
VHF/UHF – An Expanding World

David Smith VK3HZ

Weak Signal

David Smith - VK3HZ

No sooner had I pressed "Send" to dispatch last month's report to our trusty Editor than the bands opened and the first VK to ZL 2 m tropo contacts occurred.

On the evening of October 12th, the Hepburn tropo forecast was showing a stripe of enhancement from the VK2/4 border southeast to the northern tip of the South Island of New Zealand. Bob ZL3TY reported hearing the Newcastle Ch 5A TV at 5x5 and rising (this "beacon" will be a big loss when they shut down Analog TV). At 0945, on 2 m, he worked Adrian VK4OX (5x1) and Grant VK2MAX (5x4). By 1005, signals had risen to S9 and he worked Steve VK2ZT (5x2), John VK4TJ (339) and Roland VK4V DX (519). The VK2RSY 2 m beacon rose to 5x1. Unfortunately, the opening didn't extend far enough south for Norm VK3DUT.

The next morning, the band was still open, and there was a repeat of the contacts of the previous evening. Joining them were Ross VK2DVZ (5x4), Ron VK4CRO (5x4), Ron VK4DD (5x5), John VK4MJF (5x4) and Mick VK4NE (5x4). The opening continued on-and-off for the whole day, seeming to favour VK4 more as it went on.

The following morning (October 13th), remnants of the opening were still present with the last contact between Bob and Adrian VK4OX (559) at 2000Z before the band finally closed.

VK9NA Team EME Tests

Alan VK3XPD reports on some recent activities in preparation for their DXpedition:

For our forthcoming VK9NA DX Expedition in January 2011, our primary focus is on the Microwave Bands from 1296 MHz through to 10 GHz. However, due to the unpredictable and fickle nature of the Troppo as it applies to Microwave Propagation, we had also considered expanding our horizons to include 2 metres EME.

Rex Moncur VK7MO kindly offered us a suitable homebrew portable Yagi for the purpose. It is a rather large antenna with 19 elements and a full 6 wavelengths (12 metres) long.

With the ARRL EME Contest on Sat-Sun 30-31 October, Michael VK3KH suggested we set up a "portable" Station to determine if 2 metres EME was possible with this single Yagi combined with the RF gear we were taking.

As most of you will no doubt be aware, the logistics in managing such a long yagi can be quite challenging, especially in windy weather. To get an idea of the task involved, prior to the Contest we laid out Rex's comprehensive "kit of parts" on some flat ground at Michael's QTH in Mt Eliza in order to work out how it all went together.

Finally, after an hour or so, we had the basis of one very long yagi. Due to its physical size and the fact that it was originally designed to be light and transportable (via aircraft) for portable use, there are multiple longitudinal and lateral bracing ties to maintain the overall rigidity.



Michael VK3KH tames the Long Yagi

Our operating window for the contest commenced Sunday at 0200 AEDST for moonrise with the Moon setting about 12 hours later at 1400 AEDST.

To allow us some level of comfort, it was decided we should attempt to setup the antenna on the roof of Michael's business premises and operate from his first floor office in Cranbourne.

Driving down to Cranbourne with Colin VK5DK in tow on Sunday morning, it was pouring rain with a very heavy sky. We met Michael at 0100 AEDST (yes, 1 am) and set the laptop up in his office with a connection to a large video monitor.

We then initiated sessions for WSJT7 (JT65B) and a link to the Weak Signal Bulletin Board - NOUK - that gave us information on who was EME-active at any given time.



Colin VK5DK and Mike VK3KH Working EME

At 0220 AEDST we had moonrise from the North East (USA) and to our great delight the first QSO we achieved was with Joe Taylor - K1JT, the designer of the WSJT weak signal package we were using, and the main mode on EME worldwide.

With the rain continuing and the Moon not visible, we quickly worked 4 more USA stations, and one JA station. Then nothing for the next 2 hours.

As the Moon climbed up to its maxima of +38 degrees, we tracked it with fairly regular manual AZ/EL adjustments at intervals of about 30 minutes. Along the way we had several very bad periods of rain static which swamped the receiver front end with very high noise levels preventing any EME ops.

The USA window closed and the EU window progressively opened around dawn. Colin had gone home and Peter - VK3TPR visited us for a few hours.

What a nice surprise it was when we worked Guy - VK2KU with an impressive -20 dB signal. Guy had heard us from Norfolk Island in January 2010 but we were unable to complete.

Over the next 6 hours, with a few more rain static interruptions, we worked many more Stations, and had a few "misses" until the Moon finally set in the North West at 1400 hours.

Our final tally for the 12 hours was 22 Stations, for 12 countries.

We had clearly proven that our setup was "very" EME capable ! So we are taking it to Norfolk Island in January, 2011.

We are looking forward to a busy schedule of Microwave Ops and 2 metres EME during the middle 2 weeks of January, 2011.

Cheers from the VK9NA Team of Michael, Kevin, Andrew and Alan.

10 GHz Home Operations

There are a number of stations now capable of operating on 10 GHz from their home QTH at virtually no notice, which opens up new possibilities. Alan VK3XPD writes:

I'm hoping to inspire a bit of interest in 10 GHz operation via Aircraft Enhancement from those of you in Adelaide, Canberra and maybe Tasmania.

From this QTH here in Camberwell, my 10 GHz Home station up about 10 metres has an excellent "shotline" for the MANY Aircraft going to/from Adelaide, to/from Canberra/Sydney and down south to Tasmania. Anyone with 10 GHz gear in this line, or even slightly off to the sides, will benefit from this enhancement.

To give you an idea of what is possible, even in the middle of winter, Colin VK5DK in Mt Gambier some 375 km away to my west is workable using WSJT on Troppo on most bad weather days. Aircraft Enhancement gives us many dB of additional lift over a 2-3 minutes duration.

Unfortunately for Colin and I, we do not have many flights on this east-west path. We only get lift from some of the Perth flights and a few other irregular services. However, when we do get good lift, we often hear our tones and some of the Doppler trails are absolutely stunning to see on screen.

Several of us also recently worked Rex VK7MO across Bass Strait when was visiting northern Tasmania.

David VK3HZ has 10 GHz operational at home by appointment.

Russell VK3ZQB in Port Fairy is also QRV and Michael VK3KH will hopefully be QRV by appointment from his upstairs balcony (to the west only) very soon.

So how about it? Is anyone keen to try 10 GHz Home station ops? It's a whole lot of fun and it puts your your Microwave gear to good use between contests!

VK7MO to VK3PY on 10GHz

Chas VK3PY writes about a recent long-distance 10 GHz QSO:

Following an exchange of emails on 20 October with Rex VK7MO who was about to come over to the mainland for some extensive 10 GHz portable operations, Rex indicated he would be available for a quick test from Devonport prior to boarding the ferry. We arranged a sked for the next day, (Thursday, October 21) in the late afternoon. The distance between our respective locations would be about 380km, albeit pretty much over water.

For my location I chose a hilltop about 15 km west of Geelong at an elevation of 210 m ASL with a clear view to Bass Strait about 20 km away. The weather was calm and sunny, the temperature around 25°C. I arrived on site at 4:00 pm (local EDST) and was set up within 15 minutes. On switching on my 10 GHz transverter I immediately found a JT65 signal (possibly from Michael VK3KH or Alan VK3XPD, both of whom were hoping to work Rex).

Shortly after this, Rex phoned to advise he too was set up and ready to transmit. As soon as he keyed his transmitter I copied his carrier and peaked my dish on it. Imagine my elation at hearing it S9! We went to SSB and exchanged signal reports. I gave Rex 59 and received 57 in reply, with some deep QSB at times. Nevertheless the contact was "armchair copy" all the way. By this time Ken VK3NW had joined me on the hill. Since Rex was on a tight schedule there was no point in Ken setting up a separate system (pretty much identical to mine, as it happens) so he just picked up the microphone and made an easy contact too.

For the record, my 10GHz station consists of a converted MITEC data link driving a 3W DEMI PA and a 600mm circular dish. Rex uses a DB6NT transverter with a 10W PA to a 640mm offset-fed dish.

VK3NX 47 GHz Gear

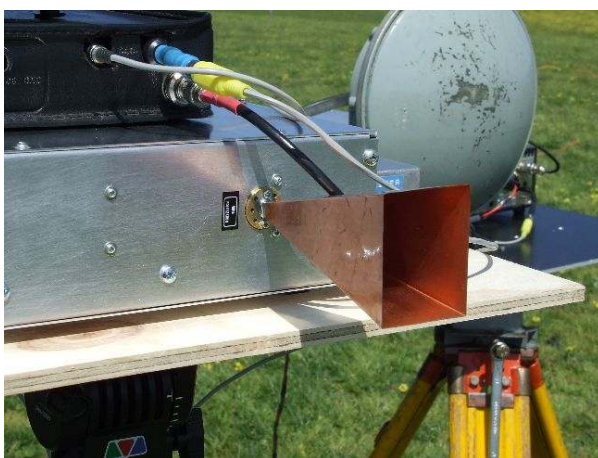
Following on from last month's report, Charlie VK3NX submitted some photos of the gear used by him for the record-breaking contacts with David VK3QM.



VN3NX Operating Location



VK3NX 47 GHz Transverter



VK3NX 47 GHz Horn Antenna

That's it for another year. Best wishes to all for the season. Here's hoping for a bumper summer of DX on the bands and in the modes that you most prefer!

Please send any Weak Signal reports to David VK3HZ

Digital DX Modes

Rex Moncur – VK7MO

This month's column focuses on 10 GHz terrestrial operations using the digital mode JT65c. The key to long distance tropo-scatter operation where signals may be too weak to hear is to reduce the number of variables that arise from the six basic ones of frequency errors at both ends, azimuth errors at both ends and elevation errors at both ends:

- Accurate frequencies at both ends avoid the need to search for a weak signal, which may only occasionally rise above the -28 dB threshold of WSJT. This is generally achieved by locking to a 10 MHz GPS or rubidium reference and typically results in frequency errors of less than 10 Hz at 10 GHz. Short-term frequency stability is also important requiring a good quality single or double oven OCXO and a drift of less than 10 Hz over minute.

- Accurate alignment of antennas is required in both azimuth and elevation at both stations. With a typical 60 cm portable dish, the 3 dB beam-width is around 3 degrees so a 1.5 degree error in either azimuth or elevation at either station puts you 3 dB down. Desirably one would seek less than one dB loss which requires both stations to be aligned to better than half a degree. The most accurate technique we have found for alignment is to use a rifle scope (readily available at gun shops for less and \$100) that has been set to the same direction as the antenna beam based on sun or better still moon noise. Sun noise should be around 3 dB for a 60 cm dish and moon noise around 0.05 dB. While sun noise is easier to detect, the difficulty is that one cannot look directly through the rifle scope at the sun and one needs to put thin paper, marked with a cross, across the scope to form an image. If moon noise can be detected, this can be more accurate as one can align the rifle scope graticule directly on the moon. The best way to measure moon or sun noise is to use a wide bandwidth detector at the IF. Once the rifle scope is aligned one can align directly on the station in azimuth by using some feature such as a farm house that one can see on Google Earth or alternately use some marker such as a flag, the position of which has been established by GPS over a distance of at least 500 metres to achieve the required 0.5 degree accuracy. Elevation can be set by aligning the rifle scope on or just above the horizon. The spreadsheet at the following URL is useful for alignment on objects that are not directly on the path if your system includes a protractor or other means of accurately measuring relative angles:

http://reast.asn.au/2010/Great_Circle_Bearing.xls

10 GHz Rain-scatter

Colin VK5DK has provided an interesting image of the results of rain-scatter on 10GHz signals from Russell VK3ZQB as shown in Figure 1. The image covers a period of approximately 10 minutes during which Colin was receiving Russell's signal as an approximately 1200 Hz tone on alternate periods. At the bottom of the image the 1200 Hz tone is clearly visible due to tropo-scatter. As one moves up from the bottom a second widely spread rain-scatter signal appears spread from around 1400 to 1800 Hz which gradually falls in frequency and spread to completely cover the tropo-scatter signal. This image was generated using the waterfall display called SpecJT included in WSJT7.

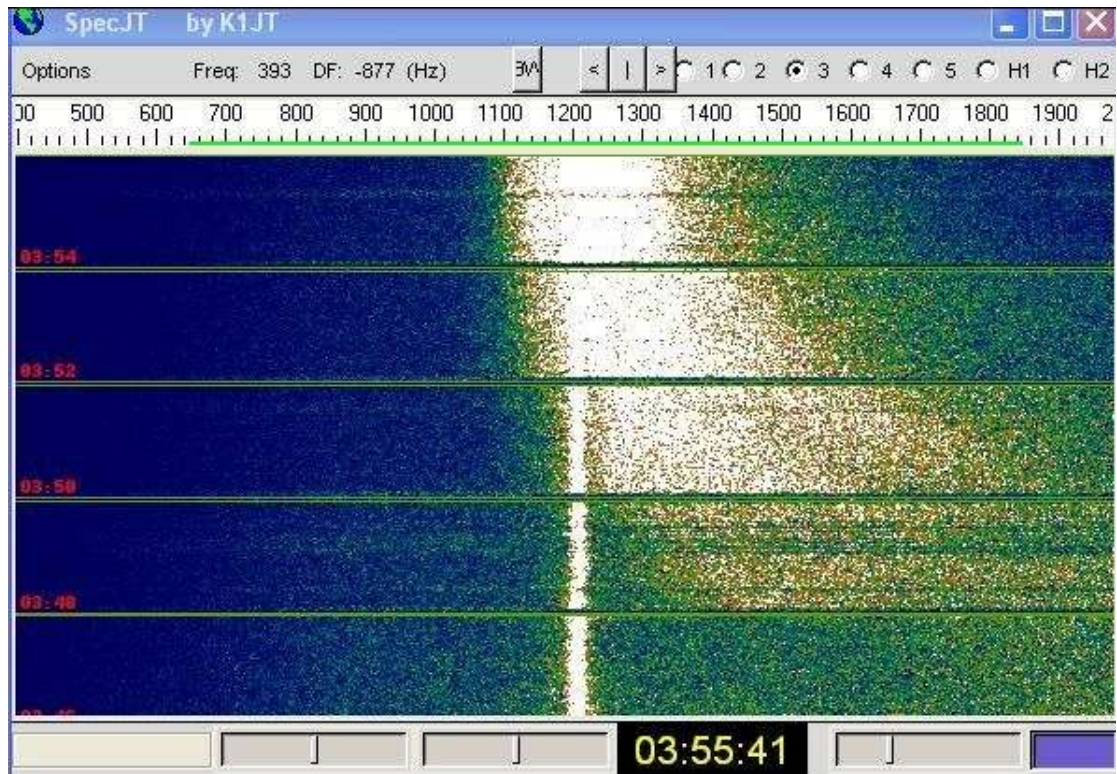


Figure 1 – VK3ZQG 10 GHz Rainscatter Signals

10 GHz Comparison Tests from Mt Dandenong

Figure 2 shows 10 GHz portable stations on Mt Dandenong with Peter VK3TPR on the left, Rex VK7MO in the centre and David VK3HZ's station on the right. Comparison tests were made with Colin VK5DK over a 402 km path that demonstrated that VK3HZ's station was about 2 dB down on VK7MO's, consistent with sun noise measurements which gave 1.8 dB on the VK3HZ station (60 cm dish) and 3.5 dB on the VK7MO station (64 cm dish). Peter VK3TPR's station was newly completed without a pre-amp and while he was unable to copy VK5DK, he did copy VK3ZQB demonstrating that he is well on the way.



Figure 2 – From left, Peter VK3TPR, Rex VK7MO and David VK3HZ's dish

10 GHz Grid Square Tour around Tasmania

During October Rex VK7MO operated portable from six grid squares mainly in Northern Tasmania working back to VK3 with contacts as shown on Figure 3. The longest contact was 585 km from Mt Wellington in Southern Tasmania to Alan VK3XPD at -22 dB. Russell VK3ZQB worked into East Devonport over 480 km. David VK3HZ worked 5 northern grid squares on both JT65c and SSB from John's Hill Lookout in the Dandenongs and Chas VK3PY at Bayview, west of Geelong, worked into East Devonport on SSB. Michael VK3KH went portable to Berwick with a newly completed station and was pleased to work into East Devonport for his second ever 10 GHz contact to VK7 at -17/-22 dB on JT65c.

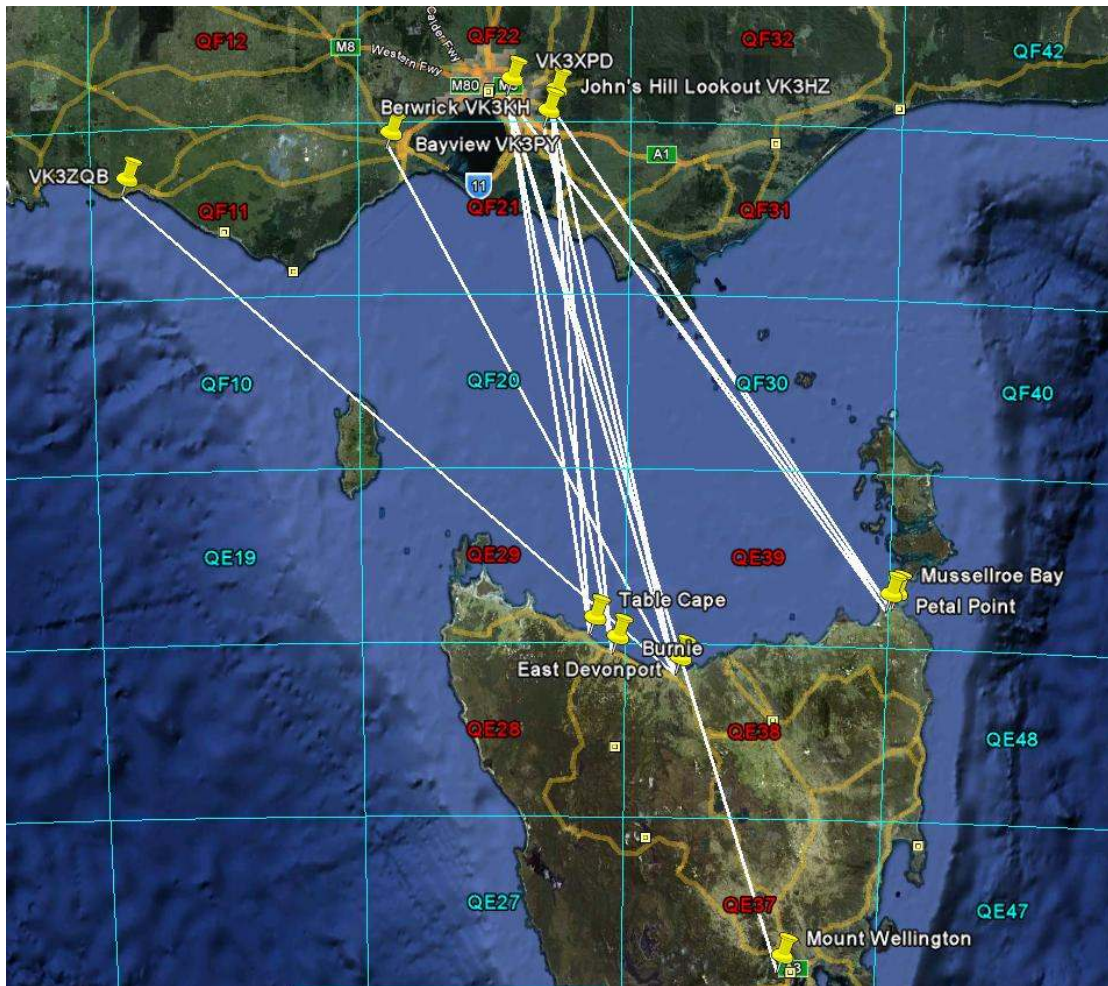


Figure 3 – Recent VK7MO 10 GHz Activity

10 GHz Grid Square Tour

Rex VK7MO undertook a tour some 300 to 600 km from Melbourne to grid squares not worked earlier this year. A total of 13 new grid squares were worked back to the Melbourne to Dave VK3HZ and Alan VK3XPD using mainly digital modes JT65c and ISCAT. Other stations participating were Peter VK3TPR, Russell VK3ZQB, Colin VK5DK, Chas VK3PY, Dave VK3QM and Ian VK5ZD. A full report of the Tour is at the following URL:

www.vk3hz.net/microwave/VK7MO_Gridsquare_Tour.pdf

Key achievements of the tour were as follows:

- Best aircraft-scatter completed 650 km VK3HZ Mt Dandenong to Port Elliott lookout in South Australia using JT65c for a new Australian digital record
- Best Aircraft scatter on ISCAT VK3XPD to near Goulburn NSW at 567 km.
- Best tropo-scatter completed 439 km VK3XPD to Green Cape on JT65c.
- Best SSB tropo-scatter VK3HZ Mt Dandenong to near Hay NSW at 322 km.

While JT65c generally worked well on aircraft-scatter it failed to decode if the Doppler variation was more than about 100 Hz over a TX period representing the aircraft crossing the path at more than about 15 degrees. In such cases the new WSJT9 mode ISCAT copes better with Doppler and short bursts of aircraft-scatter and

proved to be superior even though its sensitivity is about 10 dB worse than JT65c. It can also be used with 15 second TX/RX periods, a quarter of JT65c, giving a much better chance of completing a QSO during a single aircraft crossing.

Some initial results on using aircraft side scatter where the aircraft does not cross the path were noted and require further investigation.

Please send any Digital DX Modes reports to Rex VK7MO

The Magic Band – 6 m DX

Brian Cleland – VK5BC

October was another disappointing month for 6 m. Very little reported in VK except odd TV carriers in the 40 MHz range from the north, mainly China.

More activity though in the Philippines where Willem DU7/PA0HIP reports the following;

October was relatively good, propagation-wise, with several very good F2 openings to JA in the late afternoon and early evening. Nearly every day there was propagation in the direction of JA, UA0 (inband TV) and BY in the 3000 to 4000+ km range, sometimes for only minutes, but on many days also extended to hours. A big problem in this part of the world though is activity, on most days it was low or non-existent.

Good days to JA/BY were October 1, 3, 6, 8, 9, 10, 15, 17, 18, 19, 20, 22, 23, 30. On October 17, I even worked a JA2 with 50 mW in a whip antenna, his RST 599 on a slow s-meter, hi. On a couple of days I was working them on a 40 m dipole, because of the damage to my 2 x 7 array. All JA districts were worked, with many JA8's (4000+ KM) and also BY4, 7, 8, 9 districts and the occasional HL.

Night time TEP (Spread F) happened on several days of the month, especially in the beginning of the month, with Mark VK8MS worked on many occasions with s9+ signals, but no other activity unfortunately. The VK6RSX beacon was heard weakly on several occasions and so was the YF100/B beacon, which peaked 599 at times (but same story about activity). An especially good day for Spread F was October 1st with propagation to VK4, VK8 (MS) and VK6 (RSX). The VK4's TL, ABW, FNQ, and ZFC (new grid loc for me) were worked with signals up to an incredible S9+25 dB's, with the characteristic flutter QSB.

On the 15th October Brian VK4EK in Sapphire reported working JA2DDN.

Good opening to JA on the 6th November from the Harvey Bay area when Glen VK4BG and Harvey VK4AHW worked JG1TSG. Glen also worked JA1NPD, JK1OXU & JE1BJT.

Another good opening from northern VK4 to JA & DU7 on the 11th November. Opening extended from John VK4TL in Cairns area, south to Brian VK4EK in Sapphire and Ray VK4BLK in Yeppoon. Several JA's were worked along with Willem DU7/PA0HIP.

From the E's perspective there was nothing reported during October. Early November saw a few contacts reported, 5th November Brian VK4EK worked Rob VK3XQ, 6th November Gary VK4ABW worked Brian VK5BC and on the 11th November Joe VK8VTX in Darwin reported the Townsville beacon and worked John VK4FNQ in Charters Towers. Hopefully the E's really come to life later in November.

Hope everyone has a Very Safe & Merry Xmas & Happy New Year. Maybe the sun

will start showing more signs of activity in 2011.

Please send any 6 m information to Brian VK5BC