CQ-DATV

dotMOBI

Issue 30

December 2015

...what will be under your tree?..

http://cq-datv.mobi

In this issue

Production Team

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

Contributing Authors

Jim Andrews - KH6HTV Ted Bottomley - G4MXR
Trevor Brown - G8CJS Ken Konechy - W6HHC
Klaus Welter - DH6MAV Mel Whitten - KØPFX
Dave Woodhall - G3ZGZ
Rudi - S58RU & Mauro - IV3WSJ

Editorial

At the time of going to press the CQ-DATV download counter is registering 134,000 downloads, and so many countries that Ian has had to truncate the tracking software. We are on course to pass the 150,000 barrier in 2016.

So, is ATV in decline, at CQ-DATV we believe not, as this data shows. It is however facing change, not unusual for the age of information technology where everything happens frighteningly quickly, but if we can manage this change and the challenges it produces and not fight this natural progression, then ATV is on course for a bright future. CQ-DATV is playing its part by appearing every month and with free distribution in a whole host of electronic formats from eBooks to PDF. The age of a paper magazine a few times a year is now well in decline, for reasons of cost and infrequent appearance it just does not serve the requirements of the ATV community.

The other problems ATV faces is that we have changed or are changing from analogue to digital and in this changing world we do not as yet have a common digital standard. This is compounded by the growth of ATV repeaters that are locking us into one or other of the digital standards.

Looking back DATV started with the SR-Systems MiniMod and later DigiLite (an adaptation of the F4DAY project), but everything has to start somewhere and these were a relatively low investment (much cheaper than buying commercial TV products), constructional project which opened the digital door. The problem was when the appliance operators came on board requiring higher cost systems, which in turn required significant investment that once made, locked most of us into that system for a considerable period of time.

So we need to start now and decide which is the way to go, to achieve a common system, and engineer an ATV repeater network that reflects this agreed direction, before many more get locked into what may not be the standard of choice for the ATV community.

Is a common standard important? Well yes because ATV is now international, reduced bandwidth systems are allowing it to move to lower frequencies and presenting more DX opportunities, also the light weight kit now evolving is small enough to take on holidays to other countries.

Also we want to be able to exchange design information around the world and develop common building blocks such as DATV-Express and this works best if we are all on the same hymn sheet.

To this end CQ-DATV is an important link in the chain read in so many countries, the top country is the USA, followed by Germany, France, UK, China, Netherlands, Italy and so on, which links into advanced apologies to our readers in the USA if you have already read one of our articles, but it is important that we echo articles that might not have been seen worldwide and that advocate different DATV systems.

Last but not least CQ-DATV 32, our next but one issue, celebrates our 3rd Birthday. Nobody expected when we launched this publication that we would still be running three years later, publishing monthly with a growing readership.

One of the reasons we hope is our broad church approach covering not only ATV transmission, but using ATV kit to produce interesting copy, from Dave G3ZGZ's aerial photography through to Mike Stephens G7GTN Arduino projects, which are unfortunately on hold as Mike is currently undergoing a major stomach operation, in Derriford, and for which I am sure the entire CQ-DATV team and its readers wish him well.

Please let us know you favourite part from all of the past issues from caption contests to home construction so we can see you get more of what you like.

If you have forgotten the Caption contest we have included a picture that did not make it into print before we dropped the section. It's Our team member Trevor in deep conversation with a rather unresponsive engineer, not an unusual situation for Trevor. We will print your captions in CQ-DATV 32, our birthday issue. Please email them to *editor@cq-datv.mobi*

But before you do that sit back and enjoy CQ-DATV 30, with the stunning aerial photographs from Dave G3ZGZ and a look at the kit that supplied them. A look at the DVB-T system from three authors, Mel Whitten, KØPFX looking at DVB-T and the Hides modules. Jim Andrews again looking at DVB-T: A Solution for ARES Television Operations and finally, Klaus Welter DH6MAV looking at DVB-T2 HEVC. Ken W6HCC reports on his DATV-Express update and Trevor looks back and updates his advice from issue one on a Christmas video shoot.

Please enjoy CQ-DATV 30 and on behalf of all the contributors and the editorial team, may we wish you all a Merry Christmas and a happy new year.

CQ-DATV 31 is officially in production and meanwhile you can keep in touch by visiting our *CQ-DATV Facebook site* (please note that you will require a Facebook account to enable you to view this site).
CQ-DATV Production team

DVB-T2 test started in Cologne/Bonn region (Klaus, DL4KCK)

First pictures emerged on 13th of August 2015 on UHF channel 40 with five programs: Das Erste HD (720p50, AC3, AAC), arte HD (720p50, AC3 German, AAC franz.); PHOENIX HD (720p50, AC3, AAC); Einsfestival HD (720p50, AC3, AAC); WDR HD Cologne (720p50, AC3, AAC).

The high resolution quality from the newly rebuilt WDR regional news studio in Dusseldorf is really good. Cable TV customers in the Cologne/Bonn region without satellite TV access are now able to view WDR HD by PC receivers or latest Ultra HD TVs with HEVC decoder. I am using an Asus laptop computer G75V (PC games ready) with a fresh Windows 10 OS and a i7-3610-Quadcore-CPU (2,3 GHz) besides a GTX670M graphics card (Nvidia) and a full HD screen. The August DVB-T210-USB-stick receiver bought from GB (chinese origin) is feeding the German PC program DVBViewerPro, the included codec "LAV 0.65" has HEVC capabilities up to 2160p60 video signals.

On the second DVB-T2 testing multiplex (UHF channel 43) run by MediaBroadcast (ex-Telekom) the ZDF HD signal 1080p50 (!) is stressing my laptop CPU at more than 50 percent usage, but only with native HD video sources like live soccer games (1080i50). SD archive material is running smoothly like 720p50 programs, all streams are showing maximum 3.5 Mbit/s data rate.

Searching for ATV in ZP (Detlef Muessig, DH 7AEQ)

The author is an expat from Berlin, Germany, and is in contact with his ATV friends regularly by Skype connection to DB0TGM - mostly in his early morning hours because of the weak domestic Internet line (see also CQ-DATV 23, page 32).

Roberto, ZP5RKV, (left)

and

Detlef, DH7AEQ

Since my arrival in Paraguay in November 2014 I have been searching for an ATV repeater or at least ATV-OM. Having no success I decided to try that myself and to inspire all OM in my reach. On 1 and 2 of August 2015 I got an opportunity at an international AR meeting 40 km away from my home.

It was the 15th come-together arranged by Radio Club Amistad ZP7ARA in Coronel Oviedo. There were guests from different regions of Paraguay and from Brasil and Argentina.

In talks with the president of Radioclub Paraguayo, Francisco Pettersen, ZP5PVH, and his forerunner Roberto, ZP5RKV, I was able to get their support.

Then I discussed my project with several small groups showing block diagrams of ATV repeater, ATV reception and ATV TRX station.

The planned QTH and coverage area was another point, and many OM were interested. Peter, ZP1PG, for instance would like to take part, but his QTH is 550 km away from the planned ATV repeater.

This will be installed at an FM repeater site, and it was discussed to take such stations for an ATV link to ZP1PG in Filadelfia.

My plan was theme of the day on ZP7DD, the local FM repeater.

Many thanks to Peter, ZP1PG, for translations to intelligible Spanish. 73 Detlef, DH7AEQ, in Mbocayaty / Paraguay.
Translations Klaus, DL4KCK

With Peter, ZP1PG in marking the FM relay towards Chaco on the map

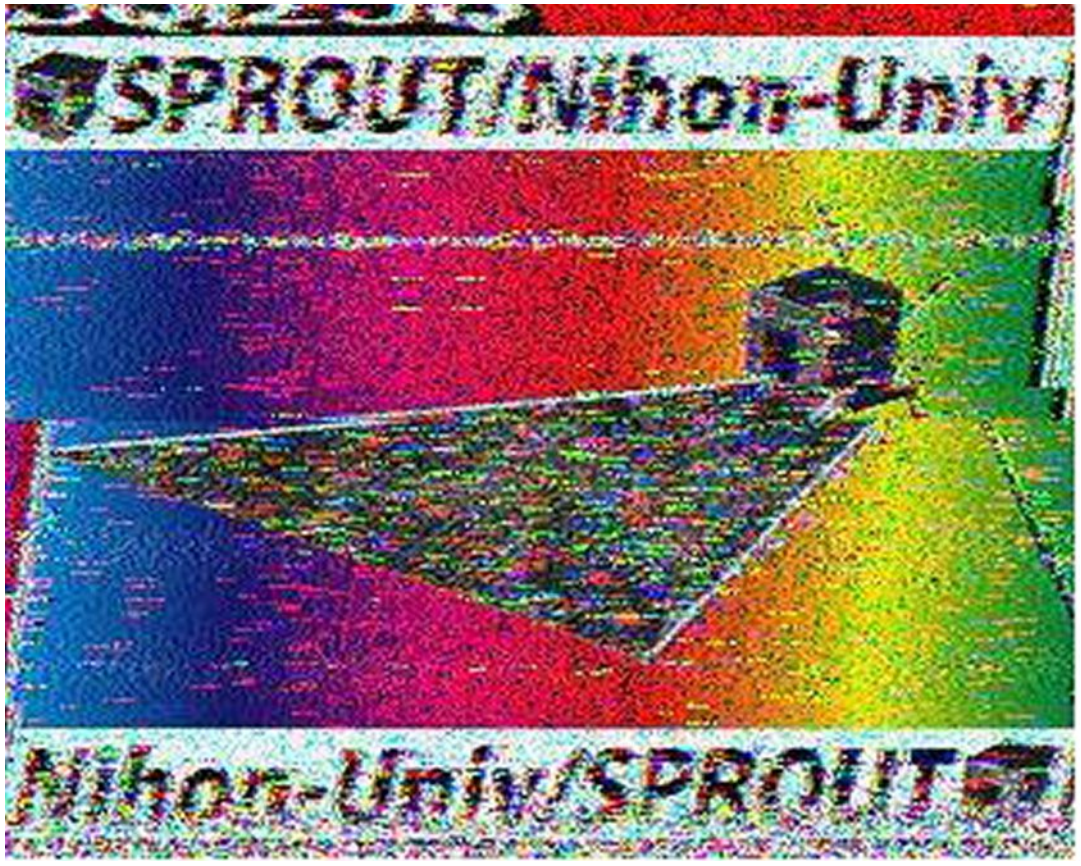
SPROUT SSTV active Sundays

Slow Scan TV (SSTV) images in Scottie 1 format will be transmitted from the SPROUT amateur radio satellite every Sunday (Japanese Standard Time)

The SSTV and Digitalker transmissions will be made on 437.600 MHz FM (+/- 9 kHz Doppler shift).

SPROUT (Space Research On Unique Technology) has the call sign JQ1ZJQ and was built by students from Nihon University. It was launched on May 24, 2014 at 0305 UT into a 654 km, 97.9 degree inclination Sun Synchronous Orbit (SSO).

The satellite can send pre-loaded SSTV images from the Message Gallery and also has the capability of sending pictures of the Earth.



Free Slow Scan TV (SSTV) software MMSSTV

http://hamsoft.ca/pages/mmsstv.php

Further information on SPROUT is at

http://amsat-uk.org/2015/11/19/sprout-sstv-active-sundays/

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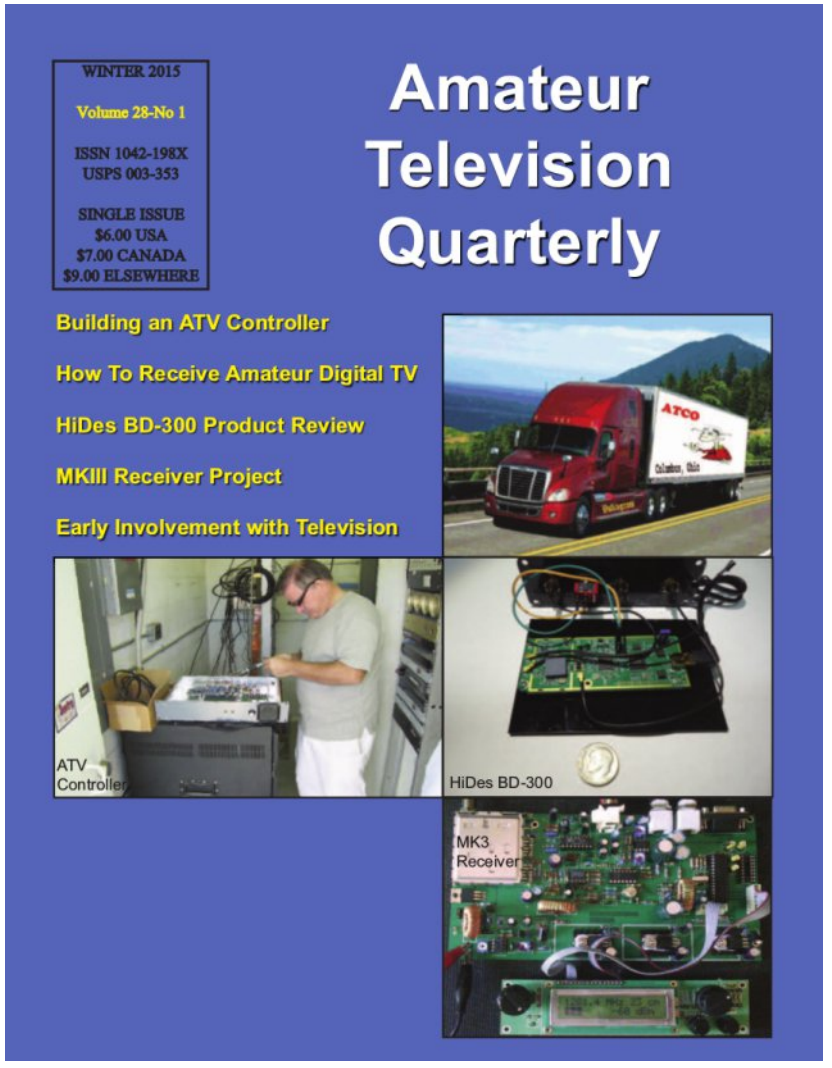

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Aerial photography

By Dave G3ZGZ

Not this sort,

Rather this one

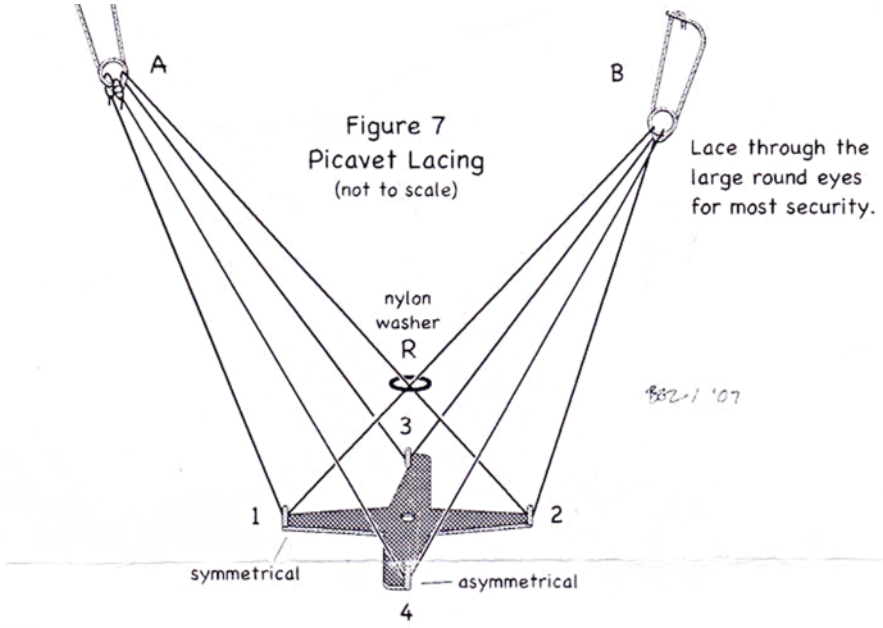
You may wonder why this type of aerial photography has a place in a technical radio publication such as CQ-DATV.

Well, read on and notice how many times I have used my radio knowledge to solve problems that arose with this pastime!

Many years ago I got interested in Kite Aerial Photography (KAP). In those days it consisted of a camera hanging below a kite on a picavet suspension (a form of self levelling platform).

The kite was a large (8 foot) delta kite and would take the camera up to around 100m above ground level.

This worked well but the pictures were not always so good as the camera and suspension would move around a lot.



LACING ORDER:
A-1-R-B-2-R-A-3-B-4-A

The camera was a simple web cam that happened to have a 16 picture memory, a vga 640x480 resolution and was put into "time lapse" mode with the addition of a simple 555 timer wired across the shutter button.

After the initial experiments were history, I fitted a small video camera with a 2.4GHz downlink that allowed viewing and recording (via my Sony camcorder that had a video input).

All of that was more than 15 years ago and about 5 years ago I moved up a notch!

This was my first quadcopter (quad) and had a very simple on board flight controller that basically only stopped it from tilting more than 45 degrees! I had been flying all sorts of radio controlled models since I was at school and quads were a new and exciting challenge. I'd already been flying R/C helicopters and this was very similar but had 4 of those whirly thingies.

Several cameras and video links were hung underneath this airframe and resulted in many hours of experimenting to try to get decent pictures and video. I used the "key-fob" and "stick" types of "spy" cameras plus the small video camera and 2.4GHz downlink from the KAP setup (the control link to the quad was on the 35MHz R/C band).

Most of the video was of poor quality and suffered from vibration that made the pictures shake badly. Stills were just OK and I ended up grabbing frames from the video that were useable to brag to friends!

These experiments were all done in South Africa before I returned to the UK in 2013

Now for another notch up in the form of a Blade 350QX quad that had a (for that time) quite sophisticated flight controller.

This picture shows the 350Qx with a Mobius camera and a 5.8GHz video downlink transmitter

By November of 2013 I had saved my pennies (quite a lot of them) and got the 350QX with GPS, altitude hold, position hold and other fancy features. This was the start of a "tripod in the sky" experience that has got even better this year. (2015).

I was able to get a Mobius "action camera" that for those who have not heard of it before is a small battery powered unit with 1080p recording capability.

This was mounted under the quad on an anti vibration mount and gave me some outstanding still and video images.

I later fitted a 5.8GHz video downlink to this quad as the R/C control frequency was in the 2.4GHz band.

I learnt a lot about interference from the Mobius camera that messed up the GPS reception. The camera uses a micro SD card to store its data and that is written to at quite a high bit rate as you can probably imagine. If the camera was put within a few inches of the GPS antenna it "transmitted" wide band noise and wiped out GPS reception.

The camera was mounted under the quad and the GPS antenna on the top but had only about 3 inches of separation.

When GPS is used for such things as holding position, and to guide the quad back when a "return to home" command is given, it's not such a good situation if the camera blocks the GPS reception!

A solution to this was found by putting the camera in a Faraday cage made from aluminium cooking foil! A strip of foil was carefully put over the camera and I made especially sure that the memory card slot was well covered.

The camera was mounted in a fixed position and as the quad was pushed around the sky either by me controlling it, or the

on board computer keeping it in position when windy, a lot of the video was at funny angles and not pleasant to watch. As with the first quad, I was however able to frame grab good pictures from the recorded video.

The next step was to make up a stabilised platform for the camera. In the video and model world this is known as a gimbal. My attempts at this were quite good and I was able to get very good pictures from my two axis home made gimbal.

A major bonus was the ability to change the tilt angle via the R/C link so I could make the camera point from about 45 degrees up to completely down.

Initially I just used the camera on the gimbal as the additional weight of the 5.8GHz video downlink and antenna made the flying time of the quad a little less than I would like.

The Mobius camera was giving sterling service and really good HD quality stills and video. But I wanted more!

I have had over 35 hours of flying time (yes, I keep a flight log) from my Blade 350QX quad and got thousands of stills (the Mobius can be set to take time lapse images) and many megs of video.

More (LOTS) of pennies were saved and in January I was able to upgrade to better video.

Those pennies were spent on a YUNEEC Q500 quadcopter.

With the two previous quads I could only see what the camera was looking at via the video downlinks and this entailed taking along a video RX and monitor. Rather a messy setup but it did work well and allowed me to frame the aerial shots I wanted.

The Q500 is one more step up in that the quad came with it's own camera built into a 3 axis gimbal and the R/C transmitter has it's own monitor screen built in. Just one box on the ground and I have everything under control and I am able to see the video that is being recorded.

The three axis gimbal and the sophisticated flight controller meant that video and still images were much better. But…

The camera on the Q500 had fish-eye distortion, not bad, but it needed correction and an even worse problem of wandering automatic white balance. This was not too serious on the still images but was a real pain in video as it would change depending on what scene was being viewed. This made post production correction very hard!

The quad is superb for aerial video and is truly a "tripod in the sky" with the gimbal working so well to keep the camera steady.

Many hours were spent flying with the Q500 and some great shots were obtained.

Unfortunately no updated firmware was made that would correct the problem with the white balance.

The camera on the Q500 has a 5.8GHz digital downlink with a 20mW transmitter and a clover leaf type antenna. This gives a radio range of around 400m and allows the pilot to see exactly what the camera is viewing. A micro SD card built into the camera is used for storing pictures and video.

In the R/C controller is an Android tablet that is used to show the downlink video and some telemetry information received from the aircraft. This gives a read out of things like lat/long, altitude, battery voltage and quite importantly the number of satellites the on board GPS is receiving.

About 3 months after I got the Q500, Yuneec announced an updated model known as the Q500 4K. Release of the new model was held up for quite a while as the camera was being fine tuned.

In July this year it was finally released in the USA with Europe to follow soon after. I wanted to upgrade to a better camera and a deal was struck where I could get the newer model camera (for not too many pennies this time).

It was a long wait till August 17th when my new model was delivered. That afternoon the first flight of the Q500 4K took place and I was immediately impressed with the camera and the changes to the way the R/C transmitter worked.

But…

Now the camera was capable of taking 4K video (if you are not sure what this means it is video with 4x the resolution of normal HD video), and that brought some other challenges as well! Before letting you in on those it is worth mentioning what the R/C transmitter can now do.

The telemetry from the quad was previously only available on the TX screen. Now the TX can save this info to a memory card for later analysis.

A jumbo's flight data recorder is almost as capable as this system(!)

About 3 times per second the quad sends data down to the controller (This works on a time division multiplex set up). Control information from the R/C transmitter is carried on a 2.4GHz spread spectrum link. This is sent in two bursts, one from a vertically polarised antenna and then the same control info is transmitted horizontally polarised. This redundancy helps ensure that the receiver in the quad always gets correct information. The data sent is encrypted and contains a checksum so that any corrupted packets are ignored.

There is a gap between these two packets and the next – mainly to allow the RX on the quad to process the incoming control information. This gap is now used to allow the quad to transmit telemetry back down to the control TX.

The data received 3 times a second includes GPS position, altitude, number of satellites used plus other vital aircraft data such as battery voltage, pitch, roll, yaw angles and the

status of the on-board compass, flight computer and error flags from the other sensors on the quad.

Quite amazing, but that's not all folks! The memory card also records a low resolution video feed that is received via the 5.8GHz downlink.

OK, so what differences were there in changing to 4K video from the previous HD video the earlier Q500 gave.

Well the camera was a totally different animal. Settings can be changed such as ISO, exposure time and most importantly the white balance!. This can be manual or automatic and once set can be locked. No more green fields that go yellow!

The biggest plus is being able to record in resolutions from 1920x1080 at 120 FPS up to 4096x2160 at 25FPS.

The higher resolution EATS up memory on the micro SD card but this is only the start of the differences when using 4K video.

To be able to VIEW 4k video, guess what, you need a system capable of showing it!

At the moment I can't view 4K video as the number of pennies in stock is FAR to low!

To do the job properly you need a fast PC (got that – 4 core 4GHz processor with 8Gb memory (oh but wait, I'm using Windows XP Pro and it only sees about 4Gb). I don't want to change the new Windows on the machine I use for video editing just yet.

Then you need a lightning fast graphics board – got half of that. The typical on-board graphics are totally not fast enough.

Next you need a suitable 4K monitor to work with the graphics board.

Lastly you need big storage – data from just one 15 minute flight where I record stills and video is 15Gb or more! Then there is the disk space needed for video editing and rendering.

When all of these are up to spec you should be able to watch and save 4K content.

Another consideration is the video editing software you use. I have Coral video studio pro X6 – a couple of years old but it will cope with 4K video.

From the above, all I have is the "fast" computer.

My home TV is a "smart tv" but can only handle 1920 x 1080 x 30 FPS when the video is recorded on a memory stick plugged into a USB socket.

I (XYL also suggested) decided that my pennies should be spent on some none essential items like food and energy bills so effectively I can't take full advantage of 4K video.

After serious consideration and looking at 4K TV's etc I think that normal HD definition is good enough, especially for the quality of video obtained from what is in effect a "cheap" camera.

The camera was upgraded to the 4K model more for the facility to change settings and had an additional bonus that most of the lens distortion has been "eliminated" from the camera.

They have changed the lens but I'm sure they have got better software in the camera to take out the barrel distortion.

Yes, the blades are sharp!

The cost to upgrade from HD to 4K is, in my opinion, a little too high at the moment.

I would have to get a better graphic card for my PC and that MAY also mean that the power supply needs changing as I'm told that they alone can consume 300W of power!

Next the monitor needs changing, and they are not cheap.

I would have to update the operating system from XP, which I don't particularly want to do.

Lastly for me to view the 4K video on my TV it will need changing for the latest model. Bearing in mind that there are no 4K TV transmissions as yet, that's a no go.

Oh, yes, I'd probably have to change my internet connection to the latest high speed fibre optic offering, at more cost, to be able to download 4K files.

All in all, not worth it at the moment.

So, what I am doing now is to capture the video at 2 or 3K resolution – in my case this is either 1920x1080, 2560x1440 or 3840x2160 as these will downscale to a 16:9 format that my computer, graphic card, monitor and TV will all handle.

I use VLC to play my media on the PC and this also handles any of the above formats without shuddering etc.

The only area I need to be wary of is that the video editing software I use is capable of accepting 4K video. Corel video studio will allow the editing and playback of 4K video whilst editing with my computer setup.

Lastly as quadcopters (or DRONES, as they are sometimes called – I don't like this classification as the general public has a negative connotation of how bad DRONES are) will be sold in their thousands this year, a few rules should be observed.

The CAA has issued their rules for flying in the UK and all of them are very sensible.

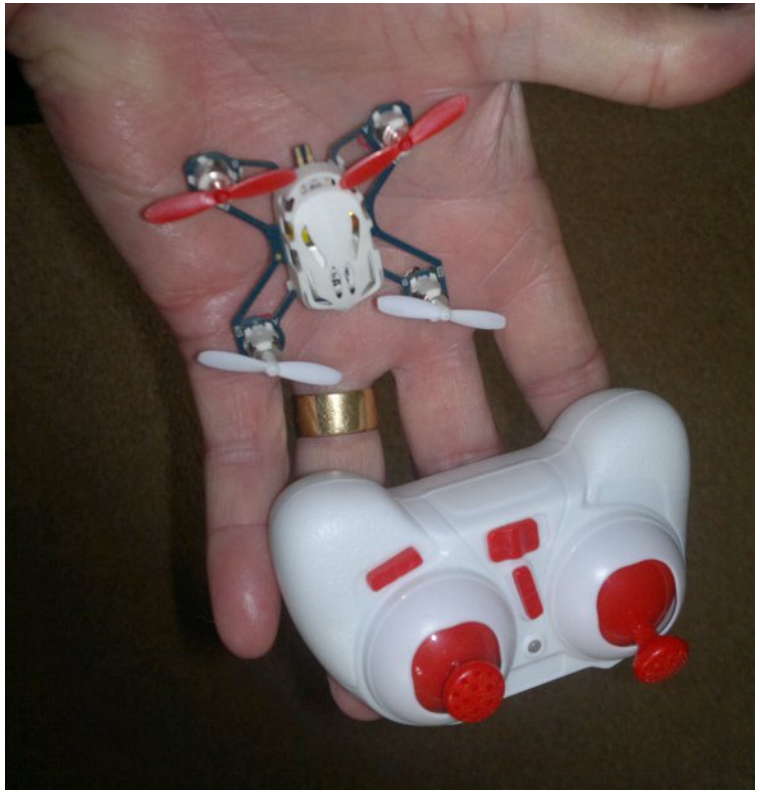
Unfortunately there will be many owners of the bigger quads like mine that have no idea what the rules are, and dozens of videos on YouTube show how stupid they are when flying.

I've seen videos of quads flying near airports, over people, roads, railways and the like. I live near Blackpool and there is even one video of a chump who flew the length of the promenade, then climbed up to the height of the tower and even rocked his quad to wave to people at the top of the tower.

The rules are very simple – no flying over 400 feet above ground, no flying over buildings, people, roads, railways or structures, not within 5 miles of an airport and that the

model MUST be within visual line of sight. At 300m away I can only just see which direction my quad is going.

The guy with the Blackpool video broke every one of these rules and it's people like that who will cause stricter rules to be brought in. Indeed recently I heard that the FAA in the States is requiring ALL DRONES to be registered. Bit silly if I have to register this one though!



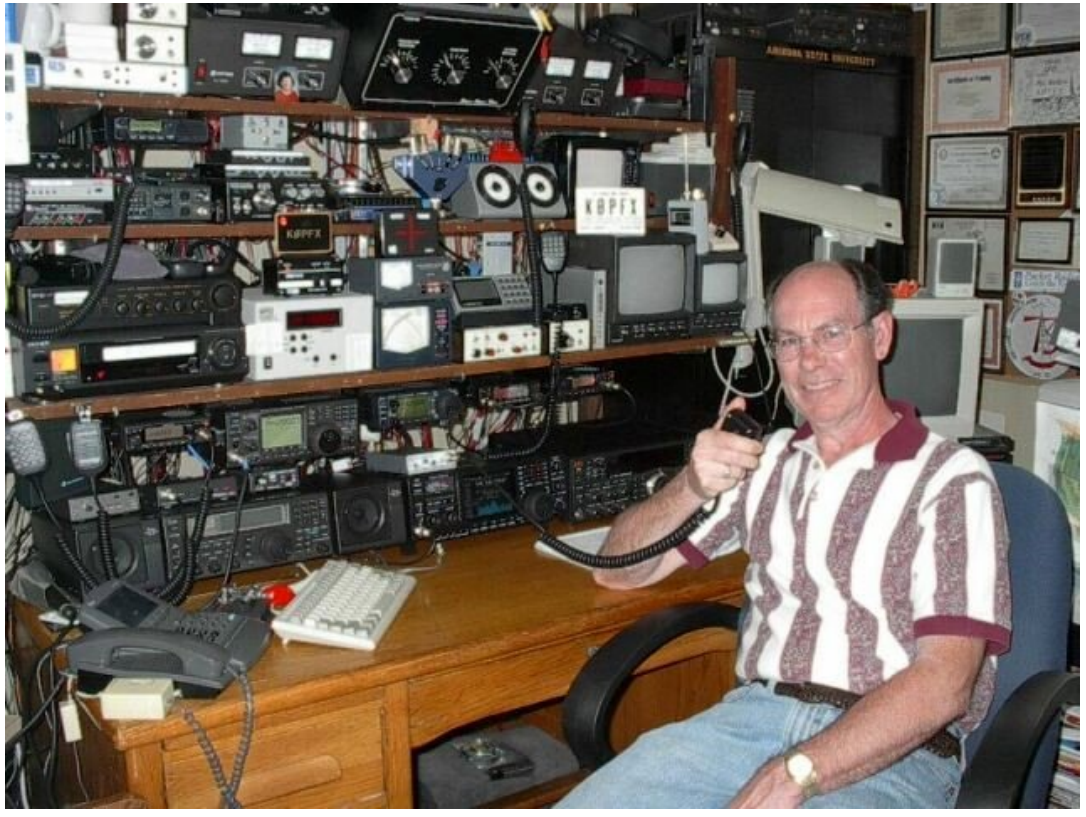
Well, now you have an insight to my other hobby and how I have been able to apply radio and video knowledge to help me get more out of flying R/C models.

I was able to build antennas, screening cages, use video cameras and video editing software that if I did not have an interest in amateur radio and TV I would probably not have been able to do.

Drones are getting bigger! (airnamics R5 UAV)
Also useful to add decorations to the top of xmas tree!

DVB-T using the HiDes modules

Mel Whitten, KØPFX



Before we all get locked into DVB-S, there is a strong case for DVB-T using small USB dongles (UT-100B) that may be found on the hides site (www.hides.com.tw/index_eng.html [1]) and often appear on eBay). These are DATV transceiver modules and can be used to drive Class A RF power amplifiers on 70cms.

To get started, all it takes is one of these dongles, an amplifier and a 70cm yagi antenna.

Software is free with the dongle. A small 10W Class A amp from OE7DBH works well for the DVB dongles.

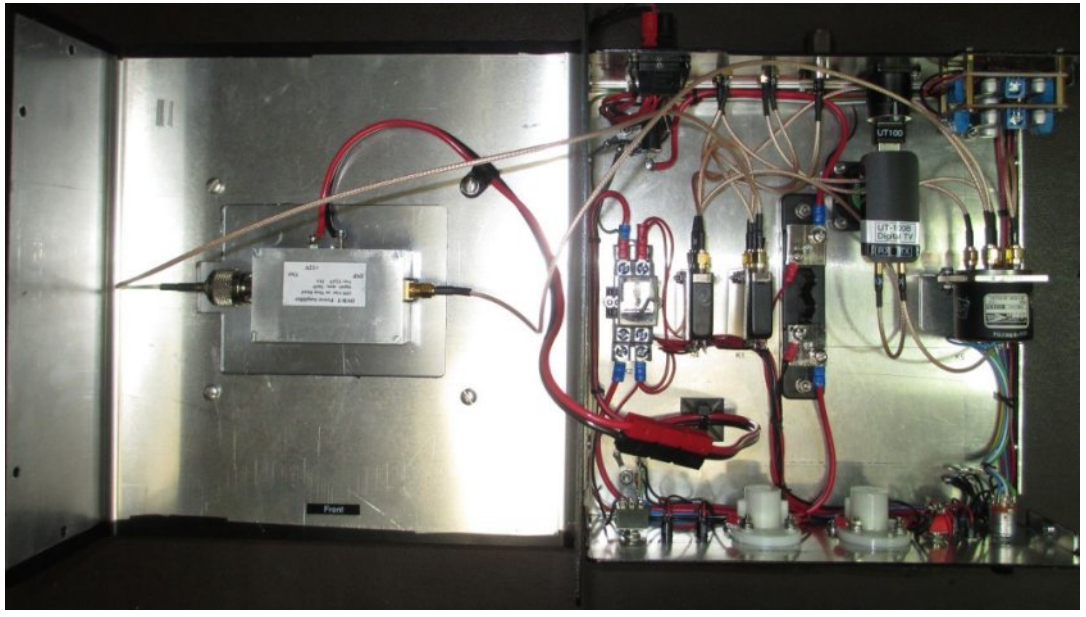
Once we have the units connected and the software installed. I have added a few bells and whistles such as pre-amp and in-line power amplifier and a rather smart front panel. Once you have the hardware connected then all the control is via the free HiDes software. That has some very interesting screens.

I am developing a DVB-T station for 70 cms and so far the results are encouraging and should be complete by the end of this year. .

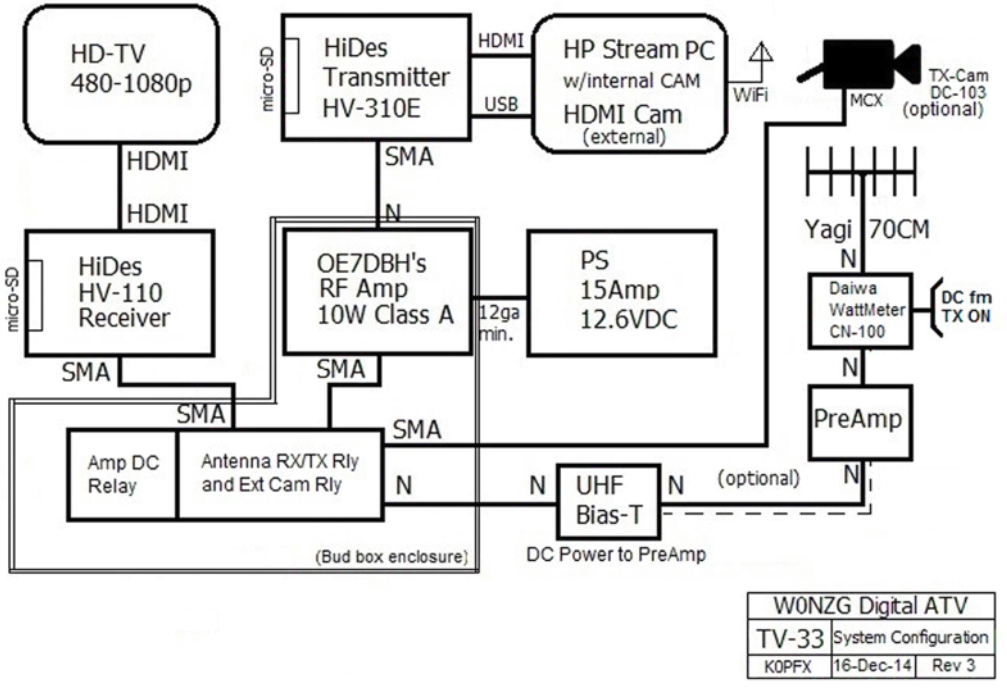
The end unit is an HDMI input and output, no digital coding via a PAL or NTSC input so say goodbye to digital coded composite video and hello to digital.

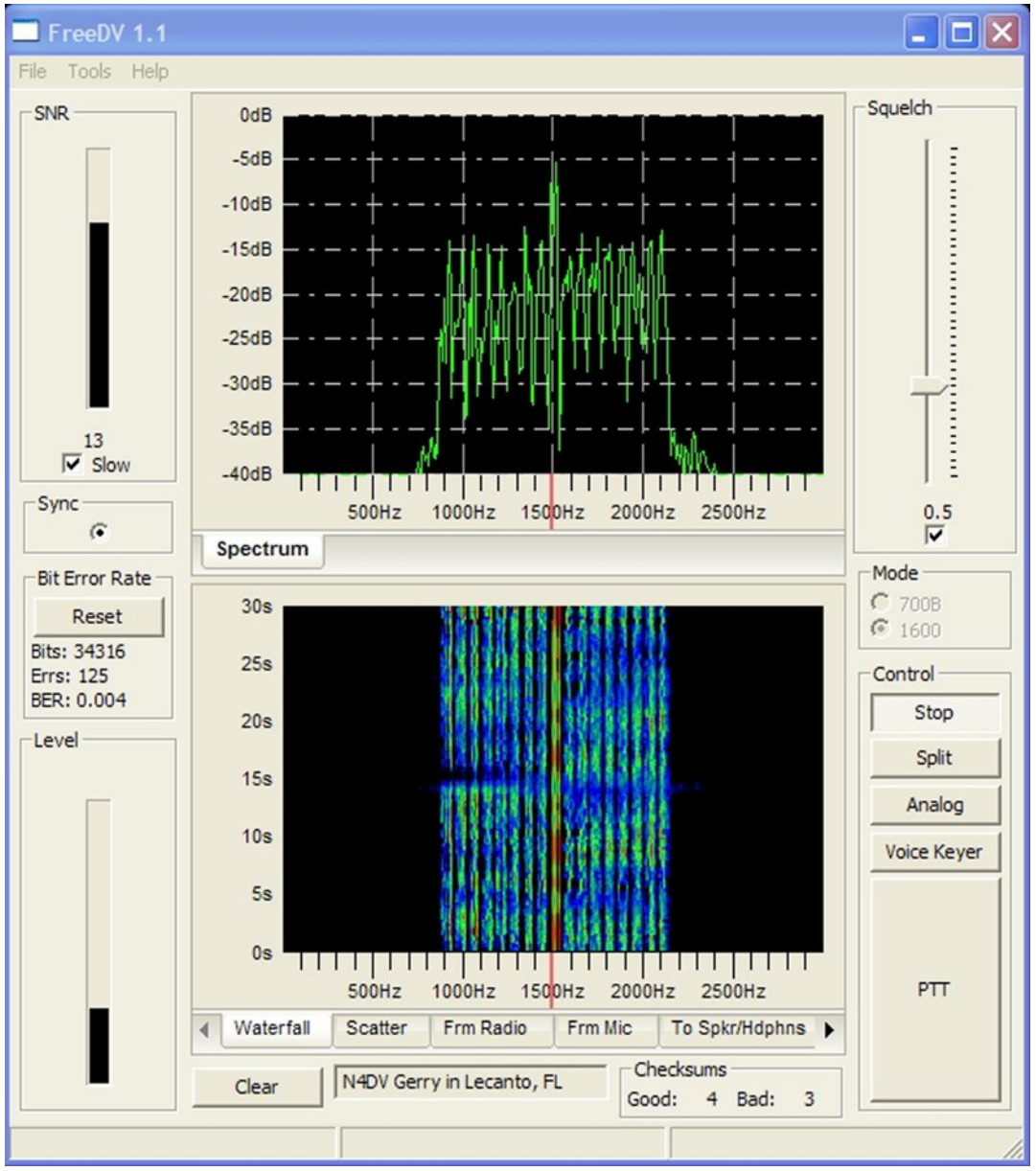
All from 2 Hides dongles a laptop control and a DVB-T receiver, why would you ant to go any other way.

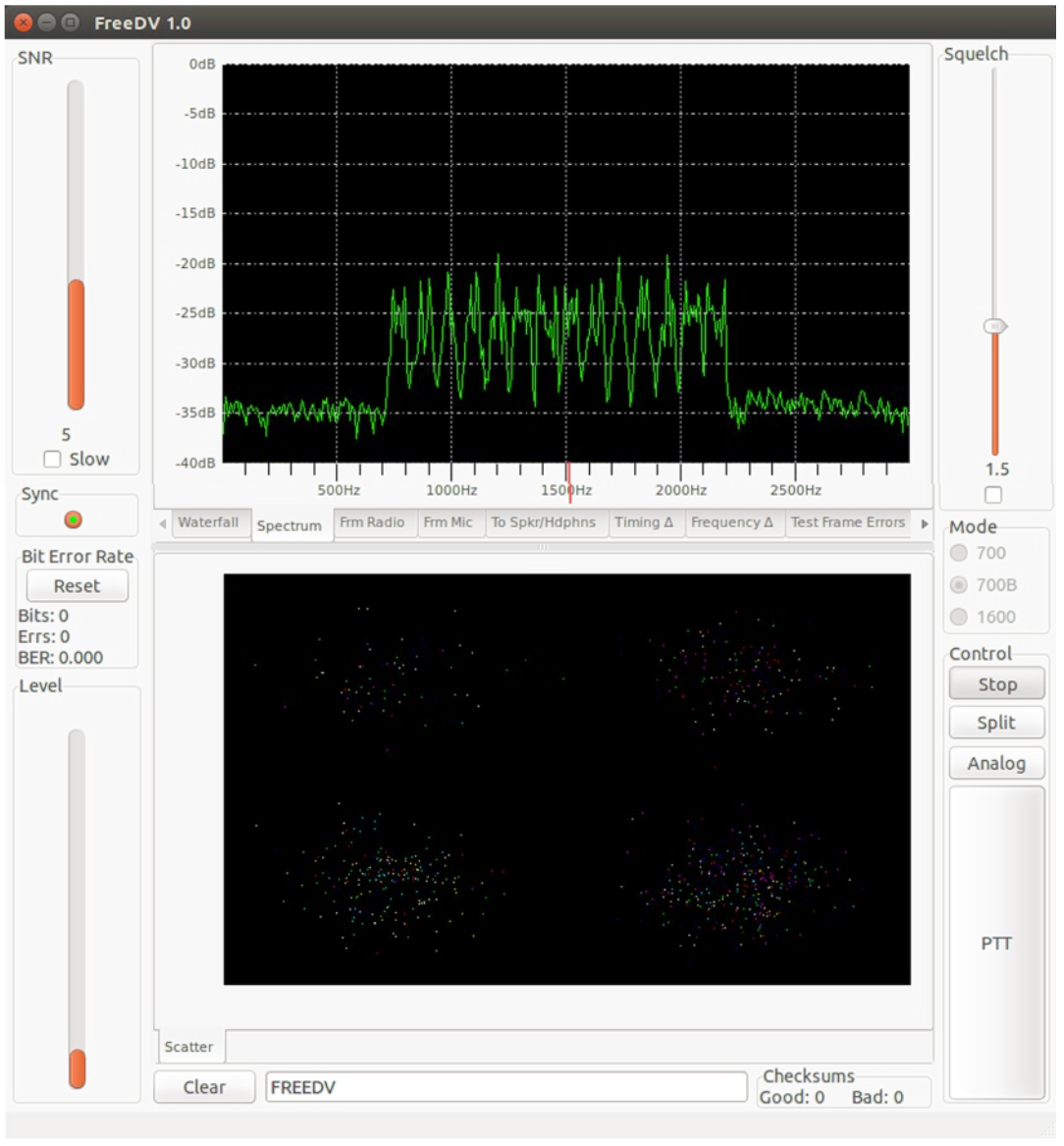
A DVB-T station using HiDes components



W0NZG DVB-T Digital ATV Station







DATV-Express Project - October update report

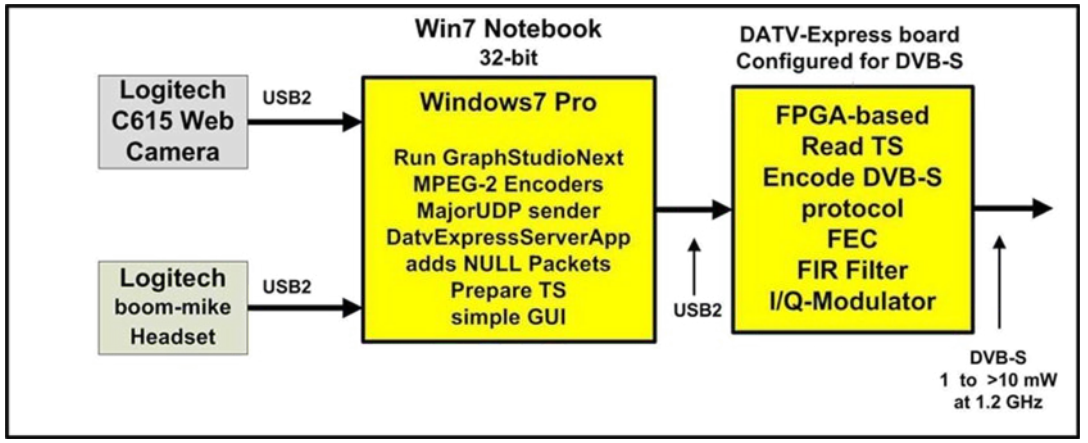
By Ken W6HHC

The order to build and test a third production lot for more DATV-Express hardware boards was started by Art WA8RMC around 2015-10-07. The project team is pleased to announce that 25 blank PCB's arrived on 2015-10-28 and were hand-carried over to the board assembly vendor on the same day. Assembled PCBA's were picked up on 2015-10-30 and the first ten boards that Art tested worked perfectly. Art declared to the project team "let the flood gates for orders open…" and sure enough he received an order for ten boards on the same day. The large order came from the Mt Diablo ARC that has recently put up a DVB-S DATV repeater, W6CX, near San Francisco.

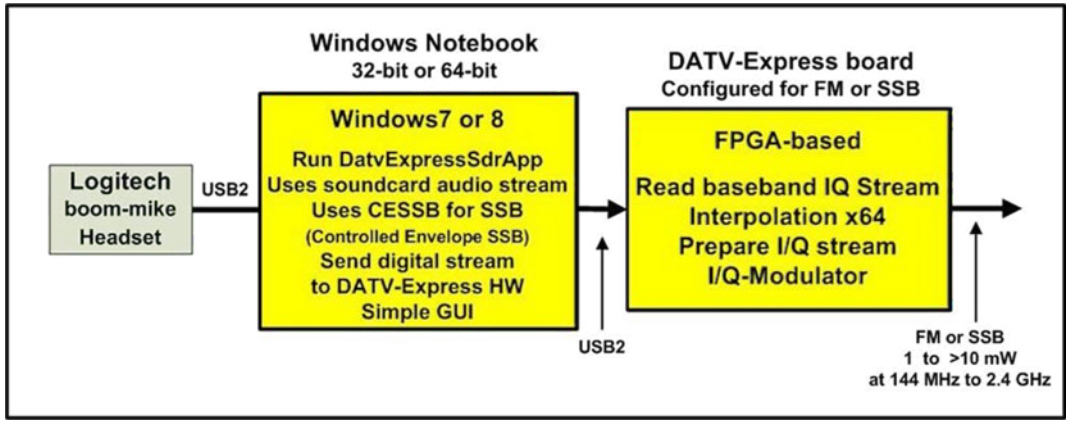
Charles G4GUO has written software and is experimenting with two new applications for the DATV-Express board that run only on Windows OS (no linux involved). The two apps for the hardware board are:

- *DatvExpressServerApp is an alpha-release program to transmit DVB-S DATV running only on a windows PC with the hardware board. (no linux). In addition, the app can be used to run a webcam and no Hauppauge hardware is required!*
- *DatvExpressSdrApp is an alpha-release program running only on a windows PC to transmit FM or SSB using the hardware board.*

PLEASE NOTE - these two applications are experimental and are likely to be full of bugs. They are provided as a service to the DATV-Express community.



Typical Block Diagram for the DatvExpressServerApp software that runs DVB-S completely on a Windows machine and connects to DATV-Express board. No Hauppauge hardware is required!!



Typical Block Diagram for the DatvExpressSdrApp software that runs completely on a Windows machine and connects to DATV-Express board to transmit FM and SSB

Charles G4GUO gave a presentation at CAT15 in September on the DATV-Express. See YouTube video at:

https://www.youtube.com/watch?v=c-2TgPw1dzE

Ken W6HHC gave a presentation at TAPR DCC2015 in October on the DATV-Express.

See PowerPoint and PDF slides at

http://www.W6ZE.org/DATV/

(click on the PRESENTATIONS link).

Ken W6HHC is working on a brief User Guide to install DatvExpressServerApp and DatvExpressSdrApp as time permits.

Charles G4GUO is working on making some changes to DatvExpressServerApp to use multicast-UPD, a more professional approach to UDP for this application that was suggested by Jean Pierre F6DZP.

Finally, the plans to finish the remaining task before finally releasing v2.04 for ODROID, Update User Guide for ODROID, is still on the "stack" of "things to do".....it just got pushed down the stack a bit.

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

DVB-T: A Solution for ARES Television Operations

By Jim Andrews, KH6HTV

Reproduced from QST magazine June 2015 by kind permission.

The Amateur Radio Emergency Service® (ARES) group of Boulder County, Colorado (BCARES) has been providing TV communication services to the local Office of Emergency Management (OEM), sheriff, police, and fire agencies since 1990.[1]

TV has been the most requested service we provide. It has been used to cover natural disasters and large public gatherings. We've covered forest fires, floods, SWAT operations, University of Colorado football games, protest rallies, 10k runs (with 50,000 runners), and more.

Originally, we used the old analog 6 MHz wide NTSC broadcast TV standard, which uses Vestigial Upper Side Band (VUSB-TV) modulation. Our typical operation consists of dispatching two-man teams carrying a portable 1W 70 centimetre TV transmitter in a backpack along with a 12V, 7Ah battery.

We use ordinary consumer-grade camcorders, and mount both the camcorder and a rubber duck whip antenna on a camera tripod. On 70 centimetre, our analog TV pictures can be received by an ordinary TV configured to receive cable channels. For some operations, we have as many as four transmitters operating simultaneously on cable channels 57 - 60. Most operations are within a half-mile radius of the command post.

For forest fires, floods, and big footraces we use higher power 10 W transmitters and Yagi antennas, along with TV repeaters to cover longer distances. We have both a fixed base repeater that covers the eastern half of our county, and a portable TV repeater. We have also used the 1.2, 2.4, and 5.8 GHz amateur bands for point-to-point links using analog FM-TV transmitters.

Most of the time our TV pictures would never be called commercial broadcast quality. We have been plagued with:

(1) weak signals and snowy pictures,

(2) multipath ghosting,

(3) mobile flutter, and often geographic locations where we simply can't get any picture, and

(4) in today's high-definition world we had been supplying low-resolution 480i pictures.

Experiments with Digital TV

I started experimenting with digital TV (DTV) in 2011. I had found a relatively inexpensive ($1100) DTV modulator from R. L. Drake, which implements the USA CATV 64-QAM and 256-QAM modulation formats.[2]

In the autumn of 2011, several other Boulder area hams and I conducted field trials comparing the propagation characteristics of analog VUSB-TV, FM-TV, digital CATV 64-QAM, and DVB-S (satellite standard) systems. We discovered many issues with those DTV systems, which made them unsuitable for our demanding ARES operations.

We got very similar performance from the CATV 64-QAM and the DVB-S. Some of the key drawbacks to CATV 64-QAM were the poor receiver sensitivity (-78 dB), and intolerance of multipath propagation. In many situations, even with true line-of-sight between two Yagi antennas, the receiver would not decode CATV 64-QAM signals due to multipath.

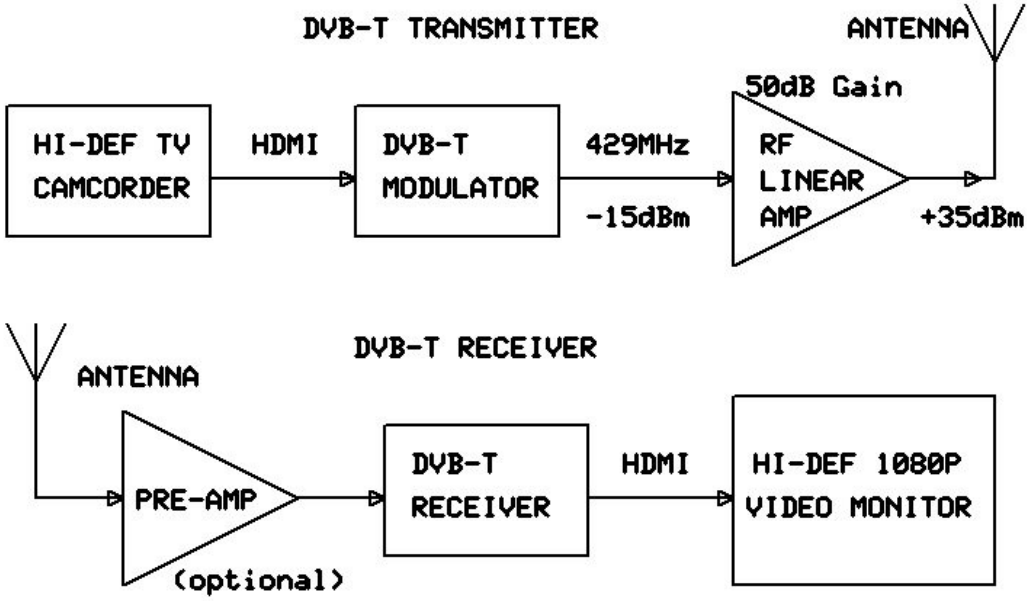


Figure 1 - Block diagram of the DVB-T TV system.

The DTV-T Solution

This past spring, I became aware of a new low-cost solution to digital television. The Spring 2014 issue of Amateur Television Quarterly had several articles about hams' great experiences using new DTV equipment from Hi-Des Technologies of Taiwan.[3]

They offered for sale DTV modulators and receivers that used the European broadcast DTV-T standard. I immediately ordered their model HV-100EH modulator ($560) and model HV-110 receiver ($169).

We use the European system instead of the USA ATSC 8-VSB broadcast standard because of the cost and equipment size. I have never found any 8-VSB modulators available at a reasonable cost that hams could afford, nor in a small size suitable for portable ARES operations.

Figure 2 - BCARES crew (Dave Sharp, KIØHG, and David Robinson, WØDRR) with TV camera and portable DVB-T TV transmitter at a Colorado University football game.

The HV-100EH modulator is fully synthesized and covers from 50 to 950 MHz and 1200 to 1350 MHz, thus including the 70 cm, 33 cm, and 23 cm amateur bands where video is permitted by the FCC. It accepts either standard definition (480i) composite, or high definition (up to 1080p) HDMI video inputs.

It encodes the video using either MPEG2 or H.264. Both the operating frequency and bandwidth are programmable. The bandwidth can be set from 2MHz to 8MHz in 1MHz steps (6MHz is the US broadcast standard).

At the 2MHz bandwidth, the modulator is capable of transmitting only standard definition video. You can select either QPSK, 16-QAM, or 64-QAM modulation format.

Programming requires an external PC computer and a USB cable. After programming, the computer may be detached from the modulator. The modulator puts out only -3 dBm RF power and is adjustable downward in 1 dB steps. An RF power amplifier is needed to supply reasonable power levels to an antenna. The RF power amplifier must be very linear to avoid distorting the digital signal and creating unacceptable out of channel emissions.

The HV-110 receiver is likewise fully synthesized and covers from 170 to 950MHz. The receive frequency and bandwidth are programmable via the supplied remote control. It provides both composite (standard definition only) and HDMI (up to 1080p) video outputs.

TV Receiver Sensitivity

We measured the receiver sensitivity for 6MHz wide DVB-T channels as -97dBm for QPSK, -92 dBm for 16-QAM, and -82dBm for 64-QAM. Because most of our BCARES operations used low-powered transmitters, we chose QPSK for its superior receiver sensitivity. The QAM modulations allow higher data rates, but we found that was important only for scenes that contained a lot of really fast motion, such as car races and sports. We found very acceptable high definition 1080p performance with normal scenes using QPSK. DVB-T QPSK is 19dB (3 S units) more sensitive than US CATV 64-QAM signaling. Adding an optional low noise figure pre-amp in front of the Hi-Des Technologies receiver enhanced the QPSK sensitivity still further to -100dBm. By comparison, a perfect P5 picture (40dB SNR) using analog VUSB-TV signals requires approximately -60dBm RF input.

Field Trials

We ran an exhaustive set of field trials this past summer to determine how well the new 70cm DVB-T system performs compared to 70 cm analog VUSB-TV. Our 70cm propagation tests used the system of Figure 1 carried in the simple backpack portable arrangement (Figure 2). We compared a 1 W VUSB-TV transmitter with a DVB-T transmitter, which had selectable power levels of 300mW, 1W, and 3W (+35dBm).

Figure 3 - Complete DVB-T TV transmitter system includes a (left) Hi-Des modulator, (right) 70 centimeter, 300 mW / 1 W / 3 W linear amplifier, and (center) high definition camcorder.

Figure 3 shows the complete 3W, 70cm, DVB-T transmitter and camera.

The first propagation tests simulated a typical SWAT callout, where cameras were to be deployed in a residential neighborhood. In other tests we carried transmitters around, outside, and inside large buildings in an industrial environment. The final acid test involved our BCARES operations at a University of Colorado football game. We deployed roving camera crews all over the stadium, surrounding buildings, and parking lots. Figure 4 depicts a comparison of received digital and analog pictures.

For the Colorado University football game test, we received perfect pictures using 300 mW most of the time. In some locations where previously we could never before receive 1W analog signal, now either the 1W or 3W DVB-T signals got through. The DVB-T system worked far better than the old analog NTSC system.

Conclusions

We learned that if you can receive a P2 quality analog NTSC picture, in all likelihood you will receive a P5 DVB-T picture. A P3 analog signal guarantees a P5 DVB-T picture. A 1W 70cm transmitter with antennas 5 feet above ground will cover a 450-yard radius, will provide P5 digital TV, or P3 or better analog picture, in a suburban service area. Raising one of the antennas to 20 feet increases that coverage to a 900-yard radius.

Multipath ghosting, almost always present on the analog pictures, is completely absent from the DVB-T images, resulting in an always perfect P5 picture. Mobile operation always resulted in 'mobile flutter' on the analog picture, even in strong signal areas. DVB-T mobile reception tests at speeds up to 65 mph always resulted in perfect P5 pictures with no breakups.

Figure 4 — Inside the Colorado University police command post. Mark Huff, KBØLRS, at the BCARES TV net control position, monitors live (left) digital DVB-T and (right) analog images.

Very long distance propagation is possible with low power DVB-T signals when a clear line-of-sight path is available. With DVB-T signaling we provide public safety officials with extremely high quality, high-definition (1080p) images.

Notes

[1] *www.arrl.org/ares*

[2] J. Andrews, KH6HTV, 'Modern ATV System Design,' QST, Feb 2013, p 46.

[3] *www.hides.com.tw*

All photos by the author.

Radiorama issue 50 is 112 pages and is downloadable free by clicking on this link:- *http://www.air-radio.it/*

Radiorama is a publication dedicated to the spread of radio listeners, national and international, to the world of radio in its broadest term, also acting as the official organ of RIA; It is made exclusively with the selfless contribution of Members of the Association, according to some guidelines present within the COLLABORATE that facilitate the edition. Over the years Radiorama has achieved success among the most important publishing companies in the sector, appreciated and followed even outside the Association and abroad.

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/

Christmas Shoot Revisited

By Trevor G8CJS

CQ-DATV 30 and its Christmas time, CQ-DATV 1 actually came out on February 2013, but I wrote the article, "Shooting your own video" the week before Christmas with advice given to my neighbour on how to film his son Joe opening his presents on Christmas morning, he was two and now is four and growing up fast.

I thought CQ-DATV 30 would make an ideal opportunity to revise the advice given in issue 1 and this time to get it out before Christmas.

My own kit has changed and this year I will be filming my own grandchildren's present opening ceremony using my Samsung NX500, but the Canon S95 still works and out performs the family camcorder, so the advice from CQ-DATV1 still holds up and bridge cameras (stills cameras, that also film in movie mode) are still my favourite and represent good value for money.

This year will be my first H265 shoot so it will be good test of the transcoding and use of an EDL to process a cutting copy and finally a full resolution render as described in CQ-DATV 29

Back in CQ-DATV 1 I recommended having the lens on its widest setting and using a good stable tripod so that you don't spend all of the time holding the camera, that advice still holds, but keep the tripod low, eye level is more attractive than the top of head shots, but beware of obstructions, which are much more prevalent at this level.

Start with a full charged battery and plenty of room on the memory card, it's a good idea to dry run the event and find out how long a battery will last and how much memory the shoot will consume (no you don't need to open the presents).

If you are using the sound on the camera remember the person holding it or persons near to it will be very dominant, so keep quiet.

I also talked about mixed colour temperature lighting, assuming your subjects have delayed opening presents until the day light is coming through the window, if not you might be shooting fully under artificial light and the camera will need colour balancing accordingly.

Other advice was do not shoot the whole scene from a single camera position as it starts to look like CCTV, but a locked off sequence of and adult assembling one of the more complex presents, that can be given the time lapse treatment in post production, always adds to the event.

Facial expression are always a must, don't just rely on the camera locked off on a tripod, try getting those golden moments hand held when they present themselves. Remember looking room when framing is important if the subject is not looking into the camera, to offset them in the frame so they look into the frame

If a bike is involved or pedal car when you have filmed its first outing try to recreated some of the passage with the camera in a position that will deliver POV shots (Point Of View) they really do add to the first bike ride, so think of a camera mount in advance of the event so these can easily be replicated after the shoot. Filming them on different day rarely works in the UK as the weather will almost certainly be different.

Last of all cover yourself if you have two camera's use them both, perhaps one on a remote tripod and the other hand-held, preferably both with the same look resolution and colour balance wise so they can be cut between in post production.

It's not all about the children, adult reactions make good cut-aways, they might be needed to cover re-positioning the tripod mounted camera.
(img,, alt: shoot3 src: ../Images/shoot3.png)

Titles might also need to be shot perhaps, the outside of the house.

Think it through, and try to build in some unexpected shots, particularly POV shots

I left you with some long expired links, so let refresh that with

http://www.wondershare.net/ad/video-editor-win/filmora-bing.html?utm_source=bing&utm_medium=cpc&utm_campaign=VEWin_Search_pid(1107)_UK&utm_term=video%20edit%20softwares

A great demonstration of how to use the Wondershare editor and a look at some of its new features.

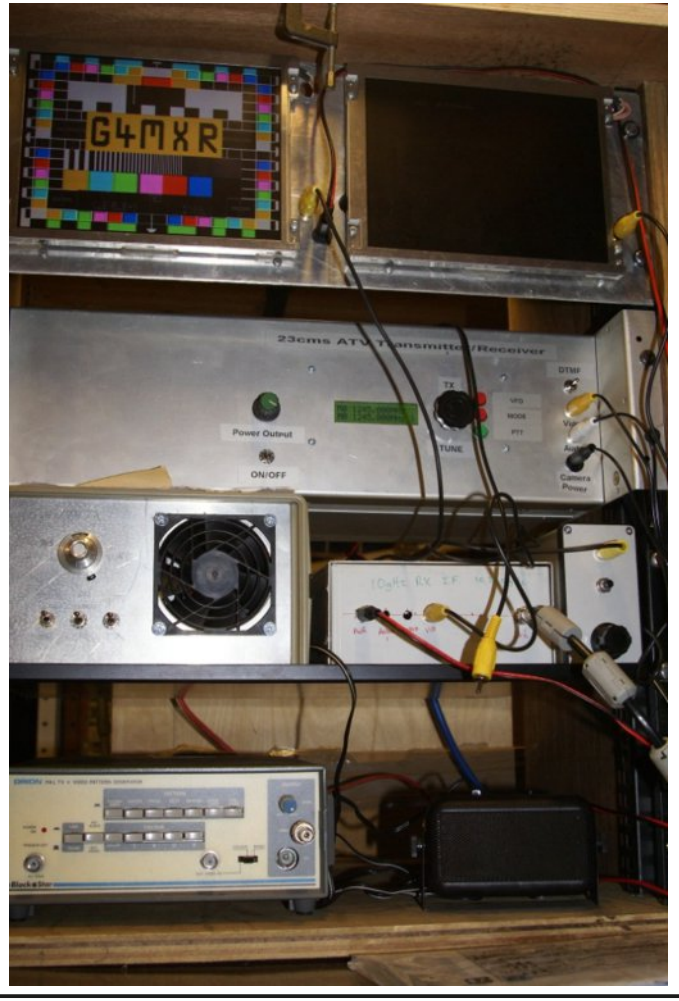
Good luck, but you won't need it.

Show and Tell!

Ted G4MXR

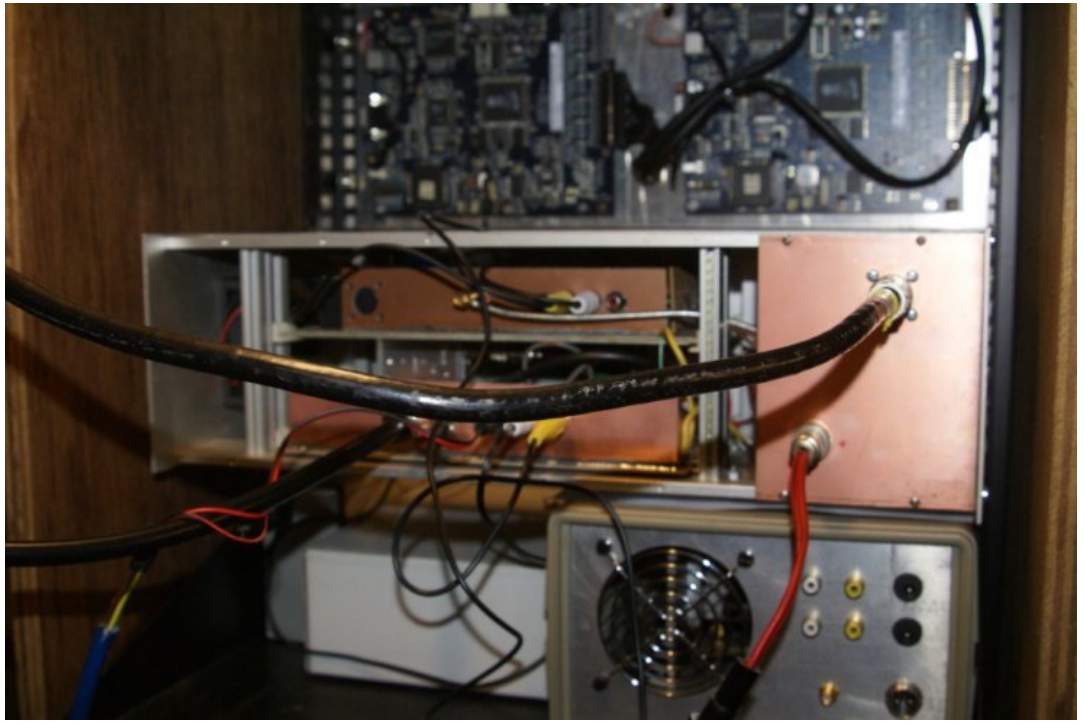
Or I'll show you mine if you show me yours...

Just another barmy idea I had one evening after a couple of glasses! I wondered if various stations showed each other (via CQ-DATV) what gear they were actually using, any misgivings of amateurs cobbling together a station that is fully functional but a mess should fade away! It doesn't have to be pretty to work well (of sorts!).



My main TV Station. Top left and right are two 8.5" HD Monitors that came from a very strange place - the Gents toilets in a Blackpool Nightclub! Previously used to run adverts at "eye level"...

Below that is my 23cms TX/RX. The cabinet was bought at a rally in Germany a few years ago for all of 3 Euros! G3ZGZ RX, G1MFG TX with a G3ZGZ pre- emphasis board and a simple RA18H1213G MOSFET module mounted on a PC MPU heatsink and cooling fan; power control brought out to a front panel control instead of the on-board pot. G6ALU (modified) controller board. Top right, you may just be able to see a switch marked "DTMF"; this provides the correctly sequenced tones required to switch on (and off) the 10GHz GB3FY TV Repeater using the 23cms "Portal". Works great! 3rd shelf down, L – R: 3cms tunable TX (G3RFL design using a YIG) with 3W amplifier; still being finished but fully working. Next is my 3cm RX, another G3ZGZ unit with a 9MHz LO LNB mounted virtually at the top of my 28 foot mast; just below a 35ele Tonna for 23cms. Stood on its edge is the TCG – a G3RFL design and programmed board. Bottom shelf has an Orion PAL TV and Video Pattern Generator sitting beside a bhi Noise Eliminating Speaker for 23cms and 3cms audio – another ongoing project still to be integrated!



A rare view of the back of the ATV Rack – only taken so I know how to reconnect everything if I had to take it apart for some reason! Twin antenna feeds (cheaper and easier than expensive masthead relays) with the RX down-lead coming

from the antenna via an F1JGP design pre-amp that is powered via a separate power lead coming from the RX which is powered "off" and bypassed during TX. I bought the PCB from F1JGP a while back from his website (hope you can read French!) and built the circuit up and boxed it in a standard tin-plate box before mummifying it in a waterproof diecast box. One decent high power coax relay switches the antenna between TX and RX and a further smaller relay applies a 50 Ohm dummy load to the pre-amp input during TX to protect the front end from both higher powers and poor relay isolation at 23cms.

Cameras...

Nothing special and clamped to the top of the Rack...

A £25 special off e-bay is on the right which has good video and a built-in mic that is terrible!

An ex CCTV Vista camera on the left which also has a terrible built-in mic (dreadful in fact!) with a passable picture given that it has had power permanently applied for a few years by the previous owner; you guessed it, another night club!

Certainly not perfect but OK for outdoor use when /P as it is reasonably waterproof in a light shower.

The main "Operating Position" in the shack/workshop. Top to bottom and left to right: Gould OS3000A Oscilloscope, HP8570A Spectrum Analyser, Yaesu G-450C Rotator Control Box, Icom IC-R7100, 100W continuous dummy load; good to 2.5GHz, WX Satellite RX, Yaesu FT-897, base mic and my trusted Icom IC-910 (tuned to 144.750MHz for talk-back of course!).

That's about it for TV! I have a Power Amp for 23cms based on 2 x XRF286s built, boxed, tested and working but currently rebuilding the PSU with a meatier transformer (thanks Dave G3ZGZ) which will give me 150W out for 10W in. Should give me everything I need for a while at least!

Cheers all! Get assembling your station out of whatever you have and see/hear you on the air! **Ted G4MXR**

The good old days?

A blast from the past, this picture was sent in by Rudi Pavic S58RU one of our Slovenian readers and shows three camera tubes.

Far Left 4 1/2" image Orthicon tube, middle 3" image Orthicon tube, far right is a vidicon tube

Interesting to remember that these tubes produced only black and white pictures.

This technology still exists today, but they are collector's items and are no longer in service (unless you know otherwise)

This camera is a Marconi MK III Image Orthicon camera that became famous for its focus handle which was often likened to a beer pump.

Home-brew

by Rudi S58RU and Mauro IV3WSJ

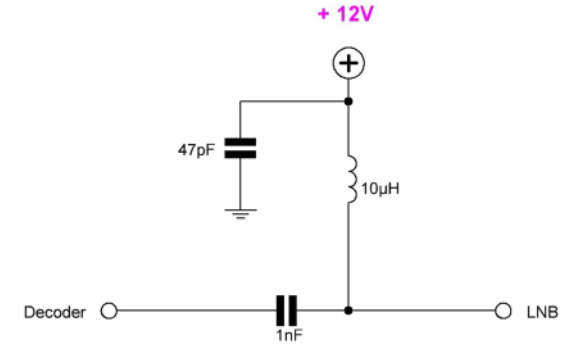
In CQ-DATV 29 we introduced the DATV repeater, S55TVJ ATV. In order to receive 10GHz ATV DVB-T you need a need: DVB-T receiver. DVB-T Receivers are not designed to supply the phantom power required by LNB's, so one of the problems was to external add the power.

Not a major problem and Dolf S52DS came up with a choice of two commercial units that could be inserted in line to add this power FRACARRO model: SPS 1750 and model: MPCCF 236,508th at a cost of 13 euro's.

http://www.ebay.it/itm/Fracarro-mpccf-inseritore-tensione-fracarro-/111268545869

http://www.fracarro.com/index.php/en/dj-list/item/16-multiswitches/314-sps1750

Once you have a commercial solution that works, your thoughts turn to home engineering and this was the home-brew circuit we can up with



This is the inside of the repeater, we only showed the exterior in the last issue. As you will gather phantom powering an LNB to feed a DVB-T receiver was the least of our problems.

Difference between DVB-T, DVB-S and DVB-C

DVB-T

- It is the short form of Digital Video Broadcasting-terresial.
- Transmission modulation scheme: Coded OFDM
- Transmits compressed audio and video in MPEG format.
- Data modulation schemes used: QPSK,16QAM,64QAM
- Employs external encoder (RS encoder of (204,188) and internal encoder (convolutional coder).
- Uses internal and external interleaver.
- DVB-T uses VHF and UHF frequency channels mainly with bandwidth of 6MHz, 7MHz and 8MHz.

DVB-S

- It is the short form of Digital Video Broadcasting-Satellite.
- Uses MPEG-2 for digital compression and decompression.
- Uses C band as well as Ku band frequencies.
- Digital DBS receiver employs FEC techniques for error correction.
- special satellites are launched for the purpose.
- Uses both LHCP and RHCP polarization types for transmission
- DVB-S mostly requires smaller antenna in size.

DVB-C

- It is the short form of Digital Video Broadcasting-Cable.
- Uses MPEG-2 or MPEG-4 compression.
- Data modulation: 16 QAM or 256QAM
- Uses RS encoder as FEC.
- Interleaving module is used in the chain.
- Cable TV signal is carried using coaxial cable or fibre cable from cable service providers to the subscribers.
- DVB-C uses frequencies from 55.25 to 403.25MHz.

For those interested in DVB-T, Ken W6HHC has produced several 'DATVTalks'.

A compendium of all these talks can be downloaded, in all the usual formats, from the CQ-DATV ebooks page.

DVB-T2 HEVC at the door

By Klaus Welter, DH6MAV

Reprinted from TVA 178 by kind permission.

The highly efficient DVB-T2 system for Germany will be different from existing DVB-T2 broadcasts in other European countries. In this magazine we already pointed to the new compression standard HEVC, which is being tested with experimental DVB-T2 installations in Berlin, Munich and Cologne/Bonn. The Munich research institute IRT hosted a colloquium on first results in July 2015.

The new video codec MPEG-H Part 2 HEVC (H.265) "High Efficient Video Coding" is only part of some more advanced parameters in DVB-T2, which are causing the need for very new set-top boxes and internal TV receivers.

Thanks to HEVC not 4 Mbit/s, but only 2,5 Mbit/s per SD TV stream is used and so up to seven programs within one multiplex with 8 MHz rf bandwidth (22 Mbit/s) are distributed.

HD TV streams are peaking at 4 Mbit/s and filling one multiplex with up to five programs. ARD HD channels are distributed with 720p50 resolution like on TV satellite, but ZDF (Mainz) is testing 1080p50 (up-converted from 1080i50) as well as one of the "private" commercial stations which are scrambled (Conditional Access System).

With Ultra HD (4k) resolution only two programs would fit into one DVB-T2 multiplex, but in Germany no station wants that - only South Corea has terrestrial UHD broadcasts already.

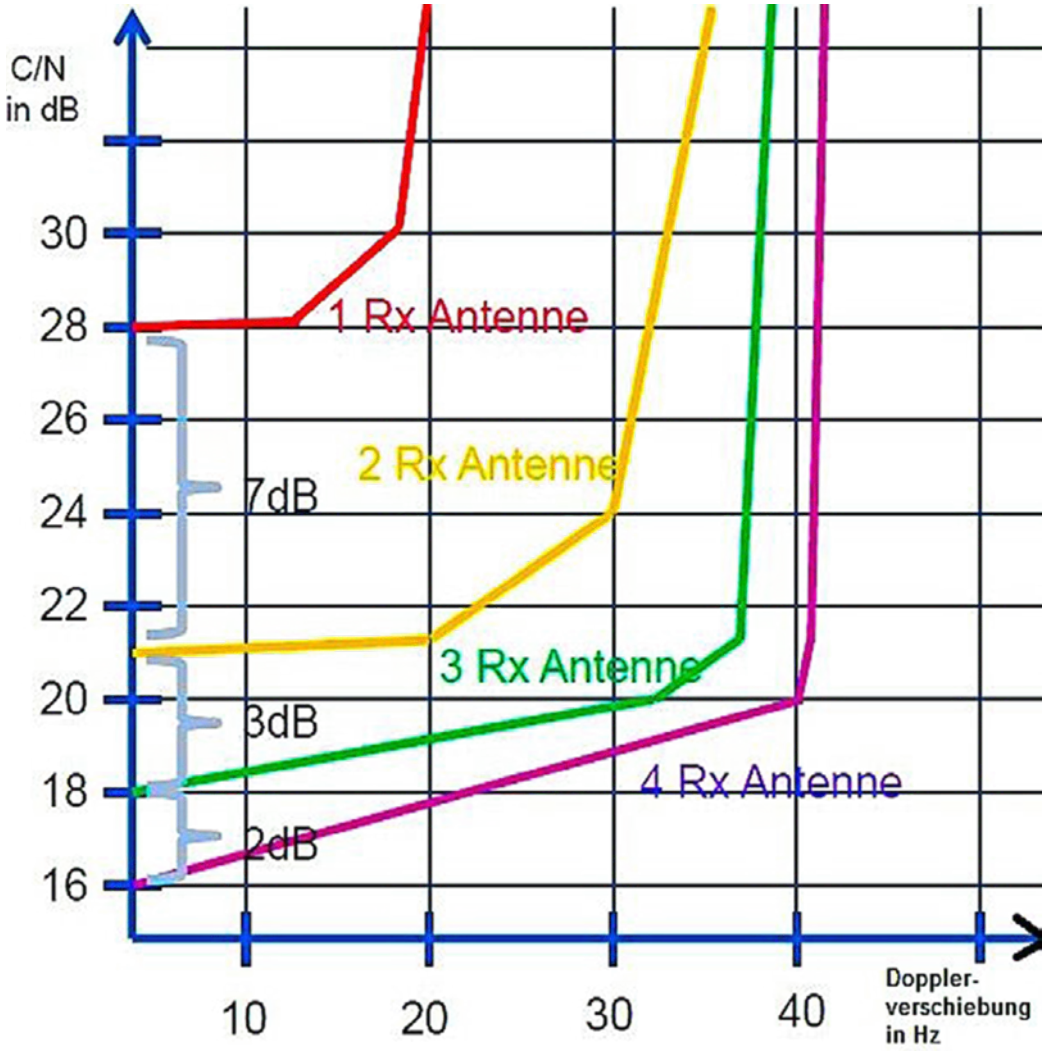
Like with Ultra HD test channels on TV satellites the terrestrial HD HEVC coding is reducing bitrates by using

Laboratory building a diversity test receiver. Two by two antenna inputs are wired.

I- and P-Frames with more motion vectors and different sizes of "Coding Tree Units". In the end the quality of HEVC video signals is clearly better than MPEG-2 or even MPEG-4, but this takes up more time in encoder and decoder. The delay in live broadcasts can reach up to seven seconds - soccer goal reports will be late against radio broadcasts...

The diagram on the next page shows a simulation in the laboratory on the impact of antenna diversity on the mobile len reception. Vertical applied carrier-noise distance (C / N, the carrier-to-noise ratio), horizontal frequency moderate Doppler shift (in Hz).

Example: With just one Rx arrival antenna reception works with only moderate travel speed up 18 Hz and a displacement minimum C / N ratio of 30 dB; the C / N may deteriorate to 28 dB at low speed tern.



By contrast, at 4 Rx antennas and high Vehicle speed speed with 40 Hz Doppler shift, the C / N ratio as well even drop to only 20 dB, as with increasing distance is to be expected from the transmitter site. Antenna diversity is also the standing (Zuhause-) receiving benefits. In the laboratory was a gain of 12dB with four Rx antennas instead of just having an identify.

Currently under discussion were previously two test modes. With 3-fold diversity and a DVB-T2 for parameterization 23.8Mbit / s was found at a maximum speed of 150km / h, a good transmission quality. Note: An ICE travels fast ... - but still have the Discussions underway.

Schedules for the all Germany distribution of DVB-T2 HD are beginning in 2016 with "pilot transmissions" at several big cities and areas, until 2019 most regions are supplied and all DVB-T transmissions stopped. This in parallel with clearance of the 700 MHz band (UHF channel 49-60), channels 61-69 were vacated in 2010 already. What about mobile phone companies having bought their new frequencies for many millions of Euros, when neighbouring countries like Austria and Swiss are furthermore broadcasting TV there from the Alp mountains? One of the colloquium lecturers pointed only to the "BNetzA", the national German telecom authority.

IRT is testing various parameters at the Munich DVB-T2 installation, in contrast to Berlin and Cologne/Bonn there are three synchronised transmitters. Mobil TV reception in public transport and mobile vehicles is tested using antenna diversity, Parrot and Hirschmann are providing prototype receivers for some BMW, Audi and Volvo cars. Test results showed good decoding success up to 180 km/h - a critical value is Doppler shift requiring a guard interval of 112 microseconds with 16k FFT.

The transmitter data header includes signalisation for receivers and demodulators, for instance the channel of a neighbouring synchronised network, so the flawless hand-over to an identical program in case of low C/N in a mobile receiver is possible. For television engineers the location identifier enables to direct the domestic roof aerial to the preferred station - this was not available with DVB-T. Klaus, DL4KCK, reports that the Cologne DVB-T2 test transmitter is showing the exact geographic latitude and longitude in it's "transmitter identification information" (decoded by the German PC program Transedit).

A major improvement with DVB-T2 HEVC is the separation from interlaced scanning - if the source video is interlaced (most HD productions worldwide are in 1080i still), it gets converted to progressive frames before transmitting. By the way: latest Ultra HD TVs have HEVC decoders included and are mostly able to receive the new generation of DVB-T2.

"DVB-T2 HEVC" is an unwieldy and to date in advertising unusable printout. To distinguish it from a DVB-T2 with MPEG-4 video encoding, as well as abroad often in use, it requires special labelling. The author would be in agreement DAB + (DAB with plus sign) but would prefer DVB written as T2 +. But this is far from agreed by the Broadcasters. It has, however, been used by the receiver-build industry. Certified devices for terrestrial HD reception, with HEVC signal encoding carry, the green logo DVB-T2 HD (with italic HD).

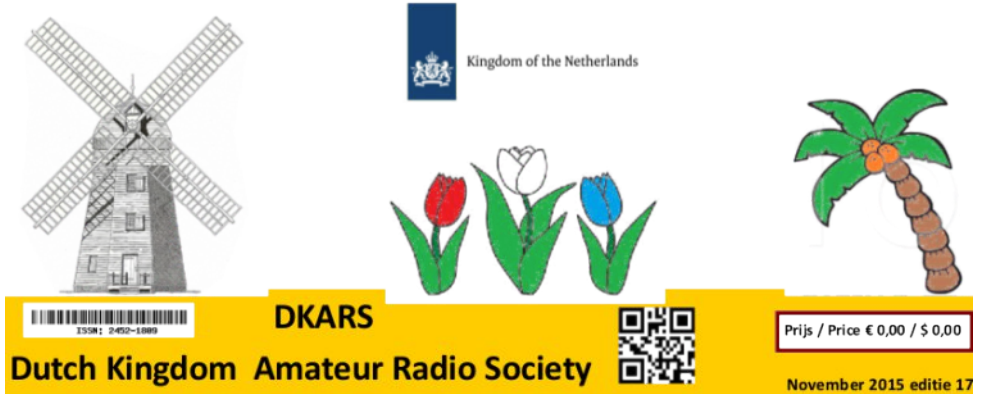
Many thanks to IRT personnel in Munich who redacted the original script just before IFA Berlin. They conduct research and development for ARD, ZDF, DRadio, ORF and SRG/SSR.

Translation Klaus, DL4KCK

DKARS MAGAZINE

3 oktober 2015:

DKARS voorzitter Eltje Veen, PA3CEE
Silent Key



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

Nothing Whatsoever to do with Television!

By Ted G4MXR

In the early sixties, my Father (the late GM0HNP) taught me everything about valves that you ever needed to know; no-one owned any of those very expensive three-legged fuses in those days, unless you were very wealthy! Most of the gear he had was ex-military from WW2 and their manuals were the basis of my education.

About a year ago, I bought a Bush VHF Type 64 Receiver from the local Auction House here in Cleveleys for all of £3! No-one else wanted it and as I had already checked inside to make sure it actually had "guts" and didn't smell of burning, I thought I would give it a go…

I plugged it in and switched on from a distance and it sprang to life! Marvellous! Panel Lights, Magic Eye tuning indicator, LW, MW, SW but no VHF. Quickly took the back off and checked for heater lights which were all lit but one was in a metal shield and it looked like a VHF Converter; I was correct but was a little dismayed to see what I found inside the can:

I remembered my lessons; CC meant dual triode and I knew I had some somewhere. ECC82s, ECC83s and lo and behold – a single ECC85!

Plugged it in, the heater lit and away it went on VHF.

So for a bit of memory (free), an old valve in a box (probably free) and a £3 investment at the local auction, I have a very nice wooden cased radio from 1958/59 that now sits here in the shack. It only tunes from 88-100MHz (as all the old ones did) but as I usually only listen to Radio 2 on 88.6MHz, who cares! And that great rich sound only available from valves.

I also remembered why I just loved fault diagnosis with kit like this – always obvious and 99.9% of the time a pretty obvious blown valve!

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