In this issue

Contributing Authors

Trevor Brown G8CJS
Michael Edwards G8CPF
John Hudson G3RFL
Klaus Kramer DL4KCK
Richard Carden VK4XRL
David Holden G3WUN
Ken Konechy W6HHC
Mike Stevens G7GTN
Tomtom DL1MFK

Editorial

Wow! 2016 and its CQ-DATV's third birthday. We produced our first magazine in February 2013. This came out of a drive to push ATV further and faster than had ever been tried before. By issue 5 (August) we took an another ambitious decision to move from a bi-monthly publication to a monthly publication.

The original format chosen was eBook (ePub, mobi, AZW3) and it was hoped to develop an app so that the magazine would just appear on you eBook reader app every month. This is the one link in the chain we have not yet developed, but we did add a PDF format download so that readers that did not own an eBook reader would not miss out.

The original production team of Ian and Trevor were joined by Terry who took over the complete production of the PDF version. (Trying to do both proved too much for my ageing brain cell - Ian)

We have never had a monthly ATV magazine before and it is hard work that requires a team effort to keep it in production.

The main worry was not 'could we produce a magazine in three versions of eBook and a PDF copy', but could we find enough copy! We have been blessed with an overwhelming level of support with regular contributions from John our construction project ace through to Ken our DATV express expert. Mike our Micro controller whizz and Richard, who has put digital world together.

We also wanted to widen the subjects covered to include more than just DATV and the communication side of our hobby. Dave keeps popping up with updates on his home constructed quad copter and Trevor has put together film production training based around simple bridge cameras that can be used for stills and movies.

This issue we have also looked backwards to what is often called the golden age of ATV with a look at the first ATV outside broadcast vehicle 'Matilda' and its appearance at the 1957 Dagenham show. We are indebted to Simon Hall for the photographs which we believe were taken by his father Bill Hall.

Sorry to end on sad news, but Mike our Micro controller whizz, who has been a major contributor and supporter of this magazine is still very ill. As we reported in earlier issues, he has had major surgery and was released from hospital only a few weeks back and yes, he jumped back into the saddle and produced copy for this issue, but has had a further relapse,. More surgery and in the next few days will be starting more Chemo therapy. This time for a tumour.

Mike has supported CQ-DATV from issue one and I am sure we all wish him well and hope he makes a full recovery.

CQ-DATV Production team

Anniversary

The BATC (Basingstoke Amateur Television Club) eventually published a landmark issue, 250, of their quarterly(?) magazine CQ-TV.

They are looking for a new membership secretary and also for someone to create an index of recent CQ-TVs. They are also still looking for volunteers to help with the re-development of their web services, including the membership database.

DATV-Express Project

Art WA8RMC has reported to the project team that 24 each blank PCB's were received this week and the entire parts kit was then delivered to the PCBA assembly house on 2016-01-22. Testing of the new assembled DATV-Express boards is expected to begin this coming week.

73…de Ken W6HHC

Quad or Drone?

CQ-DATV has now had at least three articles on Quad copter ATV.
We have resisted calling these devices Drones because of the military link, but Intel have now put together Drone 100 a 3D masterpiece of art and airborne technology, working with Ars Electronca FutureLab* using Intel® technology and Ascending Technologies' drones to push the boundaries of what's possible.

See how it was done.
http://www.intel.com/content/www/us/en/events/videos/making-of-drone-100.html

Convention

The BATC's 2016 Convention for Amateur Television (CAT 16) will be held in the Conference Room of the RAF Museum Cosford (near Telford, Shropshire) on Saturday 24 September and Sunday 25 September.

The RAF Museum Cosford is near to junction 3 of the M54; further details can be found here:

http://www.rafmuseum.org.uk/cosford/

Attendees to CAT 16 will be able to view the Museum exhibits and time will be set aside in the programme for this. Details of suitable hotels nearby will be published in due course.

The BATC Biennial General Meeting will take place on the Sunday afternoon.

Dave G8GKQ

Silent key

Sadly, on Friday 8th January 2016, Peter Blakeborough G3PYB, the BATC president, passed away. Peter was an important part of the ATV community and will be missed by us all.

His name first appeared on my radar when I became BATC secretary. I researched all the previous secretary's and their contributions to the BATC in order to formulate my own role roll. Peter was an early secretary back in ???? but had left before I joined committee.

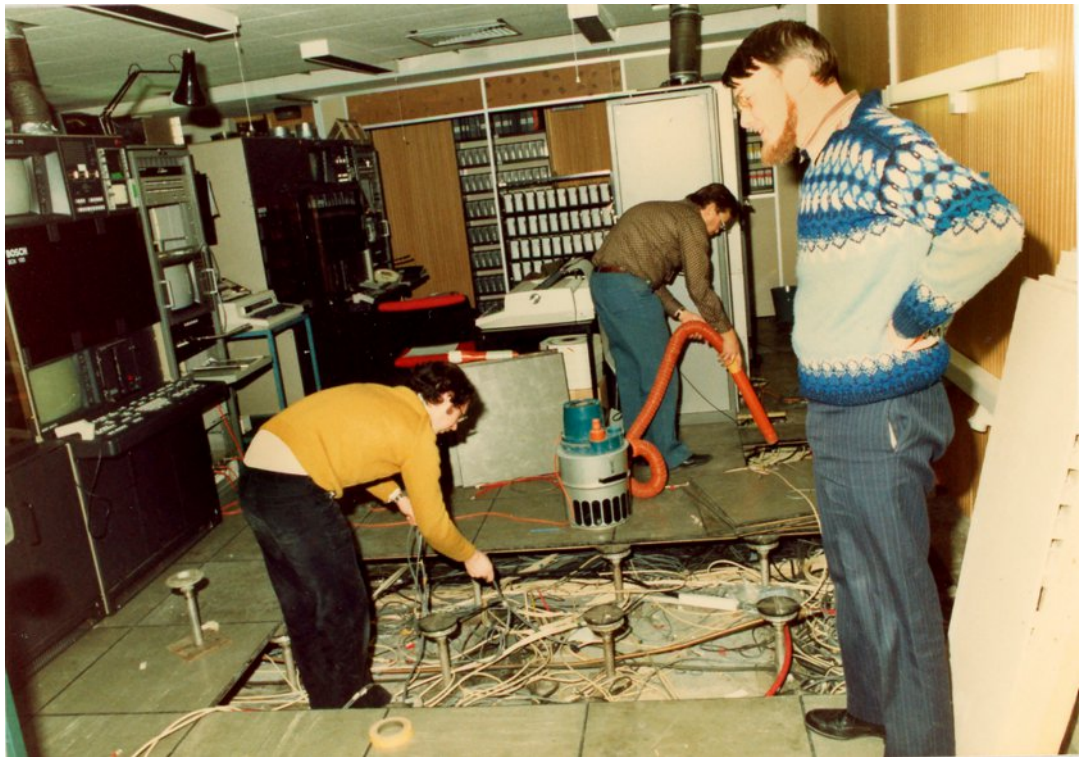
It became evident when his picture appeared in CQ-TV 75 operating a Portable SSTV station on Silver Hill Jamaica, that he had left BATC committee because of a job move.

In those early days you needed a special license for ATV and with it came a special call sign that ended in /T. Peter's was G6ACU/T

He did reappear in the UK and formed a relationship with Wood and Douglas and was always part of their rally stands, mostly demonstrating his own 10GHz portable ATV equipment, rather than the latest Wood and Douglas products. The relationship continued as Wood and Douglas left the amateur radio scene and moved into professional products for lots of industries, including Broadcast TV.

In the late 80's he appeared at my works QTH, Yorkshire Television, leaving behind Link Electronics where he had worked with Dave Mann G8ADM, the current BATC secretary. This is where I came to know him best.

Peter was part of an engineering and installation department. I was in VTR operations. We may have been separated by a floor and a different reporting structure, but we shared the



A Youthful Peter, finding what lurked below the computer flooring in the VTR department, during a new installation

same canteen and club bar and exchanged ideas, always about Amateur Television, which was a passion for both of us.

Peter introduced me to FM ATV. I was a little entrenched in 70cms and AM, but he was the driving force for adopting FM TV as ATV moved on up to the wider spaces of the 23 cms band.

Just in time because the opportunity to build a 23cms ATV repeater presented itself, GB3ET. The application had been completed by another ATV enthusiast, David Long G3PTU and had a site 1200 ft AGL (yes above ground level), this was the Emley Moor TV mast that supplied Yorkshire Television programs.

I mastered the control logic, Micro Processor Control and though I knew little about micro's and even less about RF, so Peter turning up really was a blessing. Peter was always an RF man, the expert on FM ATV and he worked in the same building. Yes, we became great friends, I know without his help G3BET would have never radiated its signal around Yorkshire.

The installation was even more fraught than the construction. The kit was housed in the Turret room, just below the TX aerial

Access was via an open lift. I still remember both of us crammed in that lift together with a 19" rack when it stopped half way up! I think we considered the option of descending the climbing ladder. Fortunately after about 20mins it came back to life.

Emley Moor tower lift

Some years later the late Grant Dixon came to see our installation

Sadly Yorkshire Television came to an end with a mass exit of people. We always likened it to the film The Great Escape, and as people left in waves, we named the waves after the three tunnels in the film, Tom, Dick and Harry. People even used to mimic releasing sand from their pockets.

After being interviewed for a wave of redundancies, Peter left in the Early 90's (Tom) I stayed until Harry (1998)

Peter moved into TV automation with Philip Drake Automation and spent a lot of time in Russia, even to working on the language, it was not the last of Peter. The BATC put a series of stands up at IBC and Peter was always there with his new company, so yes, we met every year and talked ATV.

The BATC IBC stand, Peter was working not too far away for Philip Drake

When Mike Cox retired as the BATC president, I crossed my fingers, held my breath and asked Peter if he would take on the roll and well, the rest is history. He succeeded Mike Cox and became the BATC president. A role he was still performing when he passed away that Friday afternoon.

He contributed greatly in this role, and built a Veroboard vision mixer and turned up at both the Microwave round table meetings and the AMSAT colloquiums with this temperamental mixer, with which he streamed their lectures via the latest BATC innovation (the BATC streamer). Some of the programs still exist in the library section today.

Is ATV the poorer because of his passing, yes, whatever the problem Peter had a solution and he has taken us from AM through FM into the digital age and will be sadly missed by everybody connected with ATV.

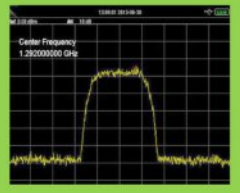
Goodbye Peter and thanks for being my supporter, helper and most of all friend - **Trevor Brown G8CJS G6AGM/T**

Peter streaming one of the early AMSAT meetings on a homemade mixer he had put together a few days previously just for the event.

This is how I would like to remember Peter - always setting up a Microwave link. BATC conventions, microwave contests, Peter was always there.

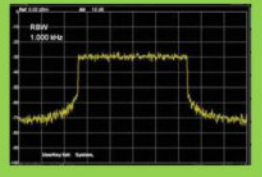
Digital Amateur TeleVision Exciter/Transmitter

now available from



DATV-Express

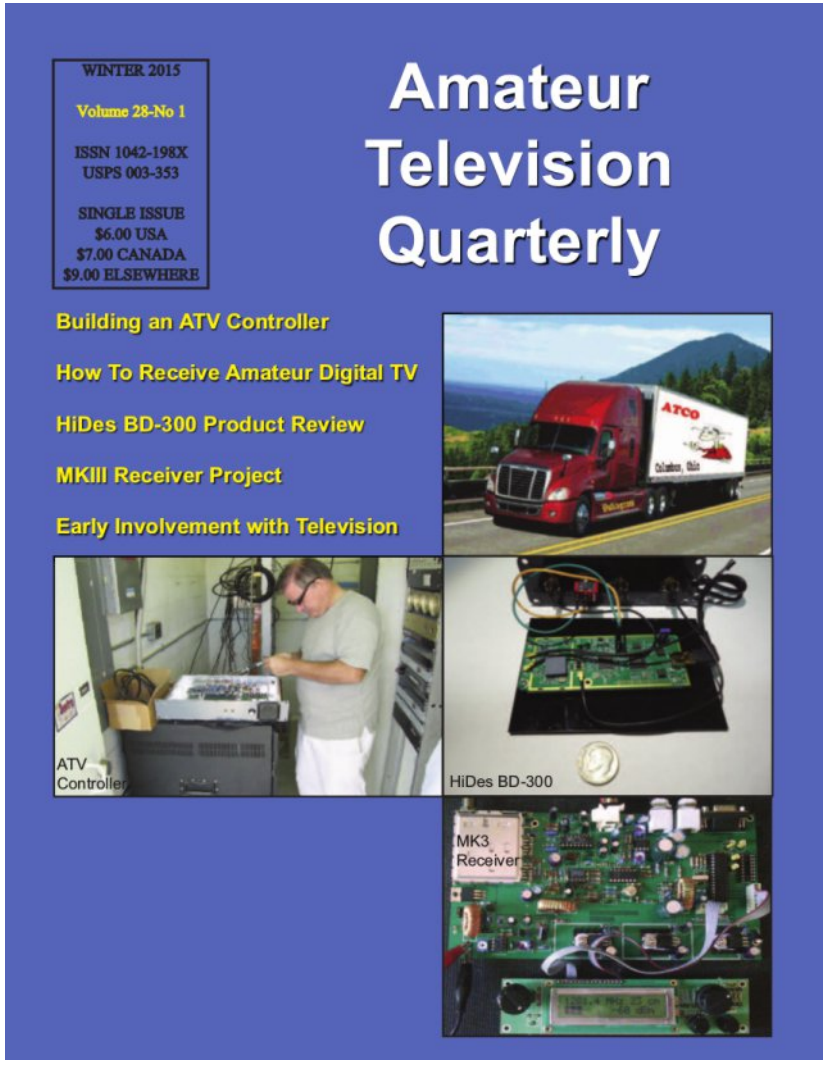
- A more affordable DATV exciter can now be ordered
- Fully-assembled and tested PCBA
- DVB-S protocol for DATV (using QPSK modulation)
- Can operate all ham bands from 70 MHz-to-2450 MHz
- RF output level up to 10 dBm (min) all bands (DVB-S)
- Software Defined Radio (SDR) architecture allows many variations of IQ modulations
- "Software-Defined" allows new features to be added over the next few years, without changing the hardware board
- As extra bonus, the team has been able to get the board to transmit DVB-T 2K mode, however we cannot guarantee the performance of that protocol. Caveat Emptor!
- Requires PC running Ubuntu linux (see User Guide)
- Price is US$300 + shipping – order using PayPal



For more details and ordering

www.DATV-Express.com

register on the web site to be able to see the PURCHASE page



ATV Quarterly - Don't miss another issue! Subscribe Today

USA $22.00 year, Canada/Mexico $25.00 year DX $32.00 year (US $) Cyber: $15/yr. Visa, M/C, AMEX, PayPal via Internet: www.atvquarterly.com
Cheques or Money Orders to P.O.Box 1594 Crestline CA 92325
Published by ATV Quarterly tel (909) 338-6887 email: wa6svt@atvquarterly.com

24cms Look through filter using a YIG

By John Hudson G3RFL

The first part of this article, the description of YIG, is taken from an application note by Micro Lambda Wireless, Inc. and is reproduced with their kind permission.

What is YIG?

Yttrium Iron Garnet (YIG) is a crystal that has very high Q characteristics. This high Q provides very low phase noise in oscillators and multi-octave frequency tuning for both oscillators and filters

YIG crystals are "grown", similar to silicon crystals. The pulled crystal is "sliced and diced", resulting in small YIG cubes. (Unfortunately, the cube shape is non-uniform, and as a result has non-uniform coupling in a resonator circuit.) These small YIG cubes are then put into a "tumbler" that slowly shape the YIG cube into a YIG sphere (very similar to smoothing a stone for jewelry). The size of the YIG spheres range from 10-30 mils. The YIG sphere is typically mounted on the end of a thermally conductive rod (normally beryllium). This is done for two reasons:

1) the rod acts as a "tuning stick" for orienting the YIG sphere in the resonant circuit,

and

2) YIG has best performance when it's temperature is kept constant; the rod is a thermal conductor to/from a proportional heater and the YIG sphere.

(YIG oscillators and filters have been designed without the rod and heater for low cost. However, the impact on performance limits applications.)

How Does YIG Work?

YIG is a ferrite material that resonates at microwave frequencies when immersed in a DC magnetic field. This resonance is directly proportional to the strength of the applied magnetic field and has very linear "tuning" over multi-octave microwave frequencies. The DC magnetic field is generated using an electromagnet, a permanent magnet, or a combination of both. The magnetic field of an electromagnet can be "tuned" using a variable current.

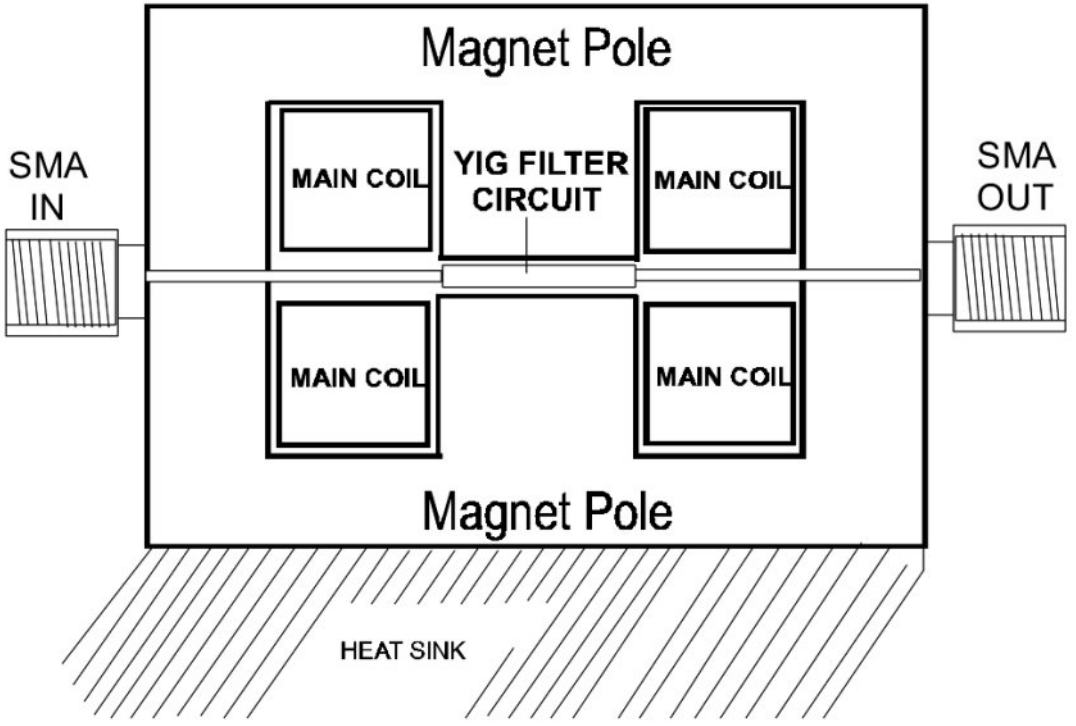


Figure 1 - Typical YIG-tuned filter cross section

YIG crystal resonance is the alignment of external electron paths at the molecular level (precession), creating a "combined" magnetic dipole:

a magnetic field resonating at microwave frequencies around the YIG sphere.

How do we use YIG?

Current generates magnetic fields, and magnet fields can generate current when coupled to a conductive "loop". Using small conductive "loops" allows coupling to & from the YIG spheres resonant magnetic field (see figure 2).

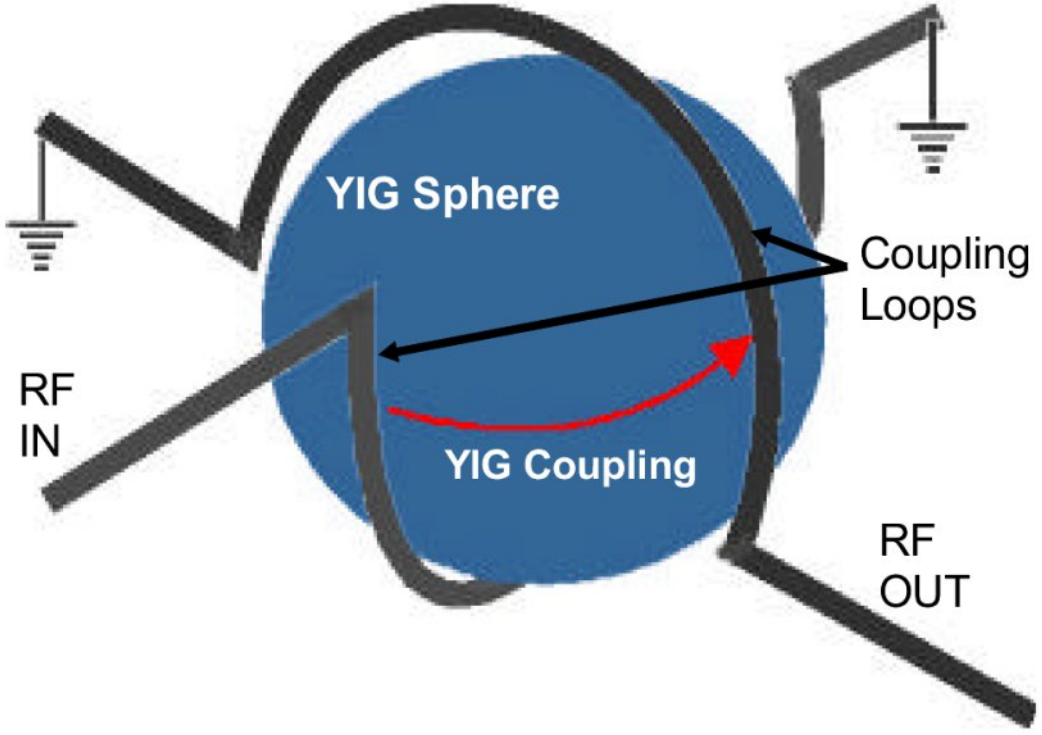


Figure 2 - Coupling structure of a single stage bandpass filter

There are three basic methods in which this coupling is applied:

Signal Transfer - Band pass Filters

Signal Reflection - Band Reject Filters

Oscillation-Feedback (see oscillators)

Bandpass Filters

Figure 2 illustrates typical coupling of YIG resonators in a single stage (sphere) band pass filter. The coupling loops are aligned at a 90° angle to prevent direct RF coupling. One end of each loop is grounded. This prevents the filtered signal from being reflected.

The RF input signal of the coupling loop modulates the magnetic field around the YIG sphere, this modulation is coupled to the magnetic field resonating around the YIG sphere, which then couples to the second/output loop. The RF signal passing through the filter must be the same frequency as the RF magnetic field resonating around the YIG sphere.

The frequency bandwidth/spectrum that is coupled through the YIG resonator is dependent on the spacing between the YIG resonator and the coupling loop. The closer the loop, the wider the bandwidth.

Bandwidth can also be expanded by increasing the number of YIG resonators and carefully "tuning" the RF coupling loops. Filter insertion loss increases with expanded bandwidth.

A YIG band pass filter's 3 dB bandwidth expands as the filter is tuned to higher operating frequencies at a rate of approximately 20% per octave (e.g. 30 MHz @ 2 GHz, 50 MHz @ 18 GHz).

Micro Lambda's standard YIG band pass filter's 3 dB bandwidth is 15 MHz to 40 MHz (@ 2 GHz); 20 MHz to 50 MHz (@ 18 GHz). Filters with 3 dB bandwidths greater than 500 MHz are available above 6 GHz operating frequency.

There is a limit (i.e. Limiting) on the total amount of RF energy that a YIG resonator/sphere can couple/ transfer (e.g. 0 dBm to +10 dBm).

Band Reject Filters – Signal Rejection

Figure 3 illustrates typical coupling of YIG resonators in a two stage (sphere) band reject filter. There is only one coupling loop (ribbon) per YIG sphere. The coupling loops are aligned along a straight line and are interconnected between the YIG resonators

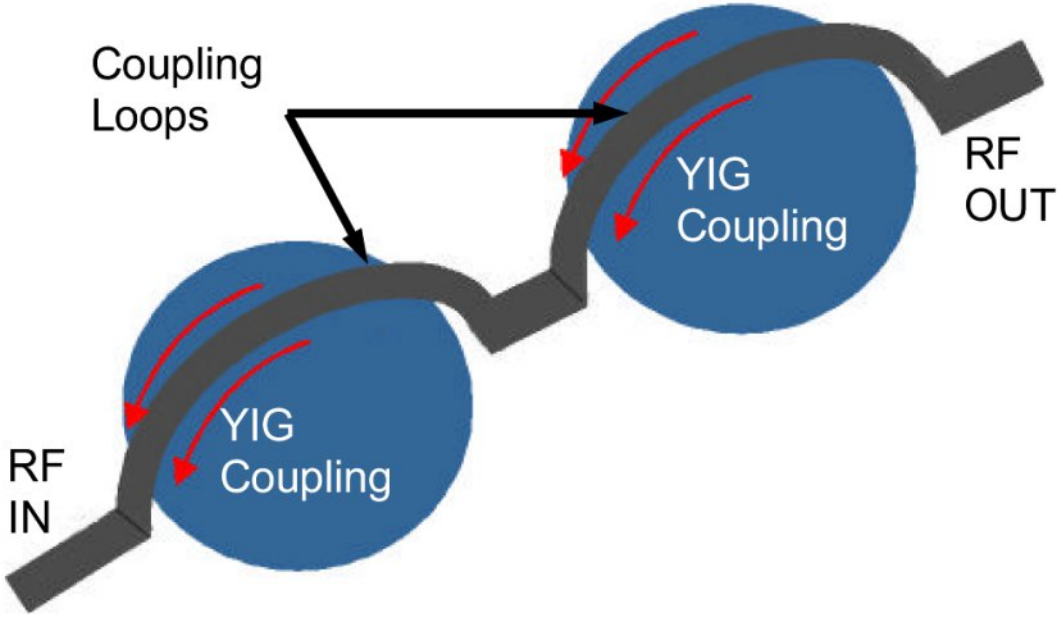


Figure 3 - Coupling structure of two stage band reject filter

The coupling loops are essentially RF transmission lines that pass all RF energy. However, when these transmission lines are located close to the surface of the YIG sphere, the loop couples to the magnetic field resonating (@ microwave frequencies) around the YIG sphere.

This coupling essentially reflects/rejects in coming frequencies that are at the same RF frequency as the RF magnetic field resonating around the YIG sphere.

Rejection bandwidth is widened by increasing the number of YIG resonators and carefully "tuning" the RF coupling loops.

Micro Lambda's standard band reject filter's 40 dB rejection bandwidth is 15 MHz to 70 MHz.

YIG Filter Specifications

There are four basic specification categories for YIG filters: RF, magnet, power consumption and environmental conditions. They are all somewhat interdependent and define unit performance and cost.

RF Specifications:
3 dB BANDWIDTH

The frequency span (in MHz) between the points on the selectivity curve at which the insertion loss is 3 dB greater than the minimum insertion loss. Also called 3 dB pass band. See item A, Figure 4

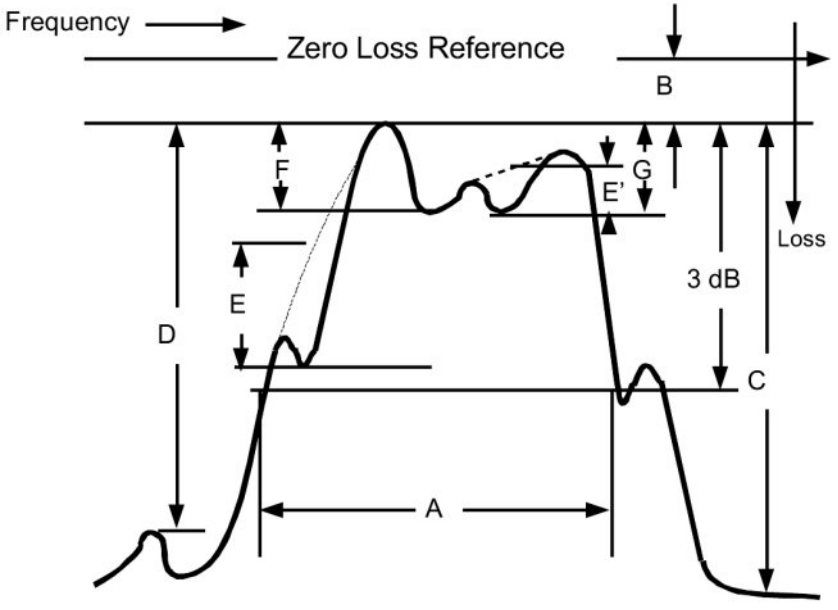


Figure 4 - Bandpass Filter Skirt

Frequency Range (Band Centre)

The range of frequencies (in GHz) over which the YIG Filter must meet all specifications.

Insertion Loss (Band Pass)

The transmission loss measured in dB at that point in the pass band which exhibits the minimum value. See item B, Figure 4. (Band Reject: Item B, Figure 5)

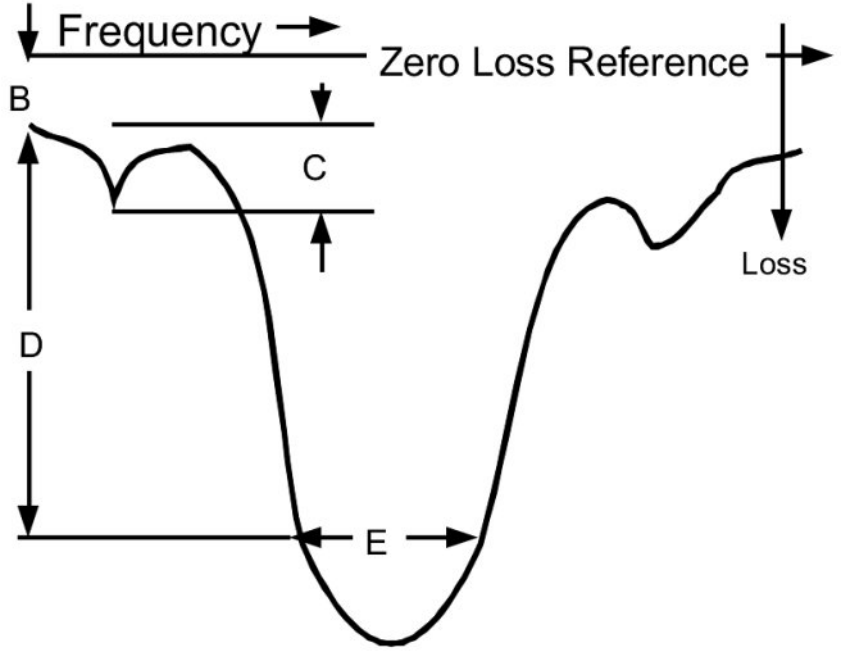


Figure 5 - Band reject filter skirt

Limiting Level

The input power level at which the input/output characteristics exhibit 1 dB compression, i.e., the transfer function becomes non-linear in that the output increases less than 1 dB for a 1 dB increase in the input.

Loss Bandwidth

The frequency span (in MHz) at a given insertion loss referenced to the pass band minimum insertion loss.

Non-operating Signal Rejection

The amount of signal rejection (in dB) referenced to the insertion loss, measured at any point across the frequency range with zero current through the tuning coil.

How we drive the YIG

Let's start with the human interface. There is an LCD display of the centre frequency of our YIG filter. It needs to be adjustable by the user and to this end I have provided two push buttons to increment or decrement the frequency across the 24 cms band. Rather than latches and display decoders, I have programmed up a PIC.

This is a dsPIC30F4012, which will deliver the I2C clock and data to the LCD readout, this section of the code already existed and has been used in several other projects, so it made sense to go down this route.

The push buttons are normally open style and are de-bounced in the PIC software. We then need to generate an output from the PIC which is proportional to the desired readout,. This was a new section of code although loosely based on my work with the YIG transmitter in an earlier issue of CQ-DATV (see the *CQ-DATV Omnibus*).

The PIC output voltage is converted into a current suitable for driving the YIG more on that in the next issue along with a single sided PCB layout that can be home etched to complete the project. I also included a programming socket on the PCB so the code could be customised to individual YIG's and the PIC reprogrammed without removal.

This is proving unnecessary as I have now tried several YIGS and they are extremely linear devices and do not require individual calibration, making them ideal for an amateur project.

Also, in the next issue, I will be evaluating this unit as a repeater look through filter and, without giving too much away, let's say initial results are encouraging. Making this an inexpensive low cost, must have unit for any ATV operator.

The PIC code is available on the *CQ-TV download site*.
The Micro Lambda datasheet, **ytfdefinitions2.pdf**, contains more information and is available from their *website*.

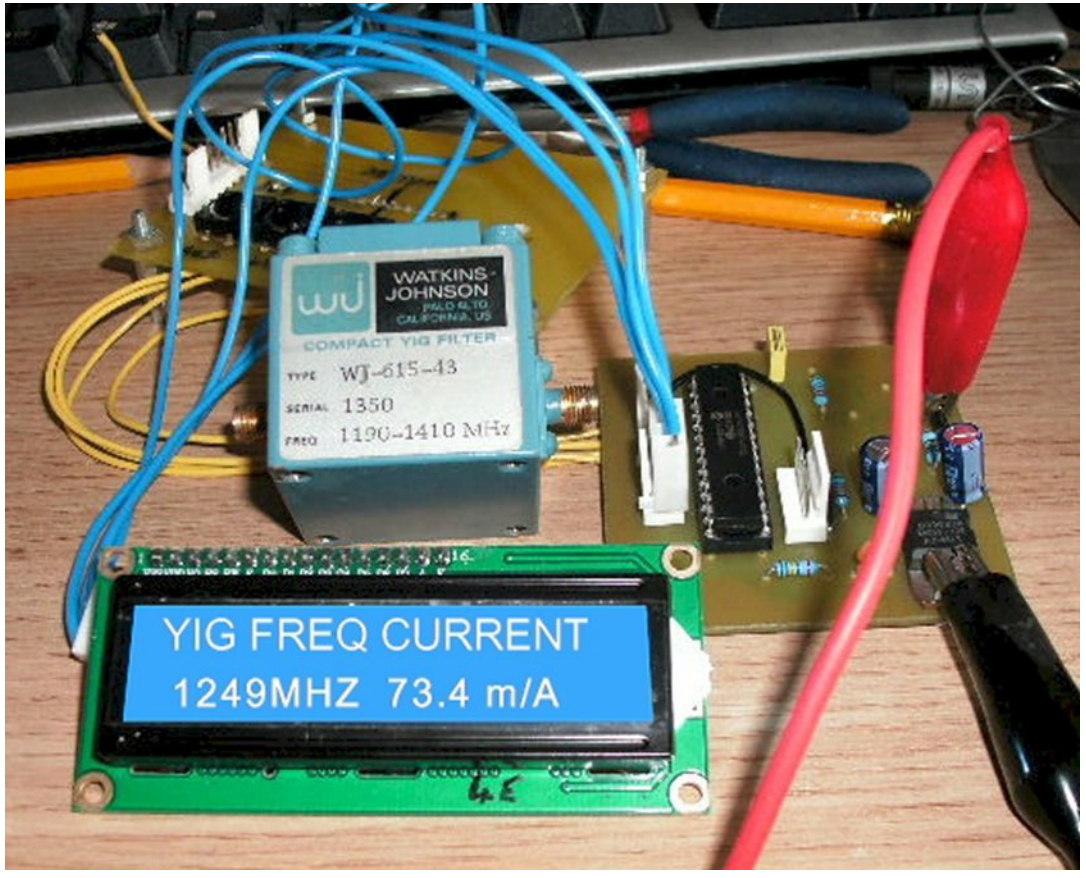


Figure 6 - The prototype YIG filter

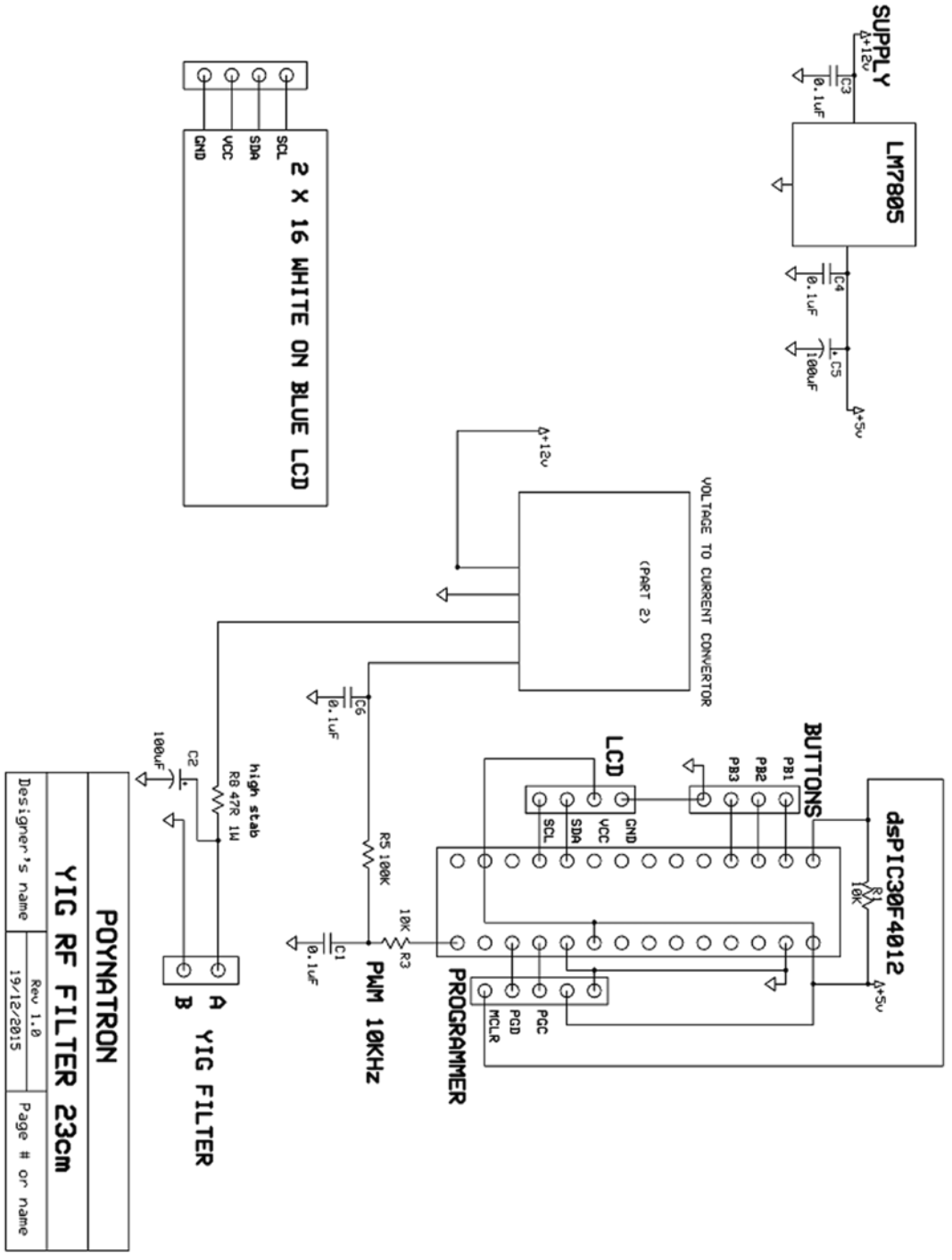
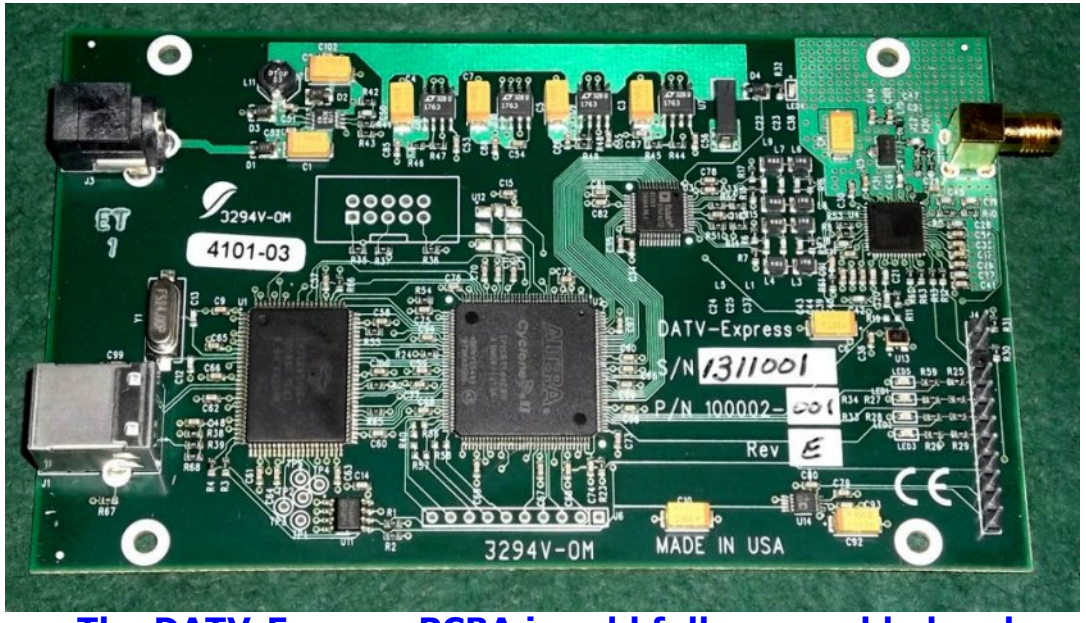


Figure 7 - The circuit diagram

DATV-Express Project - December update report

By Ken W6HHC

The latest production batch of DATV-Express boards sold faster than the project team expected. Only one board is left in USA inventory (for world-wide shipments) and four boards are available for European Union shipments from the project EU distribution centre in England. As earlier promised, boards for EU shipments can be ordered normally from the *www.DATV-Express.com* web site (US$300 + US$30 for shipping) and are delivered with all VAT and taxes in EU already paid.



The DATV-Express PCBA is sold fully-assembled and fully-tested

Art WA8RMC has started processing the next production batch of DATV-Express boards. He has already received 48 each blank PCBs and 24 sets of "expensive" components and is currently ordering all of the smaller parts like resistors and capacitors, etc. Art's production goal is to have the next set of 24 each DATV-Express boards assembled, fully tested, and available for sale by the end of January.

Ken W6HHC is still struggling to find time to finish up alpha-testing and alpha-documenting the DatvExpressServerApp-with-InnoSetup-installer software package for Windows operating systems. The biggest time conflict is that Ken is planning to be married at the end of January….so spare time for ham radio has-been/is scarce. See the "October Update Report" for more info on the DatvExpressServerApp for running the exciter board from a Windows OS computer (instead of Linux).

"project is set to slow speed"….de Ken W6HHC

Digital World DATV

An Introduction to DATV - Part 2

In the first part of this article found in CQ-DATV 31 we delved into DATV in a very general way noting experiences we had along the way since 2002. In the first article we mentioned where do we start?

When starting a repeater for example the overall picture will be different depending on circumstances within your area of operation. I mentioned that I thought DVB-T was the better way to go and using MPEG 4 it will give you more room to add extra transport streams, if that's the way you want to go with the added bonus that HD can be added if required down track.

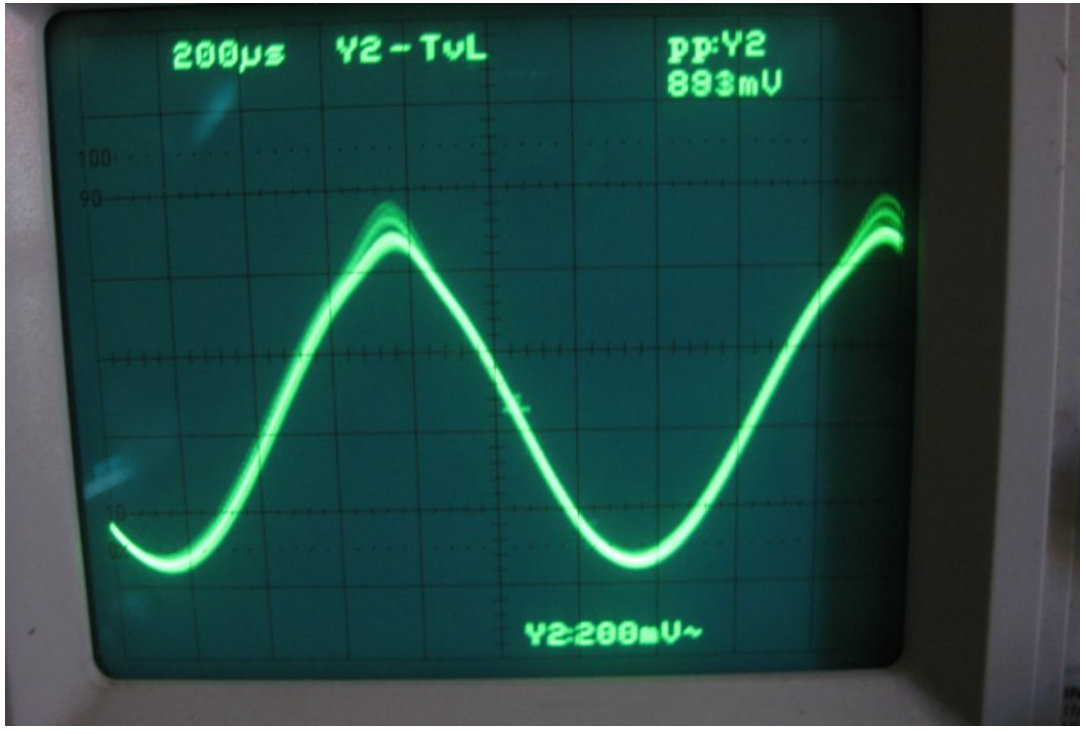
It therefore would be desirable to sit down with those involved and map out what your requirements might be. You may want different receivers for different area's or different input frequencies. You should keep in mind that FM is still the cheapest way to get into ATV.
Here in Australia we are lucky that we have Mini-Kits (*http://www.minikits.com.au/*) where Mark has a range of different kits available to cover all your FM requirements.

Extra things you may wish or desire could be:

1. *Quad viewer – you will need some form of VDA as normally no loop through facilities are provided. (I prefer to use VDA's)*
2. *Automatic audio level controller and metering – some form of by-passing required either when board is removed or you may want to remove it remotely.*
3. *Skype interface*
4. *Watermarks on transport streams – make sure you can adjust the levels to prevent burn-in.*
5. *Provide extra transport streams – HD etc.*
6. *Small LCD screen with audio metering and switcher for monitoring when required.*

It is much better to think of these things now rather than later even if you don't fit them. Over the Christmas and New Year Holiday period I managed to knock-up a system as shown in the photo.

The system has individual VDA's on the inputs so as to feed the quad box and monitoring switcher. A separate unit holds the WD mini player and tone oscillator. The control of the system is via a PICAXE – 28X2, no DTMF tone decoding has been fitted, however that could be provided by updating the software as I had fitted a DTMF decoder. We have never operated with a DTMF system ever. The space at the top is for the exciter amplifier @ 1w and filter and main 100w power amplifier (25w DATV). The modulator is a PVI unit which has its own problems as I have mentioned before, like re-booting on loss of input signal and audio distortion when feed from low impedance ADA unit.



The FM receiver is a modified Scientific Atlanta B-Mac receiver fitted with a PAL output board fitted at the bottom of the rack. The digital receiver is the Strong STR-4950E which allows DVB-S and DVB-S2.

There are a number of power amplifiers around for amateur use plus you can always use an ex commercial unit.

a. *Mini-Kits* *http://www.minikits.com.au/*
b. *DGOVE* *http://www.dg0ve.de/en/*
c. *KL6HTV* *http://kh6htv.com/*
d. *W6PQL* *http://www.w6pql.com/70cm/500wassembly.htm*

Just to name a few.

Now what about the 23cm input from your own QTH, for FM there is not alot available. DGOVE and Mini-Kits provide a nice arrange of units. Comtech did have TX modules but aren't my favourite due to excusive field tilt, however these units maybe still available on eBay.

You should read the relevant information regarding these units as found on a number of sites, including:

http://www.g8ajn.tv/comtech.htm and *http://goo.gl/xsYGE4*

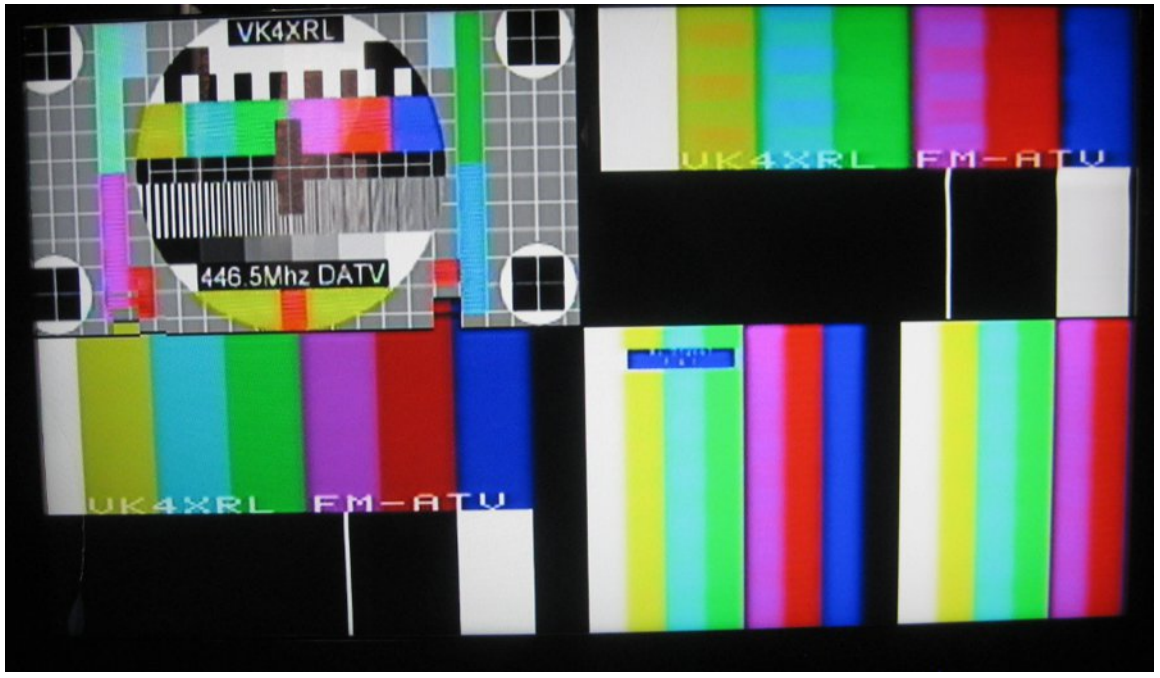
Photo shows the field tilt when using the Comtech TX unit.

This page also has information on the digilite system and the DATV Express Project can be found at *http://www.datv-express.com/*

Also the DATV – DTX-1 is available from the BATC shop for members or checkout *http://www.dtx1.info/*

Note that Stefan has a complete range of digital options from SR-Systems e.K.

My own rack for ATV as shown consists of (from the top) Monitor and audio OSD level indication, Waveform monitor Audio Level source indication, OSD unit and Spare VDA's, 23Cm FM receiver, Yaesu radio, Input switcher and test/Ident Generators, Test signal switch-Leitch, Off-Air Olin HVBT-2000B, Patch panel-RF, DATV TX-1287 DVB-S and DVB-S2 23cm 4 Watt transmitter.



Repeater Quad output

Repeater setup "Off Air"

LG OLED-UHD-TV top quality

Klaus, DL4KCK

My new flat OLED-UHD-TV 55EF9509 from LG (South-Korea, assembled in Poland) is very light-weight in spite of it's 55 inch screen, has a very thin body and a price range of 4000 Euro like my 10 years old Philips LCD-HD-TV (42 inch).

The OLED is showing the best display quality possible today, the "organic light emitting diode" pixels exhibit unknown resolution and colour range when fed with good UHD videos from TV satellite and YouTube 4K. The "real black" ability is better than with expensive UHD beamers and even 4k DLP cinema projectors.

Another point is the excellent Stereo-3D display quality with light-weighted passive 3D glasses.

An incoming 3D-TV signal from a Sky receiver or from one of many smart apps (fast online connection needed) is identified and displayed automatically in 3D, no flickering included.

3D-Blu-ray-Disks are displayed in Full HD resolution also vertically, opposite to passive 3D-HD screens. The OLED-UHD-TV is ready for HDR videos - a special test video downloaded from *http://demo-uhd3d.com/* and played back from a USB-Stick is switching the screen to HDR mode with very bright contrast levels possible only in some Dolby-Vision laser projection cinemas until now.

Thanks to the embedded HEVC decoder also the first DVB-T2-HD tests in Germany are displayed, as well as Netflix or Amazon Prime 4k movies.

The internal WebOS software from LG provides an Internet browser, ready to show even online HD videos like the one available on the AGAF web page at: *www.agaf.de/2015_HAMRADIOspezial2_DL9KAR_1080p25.mp4*

GPS disciplined 12GHz Frequency Counter (G3RFL design) – Follow up

By David Holden G3WUN

Having been involved with the sales, technical support, and use of test equipment for a large part of my career, any article or project relating to this subject immediately gets my attention. John's design **[1]** in Issue 26 'ticked a number of boxes' for me:

- *The project uses a PIC - !'m keen to learn more about PICs and PIC programming*
- *Ease of construction – PCB production and some SMD assembly*
- *High frequency capability – my existing counter stops at 1GHz*

However, I didn't have a Rubidium-based oscillator as used in the original article but did have a home-made GPSDO sitting unused in my shack. My GPSDO was based on a design by EI9GQ **[2]**.

This was built to provide 10, 5, and 0.1MHz outputs for general use. It did however, require some modification as explained later. Consideration was therefore given as to whether it could be used in place of the Rubidium oscillator.

The frequency stability of a GPSDO is restricted by many internal noise sources - OCXO instability, GPS receiver timing jitter, voltage reference noise, temperature variations, power supply noise and instability, etc. However, the resulting stability should be superior to that of an uncontrolled OCXO oscillator and comparable to that of a Rubidium-based oscillator, at least for most amateur requirements.

Construction

Step 1
Having decided to start the project, examining the specification of the Rubidium oscillator indicated that the output was 0.5V rms sine wave, whereas my GPSDO was a (rough) 3.0V peak square wave. This obviously needed attention so the GPSDO 10 MHz output was filtered using a 10MHz LPF design as described in another GPSDO project by YO4HFU **[3]**. After filtering, the output was a 1.5V pk-pk (0.5V rms) sine wave.

Step 2
Was the construction and assembly of the main pcb. This progressed smoothly until the time came to test it. When first powered up, the LCD displayed rows of blocks. This resulted in many emails to and from G3RFL (thanks again John).

The lack of display was due to an I2C addressing issue – the display's hard-wired addressing options were 20 to 27 whereas the required software address was 4E. Then, with modified code and temporarily using a 10MHz xtal osc 'block' as a timing source, all seemed well.

Step 3
The 12GHz 'front end' used a pcb (unpopulated) **[4]** and a 'Designer Kit Housing' – a nice milled aluminium enclosure **[5]**, both sourced from a US company. 0603 SMD devices were purchased in the UK and assembly went ahead without any issues. A (nominal) 12V to 5V regulator was included in the housing to avoid the risk of accidentally applying more than 5V to expensive silicon.

Step 4
The 10MHz input from the GPSDO was connected to the pcb, directly to the Rubidium oscillator connections in the original design. The Lock signal input line was taken to 0V. The down-side is that 'Standard Locked' is always displayed.

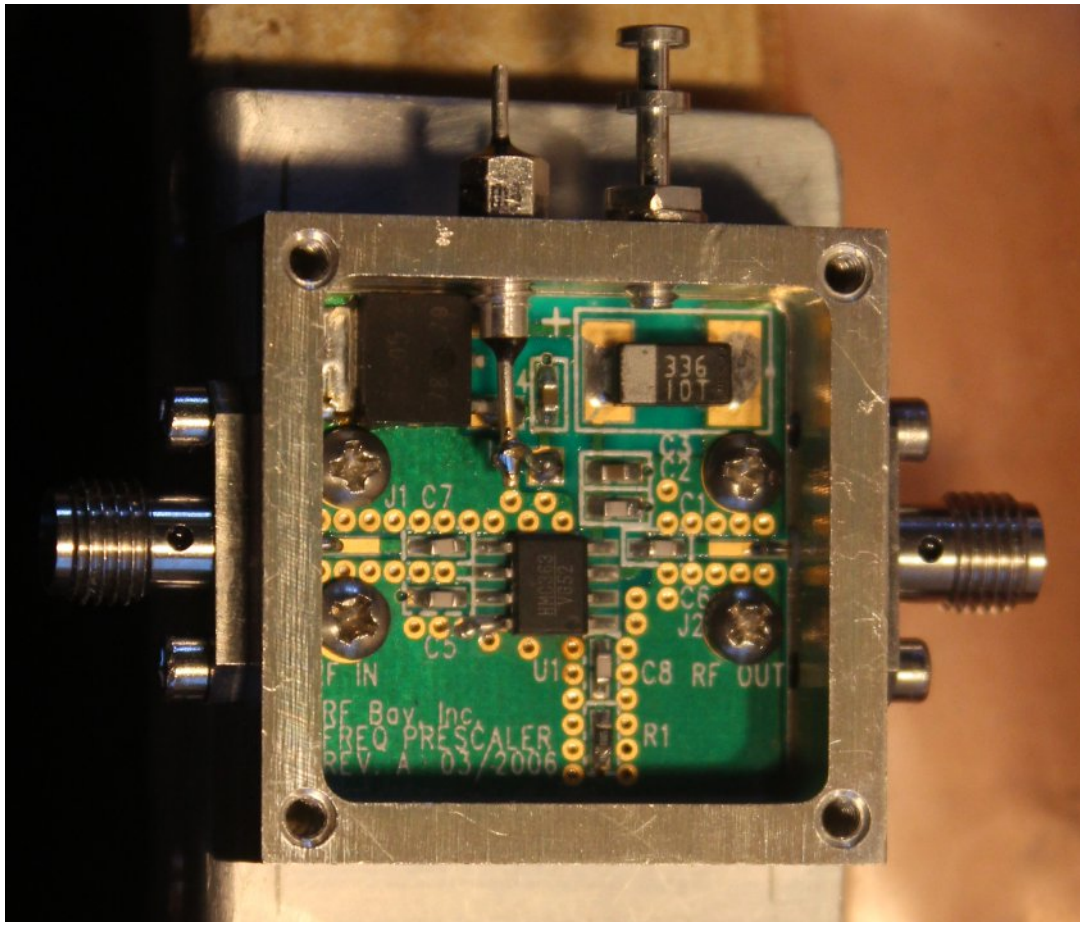


Photo 1 - Front End. (PCB is 1”x1”)

Future modifications may result in providing a ‘Lock’ signal output from my GPSDO.

Step 5
Is the point at which many of my projects grind to a halt – installing the electronics in a housing. In this instance I decided not to fall into my usual trap and try to squeeze the electronics into as small a case as possible, but leave room for future additions.

Photo 2 shows the 12GHz ‘front end’ mounted on the back panel and connected to the main pcb with semi-rigid coax.

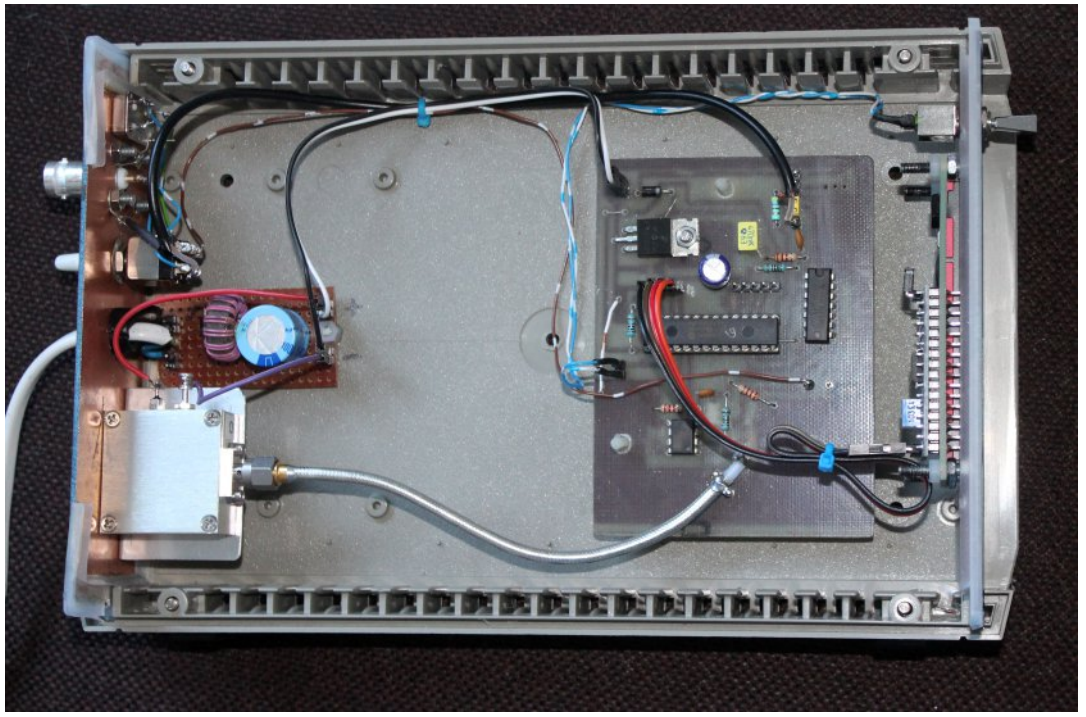


Photo 2 - Final Assembly

Adjacent is a simple supply filter, then a DPDT switch, this selecting the incoming GPSDO 10MHz signal (BNC socket) or output of the 10MHz oscillator block (top) to the counter circuitry. More portability is thereby possible - at the expense of accuracy, by avoiding the need to use the GPSDO.

One of the benefits of the acres of empty space and, contrary to normal test equipment practice, the use of a plastic case, is that it leaves the potential for incorporation of an OCXO or even a full GPSDO (and antenna) for increased portability.

Final thoughts

This was an enjoyable project to complete.
It satisfied my objectives – and confirmed how much more I need to learn about PIC programming and the use of Microchip’s MPLAB software!

If I were to start again, in view of my own final layout I might re-orient the MD506 and perhaps use a double-sided pcb. The latter for no other reason than to simplify the +5V track routing and for usual RF screening practice – though as suggested in the original article, no adverse artefacts were noticed by the use of a single-sided board.

Most components were from the 'junk box' though the 'front end' and a few other items resulted in a total cost of approximately 80 GBP.

A fully assembled 'front-end' alone, from *http://www.rfbayinc.com* is 260 USD (approximately 173 GBP)

Commercial counters with this capability would of course cost significantly more than 80 GBP.

Bibliography

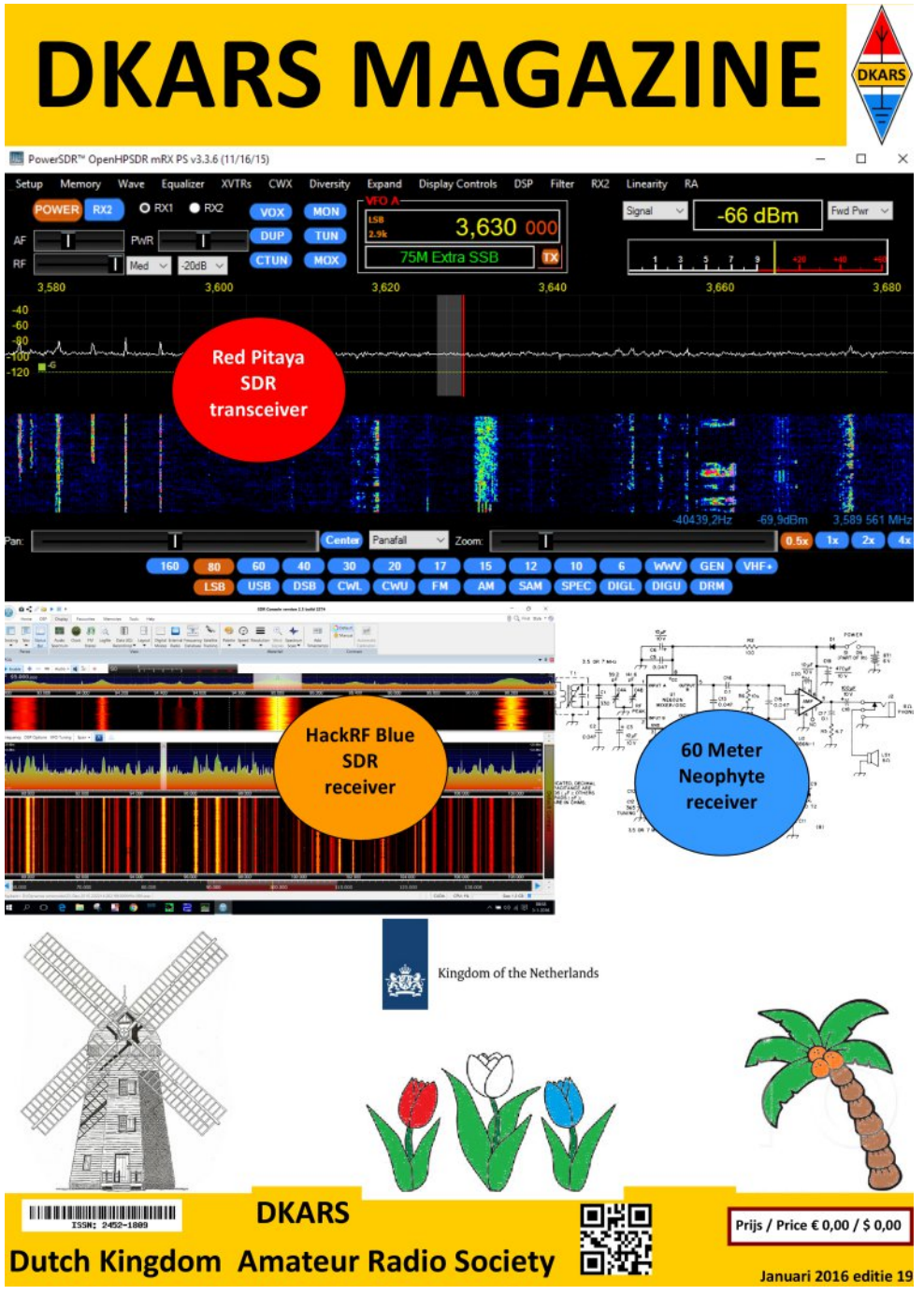
[1] G3RFL 12GHz Counter (Issue 26)
http://cq-datv.mobi/ebooks.php

[2] EI9GQ GPSDO
http://homepage.eircom.net/~ei9gq/gpsdo.html

[3] YO4HFU GPSDO *http://www.qsl.net/yo4hfu/GPS.html*

[4] Front-end PCB (Ebay): *http://goo.gl/DXD7Ou*

[5] Front-end hardware (Ebay): *http://goo.gl/fqb24r*



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

CQ-DATV remembers Matilda

ATVs first OB unit, unless you know better!

This was a London Taxi cab converted into an outside broadcast unit by ATV enthusiasts living in the Cambridge area. We do not have a full inventory of the equipment on board, but it was equipped with a 70cms ATV transmitter and a home built Saticon Camera.

The various crew tasks were involved a multi-skilled camera man who had to operate the camera and point the aerial. There were various signs on the vehicle including 'please do not use the lavatory whist stationary', although its doubtful this facility existed. Other modifications to this txi cab were the radiator cap which was an old soda syphon top.

The camera was built by G8FY and the actual cab belonged to the Matilda Resurrection group and was originally purchased for £5.

Right wall G2WJ CCU, G3KKD CCU, and Matilda OB reception control. Romford mixer and master control gear is hidden at the left

The highlight for Matilda was to appear on the BBC television programme Panorama. This followed a visit to an ATV convention by the Panorama film crew.

It was also of the star of the 1957 Dagenham Show as the pictures above depicts.

CQ-DATV would like to express its thanks to Simon Hall (son of Bill Hall who we suspect took the photographs).

Thanks Simon!

Ted Mitchell G3GZW assembled the 70cms 10m and 4m aerials using the electricity peoples ladder

Right of stage master sound and vision mixer

Matilda and the Cambridge crew were due to arrive at midday on the Saturday (suspect they had a few problems Editor)

CQ-DATV

dotMOBI

A Cheap Effective Antenna for Ham-TV Reception from the ISS

By Michael Edwards G8CPF

The thought of building an antenna to receive the Ham-TV transmissions from the ISS can be quite daunting .... Will it have enough gain ? .... How accurately does it need to be tracked ? etc, etc. Most will by now have seen the excellent systems produced by the BATC/ARISS team, and have marvelled at all the effort that must have gone into it.

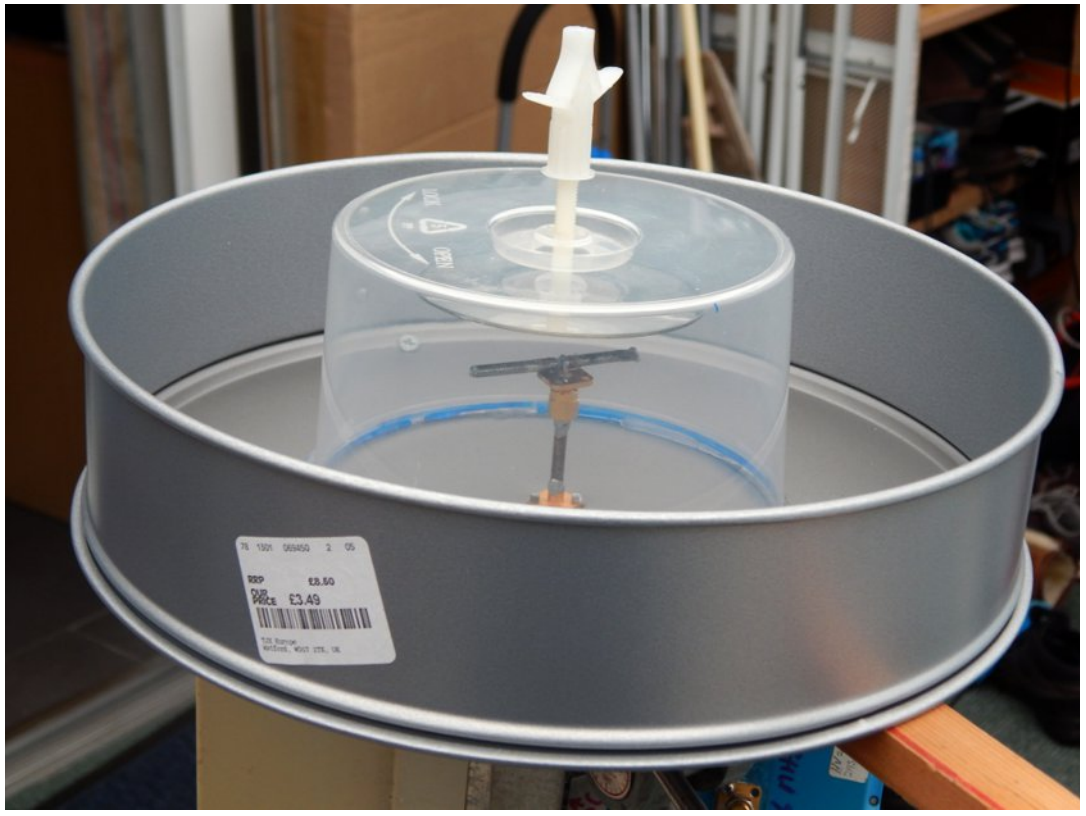
WELL.....if you are satisfied with getting a short glimpse of the signal ... just to say "It CAN be done"... then here is a very simple way of achieving it.

During the latter years of my working life I was required to build an antenna that would receive signals from Low Earth Orbit satellites operating on 150MHz & 400MHz. Some of these satellites had been in orbit since the 1960s, and signal strengths were expected to be very weak.

Drawing upon Amateur Radio knowledge and experience I was able to re-scale the Short Backfire Antenna design for 150MHz, and to incorporate another one for 400MHz at its centre. This way it was possible to keep reception of both signals "phase centred", which was a project requirement.

Results were surprisingly good, enabling us to receive signals from horizon to horizon on most passes, and even to detect signal at 2deg BELOW the horizon in some instances!.... all without having to track the "birds"!..... we DID have a very open well elevated site....

The Short Backfire Antenna takes the form of a sort of "flat dish" !?....i.e. it has a solid reflector with the active element placed at its "focus".....



However, its beam-width is much broader than that obtained from a conventional dish .. being almost hemispherical. Its design seems to enable signals from almost any angle to experience multiple reflections, ending up at the active element.... The design can be further improved by adding extra "choke rings" around the circumference, as evidenced by their use in the best type of GPS antennas.

So, with the "grey cell" still twitching, a journey to the hardware shops was called for.....

What was needed was a circular metal pan of 2 wavelengths diameter, with vertical sides half of a wavelength tall.....perhaps a frying pan , or, even better, a cake tin!

Frying pans tended to have a curved base to the wall, and were heavy and more expensive.....

But at HomeSense I discovered a very cheap(less than £4) cake tin that had the almost perfect dimensions.....27 cm dia x 6.5 cm tall.

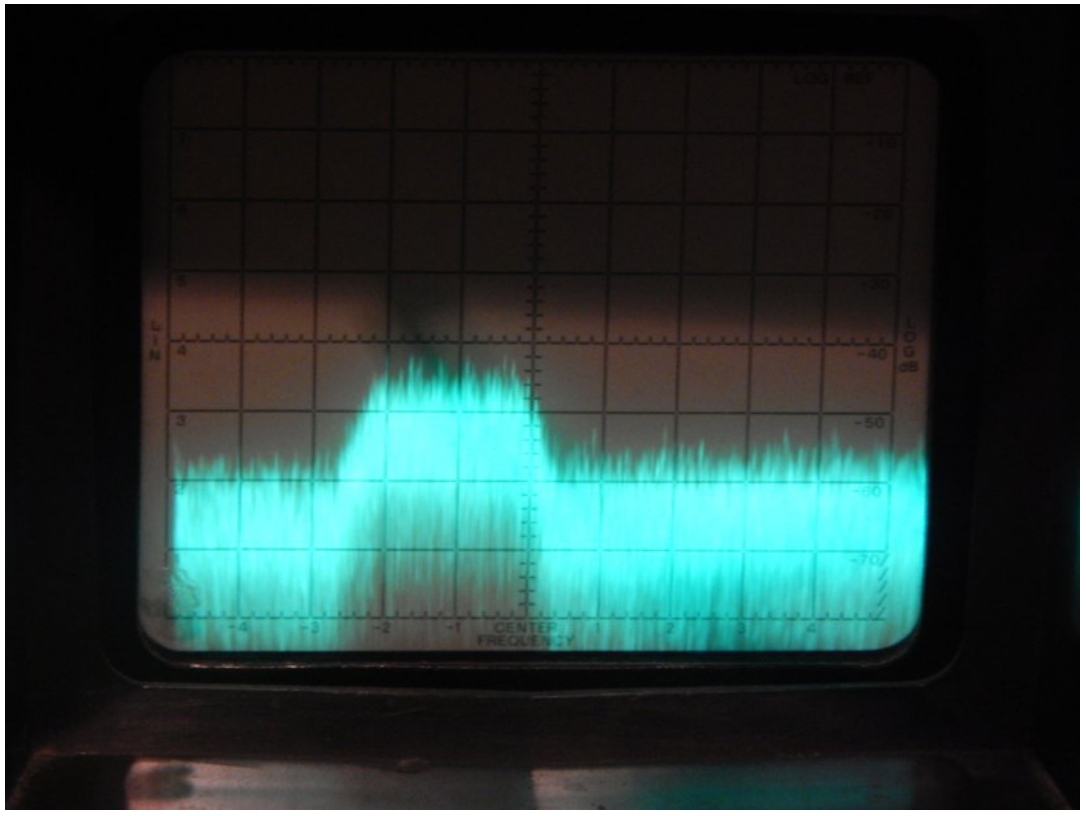
Aim to mark out the exact centre on the back of the pan, to drill for co-axial connection to the active element which should be mounted a quarter of a wavelength above the internal surface.

I would suggest to use a long-shanked, through-hole, chassis mount coupler (either sma or bnc) at this piont, to give the possibility to adjust the spacing of the active element for perfection! A quarter wave of hardline(fitted with the appropriate plug) is ideal to double as both feed and support.

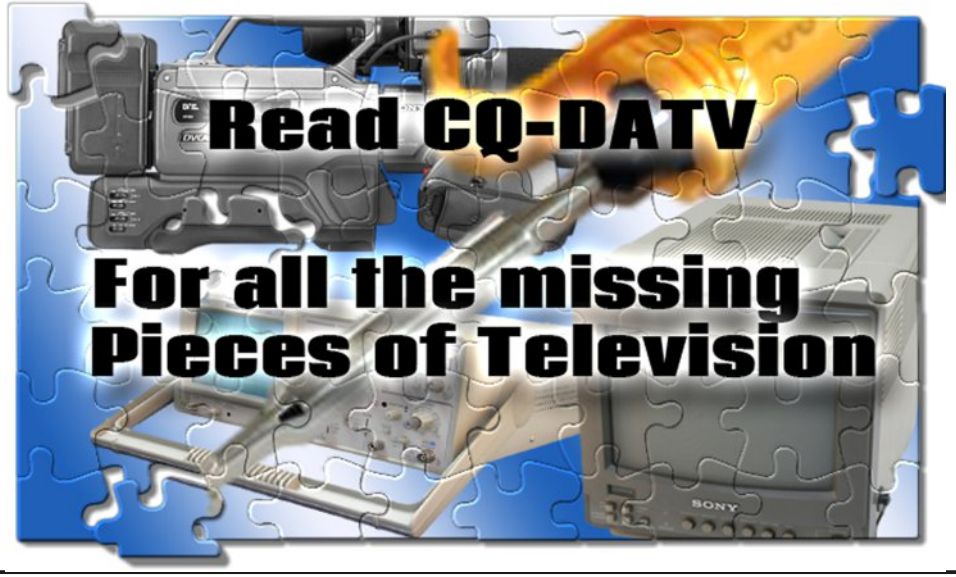
A circular reflector (half wavelength diameter plus 5%) will be needed, mounted at a further quarter of a wavelength above the active element.... Again, ideally its' spacing could be made adjustable with a threaded rod.... e.g. nylon bolt. I drilled and tapped a hole to take this, in the centre of a CD/DVD Multipack lid, which, glued with silicone to the base of the pan, makes a good "radome" over the entire active element assembly.

One will note that I have been using the term "active element", rather than "dipole".....In fact, so far, I have only used a linear dipole as the active element..... OK, everyone will be saying "You need a circularly polarised element with opposite sense to that transmitted due to the reflection from the backplane" ..... Maybe ideally you do ..... but, as can be seen from the photo (top right), a simple dipole will give surprisingly good results ..... possibly because of the depolarising effect of the multiple reflections encountered in a Short Backfire Antenna.

There is always the opportunity to improve upon a basic design... so I hope that sales of a particular size of cake tin will suddenly rocket when you all give it a try...Good luck.....



Best 73... de Mike in Minehead ...G8CPF



Assembling a temperature controlled soldering station

By Mike G7GTN

When the heating element failed in my original Weller TCP45 soldering station went looking around for another soldering solution as a back up to the hopeless Antex iron I was left with. The online auction sites are totally awash with Hakko clones and in particular the 936 as a long since retired model. I set a budget and went looking to see if possible to build (or assemble a slightly different version of this) I knew that I wanted at least some type of more modern digital type readout, instead of the pure analogue panel markings on the original manufacturers unit.

Figure 1 – Pre assembled processor control module

Well my budget was a lowly £20, so was a challenge from the very start. Firstly obtained the fully built controller as shown in Figure 1 for £5.76 then next came the soldering iron, these will often be called pencils and have names such as T12 handle or Hakko 907 if you do a search. My iron came in at £2.20 complete with a useless conical tip.

Next major dilemma was me doing any metal-work to be able to house this. Looking more closely at Figure 1 and the

Old laptop power brick used as Power Supply

precision cut-outs required I then totally lost my nerve and went mad and spent £10.77 to purchase a pre-punched anodised enclosure. The benefit was that has all of the panel markings already done and finishes the project very nicely and certainly ahead of what my very basic metal working skills would have ever allowed me to achieve.

With purchasing a pack of ten clone tips for the iron the total came in at a whopping or more like fully eye watering £20.73 so I did manage to go wildly over my total budget for this project!

In a bid to regain some financial control over the quite spiralling costs I decided to use an old 19V 3.4A laptop power brick to get to a 45W capable controller, but oh dear unless this was opened I had no space in the enclosure to be able to make connections via the switch for the mains input. Instead I had to solder connections to these points and had to resort to the old favourite hot glue (desperation fixer) Whilst I do not intend to be putting my fingers inside when powered on, you must make sure you use safe and appropriate techniques when dealing with mains powered appliances. Even bad examples can prove to have some value in learning.

Chief operator getting ready for some soldering fun

Yes I should have selected a more appropriate power supply from the start and certainly at a minimum employed the use of good quality heat shrink tubing on all mains potential connection points. Think is time to quickly close the cover on this hot glue extravaganza project.

Did it ever solder well? Yes it certainly did with the right operator behind the iron….

References

If you are very keen then you could even construct your own controller system based on an Ardunio, one such design that uses a 16X2 LCD can be found using the link *https://hackermagnet.com/portfolio/soldering-station/*

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

The problems of still pictures and flash guns Part One

By Trevor G8CJS

In the last few issues I have been explaining the use of Bridge Cameras for filming, yes it has centred around the Samsung NX 500, because I own one and it is a replacement for the Canon S95 which I wrote the earlier CQ-DATV articles around. I have tried not to make the advice too model specific and keep the hints and tips as wide as possible.

In this issue I would like to talk a little about shooting stills, which have slightly less ATV uses, unless it's to write and illustrate an article for a future edition of CQ-DATV...hint. If you bought a bridge camera rather than a dedicated movie camera, it's a good guess you might want to take stills so you may find this useful.

Early Flash

I would like to start with flash photography and some of its technical problems. The first one being flash sync. There are several problems to get right and the main one is to get the flash to light up when the camera shutter is open.

The original way used to be open the shutter fire the flash, and close the shutter, by original I am referring back to the blue one shot PF1 bulbs..Before Ian adds any illustrations of magnesium troughs, held above the photographers head...I am not that old.

The blue one shot bulbs that went off when you applied a 22v battery and temporarily blinded you, took time to ramp up, so the camera had a flash sync logic that fires the bulb and the after a short delay opened the shutter, it was called M sync and was selected by a M or X position switch.

Early One shot bulb flash

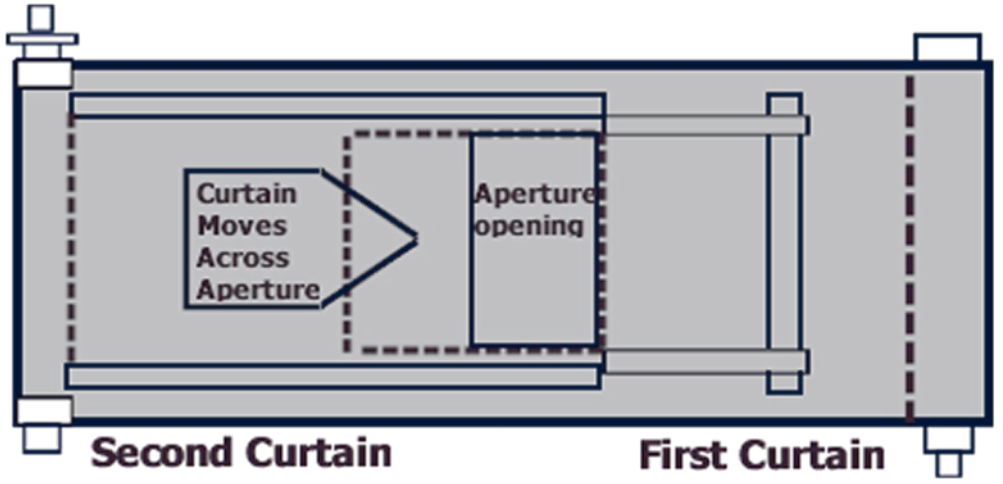
This worked well with the more complex focal plane shutters of the SLR cameras, which had a two a curtain shutter. the first one obscured the film and when operated slid away to allow the film to be exposed, before the second curtain closed the path.

If you selected a shutter speed faster than 1/60 then the second curtain travelled with the first curtain as a sort of travelling letter box, this was not a problem with the bulbs that stayed illuminated for a duration long enough for the letterbox to travel across the film.

This all changed with electronic flash which performed differently, first it needed triggering when the shutter was wide open (X sync) and it only illuminated the scene for typically 1/10000th of a second so the shutter could not be put into travelling letterbox mode and had to remain open for 1/60th or 1/125 (depends if it was a vertical or horizontal shutter).

Not all cameras had focal plane shutters, it was an SLR thing that allowed you to look through the actual lens that took the picture. This did affect modern digital cameras, which have various types of shutters from electronic to mechanical so you need to check sync in the instruction book. The Samsung NX 500 has a limit of 1/200th of a second.

The next problem was exposure and this is locked into the physics. Flash lit pictures suffer from a poor depth of lighting, because the light source is near to the subject, so if it travels 6m to illuminate the subject it will be considerably reduced in brightness at 12m. Unlike the sun which has travelled 95 million miles to our subject and has another 95 million miles to go before it diminishes in brightness, by the same laws of physics. This means the exposure varies with the distance from the light source to the subject.



Focal Plane shutter

Very early systems locked the exposure (iris) setting to the focus setting so moving the focus further away increase the exposure. This was never good and soon the electronic flash guns, were adorned with the word computer flash, don't get carried away this was a very crude light computation. You told the flash gun the speed of the film in ISO and it told you the iris setting for the camera (shutter speed was a little redundant, leave on 1/60th). The flash gun lit up and had a small sensor to measure the reflected light, and when sufficient light had illuminated the scene it switched off, so the scene illumination was controlled by the duration of the light not its brightness.

Early Computer Flash

These flash guns often had multi iris settings labelled red yellow and green, so you had a choice of Iris settings and these were achieved by putting ND filters in front of the flash gun sensor to reduce the returning light. These flash guns still exist today can be found on eBay or charity shops and only have one contact and return, so the only information exchanged with the camera is the trigger, illuminate now command.

Technology marched on and the flashguns grew a greater level of complexity and talked more to the on-board computer of the modern digital camera, this produced more connections between the camera and the corresponding flash gun for better communications, usually through the same mechanical camera shoe, and the word TTL (Through the lens) was born for flash photography. The problem was lack of a common standard across manufacturers, so compatibility issues arise. The small flash gun that comes with the NX 500 has 7 connections, but then it is powered from the camera battery, so that probably accounts for two of the connections. The shoe has a large centre pin so it is probably compatible with an old single contact flash gun providing you can figure out the exposure (I have not tried it).

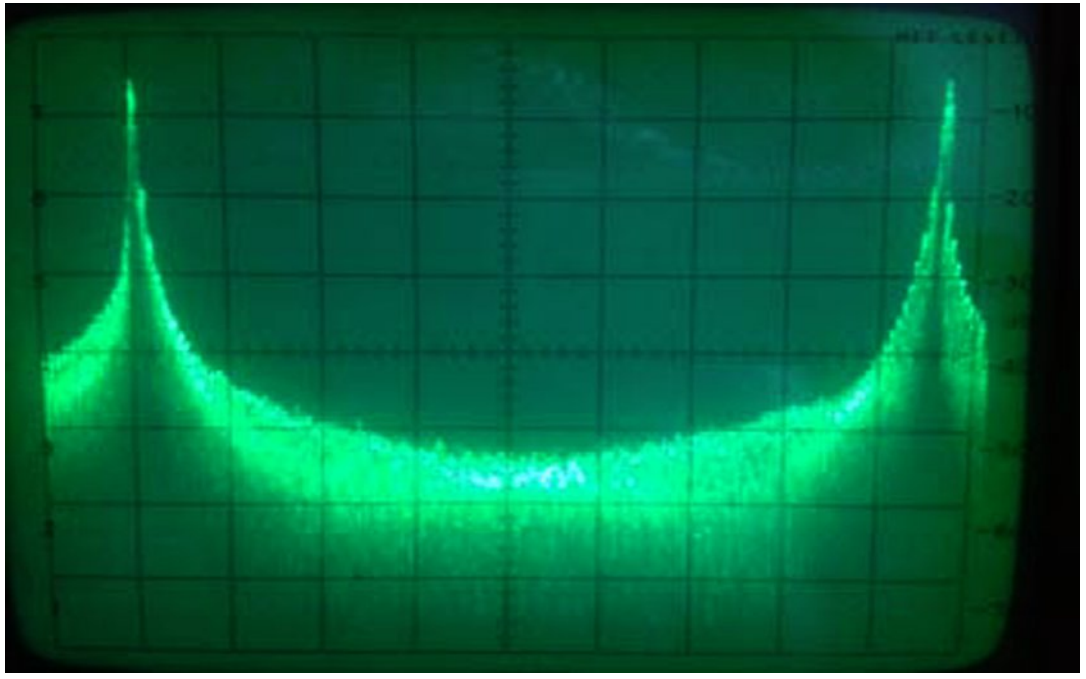
NX 500 note the seven connections

Once we have the light flashing, illuminating the scene and in sync with the shutter, and the correct exposure, we have the age old problem of, flash on camera produces poor lighting, poor depth of lighting, ugly shadows and red eyes. The shadows are because it is a hard light source, i.e. a small light source, red-eye because it is too near the lens and poor depth of lighting because it is too near the subject. You can see these limitations every day. The family meal where a pictures is taken of everyone present from the head of the table and the light falls off so the end of the table is in darkness, portraits against a wall with an ugly shadow on the wall, red eyes if the lens is a long focal length, although modern software will often fix this in the camera and make a copy of the picture with it removed, it just a menu fiddle. Some of the problems are fixable, the most popular is bounce the flash of the ceiling, only works on white ceilings, so the light source is not a point light source it is the size of the ceiling bounce and the depth of lighting increases because the light has travelled further. You need a flash gun that can be aimed at the ceiling and this is not the case for the small flash gun that is included with the NX500, there is a fix but it is expensive (getting on for the same cost as the camera). Also the exposure is changed as the bounce path reduces the light by several stops, Some of the flash guns with tilt heads have a forward facing sensor to do the calculations and automatically correct the exposure

In Part 2 we will be looking at better solutions to get better flash pictures

FM-ATV alignment - a new approach

By Tomtom, DL1MFK, from Munic



The spectrum on the old HP-Specki, 500Hz/div at 10198MHz

Watching the output spectrum of FM-ATV transmitters there are more peaks at high video frequencies, the deviation is dependable on pre-emphasis effects. Line frequency in Europe is 15625 Hz and was used in old Rhode&Schwarz test generators for AM-TV alignment. According to German ATV repeater sys-ops some telecom authority controllers have employed small generator boxes with 15625 Hz - 1 Vpp output to check the ATV-TX rf output. FM-ATV repeater license regulations are limiting the deviation to 3,5 MHz when using 13 and 23 cm bands. Citing the license document: "For transmissions on bands between 1240 and 2450 MHz the maximum bandwidth is 16 MHz at -40 dBc. Above 3400 MHz the maximum bandwidth is 18 MHz at -40 dBc. A sound sub-carrier at 5,5 MHz is recommended, more sub-carriers are allowed, but in total not extending the maximum bandwidth."

Now using Carson functions the FM signal bandwidth B is set by Fmax and the modulation index M: B = 2 x Fmax x (M+1). The maximum deviation D = Fmax x M.

The modulation signal is now a 16KHz square wave with 1Vpp (violet/purple), the second signal (yellow) I inverted. It comes directly from the video output from the receiver to which a 10GHz LNB is connected.

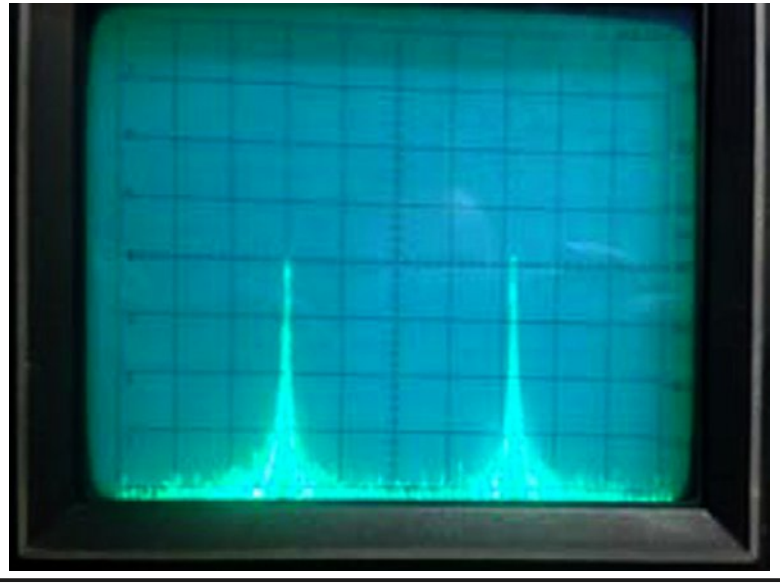
In several documents for Fmax the PAL colour sub-carrier frequency 4,433 MHz is used. But the video signal can extend to 6 MHz, only limited by an input video filter at 5 MHz threshold value. Knowing the maximum deviation we can employ the Bessel functions with an interesting effect included.

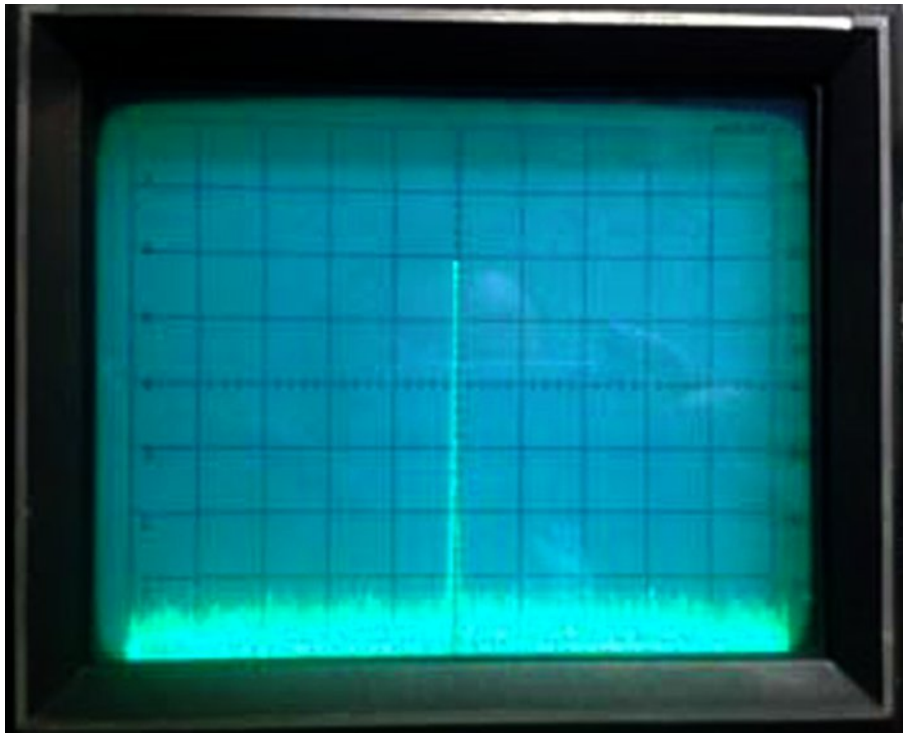
Transmitter power is shared between carrier and sidebands, but there is a special deviation value where the carrier power is zero! Taking Fmax = 5,5 MHz and modulation index of the first zero point at 2,4 MHz deviation we get:

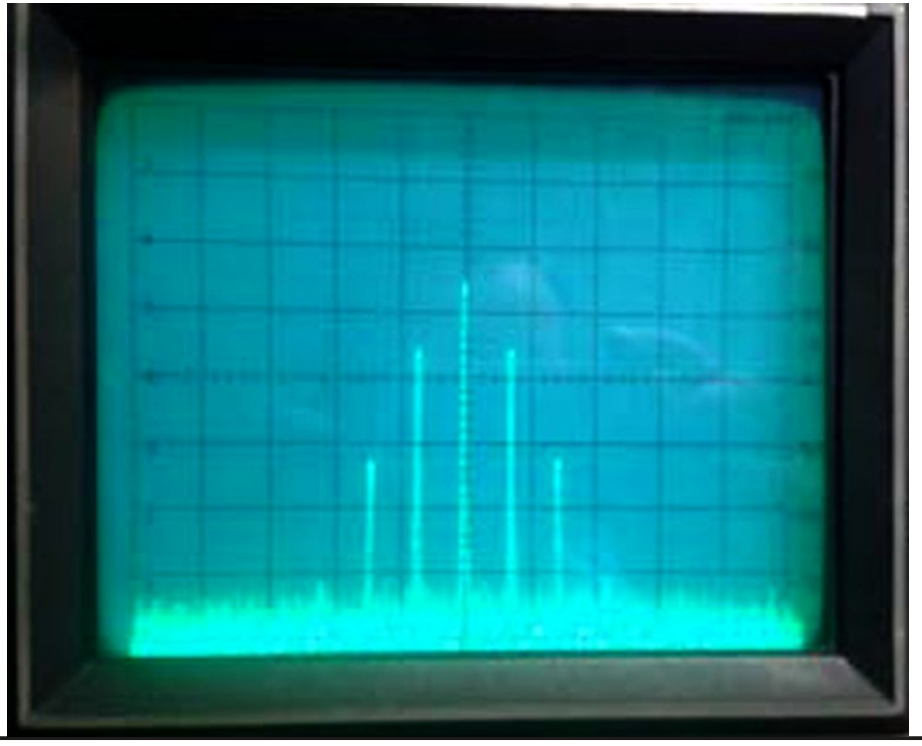
bandwidth (MHz)	modulation-index	deviation (MHz)	modulation frequency (MHz)
12	0,0909	0,5	0,208333
16	0,4545	2,5	1,041666
18	0,6363	3,5	1,458333
27	1,4545	8,0	3,333333

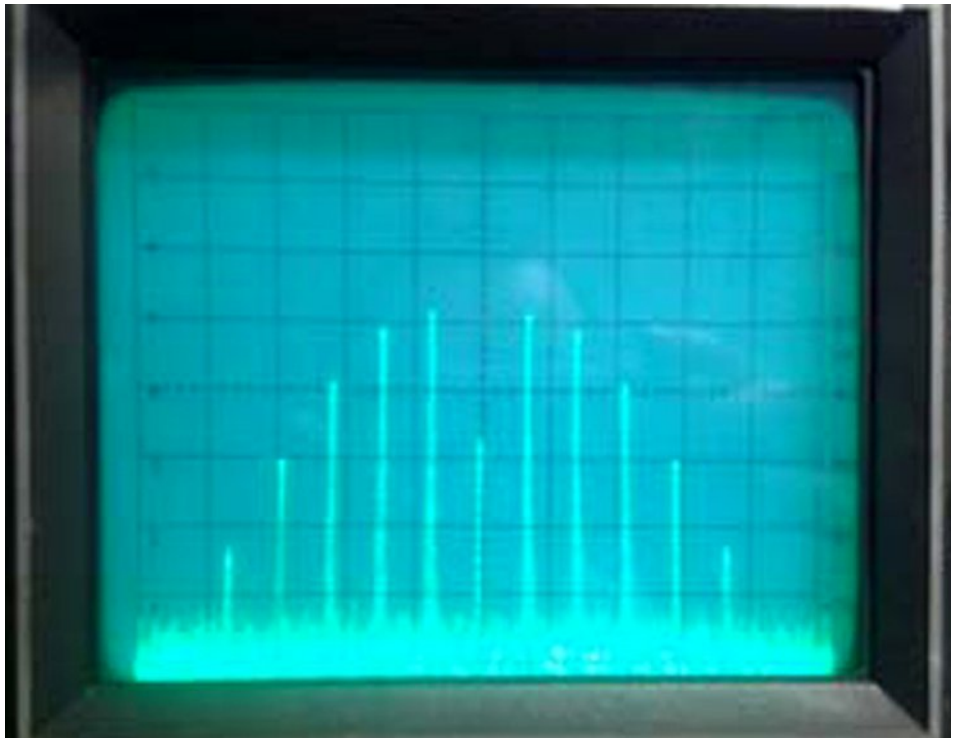
Take the spectral analyser!

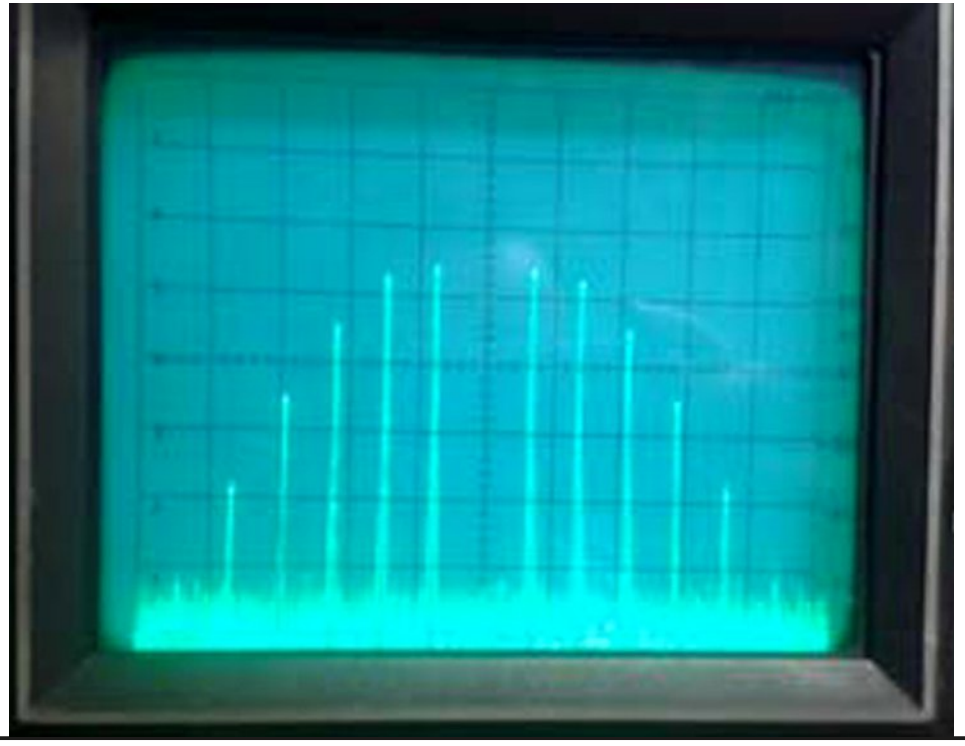
Beginning adjustments we are giving the wanted modulation frequency (sinus) for the appointed bandwidth into the video input (75 Ohm) with 1 Vpp. Now turning up the modulation from zero level only the carrier peak is shown on the spectral analyser. Soon there are 3 peaks and more (sidebands), and at one point the carrier peak in the middle begins to decrease - go on cranking up the modulation value until the carrier peak is gone below noise level. Ready!











This adjustment feels like a "dip" control - getting near the zero carrier point this peak is moving faster. Turning modulation up too much, the carrier peak comes back again. This way any FM-ATV station is set up to license conditions very easily - the modulation level is always 1 Vpp, but the output bandwidth is limited by lower deviation than in broadcast installations.

Video AGC for ATV

Employing a video AGC (automatic gain controller) chip like MAX7452 is a simple solution to limit the TX output bandwidth. But - an incoming ATV signal with wrong video level gets "levelled" without letting that ATV station known that the level is wrong. I think this "automatic levelling" is only suitable on ATV links, on ATV repeater outputs it is better to "cut" any signals above 1 Vpp.

The chip MAX7452 shows a problematic performance with deviation adjustments - the input level 1 Vpp at 16 KHz gets leveled to 0,3 Vpp, switching off the AGC function it is 0,6 Vpp. Only with much higher input levels the AGC chip gives out 1 Vpp at 16 KHz. Please be aware of this behaviour to avoid a surprise...

Source

http://www.dl1mfk.de/Projekte/DB0QI/Pegeln/index.htm

Translation Klaus, DL4KCK *www.agaf.de*

Caption contest

Some of the printable suggestions as to a suitable caption to the picture:

"If you don't move, we could send this picture by slow-scan" - G8KZN

"I thought you were transported to Australia" - Richard Carden VK4XRL

"You look hard up for a good read why not turn to CQ-DATV, birthday issue." Richard Carden - VK4XRL

"You must be from CQ-TV frozen in time." (details with held by the editor)

"Can't be easy getting a static address in Knaresborough" - Trevor

"This Guy is a right dummy. He is doing mobile ATV on his bike" - Mark Hoey

"I don't think that you have quite got the hang of your new tanning sun bed!" - Ian

External links

If you have an eBook reader that does not have WiFi then you will not be able to use the hyper-links in this publication.
If you have an eBook reader that has WiFi then you will be able too providing you are in a WiFi zone.
But if you have a Kindle 3G then yes, but only to Amazon, and there is not a lot of ATV material on their site.
Smart phone reading apps are ok providing that you have a 3G data connection.
Note: These links will fire up your devices browser and if you are using 3G/4G then you will incur data usages charges.

Legal Niceties (the small print)

E&OE. Whilst every care is taken in the production of this publication, dotMOBI accepts no legal responsibility for the advice, data and opinions expressed. dotMOBI neither endorses nor is it responsible for the content of advertisements or the activities of those advertisers. No guarantee of accuracy is implied or given for the material herein. dotMOBI expressly disclaims all liability to any person in respect of anything and in respect of the consequences of anything done or omitted to be done wholly or partly in reliance upon the whole or any part of this publication.
As the regulations for the operation of radio frequency equipment vary in different countries, readers are advised to check that building or operating any piece of equipment described in dotMOBI will not contravene the rules that apply in their own country.

Copyright

Notice to Contributors

Authors are alone responsible for the content of their articles, including factual and legal accuracy, and opinions expressed by them may not reflect the editorial stance of the publication. Material submitted to dotMOBI should not infringe the copyright of other writers or bodies.
Contributions are accepted for publication on this basis alone.
dotMOBI publications - *http://cq-datv.mobi*

Author Guidelines

CQ-DATV welcomes contributions from our readers. It does not necessarily have to be on ATV, as long as it is of interest to our readers.

Although a formatted article showing the layout can be sent, we prefer an unformatted text file of the script, along with annotations of where important images should be placed. All images should be identified as Fig 1 etc and sent seperately.

Images should be in PNG format if possible and the best quality available. Do not resize or compress images, we will do all the rework necessary to publish them.

If you are sending a construction project, please include the dimensions of any pcb's and make the pcb image black and white, not greyscale.

CQ-DATV reserves the right to redraw any schematics and pcb layouts to meet our standards.

Production Team

Ian Pawson - G8IQU Trevor Brown - G8CJS
Terry Mowles - VK5TM

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

Coming up in CQ-DATV

Is this the latest issue of CQ-DATV? *Click here* to go to our web site to check to see if there is a later edition available.