VHF/UHF – An Expanding World

David Smith VK3HZ

Weak Signal

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Aircraft Enhancement

Even though the band conditions are fairly quiet, Aircraft Enhancement will always be a possibility for long distance contacts. Barry VK3BJM writes of his recent experiences:

I wanted to let you know about the experiment Colin VK2BCC, Arie VK3AMZ and I have been conducting over the last month. Working into the Blue Mountains area, using the Melbourne > Sydney aircraft track, has been almost impossible from here in Kyneton - the track is too far to the east of our signal path to support AE. Well, a combination of observations by Colin and myself has revealed the method.

Back on the morning of June 9th, towards the end of the morning AEP "window", I noticed that an Airbus A330 (QFA575) flying from Sydney to Perth had tracked down the Sydney > Melbourne path to the ACT. It then changed course to 263 degrees. This takes it across just north of Holbrook, Yarrawonga, Echuca, exiting VK3 between Kaniva and Bordertown. The flights to Perth do this occasionally, not constantly. I had observed this path in use before, and made observations on the resultant enhancement window created for the Mildura and Adelaide 2 m beacons - described in "VHF/UHF An Expanding World" in November 2008. The track also provided me with my first 2 m contact with Peter VK5ZPG, documented in the Jan/Feb 2009 edition of the column.

The aircraft had only just changed course and looking at my ADS-B screen, I thought it would be worth trying to work Colin, who was logged into the VK Logger at the time. I sent him a few messages, but as luck would have it he was away from his computer and so we missed the opportunity. (The aircraft did provide a 56 contact at 2347z with Peter VK5PJ on 144.100, so it wasn't completely wasted.)

There followed an email discussion between Colin, Arie VK3AMZ and I about trying this out with more intent. It was agreed that when an aircraft was seen on the path, Colin would run a CW keyer. The keyer would send a short burst of CW, then pause for Colin to listen for responses. Over the next couple of weeks though, the aircraft flew a number of paths to Perth - any path, it seemed, except the one we wanted. Mostly they tracked west out over Katoomba and West Wyalong; sometimes it was down the track to Melbourne, only changing course when they neared Mansfield, bringing them across a little to the south of my QTH.

Whilst we were being frustrated by this, Colin identified exactly how and why the route changes were taking place, and how we could be as informed as the pilots. I'd suspected that the decision was based on a meteorological factor, but Colin identified that it was the location of favourable (read fuel/dollar-saving) winds that was "sealing the deal". This BOM link gives us the map to monitor what is going on, and whether it is worthwhile getting up in the morning:

http://www.bom.gov.au/australia/charts/viewer/index.shtml?type=windbarb&level=200hPa&tz=AEDT&area=Au&model=A

July 1st was our first chance with a favourable chart. Sure enough, VOZ553 and QFA575 took off from Sydney within 10-15 minutes of each other, and turned right at the ACT. Colin ran a keyer, which appeared out of the noise as the aircraft moved from 56 to 55 degrees from me. (The Logger has Colin at 54.9 degrees from me.)

The enhancement lasts about a minute and a half - Colin's signal drops out when the aircraft is at about 53 degrees from me. (My ADS-B receiver won't resolve down to minutes and seconds, so I can't be anymore precise than that.) Both VOZ553 and QFA575 flights use A330, so they are a decent size - better than a B737, for sure. In fact, I think almost all the Sydney-Perth QANTAS and Virgin flights run A330s. QANTAS also runs a 747 on the route, once daily, which is even better for those who might be in the shack around midday. A Jetstar B737 that took the route only generated 41 signals, at the same height as the A330.

The two flights were at 40000', and most of the flights along the path are at that height. We've had one day where they flew at 32000', and it seems we do not have mutual visibility at that altitude. Our path is 666 km, if the calculator on the Logger is to be believed.

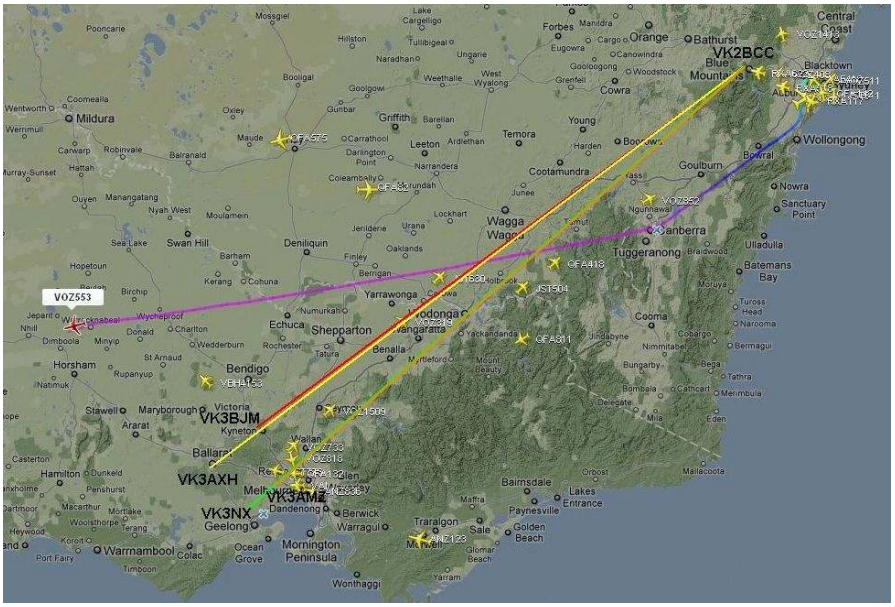
Colin runs 100 watts to a single 12-element Yagi (unsure of his feedline/loss), and appears as a reasonably consistent 51 signal. My signal appears mostly at the 52 mark.

We have now repeated this a number of times, all with the same favourable result (except for the day when the A330 was tree-hopping at 32000').

The enhancement also works for Arie VK3AMZ, who is a little bit south of Melton. Arie naturally sees Colin a few minutes before I do and, due to the path geometry, Arie's AE window to Colin is quite separate to mine. The "hotspot" is around Cookardinia, just NNW of Holbrook.

Weather permitting; it would be well worth others to the west of Melbourne (Ballarat, Geelong and Bendigo, for instance) giving this a try out. I'm interested in getting Ian VK3AXH to attempt it - Colin tells me Ian is on the same beam heading from Blackheath as myself. The big question is whether Ian is too far over the Great Divide to see the aircraft.

I'd also like to see if the same aircraft would support AE into the area to the west of the Blue Mountains - Orange, Bathurst, etc.



Aircraft Enhancement Paths

It's good to see Barry and co. investigating the use of AE for paths where a contact would not otherwise be possible. Rex VK7MO is carrying out similar AE experiments looking at aircraft flying across the path between him and VK3. The only flight that is visible to both ends and flies across the path is an Air New Zealand flight that goes

directly from Auckland to Perth once per day (but not every day). Unfortunately, the flight path of the aircraft varies significantly from day to day – one day flying as far north as Tullamarine Airport and another day sneaking through by flying almost directly over Rex's QTH in Hobart. In about 2 weeks of attempts, only once has the aircraft been a) flying; b) with ADS-B so we could "see" it; and c) flying down the middle of Bass Strait. Much patience required!

GippsTech 2011

Another GippsTech has been held and, once again, it has shown itself to be one of the premier events for VHF/UHF/Microwave enthusiasts. Many excellent presentations were given ranging across the most diverse aspects of the hobby covering bands from 6 m to 10 GHz and beyond. Thanks to those volunteers who gave their time to organise and run the event, and thanks to all the presenters who have provided much food for thought!

One aspect of GippsTech that I do enjoy is the chance to catch up face-to-face with like-minded people. The informal Friday night dinner, Saturday dinner and the breaks during the day provide a chance to exchange ideas and hear about people's projects. This year, it seems that many people are working on microwave transverters – many based on the no-tune kits from Graham VK3XDK. Many are also talking about frequency locking of rigs and transverters, hoping to eliminate one uncertainty when trying to make a microwave contact.

If you haven't attended a GippsTech, then pencil in the second week in July 2012 (date to be confirmed) for a visit to Gippsland.

Beacons

One piece of information gleaned from the discussions at GippsTech is that the local Gippsland beacons have been getting a major makeover in recent times. Ralph VK3WRE writes:

Some info on the VK3RGI beacons in Gippsland QF31ip. Recently, Jim VK3ZYC, Michael VK3ALZ and I completed the antenna work at our beacon site. We now have new antennas on all bands from 2 m to 3 cm at a height of 15 m.

The microwave beacons are up and running with the exception of the 3.4 GHz unit which is still under construction.

The 2 m beacon runs 10 watts into a Halo. 70 cm has 10 watts into 4 phased yagis. 23 cm has 10 watts into an Alford slot. 13 cm runs 10 watts into a slotted waveguide.

5.7 GHz is a 1 watt unit locked to a 10 MHz rubidium reference with waveguide feeding the slotted waveguide antenna. 10 GHz is running 1.2 watts locked to the 10 MHz rubidium reference with waveguide feeding a slotted waveguide antenna. The 5.7 and 10 GHz beacons are CW keyed with a 1 minute key down period and 30 seconds of CW

All the beacons have the allocation .434 e.g. 2403.434 MHz, 5760.434 MHz.

The 10 GHz beacon has been "seen" by Colin VK5DK over a 500 km path. Hopefully many more DX reports will come in.

We also have VK3RED on 2 m in east Gippsland at Donalds Knob which has been running nicely for the past 2 years. VK3RED was installed to encourage ZL operators to look a bit further south to Victoria. VK3RED is on 144.436 MHz 10 watts CW.

Home Microwave Activity

There are an increasing number of stations who now have a permanent microwave setup at their home QTH. Alan VK3XPD, Russell VK3ZQB and Colin VK5DK have

been having regular QSO's on 10 GHz for over a year, and they are now working on 24 GHz systems.

In Gippsland, Rod VK3BQJ is now operational on 10 GHz and 5.7 GHz. He writes:

After endless problems with rain and wind and more rain and more wind, I finally have the new 10 GHz gear up. It's running 5 W to an 850 mm dish and GPS locked. The IF is an (unlocked) FT290R. The VK3RGI beacon is pushing S9 since the recent rework.

With encouragement from Ralph VK3WRE and Jim VK3ZYC, I have got JT65c going and have worked Ralph over a 125 km path. Signals were almost SSB level on the night we tried two-way, shack to shack - I had seen him before one way. I'm also seeing Jim but not two way as yet - dish pointing problem at Jim's end and big pine trees. I'm still learning the finer points of JT65c but starting to look at working a bit further.

I also have 5.7 GHz running – 10 W to a 1 m dish, GPS locked.

Please send any Weak Signal reports to David VK3HZ

Digital DX Modes

Rex Moncur – VK7MO

432 MHz FSK441

Congratulations to Adrian VK4OX and Arie VK3AMZ on completing a 432 MHz QSO using meteor scatter propagation on 31 July over a distance of 1447 km – believed to be longest distance 432 MHz meteor scatter contact in VK and probably only the second 432 MHz meteor scatter contact in VK. Adrian VK4OX reports as follows:

On 2011-07-30 between 1830utc and 1910utc (Sunday 31st July, 0430-0510 local time) I completed a successful FSK441A QSO with Arie VK3AMZ on 432.360MHz. We used WSJT4 FSK441A because I believe it decodes shorter pings better than WSJT9.

We started at 1828utc and I was well on the way with a 900 msec burst at 1831utc. A few more pings and then an incredible 1500 msec 24dB burst at 1857utc. Finally, a solid ping at 1909utc. Arie received my RRR at 1910.30utc

The Delta Aquarids is hardly a great shower. We were just using it as preparation for the Orionids in October. I was not at all confident. We started on the previous Thurday morning, but Arie was having trouble receiving. On Friday morning I got 10 pings in an hour and a half but Arie was still in trouble. Saturday morning I received 7 pings in an hour and a half but still we could not complete. By Sunday morning Arie had things under control and we completed in about 40 minutes.

When I was in Sydney signing VK2FZ, I did have a 432MHz FSK441 QSO with Rex, VK7MO, on 2004-12-12 (Geminids). I think that was the first ever FSK441 QSO on 432MHz (in Australia). I don't know if any other 432MHz meteor scatter QSO's on any other mode have ever been made. I'd be interested to know. This QSO with VK3AMZ , QRB 1457km, is my best distance so far.

Clearly, 432MHz FSK441 is a realistic proposition during shower activity.

144 MHz FSK441

Welcome to Kevin VK4UH who has joined in the weekend 144 MHz meteor scatter activity sessions on 144.230 MHz and completed with Arie VK3AMZ.

ISCAT-A

While ISCAT-A is still an experimental mode it can be downloaded at the following URL:

http://www.physics.princeton.edu/pulsar/K1JT/WSJT9_r2433.EXE

The original version of ISCAT is now called ISCAT-B. ISCAT-B is designed for ion-scatter and meteor scatter on 6 metres. ISCAT-A is specifically designed for microwave aircraft scatter and works well up to 10 GHz.

JT65a – Tropo-Scatter

JT65a is the most sensitive mode for tropo-scatter on VHF, being 1.2 dB more sensitive than JT65b. Rex VK7MO in Hobart, runs JT65a skeds on 144.225 MHz most weekday mornings beaming towards Melbourne at 07:30 am Vic/Tas local time with Jim VK3II and Peter VK3SO. Peter VK3TPR and Richard VK3RR also join in. Other stations are welcome to join in – just call up or down 500 Hz to clear any contact in progress and once you are seen you will be called in.

Please send any Digital DX Modes reports to Rex VK7MO