
VHF/UHF – An Expanding World

David Smith VK3HZ

Weak Signal

David Smith - VK3HZ

Welcome back from the break. I was going to write that this report will cover both the November and December months. However, November was a month with very little propagation of note. So, we'll move on to December.

Normally, the period between Christmas and New Year is one of intense Sporadic E activity on 2 m. However, this year has been extremely quiet on that front. The only Es activity reported was on December 18th at around 1025Z when Adrian VK4OX worked Norm VK7AC and Peter VK7PD. Prior to the contacts, Adrian had been hearing the Hobart VOR on 112.7 MHz on and off from about 0940.

In contrast, Tropo enhancement produced some good openings between VK6 and VK3, and also from the east coast across to New Zealand.

On the morning of December 3rd, Bob ZL3TY reported hearing several VK 2 m beacons including VK3RED, VK3RGI, VK7RAE and VK2RSY. At 2240Z, he worked Colin VK2BCC with 5x9 reports both ways. At 0130Z he worked Steve VK2ZT at 4x1. By 0400Z, signals had risen and they repeated the contact, this time with 5x9 reports. Other stations worked on 2 m included VK2ZQ, VK2BZE, VK2BHO, VK2ARA and VK3DUT (5x9). At 0710, Bob worked Steve on 70 cm at 5x1. He also worked John VK2BHO on 70 cm at 5x1. The VK2 and VK3 beacons were still audible at the end at 0910Z.

On the evening of December 9th, another ZL opening occurred – this time to the north island. At 0530Z, Ross VK2DVZ worked Nick ZL1IU on 2 m (5x5) and 70 cm (5x1). Other stations making it across the water included VK2ZT, ZL1RS, ZL2ADU and ZL1SWW.

From about December 12th, a large, very slow moving, high-pressure cell had been building up over the Bight, and was starting to produce results. This culminated in the 2000+ km contacts on 10 GHz from VK6 to VK5 and VK3, reported in the Digital Modes section later. Also of note, on the morning of December 15th at 2245Z, Ian VK3AXH worked Rob VK6LD/P on 70 cm over a distance of 2341 km. Rob was operating the remote station he has set up in Albany, but more on that later. At 2300Z, Andrew VK3OE operating his remote station VK3OER in central Victoria worked Rob VK6LD/P on 2 m – a remote station to remote station contact. Also holding up the VK6 end were Derek VK6DZ (also operating /P at Torbay Hill with 10 GHz), Wayne VK6JR and Ron VK6VOX. Many VK3 and VK5 contacts were had, with the opening continuing until the evening of December 17th.

During this time, conditions were also enhanced in other directions by the high-pressure cell. On the morning of December 14th at 2125Z, Peter VK5PJ worked Norm VK7AC on both 70 cm (5x9) and 23 cm (4x2) – a distance of 1027 km.

By December 20th, the High had moved over to the Tasman Sea, and an opening to ZL from VK2, and later VK4, was the result. During the opening, on the morning of December 20th, an unusual callsign was worked by a number of stations. Steve ZL1TPH was operating from his usual portable location at Cape Reinga using the special callsign ZM90DX. This callsign commemorates 90 years of Kiwi DX operation. Steve worked many stations and was heard by Ross VK2DVZ on 23 cm (519) but failed to complete that contact.

VK6LD/P Portable Station

As mentioned earlier, Rob VK6LD has set up a remotely-controlled station in Albany, WA. Rob reports:

The south coast area of WA, around Albany and Esperance is only sparsely populated with amateurs and of these, only a few are set up for long haul DX on 2 m and 70 cm. Having lived down that way previously from 2007 - 2011, I had a great time working into VK5 and VK3 when the VHF and UHF bands were open. Unfortunately work brought me back to Perth in 2011 and the opportunities to work east from Perth on 2 m and 70 cm are quite rare.

My thinking and aim was to get back to working some DX across the Bight and secondary to that was also to work locals on FM, a secondary HF station for local contacts and something to operate when I visit back to Albany.

Fortunately, I still own a property in Albany, so I had somewhere to site some equipment and I needed to install an antenna system from scratch, an Internet connection and a secure area to install all the equipment. This was to include 2 m and 70 cm yagis to point east, the 2 m / 70 cm collinear for FM contacts and a Codan 9350 auto tune mobile antenna for HF operations.

The remote station uses an IC706MK2G and a product called RemoteRig (<http://www.remoterig.com/wp/>). The RemoteRig product allows me to operate from my QTH in Perth and to transmit/receive remotely from Albany, approx 400 km south.

The yagis used are deliberately fairly short. On 2 m is a 7-element M2 and on 70 cm is a 12-element M2. The yagis are fixed facing approx 100 deg azimuth and no rotator. The rationale behind this being from my location, Adelaide is about 95 deg and Melbourne is approx 105 deg.



VK6LD/P Remote Station Antennas

Finally I had gathered all the requisite pieces and scheduled a trip to Albany to install. The installation of the antennas, pole and brackets, running cables neatly, constructing a secure cupboard, relocating the TV antenna to minimise any potential for TVI, setting up a 3G mobile broadband connection and reconfiguring the RemoteRig hardware and software to suit all took me the best part of 2 weeks work - much to the XYL's displeasure!

In all my careful checklists and packing, I managed to leave behind a vital cable. Not content to leave turning on the system until my next visit in Feb 2014, I made an 800 km round trip back to Perth one day to collect the forgotten lead - The XYL thought I was mad! :)

Anyway, with the cable in hand, the system was hooked up on the last night I was in town before returning to Perth. I finally sorted out all the remote connection issues and crawled into bed around 1.30am, to be up early the next morning to head back to Perth.

The Optus 3G is holding up, but can be a bit laggy at night - for the price I can live with it. Everything seems OK and touch wood it is still working for me.

Judging by the number of stations worked by Rob from his remote station, the system seems to be working well, and is a very welcome addition for those of us to the east.

47 GHz Contact

Doug VK4OE reports on a recent contact he had on 47 GHz:

Rex VK4REX/P was operating at Howells Knob (QG63JF) inland from the Sunshine Coast, and I was operating from Mt Gravatt (QG62MK) in Brisbane. This morning (November 7th), we completed our first QSO on the 47 GHz band over a distance of 91.4 km. Signals were around 5x1 each way on a warm and hazy day over a path that is normally line-of-sight.

This is not the first QSO on this band in VK4 - about five years ago I had some limited short distance QSOs - but the one today is more worthy to be the initial, officially claimed, VK4 distance record for the band. One of those original transverters has recently been modified and improved - now working significantly better than the original one. Longer paths are expected to be readily covered when I graduate my antenna from a 26 dBi horn to a machined dish originally designed for 38 GHz use.

Equipment summary:

VK4OE/P - 100 mW TX power to 26 dBi horn, plus a Kuhne low noise power amplifier and WR22 waveguide four-port transfer switch to manually change between RX and TX states.



Doug VK4OE with 47 GHz Equipment

VK4REX/P - 30 mW TX power to Procom dish and feed, plus a Kuhne low noise power amplifier with servo driven mechanical rotation plate to change between TX and RX.

UPDATE: Rex decided to later test his FT-817 IF radio and found that instead of the normal 2 Watts of drive power that he designs his transverters around, he was only getting around 4 mW output from it. He thus calculates that his transmitter power was in the order of 80 uW!

After correcting the problem, on November 19th, Doug and Rex decided to try again over a longer path. Doug moved to Eagle Heights in the Gold Coast hinterland for a path distance of 132 km. After optimising dish pointing, signal reports were 5x2 both ways for a new 47 GHz National record.

They now have plans to attempt an even longer path of 181 km.

78 GHz Record Contact

Alan VK3XPD reports on recent events on 78 GHz:

On the millimetre wave front, I wish to advise that the current 78 GHz SSB Record has been extended. On December 14th, Russell VK3ZQB and I extended this National Record out from 11.7 km to 31.8 km. The final path was from Tower Hill near Warnambool to Mt Warnambool. Both transverters delivered about 10 mW to 300 mm dishes.

Despite the less than ideal local weather conditions, the signal's were crushingly strong at 5x9 +20 !

So, with that much signal margin, we decided try for a Tower Hill to Mt Leura shot near Camperdown. We were however unsuccessful. We believe this band requires true "Line of Sight" signal paths and since Mt Leura was below the visual horizon, we failed. No matter - we just need to look for a few alternate Line of Sight paths.

As the summer progresses, I'm sure there will be more extensions to the 78 GHz distance records to follow.

Please send any Weak Signal reports to David VK3HZ

Digital DX Modes

Rex Moncur – VK7MO

New 24 GHz EME World Record

On 16 November Charlie, VK3NX, worked Charlie, G3WDG, over 16878 km for a new 24 GHz World record using JT4F. Earlier on the same day VK3NX worked OK1KIR on JT4 and also on CW for a new CW record of 15885 km.

10 GHz Terrestrial with JT4f

During November Rex, VK7MO, travelled to Western Australia, to setup Derek, VK6DZ, on 10 GHz for terrestrial operations. Derek lives close to Torbay Hill, about 30 km west of Albany – the site used by Wally, VK6KZ, for his 10 GHz World record contact with Roger, VK5NY, back in 1994. The system Derek is using is fully GPS locked and produces 10 watts output to a 60 cm dish. With the increased sensitivity of JT4f cf SSB, higher power (VK6KZ ran 100 mw) and larger dish size the sensitivity of the new system is improved by some 50 dB. As training for Derek, Rex travelled around the Southern part of WA activating some 24 Grid locators as shown in Fig 1. The longest contact was 746 km to near Geraldton. The red circles indicate JT4f contacts only and the white indicate SSB and JT4. The orange was via aircraft scatter using ISCAT-A.

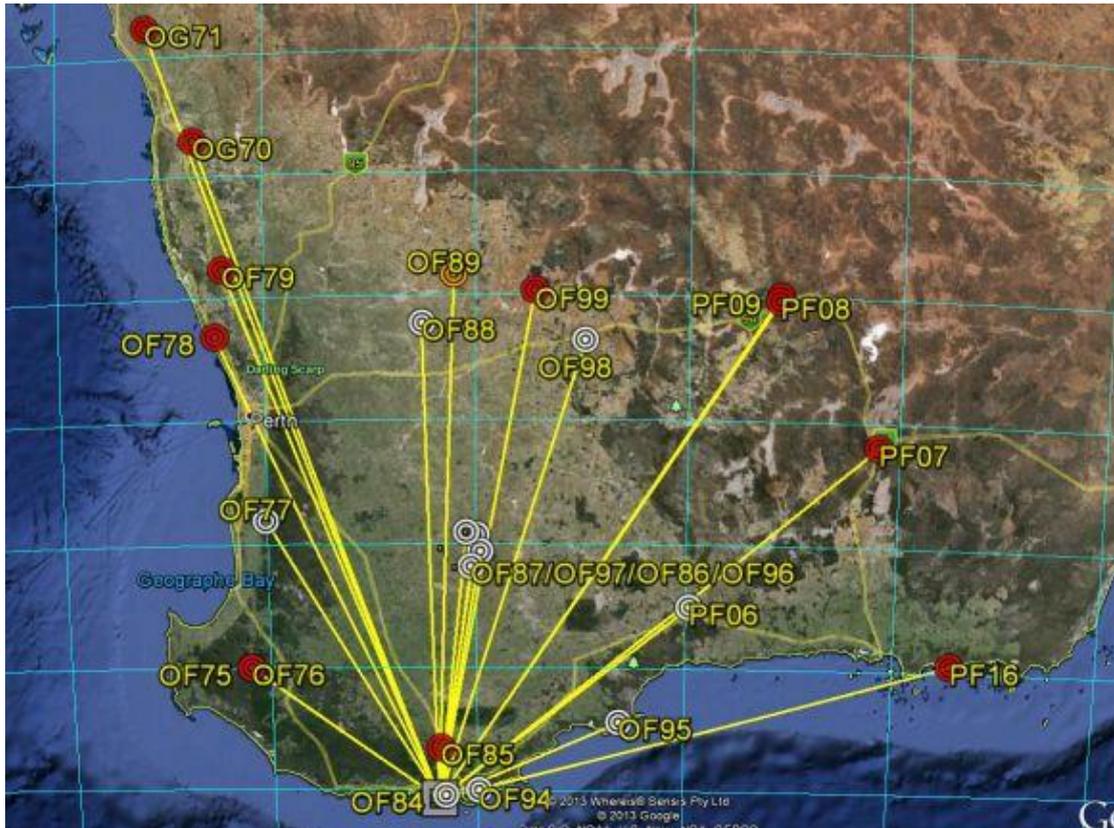


Fig 1: Grids worked on tour of Southern VK6

On the way back Rex also ran some JT4f training sessions with David, VK5KK, from the near Port Lincoln to Adelaide and made contacts with Colin, VK5DK, and Russell, VK3ZQB, from the Adelaide Hills.

By around 11 December there was evidence of potential ducting across the Bight and Rex travelled down to near Port Campbell and a number of stations were alerted to the possibility of an opening. On the evening of 13 December the first station to copy a single tone signal from VK6DZ was Keith VK5AKM using a 22 dB patch panel antenna. Shortly after VK5KK using a 38 dBi dish and 4 watts completed a JT4f QSO over 1913 km (this was repeated three times over the following 2 days and the distance increased to 1932 km. The next morning Rex set up on a cliff near Port Campbell and rang Derek who had stayed up all night at Torbay Hill. Immediately Derek started transmitting his 1270 Hz tone was clearly evident and a 2293 km QSO was quickly completed with signals -16 and -13 dB. While SSB was attempted and Derek copied callsigns and Rex copied Derek giving a 3/1 report, an SSB QSO was not completed. Fig 2 shows the paths involved with VK5KK and VK7MO. It also shows a potential path to the North East coast of Tasmania which would allow the existing World Record of 2696 km to be extended to 2720 km.

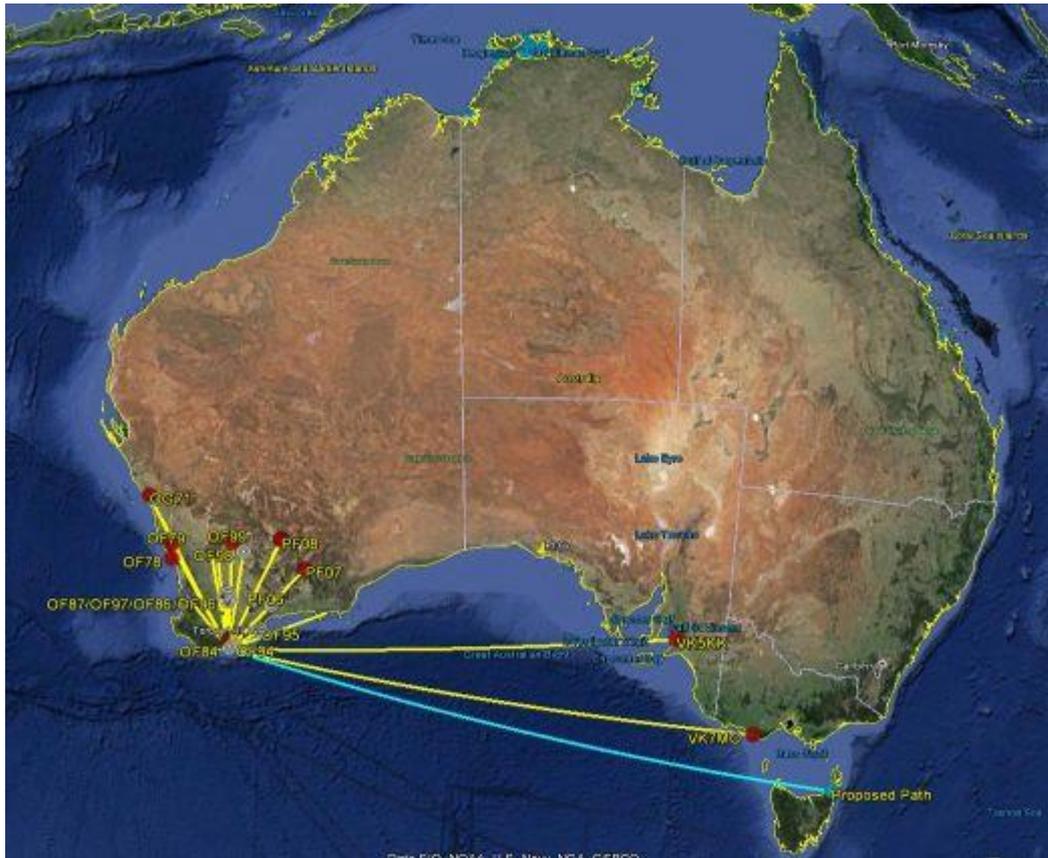


Fig 2: 10 GHz contacts from VK6DZ to VK5KK and VK7MO and proposed longer path

Now that Derek is set up to go portable at relatively short notice there is the prospect of many more QSOs on 10 GHz across the Bight. With a series of stations able to run GPS locked JT4f from Adelaide to the East we should be able to track the development of suitable conditions from VK5AKM & VK5KK near Adelaide, VK5DK at Mt Gambier, VK3ZQB at Port Fairy, VK3NX at Geelong, VK3XPD in Melbourne, VK3HZ portable in VK3 to VK3GHZ near Bairnsdale and potentially VK7MO portable in Tasmania.

JT4f, which is part of the WSJT suite, has the advantage that it copes well with tropo-scatter spreading and at this stage is considered to be the preferred digital mode for 10 and 24 GHz tropospheric propagation. The practice is to conduct JT4f QSOs on 10368.225 MHz which is the focus frequency for narrow band digital modes in the VK band plan. JT4f is still under development but one should use at least Version 9.5 R3033 or later to gain the features that will be discussed below. There is evidence that ducting produces less spreading than tropo-scatter but often the propagation seems to be a mix of both tropo-scatter and ducting with the associated spreading and JT4f is the best compromise for both. GPS locked JT4f also has the advantage of single tones which allow one to find the weakest signals and to monitor the development of propagation. Thus at this stage it is considered we should standardize on JT4f for this work to avoid the confusion of moving between different modes. JT4f differs in a number of ways from the more familiar JT65 and thus one needs to gain some experience with its use by working closer stations so as to be ready when there is an opening. The main differences are the use of single tone messages, the MinW (minimum bin-width) facility, averaging facility, and the exchange of S/N reports as discussed below:

Single Tones: Given that both stations are GPS locked it is possible to send simple

messages such as RRR, 73 and QRT based on the frequency of single tones. A single tone can be sent by using the “@” symbol in front of a number which specifies the tone frequency, in any TX box – for example @1000 produces a tone of 1000 Hz. Single tones have the advantage that all the energy is constrained to one frequency and have a significant advantage over multi-tone messages. JT4f also has a facility to integrate single tones over a full one minute period which gives around 8 dB advantage over multi-tone messages. This facility is implemented by going to the Setup menu and ticking plot average JT4 Spectrum. The program will then add a Yellow graph to the main WSJT graphing window which shows a peak on the frequency of the single tone. If no signal is present one will see random peaks from period to period (from the noise) so one needs to gain some experience in looking for weak single tones to use this facility correctly. The frequency of the single tones can be read directly from the waterfall (set to the frequency scale) if they are strong or from the Yellow graph. Frequency on the Yellow graph can be read by moving the mouse vertically around the peak and a small yellow window will show up with the difference frequency from 1270 Hz from which one can derive the actual frequency (we are working with Joe Taylor K1JT to make this simpler). The single tones that are currently being used are:

@1270 this is used for tuning (eg if one station is not fully GPS locked) or when waiting for propagation

@1000 this is used to signify that the station is ready to receive messages in multi-tone form

@1500 = RRR

@1700 = 73

@2000 = QRT

MinW: The current version of JT4f has the ability to match the bin-width to the amount of spreading. It does this by attempting decodes at the narrowest bin-width (designated “A” or 4.8 Hz) and then if it cannot achieve a decode it doubles the bin-width and makes another attempt and keeps trying right up to the f bin-width of 157 Hz. When a decode is achieved there will be a letter at the end of the line signifying the bin-width at which a decode was achieved. One issue with this approach is that the program may gain a false sync at a narrower bin-width and thus never test at the bin-width where a good sync might be included in the average. To overcome this it is best to start the program from just a little below the expected bin-width. The MinW feature which is on the main WSJT window just below the tolerance can be adjusted. One can make an estimate of the amount of spreading from the initial 1270 Hz tone to set MinW. The relationship between the letter designator and bin-width is as Table 1:

Letter Designator	Approx Bin-width (Hz)
A	4.4
B	8.8
C	17.5
D	39.4
E	78.8
F	157.6

Table 1: Bin-width Designator and Bin-width

Averaging: The averaging facility is useful when the signal is strong enough to gain sync but not decode but by including a number of periods in the average one can

decode these very weak signals. One can typically gain an advantage of 2 to 3 dB by averaging over up to 6 periods. The main issue with averaging is that one must exclude from the average any periods that do not produce likely valid information to average. Given that both stations are accurately locked for time, valid syncs will be within 0.4 seconds for a terrestrial path (the variation arises due to the fact that WSJT uses 0.186 second interrupts and with this applying to the timing at both ends there is with rounding the potential for 0.4 second variation). It has been found that it is best to set the sync to zero (the default is 1) as then the program will pick up sync almost all the time, but many will be false. Thus one must use information such as the correct DT and correct DF to decide which are likely to be good syncs for inclusion in the average. The decision as to the correct DF depends on the spread of the signals which can be determined from the initial 1270 Hz tones.

Signal Reports: The practice is to exchange signal reports in the form of dB levels. Fig 3 shows the format of the messages and reports as can be setup in the JT4f options. The report is transferred to the message when you double left click on the other station's callsign. (there is a small bug in JT4f at present in that single tone format is overridden when you double left click on the callsign to pick up the report and thus it is necessary at this stage to click on Gen Msgs to return to the single tone format in TX4 to TX6. Hopefully this will be fixed by the time you read this).

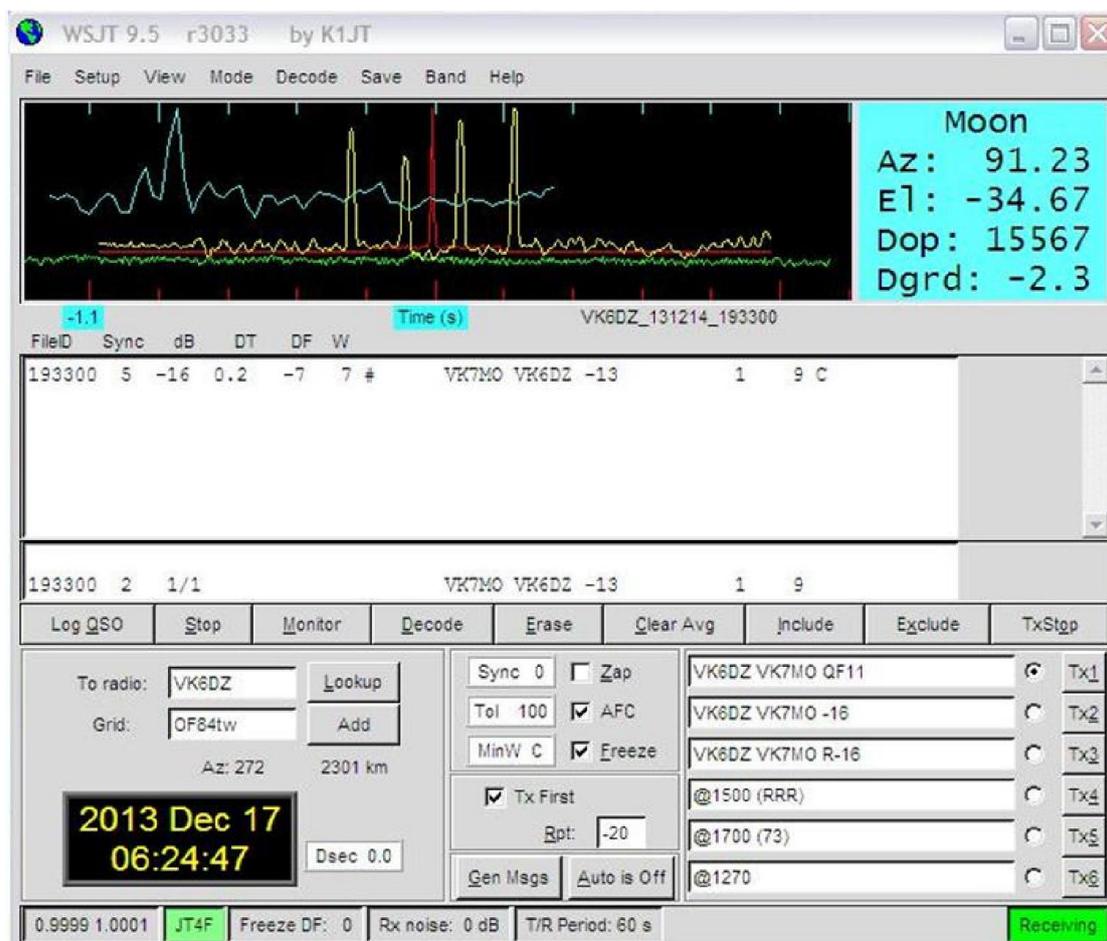


Fig 3: Recommended Message format

Tolerance and Freeze: Tolerance is implemented by ticking freeze (see Fig 3). On weak signals, JT4f sometimes picks up a false sync from the noise plus the three

lower tones or the three higher tones and noise above them. To avoid this one can set the tolerance to 100 Hz and click on the waterfall to position the tolerance based on the 1270 Hz tuning tone.

Conventions: The convention is that the Easterly station transmits first period.

10 GHz EME Demonstration in VK6

During the trip to Western Australia mentioned above Rex, VK7MO, gave talks to the WAVHF group covering the arrangements to set up Derek VK6DZ and also a talk on small station 10 and 24 GHz EME. The following day Rex gave a demonstration of 10 GHz EME with his small 77 cm dish to the group (Fig 4). Many group members had the opportunity to work either OK1KIR or G3WDG. It was fitting that VK6KZ who used a G3WDG transverter for his 10 GHz record contact back in 1994 was able to work G3WDG on 10 GHz EME some 19 years later.



Fig 4: Members of the WAVHF group observing the 10 GHz small station EME demonstration

Please send any Digital DX Modes reports to Rex VK7MO

Meteor Scatter

Kevin Johnston – VK4UH

The November to Christmas period for 2013 has seen the beginnings of the Summer VHF season with enhanced propagation across the bands. Activity has been good over the holiday with multiple Es and Tropo events occurring. Either of these VHF

“enhanced propagation” effects can influence results on meteor scatter where these other modes may significantly extend MS paths well beyond the typical 2500 km limit. By way of example, last year in September 2012 Arie VK3AMZ successfully completed with Bob ZL3TY October over a 2341 km path at a time when the Hepburn chart was showing the possibility of tropo ducting with a big cloud of “yellow” at the ZL end of the path. Although this path is theoretically possible by MS alone the number of pings received in either direction up until then had been very small. In October 2012 Starr ZL3CU reported decoding pings from Ross VK2DVZ over a path of 2179 km, even though he was beaming over the NZ Southern Alps which would normally block this path for MS due to limiting elevation. At the same time Simon ZL4PLM and Ross VK2DVZ made exchanges. On this occasion there was high probability of Tropo extension at the VK end of the paths which would both extend propagation and also increase the elevation of signals across the ZL Alps.

Our Meteor-scatter counterparts in Europe have recently extended (as reported in Dubus 3/2013) the MS World Record to a staggering 3377 km on 2 m using this combination propagation mode of MS-Tropo during the European Perseids shower in August 2013. EA8TJ in the Canary Islands (IL18rj) off the West Coast of Africa completed with 10 stations across UK, Holland, Belgium, Switzerland, Germany and Italy using this combination propagation mode. The longest path being to S50C (JN76jg) running 1.5kw of FSK441 to 4x18 element yagis. It is suggested that the critical feature is the point and angle where the MS signal hits the tropo duct. The take home lesson for us here in VK and ZL is not to abandon Meteor Scatter activity just because there are other “tempting” propagation modes about at this time of year.

December brought the Geminid Meteor Shower. This shower typically brings the best conditions for the MS calendar each year. The Geminids occurred over an extended period peaking on 14 December. The shower occurs every year where the orbit of the Earth around the Sun takes us through the cloud of celestial dust and debris remaining from the asteroid Phaeton. The ZHR can be as high as 120 meteors per hour at its peak.

Regrettably even though the peak of the Geminids Shower occurred over a weekend period results and activity were disappointing this year, not achieving the very high return rates reported during previous showers. Reports on the logger described frequent hyper-dense returns (burns) extending up to 30 seconds even on 2m. I unfortunately was away in VK5 and missed the peak. Arriving home late on the Sunday evening (15th Dec UTC) I had made prior arrangements for a sked with Arie VK3AMZ to attempt a 70 cm FSK441 MS contact during the night when Gemini would be low on the horizon for both stations.

Commencing at 17:00 UTC, 03:00 am local time, a successful 2-way QSO was completed by 19:00 UTC on 432.230 MHz. The best ping received at the VK4 end was 230 ms long at 12 db above the noise. Over a distance of 1402 km. This is certainly a first for me.

Meteor Scatter on 70 cm shows the reverse of the effects described last month for operation on 50 MHz. Since the wavelength is roughly 1/3 of that at 2 m then the duration of the pings is roughly $1/(3^2)$ or 1/9th of the time expected on 2 m. The amplitude of returns is expected to be $1/(3^3)$ or 1/27th or 15 dB weaker.

Finally this month some more experience has been gained running MSRX programme mentioned last month. I have been successfully running this application in the background, behind WSJT for most of my MS operations over the last two months. Accepting that the decoding process in MSRX effectively delays the appearance of decoded signals for almost a complete cycle it is still proving very useful for weak pings that FSK441/WSJT has missed. The averaging facility is also fascinating where the MSRX programme “stitches together” data from multiple weak

pings received during a single period, none of which gave a complete decode by itself. The result sometimes a complete usable decode where none existed before. More on this when more experience has been gained.

73s from this keyboard and all the seasons' successes for 2014.

Please send any reports, questions or enquiries about Meteor Scatter in general or the digital modes used to Kevin VK4UH

The Magic Band – 6 m DX

John McRae - VK5PO

December had some interesting DX.

The sun has been active, and if we had that sort of solar activity at EQUINOX, I think we would see some real exotic DX. Maybe even European propagation.. Propagation from Central America and the USA was almost absent, unlike over the previous two years, although VK5BC and VK5PO worked TI5/N5BEK on the 3rd of December. Some stations in VK2 and VK3 heard YS1YS and the TI2NA beacons briefly, during this time also.

On the 10th of December, VK5PO heard YS1AG on CW, but was unable to complete a QSO.

The usual aTEP was prevalent many times during December from JA, and JA was worked from most call areas.

The 15th of December at 06:23z saw Wayne, VK4WTN, complete a 2-way CW QSO with JJ, FW5JJ on Wallis Island. It was not until the 26th of December at 01:57z that Andrew, VK3OER was the next VK to work Jean Jacques, "JJ" on CW. Followed on by VK5PO, VK4CZ, VK3GHZ, VK4AMG, VK3OT and finally VK5SIX at 03:05z, when FW5JJ faded.

KH6SX was worked on both SSB and CW firstly on the 10th of December between 04:43 and 05:02z by VK4RF, VK5RM/4, VK3DUT, VK5PO, VK3XDX and finally VK5ZK.

Then again on the 26th December Art, KH6SX was worked by VK3VG on SSB then followed by VK3ZAZ and VK3OER on CW. This was a twenty minute opening, and the first QSO was at 04:15

E6RQ Alan, (VK4WR) Was worked by many stations between 07:21 and 09:05z on the 7th of December. Stations in Alan's log include VK3DUT, VK5PO, VK5ACY, VK5BC, VK3ZAZ, VK5JR, VK4CZ, VK7DX, VK3OER and finally VK2ZQ. CW and SSB was used. On the 9th of December, E6RQ again was worked by these stations: VK3XDX, VK3AUU, VK3YFL, VK1DJA and finally VK4's WTN and BG. This opening started around 06:15 and finished around 07:26z. There were further "openings between Niue and VK7, 3, and other times during December also.

VK5PO managed to get an excellent Christmas "present", when on Christmas day, at 00:43z made a 2-way CW QSO with Sigi, H40FN located in Temotu Province. The grid square was RH29UG .

WSPR (Weak Signal Propagation Reporter)

This mode has been around for three to four years now, but it was excellent to see upwards of forty different VK stations, which included all states and territories using it on six metres. This is the most activity seen so far using WSPR. VK4TVL, Lloyd in Townsville amassed 45 two-way reports.

So, 45 different callsigns were logged at least. That is an excellent use of WSPR.

Sporadic E propagation was excellent from time to time during December.

VK6 to VK4, VK8 to VK7 etc, all states and territories seem to have made contacts. Some excellent "night E's" were prevalent also. Huge signals were commonplace between VK5 and VK3 call areas.

Merv, VK4DV at Rockhampton worked a few stations via sporadic E. Using SSB, Merv worked VK2ZIW, VK1DJA, VK2DO, VK3NX and VK3HY between 02:25z to 03:45z. Congratulations are extended to Merv for 50 years as a WIA member!

Finally, From Graham, VK6SIX come these observations:

Interesting year of 6 metre DX from my shack in OF77XX

I was in the shack every day in 2013, and looking through my 3 paper logbooks that covered all activity in 2013 on 6 metres I have these statistics:

Total number of days with 6 metre openings in 2013 (QSO's with other stations) - 22.

Total number of stations worked on 6 metres in 2013 – 53 (some stations worked more than once).

Number of countries worked - 7, including ZL, VK, JA ,HL, A92, DU and 9M2.

Countries heard but not worked – 1 - BA4SI.

Please submit reports, logs or other info you may consider useful to John VK5PO