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# VHF/UHF – An Expanding World

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## Weak Signal

David Smith - VK3HZ

Spring is here and the weather seems to have turned for the better. This means that the Spring VHF/UHF Field Day is not far off. This year, it will be held over the weekend of the 13-14 November. If you are planning to go out, please tell us about it by posting a message on the VK-VHF reflector. If you are not already registered for this reflector, details may be found at <http://pobox.une.edu.au/mailman/listinfo/vk-vhf>. We are looking forward to a large turnout this year.

Unfortunately, it looks like another of our bands may be under threat. The ACA has released a discussion paper on proposed apparatus licensing arrangements in the 5725 - 5825 MHz band for broadband wireless access in regional and rural areas of Australia. Changes could effect operation at 5760 MHz with further high power exclusion zones being implemented as on the 9cm band. The paper may be found at:

[www.aca.gov.au/radcomm/frequency\\_planning/radiofrequency\\_planning\\_topics/hp5g8disc.htm](http://www.aca.gov.au/radcomm/frequency_planning/radiofrequency_planning_topics/hp5g8disc.htm).

Unfortunately, the closing date for comments has already passed. However, it is hoped that the WIA (newly invigorated) will be heavily involved in discussions about the future of this band.

Our Digital Modes correspondent – Rex VK7MO – is planning a digital DXpedition to the heart of Australia. He plans to be in Adelaide on 2 October to give a talk on Digital Modes. He will then be heading north to activate some gridsquares on 2 m via Meteor Scatter using FSK441. He is also going to attempt to work all states on 2 m MS in one day. More information will be posted to the VK-VHF reflector when Rex has finalised his plans.

Now to news of activity in the upper reaches of our spectrum. On 27 August, KF6KVG and W0EOM extended their record on the 122 GHz band to 24.88 km, across the Silicon Valley. Precision 1 ft dishes were used. Transmit power was about -23 dBm (5 microwatts) and noise figure estimated at 25 dB. Triplers with output in the 40 to 41 GHz range with power of +19 dBm were used to drive the mixers and multipliers. Transmit frequency was 122.4 GHz, referenced to 10 MHz. Signals were at the noise floor but easy CW copy. Weather was calm, mild and fairly dry. The 2nd harmonic on 81.6 GHz was used to align the antennas.

Please send any Weak Signal reports to David VK3HZ at ...

## Digital Modes

Rex Moncur – VK7MO

It is good to see some of the more remote areas trying out FSK441 on 2 metres. Don, VK6HK, has worked Ron, VK4KDD/6, portable at Port Hedland and both stations were monitored in Broome by Ces VK6AO/6. Rex, VK8RH, in Darwin and Ron, VK4KDD/6 completed the first FSK441 Meteor Scatter contact from VK6 to VK8. Jeff, VK8GF, in Alice Springs is also setting up for FSK441. What this means is that no station on the Australian mainland is too remote to have regular contacts on 2 metres to someone else. Note that FSK441 works well in the range 1000 to 1800 km

and that contacts have been made as short as 500 km and as long as 2300 km. Welcome to Errol, VK4ZHL, and John, VK2GCN, who have joined the meteor scatter activity sessions.

Joe Taylor, K1JT, gave an outline of the next mode for WSJT called JT1 at the recent EME 2003 conference in Princeton in the USA. This mode moves away from FSK to PSK and uses even more intensive source encoding and Forward Error Correction to achieve a 4 dB advantage over JT65 in simulation tests. A useful advantage of the new mode is that the total bandwidth is only 2.5 Hz and a number of stations can call in the same SSB passband without interfering with each other. A listening station could then decode the particular station they wished to work by clicking on the signal on the spectrum display or even click and decode a number of signals to select which one they wish to work. Joe advises that he hopes to release the new mode some time in the Fall or our Spring.

There is some evidence that JT65 can give false decodes when trying to receive a tropo-scatter signal in the presence of an AE (aircraft enhanced) signal. This is probably to be expected as tests between David, VK3AUU and Rex, VK7MO, show Doppler shifts of 3 or 4 Hz on AE signals and JT65A tones are only spaced 2.7 Hz apart. The problem usually shows up as exotic callsigns like UZ3ROD or LY2MY and a grid square in some outlandish place. The problem may also show up due to meteor pings where Doppler shifts on 2 metres are typically up to a few tens of Hz. It is particularly prevalent on the path between VK3II and VK7MO where the presence of aircraft can be recognised by a ripple on the green signal strength line. The only solution we have come up with so far is to recognise and ignore false decodes. We did think that the wider tone spacing of JT65B or C might help but tests proved these also suffered the same problem.

It is sometimes useful to have a better idea of the DF (Frequency Difference from the sync frequency of 1270.5 Hz) reported by JT65 in looking for a very weak station on Spectran or a small spike on the spectrum display. On terrestrial paths, the DF should be symmetrical such that if another station sees you at say +100 Hz, you should see them at -100 Hz. There can be small differences in symmetry due to some computers (usually laptops) not generating the tones on the exact frequencies but these are less than 15 Hz. On EME paths the DF is affected by the Doppler shift due to Earth rotation on both paths and this adds twice the Doppler shown on JT65 to the DF. The formula is  $DF = 2 * \text{Doppler} - \text{other station's reported DF}$ . Also in looking for a very weak signal on Spectran it is useful to mark any frequency you think is showing some weak specks and check this against any later specks. It turns out that if you enable the audio filter on Spectran (Filter > Show), you can set a pair of green marks for the audio bandwidth on the scale by right and left clicking just above the scale and if you set these at the same point it provides the marker for identifying a weak signal.

Please send any Digital Modes reports to Rex VK7MO at ...

## EME

David Smith – VK3HZ

The 11<sup>th</sup> International EME Conference took place in early August in New Jersey with participants from 14 countries. A summary of conference activities can be found at <http://www.nitehawk.com/rasmit/NLD/eme0409.pdf>. Keynote speaker was Joe Taylor, K1JT, who presented "Fundamental Limits on Weak Signal Communication", including a discussion on the proposed new WSJT mode – JT1. His presentation can be found at <http://pulsar.princeton.edu/~joe/K1JT/EME2004.PDF>.

Joe is attempting to squeeze every ounce out of this new mode to maximise performance. This means that the messages passed across contain the absolute minimum required. However, his example QSO (using Rex VK7MO's callsign) created a flurry of lively discussion on the Moon-Net reflector about what actually constitutes a valid QSO. In JT1, both callsigns and signal strengths are exchanged and acknowledged, but the initial response to the CQ optionally uses an abbreviated callsign to identify who is being responded to. In the end, commonsense prevailed and there was agreement that Joe's message sequence was valid. However, I found it rather ironic considering that the currently accepted message sequence for an EME CW QSO falls well short of acceptable, I believe, for a valid QSO. Only callsigns are exchanged – no “unknown” information such as signal strength – with M, O, RO and R also sent to indicate progress of the QSO. Many stations do exchange RST signal reports, but this is not required for a “valid” QSO. And, unfortunately, apparently many “invalid” QSO's, particularly pre-arranged skeds, do slip through the gaps.

In mid August, good EME conditions matched up with reasonable times (at both ends) for the NA and EU windows, providing an opportunity for smaller stations to work some of the big guns via EME on digital modes. Dave W5UN is one big gun who has taken enthusiastically to digital modes and provides a huge signal, helped, in true Texan style, by his array of 32 x 5 WL 17 element yagis and 1.5 kW. He worked a number of smaller VK stations including Ian VK3AXH, Graham VK3XDK and me. I also managed to work Gary KB8RQ whose array is “only” 24 x 13 elements, supported by two truck chassis.



Gary KB8RQ's EME Array

This all shows that EME contacts are possible for smaller stations when running digital modes. Hopefully many of them will get the EME bug and go on to build larger antenna arrays, with the ultimate goal of hearing their own echo off the moon.

## 2 m & 70 cm FM DX

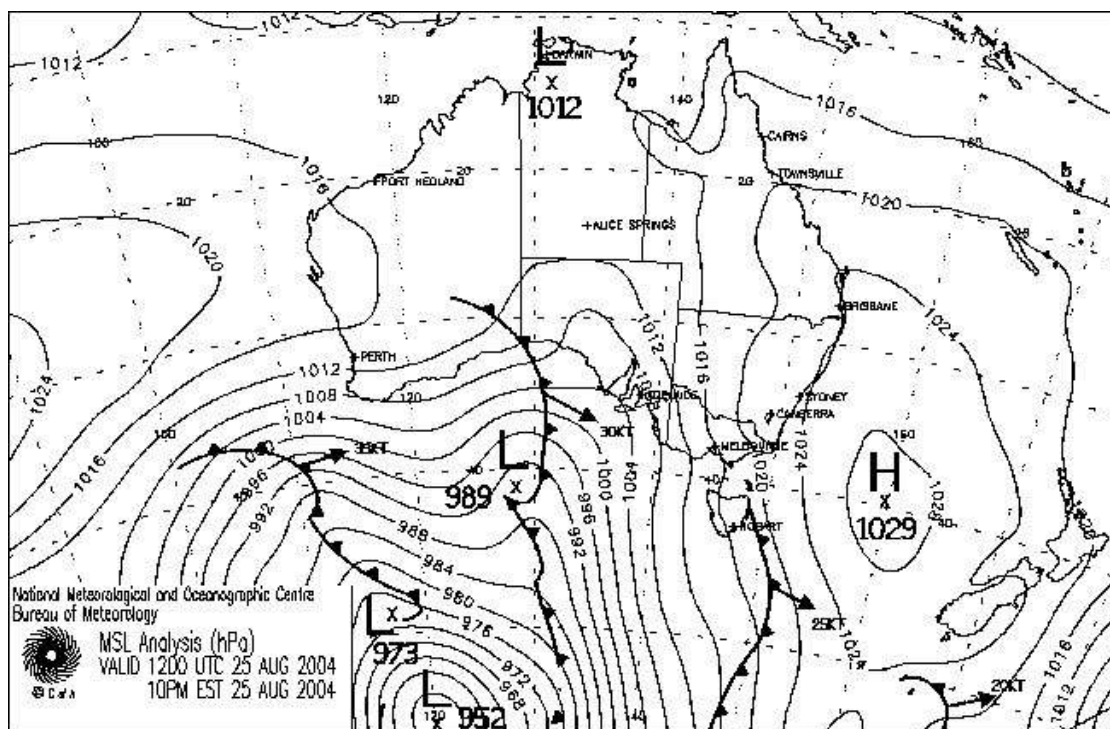
Leigh Rainbird - VK2KRR

Very poor 2 & 70 FM DX conditions again in Australia for August. More cold, wet and windy conditions moving through in the south, making for a very unstable troposphere. On the north Queensland coast, more enhancement of signals was noted, but not much in the way of extended paths unfortunately.

Mike VK4MIK at Butchers Creek on the Atherton Tablelands, reports on a number of occasions during August, of which he was able to access the Townsville 146.700 repeater at around 250 Km south. On most occasions Mike has been running low power tests and has been able to run down to 5 watts, and some times as low as 1 watt has been no trouble.

The frustrating part for Mike and the other operators up that way is that the conditions have not produced long paths down the coast like it should. But, on the 18th of August, a slight bit of relief was provided. At 8.47 pm, VK4MIK made it into the Townsville repeater and spoke to Felix VK4FUQ. After this, Mike made the 535 km trip to VK4RMK in Mackay and had a QSO with Wal VK4AIV. A short simplex contact was also attempted and completed between VK4AIV and VK4MIK on 146.500 at 544 km. This is Mike's longest 2 m simplex contact, well done guys.

Moving to the southeast, there were no major openings in August. The only real signal enhancement noted was "frontal enhancement" in the evening of Wednesday the 25th of August. The day had been unusually warm, over 20 deg C and warm air was being pulled in from the north ahead of a strong weather front.



Earlier Wednesday morning, knowing that there was the chance of frontal enhancement, I checked the BoM rain radar for the Adelaide area, this indicated the presence of signal enhancement in that area. Later, I caught up with Brian VK5UBC from Gawler, who did confirm that there were some semi local conditions to the west in the morning. Port Lincoln 2 m & 70 cm both S9+20 and Cowell at S9. Brian worked

5ZAW (Adelaide) & 5AEP at Port Lincoln via Lincoln 2 & 70. Also worked 5HBG at Whyalla via Cowell and could hear him simplex.

In the evening there was major thunderstorm activity around the Adelaide area and to the south below Kangaroo Island. There was very strong winds noted at the Adelaide beacon site, with a maximum wind gust of 113 km/h recorded, hence, there were no signals noted from the Adelaide area, the front was too far advanced.

After 8.30 pm that night, conditions virtually in a straight line from my QTH to Ararat were very good. This did not extend to Mt Gambier or Melbourne.

I initially noted Shepparton and Bendigo repeaters at full scale. Looking further out, Ararat was almost full scale. Switched to 70 cm and in the same direction, had a go at the Grampians 70 cm repeater at 471 Km, it was also full scale.

Among a number of stations that called in, one was Tim VK3JTM, who was portable on One Tree Hill around Ararat. Tim was using a mobile whip on 2 and 70. We tried simplex and Tim was 5/5 on 2 m and 5/7 on 70. Peter VK3XDP, just east of Bendigo also found us on simplex and he was 5/5 on 2 and 5/9 on 70.

These contacts almost indicate a slight non-ducting tropo (NDT) effect, of which I have mentioned in a previous article. While some of the usual NDT indicators were present (out going high pressure, some stronger 70 cm over 2 m), others were not (incidence of severe QSB, most cases showed equal if not better 2 m over 70 cm).

Please remember to send through any 2 & 70 FM DX reports to Leigh VK2KRR at ...