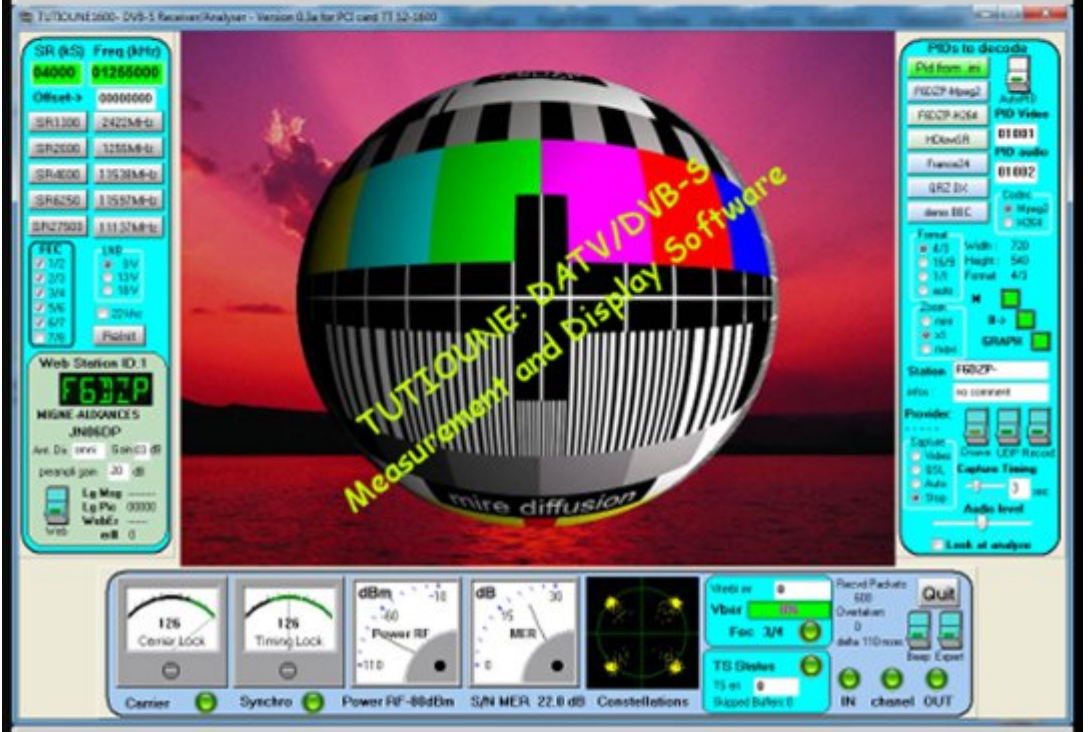
CQ-DATV

dotMOBI

Issue 11 - May 2014



http://cq-datv.mobi

In this issue

The team

- Ian Pawson - G8IQU
- Mike Berry - G1LWX
- John Hudson - G3RFL
- Ken Konechy - W6HHC
- Terry Mowles - VK5TM
- Trevor Brown - G8CJS
- Richard Carden - VK4XRL
- Klaus Kramer - DL4KCK
- John Lukey - VK2ZUH
- Jean Pierre - F6DZP
- Clive Reynolds G3GJA / G8EQZ
- Mike Stevens - G7GTN
- Paul Wade - W1GHZ

Gigaparts Ham Radio Day

March 29 was the Gigaparts Ham radio day and it was streamed live by Tom Medin W5KUB on his site http://tmedlin.com/mainpage.htm.

March 27 and Tom spent 10 hours checking out all his kit, (Like the truck Tom, editor)

March 28th was travel to Gigaparts Huntsville Alabama with

the dashboard mounted camera streaming all the way, despite some heavy rain.

Everything went well on the big day, lots of us got to see this event live, not sure if it was Toms streaming that attracted everyone or the prize of an icom IC-7100..but it was a memorable event. Thanks Tom, next time let us have some advanced notice so all the CQ-DATV readers can watch.

If you are having problems with the email links not opening in the PDF version and you are using Adobe Reader 10.xx, it is caused by that version starting up in protected mode.

Here is a link to a site that shows how to fix this the problem (tested here - works - Terry):

http://goo.gl/xwTCRO

If you have problems downloading CQ-DATV, then please let us know at faults@cq-datv.mobi

Great report just in from Phil on the Isle of Man (I.O.M), on Friday 11th April he received pictures from GB3FY using only a 14" hand held Dish

The pictures were P3 and his location was 54o13'50o98"n 4o28'10.28"w elevation 372m. This was a portable trip purely to establish if GB3FY could be received on the I.O.M. Phil now intends to mount the dish on the roof of his van and see if he can capture pictures of someone working through GB3FY

Phil has only 50mw of RF available on 10Ghz so it might need to be increased a little before we get to see Phil through GB3FY

Update:

Phil out portable on the I.O.M now getting the Repeater P5 and then DAVE TXed just 200m/W on a 17Db Horn to Phil where he got a P5 PICTURE so Dave G3ZGZ was really pleased and PHIL too..

This time PHIL was in his VAN. PHIL also took lots of PICTURES so these will follow soon, maybe even a Video.

The result of the cuts to the UK 13cm band is now available.

To be removed from the Amateur Radio Licence the bands 2350 to 2390 and 3410 to 3475 MHz. This statement provides 12 months' notice from the date of publication that the licence will be varied to remove these bands;

To be retained: amateur access to the bands 2310 to 2350; 2390 to 2400 and 3400 to 3410 MHz and put in place a procedure to enable us to remove these frequencies quickly should harmful interference arise in the future (to other user's in the released and adjacent bands).

We are making available 2300 to 2302 MHz for amateurs to use. This requires a Notice of Variation (NoV) to the standard Amateur Radio Licence.

The full document is available at http://goo.gl/fGMqX2

HamTV on ISS

The onboard HamTV of the ISS has now been comissioned. The two following links are the commissioning video's, one in 16:9 and the 4:3. Koichi Wakata was in front of the camera doing the commissioning.
https://www.youtube.com/watch?v=EpFzbKvK1pk&feature=youtu.be

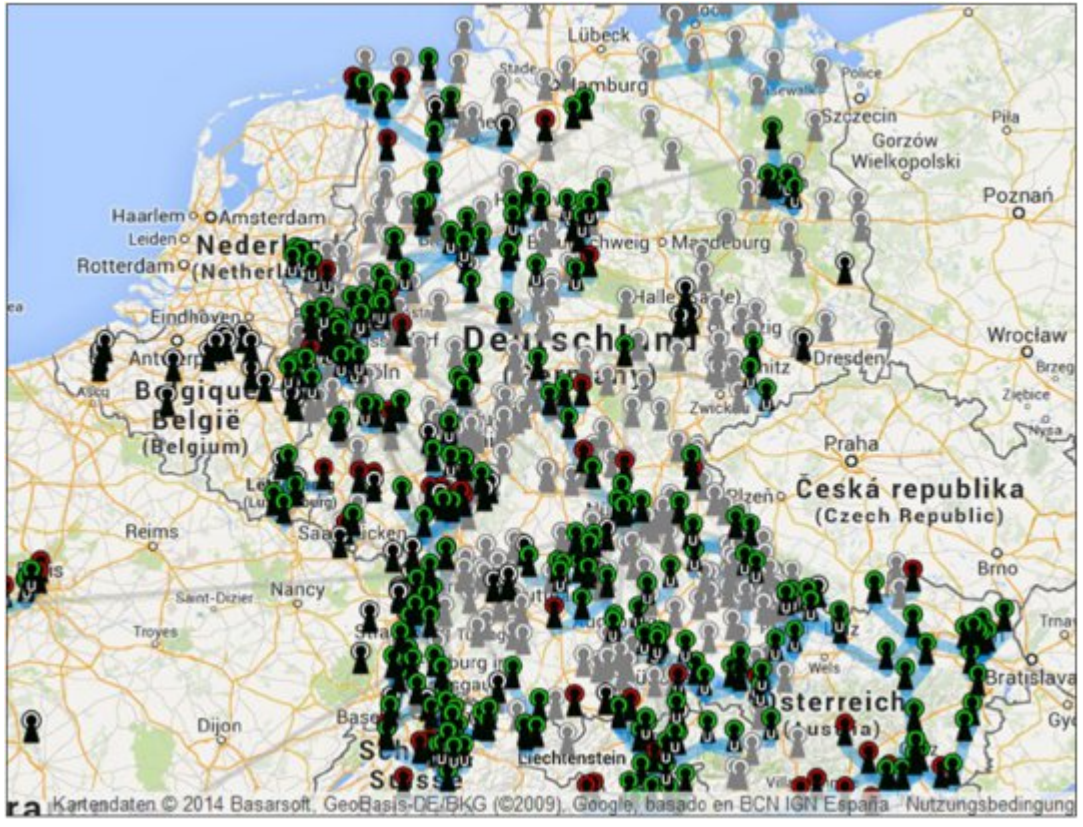
https://www.youtube.com/watch?v=61GTGTOa8AE

There are no planned operational dates yet.
Keep up to date with the ISS HamTV happenings here:

http://www.ariss.org/hamtv-on-the-iss.html

Online ATV streams and HAMNET (Frank, DL3DCW)

After eight years of supplying a free online streaming server with around fifteen german ATV repeater output streams to the ATV community Oliver, DO1OLI, handed over this task to Joerg, DG0CCO, sysop at ATV repeater Tangermuende (Elbe river), DB0TGM. The web address is the same as before http://www.atv-stream.de/ now supervised by Frank, DL3DCW, at DB0TV (near Wuppertal). Attention: stream links with "call.ampr.org" or "44.168..." in the browser adress only connect inside the HAMNET!



This modern amateur radio infrastructure called HAMNET is a fast successor of the pre-internet Packet Radio network, providing rf links and user ports for data, DigiVoice and DATV on 13 and 6 cm bands using WiFi devices and aerials. On some links the TCP/IP data rate is 40 Mbit/s exceeding any normal DSL internet connection! Started in Austria about ten years ago the HAMNET now has chunks or chains of data stations with rf connections and VPN tunnel interconnections via Internet between them all over central Europe.

Many ATV repeaters are providing HAMNET user inputs additionally as well as Skype inputs. Newer developments try to realize ATV stream servers on Raspberry Pi mini computers and "Multicast" outputs.

translation by Klaus, DL4KCK
www.agaf.de

NASA to Transmit Video via Laser

A team working at NASA's Jet Propulsion Laboratory are preparing to send video via laser beam back to Earth. It is part of the OPALS experiment:

http://phaeton.jpl.nasa.gov/external/projects/optical.cfm

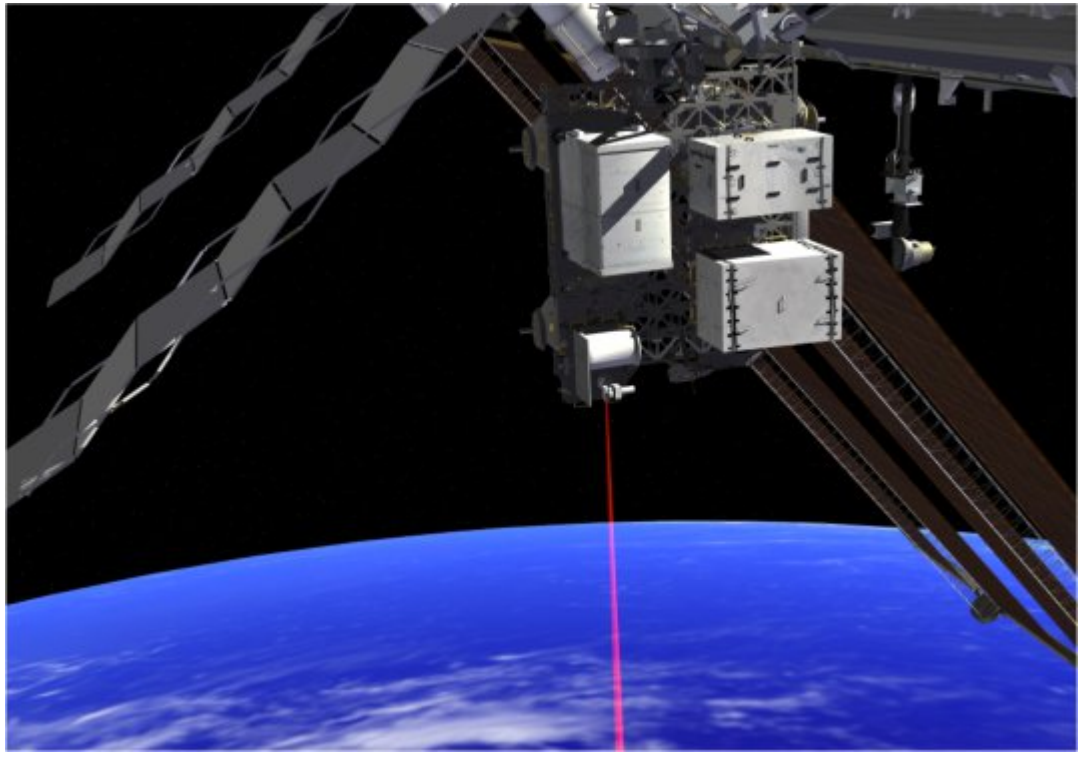
As scientific equipment becomes more complex, with high data output and the need for high definition pictures and video, the current RF systems run into limitations. It is hoped that laser transmission will acheive transfer rates and higher bandwith far in advance of what RF systems can provide.

Communications rates from deep space missions are currently 200 to 400 kilobits per second. The first OPALS tests are expected to demonstrate 50 megabits per second transfer rates with future deep space optical communication systems expected to provide over one gigabits per second.

The system uses primarily commercial off-the-shelf hardware and encloses the electronics in a pressurized container.

OPALS will be conducting transmission tests for a period of nearly three months. The space station will be tracked by a ground based telescope firing a laser at the OPALS module. The module should respond by locking to that beam and firing an approximately 100 second burst of modulated laser, encoded with a video stream.

From -
http://www.jpl.nasa.gov/news/news.php?release=2014-111



Picture courtesy NASA/JPL-Caltech.

Using DATV-Express boards with GNURadio

Two hams are using the DATV-Express IQ-modulator board to transmit different modulations by using GNURadio software. Alex OZ9AEC has created a GNURADIO "sink" module which allows GNURADIO to be used with DATV-Express. [NOTE – think of "sink" as the opposite of "source".] Rob MØDTS did some work on transmitting SSB.

Rob reported on the BATC Forum that he was "…working with GNURadio and the DATV-Express to make an SSB transmitter. You could also use an RTL-SDR dongle as the RX and a changeover relay to make a full SSB transceiver.

Audio is taken in from the soundcard and converted to a complex IQ signal, the upper sideband of this complex signal is filtered.

This is then goes into a very crude AGC circuit and then into a resampler to take it upto 2048ksymb/s complex signal for the DATV Express output."

Rob used the newer version of GNURadio, so making the GNURadio file available will be tricky as most people are still using the older version so it would not work.

The GNURadio DATV-Express sink module efforts for both OZ9AEC and MØDTS are at:

https://github.com/csete/gr-datvexpress

As Charles G4GUO pointed out to me… "There are already a load of applications available for GNURadio and now they can be used for the DATV-Express board using this sink module".

73…de Ken W6HHC

Whenever I email Ian Pawson or put CQ-DATV copy into the drop box I normally get either an email reply or my computer acknowledges that someone has removed or changed the dropbox files. So on Monday 14 April I started to get that panic feeling when this stopped happening. By Tuesday I was frantically leaving messages on Ian's phones and by Wednesday I had left a message on his mobile phone.
For those of you that do not know Ian other than through the publications he has produced CQ-TV in the past and started CQ-DATV so he could promote ATV via eBook. Ian lives alone and quite recently we went through this same emergency when he fell off the steps while cutting his hedge and had to produce at least one of our magazines one handed the other one still has metal plates in it.
Then I received an email from a lady I have never met, it popped up in my in tray and I could just read the subject Ian Pawson, you can stamp around all you want on the computer keyboard, but you cannot open and read emails until the download is complete, after what seemed like an age I could open the email and read that Ian was alive and well. He had collapsed in his house the previous day and although on the floor managed to summon the Paramedics. He is alive and well and after an operation and a spell on ITU, at the time of writing he has been transferred to a non ITU ward.
I have spoken to the lady who sent me the email (Beryl) and also had one phone call from Ian from his hospital bed, he has asked me to convey to all CQ-DATV readers his apologies for a late edition of CQ-DATV..Ok Ian on this occasion we will accept your excuse..but do not let it happen again. I have already confiscated your hedge cutter, and can see further measures are required
Can I take this opportunity to thank Terry VK5TM for stepping up to the editors chair I know when he agreed to compile the PDF version of CQ-DATV last month he was never expecting such a rapid promotion, can I also apologise to anyone that has sent in copy and it has not appeared here. Terry is working under difficult circumstances on the PDF version of CQ-DATV and we may have to go with a PDF only version of CQ-DATV 11 as Ian is the only person who can create the eBook version. Once again can I apologise for any delays and say we are at a loss without our leader and hopefully it won't happen again, and can I add my personal thanks to everyone that has supported CQ-DATV with copy. This is the widest read ATV magazine and all thanks to Ian the founder and everyone else who sends in copy.

Trevor Brown G8CJS
CQ-DATV Contributor

From the temporary stand-in Editor

In one of the news articles of this edition, many may just be finding out that yet another slice of the Amateur Radio frequency allocations has been removed from our use.

Why? Money. The big players in the radio frequency spectrum want MORE. Not just money, but also frequency allocations to help them in that pursuit. While we all know that more and more things are utilising some sort of wireless technology, how many see a lot of those things as just unnessary?

So what can we, as Amateur's, do about it? It would seem to be very little. Amateurs as a percentage of the population are a very insignificant group and nobody (that yield's the axe) listens to insignifcant parts of the population.

Yes, almost every country has a national body that represents the Amateur Radio operator/hobbyist, but what are they doing to stop this rot? At the rate our frequency allocations are disappearing, not enough. And this is not just a UK issue, it is happening worldwide.

There is a saying that one vote can make a difference. Call me cynical, but can anybody recall any situation where this has actually happened? I can't, at least not in anything that has been worthwhile or of benefit to a group such as Amateur Radio.

Many of you will get angry over this situation, many will sit there, resigned to the fact that this has happened. Most will do absolutely nothing about it. Well, it is time to get off your collective backsides and make it known that the Amateur Radio fraternity is not going to stand for this continual erroding of our slice of the Radio Spectrum. If nothing is done, Amateur Radio could well end up with almost no Radio Spectrum at all.

The anger needs to be channelled. Writing hateful, abusive letters, emails or blogs etc is NOT the way to do it. Every Amateur needs to make it known to whoever will listen, that this is a hobby and that this has produced many significant advances in technology over many years. That this is a leisure pursuit that we enjoy, just as much as motor racing, football, cricket and a thousand other things are enjoyed by others.

Another saying that should be familiar is "the squeaky wheel gets the oil". Be that squeaky wheel and make as much noise as you can, but do it politely. Push your national Amateur Radio bodies harder and don't let up on the pressure.

While we are losing some frequency allocations, others are being vacated by commercial enterprises as no longer being useful for their needs. Should we be saying, OK, you can have that part of the Radio Spectrum, but give us back an allocation somewhere else in return. It was not that long ago, relatively speaking, that frequencies up to 30 MHz were considered to be useless for anything. Then it was frequencies in the VHF region that were useless. Look where we are now, frequencies all the way to light and beyond are useful for something and it was Amateur Radio that pushed those frontiers further and further out.

' Illegitimi nil carborundum'

Terry Mowles VK5TM

DATV-Express Project. March update

In March, BATC announced that fully-assembled DATV-Express boards can also be ordered through the BATC Shop under the "Hardware and Kits" category. See: viewtopic.php?t=3773 With BATC working in partnership with the DATV-Express team, BATC is stocking (ex-stock) the PCBA to enable members in the UK and Europe to purchase it without the hassle of exchange rates / customs duty / VAT when importing it from the USA. The link to the BATC Shop listings can be found at http://www.batc.org.uk/ The BATC price is directly comparable to the US price from the DATV-Express website after you have added VAT and customs/admin charges. Currently, Art WA8RMC is shipping more DATV-Express boards to the BATC Shop, almost every week.

Charles G4GUO has been now working full-time on allowing the Raspberry-Pi processor to drive the DATV-Express board in DVB-S protocol (instead of using a full-blown Ubuntu PC). This is not a quick project. Charles sees at least four "development phases" to finishing our Raspberry-Pi work.

- Development-Phase01 - move all DVB-S encoding into FPGA and talk to board with ubuntu-PC using MPEG-2

- Development-Phase02 - integrate ubuntu code used in phase01 into Raspberry and use MPEG-4 payload with PI-camera and receiving on a DVB-S2 STB (see Fig01)

- Development-Phase03 - use Hauppauge USB encoder to produce true MPEG-2 with the DVB-S protocol (see fig02)

- Development-Phase04 - combines DVB-S dongle receiver with the Phase03 design to create a DVB-S transceiver that is Raspberry-Pi controlled

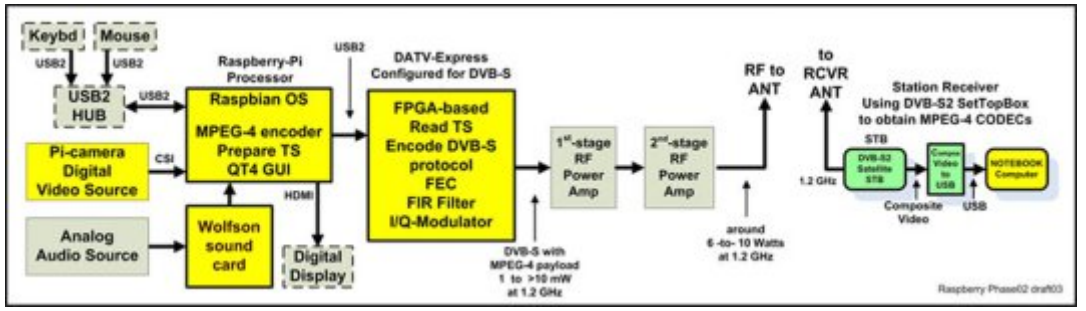


Figure 1 - Block diagram of an interim-development phase for Raspberry-Pi effort (called "Development-Phase02") using a MPEG-4 payload from PI-camera with DVB-S protocol. NOTE - a DVB-S2 STB is used to get access to MPEG-4 decoding CODECs

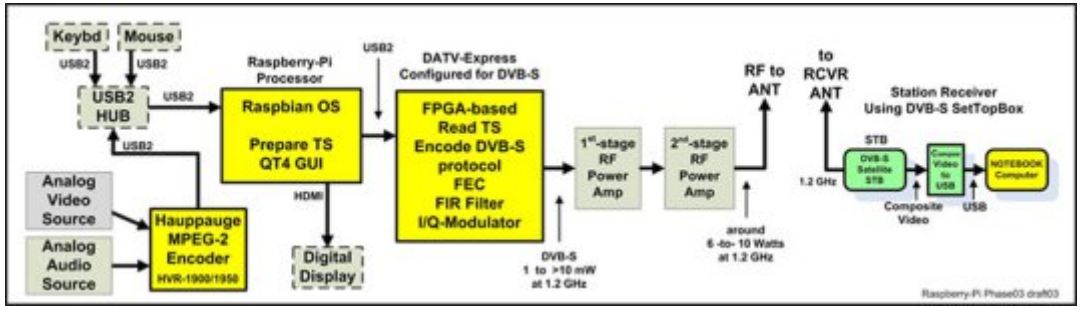


Figure 2 - Block diagram of "Development-phase03" for Raspberry-Pi using Hauppauge encoder to produce genuine DVB-S NOTE - Keyboard, mouse, hub, and display (in dashed lines) only needed to configure the transmitter.

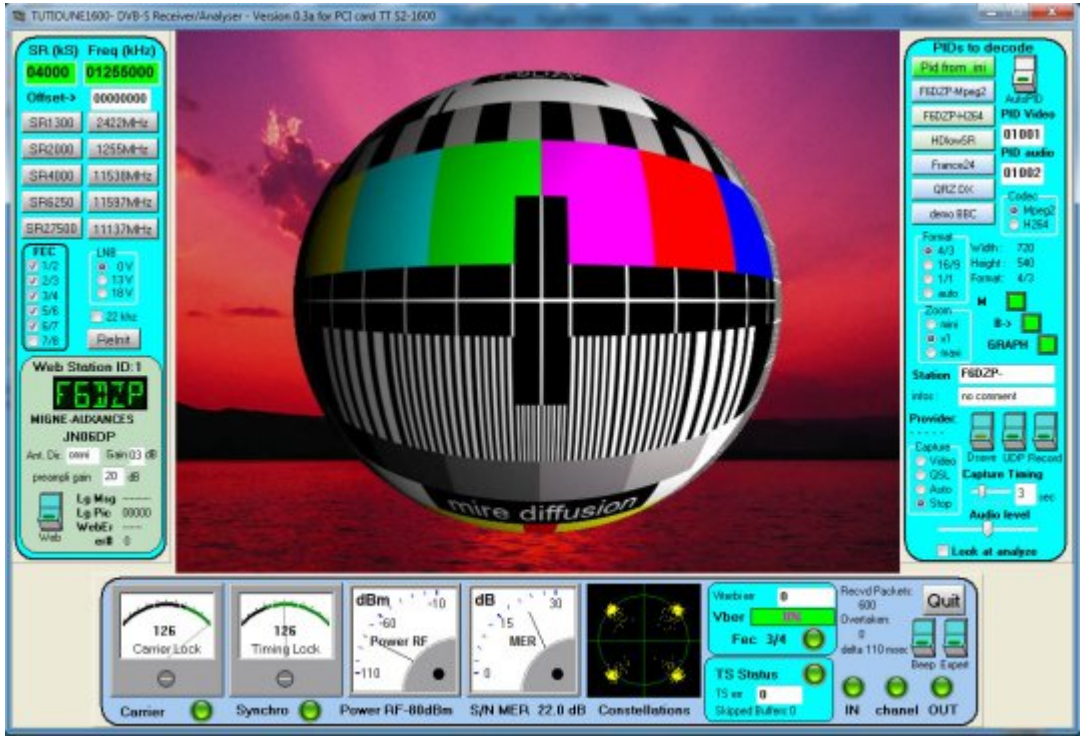
Charles has now completed "Development-Phase01" by moving all DVB-S encoding into the FPGA on the DATV-Express board and testing it with an ubuntu PC. Now G4GUO is in the middle of working on Raspberry "Development-Phase02". Charles G4GUO points out that there can be many ways to configure a Raspberry-Pi with the DATV-Express board, including using Ethernet or Wi-Fi to configure settings for transmitting.

"full speed ahead"....de Ken W6HHC

TUTIOUNE: DATV/DVB-S
Measurement & Display Software

By Jean Pierre F6DZP

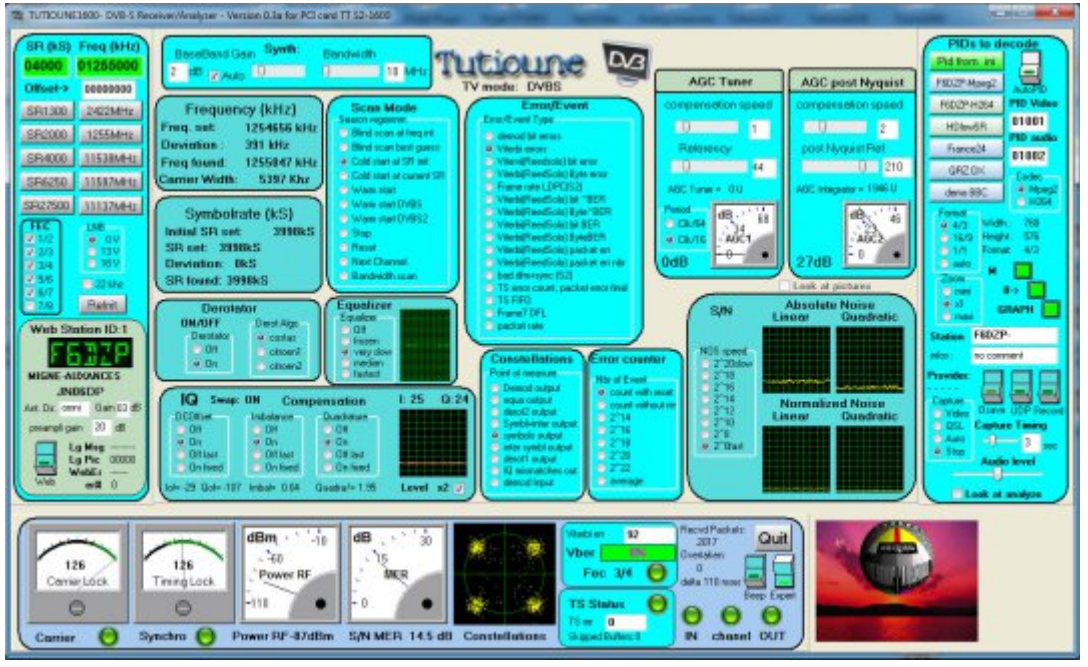
Tutioune is a new software utility that has been specially developed to provide radio amateurs and DVB technicians with a tool that allows Digital ATV (DVB-S) to be measured precisely. With Tutioune there is no more frustration at seeing only "level and "quality" information from standard satellite receivers; basic quality guidance that fails to satisfy technical users.



Tutioune 1600 - standard mode

Technical DVB-S users want to measure the received transmission characteristics exactly, so they can improve their systems and debug problems that may be encountered.

Digital transmissions are not really "all or nothing", in between there are many things that can happen; it's important to be able to observe and define the various stages.



Tutioune 1600 - expert mode

Tutioune is a software solution that can be used with a number of DVB-S PCI satellite receiver cards, such as the TechnoTrend TT-S2-3200 (€80 new and possibly less on eBay) or the best: TT S2-1600.

For the 2 families of card there are now two versions:
Tutioune1600 for TT S2-1600
you can find it here :
http://www.vivadatv.org/viewtopic.php?f=60&t=214

Tutioune3200 for TT S2-3200
you can find it here :
http://www.vivadatv.org/viewtopic.php?f=60&t=276

Quick user guide:

You can receive D-ATV just by clicking twice!

- choose symbolrate,

- choose frequency

Et voila, that's all

DVB receivers don't need anything else. Forward Error Correction (FEC) is automatically detected and PIDs don't matter for measurement. When displaying the received transmission, PIDs for video and audio are very often single values, so when we select "AutoPID", Tutioune automatically selects the first PID that it detects.

After measuring, if all is OK TS status LED is green.

We can distinguish 13 panels in Tutioune interface:

1) Name and zero-tuner gain and bandwidth Tuning.
2) Frequency tuning
3) Symbol Rate tuning
4) Tuner AGC tuning
5) Integrator AGC tuning
6) LNB voltage if required
7) Equalizer tuning (for coaxial compensation)
8) IQ offset and balance tuning
9) observation of RF , IQ, digital S/N MER, constellations plus informations about VBER, BER corrected by Viterbi, BER corrected by Reed Solomon
10) Big Green led "TS Status" to tell you when you can analyse, decode and see the Transport Stream
11)SymbolRate auto scan (when you are not sure)
12) Short cut memory buttons (top right) to choose your favourite symbol rate and frequency
13) When the big green LED "TS Status" is on, your tS stream is ready to be decoded or sent by uDP, recorded...

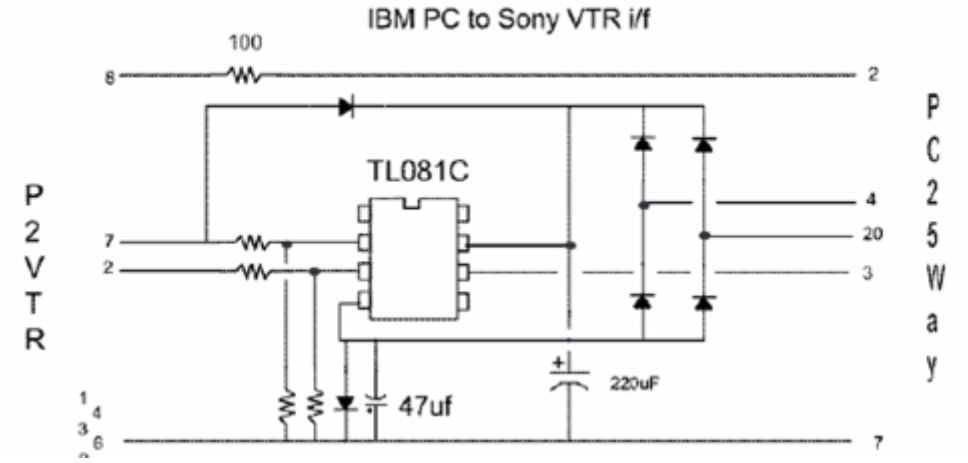
We can observe in real-time all the effects of moving antenna and changing transmitter power. With Tutioune you can provide a really useful signal report.

Remote Control of Sony Broadcast VT Machines

By Trevor Brown

For those of you that still dabble with Sony 1" and Beta SP machines, they have a 9 pin D socket for transport control and time code display. This uses RS 422 and was a common TV control standard when these machines were new.

This simple circuit converts RS 422 to RS 232 and requires no external power as its modest requirements are met by the signal controls in RS 232 (Unlike USB, RS 232 has no power). Modern PC's are now devoid of com ports and USB seem to be ruling the world, but if you have an old PC and want to dedicate it to remote control of a Sony machine then this simple circuit might be for you. All the unmarked resistors are 1K and all the diodes are IN914. The pin numbers are for a 25 way com port but fig 4 shows the conversion to 9 pin com ports.



The software to control it is a free download from http://goo.gl/TLP0hW it runs on windows and although old seems to work on most operating systems up to XP, windows 7 might be a bit beyond it.

The TL081C can still be found on the net as can the 9pin D types connectors, as for the machines which were in the £20k to £30k price range when new, they now often change hands on eBay for the low hundreds or less.

25- PIN CONNECTOR		9-PIN CONNECTOR	
Signal	Pin	Pin	Signal
TD	2	3	TD
RD	3	2	RD
RTS	4	7	RTS
CTS	5	8	CTS
DSR	6	6	DSR
GND	7	5	GND
CD	8	1	CD
DTR	20	4	DTR
RI	22	9	RI

DATVtalk08 Digital ATV - Understanding DVB-S Protocol

by Ken Konechy W6HHC
and Bandwidth Updates by Hans Hass DC8UE

Reproduced from the Orange County Amateur Radio Club newsletter. www.W6ZE.org

[Please Note – This is the seventh article in a series of DATVtalk articles to introduce Digital-ATV to hams and to explain various aspects of this new area of ham radio. In the CQ-DATV5 issue, the DATVtalk02 article was the beginning of this series and presented an introduction article about Digital-ATV.]

There are about four protocols being tried by hams for Digital-ATV (DATV) today. The four protocols were described in DATVtalk02. These DATV protocols are:

- DATV-S (originally used for commercial Standard Definition [SD] satellite transmissions)
- DATV-T (originally used for commercial SD terrestrial transmissions…over-the-air to your TV)
- DATV-S2 (originally used for commercial HDTV satellite transmissions)
- ITU-T_J.83-B (originally used for US/Canada cable-TV-industry transmissions)

Ken plans to cover each of these protocols in future articles. But, today we start with the DVB-S protocol.

This month, DATVtalk will explain a few Digital-ATV concepts that are typically not understood by most hams and even analog ATVers. Using the DVB-S standard to transmit a digital ATV signal involves:

- MPEG-2 compression data rates for video
- Video bit-rate needed
- Net Data bit-rate available
- Symbol-Rates
- FEC (Forward Error Correction) algorithms
- QPSK (Quadrature Phase Shift Keying) digital modulation
- RF Bandwidth

This article will now walk through these various DATV factors and arrive at determining the resulting RF bandwidth for DVB-S.

Video Data-Rate and Compression

DATV needs to compress the video data rate from a camera to a manageable value using video compression technology such as MPEG-2 or MPEG-4. Today, most hams use Standard Definition digital TV (SDTV) using MPEG-2. For DATV, the analog camera output (NTSC or PAL) is first digitized by the MPEG-2 Encoder board shown in Fig 1, and then compressed by the MPEG-2 algorithm. The reason the compressed video data rate varies in Table 1 is that the low value means little motion (a "talking head" QSO) in the video scene and the higher value means a lot of motion (like a soccer game). In the near future, digital cameras will find their way into mainstream ham DATV.

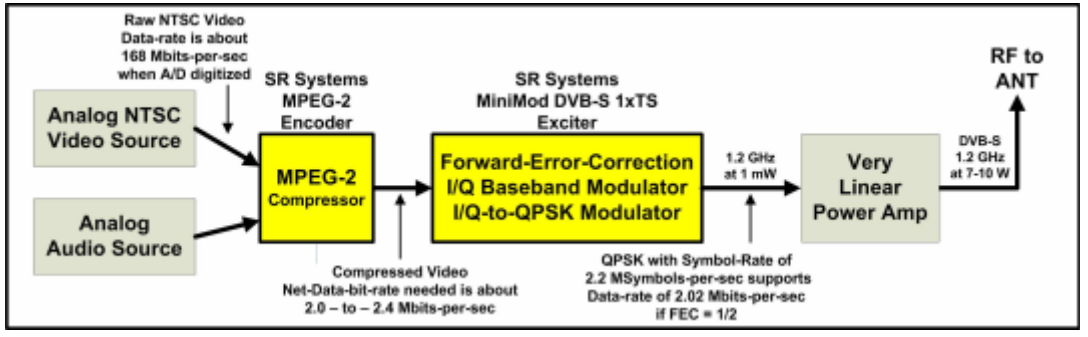


Figure 1 DATV Block Diagram Showing Various Data-Rates and Symbol-Rates for DVB-S QPSK(for 2.2 MSymbols-per-sec, the Bandwidth is 3 MHz)

Table 1 – Camera Video Data Streamsand MPEG-2 Data Streams

Video Data Stream	Data-Rate	Notes
Analog NTSC camera	168 Mbits/sec	A/D digitized, uncompressed
NTSC MPEG-2	2-3 Mbits/sec	compressed
VHS MPEG-2	1-2 Mbits/sec	compressed
Analog PAL camera	216 Mbits/sec	A/D digitized, uncompressed
PAL MPEG-2	2.5-6 Mbits/sec	compressed
HDTV camera	1-1.5 Gbits/sec	uncompressed
HDTV MPEG-2	15-60 Mbits/sec	compressed
HDTV MPEG-4	12-20 Mbits/sec	compressed

Stefan-DG8FAC of SR-Systems (located in Germany...see links at the end) has explained to me that in Europe many hams set the MPEG-2 output data-rate to be 2.5 Mbits/sec for PAL. Stephan further suggests that the MPEG-2 output data-rate for NTSC would be about the same. I suspect that for NTSC there should be about a 22% reduction in MPEG-2 output data-rate from PAL, to about 2.0 Mbits/sec. I originally planned for a 2.5 Mbits/sec video stream. But when I finally tested my station DVB-S transmitters, I measured that the NTSC MPEG-2 output (including audio) displayed reasonable quality all the way down to a data-bit-rate reduced to about 1.9 Mbits/sec stream. For comparison, I also added a row to show MPEG-4 compression with HDTV.

FEC Inflation of Video Stream Data-Rate

Forward Error Correction (FEC) is a technology that not only can detect an error on the received signal, but adds enough redundancy of the data so that it can correct the wrong bit. It can even correct two wrong bits. Since redundancy increases the data-rate of the video stream, there is a trade-off between more redundancy and the required video data-rate becoming too large. As we will see a little later in this article, the larger the video stream data-bit-rate, the higher the required RF bandwidth. So at some point the FEC algorithm will not have enough redundancy to correct too many errors, and the DATV screen will go blank.

The DVB-S commercial television standard uses two different Forward-Error-Correction (FEC) algorithms together in order to provide protection against noise errors and multi-path errors. The first FEC algorithm is called Viterbi. The second FEC algorithm is called Reed-Solomon.

The Viterbi FEC algorithm can be configured for different levels of error correction. These different Viterbi configuration/redundancy settings are usually called: 1/2, 2/3, 3/4, 5/6 and 7/8. The first number ("1" in the case of configuration 1/2) is the number of input bits. The second number ("2" in the case of configuration 1/2) is the number of output bits from the FECviterbi algorithm. So the MPEG-2 output data stream is "inflated" 100% by this FEC algorithm configured for 1/2. That is...for every bit going into the FEC engine, two bits come out. A FECviterbi algorithm configured for 3/4, for example, would inflate the MPEG-2 output data stream by 33%. So FEC levels can really inflate the data-bit-rate going to the RF modulator; the MPEG-2 algorithm compresses the video stream, but the FEC algorithms start to expand the required data-bit-rates again.

The Reed-Solomon FEC algorithm has a fixed configuration. Its data stream "inflation rate" is 188/204. So for every 188 bits going into the FECreed-solomon algorithm, 204 bits come out...an additional FEC inflation of 8.5%.

Digital Modulation Symbols and Symbol-Rates

Digital modulation technology like BPSK (for example PSK-31), QPSK (Quad Phase Shift Keying – like DVB-S) and QAM256 (Quadrature Amplitude Modulation with 256 "constellation points") have the ability to put more information into a narrow frequency spectrum than analog

modulation. The complexity of the digital modulation scheme, allows us to pack more "data bits" into each SYMBOL. Table 2 lists out how many data bits can be packed into a symbol for several well-known digital modulation technologies.

Table 2 – Symbol Bit-Packing for Various Digital Modulation Technologies

Modulation Scheme	Data Bits per Symbol (Me)
BPSK	1
QPSK	2
8-VSB	3
QAM16	4
QAM256	8

Table 2 means that QPSK will pack two data bits into each symbol being modulated. If we know the final output data-bit-rate (I will call this inflated data rate the "Gross Data-Bit-Rate") we need for the television signal, then the "symbol-rate" we need is exactly one-half of that data-bit-rate. For example:

Gross Data-Bit-Rate = 4.5 Mbits/sec
Symbol-Rate Needed = 2.25 MSymbols/sec

The formula to calculate the Symbol-Rate setting that I need for my DVB-S transmitter is:
Symbol-Rate Needed = NDBR / (Me x CRv x CRrs)
Where:
NDBR = Net Data Bit Rate (aka the information rate)
Same as MPEG-2 output stream data rate in Table 1
Me = Modulation Efficiency (2 for QPSK in Table 2)
CRv = Correction Rate setting for Viterbi (1/2, 3/4, etc)
CRrs = Correction Rate value for Reed-Solomon is 188/204

I will now calculate an example for QPSK where the output of MPEG-2 is 2.4 Mbits/sec and FECviterbi is configured to a value of 1/2.

$$\text{Symbol-Rate Needed} = \frac{2.4 \text{ Mbit/sec}}{2 \text{ bits/symb} * (1/2) * (188/204)}$$

$$\text{Symbol-Rate Needed} = \frac{2.4 \text{ Mbit/sec}}{0.921 \text{ bits/symbol}}$$

Symbol-Rate Needed = 2.65 MSymbols/sec

If I change the FECviterbi setting to 3/4, then the CRv value becomes 3/4 and the results are:

Symbol-Rate Needed = 1.73 MSymbols/sec

The Symbol-Rate that is needed was reduced because the "inflated data-rate" caused by a lot of FEC redundancy was reduced. The values inside Table 3, shows the Net Data Bit Rate that can be supported by a particular Symbol-Rate using several FEC settings. The FEC setting needs to result in a number of Net Data Bit Rate that is at least 2.4 Mbits/sec. The red values in the table show FEC settings or Symbol-Rates that result in a Net Data Rate of less than 2.4 Mbits/sec that I set as my goal for MPEG-2 video stream output.

Confusion about the word "Bandwidth"

Note – Hans DC8UE, who has many years of experience as a satellite communications engineer for commercial television, was very kind to spend a lot of time to help me understand RF bandwidth for DATV. While talking to hams in Europe about DVB-S DATV repeater designs, Ken noticed that sometimes he was given unexpected values of RF bandwidths being used by the European repeaters. The Symbol-Rates (S/R) being reported by the repeaters were always accurate

Table 3 – Symbol Bit-Packing forVarious Digital Modulation Technologies

Modulation	FEC Coderate	DVB-S RF BANDWIDTH for DATV (RF BWallocation = SymbolRate x 1.33)					
		2.0 MHz (SR = 1.5 MS/sec)	2.5 MHz (SR = 1.88 MS/sec)	3.0 MHz (SR = 2.25 MS/sec)	4.0 MHz (SR = 3.0 MS/sec)	5.0 MHz (SR = 3.75 MS/sec)	6.0 MHz (SR = 4.50 MS/sec)
QPSK	1/2	~~1.38~~	~~1.73~~	2.07	2.76	3.46	4.15
	2/3	~~1.84~~	2.30	2.76	3.69	4.61	5.53
	3/4	2.07	2.59	3.11	4.15	5.18	6.22
	5/6	2.30	2.88	3.46	4.61	5.76	6.91
	7/8	2.42	3.02	3.63	4.84	6.05	7.26

NOTE-1: NTSC Analog Camera produces about 2.0 Mbits-per-sec MPEG-2 output for Ham Radio type broadcasts. The encoded audio data rate is usually at least 64 Kbps.

NOTE-2: The Net Data Bit-Rate values inside the Table need to be at 2.07 Mbps or larger to support the expected camera and audio data rates coming from MPEG-2 encoder

Note-3: The Net Data Bit-Rate values inside the table shown in RED (with strikethrough) are Net Data BitRates that are too small to support the payload data stream.

(Symbol-Rate is always a setting in the transmitter, so it is well known), but the RF bandwidth reported by repeater owners sometimes had an unexpected relationship to Symbol-rate. A little searching on the internet (love the Google and Bing search engines) showed that there are at least three popular ways methods of defining RF Bandwidth for DVB-S.

- **"minus 3 dB" bandwidth method**
- **"occupied" bandwidth method**
- **"allocation" bandwidth method**

So if you were to ask three different hams "what DATV bandwidth are you using?"...you may get three different answers when talking about the same DATV DVB-S repeater!!

The authors agree that the most important purpose of describing bandwidth for DATV hams...is to provide a value that can be used for band-plan spacing and frequency coordination to avoid adjacent interference. Now we will look at these three methods of describing RF Bandwidth for DVB-S (QPSK modulation).

"minus 3 dB" bandwidth method

With this method, the bandwidth is measured at the points that are down 3 dB. This is a typical method for measuring an analog filter bandwidth and represents the "half-power point" if you are looking at voltage on a spectrum-analyzer.

Mathematically, BW-3dB ~S/R for this definition of bandwidth

While the BW-3dB method is very familiar to analog engineers and analog ATVers, it is not very useful for DATV to define the bandwidth of a digital signal transmission link for two reasons.

First, creating a digital-(pulse-)modulation signal produces a non-Gaussian signal-flank (shape).

Second, you would not want to space the frequencies of several DATV stations "shoulder-to-shoulder" on their 1/2–power points, since significant power would overlap neighboring frequencies. This approach to spacing of stations

would create potential receiving interference. Especially, if several DATV repeaters are located together on the same hill-top or tower so that receiving antennas are pointing in the same direction toward adjacent DATV repeaters.

As a note: The bandwidth of the DVB-S carrier at the minus 3.8 dB points is approximately the same as the symbol rate (S/R).

"occupied" bandwidth method

As defined by the commercial satellite standard, 3GPP TS 34.121, section 5.8, the Occupied Band-Width (OBW) is the bandwidth containing 99% of the total integrated power of the transmitted spectrum, centered on the assigned channel frequency.

Mathematically for hams: BWoccupied = 1.19 x S/R

How is the occupied bandwidth measurement determined? During this measurement, a Gaussian filter with a bandwidth greater than 10MHz and a resolution bandwidth (RBW) of 30 kHz or less is used to measure the distribution of the power spectrum.

First, the total power found in the measured frequency range is calculated.

Then, starting at the lowest frequency in the range and moving upward, the power distributed in each frequency is summed until this sum is 0.5% of the total power. This gives the lower frequency value for measuring the bandwidth.

Next, starting at the highest frequency in the range and moving downward, the power distributed in each frequency is summed until 0.5% of the total power is reached. This gives the upper frequency value. The bandwidth between the 0.5% power frequency points is called the "occupied bandwidth".

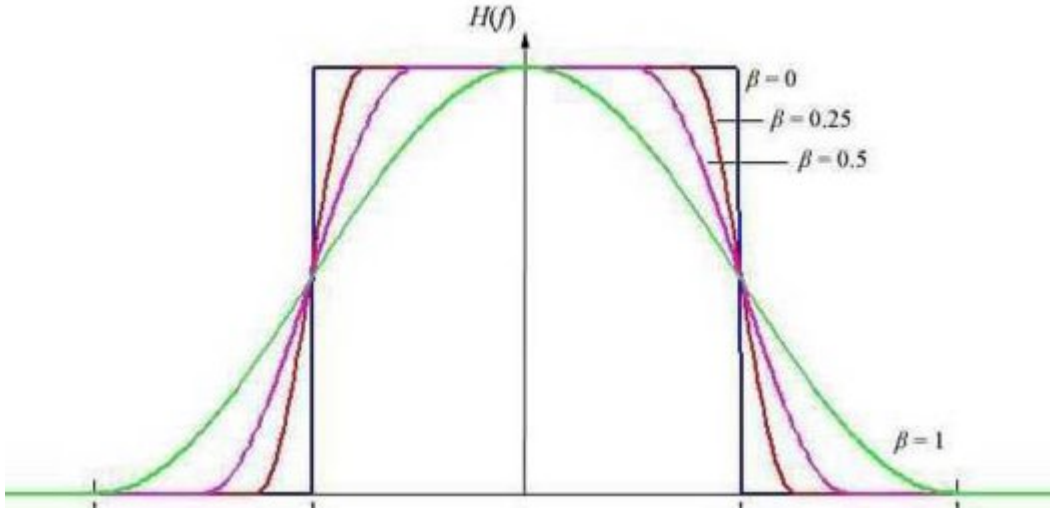
While the "occupied" bandwidth spacing of repeater frequencies is better at preventing adjacent interference than "minus 3 dB" bandwidth spacing, it still lacks one feature. The spacing should have a little guard-band to allow for unplanned obstacles ...like signal-path nonlinearity, etc.

"allocation" bandwidth method

This method for describing bandwidth provides a little guard-band between adjacent DATV signals. The allocation bandwidth for DVB-S is calculated as

BWallocation = (1 + Roll-off-Factor) x Symbol-rate
BWallocation = 1.35 x S/R

when using a 0.35 Roll-off-factor. The Roll-off-factor (as



shown in Fig 2) controls the grade of the slope of a DVB-S signal-edge.

Figure 2 – Different roll-off slopes for different Roll-off-factors

The "allocation bandwidth" is determined by the big commercial satellite-providers (like inside the **Intelsat Earth Station Standard 420: (IESS420e.pdf)** as an area, inside that the power-level will be not be lower than –26dB. There will be a filtering necessary on the signal borders (mostly performed by software), which takes care, that the borders rolls out weakly. The grade (slope) of this roll off will be described by the Rolloff-factor. It shows the relationship between half of the roll off area to half of the wanted channel-bandwidth.
The DVB-S standard specifies the Roll-off-factor at 0.35. A raised cosine filtering at the edge region for the transmission path is required. The used filter generates in a first step only a root raised cosine shape. Only in combination with the same filtering inside the receiver you will get the wanted raised cosine form of the filter shape.

Choosing an RF Bandwidth for DVB-S DATV

It turns out, one of the advantages of digital-ATV is it can be more bandwidth-efficient than analog-ATV. With DVB-S and QSPK modulation you actually have the ability to easily make the DATV RF bandwidth as narrow as 2 MHz or 3 MHz without giving up any noticeable quality. This is because the commercial DTV standards planned to transmit several Television streams inside one normal (old) RF TV bandwidth.

Fig 3 shows a D-ATV DVB-S QPSK signal using a 1.5 MSymbols/sec symbol-rate of (generated by a MiniMod). It shows clearly 2.025 MHz of used bandwidth.

Below 35dB you can see the additional shoulders, generated by distortion on the non-linear characteristic curves of the RF amplifiers being used. There is more on non-linearity, later in this article. The "allocation bandwidth" is in practice really very useful to describe the real used bandwidth for spacing DATV repeater frequencies. However, for ham radio, Ken

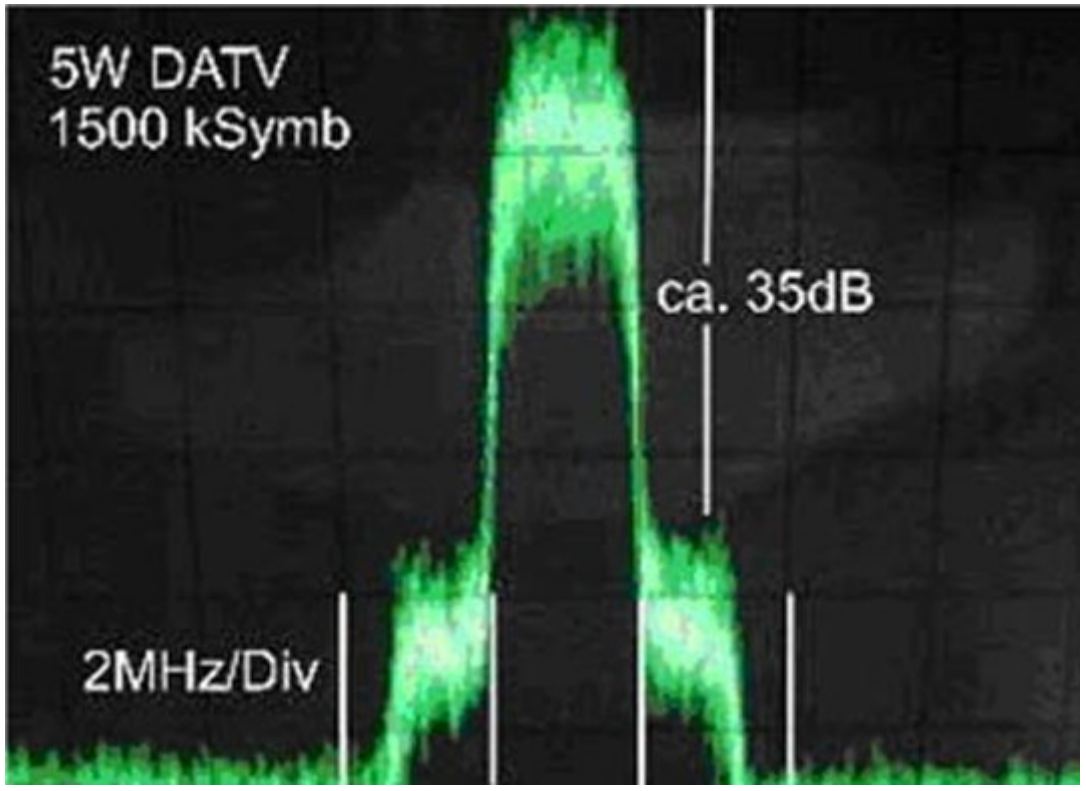
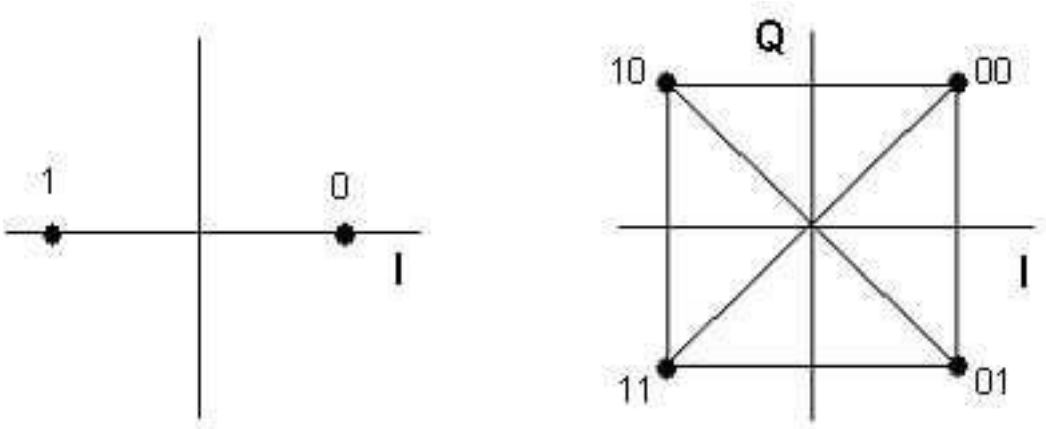


Figure 3 – DATV QPSK signal at 1.5 M Symbol/sec produces 2.025 MHz of bandwidth

W6HHC prefers to "adjust" the bandwidth allocation formula slightly to

$$BWallocation \sim = 1.33 \times S/R$$

Ken explains that this "adjusted value" is less than a 2% error and is much easier to calculate in his head. The authors both agree that hams should only use the term BWallocation when they talk about DVB-S RF bandwidths for DVB-S. As Table 3 displays, a 3 MHz RF bandwidth can be achieved with plenty of error correction capacity (FEC = 1/2) by selecting a Symbol-Rate of 2.25 M Symbols/sec.



Non-Linearity effects on QPSK bandwidth

Digital modulation using phase shifting (PSK) like BPSK or QPSK transitions from one state to another state. For QPSK, you are always in one of four states...and your next transition can be to any of those four states, as shown in Fig 4.

Figure 4 – Theoretical transitions in the I-Q plane made by BPSK (on the left) with two states and by QPSK modulation with four states.

However, non-linearity in the RF amplifiers can cause the received values of I and Q to contain errors from the theoretical. It is extremely important, to avoid compression in the power amplifier and to operate the signal path and PA in a linear mode. Figures 5 and 6 show the effects of increasing non-linearity on the transition of states for QPSK modulation. You can see in Fig 7, that the power levels of the shoulders (aka spectral regrowth) have grown to 20 dB below the carrier. This will splatter power into adjacent frequencies outside of the allocated bandwidth.

See figures 5, 6 & 7 on the last page of this article.

So while the average power level may seem low, the peaks can be going into compression (or even flat-topping in saturation), hence nonlinearity and hence stronger shoulder power levels. Commercial satellite-uplink operators adjust their shoulders to be more than 26 dB below the main carrier. Likewise, it should be the duty of hams that operate DVB-S repeaters and transmitters to not allow the shoulders to get within 26 dB of their main carrier in order to avoid interference to nearby frequencies.

Conclusion

The authors are impressed that the DVB-S protocol brings ATV to a whole new level of performance for hams compared to the old analog technology. The Forward Error Correction and QPSK modulation are very robust…and it allows a savings in RF bandwidth for ATV. My own field tests show that DVB-S overcome snow (weak signals) and ghosts (multi-path propagation) that had plagued analog-ATV transmissions in the same locations. It is no wonder that today; DVB-S is the most widely-used protocol for DATV.

Contact Info

The authors may be contacted at W6HHC@ARRL.net and HansHass@WEB.de

Useful URLs

- British ATV Club – Digital/DigiLite/DTX1 forums – see www.BATC.org.UK/forum/
- BATC info site for DTX1 DVB-S exciter – see www.DTX1.info
- DATV-Express Project web site (SDR-based exciter) – see www.DATV-Express.com
- DigiLite Project for DATV (derivative of the "Poor Man's DATV") – see www.G8AJN.tv/dlindex.html
- Orange County ARC entire series of newsletter DATV articles – see www.W6ZE.org/DATV/
- PE1JOK and PE1OBW on "The Ultimate Resource for Digital Amateur Television" – see www.D-ATV.com

- SR-Systems D-ATV components (Boards)
  – see www.SR-systems.de
- Yahoo Group for Digital ATV
  - see groups.yahoo.com/group/DigitalATV/

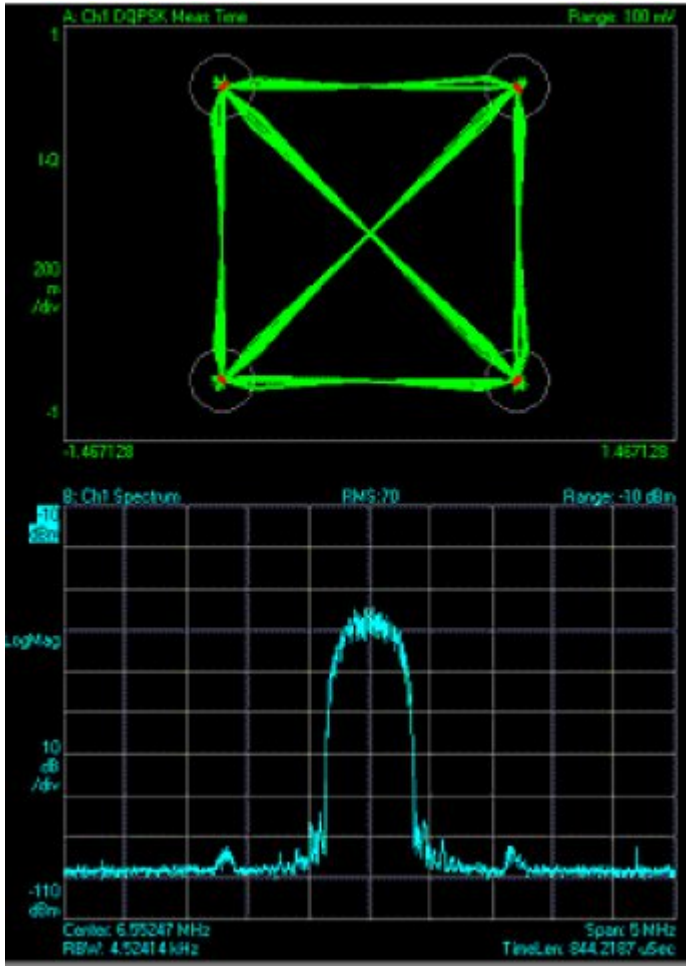


Figure 5 - Real-world QPSKstate transitions closely match theoretical with good linearity

Photo courtesy of PE1JOK and PE1O(BW)

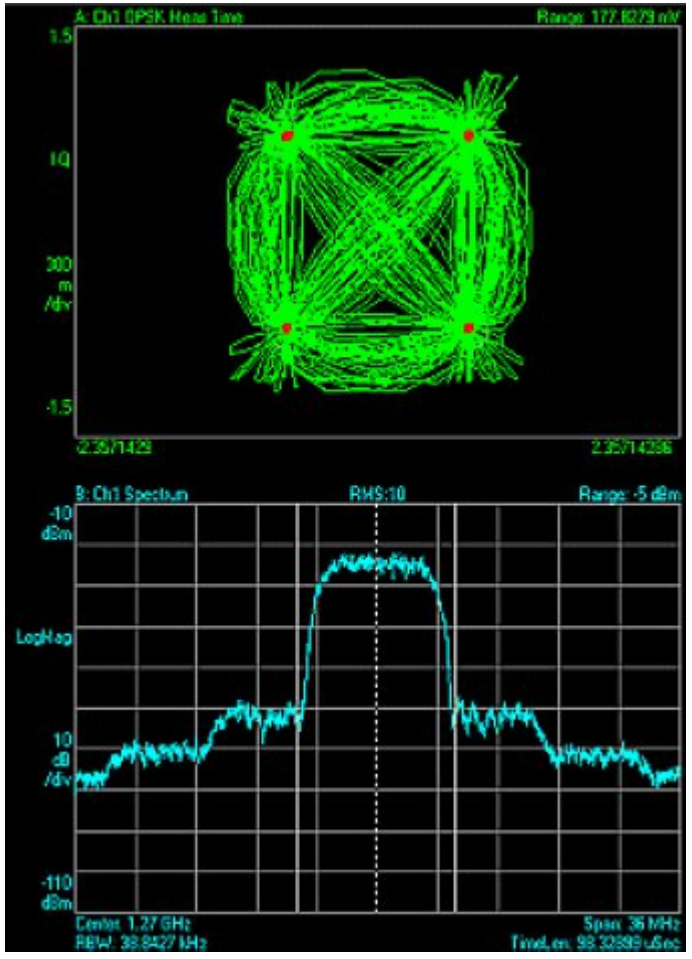


Figure 6 – More amplifier non-linearity increases errors as power increases

(Photo courtesy of PE1JOK and PE1OBW)

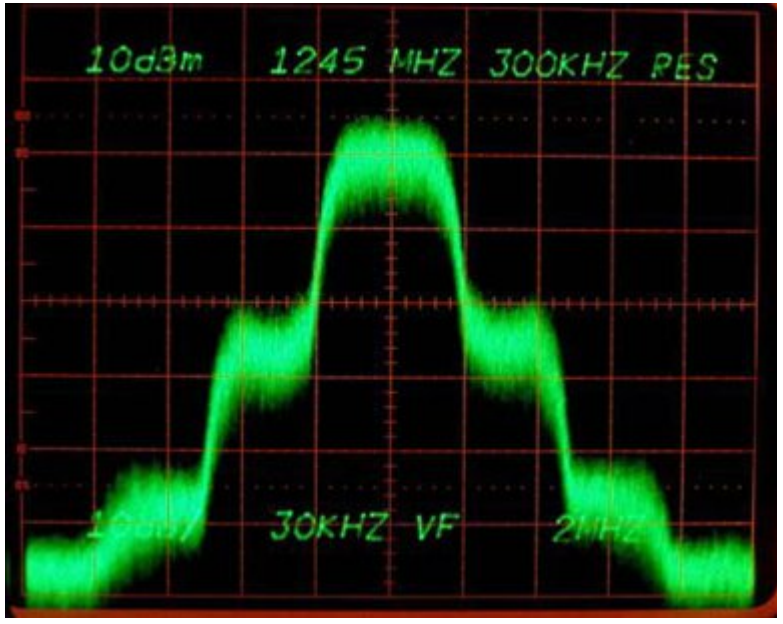


Figure 7 – Spectral regrowth after amplification with shoulders now only 20 dB below the carrier

(Photo courtesy of Art-WA8RMC)

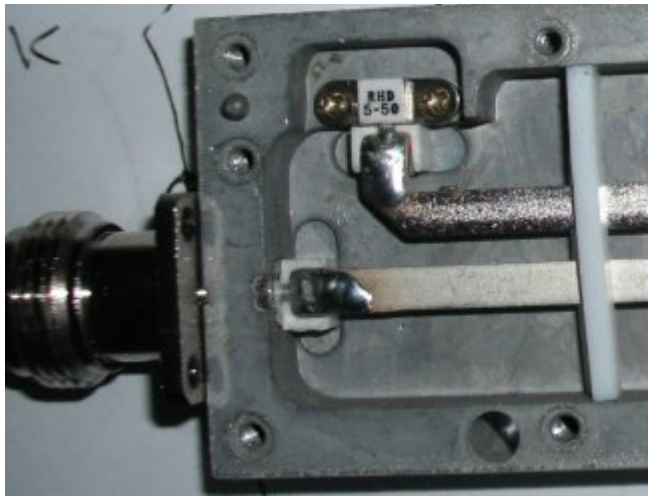
by John Hudson G3RFL and Lee Hudson M0LMH

Back in CQ-DATV 1, I put together a very simple dummy load and I received a lot of feedback so many of you built it. Amongst the emails were several requests to add power measurement. I did give this some thought including measuring the temperature change of the device and nulling out room temperature in a wheat stone bridge.

Then I got wrapped up in constructing GB3FY, the local 10 GHz FM ATV repeater. Now that is working and my drawing board is empty, I have a little spare time before the grass starts growing and demanding my attention, so I can refocus my thoughts on the Power Meter.

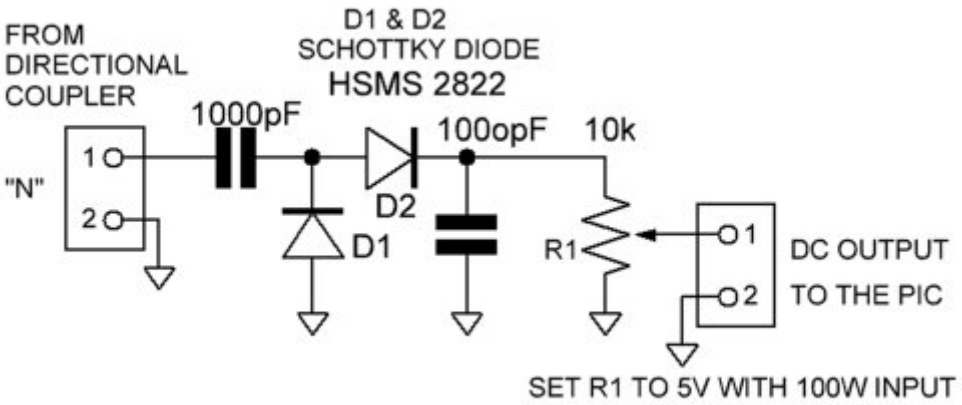
I usually start with a trawl of eBay, which is where I found the YIG that made the transmitter in GB3FY work, this time I found a -20db coupler at a very reasonable price.

If you are not familiar with this sort of technology it has an input and an output so it can be connected in line with your antenna or dummy load. It also has a third port where RF is coupled via a pickup line and delivers a signal which is -20db on the original signal.

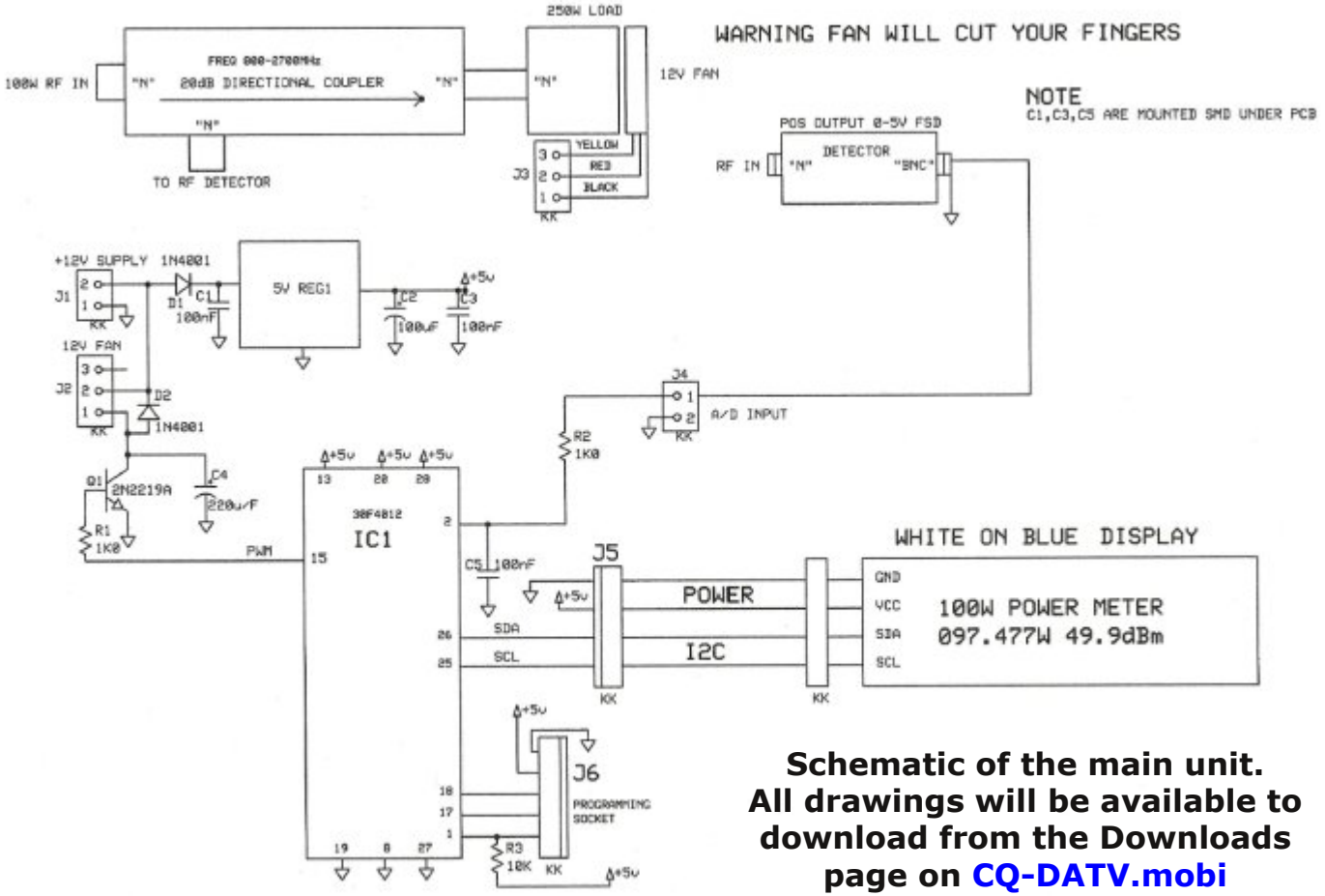


I purchased several of these units and because they all will handle high power, the coupling loop is terminated with a 5W Surface mounted resistor so in theory they would handle 500W down the inline path, but I am only interested in 100W, for some time to come.

Following the coupler, we need a detector to convert the signal to a DC voltage that is proportional to the power we are transmitting. Clever little unit and they do appear on eBay.



Detector circuit example - note - this circuit has not been tested



Schematic of the main unit. All drawings will be available to download from the Downloads page on CQ-DATV.mobi

So next we need to interface this DC voltage to a suitable display so we can read the power.

This actually went together in a single evening and worked first time (well almost) The DC from the coupler (Top Right) is coupled into a ds30F4012 which is a PIC microcontroller with a built in Analogue to Digital converter. This device also has its own internal XTAL, a x16 PLL to make it clock even faster and I2C (two wire interface) that is required by our LCD display (more later). Yes the PIC needed to be programmed and as always putting the 0's and 1's into the device was easy. I even included a socket in the design for this purpose, the problem comes in deciding which 0 and 1 (something they call programming)

For those of you that understand this obscure science you can download the source code from CQ-DATV.mobi.

I need to credit my Son Lee Hudson M0LMH at this point, for without his help writing the software, this project would still be on the drawing board.

For those of you that cannot programme these chips, I can be contacted via the CQ-DATV editor and you won't be the first to need help with this.

An explanation of how it does what it does

What is happening is that with 100W going through the Directional coupler you get a signal –20dB down (1W) out of the coupling device. When rectified this should produce 7V, so if we pad that down to 5V, then BINGO the PIC A/D 10 bits can interface its input to this.

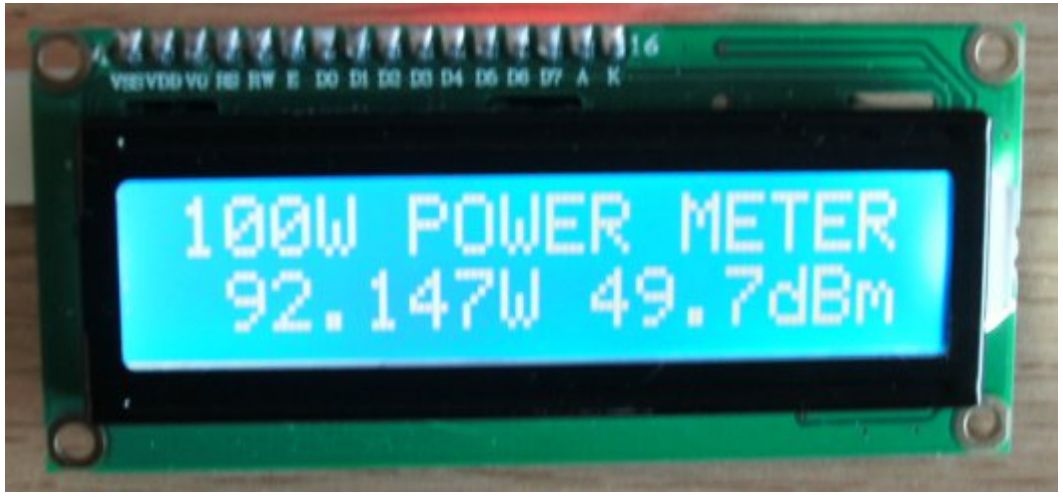
At an A/D value of 1023, the power wants to read 100.000W….So we have 6 digits and 3 digits for the dBm scale.

To process this, we took the A/D value, squared it, then divide by 65536, then divided by 10465.
Now we have the whole WATTS so we save that. Next we Multiplied by 1000 and divided by 654. Now we have the milliWatts figure, so save that.

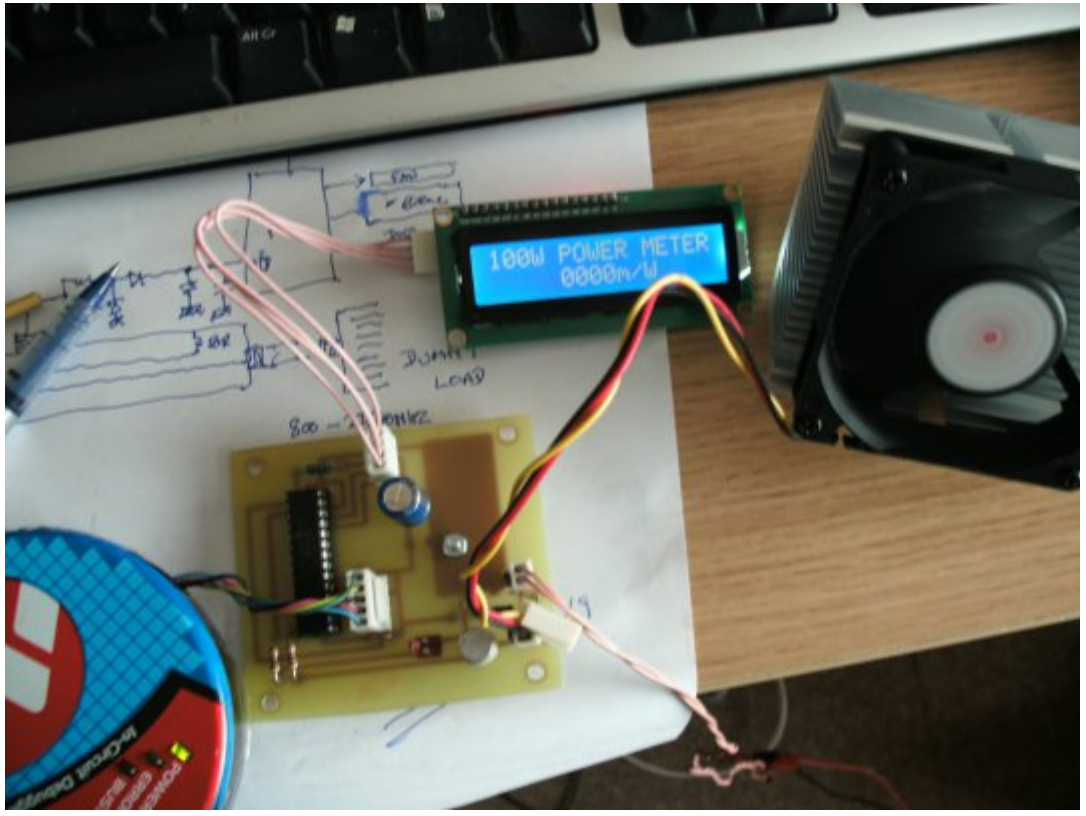
Next and this is the harder bit, Lee sorted out how to convert these two values into dBm, 0 to 50, with a fraction left over. This took 48 bit MATHS, real genius on how it works.

Multiply the Watts value by 1000 and add the milliWatts to it. This gives us a big number whose total value is now in milliWatts. Now divide by the magic number of 1.258927714 (this is about 1dB). Answer is in dBm with a fraction left over. Convert all these numbers (that's 9 digits) to ASCII and deliver to the LCD.

Lee then refined the code by adding leading Zero blanking on 3 digits (Ok he is the mathematician in the family).
You can use any POSITIVE output detector and any 20dB Directional coupler just as long as 5V equals 100W. An extra thing I added was the 12V fan speed control on the 250W heatsink, both cost just £8. These are a u/P heat sink for PCs. Beware, the FAN blades are knife edged.
The display I chose was again from eBay and is a very attractive blue and white display.

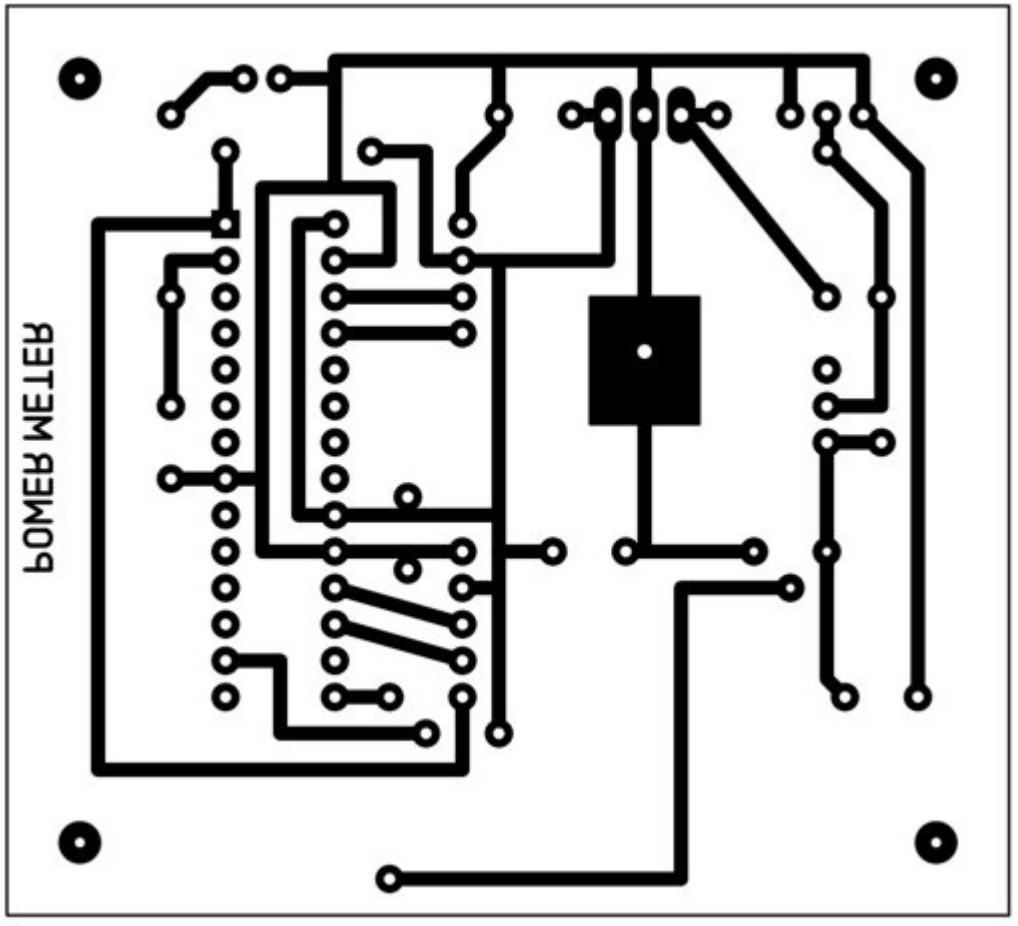


It requires a 5v power supply and then connects directly to the ds30F4012 microcontroller via a two wire interface called I2C.
As long as you connect SDA (data) and SCL (clock) to the respective pins on the processor, then you will not have any problems and if you get them the wrong way round, don't worry you will not do any damage.



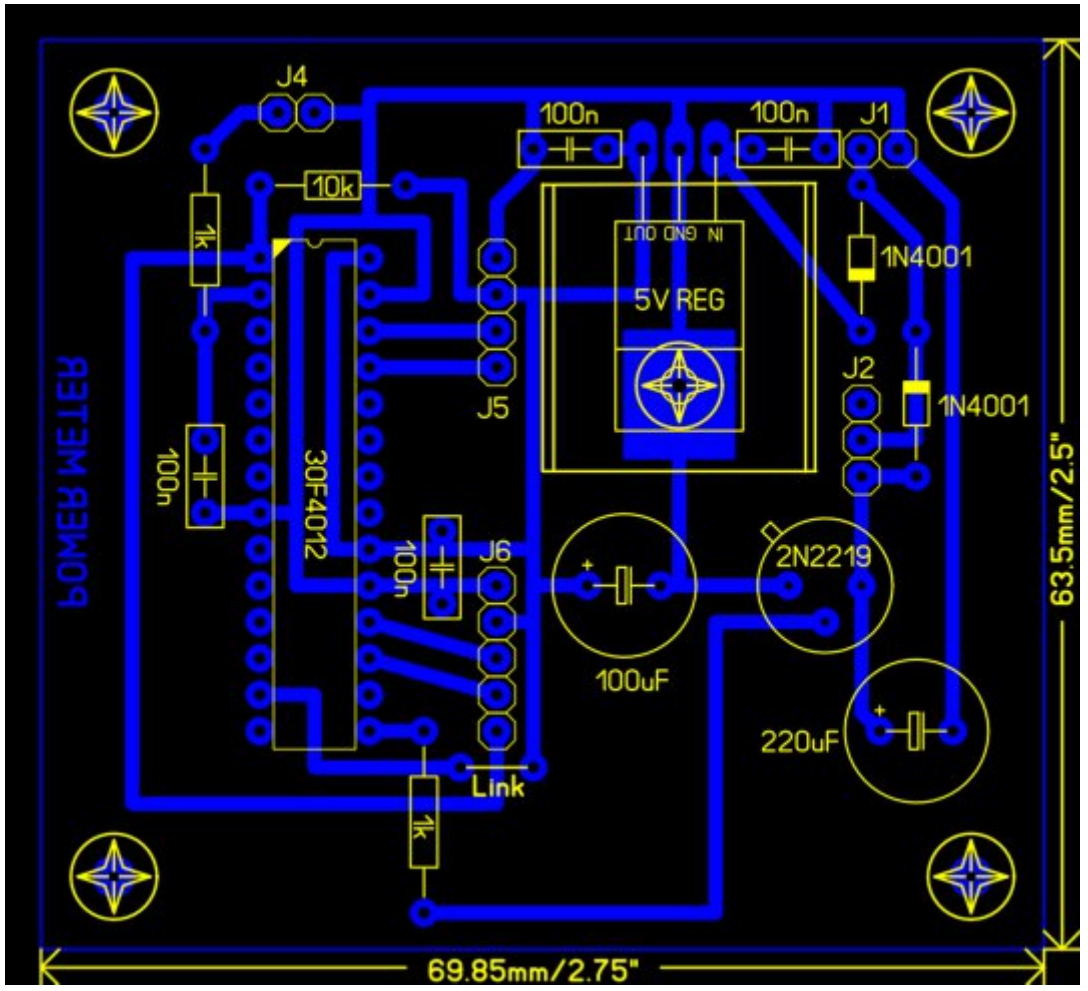
Note that the picture above shows the prototype pcb

Everything working, I turned my attention to a PCB for the unit (well, I need my prototyping board for my next project). As usual with these projects, the planning and code writing took up all the time, but now that is complete you can home etch the simple single sided PCB, drill and fit the components in a single evening. There is nothing to align, adjust or trim,



The pcb measures 2.75 inches by 2.5 inches.

(Please note these have been redrawn by the editorial staff from material supplied by the author)



The component overlay for the Power Meter.

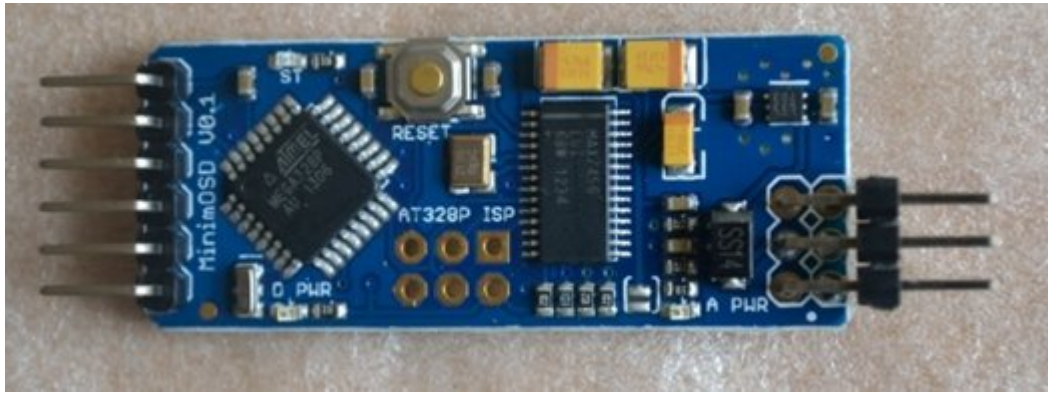
Note that provision has been made for a mini "U" heatsink if required.

All drawings and source code for this project available to download from the CQ-DATV.mobi website downloads page

Review - eBay MAX7456 OSD Generator Modules

By Mike G7GTN

I discovered these interesting OSD modules recently on eBay, originally intended for Model Aeroplane type hobbyist applications.



It was immediately obvious to me that they could be simply repurposed to provide some on screen Callsign and Caption Generation facilities for our Amateur Television activities. They are based on the Maxim MAX7456 Black & White OSD device. This chip requires communications from some type of processor to control the devices SPI pins under software and hence generate our captions. This is taken care of by an on board ATMEL ATMEGA328P micro controller device being run at 16MHz clock speed. We have the added benefit that the processor is already pre-loaded with an Ardunio Boot loader. That provides an easy software platform for us to develop with and easily use.
The MAX7456 is a very versatile chip in that it will generate both PAL and NTSC video signals internally by changing a couple of software registers, being able to display 16 lines X 30 characters and 13 X 30 respectively in these differing video standards. Tests do reveal that the device likes to draw around 100ma and equally loves to run warm to the touch. If a composite through video source is not connected then the device will just generate its own video syncs and display your programmed characters on a solid Black Screen.
The characters themselves have several control attributes available, invert, background and also flashing. We also have the ability to create our own custom characters and very easily program these in the devices NVRAM area.
So we can easily build a logo or even very basic picture by placing these individual self-designed characters together. I will cover this potentially quite useful aspect fully in a separate CQ-DATV article later on in this small series of ultra-simple OSD projects.

Shown is a sample of the MAX7456 OSD being overlaid on top of a standard PAL composite video camera picture, alongside is the result when no through video is available to the device.

These modules can be found by doing a search for minimOSD and are generally available from eBay for around £12 fully shipped. Way less than either the cost of the individual components or the difficulty of trying to mount the SMD MAX7456 to a TSSOP28 type breakout board to do hardware & software development on. They are easily small enough to build in to each of your own television transmitter projects. In conclusion these make quite nice little OSD Video generators for a price not possible to even buy the individual parts.

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/

DVB-T-Receiver HV-110 (Darko Banko, OE7DBH)

We have been waiting for this device for years, now it is here: small, compact, simple to use and affordable.

It is a stand-alone DVB-T receiver for rf bandwidths between 2 and 8 MHz and a frequency range from 170 to 950 MHz. The designer made one mechanical fault: you cannot use CVBS (analog) and HDMI (digital) output ports at once because of the narrow placement. Switching between narrow and wide bandwidth is done at the back side, and the SMA input does not provide an in-line power supply for pre-amplifiers. But that is all of my criticism.

The HV-110 is very small (10x7x4 cm), needs only 600 mA with 5 V DC and no PC support, but brings a pre-programmed channel listing for 23 cm and 13 cm bands (with down-converter). It can receive narrow-band as well as wide-band COFDM signals and saves search results automatically, but you can choose manually frequency and bandwidth too. As accessory an analog cable for FBAS video and stereo audio is enclosed, the end user price will be 159 US Dollar according to HiDes (Taiwan).

On my lab table without QRM I managed to get perfect video and audio reception with only -102 dBm input rf level, at -105 dBm none of it, using the HV-100EH TX with 16QAM, 2 MHz BW, MPEG-2 on 436 MHz. The HV-110 receiver is made for H.264 video signals, but accepts MPEG-2 video too. Using a DC101 TX on 474 MHz with H.264 video and 4 MHz BW and a HV-100EH TX on 436 MHz with MPEG-2 video and 2 MHz BW the searching function incl. saving was successful, and switching between both channels by remote control needed about 3 seconds.

For parallel use of HDMI and CVBS ports you have to solder a small patch cable to FBAS video and audio feeding points on the PCB (no modification planned by HiDes). If you need in-line power supply for a pre-amplifier, attach a T-Bias-Feed at the rf input. Avoid strong rf signals there - the sensitivity could get worse!

Update:

In a sensitivity contest I compared the HV-110 and a SR-Systems receiver in this configuration:
TX HV-100EH, MPEG-2, 436 MHz, 2 MHz BW, 16QAM, Pout 0 dBm, ------> fixed 30 dB attenuator ----> variable attenuator ----> coax cable ------> test RX.

Result:
No more video and audio signal decoded with SR-Systems receiver at -87 dBm, dto. with HV-110 receiver at -106 dBm, dto. with UT-100B&D receiver at -107 dBm. With such levels below -100 dBm no pre-amplifier is needed, more important is a good aerial and an input filter against unwanted neighbour signals.

Practical conclusion: if you can receive a 70 cm narrow-band FM station with S5 level, there is a chance to get a DVB-T 2 MHz BW video signal with HV-110 at equal power, aerial and propagation conditions.

Link to forum announcement (scroll down for English version)
http://goo.gl/SMGIyn

translation by Klaus, DL4KCK
www.agaf.de

By Trevor Brown & Dave Woodall G3ZGZ

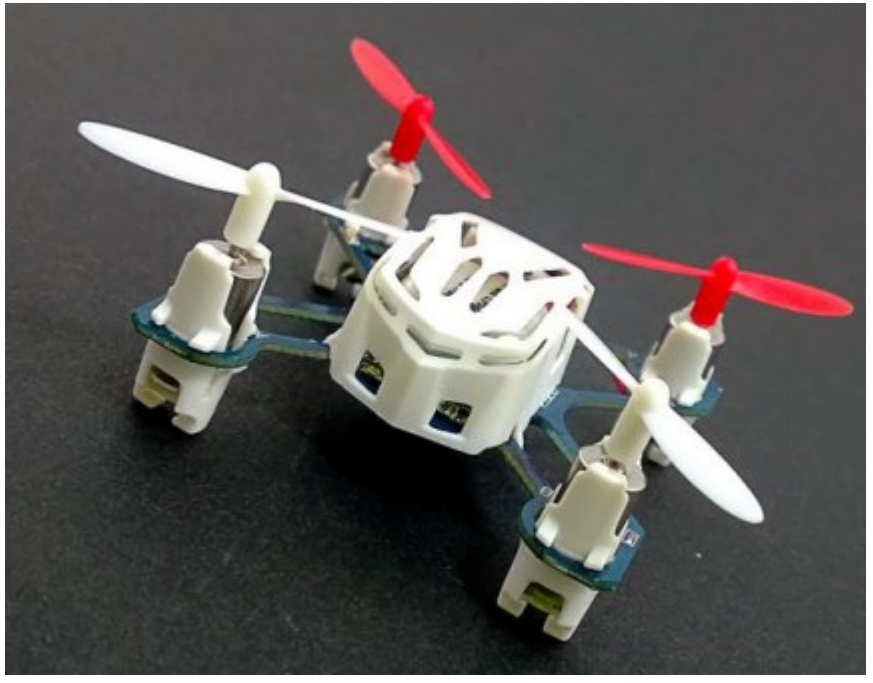
For those of you that remember the 80's and BATC meetings, they were all held at Crick Post House, being situated in the middle of the country and having good motorway access, almost on the down ramp of turn off 18 on the M1 motorway. We seemed to have cart blanch access to power for the OB trucks and when we had filled every conference room we burst out onto the patio's and car park with flea markets and demonstrations. Being a hotel we could all turn up on the Saturday rig our kit, eat drink and talk ATV all Saturday night into the small hours. I have to admit there were times I booked a room and never saw it, I spent the night talking and that ran through into the 6am start for traders.

When we did eventually run out of space we had a 200ft Marquee put up in the grounds, I know we almost closed the motorway access ramp with queuing. I have a lot of very fond personal memories of those days. All that remains is the Video I made for GB3ET news which I have put on the BATC streaming site www.batc.tv in the film library.

The star of the show was Brian Parkins and his ATV equipped helicopter which is featured in the video. The camera was enormous by today's standards and the pictures were relayed back to ground on the 24cms band using FM modulation. This was the only real problem, motor vibration causes modulation and no matter how much foam packing you put around the transmitter you get microphony modulated onto the pictures, probably made worse by the small size of the model, you cannot get the transmitter away from the helicopter motor, if any ATV application cried out for DATV this was it.

So now we have DATV lets spool forward to present day and see where Brian's idea led.

First of all the helicopter has changed into a quadrocopter, which is a really clever idea, if you have speed control over all four motors you have a very manoeuvrable aircraft, slow



one engine and it rotates around that engine, slow down any pair and that's the direction it will travel in.

Unfortunately the professional TV equipped models start at around £1k and well, you know, boys and their toys. I wanted to get my hands on one.

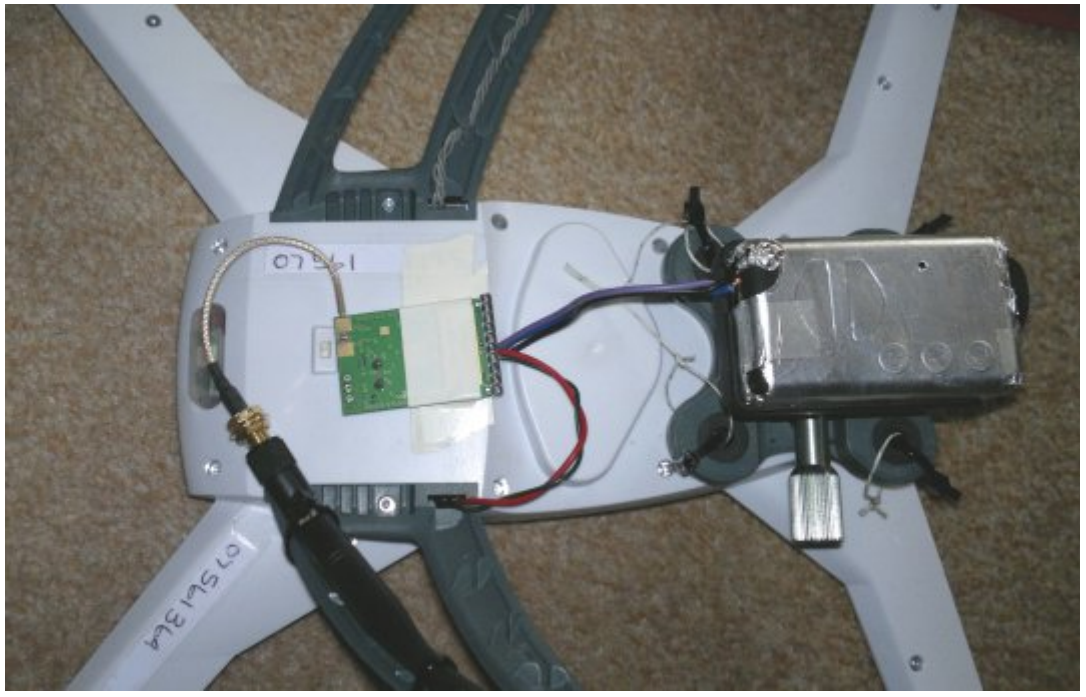
You have to understand at this point it was purely for research to see if I could master the required skill to fly one of these models. Mine was a Hubstan and cost a little under £30. You laugh, but it was full duplex control on 2.4Ghz It charges up from a computer USB lead but sadly is not equipped with TV, but I can report that I now have 20 hours in my logbook. I am on my third set of props and one or two of the home ornaments have err, well, where would we be without superglue. Ok this 5cm model is never going to support a TV camera, but some of its bigger brothers that are sub £200 come TV equipped.

The next step came from contact with Dave G3ZGZ who sent me this picture from his Blade 350QX quadcopter fitted with a camera and downlink.

The camera is a "Mobius action camera" which is a low cost CMOS camera that has a micro SD card recorder built in. This camera gives excellent images and can be set to record video at full HD or take stills. There is a composite video out that I use with the downlink for checking what the camera is viewing.

The downlink is a very small 5.8GHz video (and sound) "sender" often used for extending a satellite or CCTV signal from room to room. This has an output of about 50mW and feeds a small omni antenna. When used with a patch antenna on the ground it will give a good signal over about 200m provided the quad stays "line of sight". At 200m away the quad is far too small to be able to visually see which way it is going so it never gets used over that distance.

The quad has a fair amount of vibration and despite carefully balancing props there is still some "jello" on the recorded video. "Jello" is the term used to describe a wobbly picture caused by the way the CMOS camera scans it's sensor. The camera sensor is active to incoming light all the time and is sequentially scanned across the frame. This means that due to the time taken to scan and process the



Above - Camera and 5.8GHz downlink
Left - Blade 350QX Quadcopter

image, the picture content has changed before a frame has been built up (especially due to vibration which is at a higher frequency than the frame scan).

The picture from the camera shows the effect that over a complete frame the image appears to be compressed and expanded whilst the scan is going from top to bottom and wobbles like a jelly! Hence the name "jello".
This effect is almost totally caused by vibration of the camera in the vertical plane. The same effect happens on the horizontal plane but as the CMOS sensor is scanned fast (compared to vertical) it is nowhere near as noticeable.
The pictures shown on the next page were either stills or frame grabs from the recorded HD video as the composite video output from the Mobius camera is not full definition, or full screen as it was intended for monitoring where the camera is pointing.

Having said that, the downlink video is good enough to be able to fly the quad in the "First Person View" (FPV) mode where the pilot on the ground sees an out of the cockpit type of view.As a side comment, I'm glad that I have radio knowledge that most quad and plane modellers lack.

The Blade 350 has an on board GPS receiver that is used as an aid to flying and also as a "return to home" facility.
It is also intended to have a Go Pro camera mounted on it for aerial photography. I used a Mobius camera as it is lighter and, of much more importance, lower cost!

Fortunately the good old "Faraday cage" comes to our rescue.

You may have noticed on the pictures showing the installation on the quad that the camera has a shiny aluminium cover. This was not put there by the manufacturers but is just cooking foil used to screen the camera noise.

It's very effective and I can bring my Mobius camera right next to the Garmin and it no longer effects the GPS reception. Once I did this simple mod I had no more trouble with the Quad's GPS reception.

Now I get extreme pleasure in combining my RC modelling with video and amateur radio!

As amateurs you are well aware of EMC problems with anything electronic. The cameras used are no exception and virtually all of them generate wide band noise that goes from a few KHz up to GHz. With the cameras I have used the noise from them is usually caused when writing to the storage cards as the data transfer here is at megabit rates and contains lots of lovely (to some) square waves! Well, you can probably guess what happens when a camera is mounted close to a GPS antenna! This is the case with my quad and I carried out some simple tests using a hand held Garmin GPS. When the camera is brought within 10-20 cm of the GPS the noise floor of the GPS rises to the point where it stops working. This could be said to be "not good" on the quad when the "return to home" mode needs to be used!

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.

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.