
VHF/UHF – An Expanding World

David Smith VK3HZ

Weak Signal

David Smith - VK3HZ

Firstly, a big thank you to Brian VK5BC for all the effort he's put in over the last 8 years, compiling the 6 m notes for the column. And welcome to John VK5PO who has taken over the reins.

The bands have had some life, even though summer is now behind us. On the evening of March 3rd, Harry ZL2ADU on the south-western tip of the NZ north island found good propagation on 2 m into eastern Victoria. At 0920Z, he worked Norm VK3DUT (5x1). He was hearing the VK3RED beacon at 5x2. By 1000Z, the VK3RGI beacon was 5x9 and he worked Rhett VK3GHZ (4x1). By 1100Z, Rhett had risen to 5x2 and he worked Ralph VK3WRE/P (5x7).

The following morning (4/3), VK3RGI was down to 5x1 and Harry worked Rod VK2TWR (5x1) and Norm (5x1). Meanwhile Steve ZL1TPH/P had set up at his usual portable location at the north end of the north island. He also was hearing VK3RGI (5x5) and VK3RED (5x2). At 2140Z, he worked Norm (5x6), Rod (5x2) and Colin VK2BCC (5x5). Harry also worked Colin (5x5). Ralph ZL1TBG also worked Norm (5x5). Later in the day, at 0430Z, Nick ZL1IU appeared and worked Norm (5x2), Steve VK2ZT (5x9) and Ross VK2DVZ (5x6) before the band closed at about 0600Z.

On the morning of March 8th, conditions were good up the coast between southern VK2 and VK4. At 2100Z, Adrian VK4OZ worked John VK1CJ (1010 km) and Rod VK2TWR (1130 km) on 2 m. He then worked Rod on 70 cm. The rugged terrain at the southern end makes these fairly difficult paths.

Sad Month

It has been a sad month with the loss of two leaders in the VHF/UHF field in Australia.

On March 10th, Neil Sandford VK2EI became SK. Neil was a great achiever, but extremely modest about it. I didn't know Neil well, but I remember many of his short GippsTech presentations which were always impressive examples of practical resourcefulness in VHF/UHF and microwave areas. Neil was a true gentleman in the amateur fraternity, and a knowledgeable one at that, who treated everyone with consistent grace and courtesy. He will be greatly missed.

On March 28th, Eric Jamieson VK5LP, "The Voice in the Hills" who wrote this column for 30 years (1969 - 1999), became SK. I never met Eric, but heard many stories of his exploits which, no doubt, will be covered elsewhere in this magazine. However, I did realise that my small feet would never fill the big boots he had left when he retired from writing the column. Again, he will be greatly missed.

Beginner EME

Barry VK3BJM write of his exploits in getting started in EME:

Early last year I was contacted by Allen, VK4EME, with regards to trying for an EME contact on 432 MHz. We had a couple of fruitless scheds, but after the final one on Sunday 11th of March I decided to try the Echo mode in WSJT, on 2 metres, as the moon set. And bingo - I had echoes!

The next day, about 10 degrees before moonset, I scanned down the N0UK logger to see who was where. Franco, I2FAK, was calling on 144.126, so I went looking there. Sure enough, his signal was easily readable. Despite Murphy, who disconnected Franco's mains power for about 5 minutes halfway through the contact, we completed just before moonset. Initial #1 in the bag.

I'd decided that I would continue using my existing 4 wavelength, 14-element DL6WU Yagi, rather than leap into the unknown with something new; I didn't need any extra time being consumed strolling up that avenue of fun. But I had been looking at the G/T table for 2 metre Yagi that Lionel, VE7BQH, had compiled, and it had struck me as odd that for all the tweaked super Yagi in the table, he had never included a bog basic DL6WU yagi, even as a benchmark to judge how much better the others were. So I contacted Lionel, to ask him if he would be interested in running the vital stats of my Yagi through the mill and seeing what came out; he said he'd be pleased to! He also modelled the array of four, to see if the spacing needed any tweaking; and to do a performance comparison between the 2 metre array with the 70 centimetre array nested inside, versus just the 2 metre array. As it turned out, a minor tweak to the spacing suggested an improvement of about 0.5 dB of gain, without upsetting the F/B of the array. But the removal of the 70 cm array suggested an improvement of 2 dB - do both and we're talking 2.5 dB...

After this I decided it was time to add elevation capability to my 2 metre array. That, and the removal of the 70 cm array, basically meant removing everything from the tower. As much as I might dislike taking myself off the air, this would also mean I would have a chance to untangle my rotator body from the two sections of tower lattice; the body stuck out through the lattice, and prevented me from winding up the inner section. I also decided to start searching for a second tower, to carry the 70 cm array.

At the end of the July 2012 school holidays, I took a week of leave. As it happened, the project got a kick-start when on the first day of the leave, a fault developed in the rotator cable, which sent the direction indicator mad and eventually released smoke from two transistors in the control box. I couldn't use the array now, anyway, so down came everything. In the end it was nearly 7 months of work before I was back on the air, as chances to work on the project seemed as hard to catch as the smoke from those transistors...

I built a new H-frame, from XL (Extra Light) Galvanised tube - this has a wall thickness of 2 mm. The old one had been built using Medium galvanised tube, which has 3.2 mm walls. The weight-saving in the new frame came in at nearly 25 kilos. I added a 2.5 metre extension to the "stub" mast, to lift my 23 cm array and the ADS-B receiver Yagi well above the 2 metre array. Using an actuator and two "pillow block" bearings mounted on a 6 mm aluminium plate to elevate the array proved fairly easy. I set up a test mast at ground level and spent a day or two testing, measuring and calibrating the elevation control, before shifting it to the tower.

I also took the opportunity to measure the insertion loss of every piece of heliax and other coax in all the cable runs up to the tower, both to reassure myself that they were all still ok after 7 years of use, and to have something quantifiable to feed into the likes of Doug, VK3UM's EME calculator.

Incidentally, I didn't wake-up to the rotator cable fault actually being in the rotator cable until I had the tower up again. As mentioned, I'd decided to source a second tower, and this was achieved in October. I also bought a second rotator, of the same model as my original rotator, at about the same time. This meant I had spares, and a "known good unit" as a reference. Having raised the tower into the air, turned on the control box and seen frighteningly familiar behaviour in the form of wild needle swinging, I depowered everything (really quite quickly...). A process of elimination,

aided by a two metre rotator cable patch lead, soon pointed the accusing finger at the old cable. Once replaced, everything was peace, light and happiness again.

And so I finally fired everything up just after 2000z on the 28th of February this year. My first contact was with Anatoly, RK3FG, at 2034z; after which I worked Guy, VK2KU; Mike, R3BM; Bjorn, SM5CFS; Roland, DK4RC; Rick, PA1BVM; John, G4SWX; Rune, SM5CUI; Joop, PA0JMV; Milos, S52LM; Chris, SP4K; and Rene, PE1L. Twelve contacts, for eleven new grid locators, in a little under three hours. So far all contacts have been made using JT65B; I would like to get the system working to the point that CW gets a run - which brings me to my receive system...

It was commented on that I seemed not to be hearing the other stations quite as well as they were hearing me, and at the moment I suspect my old pre-amplifier may be the culprit. As it turns out, it is the only part of the system that I didn't take away and "quantify" in any way. It is one of the venerable VK5 Equipment Supply Committee (ESC) kits that I built in the early 1990s, using a BF981. After a bit of looking around, I decided to try one of the pre-amplifiers made by Gyula Nagy, HA8ET, using an ATF-53189 E-pHEMT FET. Ordinarily, I'd (at least) have assembled the whole thing, but although I can reasonably accurately measure the gain of the device, I don't have any way of measuring the Noise Figure to ensure that, when I've adjusted the pre-amplifier, that parameter is ok. Gyula had populated and tested boards, which he could supply with suitable boxes into which I would install the board, so I went with that option. The pre-amp arrived on the day before Good Friday, and I nearly have it ready to install at the mast-head. It promises 21.5 dB of gain, and <0.6 dB Noise Figure.

The final piece of the puzzle is about to be worked on; the High Power Permit, to allow me to use my MRFE6VP61K25H 144 MHz SSPA at it's full potential. After that, I need to work on getting that second tower up, and my 70 cm station back on the air. And yes, I'll be incorporating elevation into the 70 cm array, too; I just haven't decided whether to stick with the four Yagi - or push out to eight...

Photos of the project are viewable on my Flickr page, in the "EME" set (<http://www.flickr.com/photos/72319077@N00/sets/72157630998604976/>).

VK3 Microwave Activity Day

With fairly short notice, a VK3 Microwave Activity Day was organised for Easter Monday, with 2.4 GHz being the primary operating band. Of course, contacts on any other microwave bands were also encouraged. Unfortunately, possibly because many people have Easter activities organised for them well in advance, participation was a bit down on expectations.

Seven people participated, spread over four locations:

- Gavin VK3HY and Rob VK3MQ at Mount Dandenong
- Ian VK3AXH, John VK3AIG and Lindsay VK3WM at Mount Buninyong
- Mike VK3KH at Arthur's Seat
- Peter VK3TPR at home in Glen Waverley.

Signals between the portable stations were S9+ on 2.4 GHz and 10 GHz but Peter struggled a bit from home. Every one that participated had a great time and the weather was very kind to them all.

The next MAD might be scheduled for a non-holi-day.

GippsTech

Finally, don't forget to mark in your diary the weekend of July 13th and 14th for GippsTech 2013. GippsTech is THE event for VHF/ UHF/ Microwave enthusiasts in Australia, not to be missed.

For more information, see www.vk3bez.org/gippstech.html

Please send any Weak Signal reports to David VK3HZ

Digital DX Modes

Rex Moncur – VK7MO

VK3XPD Extends 24 GHz EME World Record

On 13 March Alan, VK3XPD extended his 24 GHz World record (see report in April AR) to 15,874 km with a QSO with OK1KIR using the new JT4 mode. In order to operate to his moonset, Alan had to use a long waveguide run with a number of standard and flexible sections which meant he was only getting around 6 watts to the feed. Alan was using his 3 metre dish and OK1KIR was running 21 watts to a 4.5 metre dish.

Variable Bin-width Decoding Feature of JT4

JT4 has a feature that allows decoding to be automatically optimised for the spreading of signals such as occurs with rain scatter, EME and to an extent also on tropo-scatter. Table 1 sets out the tone spacings for the various JT4 modes.

Mode	Tone Spacing (Hz)
JT4A	4.375
JT4B	8.75
JT4C	17.5
JT4D	39.375
JT4E	78.75
JT4F	157.5
JT4G	315.0

Fig 1: Tone spacings of various JT4 modes

Under the original version of JT4, the bin-width was the same as the tone spacing such that for example when using JT4G the bin-width was 315 Hz and thus the sensitivity was significantly reduced compared to JT4A with only 4.375 Hz bin-width which picked up much less noise. The variable bin-width feature maintains the tone spacing at the levels set out in Table 1 (say 315 Hz for the "G" submode) but it first attempts decoding with the narrower bin-width of the "A" mode and thus gains the extra sensitivity for signals that are not spread. If it cannot achieve a decode in the "A" mode, it then increases the bin-width to that of the "B" mode, 8.75 Hz and attempts a decode and so on. For weak and widely spread signals it might move all

the way up to the JT4G mode before it optimises the decoding process to the spreading of the signal. The advantage of this process is that one can gain optimum decoding for signals with unknown spreading. When the program does decode, it includes a letter in the last column which represents the actual bin-width it used to achieve the decode. One disadvantage of this process is that depending on computer speed it may not complete the decoding process until after you have started TXing. There is also a risk that it may find a false sync prior to getting to the optimum bin-width. The latest version of WSJT, r3033, includes a new feature called MinW which can be set to start the decoding process at higher bin-widths which should be set just one or two steps below the spreading you expect.

While it appears best to always use the widest "G" mode and let the program optimise the bin-width the disadvantage is that the very wide tone spacing of the "G" mode does not leave much room for tuning errors or Doppler and thus the "F" mode is generally preferred.

Spreading on 10 GHz Tropo-Scatter

Tests were conducted between Rex VK7MO and Rhett VK3GHZ on 19 and 20 March over a 564 km path. It would be expected that tropo-scatter signals would be spread to some degree as signals via tropo-scatter travel via different path lengths which effectively add random Doppler shifts. Joe K1JT has analysed the spreading of the signal between VK3GHZ and VK7MO and shown that it reduced significantly between 19 and 20 March (Fig 2). As described above, JT4F can automatically optimise to the actual spreading and generally exceeds the performance of JT65c if spreading is more than about 20 Hz on tropo-scatter. JT4 also has a facility (implemented in the Setup Menu – Plot Average JT4 spectrum) that improves the detection of signal tones and that can be especially useful in looking for evidence of weak Tropo-scatter.

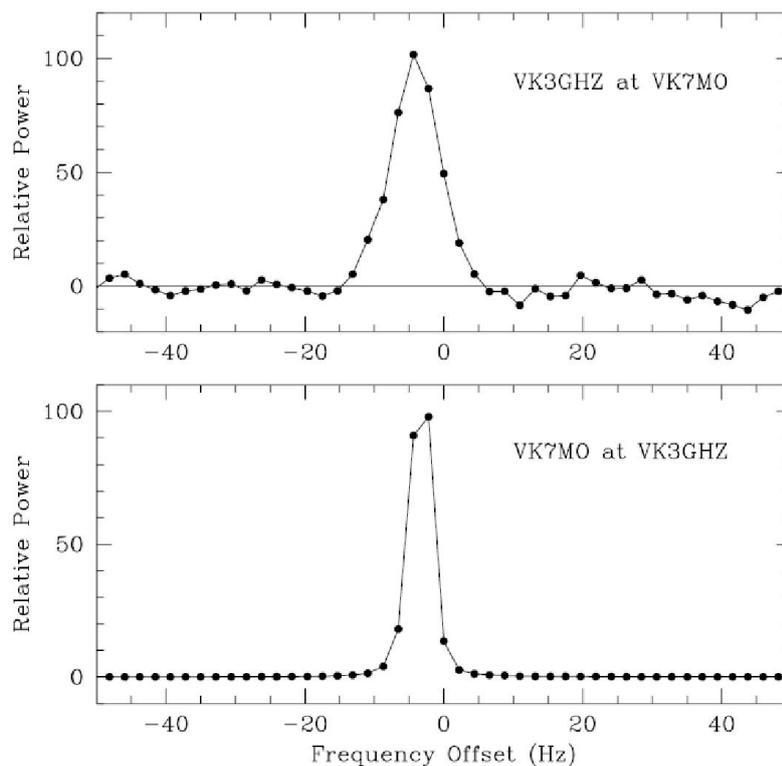


Fig 2: K1JT Analysis of Single tone Spreading:

Top 19th of March, bottom 20th of March

Spreading on Forward 10 GHz Rain Scatter

On 21 March, VK3GHZ ran tests with VK7MO at a time when there was light to moderate rain on the path as shown in Fig 3 from the Bureau of Meteorology Radar. A QSO was readily completed on JT4 with signal levels at around -13 dB. Somewhat surprisingly for rain scatter, the signals were only minimally spread by up to 30 or 40 Hz as shown by the single tone test at Fig 4. While most microwave rain scatter in VK is done over oblique paths where the Doppler shift can be more than a 1000 Hz direct forward scatter limits the Doppler shift due to the narrow beamwidth of the antennas and the fact that the path length cannot vary nearly as significantly as on an oblique path. While the tests were done in the JT4F mode the program actually decoded these narrowly spread signals in the "A" binwidth as shown in the last column of Fig 5.

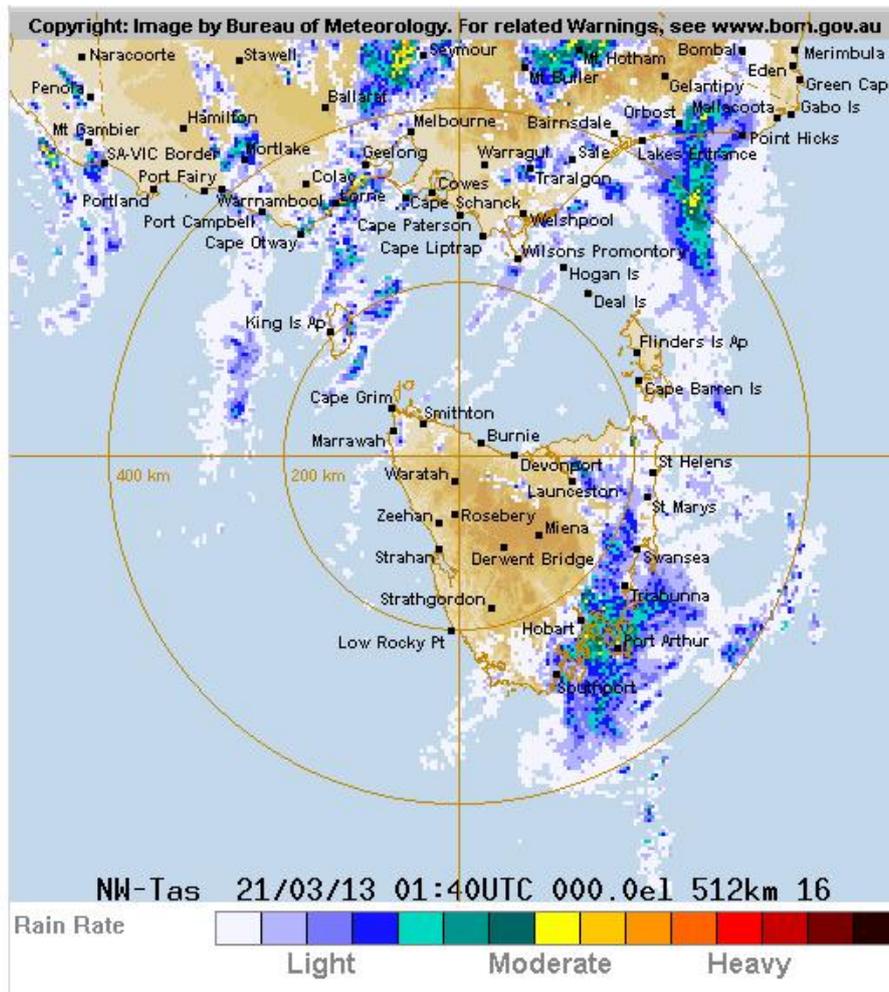


Fig 3: Rain on Bureau of Meteorology Radar at time of tests on 21 March

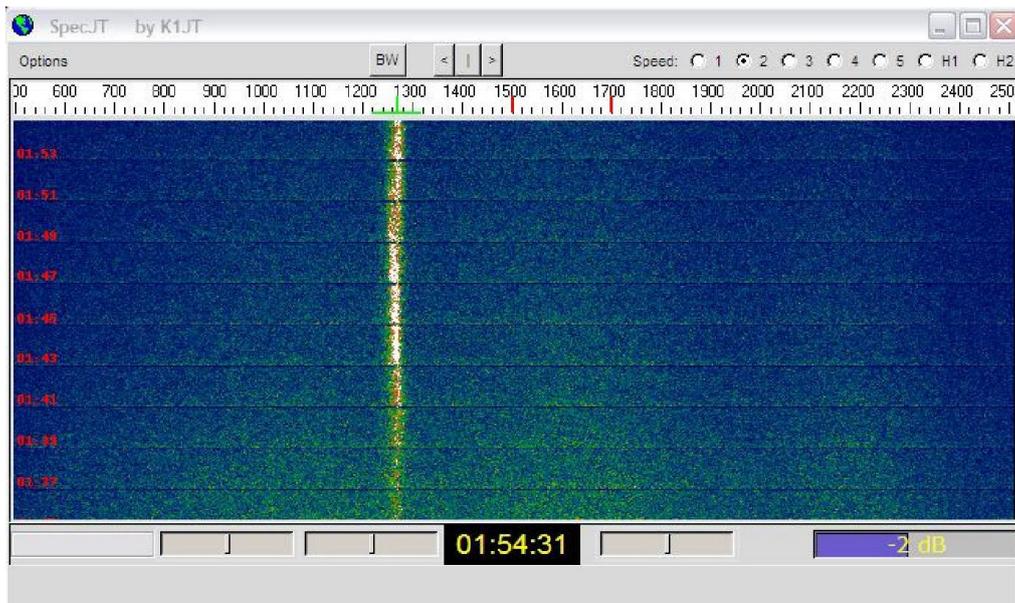


Fig 4: 1270 Hz tone shows development of rain scatter on 21 March

015900	8	-13	-0.2	-2	28	*	VK7MO	VK3GHZ	QF32	1	28	A
020100	8	-12	-0.2	-4	31	#	VK7MO	VK3GHZ	R-12	1	13	A
020300	8	-12	-0.2	-4	28	#	VK7MO	VK3GHZ	-12	1	14	A
020500	8	-13	-0.2	-2	28	#	VK7MO	VK3GHZ	R-12	1	6	A
020700	8	-12	-0.2	-2	28	#	VK7MO	VK3GHZ	73 000	1	24	A
020900	9	-12	-0.2	-2	28	#	VK7MO	VK3GHZ	73 000	1	18	A

Fig 5: Forward Rain Scatter decodes in the “A” bin-width

Please send any Digital DX Modes reports to Rex VK7MO

The Magic Band – 6 m DX

John McRae - VK5PO

Hi fellow 6 metre enthusiasts.

It is with sincere appreciation that I have been given the opportunity to scribe this column. Having had a keen interest in 6 metres for at least 30 years, it will be an enjoyable “task”.

Huge tributes go to the column writers that have preceded me, Like me, these fellows epitomise the SIX metre tragic.

I still remember vividly the huge pileups on 6 m when I operated at VK5ZAH. At the time, I was a novice operator, with the call VK5NJF. Norm (VK5ZAH) let me plug a key into his Kenwood and get stuck into some good CW. What a blast! Those memories shall stay with me forever. You just do not hear those type of JA pileups any more!

Please have a read of the WIA 6 Metre Band Plan, familiarise yourselves with it, as most of us are aware, there have been ongoing problems for “years” in respect to the

“calling frequencies” . Please remember that 50.110 is the international DX calling frequency, and 50.200 is the domestic calling frequency.

It is important that we observe this band-plan, as in doing so, will minimise on air friction and makes it BETTER for everyone. Want to call another VK? Use 50.200, if we ALL do this, it will be terrific.

The 6 metre band restriction of RF output in the eastern states needs to be addressed, as the TV transmitters that hindered full legal output, have now ceased broadcasting. I will be making representation to the WIA to find out what the current status of this situation is. The ACMA need to allow for 400 watts PEP for all VK stations. Can I suggest that you all write to or email the WIA requesting that the ACMA get the LCD changed.

March activity is not what you would expect at a solar cycle maxima. In fact, the figures started rising slowly during the second week. They then gradually decreased again!

All the “die-hard” ops that have borne witness to many preceding cycles say this one is a NO SHOW. Only a handful of VK-W Land QSO's so far, One VK4 to UX. TEP in its various forms has been giving a handful of VK4 and VK8s some propagation into JA, HL, BY etc. The equinox has helped in the tropical zone, as VK8AW shows below.

VK0JJJ at Mawson station, Antarctica. Craig reports that the Beacon VK0RTM is on air. Craig is QRV on six metres. VK0RTM is on 50.300 Mhz, running 50 watts into a pair of loops. Craig says on the 26th March “I have replaced a faulty power supply on the beacon VK0RTM today and the revised output power is now 280w EIRP”.



VK0RTM antenna with local wildlife

Meteor Scatter has its usual regular followers, and some others that pop in from time to time: VK7's : DD, DX, AB, XX and JG , along with VK1RX, VK3AUU, VK3XDX, VK2's : BLS, ASY, Also VK5's PJ, PO and BC, VK4's CZ, and WTN would on most occasions swap a signal report or two between each other. We congregate around 50.200, and sometimes 50.190 is used. Several stations also use 50.230 for digital modes. If you get up early, have a listen.

SPORADIC E. This propagation has been VERY sporadic, with several brief

openings between VK5 and VK6. On 19th March, VK5BC and VK5PO worked VK6's KXW, OX, AKT, JJ and a few others. VK5AKR reported hearing the VK4RGG beacon at 11:35pm local time on the 16th of March. No other Sporadic E reports were received.

EME. VK6OX, VK8AW and VK5PO have made several contacts to various stations via the Moon.

VK6OX worked ES6RQ on the 25th Mar, 20:10z

VK8AW worked W7CW on the 25th Mar 08:54z

VK5PO worked K2ZD on the 1st Mar 12:02z

ES6RQ 22nd 16:40z

G4IGO 23rd 16:58z

G8BCG 25th 19:03z

Gary, VK8AW, sends in his six metre log : (approx. 15 DXCC's!!)

This month (March) has seen a good increase in activity on 6 from here in Darwin.

7 Mar – worked KH7Y (Fred) at 0710z on cw, BV3CE worked at 1150z on ssb.

11 Mar – worked JA1QOP at 1210z on cw. The band then shifted west and I worked DU1EV at 1215z on cw, followed by BU2BO at 1225z on ssb. Then at 1228z, JR2HCB came in on ssb followed by A92IO (Dave) 1345z from on ssb. The band went short and at 1355z 9W6RT (Rodger) on ssb, followed by A45XR (Chris) coming in at 1420z on.

12 Mar – worked VR2HF (Dan) at 1220z on cw S8 followed by 9M6YBG in East Malaysia at 1355z on ssb . Then BV2DQ (Ran) on ssb at 1350z.

15 Mar – worked KH0XH (Seiya) at 1320z on cw from the Mariana Islands, followed by KG6DX (Joe) at 1325z on ssb S5.

17 Mar – worked H44G (Manfred) at 0545z on ssb.

24 Mar – worked E6RQ (Alan) at 0428z on cw, followed by KH9/WA2YUN at 1100z on ssb for a NEW one!. Then KG6JDX from Guam came in at 1100z on ssb!!

Maybe we need to “head north” to get in amongst some of that excellent DX!

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