VHF/UHF – An Expanding World

David Smith VK3HZ

Weak Signal

David Smith - VK3HZ

10 GHz Band

For those seasoned VHF/UHF operators looking for a new challenge, the 10 GHz band provides a variety of fascinating new experiences.

Despite general belief, propagation paths on the band are much more than simply Line-Of-Sight. When a path is LOS, the signals can be rock-crushingly strong, seeming to come from all around, reflected off trees and rocks, even over distances of greater than 150 km. Beyond that, troposcatter propagation takes over and can provide signals beyond 400 km without special conditions. The clouds and rain seem to contribute a variable amount of scatter depending on their nature, spreading the signals in frequency and introducing Doppler shift. With careful planning of the QSO path, Aircraft Enhancement has also been used for contacts, providing strong, if somewhat brief, signals over distances up to 850 km. Then last summer, tropo ducting was used for a contact of almost 2300 km between VK6 and VK3.

Like any band, good results require decent equipment. While there are no complete off-the-shelf 10 GHz systems available, building your own can be a fairly simple systems integration job, putting together gathered bits and pieces to form a complete unit. There are now a number of sources of transverters – VK3XDK, Minikits, DEMI and Kuhne come to mind. Dish antennas are readily available – either offset-fed satellite dishes or prime-focus dishes such as the Mitec surplus ones. There are many fellow 10 GHz band operators around who are more than willing to provide advice and assistance with building a system.

Many people now run frequency locking on their systems, opening up a wide range of new possibilities. Narrowband Digital modes such as WSJT JT65 or JT4 are now possible producing a substantial extension of the distance that can be worked. Even if voice contacts are your primary interest, Digital modes dig much further into the noise and so can be used to test a path, peak your dish pointing and then “play the QSB” until signal levels reach those necessary for an SSB contact. Digital modes also allow ready observation of effects like cloud and rain scatter.

Many permanent Home stations are now appearing. While a reasonably clear location is an advantage, QSOs are still possible using scatter from surrounding hills, clouds, and rain bands. Building a portable system is not all that difficult using, for example, a surveyor’s tripod to support the system.

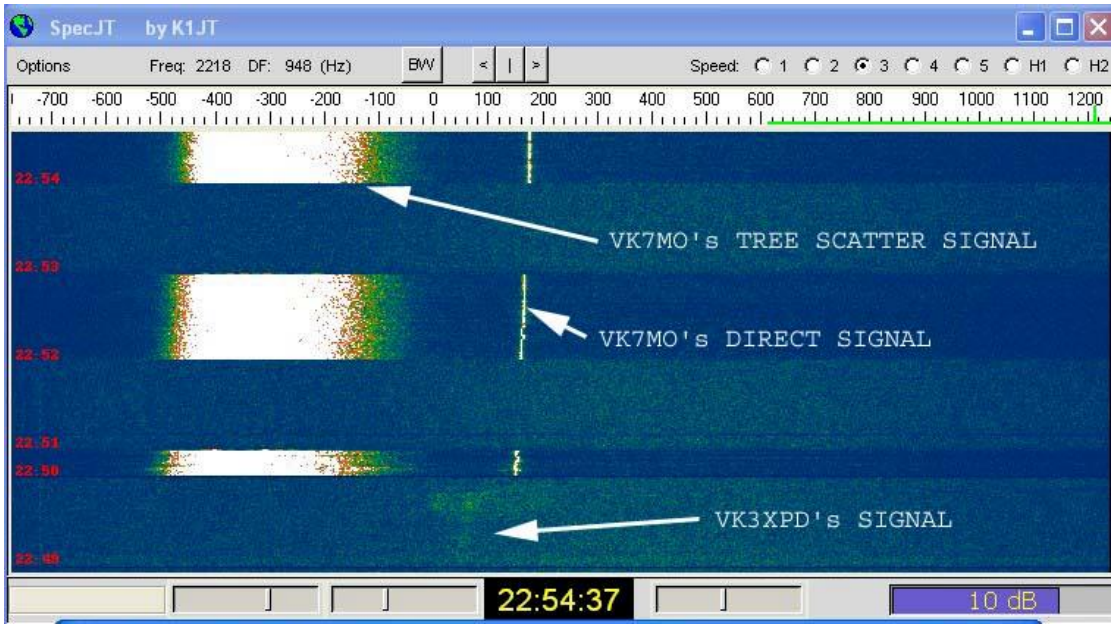
Russell VK3ZQB has a permanent home setup on 10 GHz. He has regular QSO’s with Colin VK5DK in Mt Gambier over a path of about 150 km. At one stage, Rex VK7MO was operating nearby and Russell observed some unusual signals as he explains:

While Rex was in Portland operating on 10 GHz, his signal to me would have been strong enough to light a P lamp connected to my dish feed. I had a contact with Rex on phone and he was 60dB over 9 with the dish pointed at him.

While he was working Alan VK3XPD and David VK3HZ, I rotated my dish about to see what I could hear. Rex's signal was readable regardless of my dish direction and because of the saturation of signal, I could detect scatter from cloud formations and other obstructions around my QTH.

The most significant signal was scatter of Rex's signal from a 50 m high Norfolk pine,

30 m North East of my antenna. Attached is a screen shot of Rex's signal, showing the signal I was receiving direct from Alan VK3XPD at the bottom, and Rex's direct signal received off the back of the dish, plus the enormous splotch of signal reflected from the Norfolk.



VK7MO Scattered 10 GHz Signal at VK3ZQB

You can see the direct signal from Rex and the reflection from the tree, spread probably due to the multiple reflections from different parts of the tree. However, the strange thing is the Doppler shift that has the tree reflection at a lower frequency than the direct signal.

In later discussion with Rex about the supposed scatter from the Norfolk, there are some questions that put doubt on it. For me to see a Doppler shift, the tree would need to be moving. The Doppler shift is nearly 450 Hz from the direct signal. This is a large shift for a reflection 30 m away and only moving slightly with the 10 - 12 km/h breeze.

The next possibility would be a significant cloud or rainstorm behind the tree, but on that day I had light drizzle rain in the morning which had cleared to a sunny day at that time. Getting signal past the tree is near impossible and earlier tests with a 9.75 GHz radar proved this tree to be a complete absorber of microwave energy.

If it is Doppler, whatever was reflecting his signal was moving at a constant speed in the shot line for more than 10 minutes without any change. Previous experience with cloud or rain scatter is that the shape of the smudge changes and moves with time requiring constant adjustment of the azimuth.

This one did not fit the mould of normal rain scatter and so I think the conclusion can only be "Why is it so?"

So if you're looking for a new challenge, why not give the 10 GHz band a go.

VK6 23 cm Net

Rob VK6LD writes about a new Net:

Just a quick message to advise a 23 cm Net has been running in Perth for several weeks and looking for numbers to grow and keep it interesting.

The Net takes place on Thursday evenings commencing at 7.30 pm local time (1130hrs UTC).

Net Frequency is 1294.100 MHz, FM mode (Vertical Polarity).

Second half of the Net we try USB for those with SSB equipment on 1296.150 MHz (Vertical and Horizontal Polarity).

Alternate/Liaison frequency for those who are Rx only or can't get through on 23 cm is 146.575 MHz FM.

Net Control Stations are Rob VK6LD (South of River) and Andrew VK6IA (North of River) taking check-ins and running the net.

We hope the Net will run for around 30 minutes, but the last three weeks it has been around an hour, so need to improve on that!

The Net is an opportunity to meet up with other enthusiasts on air, exchange signal reports, go mobile / portable / hilltopping and to make improvements to our stations, etc. Already have stations upgrading and planning to upgrade their antennas and putting them up higher in the air.

Please spread the word and hope to hear you next Thursday night.

Please send any Weak Signal reports to David VK3HZ

Digital DX Modes

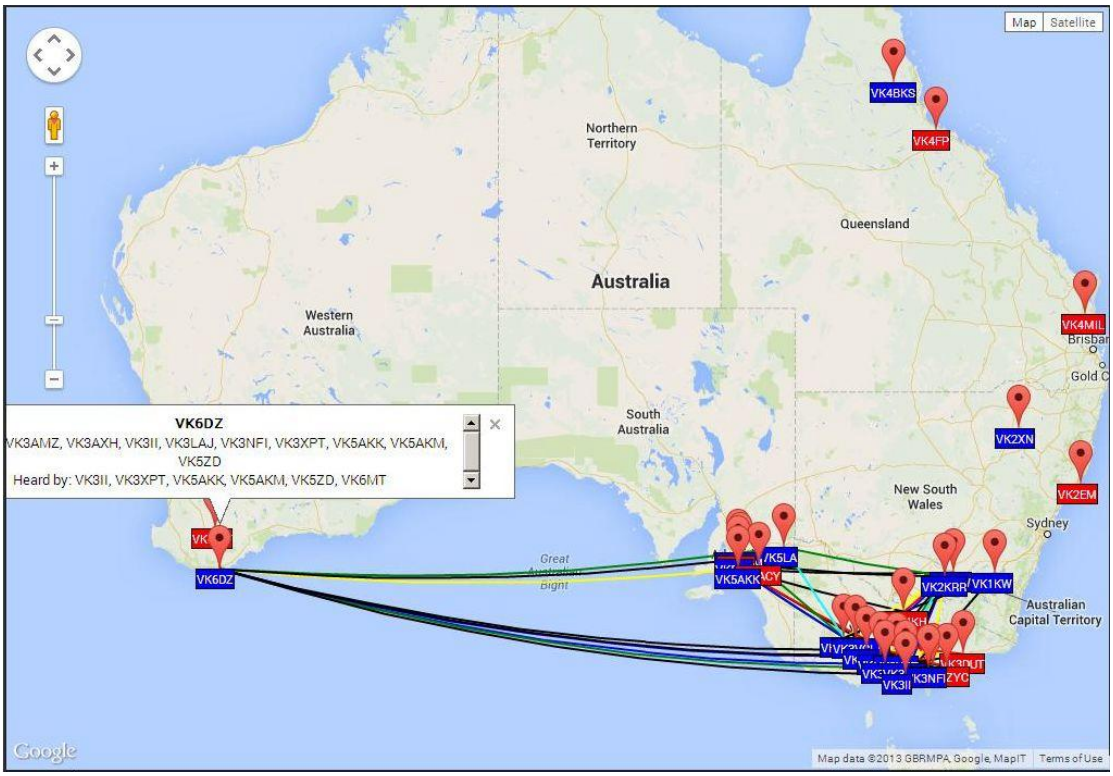
Rex Moncur – VK7MO

WSPR – Weak Signal Propagation Reporter by Leigh Rainbird VK2KRR

WSPR stands for Weak Signal Propagation Reporter and is a software program developed by Joe Taylor K1JT. The software can be freely downloaded from the K1JT pages at http://physics.princeton.edu/pulsar/K1JT/wspr.html. Numerous ham stations world wide use WSPR everyday, mostly for investigating and monitoring radio propagation conditions on almost all bands which not only include LF, MF, HF, but also VHF, UHF and Microwaves.

This month's information will be just a brief insight but will be followed by more detailed articles in coming months. The focus will be on, 50 MHz, 144 MHz, 432 MHz and 1296 MHz.

In Australia, the number of operators using WSPR on VHF and above rises and falls depending upon the time of year and how good the band conditions are. The number of stations interacting with WSPR continues to rise each year. There are a number of dedicated stations that kindly provide many hours of operation of their stations everyday for the benefit of the wider VHF community, as everyone can access the resulting data about the state of the propagation on the WSPRnet site at http://wsprnet.org/drupal/ specifically in the database or maps section.



Picture – 2m Tropo duct paths across the Great Australian Bight identified on WSPR map from 17th Dec 2013.

How can WSPR be of benefit to me? WSPR has a number of different uses. Primarily, as its name states, it's a Weak Signal Propagation Reporter, which is what it does best. You can leave it running while you have better things to do than listen to noise, keep an eye on the WSPRnet site and then rush back into the shack when the band opens up! The program, when linked to your radio and the Internet, will decode weak (or strong) WSPR signals from other stations and automatically upload them to the WSPRnet site for you and others to view. You will know if the band is open or not, or can review data from your station at a later time to see what you have missed out on!

Secondly, WSPR can also be used to test changes to different parts of your station in relation to its performance. The WSPR program provides you with signal reports as Signal to Noise Ratio (SNR) in dB. You could for example, test different antennas, or antenna configurations, different beam headings. Test different coax or pre-amps. Different levels of output power, different radio's etc. Find out which combinations of equipment gives you the best or worst performance.

What are the allocated WSPR frequencies? WSPR takes up only 200 Hz bandwidth on all bands, and each transmission is only 6 Hz wide. Frequencies are allocated to be used worldwide. These are what the radio dial is to be set on, all are in USB mode. The frequencies are – 50.293 MHz, 144.489 MHz, 432.300 MHz and 1296.500 MHz.

What are the critical aspects of being able to successfully use WSPR? Your radio's frequency stability is most critical; this should not drift more than 4 Hz over the 2-minute transmission period. Your computers timing is next most critical, this needs to be very accurate to within approx 2 seconds, though may work out to about 4 seconds if your lucky. Your radio's frequency accuracy is next most critical, if you're not in the bandwidth for WSPR then you won't be decoded.

What results can I expect from WSPR? There are numerous variables that produce different results. If your station set up is correct and the band you are on is open, the results could be quite surprising. On 50 MHz you could expect to be heard Australia wide or even worldwide. On 144 MHz you may identify paths that you never thought would be possible and others which may catch you out by surprise at times when you may least expect the band to be open.

How much power should I use? WSPR in general uses QRP transmission levels. This is because when you're looking for band openings that can be used for SSB voice communications, you will need more power to complete the voice QSO in comparison to the weak signal, narrow band abilities of WSPR. With different propagation characteristics, the general consensus on 50 MHz is to use no more than 20 Watts. And on 144 MHz most stations are settling on 10 Watts.

Hope that's enough to get you going, I'll expand on this information over the coming months.

Please send any Digital DX Modes reports to Rex VK7MO

Meteor Scatter

Dr Kevin Johnston – VK4UH

As winter approaches, conditions for "random" meteor scatter propagation are generally declining. This was reflected through April even during the weekend activity sessions. Meteor return rates were low with "pings" both short and weak. Activity was further decreased, at least from the point of view of the northern stations in VK4 etc, operating in period 2, by a lack of active stations operating from the Southern States, in Period 1. This was particularly noticeable on Saturdays when only one or two dedicated stations from VK3 have been appearing.

The enhanced propagation anticipated from the Lyrid Meteor Shower, which peaked on 22nd April, was also disappointing. Although there were hyper-dense meteor returns surrounding the Lyrid Shower to be heard, resulting in intense and prolonged "burns" some extending for tens of seconds, the peak of meteor activity from the shower fell mid-week and at times when few stations were available to take advantage.

In last month's report I made mention of the release of a new version of WJST (Ver 9.7). This month I found reference to yet another version (Ver 10.0 r3769). Although this proved a little difficult to track down at first, once located it was downloaded and installed without problem.

The programme can be found at:

http://physics.princeton.edu/pulsar/k1jt/wsjt_10.0_r3769.exe

The corresponding user guide was located at:

http://physics.princeton.edu/pulsar/k1jt/doc/wsjt

There is a note from Prof. Joe Taylor K1JT, the author of the software, indicating that this version is an "Old Reliable - Candidate Release" mainly aimed at VHF/UHF/Microwave users for MS and EME. He is also asking for feedback from anyone who tries this version. Most of the current useful modes are provided including FSK441, JTMS, ISCAT, JT6M, JT65, JT4, 15 wpm CW structured for EME and Echo. I ran both of the new versions in parallel for several activity sessions, both seemed stable and reliable. The user guide above also provides useful background information for these modes and for MS and EME operation in general. This would I believe be useful for newcomers to Meteor Scatter and digital EME operation.

The next major Meteor Shower will be the Eta Aquarids (ETA). Hopefully there will be something more positive to report on this next month. The shower is expected to peak around the 5 - 6th May but is known to have a slow rising peak and prolonged duration. There has already been a noticeable rise in meteor return rates, occurring over the weekend of 25 – 26th April, as this report was being prepared. It is probable that this was due to the early commencement of the ETA shower. Time to dust down the equipment in anticipation and watch the VK- logger for reports.

The ETA shower in previous years has supported MS activity extending up to 70 cm and with digital, CW and even SSB contacts being completed.

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