
VHF/UHF – An Expanding World

David Smith VK3HZ

Weak Signal

David Smith - VK3HZ

The origins of the title for this column go back at least 40 years to a time when the VHF/UHF bands were a fairly specialised area. Becoming operational on the 23 cm required building exotic equipment and the bands above that were very tricky technology. This, I believe, led to the phrase “An Expanding World” meaning that it was one of the few areas of Amateur Radio in which experimentation and innovation was still quite extensive.

Fast-forward to today and we now have a wide selection of off-the-shelf rigs that cover the VHF-UHF bands up to 23 cm and do quite a respectable job of it. While there is still some innovative work going on such new digital communication modes and high power solid-state amplifiers, most of the technology is now well established.

Those who, 40 years ago, might have experimented in the VHF/UHF region are now getting their hands dirty in the mid to upper microwave regions – what I believe is now “The Expanding World”.

All this is in way of a mild apology to VHF/UHF enthusiasts because this month’s column is devoted entirely to the microwave areas where we are currently seeing a surge of interest.

New 10 GHz World Record

For a number of years, the 10 GHz World Distance Record was held by Australian Amateurs. On 30/12/1994, Roger VK5NY/5 portable near Adelaide worked Wally VK6KZ/6 portable in the south of VK6 over a distance of 1912 km. This record stood until 2000 when DL4AM and DJ3KM worked over a distance of 2070 km. Recently, the distance has again been bettered.

On 10/7/2010, a group of six Swiss hams located in the Cape Verde Islands worked into Portugal over a path of 2696 km. They used SSB and the QSO continued for almost 25 minutes. Earlier in the day, they had already broken the record with a contact into Morocco over 2200 km.

All is not lost for VK however. We do have good sea paths of greater distance – for example, from the southern tip of VK6 across to Wilson’s Prom is 2700 km and to the northeastern tip of VK7 is about 2870 km. Unfortunately, these areas are sparsely populated with microwave operators so portable operations would be necessary. As well, suitable propagation would be very rare. Perhaps we should investigate the establishment of beacon stations that can also be remotely operated for the occasions when openings do occur.

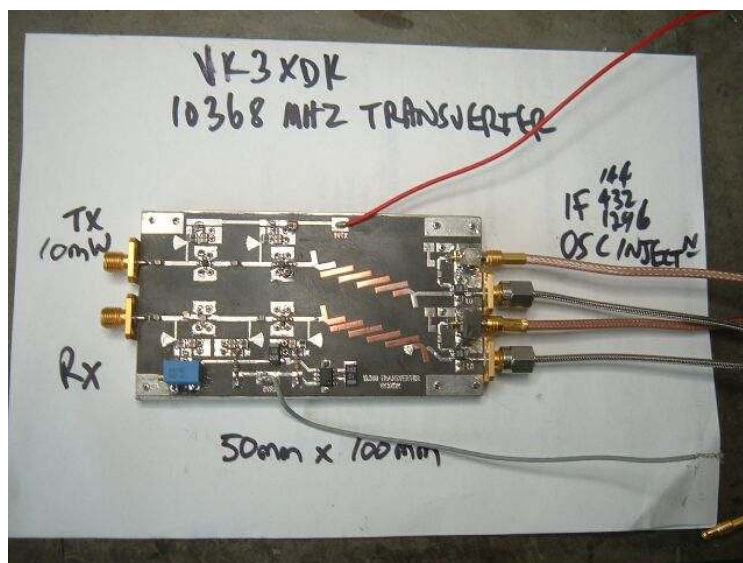
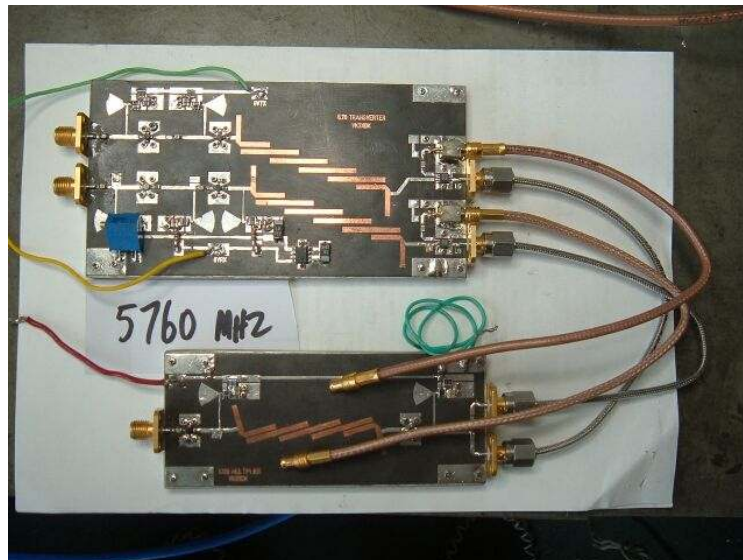
New Series of Microwave Transverters

Graham VK3XDK has been working on the design of simple, no-tune transverters for the microwave bands 2.4 GHz, 3.4 GHz, 5.7 GHz and 10 GHz. Performance testing of the prototypes by Alan VK3XPD has shown very good results.

The transverters use MMIC’s and low cost mixers with no-tune stripline filtering on the board. The standard IF is 70 cm, but 2 m is also an option for some of them. No onboard RF switching is included, with separate chains for the transmit and receive

paths. Each transverter has a separate multiplier board for generating the LO from a lower frequency oscillator. A synthesised oscillator board is currently under development. The PCB's are made from Teflon board with the transverter board roughly 100 x 60 mm and the slightly longer multiplier roughly 120 x 60 mm in size. The boards are glued to an aluminium base using silver epoxy glue.

Prototype boards that have been hand-etched by Graham are shown in the accompanying photos.



The prototype boards use tiny screws for earthing which have proven somewhat fragile. Graham and Alan are currently investigating having the boards professionally produced using plate-through holes for the earthing.

It is proposed that kits will be supplied with the blank PCB already glued to the aluminium base. Assemblers then fit the supplied SMD components etc. themselves. No pricing is currently available, but will be "at-cost" and so very reasonable.

More information may be found at: <http://www.vk9na.com/Transverters.html>

With very limited advertising on the VK-Microwave group, there are currently Expressions of Interest from 30 Amateurs for about 60 transverters. If you are interested, please contact Alan VK3XPD on alandevlin@bigpond.com

24 GHz Surplus Transverters

Recently on “that” auction site, a number of 23 GHz and 26 GHz transceiver modules appeared from an Israeli seller. These were snapped up quickly, but if you do see one available, they appear to be the basis of a very good transverter for 24 GHz. These modules, originally manufactured by the French company Thales, have quite impressive specifications for their small size. The quoted power output is over 1 watt with very low IF drive requirement of -20 dBm. The LO is at half frequency (12 GHz) at $+12$ dBm. Output is direct to waveguide, although waveguide to SMA transitions could be used allowing a cheaper (and lossier) SMA relay to be used for T/R switching.



An article appeared in a recent issue of the UK Microwave Group magazine Scatterpoint described the simple conversion of one of these modules to 24 GHz.

47 GHz experiments

Dan VK2GG has been developing a 47 GHz setup based on a Kuhne transverter with an Elcom synthesiser as LO and 432 MHz IF.

On Sunday 8th August, he and Peter VK2YGM tested his two transverters over two short paths. Using 0.15 mW directly from the transverters into 36 dB dishes, signals were reported as “full scale” over an 8.3 km line-of-sight path. That is already a VK2 record. The dishes are very sharp – beamwidth is about one degree – so accurate pointing is required.

On Friday 13th, they extended to distance to 32.3km over a sea path with lots of sea spray. Look out for more to come.

MAD's

Matt VK2DAG is proposing regular Microwave Activity Days to boost activity on the microwave bands. He writes:

I would like to get more action happening then just 3 contests a year!

- *Your wife and family know that there is a set day per month that you want to go out and play.*
- *Other people with uW gear will go out and play as they will know there will be someone out there.*

- You can haul the uW curious out with you to show how its done.
- Get out and test those possible field sites you have seen on Google maps.

So how does the 3rd Sunday of each month sound?

15th August, 19th September, 17th October, 20/21st November (also the VHF/UHF Field Day) and 19th December.

Between 10 am and 2 pm local. Gives enough time to get anywhere and set up.

Liaison on 146.500 FM simplex calling. Far enough away from transverter IFs and pager crud (most of us will set up on hill tops close to pager sites so the further away the better).

Go here <http://www.heywhatsthat.com/> and zoom in on the hills you want to try. Select "New Panorama" give it name (I have been calling the sites I have been looking at VK2 hill name). After the website has processed your request on the map press "Visibility Cloak" to see what you can see and also press "Show Profile" to see what the terrain is like between any point you click on the map.

Justin VK2CU and I are planning to have a test of 13cm (2403) on Sunday 15th August. I will be going to hill at Killcare QF56ql. I will also throw in 3cm and 13cm (2301).

All reports are that Sunday 15th was a great success. According to Matt:

Good to see a bunch of us get out there and have a go. Also good to see some spots from VK4 (VK4OX, VK4OE and VK4WIS were also out in Queensland).

I was mostly happy with my gear. Had some cable fails and other pit falls, so now I know how what to fix and what needs improving. 100 km on 3 cm and almost making a contact on 6 cm - all good. VK2XDE Steve and I had the chance to test theory we have been toying with on 2403.

12cm VK2XDE Steve and VK2CU Justin

6cm VK2CU Justin

3cm VK2GOM Rob and VK2TRF Jack

Jack VK2TRF had the idea of swapping the day (alternate Saturday/Sunday) each month so we can capture more happy uWers. Next month some people have already organized Sunday so I suggest we go forward from then.



Matt VK2DAG on 10 GHz

Keep an eye on the VK Logger Forum for the latest information.

Justin VK2CU bolted a mast into the back of the Kingswood ute, mounted several antennae and ventured out. Rob VK3GOM also headed to the hills, but was a little nervous about the windy conditions. After his recent mishap when his dish was blown over and destroyed by an errant gust, he compensated with some locally available counterweights (rocks) on the tripod feet.



Rob VK2GOM's Stabilised 10 GHz System

Please send any Weak Signal reports to David VK3HZ

Digital DX Modes

Rex Moncur – VK7MO

Joe Taylor K1JT advises that while the new modes in WSJT8 all work they have not generally demonstrated a useful improvement over the modes in WSJT7. The one exception is ISCAT which is designed for ion scatter on six metres and this showed a useful improvement over JT6M. Our own VK testing (Alan VK3XPD and Dave VK3HZ to Rex VK7MO) has shown that ISCAT is useful for 10 GHz aircraft enhancement and tropo-scatter as it copes well with the high Doppler shift at 10 GHz.

Joe has now withdrawn WSJT8 and has set up a test team of a few people in Europe, the US and VK to give him practical feedback on the further development of these modes. John VK4JMC, Peter VK3SO and Rex VK7MO are the VKs on the test team. To date ISCAT has been further improved and will become a permanent feature of the next release of WSJT. In VK our work has focussed on JTMS which is a new mode designed to replace FSK441 but has been significantly improved since

its release in WSJT8, by providing information from shorter pings. WSJT9 also includes echo mode that allows testing of the EME performance of your station and was originally included in WSJT4 but not in later versions.

JTMS uses minimum shift keying as compared to FSK for FSK441 and transmits about 30% faster to make better use of short pings. It also includes an averaging feature, which allows it to pick the best from a message where the ping is long enough to repeat some of the information. Our tests to date indicate that its performance is similar to FSK441 but that it gives far fewer garbage decodes and a much cleaner output. Further testing and development will continue to see if it can in fact produce the potential advantage implicit in its faster speed before a decision is made on including it in the next public release of WSJT. In the interim it is likely that we will conduct wider testing of a Trial version during some VK/ZL Meteor Scatter Activity Sessions. If so information will be promulgated on the VHF reflector.

Another feature of the Trial version is a new Graphical User Interface (GUI). While the Europeans and North Americans have been the main drivers this has provided the opportunity to extend the size of the boxes in which the transmitted information is typed. This has advantage in VK/ZL where we often call more than one station at a time as all of longer message is all visible in the box. Another new feature of the GUI is information in the Astronomical Window on the amount of spreading for EME at the frequency being used. This is useful for selecting the appropriate JT4x mode for microwave EME.

Please send any Digital DX Modes reports to Rex VK7MO