the concatenation of the camera OETF (opto-electronic transfer function) and the display's EOTF (electro-optical transfer function). More details can be found in Section 2 of the ITU-R Report on HDR television production, BT.2390.

Similar problems are encountered using display-light conversions with other HDR production formats. What is needed instead are "scene-light" format conversions, where those issues can be avoided.

HDR Cameras

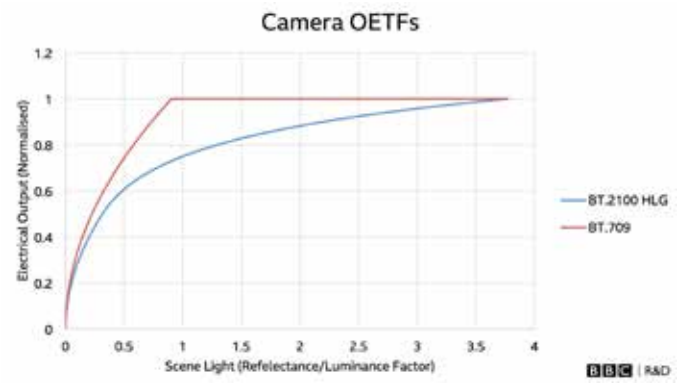
To understand why scene-light conversions address the needs of live HDR TV production, it's helpful to consider how a typical HDR TV camera works. A simplified diagram is shown below.



Many HDR cameras for live TV production offer two simultaneous outputs – one HDR and another SDR BT.709. The linear light signal from the camera sensor is considered to be normalised in the range zero to one. In practice other normalisations might be used to achieve the desired signal levels and noise performance. The linear light signal from the sensor is passed through the HDR camera OETF to convert it to the HDR electrical signal for output. The camera exposure is adjusted for the HDR output, and the SDR signal is derived by applying a fixed gain to the linear scene-light from the sensor, followed by a conventional BT.709 OETF.

SDR cameras are usually adjusted so that, under controlled lighting, the SDR signal hits full-range for a 90% reflectance test chart i.e. a card that reflects 90% of the light falling on it. In practice, under varying lighting conditions such as those found at an outside broadcast, the cameras are adjusted for correct exposure of skin tones, but they are roughly equivalent setups. ITU-R BT.2408 recommends that the same 90% reflectance card should deliver an HLG signal of around 73%. By working through the mathematics, it can be found that applying a gain of 4.193 (12.4 dB) to the linear scene light signal before applying the SDR BT.709 OETF, ensures that

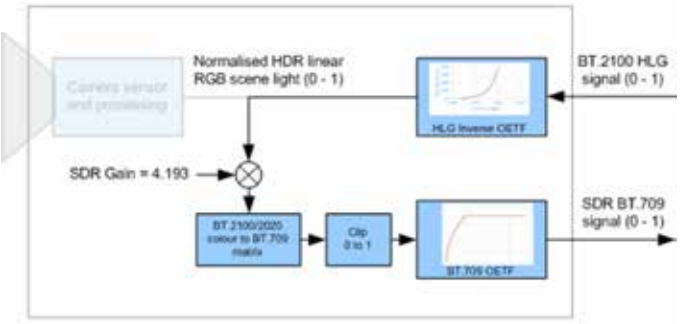
both SDR and HDR signals are correctly exposed. The responses of the camera SDR and HDR OETFs, with the appropriate gain applied, are shown below.



In practice other gain adjustments may be included in the camera channels. We found that we had to dial-in a gain offset of 9.0 dB on the cameras that we were using to achieve the desired exposures.

Scene-Light Format Conversion

As discussed earlier, for our application we needed to take the HLG HDR signal and convert it to SDR BT.709 after the UHD production mixer (or switcher). The end-to-end workflow that we used is described in detail in Section 7.1.3 of the new revision of ITU-R Report BT.2408.



By changing the direction of the signal flows in the camera diagram above, it's easy to see exactly how that can be achieved.

The RGB HLG signal is passed through an HLG inverse OETF to recreate the linear scene-light signal produced by the camera sensor. The scene-light signal is then passed through the same SDR processing chain found in the camera – a scaling of 4.193, followed by a clipping stage and finally the standard BT.709 OETF.

The HLG to SDR conversion could apply more sophisticated tone-mapping from HDR to SDR and colour management. But the diagrams neatly illustrate the principles of scene-light conversion.

The Live Broadcast

The final results from the scene-light conversion were so good that the Vision Engineers were able to rack (or shade) their cameras in the conventional manner, using SDR monitoring and the SDR output from the camera control units (CCUs). They knew from our earlier tests that the exposure of the HDR signals would track the iris adjustments made for SDR and deliver spectacular HDR images. On the day, they were sufficiently confident with the conversion that it was left to just me and my R&D colleague Simon Thompson to monitor the HDR, and the subsequent down-conversion to SDR BT.709.

Small differences were just perceptible when comparing the SDR conversion and native SDR from the camera CCU side-by-side, due to minor differences between the HDR and SDR camera channels. However, one was not necessarily better than the other, and the Vision Supervisors working in the UHD HDR OB trucks were very happy with the results.

In fact, the whole production crew were so satisfied with the results that we discovered our HLG to SDR down-conversion was the signal source for the international 1080i SDR feed, reaching an estimated audience of 1.9 billion viewers worldwide. Quite an achievement for HLG HDR, and one we're very proud of.

Developing this simple scene-light format conversion might at first seem like a small step towards completing the HDR production eco-system. But in fact, the problem of ensuring near identical colours in SDR content derived from an HDR workflow, compared with those from an SDR production workflow, is one that the whole industry has been trying to solve. It has so far proved a block towards the widespread adoption HDR live production. This new workflow that we developed, greatly simplifies HDR production without compromising quality. It was used for the very first time last week for both The Royal Wedding and a sporting event in the U.S. Now that the solution has been shown to work so well, and on such a large scale, we are hopeful that it will enable a significant increase in HLG HDR television production; which can only be good news for television audiences around the world.

A 3 Watt LDMOS Driver for the 432MHz band

John C Worsnop. PhD CEng MIET, G4BAO

Editors note – this article describes a useful driver amplifier kit available from John G4BAO which when driven by the Portsdown system produces a clean 500mW watts of DATV on 437MHz.

The amplifier compliments the 23cms version described in CQ-TV 242 and available in kit form from John - if there is sufficient John interest may produce a 146MHz version with similar specs – please email John directly.

Introduction

The popularity of my 2.5-Watt driver kit for the 1296MHz band (1) and the recent publication of G4DDK's Iceni 4322MHz transverter (2) inspired me to create a version of the driver board for 432MHz. This article describes that driver amplifier covering the band 430-440MHz band requiring around 10-20mW of drive for full output. As well as its use for SSB, CW and digital modes with the Iceni, it should prove useful to add to the BATV "Portsdown" DATV transmitter (3).

Specification

The design is very simple and based around a single SOT-89 plastic PD85004 40V LDMOS device from ST (3). The device is rated to give 17dB gain and 4 watts out at 870MHz at a Vdd of 13.5V but it performs even better with good linearity at 2.5-3 Watts at 432MHz.

The linear power output, P1dB is around 2.5Watts at a quiescent drain current of 150mA and the saturated power output is around 4Watts subject to component and device tolerances. Power gain at P1dB is around 26dB.

It can be added after low power transverters such as that by G4DDK (2) to boost the power output to a couple of Watts, sufficient to drive a larger PA device if necessary.

The PCB is designed to fit in to a readily available 37 x 74 x 30mm Schuberth tinplate box (4) (5) and if the PCB design is copied carefully, needs just a small stick- on heatsink at 2.5 Watts output.

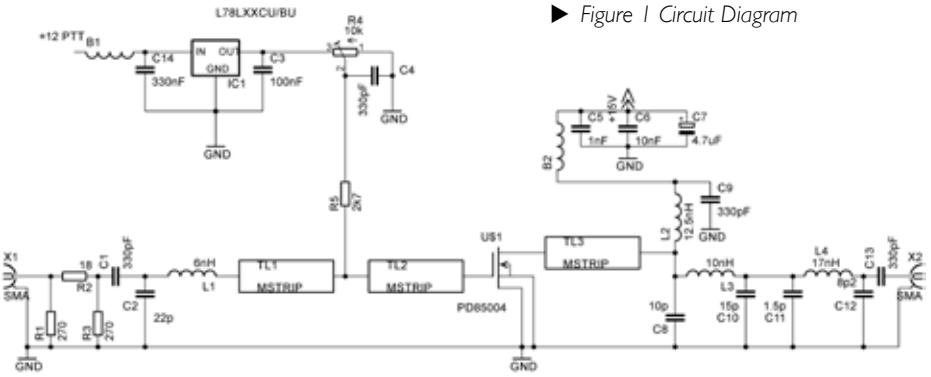
Circuit description

The amplifier uses a combination of 50-ohm microstrips, lumped and LC matching and requires no tuning. The device input is matched to 50 ohms using low pass networks consisting of C1 (a DC block), shunt C2, L1, and series lines, TL1, and TL2 split to allow the gate bias to be connected. It has an input attenuator, to reduce the gain and improve input match. Values shown are for a 3dB attenuator, but other attenuators can be fitted by choosing suitable values for R1,2 and 3. The attenuation can be set to zero by not fitting R1 and R3 and fitting a zero-ohm resistor in the place of R2.

The 13.5-volt supply is connected to the drain via a network of two chokes, B2 and L2 plus a short 50-ohm line TL3. It is decoupled over a wide range of frequencies by C9, C5, C6 and C7.

The output is matched to 50 ohms with a low pass pi network consisting of C8, L3, C10, C11, L4, C12, plus a DC block C13. This ensures that all harmonics are less than -50dBc.

To allow the amplifier to be switched in to standby mode on receive, or to switch it off under fault conditions, a low current +8 to 20V supply is applied on transmit, via B1. This feeds a 5V regulator IC1 decoupled with C3 and C14. The 5V is fed via R4, and R5 to provide adjustment of the quiescent drain current of the FET. This gate supply is decoupled by C4. Without gate bias, the amplifier takes very little current so switching the gate supply from the press to talk (PTT) line is a convenient way to switch the amplifier out of standby. Some Power Amplifiers produce a VSWR and/or over temperature alarm at logic level of +5V, so with some extra circuitry you have a way to switch off the drive to it under VSWR fail conditions or overheating by disabling the driver's bias regulator.



► *Figure 1 Circuit Diagram*

Construction

The PA is built on 0.8mm thick, standard FR4 PCB material. Layout is shown in Figure 2 PCB layout. The PD85004 used in the design is in a SOT-89 solder-down

plastic package which eliminates the need for hazardous beryllium oxide. Under the device tab there are six plated through holes to connect the tab both thermally and electrically to the ground plane underneath. This acts as a heatsink for the device along with a small stick-on copper heatsink placed directly under the device on the ground plane side.

▶ *Figure 2 PCB layout*

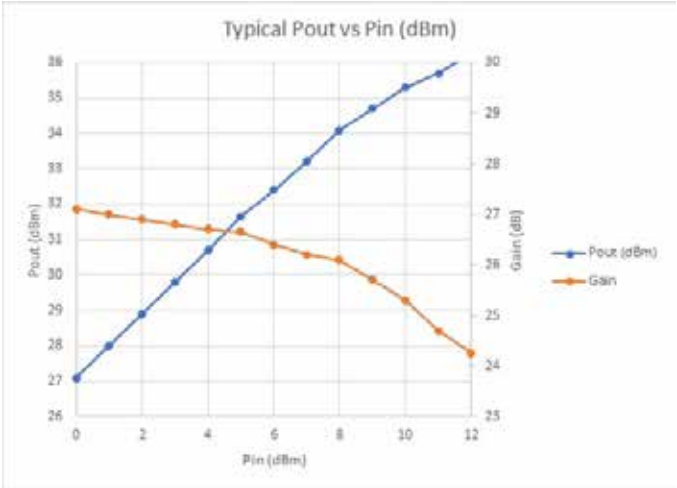
Checking the completed PCB

Connect the output from your low power 432MHz transverter to the amplifier input after first ensuring that the input power does not exceed 10mW (+10dBm). Depending on the attenuator fitted (in this example 3dB) this can be higher by the attenuator loss. Connect the amplifier output to a power meter/dummy load capable of dissipating at least 3 Watts.

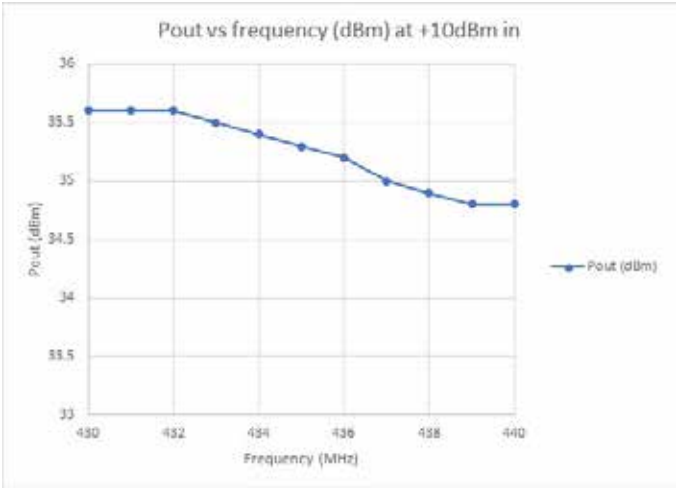
Connect the drain to 13.5 volts via an ammeter on the 1A amp range. Disconnect the RF drive and connect the gate bias supply, starting with minimum voltage on the gate and VERY carefully increase the gate voltage until the device begins to take current. This onset is very sharp, so be very careful, as the drain current can easily swing up to many Amperes if you are not careful. Set the drain current to 150mA. Switch off and then switch the ammeter to the 1 Amp range. Switch back on. Apply drive and check that the output power is in the order of 2.5- 3 Watts depending on drive level. Typical test results for my prototype amplifier are shown in Figure 4 and Figure 5.

▶ *Figure 3 Completed prototype amplifier*

Test Results



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



▶ *Figure 5 - Prototype Amplifier Power out vs frequency at +13dBm in*

Results for DATV operation

Measurements were made with a Class A style bias to see how the Amplifier performed in ultra-linear operation for DATV. Generally, DATV operators on 70cms measure spectral regrowth beyond the main signal and aim for a level of -35dB relative to the signal for the first spectral re-growth with no visible secondary growth below that.

The measurements were done with a DATV signal at 1Ms/s (~1MHz wide) on 437MHz. By experimentation it has been discovered that for ATV operation, the bias level has a "sweet spot" around 550ma for best spectrum and good power out. Operation at this level MUST use the supplied stick-on heatsink or better.

The signal source used, was a DATVExpress transmitter (6) set at +4dBm output which had a -50dB spectral regrowth, See Photo 1.

▶ *Photo 1 DATV express drive signal +4dBm*

▶ *Photo 2 Amplifier spectrum at Idq = 550mA Pout = +27dBm*

Idq (ma)	Pout (dBm)	Spectral regrowth	Secondary regrowth
550	+27dBm	-35dB	No

▶ *Photo 3 Amplifier spectrum at IDq = 350mA Pout = +27dBm*

Idq (ma)	Pout (dBm)	Spectral regrowth	Secondary regrowth
350	+27	-40dB	Yes

Conclusions

This inexpensive driver is easy to build, with readily available components and produces a useful increase in output power for low power transverters such as those using modamps as PA devices. It covers the whole of the 430-440MHz band and for DATV use the design can be regarded as a +27dBm (500mW) ultra linear amplifier if run at 550ma quiescent current with a heatsink.

Component kits for the PCB are available from G4BAO. Kits can be ordered by email with PayPal payments to ***oscarmax42@ntlworld.com***

See ***www.g4bao.com*** for prices and ordering details before sending an email!

Acknowledgements

Thanks to Sam, G4DDK for his comments on the prototype and Noel, G8GTZ for the DATV measurements.

Component list

Component	Value	Type
R1	270R	SMD 0603
R2	18R	SMD 0603
R3	270R	SMD 0603
R4	10k	SMD preset
R5	2k7	SMD 0603
C1, C13	330pF	ceramic 0805
C2	22pF	ceramic 00603
C4,C9	330pF	ceramic 0603
C5	1nF	ceramic 0603
C6	10nF	ceramic 0805
C7	4.7 uF 35V	SMD electrolytic
C8	10pF	ceramic 0603
C10	15pF	ceramic 0603
C11	1p5	ceramic 0603
C12	8p2	ceramic 0603
U$1	LDMOS FET	PD85004
L1	6nH	Coilcraft air core 0806SQ-6N0G
L2	12nH	Coilcraft 0805HQ-12NX_E_
L3	10nH	Coilcraft air core 0807SQ-10NG
L4	17nH	Coilcraft air core 0807SQ-17NG
IC1	5V regulator	L7805CU/BU
B1, B2	Dual ferrite bead	Panasonic EXCELDRC35 or 25

References

1. Original 1.3GHz driver article: - ***http://www.g4bao.com/Files/23cm_D.zip***
2. G4DDK Iceni Transverter: - ***http://g4ddk.com/IceniTechdesc.pdf***
3. PD85004 Datasheet:- ***http://bit.ly/2F4prKi***
4. Tinplate boxes (UK) from ***alan.melia@btinternet.com***
5. Tinplate boxes (Germany) from Eisch-Kafka: - ***http://bit.ly/2F35K5u***
6. DATV express project: - ***https://datv-express.com/***

There is also a BATC forum thread with more details: ***https://forum.batc.org.uk/viewtopic.php?f=13&t=5439&p=15394&hilit=g4bao#p15394***

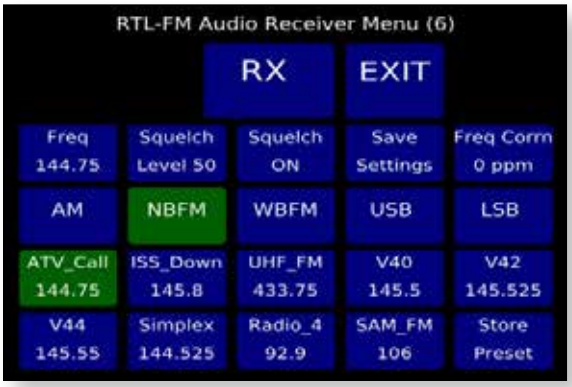
Portsdown Newsletter

Dave Crump, G8GKQ

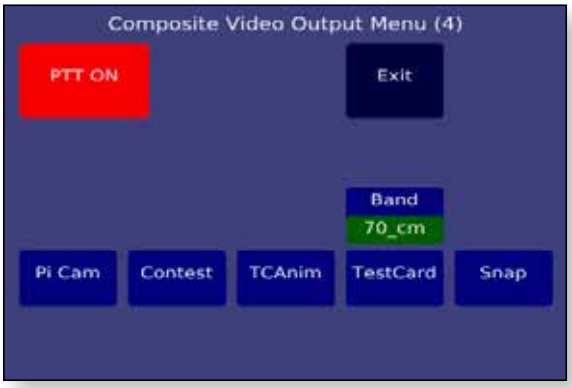
New Features

The major new features added since I last wrote in CQ-TV include:

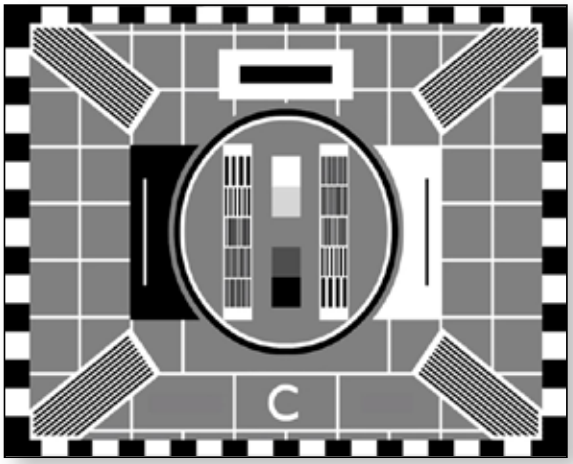
- New Portsdown build on the Raspbian Stretch operating system with full support for the new Raspberry Pi 3B+.
- Improved support for the Element 14 7-inch touchscreen
- Improved support for the DATV Express with checks for correct firmware loading.
- The ability to edit more settings from Menu 3 of the touchscreen
- A more flexible audio receiver using RTL-FM and the RTL-SDR dongle
- A new composite video transmit output menu with more test cards
- A range and bearing calculator for beacons and other contacts



RTL-FM Audio Receiver Menu



Composite Video Output Options



Test Card C is available from the Composite Video Output

Range and Bearing Calculator

The Raspbian Stretch Operating System

The move to the new Raspbian Stretch operating system is important. I now develop all new features on this operating system; before release I test some of the new features on the old Raspbian Jessie operating system. However, the more complex new features have not been, and will not be, tested on the old Jessie operating system. What this means for you is that:

- If you want the latest and best functionality, you should use the Raspbian Stretch operating system.
- If you want to use a Raspberry Pi 3B+ (the new version), your only option is the Raspbian Stretch operating system.
- The Element 14 7-inch screen is not supported on the older Jessie operating system (it still works at the moment, but I do not test new releases on it). So if you have a 7 inch screen and want to upgrade, you should use Stretch.
- The LimeSDR Mini will not be supported on the older Raspbian Jessie operating System.

- Mainstream security updates ceased to be available for Raspbian Jessie this month; however a team of volunteers from the Debian Long Term Support project will continue to provide security updates until June 2020.
- If you are happy with what you have and don't want to upgrade or connect to the internet, you can stick with the old Raspbian Jessie system forever. Just think carefully before connecting to the internet or pressing the "check for updates" button.

How can you upgrade?

Well, the full instructions are here: ***https://github.com/BritishAmateurTelevisionClub/portsdown***
This means wiping your existing SD Card, or alternatively programming a brand new card. If you are not confident to do this, you can purchase a new card from the BATC Shop – all cards sold since 3 April 2018 are loaded with the new Stretch operating system; IF you purchase a new card (and only IF), I am prepared to reprogram your old card with Stretch for you if you send it to me with a stamped addressed envelope – please contact me by e-mail for details.

Audio Output From the Raspberry Pi

There have been some changes to the way audio output is handled in the latest update. I found that if the RPi audio port (on the 3.5mm jack) was enabled and used, then the RPi would not transmit DATV until after a reboot [this is to do with the audio drivers not releasing the PWM modulator]. So, I now use the USB audio dongle for audio output from the RTL-FM receiver and for audio pass-through during Composite Video transmit output.

LimeSDR Mini Support

I have had the Portsdown development system running with a LimeSDR Mini on the test bench. It is early days, but it looks as though the Portsdown/LimeSDR Mini combination might be capable of DVB-S2 as well as DVB-S. I have already implemented the new touchscreen buttons required in the last update – I just need to write the code to make them control the LimeSDR Mini. I hope to release some basic functionality within a few weeks.

LeanDVB Receiver

The current LeanDVB DATV receiver included within the Portsdown software will only receive using the same parameters (frequency, SR and FEC) that are set up for transmit. I hope to provide another selection screen to enable the receiver to operate independently from the transmitter settings. I also hope to enable MPEG-2 decoding, but this will also require the purchase of a £2.40 MPEG-2 decoder license from
http://www.raspberrypi.com/mpeg-2-license-key

Streaming

Support for the new BATC streamer is already included in the Portsdown. You need to use the Console to enter your streamname-key, but then you can select it as an output mode by pressing "STREAM" rather than "BATC". The "BATC" button will be removed in the next release.

Limitations

I have recently noticed that the MPEG-2 test card modes struggle at 4 MS with the DATV Express. This is simply a CPU processing power problem that I cannot overcome at this time. H264 does work as it uses hardware encoding.

Hardware Options

The availability of the 7 inch screen has changed the potential size and shape of the Portsdown hardware. My latest version fits in an ex-Maplin sale 22 cm by 13 cm by 9 cm plastic box and includes a mains power supply, 12

volt power supply, EasyCap, RTL-SDR, ADF4351 and Filter-Modulator board. The USB, network and power sockets are one end of the box and the video, audio and RF sockets are on the other end of the box. I use a Logitech Webcam rather than the Pi camera.

Further Development

In addition to LimeSDR and LeanDVB, there is a long list of minor enhancements that I hope to implement soon. I was distracted by the recent ATV Contest, but I did succeed in making contacts on all bands from 146 MHz to 24 GHz using the Portsdown as the RF or video source, and I found a few more features that could do with improvement. It was also encouraging to see that many of the pictures that I received were generated by Portsdown equipment.

If you have ideas for features that you would like to see in the Portsdown, please let me know. Better still, if you are able to write useful add-ons to the Portsdown, I'll happily include them in the main build!

5.6 GHz ATV – the record DX chase

Noel Matthews - G8GTZ

The best DX record for ATV using the 5.6GHz FPV equipment has stood at 138KMs since last August when G8GTZ and G8GKQ worked up the Bristol channel from Dunkery Beacon to Cleeve Common near Cheltenham. However it became clear from the planning and exploits in the North West that this would not stand for long!

And so on 21st April Chris M0KPW and Nick G0HIK from Furness Amateur Radio Society went to Kirkstone Pass in the Lake District with their 5.6 GHz FM ATV equipment and worked G3NWR/P, manned by Brian G4EWJ at Blychau in North Wales. This set a new UK record for ATV on the 5.6 GHz band of 153 km and the full story is told by Chris in a separate article in this CQ-TV.

However, this record of 153 km only stood for 3 weeks until the 9th May when a team from Yorkshire (Barry G8AGN and Richard G0RPH) activated a 158 km sea path from Bridlington to Cromer in Norfolk, where G8JAN, G0FVG, G4NJJ, M1BKF and G8GTZ were on the cliff-top.

This path is by no means line of sight, but there was a clearly visible temperature inversion over the sea. This can be seen as a dark band (maybe brownish) forming so you can no longer see the Horizon - as seen to the right of the black line in the picture:

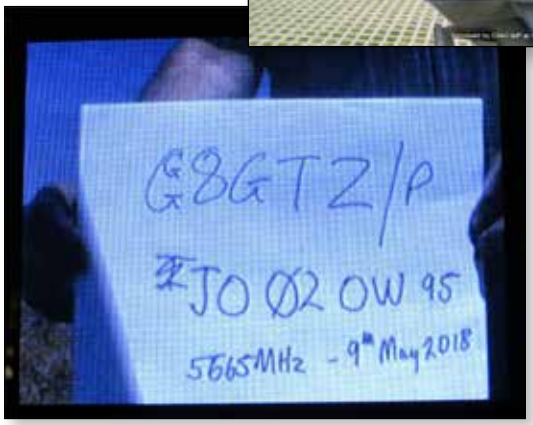
As can be seen from the pictures, the aerials were a mix of dishes and flat panels. G8AGN used a 1700 mW TS582000 module with a 21 dBi panel for transmit, and a RC832 module with a 24 dBi panel for receive.

The over-sea duct enabled all stations to exchange P5 (noise-free) pictures with each other and the signals were so strong that pictures were even received on the small turnstile aerials designed to go on the underside of the drone…

There is clearly lots of potential for greater distances to be achieved, particularly using sea ducting during the warm summer months and there are already rumours of tests taking place between Northern Ireland and the North of England so we expect to see the record being broken at least once before the next edition of CQ-TV is published!

Norfolk

Yorkshire



Discovering the joys of 5.6GHz ATV

Chris Leviston - M0KPW

Discovering the joys of 5.6GHz ATV - for those with little or no previous ATV or microwave band experience.

Introduction to the kit

Following a short article in the September 2017 edition of RadCom that stated 5.6Ghz ATV could be achieved by using cheap 'First Person Video' (FPV) transmitter and receiver units, Chris M0KPW and Nick G0HIK set about building systems. Nick went down a more technical route of using change over relays and a dish antenna with home brew feeds etc.

Chris M0KPW built his system very differently and shows that great results on 6cm ATV can be achieved without having a lot of technical 'know how' plus the different set up from Nicks would be a good comparison of the systems.

The receiver used is the standard RC832 receiver mentioned in the RadCom article, as are the transmitter units, the TS58285. There are numerous variants of these available and a few were ordered so backups were available in case of any failures. Some heat sink was cut to size and glued to the back on the units to help dissipate some heat when transmitting – the units do get very hot when transmitting for anything more than a few minutes.

Chris' system uses two commercial 5GHz panel antennae instead of a dish, and separate antennae for TX and RX to eliminate the need for a relay. These were ultimately more expensive than 'home brew', but more suited to the 'new to microwave bands' novice constructor A great deal of research was done before purchase to ensure they would be suitable for 5665MHz (low SWR etc). The two antennae in question are a '5Ghz 24dBi HV WIFI RP-SMA Wireless Signal Booster', which is used for TX. And a 'TP Link TL-ANT5823B' which offers 23dBi for RX. The only reason for the difference in the antennae is the availability and supply at time of purchase. The RX and TX units are the same as the ones described in RadCom, which are fed into a camera and TV monitor respectively. A 12v distribution unit was built allowing power for all system to come from one 12v source. A 12v to 5v converter was installed for running a memory card reader and on screen display unit. The total amount of power run when the station is operational is a little over 1 amp so running from 7 and 10ah batteries offers plenty of operating time.

A later addition was a C-DVR for recording the video and audio of the QSOs onto a micro SD card which makes it possible to review and share the recordings afterwards.

The winter months of 2017 were spent doing a lot of local activations and testing. Gradually building up the distances from a few miles to 30 miles. This enabled Chris and Nick to refine their systems and make tweaks where necessary. Even simple things such as the ease of setting up the tripod and cables being the right length.

A module was bought (search '8GHz OLED RF Power Meter' on eBay) that can measure the output power up to 8GHz, so are perfect for checking the output power of the TX units. These weren't checked until after we'd achieved distance of over 150km and using a 30db attenuator it proved that the TX units were not putting out the advertised 600mw. They were putting out anything from 100mw up to a maximum of 300mw, so being able to achieve the distances of over 150km with half the

expected power was an extra achievement. Despite Chris and Nick having the same brand of TX units, Nick had output power of around 800mw – so it shows that the quality control of these units may not be consistent.

After some research Chris found an alternative FPV transmitter unit, which is a 'Eachine TX526 5.8G 40CH 25/200/600MW Switchable AV Wireless FPV Transmitter'. This was ordered from a UK supplier, costing more, but offered more reliable delivery (2 days instead of 6 weeks) and better customer support if required. These units are switchable between 25mw, 200mw and 600mw. Again, these units were tested on the power meter to check their output – this time the meter was reading around 800mw on high and mid power, with around 50mw on low power. So again a case of 'quality control', but this time on the more favourable side!

For more details on how Chris built his station, see ***www.5-6ghz-atv.co.uk***, where his station is described in great detail and shows how easy it is to get up an running – even with little know how of ATV and the GHz bands.

Activations

Following some news in RadCom of our activities and posts on Facebook and the BATC forum it wasn't long before we started to receive request for arranging skeds. South Cumbria offers a host of locations with good line of sight into numerous locations. There were a number of interested parties who got in touch to arrange a sked (some of which are in the final planning stages as this is being written), but it was Brian, G4EWJ, from Wirral Amateur Radio Society who was first with suggestions of paths from South Cumbria into North Wales. Brian was familiar with a few suitable locations in North Wales and finding suitable locations in Cumbria was not too difficult (although not necessarily where you might think – there's always another hill that gets in the way!)

With the 'improving' weather of March and April a number of 2 ways QSO's were achieved between Chris and Nick at various locations in Cumbria, and Brian at various locations in North Wales and the Wirral. All these contacts were 2 way with P4 / P5 (depending on the path) from both sides. These QSOs were achieved in varying weather conditions, from beautiful sunshine to mist and rain. All paths were plotted in advance on 'HeyWhatsThat' and other related websites so we knew which way to beam when on site – it makes it much easier to have a bearing and we've found that little alignment has been necessary after getting set up.

Distances achieved from various activations include :

24 March – 101km

4 April – 91km (Chris at sea level)

8 April – 115km

14 April – 138km

21 April – 153km

15 May – 75km (testing sea path to sea path from Barrow in Furness to Hoylake)

Taking a 'record'

We never set out to break any 'records', we were simply looking to achieve a little bit of further distance on each outing.

We had discovered a path from IO84ML (Kirkstone Pass) to IO83FD, again in North Wales and decided there was a good chance of success. Kirkstone Pass is pretty much in the middle of the Lake District and close to Ambleside, with weekends being the only option for the sked we decided to arrange for an early start as 'visitor season' was well under way in The Lakes and tourist traffic made the roads very busy.

Chris and Nick set up at the top end of a car park opposite The Kirstone Pass Inn. An ideal location with a clear line of sight between the hills into North Wales.

The sked time was 9am and the 2m handhelds worked with perfect 59 as we called Brian for talk back, Brian transmitted first and we received his test card P5 straight away, setting a new record of 153km. Very little alignment was necessary. Chris and Nick took it in turns to transmit

down to Brian and reports of P5 and P4 were received. Chris received the P4, but given the reduced TX power of less than 300mw at this point, it's a remarkable achievement.

Obviously the record was set again a few weeks later in early May – and probably a few more times by the time you read this – but it goes to show what can be achieved with these kits and some ingenuity in the station design.

Until now all our contacts had the advantage of height, and Chris was keen to see what could be achieved over line of sight sea paths. We conducted a sea path to sea path test in the middle of May, and it was very interesting to see very deep fading in and out of the signal. We had a locked signal at a distance of 75km, and the initial colour signal was around P4 and over the course of several minutes the signal went down to P0 and up to around P4 repeatedly. It was very interesting to see the signal fade so drastically with the atmospheric conditions.

There is clearly lots of potential for greater distances to be achieved, particularly using sea ducting during the warm summer months.

STOP PRESS June 29th - M0KPW and Nick G0HIK, on Corney Fell, Cumbria worked John GI7UGV at 159km on 5.6Ghz ATV – this is probably the first G to GI on 6cm ATV. For more details see the BATC forum.

Roberto Zech, DG0VE, silent key

Some weeks ago a shocking news arrived: our friend Roberto Zech, DG0VE, died quite suddenly on 20.2.2018.

Roberto was 49 years old, sportive and health-conscious. Only recently on 17.2. he visited the "GHz-Tagung" in Dorsten, Germany, and other visitors reported good health from him. Many amateur radio and ATV friends knew Roberto for more than 30 years as a developer and producer of high level UHF and GHz devices. He provided them to radio amateurs and commercial users all over Europe.

As a certified textile machinery technician he acquired his knowledge on microwave technology in private studies. Roberto seemingly had planned new devices like a 24 GHz prototype group in a milled aluminium housing. He was an active member in several amateur radio groups like DARC and AGAF and regularly visited meetings like HAM RADIO in Friedrichshafen, UKW-Tagung Weinheim and ATV-Treffen Gloevzin with his stand.

Roberto is leaving a big vacancy especially in the ATV community. We wish his family much strength after this severe loss. Roberto, DG0VE, will always stay in our mind thankfully.

For AGAF e.V.
Uwe, DJ8DW, President
(translation Klaus, DL4KCK) www.agaf.de

In this Issue:

- Editorial: Digital deceleration
- Report from the AGAF stand of HAMRADIO 2018
- Glövzin pictures May 2018
- 33 years ATV repeater DB0OV
- ISS SSTV broadcasts on manned space flight day
- Digital conference Geiersberg
- HamTV merging server
- Integration of MeshVideo in ATV

Additional content:

G 600 - LCD digital microscope, Scandal in recent FM radio history, Experience with conversion and use of PLL-LNBs, A sailing training ship with no room for radio amateurs, ATV news from Germany, Austria, Great Britain and USA.

Turning Back the Pages

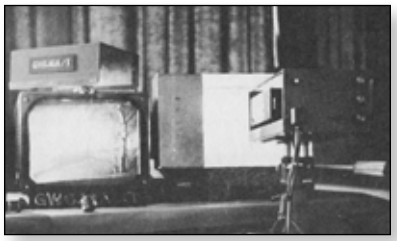
A dip into the archives of CQ-TV, looking at the issue 48 years ago. *Peter Delaney - G8KZG*

CQ-TV 72

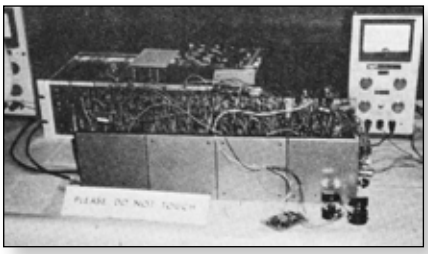
The main feature of CQTV 72, which was published in November 1970, was a report on CAT-70 - the Convention on Amateur Television held in Cambridge earlier in the year, and the cover illustration showed a piece of modern art sculpture at Churchill College, where the event took place.

The Club was celebrating its 21st birthday, and this was the largest event BATC had organised up to that time. One 'theme' that emerged from the discussions was the need to 'use or lose' in this case the allocation for amateur television on the 70 cm band.

The weekend's programme included the usual stream of lectures, films and video recordings, and the customary displays of members' 'latest projects'. In addition, Pye TVT and EMI attended (both companies manufactured television equipment at the time). A visit was also arranged to the Pye TVT factory in Cambridge on the Saturday - it must have been a sizeable party, as members traveled in 'a few cars', as well as a 52 seater coach. Members were able to visit the station of G6KKD/T, Ian Waters, over the weekend.



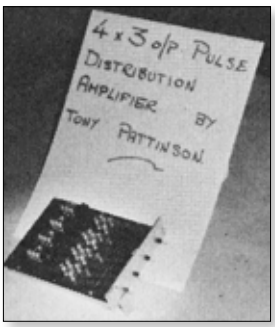
▶ *GW6JGA/T caption scanner - part of his prize winning display*



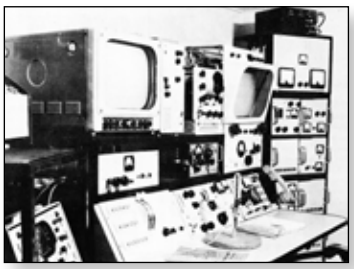
▶ *Arthur Critchley's integrated circuit display*

On the Saturday afternoon, a demonstration was arranged of amateur television "over the air", in which several of the East Anglian amateurs gave a 'conducted tour' of their amateur television set up - one of them being relayed by G6NOX/T from G6WJ/T at Saffron Walden, whilst another part of the presentation was transmitted as an outside broadcast from on the River Cam by Graham Shirville, G6AEV/T. The station of G6KKD/T was shown as a video tape recording - as Ian was presenting the whole programme from within the CAT-70 studio he pointed out he "couldn't be in two places at once".

A Convention Dinner was held in the evening, when the Chairman, Gordon Sharpley, welcomed guests from, Belgium, France, Germany, Holland, Switzerland, South Africa and the USA, whilst there were also representatives from the BBC and ITA , (Independent Television Authority), the Royal Television Society, the Radio Society of Great Britain, Pye and English Electric Valve Company (who were one of the television camera tube manufacturers).



▶ *Tony Pattinsons miniature pulse distribution amplifiers*



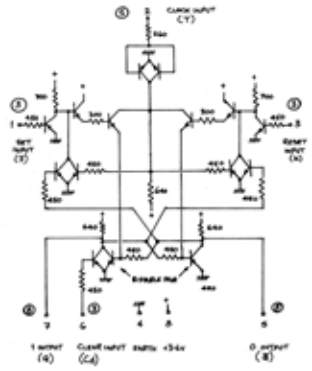
▶ *G6KKD/T's station near Cambridge*

On the Sunday morning a programme of lectures was arranged, including one on "Amateur Licences", given by a Mr Davies from the Ministry of Posts and Telecommunications, whilst Grant Dixon recounted the history of slow scan television.

The afternoon was taken up with the Club's "General Meeting", when the usual types of business were conducted. It was also noted that "the Editor, Andy Hughes, made a plea for more articles (almost all he ever says when he speaks!)" ...

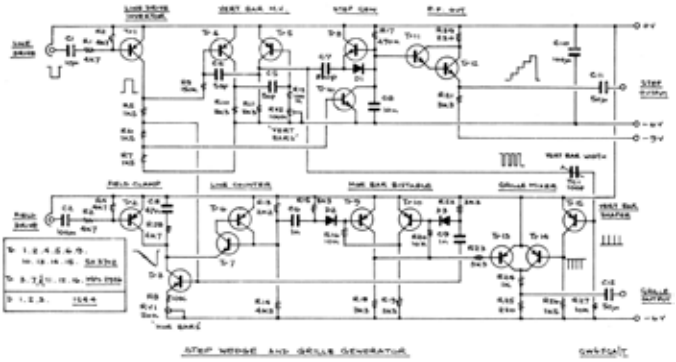
▶ *Alan Pratt with ex broadcast camera in the Cat 70 studio*

One of the lectures at CAT-70 was given by Arthur Critchley, on the topic of 'Integrated Circuits', and CQ-TV 72 also included the next part of his series of articles on the same subject.. This time he considered the µL923, which was more complex than the µL900 and the µL914. Arthur said the "internal circuitry ... is indeed a fearsome sight". It contained no less than 15 transistors, and was a J-K bistable with the "necessary self-steering circuitry to make a binary counter". In order to use them it was not necessary to understand all the internal circuitry, but rather to follow the logical rules for the inputs and outputs. Having discussed the operation of the basic µL923, the article went on to show how such devices could be cascaded to form counter chains of synchronous,



▶ *µL923 bistable ic circuit*

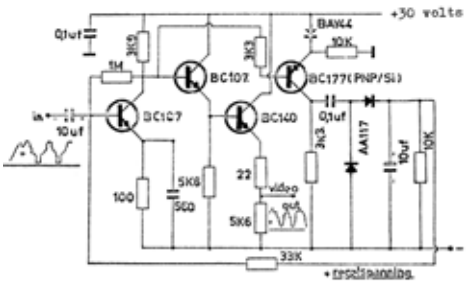
ripple or twisted ring type, and then how to make a ÷ 525 counter, with a variant for an interlaced 525 line system, and then (in block diagram form) how to create a ÷ 625 line interlaced counter chain (useful in a sync pulse generator). Arthur noted at the end of the article that "TTL ICs will be investigated as they are generally faster and better in all respects than RTL ICs, which are becoming obsolete, which is why they are available".



▶ *Step wedge and grille generator circuit*

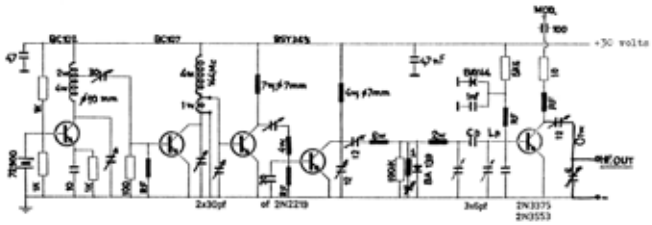
John Lawrence's "Circuit Notebook" took the form of a stepwedge and grille generator, which was useful for testing television systems independent of a camera or slide scanner. Tr 4 and Tr5 formed a multivibrator that produced pulses at 8 x line frequency, (ie vertical bars) triggered by line drive from Tr1. The bistable Tr9 and Tr10 were triggered after a set number of lines, the counter being reset by field drive from Tr2, so that the horizontal bars were stable within the image. The horizontal and vertical bar signals from Tr9 and Tr5 were then gated together at Tr13 and Tr14 to generate a grille pattern. The vertical bar signal was also used to drive Tr8, which, via D1, added to the charge on C8 at each positive edge of the bar signal. This resulted in the voltage across C8 being increased in equal sized steps, until Tr16 was turned on and discharged C8, so the process would start again at the beginning of each line. Tr11 and Tr12 formed a Darlington pair, to isolate C8 from the output load. The resultant step wedge would then appear as a set of 8 vertical bars of equally graded grey levels, from black on the left to white on the right of the screen.

The other main technical article was for a 700mW transistorized transmitter (which could drive a QQE03/20 valve output stage to about 8W) for use on the 70cm band, designed by F Eggermont in Belgium. The video



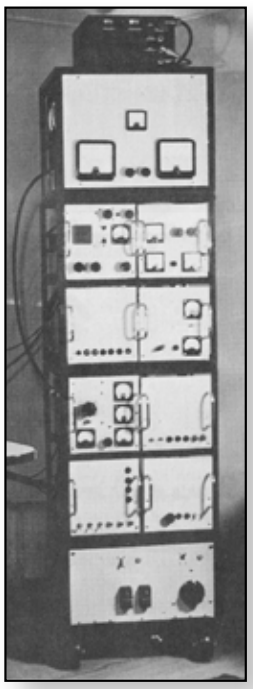
▶ *Transmitter modulator circuit*

modulator circuit comprised a BC107 with a gain of about 20, driving the double emitter follower built around another BC107 and a BC140. The BC177 acted as a clamp driven by the sync pulses. The modulator output from the emitter of the BC140 was fed to the 2N3375 output stage of the RF circuits. The rest of this circuit took the form of a BC107 crystal oscillator running at about 72.9MHz, followed by another BC107 as a frequency doubler. The resultant 145.8MHz signal was then fed through a pair of BSY34, to deliver about 500mW of drive to a BA139 varicap tripler, delivering about 300mW of signal at 437.4MHz to the 2N3375 output stage, with a pi filter for output matching.



▶ *Transmitter rf circuit*

Tucked into the bottom corner of the last page was an item of 'STOP PRESS' - the Club had just heard that Mike Bues in Epsom, Surrey, had succeeded in transmitting PAL colour bars to Dave Mann in Wembley.



▶ *G6NOX/T's on-air station ident*

▶ *Jeremy Royle, G6NOX/T talking on air*

▶ *The transmitter at G6KKD/T, described by Ian Waters during the on-air presentations*

The British Amateur Television Club

The club provides the following for its members:

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

www.batc.org.uk

BATC
Out and About

Rallies and events with an BATC stand: (subject to change)
More will be added as they become known.

2018

22 July	McMichael	***www.mcmichaelrally.org.uk***
15-16 Sept	BATC Convention	***www.batc.org.uk***
28-29 Sept	National Hamfest	***www.nationalhamfest.org.uk***
12-14 Oct	RSGB Convention	***www.rsgbevents.org***
17 Nov	Norden, Rochdale	***www.radars.me.uk***

For a list of all rallies see: http://rsgb.org/main/news/rallies/

If you are able to help on the BATC Rally stands, please contact the BATC secretary.