VHF/UHF – An Expanding World

David Smith VK3HZ

Weak Signal

David Smith - VK3HZ

A High Pressure cell that drifted across northern Victoria caused some excitement as it turned northwards up along the east coast. The expectation was for an early start to the DX season for VHF contacts across the Tasman. While signals were heard, unfortunately no contacts were made.

Interestingly, it appears that two repeaters had a QSO of sorts. The VK4RKC Brisbane 2 m repeater has input on 147.3 MHz and output on 147.9 MHz. The ZL2VH repeater near Wellington has the exact reverse – 147.9 MHz in and 147.3 MHz out. For a period, conditions were such that, once triggered, the repeaters held each other open.

While the enhancement stayed too close to the east coast to give any real VK-ZL activity, it did provide some good propagation along the Queensland coast.

Starting at 2048Z on September 12th, Ron VK4DD worked John VK4FNQ (1050 km), VK4AFC (1354 km) and David VK4ZDP (1306 km) – all at 5x9 and all on 2 m. Phil VK4CDI, Mick VK4NE, Wayne VK4NWH and Roy VK4ZQ were also in the mix working the northern stations. Conditions slowly dropped off as the morning progressed and at 2245Z, Ron worked VK4MS (1184 km) at 5x2. By 0100Z, conditions had died off.

The following morning, some enhancement was still present, but much weaker. At 2030Z, David VK4ZDP worked VK4DD at 5x1 and Ron VK4CRO (1333 km).

Aircraft Enhancement with a Difference

I have mentioned before the Kinetic SBS-1 ADS-B aircraft receiver. There are a number of these receivers set up around Australia receiving position reports from ADS-B-equipped aircraft and relaying the information to the PlanePlotter server where it is used by registered PlanePlotter users.

ADS-B operates on 1090 MHz and normal range for a ground station in a good location is about 200 nautical miles (about 360 km). I've often thought that these receivers could perhaps be used as indicators of enhanced propagation conditions. However, the problem is that aircraft normally fly at 35,000 to 40,000 ft, which is way above the normal inversion layers. So, if there is tropo enhancement, what would happen is that the aircraft transmissions would be reflected up and away from the receiver and there would actually be poorer reception. EME operators have a somewhat similar problem when the moon is low in the sky with tropo enhancement deflecting their signal back towards the ground.

However, during the period of tropo enhancement reported in the previous section, the operator of an SBS-1 receiver in Brisbane reported receiving an Air New Zealand aircraft at a range of 772 nautical miles (1430 km). How could this occur?

If the enhancement duct only covered part of the path from the receiver out to a distance of say 1200 km, then the last 230 km of the path would be a non-enhanced area (for want of a better term). The signal from the aircraft could pass down through the non-enhanced area to a height where it could enter the duct and be propagated through the duct to the receiver. Judging by the reports of good propagation up along the Queensland coast, but lack of contacts into ZL, then it appears that the

duct may have only been close to the Queensland coast.

Similar conditions were observed several years ago where numerous meteor pings were observed in VK5 on JT65 digital signals from ZL3TY. The path is too long for meteor scatter, but there was an enhancement duct present over part of the path. Thus it seemed that the signal was travelling through the duct, exiting out the other end and then being reflected by meteors – a mode of propagation dubbed tropo-enhanced meteor scatter.

VK-Microwave Group

A new email group – VK-Microwave - has been established on Yahoo Groups to cater for Australian and NZ amateur radio operators interested in operation in the microwave bands from 23 cm (1296 MHz) upwards. Discussion subjects include home and field operations, equipment construction and modification, re-use of commercial equipment and other subjects related to amateur microwave activities.

For more information, go to: http://groups.yahoo.com/group/VK-Microwave/

Hopefully, this summer will see the bridging of the Tasman on 2.4 GHz and possibly higher (10 GHz?) as stations build greater capability on either side. And hopefully, this group can help to facilitate such an event. After just 10 days operation, there are already 80 Australian and NZ enthusiasts registered on the site.

Please send any Weak Signal reports to David VK3HZ

Digital DX Modes

Rex Moncur – VK7MO

In experimenting with JT65a at marginal levels on 10 GHz, one finds it is very difficult to align the antenna just by beaming for maximum signal, in particular if one is waiting for the signal to just rise out of the noise. Techniques used for optical communications combined with techniques borrowed from moonbounce have proved useful in optimising alignment and measuring system performance of a small 10 GHz portable station.

For non-line of sight optical communication one is often dealing with beamwidths of less than plus/minus one degree and small 10 GHz portable dishes are not much wider. Such accuracies are difficult to achieve and the technique that is being used for optical communication is to draw a line on Google Earth between accurately marked positions of each station and then look for some recognisable feature close to each end of the path. The equipment can then be aligned on this feature in azimuth using a rifle scope that has previously been aligned. In elevation, alignment can be achieved to within 0.2 degrees with a good quality forestry inclinometer such as manufactured by Suunto or to within a degree or so with cheaper units found in hardware stores. The same techniques can be used to align a microwave dish, however, here we cannot see microwaves for visual calibration of the system. One approach is to align on a signal from a visible location but this is prone to errors due to ground reflections. Another approach is to peak the receiver on sun noise and then set the rifle scope to this direction by centring the image of the sun which is made visible by using a thin sheet of paper covering the objective lens of the scope. The weakness of this approach is that it does not achieve the accuracy that is available using the adjustable graticule of the rifle scope. While one cannot look through the scope at the sun one can look at the moon and carefully centre the graticule at the

centre of the moon. One can then use moon noise to calibrate the system. The azimuth and elevation of the moon can then be determined from programs such as Doug, VK3UM's EME planner or K1JT's WSJT. While moon noise is only about 0.1 dB on a small portable 1 GHz dish (around 65 cm) it is possible to get an adequate reading of moon noise using the broadband output of one's transverter. Such measurements can be achieved with a power meter such as the HP432, or a Boonton power meter as used by Alan, VK3XPD, or a home constructed unit such as described by Charlie, VK3NX at his web site below. VK7MO and VK7TW have been using a modified Wiltron 501b level meter that gives a resolution of 0.01 dB by changing the provided 500 micro-amp meter to 50 micro-amps.

http://www.vk3nx.com/files/Noise_Meter.pdf

Other units suitable for home construction are at:

http://www.g3pho.free-online.co.uk/microwaves/noiseamp.pdf
http://lea.hamradio.si/~s57uuu/eme/noistrk.htm

Once one is set up with a suitable measuring system this can be used in conjunction with Doug, VK3UM's EME calc program to check system performance. Doug has produced a revised version 6.05 that makes provision for small dishes by allowing dish size to be set to the nearest cm. Doug's program is available at:

http://www.vk3bez.org/vk3um_software.htm

Using typical offset dishes as used for portable 10 GHz operations and a good pre-amp sun, moon and ground noise to cold sky should be around the following for a quite sun:

Dish Diameter (cm)	Sun noise (dB)	Moon noise (dB)	Ground noise (dB)
65	3.5	0.1	2.7
85	5.0	0.17	2.7
120	7.1	0.34	2.7

In practice VK7MO and VK7TW have achieved 3.1 dB sun noise, 0.07 dB moon noise and 2.7 dB ground noise with a 65 cm dish, suggesting a slightly lower dish efficiency than optimum.

It is useful in the field to check sun noise to confirm system performance and to ensure nothing has fallen off or become misaligned during transport. If the sun is too high for the elevation range of your dish mount one can do a quick check between ground and cold sky. Sun noise is a check on the full system including antenna, where-as ground noise checks the receiver and pre-amp but takes no account of dish efficiency or whether it is in focus.

Please send any Digital DX Modes reports to Rex VK7MO

The Magic Band – 6 m DX

Brian Cleland – VK5BC

August was very quiet on 6 m with very little activity and contacts other than via meteor scatter. The morning of the 1st September though produced a surprise 'E' opening between 6.30am – 7.00am EST. Brian VK4EK at Saffire was attempting meteor scatter contacts into VK2 when suddenly there were S9 signals. Brian completed several contacts into VK1, 2 & 3 and also heard the VK5RBV beacon.

The past couple of summer 'E' seasons Paul A35RK in Tonga has been very active

and has surprised many with contacts into all states of Australia and New Zealand via multi hop E's. It has been very clear if there were active stations in the pacific area many contacts would be possible via E's. Thanks to efforts from Bob ZL1RS this coming season should see activity from the Cook Islands.

Bob ZL1RS visited the Cook Islands earlier this year and reports:

Earlier this year I visited the Cook Islands (E51) with Lance W7GJ for a combined 6 m / 2 m EME DX expedition and holiday. Lance operated 6 m EME using an M2 6M8GJ yagi and solid-state amplifier but during the 2 weeks there was no ionospheric propagation on 6 m. When we met with Victor E51CG, he expressed an interest in getting back on the ham bands ... including 6 m.

In August I returned to Rarotonga to help Victor raise his tower and antennas, and thanks to Lance's organisational efforts I also delivered an IC-706 to Victor from Jim

KS7S. Dave N3DB and "The Worldwide Beacon Project" team were to supply a 6 m beacon but unfortunately a mess up in the courier delivery meant it did not arrive in time to also go in my suitcase.

Victor and I worked steadily for a week and a half preparing his tower and antennas, including making the W5WVO modification to Victor's Cushcraft A50-5S 6 m yagi. The mod increases the boom length by 6 feet delivering 1.5 dB more gain and a better radiation pattern. The crane arrived in the late afternoon and the 50 ft tower with rotator was lifted into position. Then the pre-assembled stub mast with refurbished KT34 HF tribander and modified A50-5S was placed on top ... "job done" in less than 45 minutes!

Victor is now monitoring various beacon and 6 m "indicator" frequencies, as well as the usual DX calling frequencies.

The 6 m beacon was on my doorstep when I got back to ZL and will be sent to Victor before the Es season starts. The beacon equipment is a modified VHF low-band RT with a small keyer board inside. When installed at Victor's QTH it will be signing "E51CG/B BG08ct" with 20 W of CW on 50.051 MHz to an M2 "HO Loop" omnidirectional antenna.

Along with the beacon I am also sending a 7-element 6 m yagi for Warwick E51WL who will be active from Penrhyn atoll in the northern Cook Islands (separate DXCC entity). Warwick will install the yagi at 50 feet on his existing tower and will run 100 W from his IC-706MK2g.

Below is a photo of Victor's E51CG antennas.

Thanks again Bob, I'm sure all VK & ZL operators look forward to the opportunity of being able to work E51 on 6 m.

News from the Tablelands Radio and Electronics Club in far North Queensland. John VK4FNQ reports hearing the VK4RHT beacon regularly and on the 4th August logged the VK5RBV beacon. Ross VK4AQ reports that on 25 August between 0100 and 0140z he worked two JA stations on CW. On the 31st Dale VK4SIX heard the BY TV video on 49.750. Bryan VK4NMC is getting active on the magic band from Herberton FNQ. The VK4RHT beacon on 50.281 MHz is still operating in test mode from Atherton and reports would be appreciated on the logger.

Please send any 6 m information to Brian VK5BC