VHF/UHF – An Expanding World

David Smith VK3HZ

Weak Signal

David Smith - VK3HZ

So far this summer, conditions seem to be back to normal with tropo and Sporadic E openings between all the usual places. There's been too much happening in the last two months to report everything in detail, so I'll stick to the major happenings.

November 25th afternoon/evening from about 0200Z to 0800Z, there was a big tropo opening from VK4 to ZL1/2. Signals were up to S9+20 on 2m. No contacts were reported on any higher bands.

December 11th, afternoon from about 0400Z to 0450Z, the first big Es opening occurred between VK4 and VK7/VK3. Many stations involved.

December 19th, evening, there were tropo openings from VK2 to ZL and from VK6 to VK3/5. Rob VK6LD/P's remote station in Albany is proving to be extremely useful. This is probably the way of the future, with weak signal operation in major cities becoming extremely difficult due to the QRM generated by modern living.

December 23rd, afternoon from about 0550Z to 0630Z, another big Es opening, this time from VK4 to VK5. Signals were reported to be extremely strong at times, but with very severe Es-type QSB.

VK1 to VK3 Microwave

Chas VK3PY reports on recent microwave activity:

Yesterday (Sunday 30/11), David VK3QM took his microwave gear to Mt. Ginini, hoping to work back to Geelong, which he did on all bands from 2.4 GHz through to 10 GHz. Charlie VK3NX, Ken VK3AKK and I were the "home" team operating from our usual field day QTH about 15 km west of Geelong.

There was clearly a sniff of tropo in the air as signals were very steady and we could work at will, without the need for aircraft reflections. The outstanding bands were 3.4 GHz and 5.76 GHz, both of which provided conversation-quality signal levels at around 5X5. Signals on 10 GHz were also quite steady but well down, at around S1-2 most of the time. Unfortunately, our beam heading to Mt. Ginini was straight over Melbourne's WiFi fog, making copy at our end extremely difficult. While David was reporting up to 5X8, we could barely copy him (there also remains the possibility of equipment malfunction at his end, as the signal strength discrepancy appears very large). Later in the day, Charlie ducked home to get another transverter that worked on 2.400 GHz which proved a tad quieter. That allowed us to make a difficult two-way contact, but by then David had shifted to the VK2 side of the border which runs through the mountain, so no VK1 to VK3 contact ensued on 2.4GHz this time 'round.

There are several state records in that string of contacts, which no doubt David will apply for on his return. The distance was 503km.

10 GHz World Record Returns To VK

A very late "Stop Press" - on the evening of January 5th at about 0825Z, Rex VK7MO/7 and Derek VK6DZ/6 set a new 10 GHz World Record of 2732 km. Rex was located at Cape Portland on the northeastern tip of Tasmania while Derek was on Torbay Hill at the southern tip of WA. Their initial contact was Digital using JT65

with signals peaking to about –12. They then switched to SSB and exchanged reports of 3x1 / 5x1 – the difference due to Rex running 50W and Derek 10W. At the time, the Hepburn Tropo forecast was showing a massive band of enhancement spanning the entire south coast of Australia.

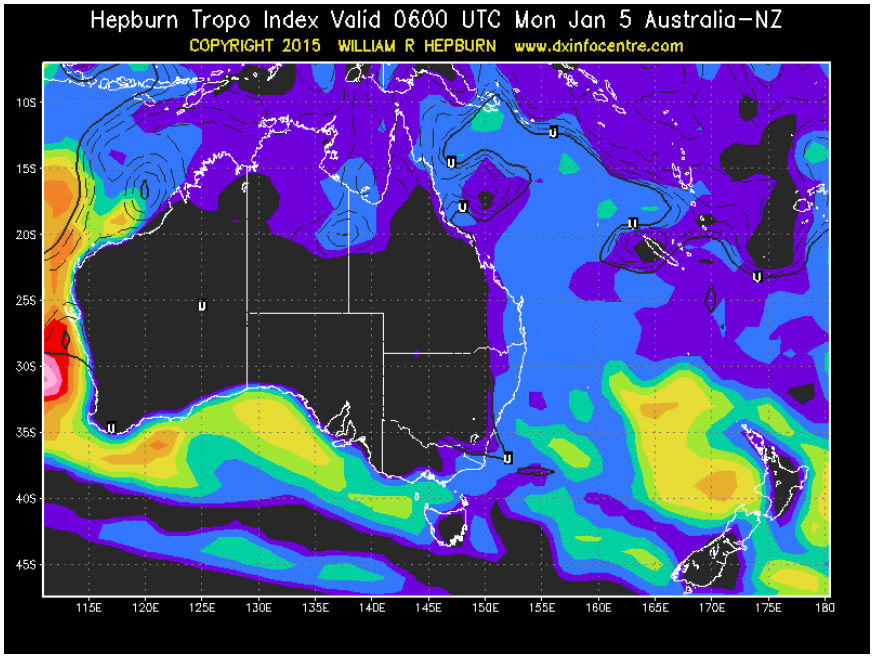

Fig 1: Hepburn Tropo Index at the time of the 10 GHz Record Contact

Following Rex and Derek's record contact, Colin VK5DK/P worked Derek on SSB from Mt Gambier to set a new VK5 10 GHz Record of around 2090 km. Reports exchanged were 52/57. David VK5KK near Adelaide was having a much harder time. He worked Derek on Digital with reports of –14/-15. Looking at Hepburn, it appears that David may have been a little way out of the duct making signals that bit weaker.

From 1994, for many years, the 10 GHz World Record was 1912 km, held by Roger VK5NY/5 and Wally VK6KZ/6. More recently this record was broken a number of times in Europe with the latest occurrence in July 2010 over a distance of 2696 km. In Australia, Rex and Derek set a new VK record of 2293 km in 2013. Well done to them for now bettering the World Record by 36 km.

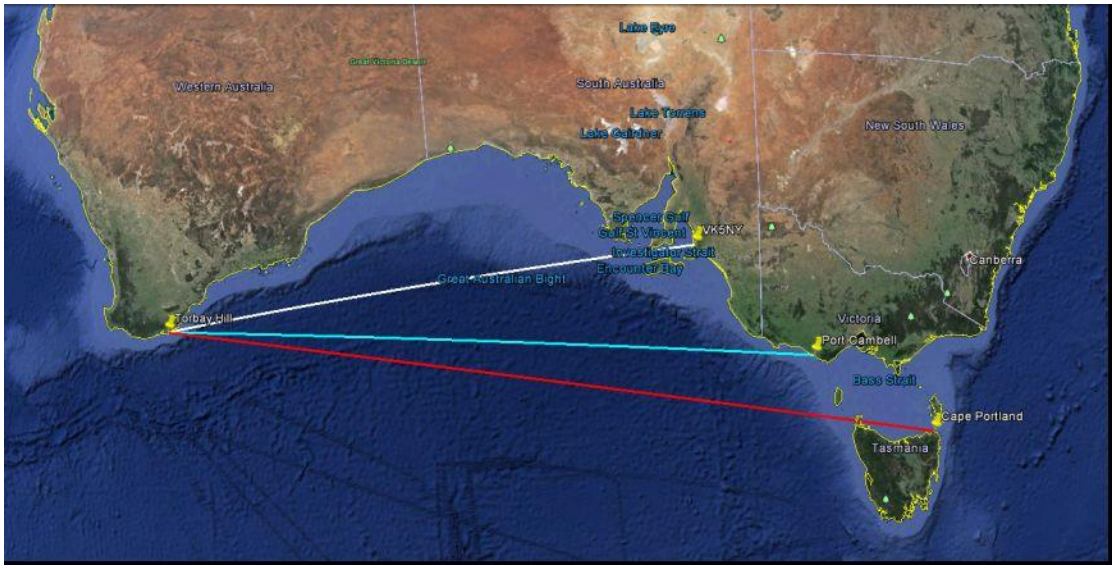

Fig 2: 10 GHz Records – White 1994 (World), Blue 2013 (VK) and Red 2014 (World)

Please send any Weak Signal reports to David VK3HZ

Digital DX Modes

Rex Moncur – VK7MO

Monitoring GPS-Locked Beacons with Spectrum Lab

The Spectrum Lab program, produced by DL4YHF, has a number of facilities that are useful for monitoring weak signals and is available at: http://www.qsl.net/dl4yhf/spectra1.html

Without GPS locking, one typically uses a waterfall program with a bin-width of around 2 Hz to monitor beacons. As more stations and beacons become GPS-locked it becomes possible to gain extra sensitivity by using even narrower bin-widths combined with averaging. Fig 1 shows the VK3RGI GPS locked 70 cm beacon as monitored in Hobart with a GPS-locked transceiver. The transceiver is tuned 1000 Hz below the frequency of the beacon to produce a 1000 Hz beat note on Spectrum Lab. In this case, the frequency is around 7 Hz low due to the resolution of the beacon PLL. The beacon has a long key down period of around 45 seconds each minute and transmits its callsign and grid locator in the remaining 15 seconds of each minute. With the signal being present for most of the time it is possible to use averaging over long periods without any significant loss. In the example in Fig 1 the bin-width has been set to 366 mHz (i.e. milliHz) and averaged over 100 periods. Reducing the bin-width from 2 Hz to 366 mHz picks up around 7 dB. Averaging picks up around 2 dB for each doubling of the averaging time or about another 13 dB when averaged over 100 periods. Overall there is a gain of around 20 dB on steady signals.

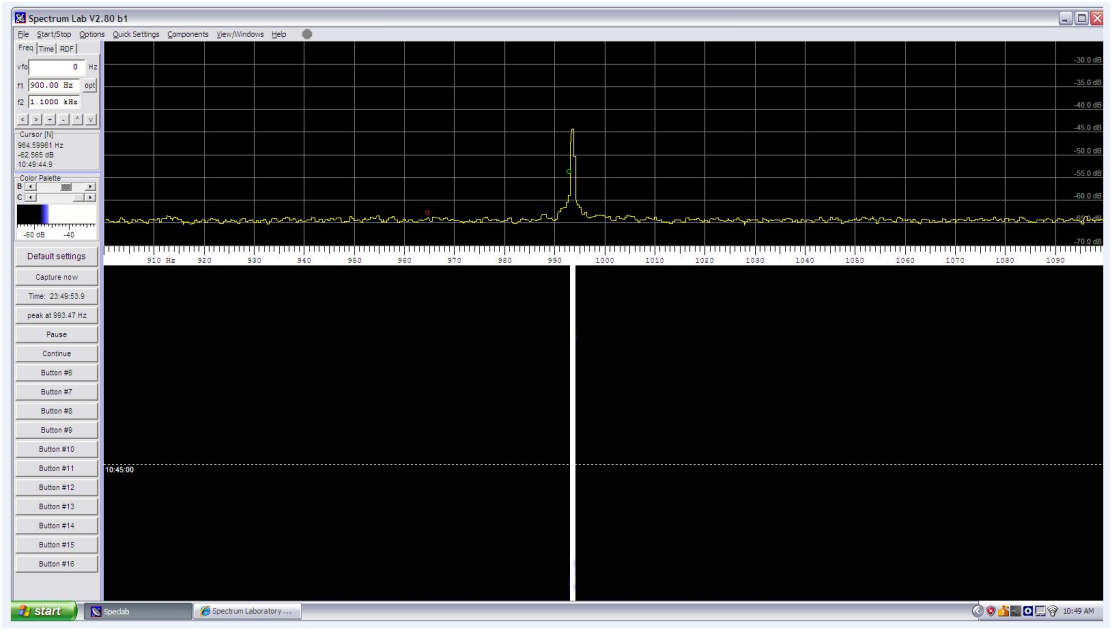

Fig 1: Spectrum and Waterfall on Spectrum Lab monitoring the VK3RGI 70 cm beacon in Hobart

Another useful feature of Spectrum Lab is the chart plotter which is the equivalent of the old pen chart recorder. This can be set up to measure signal to noise ratio and plotted over any period that one might wish to monitor changes in propagation. Fig 2 is an example of a plot of VK3RGI 70 cm beacon in Hobart over a 20-hour period. The vertical scale is 50 dB and the vertical lines are 1-hour intervals. The signal is primarily tropo-scatter but some of the shorter spikes (around 5 minutes or less) relate to aircraft.

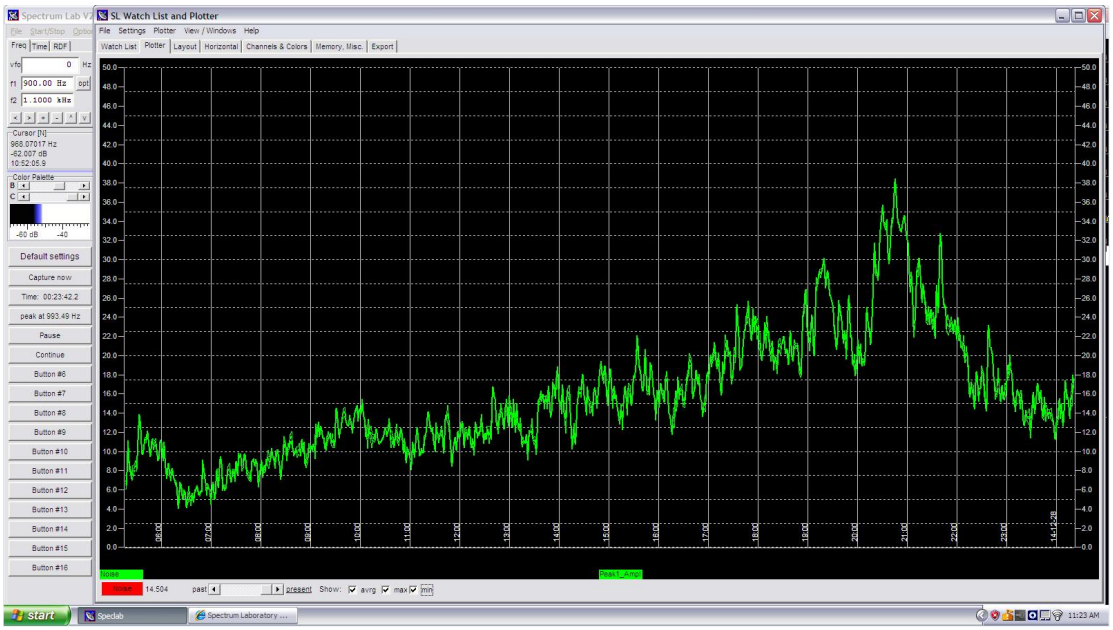

Fig 2: Spectrum Lab Chart Plotter measuring Signal to Noise over a 20 hour period.

It is also possible to use Spectrum Lab to record the raw data in a file and transfer this to Excel for plotting as shown in Fig 3. By this means one can monitor a beacon and propagation over days or even weeks.

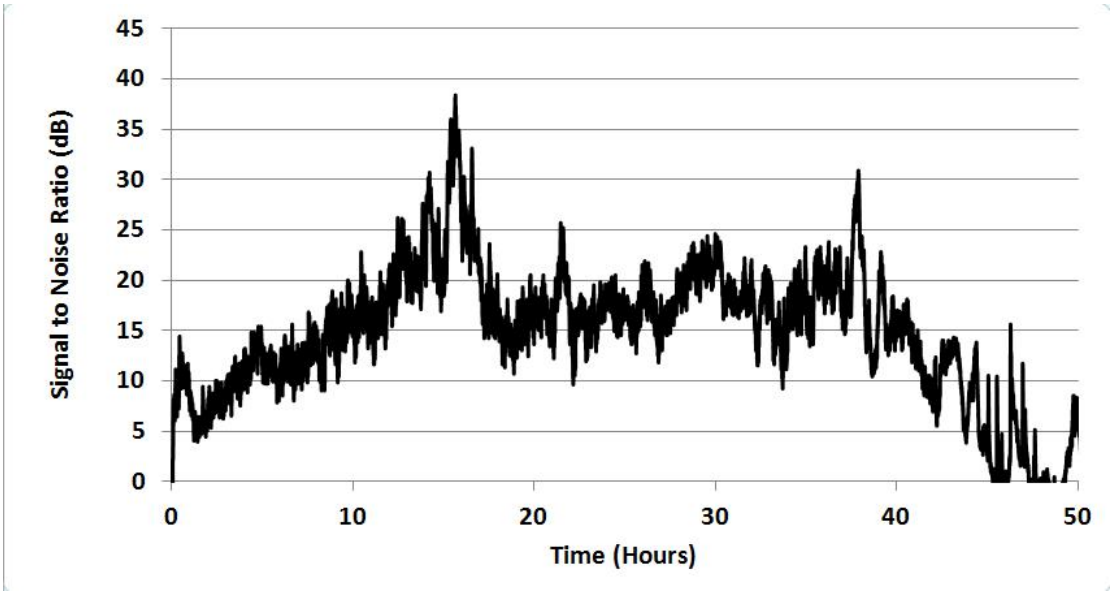

Fig 3: S/N data from VK3RGI 70 cm beacon monitored over a period of 2 days.

Please send any Digital DX Modes reports to Rex VK7MO

Meteor Scatter

Dr Kevin Johnston – VK4UH

The period since the last Meteor Scatter report, leading up to Christmas, included the predicted dates for both the Leonid (18th November) and the Geminid (14th December) meteor showers, both being Class 1 Major Meteor events for the year. The Leonids occur as the Earth's orbit passes though debris remaining from the Temple-Tuttle comet (P55). This shower is very variable with a predicted ZHR of around 20/hour although showers of epic proportions have occurred in previous years.

The Geminid shower is the result of debris from Asteroid 3200 Phaeton, arguably the best shower of the year, with a predicted ZHR of 120/hour with a very broad peak across many days.

The ZHR (Zenith Hourly Rate) is an astronomical term related to the number of "visual" meteors seen by a single observer. If we assumed that each visual meteor trail produced a significant radio return on 2 m, then a ZHR or 120/hour would imply one reasonable ping or burn every 30 seconds (one per period) and could be filling our receive screens for almost half of the time!

Well the Leonids came and went. The peak was mid-week when few operators were active and the closest weekend activity period coincided with the VHF Field day but the universal opinion, from those who were active, was that the shower was a great disappointment. Here in VK4 the return rate appeared little better than normal random levels for that time of the year. Not much more can be said - the Leonid shower 2014 followed the egregious pattern of 2014.

The Geminid's were a little different. Although the predicted ZHR of 120/hr was not even approached, there was a period of some enhanced meteor scatter propagation from this shower. Not everyone was happy. John VK4JMC reported:

"My report on the MS this weekend is that it was one of disappointment.

Saturday 13/12. This I would classify as a disappointment at this QTH with normal 'ping' intensity well below "normal" although I did complete with several stations.

Sunday 14/12. This could only be classified as much worse with only a few 'pings' seen in the first hour and no 'burns' were seen at all in the early part of the session.

Some improvement was observed in 'ping' strength during the later parts of the session but still no observed 'burns'. Nothing was seen on 70cm"

On 12th December however, Arie VK3AMZ (QF22FE) reported that the observed Geminid ZHR, reported from the Canadian Radar site, was climbing and had reached 39/hr. He calculated that the optimum timing for the near NorthEast to SouthWest Path between us would occur between 17:00-18:00 UTC (03:00-04:00 local VK4 time) on 13th December, and an hour earlier for East-West paths. On the evening of the 12 December, as the constellation of Gemini was rising in the Eastern sky at the VK4UH QTH multiple visual meteor trails were seen apparently radiating from "The Twins" that form Gemini.

For three days across the shower Arie VK3AMZ and I VK4UH (QG62kp) operated from before 17:00 UTC (03:00 local) on 70 cm only from VK3AMZ and with concurrent transmission of FSK441 on both 2 m and 70 cm from VK4UH. 70 cm pings were decoded in both directions on 12th and 13th December but neither day provided a completed QSO via the Geminids on 432 MHz.

2 m conditions at the VK4UH end were enhanced with some very impressive burns extending across entire periods and beyond. Two-way QSO were completed with VK3KH VK3HY VK5PJ VK5APN VK1WJ VK3II and VK2BLS during these times.

On 14th December, the third day of attempting a 70cm MS contact, the final 73 was received at 19:37 as Gemini was setting on the horizon. The best signal received on 70cm was a ping of 420 ms at 9 dB above the noise.

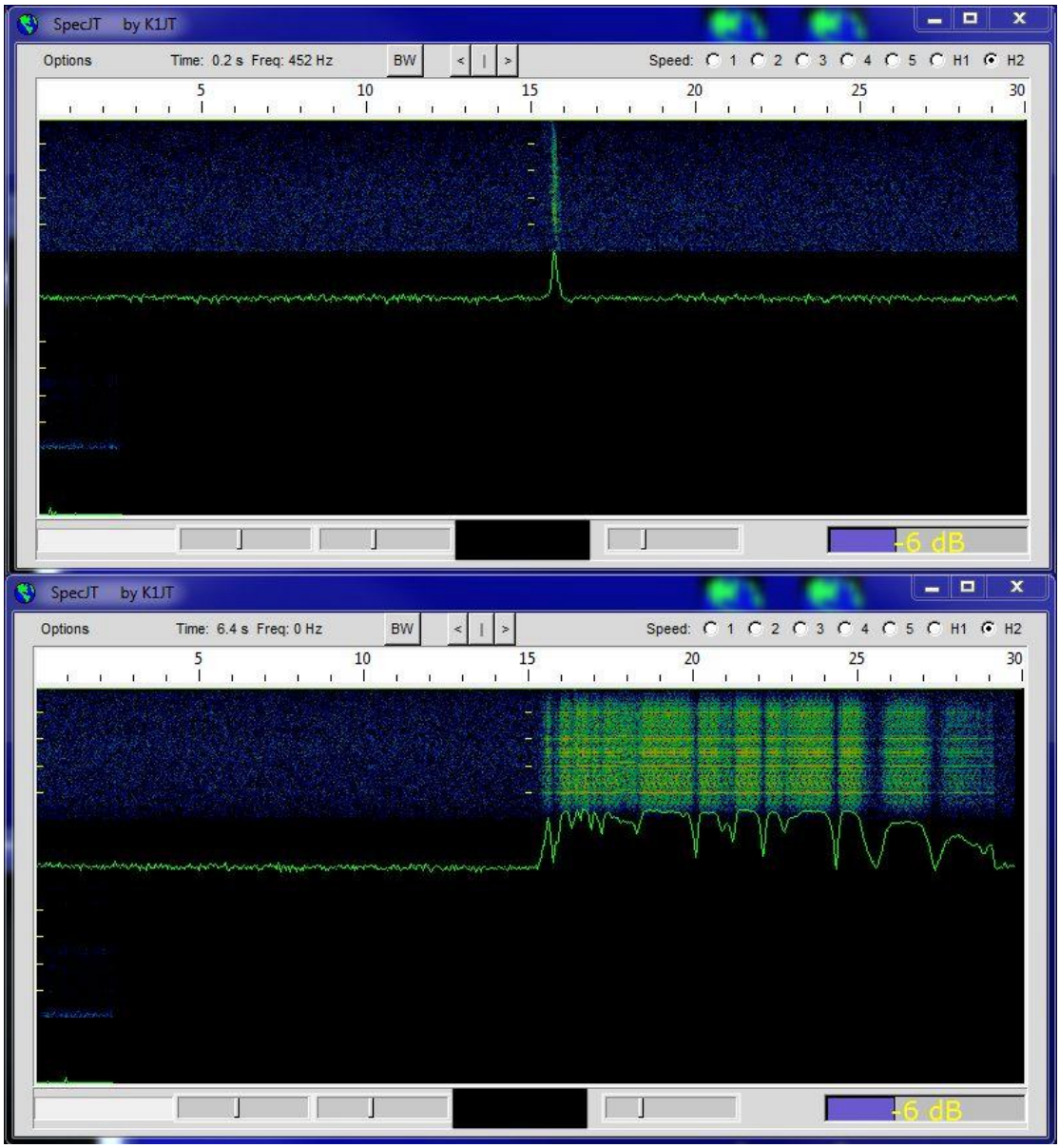

Fig 1: Concurrent MS signal on 70 cm (upper) and 2 m (lower)

The image in Fig 1 shows an impressive recording made during the shower on 13 December. This shows the concurrent reception of FSK441 signals from a single meteor between VK3 and VK4. The lower trace shows a hyper-dense meteor burn on 144.230 MHz, extending beyond 15 seconds duration at over 15 dB above noise. The upper trace is the corresponding ping received on 432.230, 9dB above the noise floor and of 110ms duration.

An article on strategies for dealing with poor Meteor Scatter conditions is being held over until next month.

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