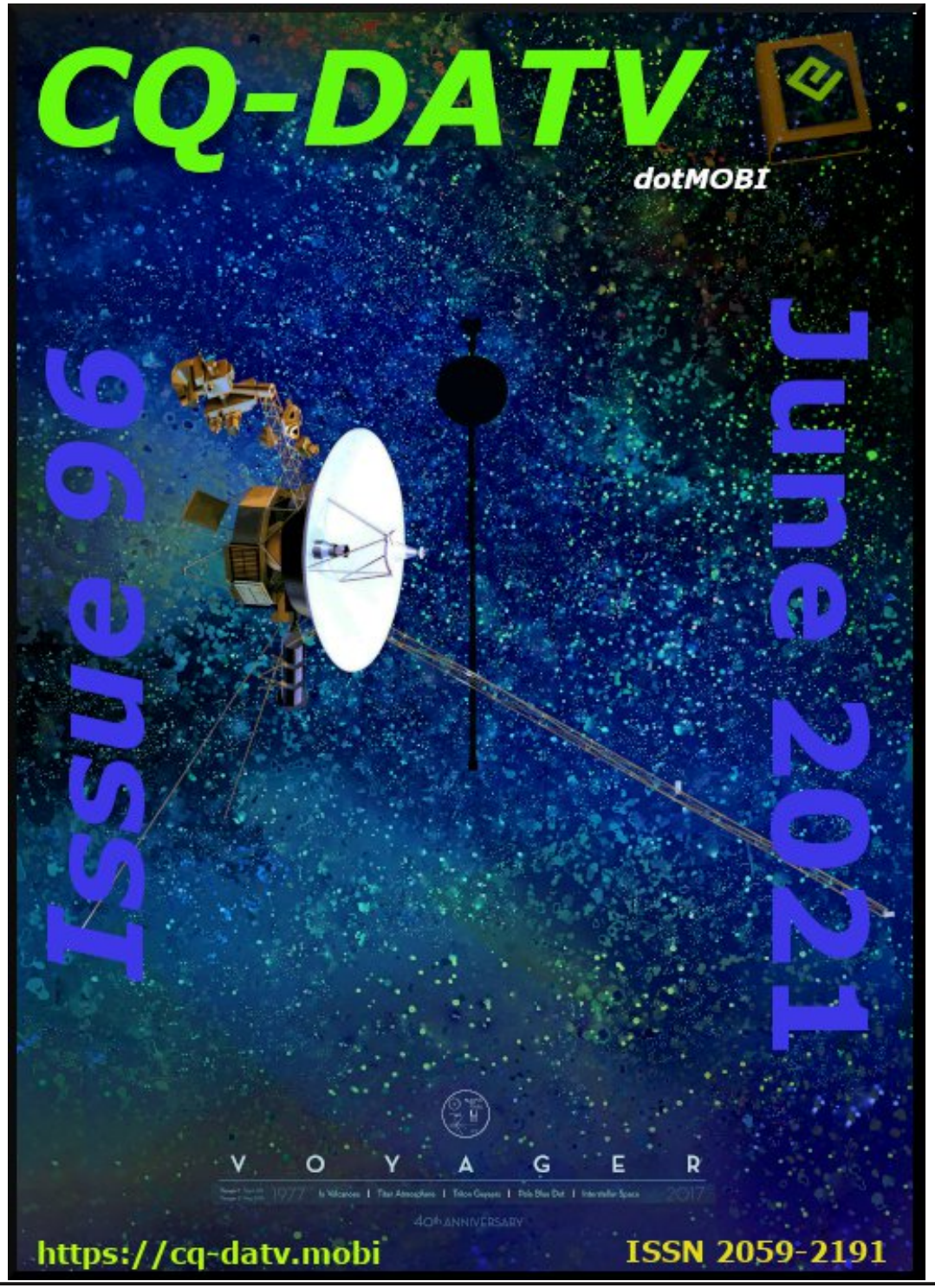

In this issue

Cover picture courtesy NASA

The CQ-DATV editors gratefully acknowledge all those authors that have contributed articles for this free magazine.

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"Where have all the Authors gone, long time passing"

Editorial

Welcome to CQ-DATV 96. We have passed another milestone in that we have been producing CQ-DATV every month for eight years and are now entering our ninth year.

Check out our web site *https://cq-datv.mobi/index.php*, where you can download all the back issues on the eBooks page and even an index (further down the Ebooks page under the Specials section). Alternatively, you can download an Omnibus with all the back issues in one file - look for the cover with a picture of a bus on it - also on the Ebooks page.

The index and omnibus editions are updated as each issue is published so they are always current. The index is also fully searchable for article, author or callsign from the main website menu on the Search page.

Also on the web site is all the supporting software and other support items for all the projects we have published in CQ-DATV under the Downloads menu item.

Now, nobody is perfect and we have had one or two complaints over the years, but we are trying our hardest to provide the ATV community with a relevant and FREE magazine.

The material for the magazine is sourced from various places - some comes from a core band of people who support the magazine, other articles are contributed directly by people just like you and articles from websites we have seen were we have been granted permission by the author to reproduce it.

We never publish circulation figures; these vary from month to month and no records are kept of who is downloading our magazine hence there are no logins required or cookies involved. The data we have is just download numbers. The largest edition was over 19,000 downloads and it is still increasing.

In this issue we have the usual news stories from around the world.

Mike Collis, WA6SVT investigates using the LDMOS, 50-volt transistor. This was designed for use in 750-watt plasma welders and RF heating devices but is very linear and well suited for use as an amplifier on the 23 cm band. The manufacturer's data sheet shows the device is capable of 750 watts at 900 MHz and 600 + watts at 1300 MHz's.

Trevor G8CJS reveals "In space no one can hear you scream." But apparently humming is possible as Trevor reports on the detection of hum from the spacecraft Voyager 1.

There is hardly an issue of CQ-DATV produced without something involving the Adalm Pluto. This time Roberto Abis IS0GRB looks at how to connect one to the internet without using the USB/Ethernet adapter.

In this month's one from the Vault, Trevor mixes something old with something new and takes is a look at a single board computer called "BASIC Engine" that features colour graphics and sound. The old part of the mix comes from some of the available software, which has the definite look of 1980's computer games.

Please sit back and enjoy CQ-DATV 96
CQ-DATV editorial team

IARU Region 1 ATV Contest 2021

This year's IARU ATV contest will go ahead on the weekend of 12/13 June 2021. However, due to the COVID-19 crisis not all participants will be able to reach their portable sites, and some may feel that they are at a disadvantage in only being able to operate from home due to National restrictions. To address these concerns, as for last year, the contest will be run with 2 sections:

Section 1 will be for participants operating from their registered home QTH. No change of operating location will be permitted during the contest for entries in this Section.

Section 2 will be for participants operating away from their registered home QTH at any time during the contest. So, even if you operate from home on one day and a portable location on the second day, if you want to add the scores under the rover rule, you must enter Section 2.

Apart from these changes, the rules are as stated in the IARU-R1 VHF Handbook V9.01. An extract can be found here: *https://tinyurl.com/fzt6k2hk*

Please use the normal entry spreadsheet

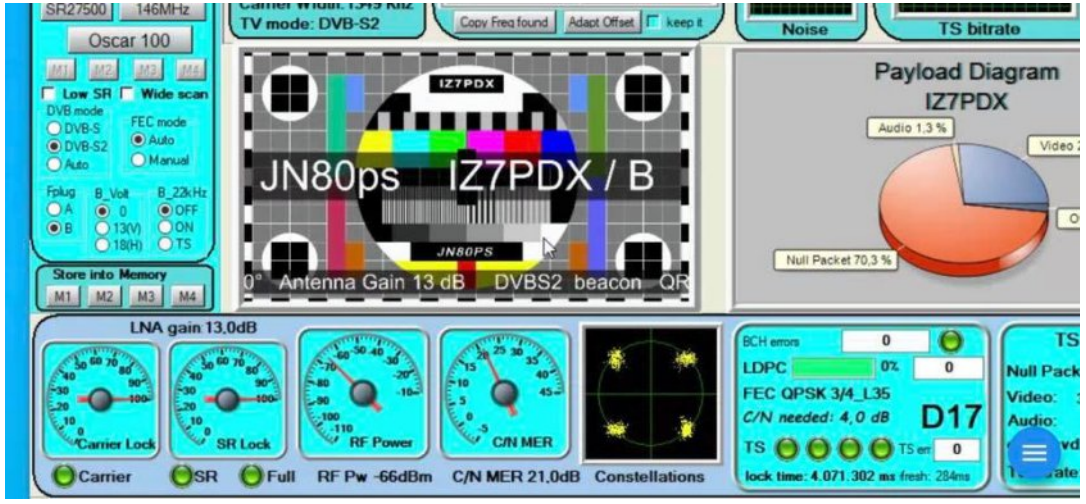
https://tinyurl.com/yvrvk79u and remember to select the correct Section on the Summary page. Entries should be submitted to National Coordinators or *atv@iaru-r1.org* before Monday 28th June.

Dave, G8GKQ - IARU Region 1 ATV Contest Coordinator.

Luigi D'Arcangelo comments:-

Tx antenna # 2, prime focus with 1 m grid reflector

Biquad double panel antenna comparison test and first fire with grilled reflector and self-used feed band 23 Cm. Same transmission DVBS2 3 W (monoscopic beacon 720 P 25 fps H264 1000 Ks) alternatively with the two horizontal polarization antennas, receiving another model similar to the first grill fire pointed towards the transmission site, distance is 10,2 km (not optical reach). Well 13 dB first fire gain on the double Biquad!
First focus signal with grilled reflector received from the site 10.2 km away from Minitioune Pro v2 tuned to the If of the



SG Lab 2m-23Cm transverter

73 of Iz7pdx Ham Radio Station.

The oldest fully operational OB truck in the world

Broadcast Engineering Conservation Group are working on this, they already own the oldest working Outside Broadcast scanner.

Project Vivat 390EXH MCR23

Not one example of a 1950s BBC television outside broadcast unit survives, despite the 50s being such an important decade for the new medium of TV.

This project sets out to redress that lack by recreating a representative operational unit. It is based on a very similar

early 1960s vehicle (MCR23 – 390EXH) but fitted out with original early 1950s equipment.

Originally this truck was BBC MCR23 - one of a batch of ten made. We're taking it back 10 years (or so) to represent the earlier Marconi equipped 50s BBC truck which look similar although based on a Bedford chassis. That had Marconi MkIII cameras and is where we've gone with the technical fit.

The name 'Project Vivat' reflects the rebirth of the truck and echoes the cry at a coronation of 'Vivat' which is connected to our project via our Marconi MkII cameras used in 1953 at HMQ's Coronation. The CCU and PSU is common with the MkIII and the goal is to have a working MkII to illustrate that.

We're nearly there now - three working Marconi MkIII cameras, all the sound/vision mixing kit, monoscope camera, etc., etc. It's taken almost 10 years of work starting with a vehicle only really fit for the scrappers. It will be the oldest fully operational OB truck in the world and BTW, we believe that our 'Southern' is the oldest operational colour truck. Unless anyone else knows differently. We still hope to do our inaugural 'broadcast' with Vivat this year. It's been 100% funded by individuals. The 'rival' truck which you may have pictures of, will be largely non-operational and uses mid 60s kit. They've had Lottery money but we decided a long time ago to not do that because it's too controlling and the 'bang per buck' tends to be poor. 'Doing it yourself' also gives a lot of satisfaction (as well as grief . . .).

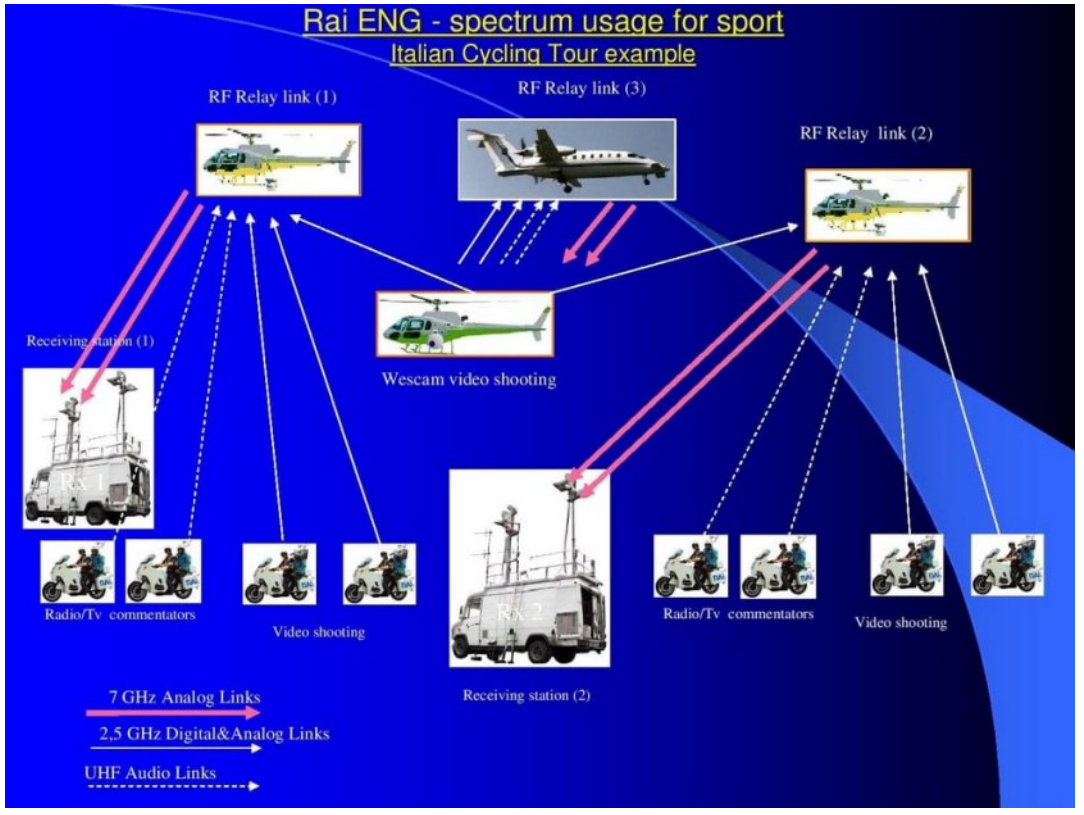
Also on the BECG site is a demonstration of the first Stereo sound transmission in 1958: Charles Brooker demonstrated how BBC listeners could experience the wonders of stereophonic sound. All you needed were two speakers, a comfy chair, basic trigonometry and received pronunciation.

This was one channel on the medium wave wireless receiver and one channel on BBC1 Television, how did they get the phase right, well they reversed one channel half way through, so it least half the transmission had the correct phase.

Source: *https://tinyurl.com/u4kphw7c*

Follow that bike!

Cycling tour of Italy and listening to the com RAI .... there is a special aircraft that follows the entire route and acts as a radio link (listenable on 459 MHz) .... the system is complex



enough to ensure full coverage of the event. The connections in the race with the mobile control unit located at the arrival of the stage are made as shown in the figure with two bridge helicopters and an aerial bridge.

Then there is at the arrival of the stage a satellite link to bring the program to the broadcasting direction of RAI 2 and RAI Sport which is located in Saxa Rubra.

From the last news I had, there have been some small changes, the means for elix reception have been made, the uplink has also been placed in the same medium, so the means have been optimized, the TXs have changed on the bikes, and the Airplane: I-CGAT Considering that the bridge plane at just 1,000 has a coverage of at least 150 km.
The 4 motorbikes and the two shooting helicopters transmit simultaneously to the bridge helicopter and the aerial bridge.

The latter transmit two distinct beams towards the 3 helicopter receptions. The first post at the beginning of the stage and which transmits on the sat an ASI "bundled" with 3 services. The second halfway through which always receives and transmits on sat 6 services and finally the third reception which is found on arrival. The reception on arrival (RX99) receives for the first part of the race the images from the sat transmitted by the other receptions and a hundred kilometres from the finish makes a switch and begins to receive her directly through the bridges installed on a crane. Everything is delivered to the two directors. One for the international feed and one for the personalized Italy here an interesting (but old) video explaining the whole system: https://tinyurl.com/4kbccbya

73 of IW2BSF - Rodolfo Parisio

Luigi D'Arcangelo reports

Group photo at the end of the fast 1298 Mhz signal reception operations. - with Bartolomeo Lacitignola

Test link 38 Km DVBS2, 23 Cm 3 W. Tx Biquad double panel antenna, Rx first fire parabola antenna 1 mt. After installing the temporary panel and beacon on the IW7ECA Bartolomeo Lacitignola terrace in Monopoli we turned on the transmitter that repeats a '' static beacon '' in loop thanks to the Adalm Pluto modulator with F5OEO firmware and patch v1. 9 by Roberto Abis IS0GRB. Despite the skyline coverage of several higher buildings we pointed the panel in the southeast direction towards Brindisi and we headed by car towards the famous Ostuni '' White City '' and then Carovigno, a beautiful village climbed the first climbs of Murgia Pugliese coming from the south of Salento. We have previously selected these spots from Google Maps based on altimetry and verified the link feasibility margin with Radio Mobile.

Despite the low quota of 126 mt of the reception site and 35 mt total SLM of the transmission site and the various obstacles present in the process and above all the lack of filters that pass the band on the receiver we received with the Minitioune Pro v2 a good one signal and satisfying MER. The wide tx panel lobe allows you to move to multiple sites without having to correct the transmission antenna's aim and to add about 20 dB of profit the reception antenna thought of it even with approximate aim. It was a nice afternoon spent in the company of the IW7ECA colleague of the Iq7gc A.R.I.

Castellana Grotte Contest Team. Find all the technical details in the photo captions.

73 everyone and happy Sunday Iz7pdx Ham Radio Station.

Continued back page...

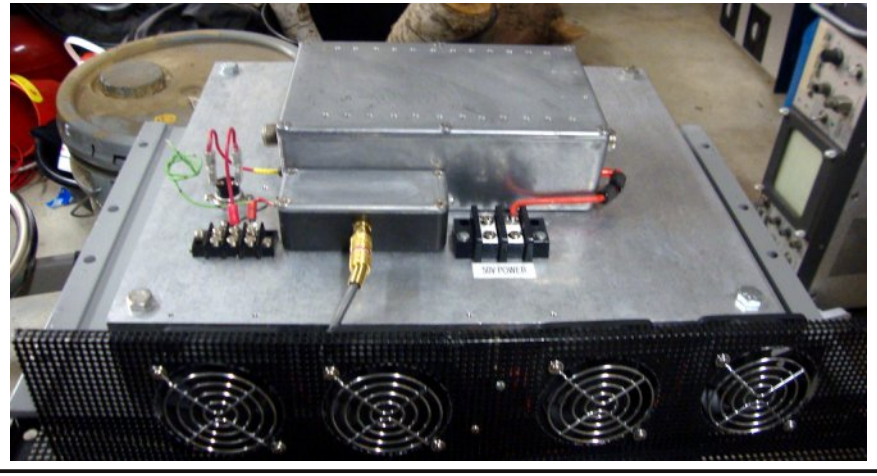
600 Watt 23cm Amplifier

Written by Mike Collis, WA6SVT
Reproduced from Boulder Amateur Television Club TV Repeater's REPEATER February, 2021

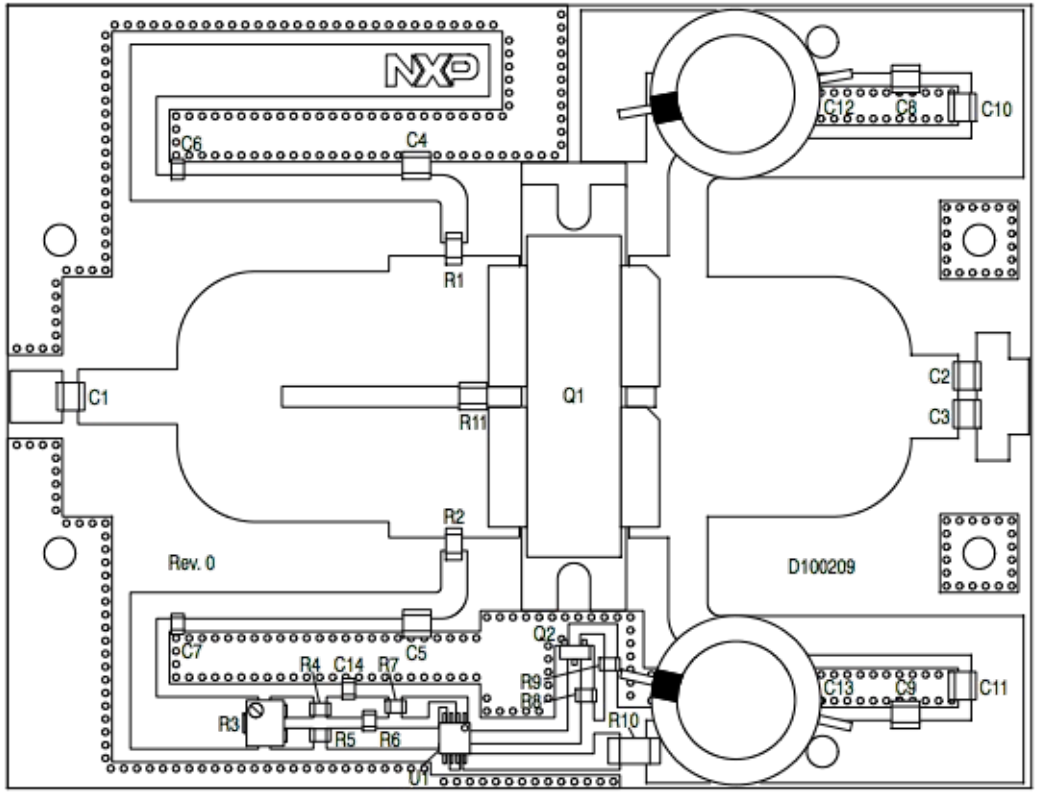
Our latest 23 cm band, ATV repeater output amplifier project is based on a RF amplifier pallet manufactured by Jim Klitzing W6PQL utilizing an NXP, MRF-13750.
https://tinyurl.com/ychdacxk

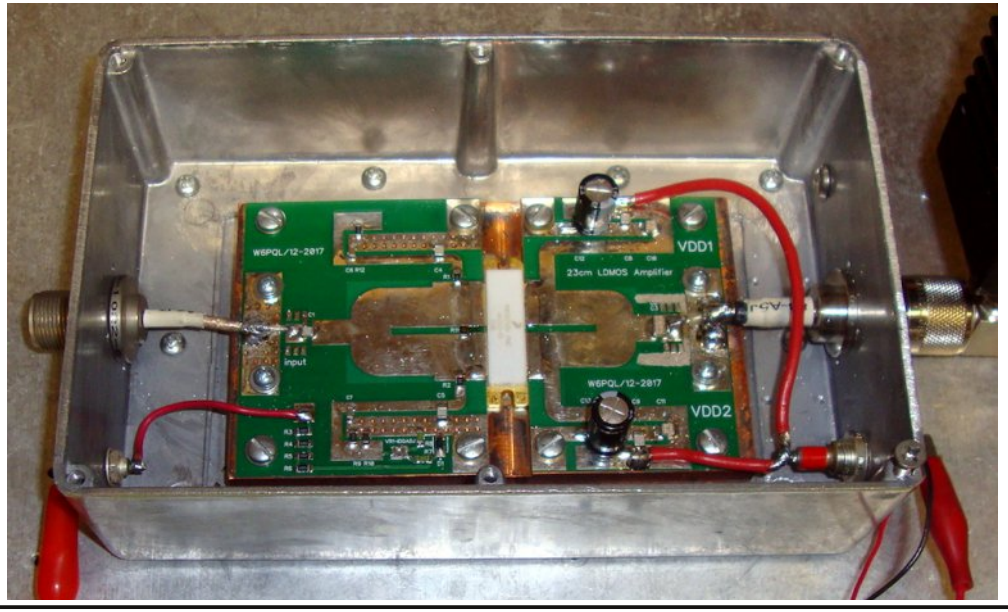
This LDMOS, 50 volt transistor although it was built for use in 750 watt plasma welders and RF heating devices is very linear and well suited for the 23 cm band. The manufacturer's data sheet shows the device is capable of 750 watts at 900 MHz and 600 + watts at 1300 MHz.
https://tinyurl.com/y8ojartv

The NXP data sheet also includes the design for a 1.3 GHz amplifier showing a circuit board layout and a complete list of required parts. Jim designed such a circuit board for using the device at 1296 MHz for weak signal mode including digital weak signal modes with their high duty cycles. Jim offers the MRF-13750 amplifier in three ways, either a complete amplifier in a case, or an RF pallet in kit form, or as a complete and tested pallet.



1300 MHz NARROWBAND REFERENCE CIRCUIT – 3.0″ × 3.9″ (7.6 cm × 9.9 cm)





Our group obtained two complete and tested pallets from Jim and built up two amplifiers. One for Santiago Peak (our first one) and the second for Mt. Wilson (a few months later) ATV repeaters. Currently we are still using VUSB analog output at Santiago but would like to move to DVB-T when most of it's users obtain new HiDes digital receivers.

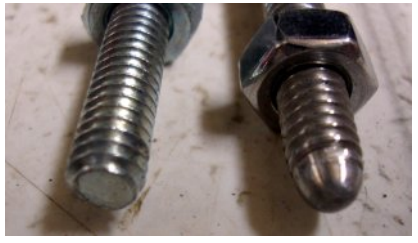
A copper heat spreader covers the full PC board underside and is 1/2" thick. The transistor is soldered to the spreader prior to adding the PCB. This was the main reason I decided to purchase the complete pallet. I am very pleased with the performance of the amplifier and how well it is constructed. I used a Hammond 1590 diecast box and cut out most of the bottom leaving a rim then fitted it over the pallet and screwed it to the heat sink to provide some RF shielding. The pallet was then directly attached to the heat sink.

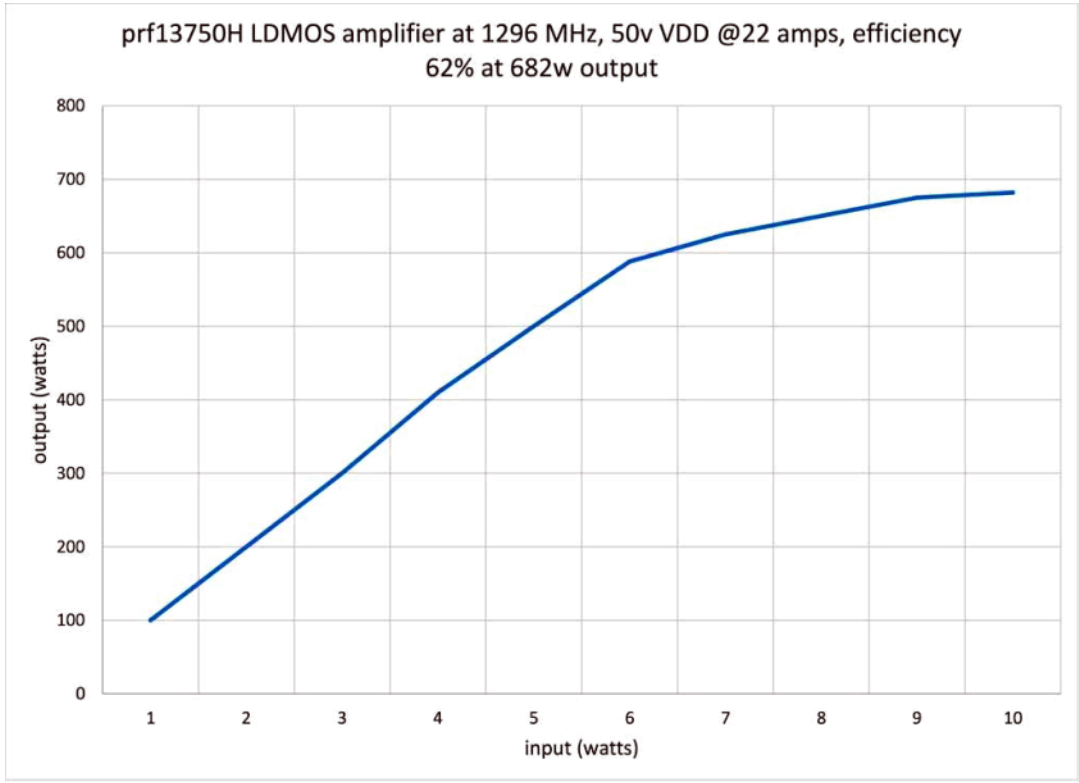
We obtained a very large heat sink big enough for a 1 KW amplifier to mount the RF pallet. A variable fan controller is bolted to the heat sink and runs the fans at 8 volts during times the repeater is not transmitting and also when the repeater is not used that much. As the heat sink starts heating up the voltage is increased and maximum voltage is 13 volts. A bimetal cutoff sensor is used in the bias line as an added safety in case the fans die to protect the amplifier.

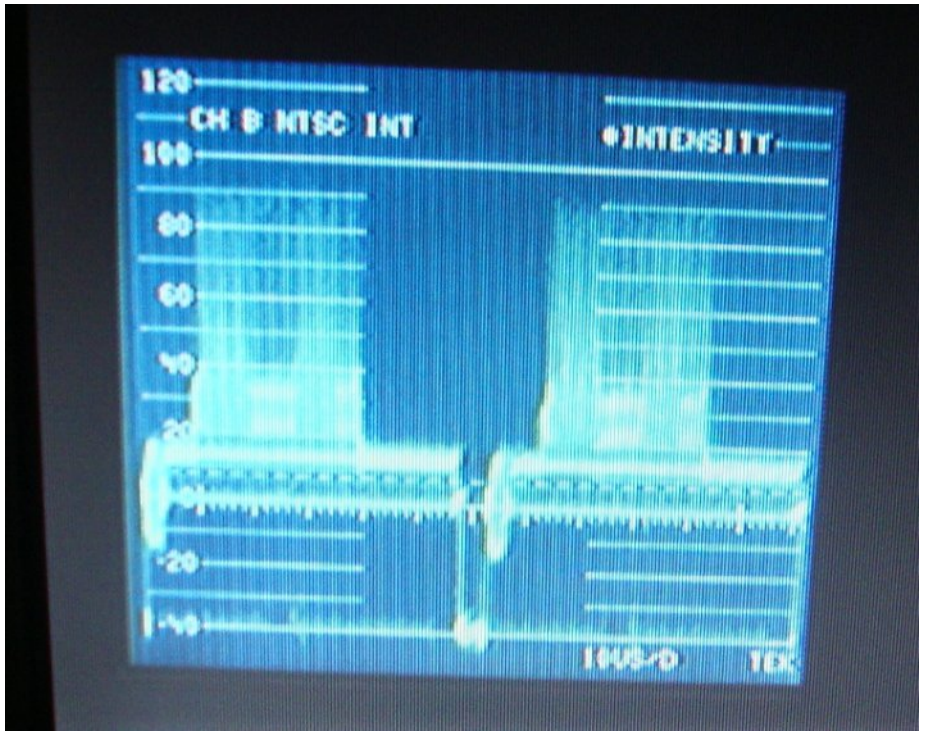
The RF pallet as received from W6PQL was tuned for 1296 MHz. Jim had provided some extra small cap pads for tuning. and I optimized the amplifer for 1253.25 MHz by adding in the small square pads on the input and output while sweeping the amplifier with about 10 watts output. This is a safe level to use while tuning. The amplifier was then checked at higher power with the lid on. Idq was set to about 1.6 amps Changing the Idq also affects the return loss. More Idq lowers the frequency of the return loss dip. Using all of the pads, I ended up with -20dB for S11, input return loss. Adding pads also widened the return loss bandwidth, which is good to have when using ATV.

DCI, 4 cavity, Band-Pass Filter -- opened up, cleaned up and de-burred

Although the amplifier is capable at over 600 watts, our antenna is only rated at 400 watts and our old DCI bandpass filter was rated at 200 watts but would arc over at 170 watts. We thus took the DCI filter apart, cleaned it and debured the ends of the resonator rods and polished them smooth to eliminate any sharp edges. New stainless steel tuning screws were made with the ends rounded off and polished. With these mods and then turning up the rf power to 400 watts, we had no arcing. Surprisingly, the insertion loss also dropped from 0.45 db to 0.3 dB.







Tests show the amplifier has 20.5 dB gain not only at low power levels but still has 20 dB gain at 400 watts as shown in this Pout vs. Pin graph. At these power levels even RG-214 is not good enough for the output jumper to the filter and filter to Heliax feedline. We used RG-393, which is a teflon version of RG-214 and will not deform when heated.

We are now using the amplifier for analog, NTSC, ATV. For a quality test, the demodulated, analog VUSB video was received at KC6JPG's QTH on a waveform monitor and Roland aimed his camera at it so I could see it while at Santiago Peak and take this photo. With NO sync boost, yes you heard that right, 400 watts peak sync and no video processing needed! The amplifier's third order IMD is very low and very, very little lower aural carrier regeneration and no noticeable 920 Hz beat between the aural and color subcarrier on saturated color images. I run the aural carrier at -12 dBc..

I also obtained a higher power slug for my Bird 43 wattmeter. The 100 watt slug was pegged measuring average analog, VUSB-TV power as you can see in the photo.

The amplifier also seems to work well for DVB-T. At 100 watts indicated output power on the Bird 43 wattmeter, the spectrum shoulders break-point was about -35dB. From the BATVC newsletters (issues 66 & 67) discussion on measuring DTV power, we know the Bird 43 reads too high for digital signals. Jim, KH6HTV's measurement said 2.1dB and Mel, K0PFX's, says 3dB. Thus, I was probably seeing DVB-T output power of the order of 50 to 60 watts, rms. This would be consistent with running a DTV transmitter with a crest factor of about 10dB.

The efficiency of this new amplifier is about 63% at saturation and in the high 40s at analog VUSB-TV power levels. Our old amplifier used a pair of four brick, 65 watt Downeast Microwave amplifiers phased together for about 80 watts peak sync, the RF modules used had only 20% efficiency at saturation and less than that at analog TV power levels. Adding to that an Astron 60 amp analog regulated power supply and the 117 VAC conversion to RF efficiency was not that good. The new amplifier's 117 VAC conversion to RF teamed up with a 50 volt switching power supply and we now use 10 watts less AC line power and get over four times the rf power output.

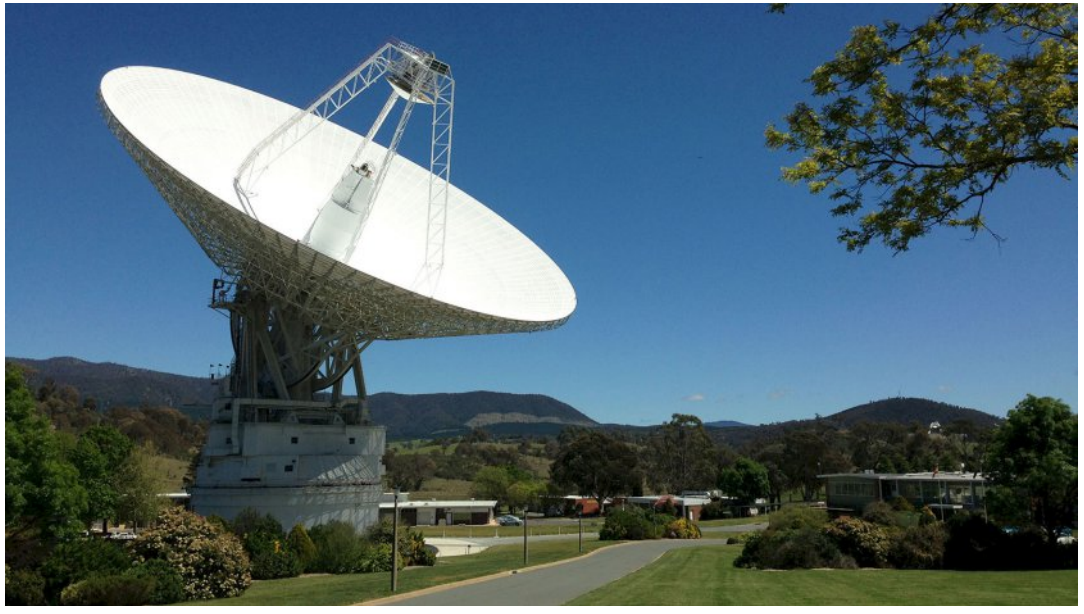
73, Mike WA6SVT

Voyager

Written by Trevor Brown G8CJS

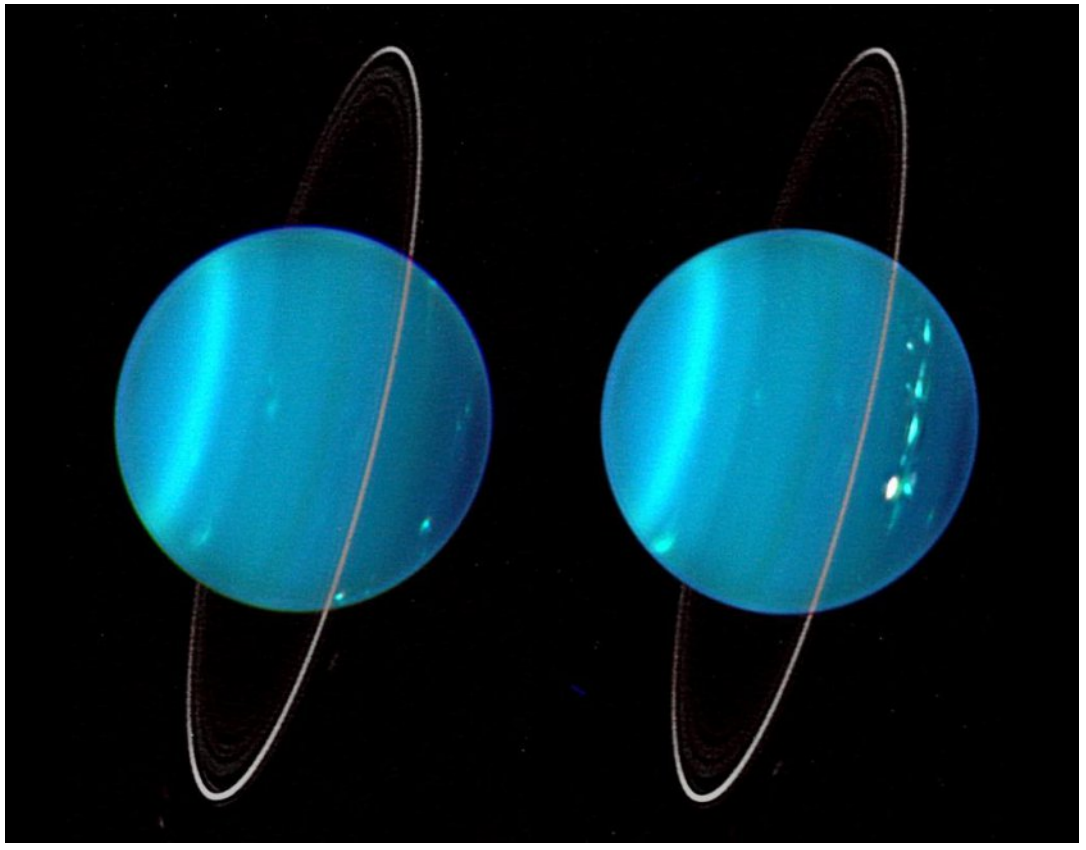
The classic 1979 sci-fi horror film "Alien" was advertised with the memorable tag-line, "In space no one can hear you scream." It did not say anything about humming!

I have to admit that outer space has always featured prominently throughout my life. I think it started with Saturday morning matinees at the local cinema where at a very tender age we were fed on a constant diet of Flash Gordon and Buck Rodgers. Later the comics I bought did not help, Eagle and their Dan Dare character have a lot to answer for.



A 70-meter-wide radio antenna at the Deep Space Network's Canberra facility in Australia

Outer space mixes well with amateur radio and receiving OSCAR 1 orbiting and sending our "hi". In CW took it to the next level. Followed by receiving pictures from ASTRA with a 60 cms dish on our patio, that always announced visitors as



Keck Telescope views of Uranus.
Credit - NASA/JPL-Caltech

they had to pass by it, to get to the front door, resulting in a momentary loss of signal and what was being beamed down well Star Trek of course.

August 2021 will be 44 years since the launch of the two Voyager space craft, both of which are still in operation and now past the outer boundary of the heliosphere in interstellar space. They both continue to collect and transmit useful data back to Earth. NASA's Voyager 1 and Voyager 2 were both launched back in 1977.

Voyager 2 was the first to be launched on August the 20. Its trajectory was designed to allow flybys of Jupiter, Saturn,

Uranus, and Neptune. Voyager 1 was launched 16 days after Voyager 2, but along a shorter and faster trajectory that was designed to provide an optimal flyby of Saturn's moon Titan which is large and possess a dense atmosphere.

Now this is real space exploration the final frontier. We have had pictures from the moon in between times, but we never got to see the original pictures from Stan Lebar's camera, 320 lines 10 frames per second *https://tinyurl.com/jatrwxds*. These recordings have all mysteriously vanished and all we ever saw was the poor standards conversions, or did we?

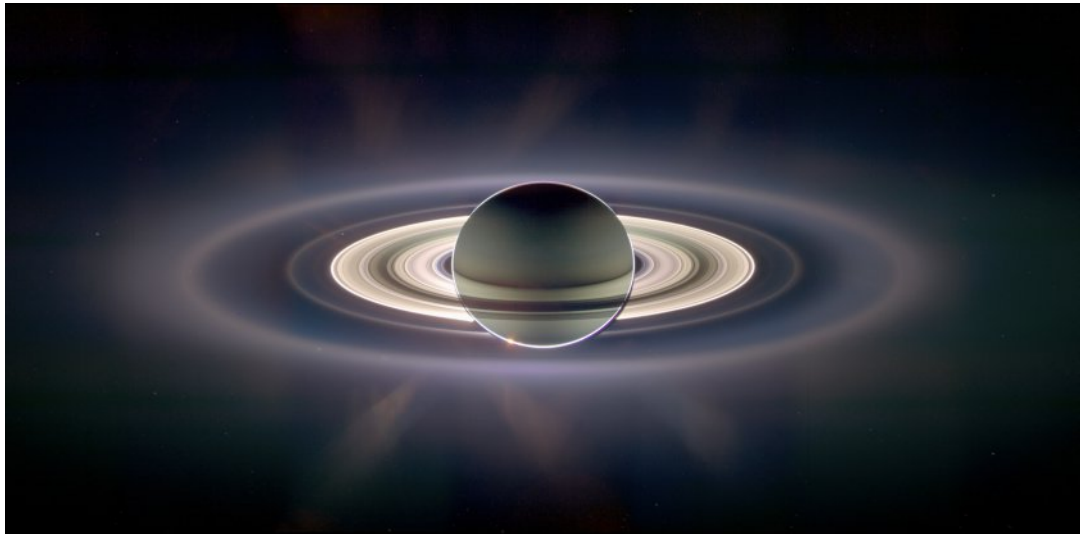
Returning to the Voyager crafts which are now more than 14 billion miles from Earth, exploring the boundary region between our planetary system and what's called interstellar space.

The flybys of Jupiter, Saturn, Uranus, and Neptune were in back in 1989. They did this with a unique launch window that took advantage of a planetary alignment of the four giant outer planets – one that will not occur again for another 176 years and sent back some stunning pictures, not bad for a vidicon tube camera.

There have also been some shock waves, three to be precise the most recent was in February 2014. The first event was in October to November of 2012, and the second wave in April to May of 2013. Perhaps, a voyage through interstellar space is not as smooth as we would like.

Uranus - Family Portrait. Credit - NASA/JPL-Caltech

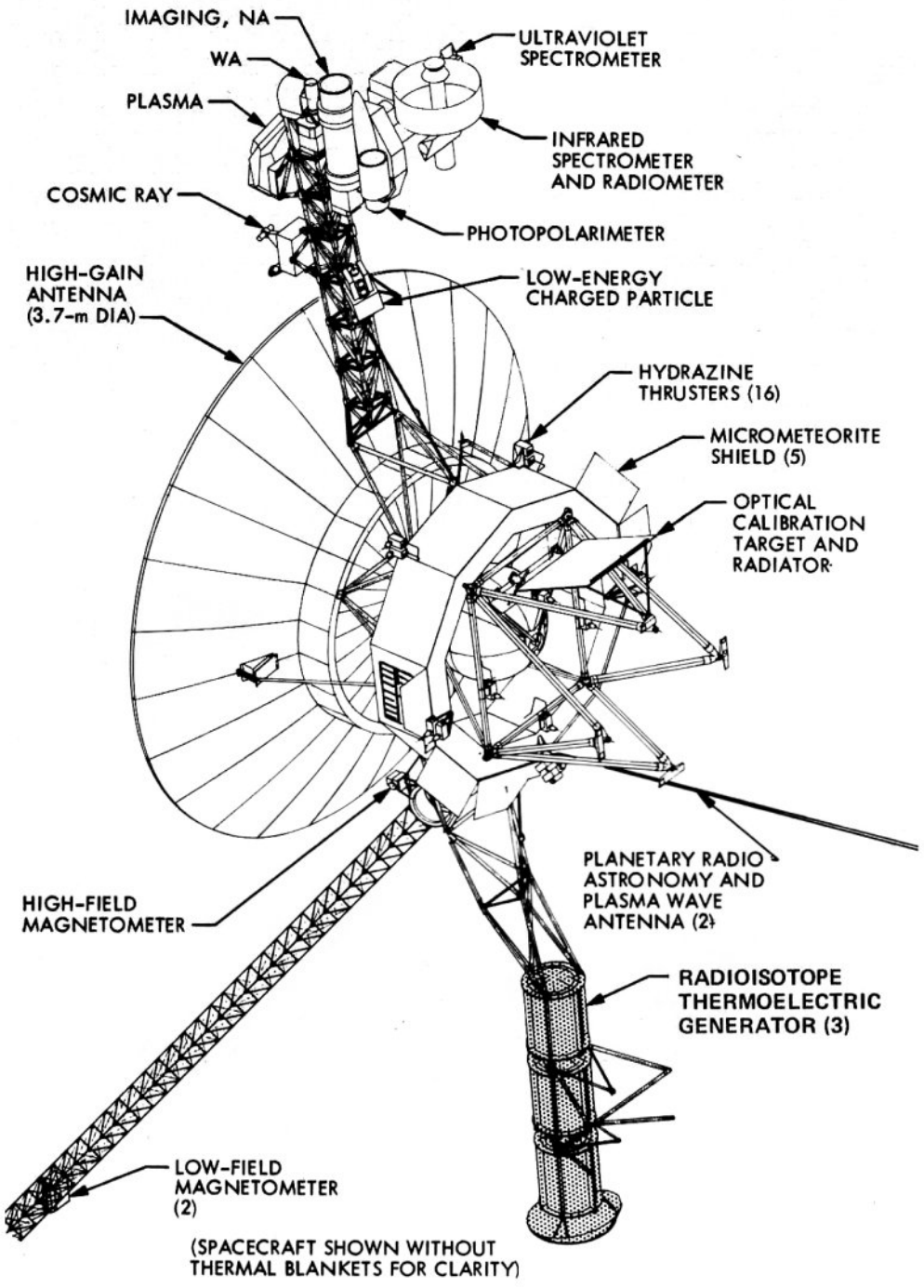
Voyager 1 has also popped up on social media this month as it sent back data revealing it has detected 'hum' of interstellar gas. Researchers from Cornell University have been studying this data sent back to Earth by the Voyager-1 craft and within this data is a persistent humming. Before you all jump in and ask if its 50 Hz or 60 Hz the team say this is a 'hum' coming from the gasses of the interstellar medium and is an eerie sound near to 3 kHz. The data coming back is slow and we are told these signals are weak.



A View of Earth from Saturn seen from a billion kilometers away, through the ice and dust particles of Saturn's rings, Earth appears as a tiny, bright dot. Credit - NASA/JPL-Caltech

Voyager 1 crossed into interstellar space in August 2012 - and is continuing to collect data. No man-made object has travelled further than this iconic spacecraft. It carries a copy of the Golden Record - a 'message to aliens' compiled by legendary astronomer Carl Sagan.

There are greetings in 55 languages, pictures of people and places on Earth and music ranging from Beethoven to Chuck Berry's 'Johnny B. Goode.'



Spacecraft diagram. Credit - NASA/JPL-Caltech

TV cameras

As ATVer's perhaps the part that most interests us is the imaging system which consists of two television cameras, each with eight filters in a filter wheel mounted in front of the camera tubes, these are vidicons, none of those CCD arrays back in 1977.

One camera has a 200 mm (7.9 in) focal length lens with an aperture of f/3, never heard 200 mm lens called wide angle before. The other uses a higher resolution 1,500 mm (59 in) narrow-angle f/8.5 lens (the narrow-angle camera), but compared with 1,500 mm lens 200mm really is wide angle.

Communications

The uplink communications are via S-band. The downlink communications are on X-band with an S-band transmitter as a back-up. All long-range communications to and from the two Voyagers have been carried out using their 3.7-meter (12 ft) high-gain antennas. The high-gain antenna has a beamwidth of 0.5° for X-band, and 2.3° for S-band. (The low-gain antenna has a 7dB gain and 60° beamwidth.)

The digital data rates used in the downlinks from the Voyagers have been continually decreasing the further that they get from the Earth. For example, the data rate used from Jupiter was about 115,000 bits per second. That was halved at the distance of Saturn, and it has gone down continually since then. Some measures were taken on the ground along the way to reduce the effects of the inverse-square law of RF levels.

In between 1982 and 1985, the diameters of the three main parabolic dish antennas of the Deep Space Network were increased from 64 to 70 m (210 to 230 ft) dramatically increasing their areas for gathering weak microwave signals.

Then between 1986 and 1989, new techniques were brought into play to combine the signals from multiple antennas on the ground into one, more powerful signal, in a kind of antenna array. This was done at Goldstone, California, Canberra, and Madrid using the additional dish antennas available there. Also, in Australia, the Parkes Radio Telescope was brought into the array in time for the fly-by of Neptune in 1989. In the United States, the very large array in New Mexico was brought into temporary use along with the antennas of the Deep Space Network at Goldstone. Using this new technology of antenna arrays helped to compensate for the immense radio distance from Neptune to the Earth.

Computers

There are three different computer designs on the Voyager spacecraft, two of each kind for redundancy. They are proprietary, custom-built computers built from CMOS and TTL medium scale integrated circuits and discrete components. Total number of data words among the six computers is about 32K. Voyager 1 and Voyager 2 have identical computer systems.

The Computer Command System (CCS), the central controller of the spacecraft, is two 18-bit word, interrupt type processors with 4096 words each of non-volatile plated wire memory. During most of the Voyager mission the two CCS computers on each spacecraft were used non-redundantly to increase the command and processing capability of the spacecraft.

There is a lot more information on the internet for the more scientific amongst us. I have restricted this short article to the more familiar topics of RF communications, TV cameras and Computer control, CQ-DATV's more usual topics. We have come a long way since 1977 and I thought it interesting to look back at the technology we used then along with the redundancy, particularly in the computing and control.

This artist's rendering shows NASA's Voyager spacecraft.

On the boom to the right, the Cosmic Ray Science instrument, Low Energy Charged Particle detector, the Infrared Spectrometer and Radiometer, Ultraviolet Spectrometer, Photopolarimeter and Wide and Narrow Angle Cameras are visible. The bright gray square is an optical calibration plate for the instruments.

The Golden Record, containing images and sounds from Earth, is the yellow circle on the main spacecraft body. The dish is the spacecraft's high-gain antenna for communications with Earth. The magnetometer boom stretches out to the upper left. The radio isotope thermoelectric generators, Voyager's power source, are visible to the lower left. Credit - NASA/JPL-Caltech

That both craft are still functioning and communicating and delivering useful data is an incredible credit to the Voyager teams. The power packs will probably not survive beyond this decade.

My thanks to all the people who have contributed to the Voyager Wiki's which provided a useful source of valuable information for this article. NASA for the pictures and all the social media reports which although fired up by the reports of hum, just remind us what NASA did back In 1977.

The Sounds of Interstellar Space

https://tinyurl.com/4stmvem6

Voyager Senses Sun's Tsunami Wave in Interstellar Medium

https://tinyurl.com/57x5b4dy

Commemorative Voyager Posters

https://tinyurl.com/3srhrvar

How Scientists Captured the First Image of a Black Hole

https://tinyurl.com/533jb8mu

So, You Want to Be an Astronaut?

https://tinyurl.com/fu5dy3te

'Exoplanets' and the Search for Habitable Worlds

https://tinyurl.com/twm75vu8

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Please consider contributing an article!

One Ham's Solution to Living Behind a Tall Mountain

Written by Jim Andrews, KH6HTV
Reproduced from Boulder Amateur Television Club TV Repeater's REPEATER May, 2021

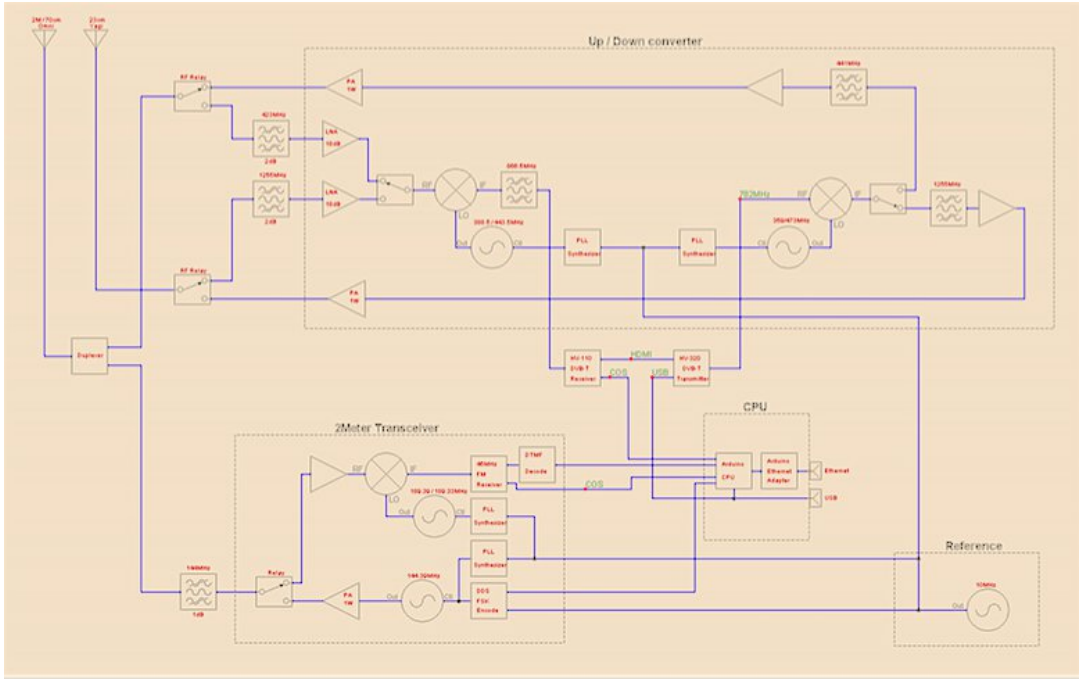
Boulder has one dedicated ATV ham who lives in the worst possible location to hit our W0BTV repeater. He is Steve, WA0TQG, on Sugar Loaf mountain. More recently, Jack, K0HEH, has been assisting Steve by relaying for him to/from the repeater. This was reported in the March issue #72 of this newsletter.

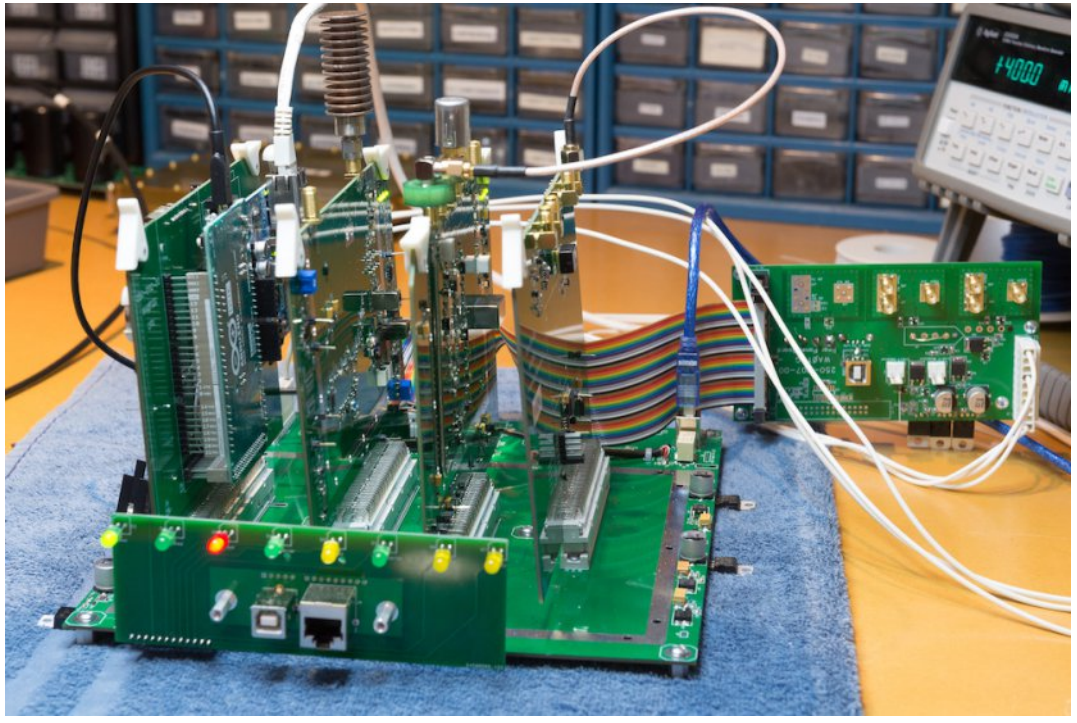
Steve, WQ0TQG & his well equipted electronics test bench

Well, Steve is a retired RF design engineer. He has a long history of very successful radio designs in his resume. But being retired has not stopped Steve from continuing to design innovative RF systems. Check out Steve's *www.qrz.com* bio for details on one of his creative ham projects.

So with this ATV rf propagation challenge, Steve has decided to design his own automatic ATV relay system to allow him to get into W0BTV for our weekly ATV nets. He plans to position the hardware at a location out on the prarie where there will be good line-of-sight paths to both W0BTV and his QTH in the mountains.

Here is Steve's up-date on the project with a few of the design details.





Thought I would update you on the progress I am making on my video extender repeater project. A lot has been done in the past few weeks such as:

1. *Built up all of the PC boards that I already have and will be using for this*
2. *Received the new PC boards from China that I laid out for this project and have built up all but one (2 meter radio)*
3. *Tested all build boards and have them running as a system*
4. *Completed the software although there will be more work on that as I work on the hardware and test out the complete system. Ethernet and USB interfaces all work so I can control the system and get debug and log information as I bring up the boards*
5. *Brought up most of the main RF converter boards including the VCOs, synthesizers, Receive section and the 70cm TX section. I just have the 23cm TX section left to verify and test.*
6. *Documentation is now up to 30 pages of schematics and over 75 pages of design notes.*

The normal operation of the system is as follows: There will be two antennas. A 23cm loop yagi pointed to the west and a 2meter/70cm vertical with a Diamond duplexer at the unit. The output power will be about +20dBm on both the 70 and 23cm outputs. I have the capability to add a power amplifier for either of the bands but right now only one.

When the unit is idle (or just power on) most of the power will be turned off to the various sections except for the processor and the 2 meter receiver. When I want to use the system I will send a DTMF command on the 2 meter link that will wake the unit up and when everything has settled it will receive the W0BCR repeater on 423MHz and repeat it out on 1255MHz. When I want to transmit I will send another DTMF command that will set the unit to receive on 1255MHz and transmit to the repeater on 441MHz.

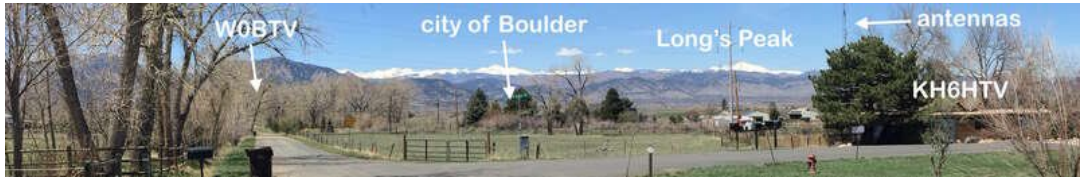
When I am done transmitting I will send another DTMF command to put it back into its previously described mode to transmit the repeater output to me on 1255MHz. If I fail to send the DTMF command and my DVB-T carrier drops for a preset time the unit will then automatically go back to the 1255 transmit mode as well. When it is in this mode if the repeater DVB-T carrier is off for another preset time the unit will go back to the idle mode.

Additional system operation capabilities: There are many other DTMF commands (some with admin access only) that can adjust these timings, load different configurations, etc. Data on the unit such as the mode it is in, various unit temperatures and any fault, error or warning conditions will be sent to the APRS system and will be viewable to anyone on the internet. In the case of any type of error the APRS system will send out an email to me (or any number of others) detailing the error. A log file is maintained on the system that shows various details of the system operation and I will be able to get to those locally through an Ethernet connection to help with any troubleshooting or operational abnormalities.

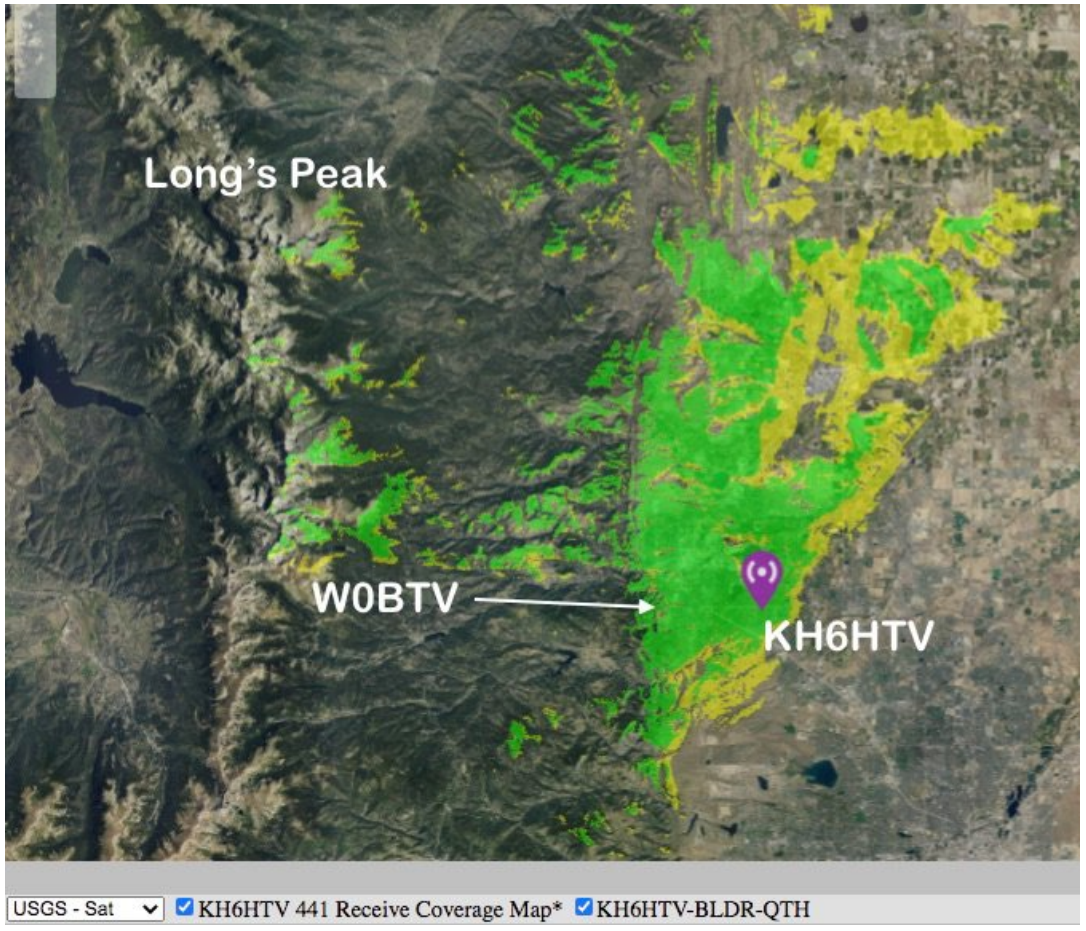
The system has many other features and everything is configurable with a file on the local memory card. There can be up to 99 different configurations saved and any one can be loaded using DTMF commands as well as setting any one as a default. The system frequencies can be changed and the operation includes a normal repeater operation where the transmitter is enabled whenever a DVB-T carrier is detected and it is dropped when the carrier goes away. One such example would be to set up a repeater with an input on 429MHz and an output on 1243MHz. I imagine that the 23cm signal would be strong enough to get into the repeater. Not sure why I do this but it is just an example of things that can be done for experimental purposes. (editor's note: This also helps Steve keep his brain cells young and functioning !)

If any of you can think of any sort of experimental or test configurations or other uses of the system let me know. I'm not willing to speculate on a finished date yet but will keep you informed of the progress and hopefully demonstrate some of the testing of the unit on the Thursday net.

Another Cross-Band Repeater:



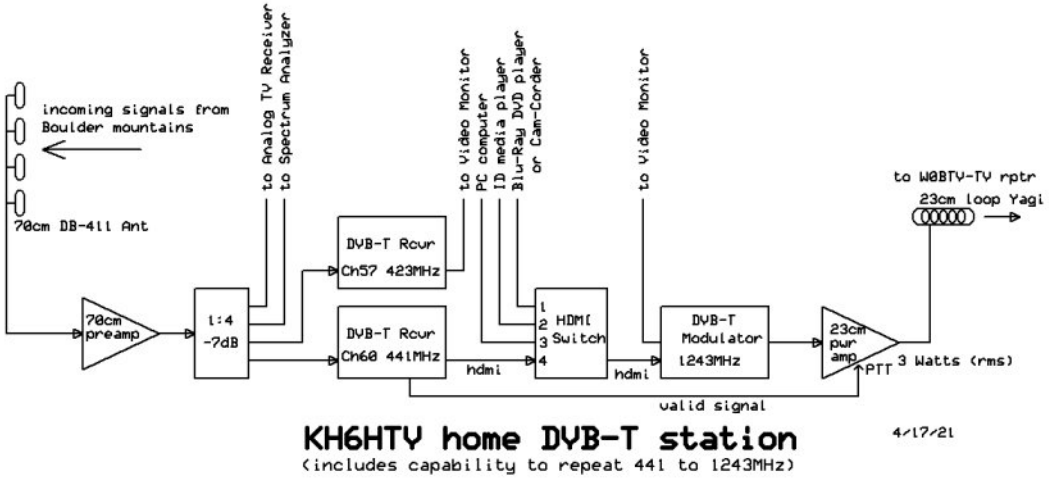
So following up on WA0TQG, Steve's efforts, I decided that I could make an easy mod to my ham shack DVB-T receiver/transmitter set-up and add the capability to also relay 70cm signals coming from the back-country up in the mountains of western Boulder County into the W0BTV repeater. My QTH is located out on the prarie in the eastern part of Boulder County. I am about 5-6 miles south-east of the city of Boulder. I have a 5 mile, line-of-sight path to the W0BTV repeater. I also have a great view of the mountains back to the Continental Divide. The view is especially good to the north-west about 30 miles up towards Long's Peak. The photo below is a satellite, aerial view with the RF coverage area from my QTH shown as the green & yellow overlay. This shows where I would be able to receive from, 441 MHz, DVB-T signals. The yellow shading is for weak signals (< 10dB rf S/N) and the greem shading is for strong signals. The coverage map was calculated assuming the transmitter would be the typical BCARES, back-pack, portable set using a 3 watt, model 70-7B, transmitter with a 6 element, Yagi antenna on a 10ft. mast. My receive antenna is a DB Products, DB-411, four element co-linear with 11dBi gain, a cardiod pattern pointing to 300o and mounted with it's center at about 35 ft. I used the free, on-line, computer program, Radio Mobile *https://tinyurl.com/uzda24jc* to generate this map.



Shown in the figure above is the block diagram of my home DVB-T receive/transmit set-up. The modulator is a Hi-Des model HV-100EH. The 3 Watt, 23cm, rf power amplifier is my own KH6HTV model 23-11A. The only item I needed to add to make it a cross-band repeater was the extra DVB-T receiver tuned to channel 60, 441MHz. I am using the low-cost, "combo" receivers. The extra receiver was modified to pick off the "Valid Signal" logic from the front panel green LED. This is routed to the model 23-11A rf linear power amplifier and inserted as the PTT logic signal. Thus when the 441 receiver detects an incoming, valid, DVB-T signal it will automatically key the output power amplifier.

The 23-11 amp had a three position toggle switch so I can determine how I want to use it. In the center position, the amp is on, but in "Stand-By" mode. In the up position, the amp is turned on. In the down position, the amp responds to the external PTT logic input. Thus when I want the system to work as a 70cm/23cm cross-band repeater, I simply set the HDMI switch to the 441 receiver and set the 23-11 amplifier to Ext. PTT.

Bingo ! -- that is all.
Jim, KH6HTV, Boulder, CO



How to connect Adalm Pluto to the Internet without using the USB/Ethernet adapter

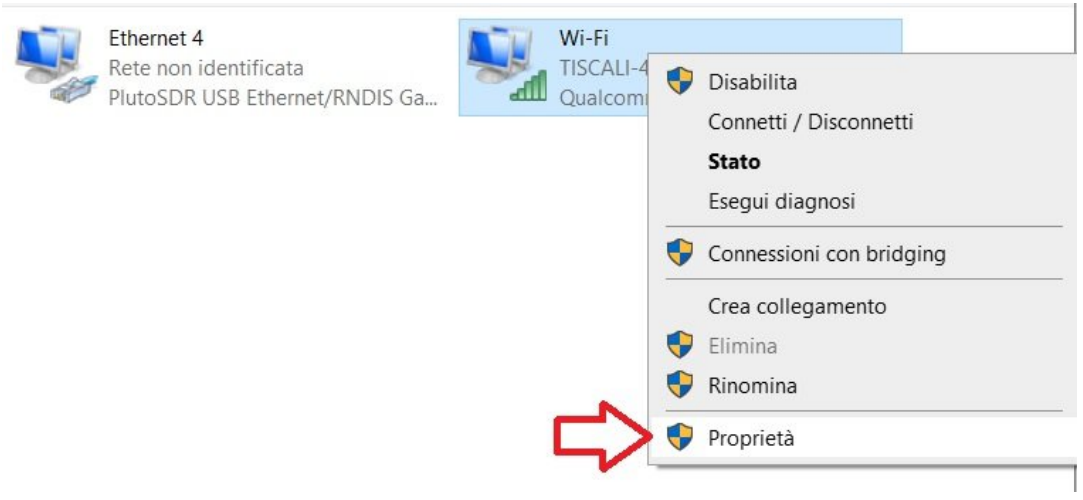
Written by Roberto Abis, IS0GRB

1- Access Pluto in SSH on its IP address 192.168.2.1 with (root/analog)

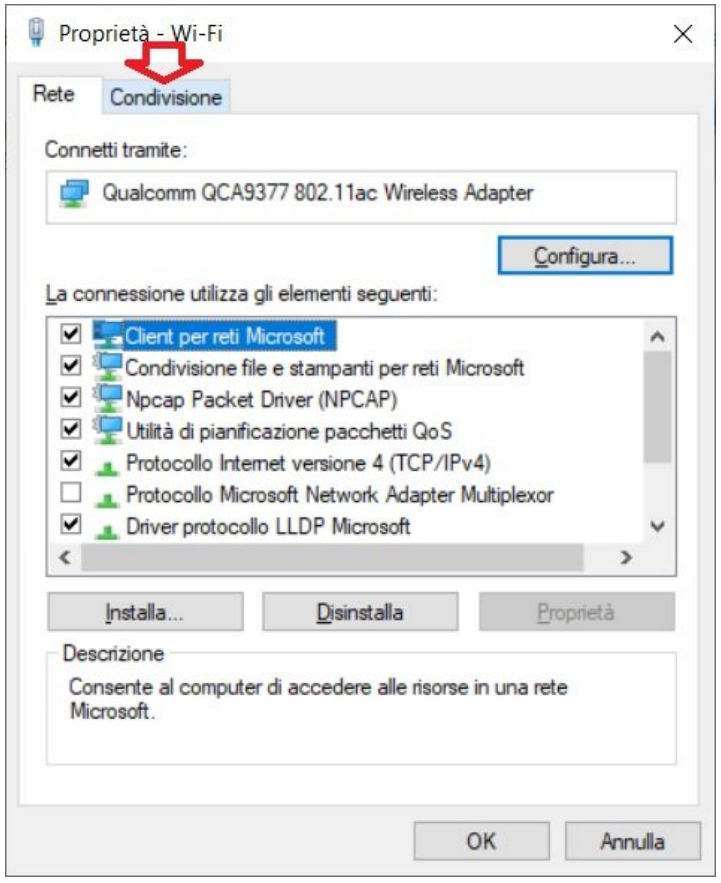
2- Enter the static route for the Internet on the Pluto:

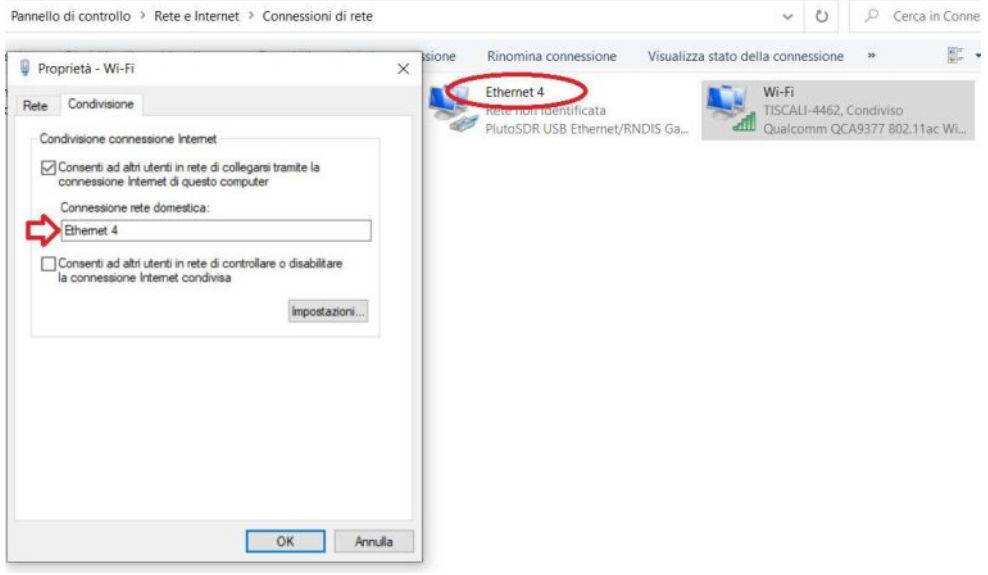
route add default gw 192.168.2.10 usb0

3- On your PC, select the property item on the wired Ethernet or Wi-Fi network (the one currently connected to the Internet):

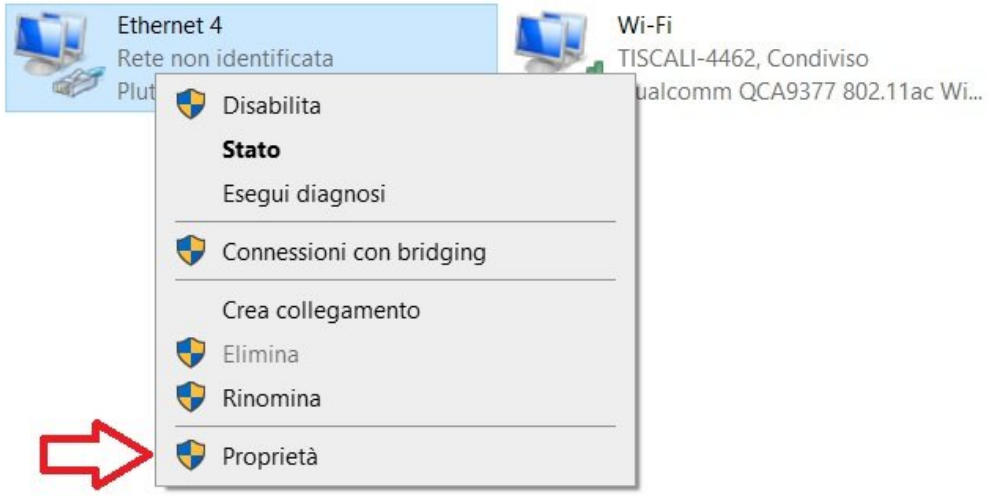


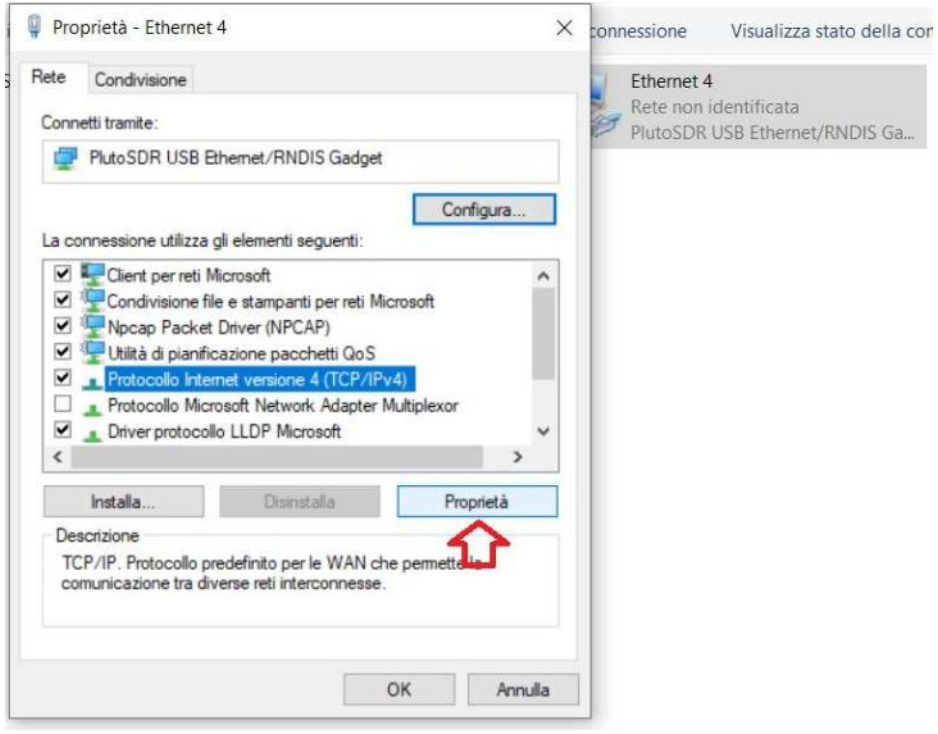
From the Sharing menu, activate "Allow other users on the network ...", then select the Pluto network, in my case Ethernet4 and confirm with OK:

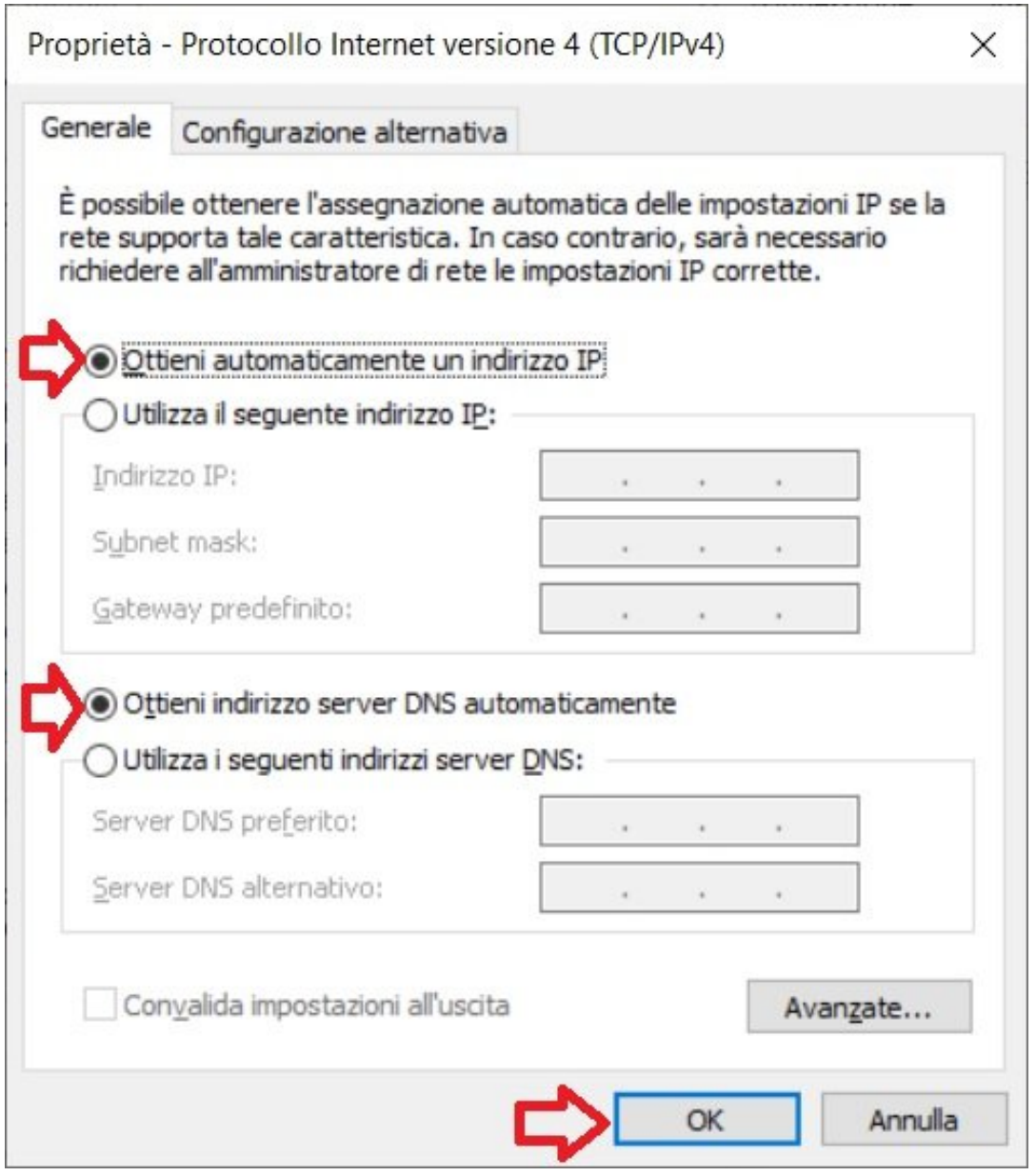




Now access the properties of the Pluto network, in my case Ethernet4 and select Automatic IP address and DNS, as after the Windows Internet sharing is activated, it sets the wrong IP address 192.168.137.1 for the Pluto network, different from the one that it should have 192.168.2.10:

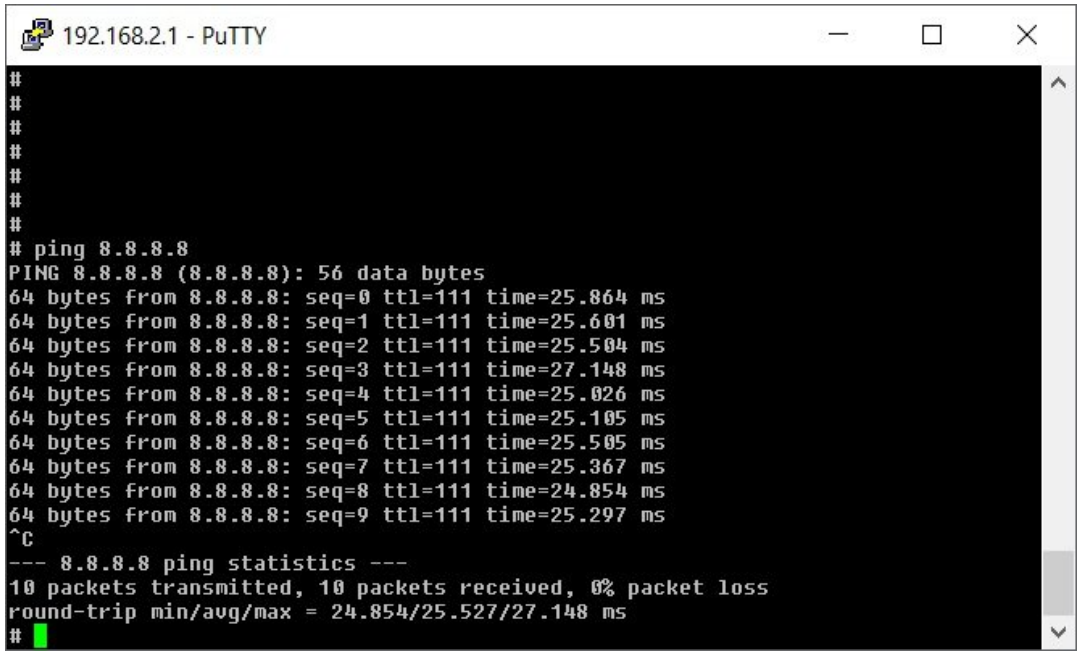


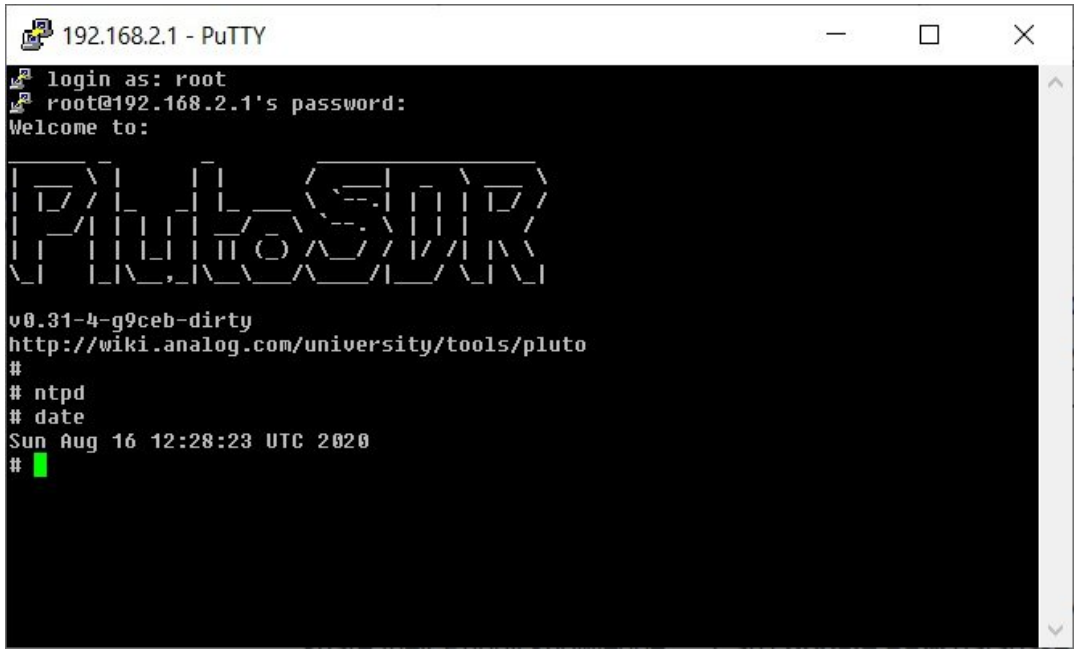




Let's now do the Internet achievement test from the Pluto:

ping 8.8.8.8





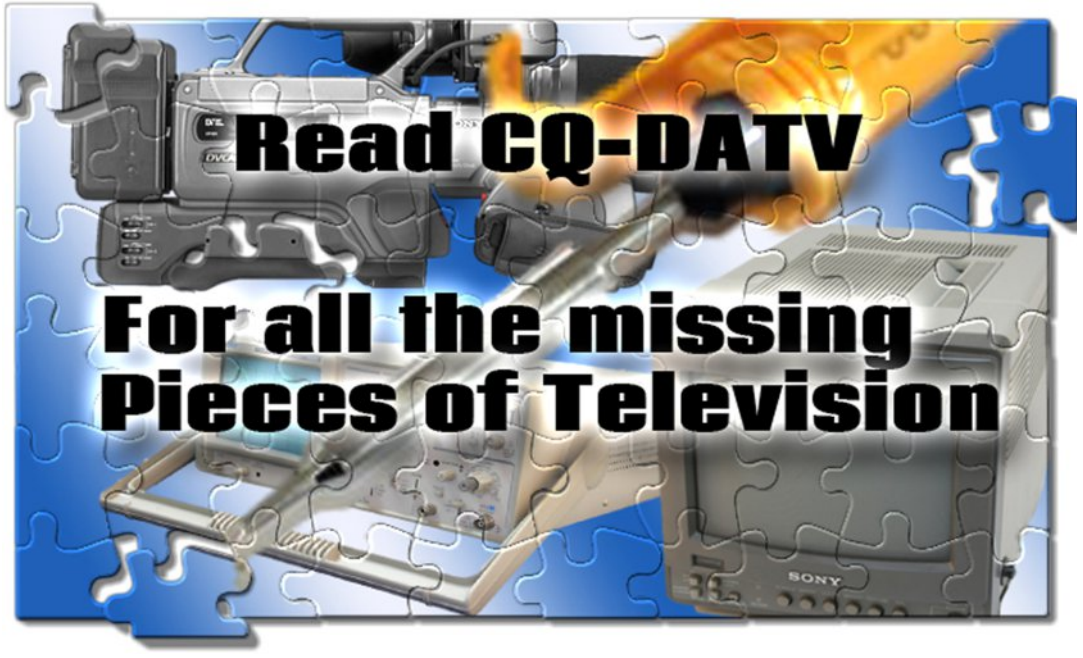
By activating ntpd you can update the date and time of the Pluto

ntpd

With the date command you can see the correct date and time

date

Please check Roberto's site for any updates to this article at *https://tinyurl.com/5aky3zpk*

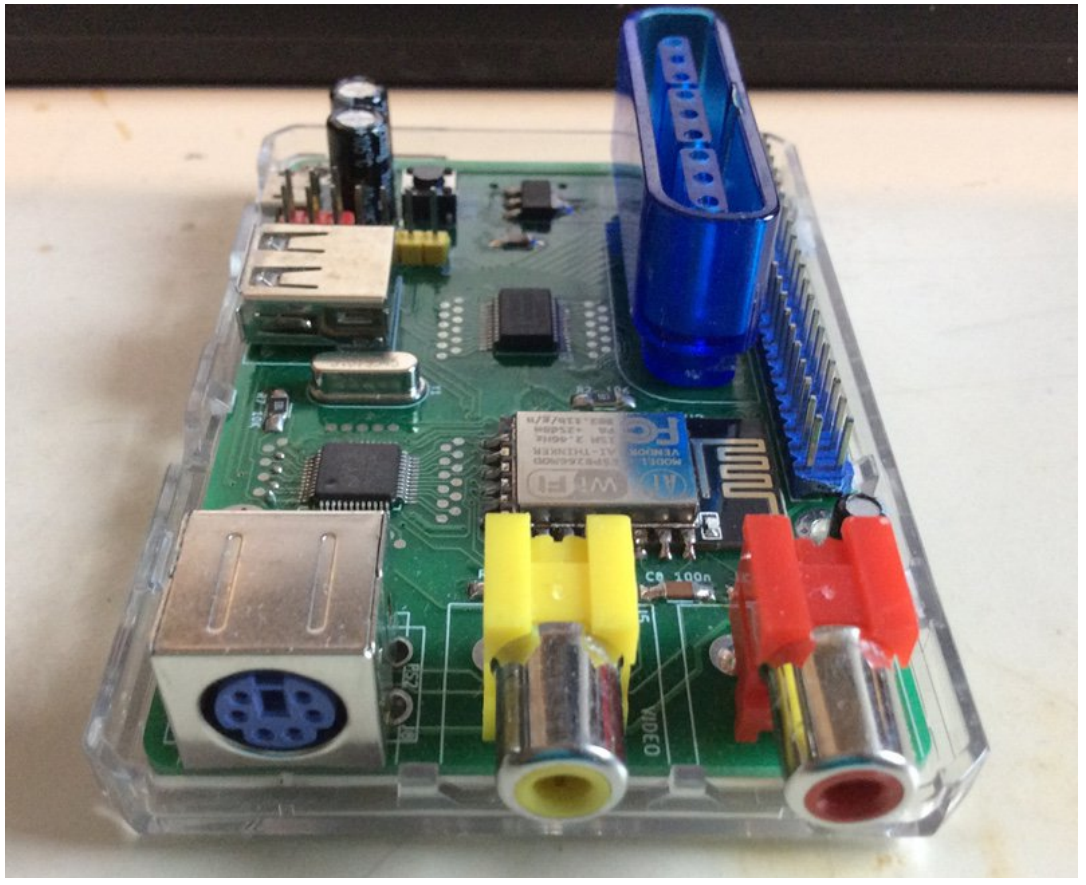


From the vault - The BASIC Engine

Written by Trevor brown G8CJS

From the vault, this month, we thought we would mix something old with something new and that is a single board home computer called " BASIC Engine" that features colour graphics and sound. The old part comes from some of the available software, some of which have a definite 1980's, 1990's look.

It you think you are back in the Jet-Set-Willy days of the Spectrum you might not be far wrong. For those of you that remember that much loved computer, let me just refresh your memory of the Keyboard connectors, the negative power supply inverter, and the DRAM chips that all were prone to failure.



This new hardware is a big improvement.

The downside is it's not available ready built, you have to put it together yourself and as, yet I have not found a single source for the components. There are SMD devices, and these need an air gun to solder in place, but there is a 1-hour video that shows a board being populated. I have personally spent longer trying to locate and replace faulty Drams on a Sinclair Spectrum, although I might add I was younger, and my eyesight was better.

The hardware might have a familiar look for those that have been following the Grass Valley Mixer project EG the 8266 and the PCF8575 which is the bigger version of the PCF 8574 used on this long running project.

The Hardware is as follows:-

- *ESP12-E/F module with ESP8266 SoC and 4 MB flash memory*
- *VS23S010 video controller with 128k VRAM and composite video output in PAL or NTSC*
- *5-bit PCM sound from I2S controller*
- *MicroSD card slot*
- *PS/2 and PS/2-compatible USB keyboard interface*
- *PlayStation controller port*
- *PCF8575 I/O extender with 16 GPIO pins*
- *I2C and SPI busses on I/O expansion connector*
- *power supplied via Micro-USB socket or pin header.*
- *RCA connectors for video and audio*

The software contains a BASIC operating system and BASIC interpreter ("Engine BASIC") that allows the BASIC Engine to be used as a stand-alone computer programmable in the BASIC language.

It provides easy access to the hardware's capabilities as well as numerous other features.

Graphic and sound are:-

- *256-color text and graphics at resolutions from 160x200 up to 460x224 (PAL: 508x240) pixels*
- *Software sprites (up to 32 sprites sized up to 32x32 pixels).*
- *Scrollable tiled background graphics engine with up to four layers.*
- *Wavetable synthesizer and PLAY command that renders music in MML format.*
- *Loading and saving of PCX image files to and from video memory.*
- *Various text fonts built-in, including an ATI 6x8 font (for up to 76 (PAL: 84) characters per line) and PETSCII.*
- *Direct manipulation of video memory and controller registers possible, permitting higher-colour screen modes, custom resolutions, and other video effects.*

The BASIC might also look familiar to Spectrum users:-

- *Structured programming constructs (DO/LOOP, WHILE/WEND, IF/THEN/ELSE/ENDIF blocks).*
- *Labels and named procedures with local variables.*
- *Numbers are double-precision floating point.*
- *String and numeric list types (particularly useful for game programming).*
- *Escape codes for PRINT, similar to the control characters in Commodore BASIC.*
- *Event handlers (sprite collision, end-of-music, errors, game controller input).*

Development features

- *"Screen editor" similar to Commodore BASIC, allowing direct manipulation of on-screen code and commands, while also permitting scrolling within the program in memory.*
- *Syntax highlighting and automatic indentation in LIST command.*
- *Loading of programs with or without line numbers.*
- *Hardware support*
- *ESP8266 CPU core running at 160 MHz, ca. 63kB free memory for BASIC applications.*
- *USB keyboards (US, Japanese and German layouts supported). Files can be stored on FAT32 file systems with long file names on MicroSD card as well as the internal flash memory.*
- *PlayStation controller support.*
- *Support for PS/2 and PS/2-compatible*
- *Access to custom hardware add-ons via the 16-pin GPIO extender or I2C bus.*

Network support

- *Separate build that provides networking capabilities (cannot be used with tiled BG/sprites and wavetable synthesizer due to resource constraints; both builds can, however, be installed in flash at the same time)*

Other features

- *Z-code interpreter for playing interactive fiction games.*
- *ASCII text editor.*
- *Firmware update from SD card.*
- *Customizable colour scheme, start-up screen mode and font.*
- *Switchable video luminance filter provides sharp high-contrast graphics on LCD screens when turned off and avoids colour artifacts on old CRT screens when turned on.*
- *Automated test suite adapted from Bywater BASIC.*

The website is a mine of information and support from hardware through to software and includes the construction video which is a real time video of the project being constructed and well work a visit.

https://tinyurl.com/5bb96zu2

SLEEPING WITH JACK

The guys were on a DX tour.

No one wanted to room with Jack, because he snored so badly.

They decided it wasn't fair to make one of them stay with him the whole time, so they voted to take turns.

The first guy slept with Jack and comes to breakfast the next morning with his hair a mess and his eyes all bloodshot.

They said, "Man, what happened to you? He said, "Jack snored so loudly, I just sat up and watched him all night."

The next night it was a different guy's turn. In the morning, same thing, hair all standing up, eyes all bloodshot.

They said, "Man, what happened to you? You look awful! He said, 'Man, that Jack shakes the roof with his snoring. I watched him all night."

The third night was Bill's turn; he was an older DX hound. The next morning he came to breakfast bright-eyed and bushy-tailed. "Good morning!" he said.

They couldn't believe it. They said, "Man, what happened?"

He said, "Well, we got ready for bed. I went and tucked Jack into bed, patted him on the arse, and kissed him good night on the lips. Jack sat up and watched me all night."

With age comes wisdom.

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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.

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Continued from page 7

The slope of the downhill road did not favor us in pointing the antennas. Working as a couple allows you to enjoy the fantastic landscapes that the Apulian territory offers us