

165 km Cloudbounce

On 11 October Rex VK7MO and David VK3HZ conducted trials in Victoria on the Australian mainland over paths of 111 km and 165 km. The equipment comprised the 60 Luxeon transmitter and the 10 mm square APD receiver as used for the 118 km tests previously reported.

111 km Path

These tests were conducted between the QTH of Barry VK3BJM (transmitter) at Kyneton and Des VK3CY (receiver) at Wedderburn. The Wedderburn location had an excellent take-off from a small hill at essentially zero degrees with no local light evident. However, there was significant moonlight that cast shadows. The Kyneton location had a good take-off over flat land with bushes and trees in the distance giving a take-off of less than one degree. Cloud cover was estimated at 30 to 50% and quite high compared to the 4000 to 5000 feet maximum we see in Tasmania. Cloud height was reported at 11,000 feet at Avalon airport on the other side of the Great Dividing range and may not be reliable.

External light was measured at 46 nA compared to dark test of 23 nA.

Signal levels were 30 to 32 dB above the noise in 20 MHz bandwidth and peaked at -11 dB on WSJT. Signals were very consistent and varied only one to two dB in total.

Signal levels on the 111 km path are similar to those on the previous 118 km (peaked at -9 dB) and the few dB variation could be differences in conditions or a slightly worse geometry combined with the fact that no measures were taken to adjust elevation and azimuth to optimize signal level.

165 km Path

For this trial the receiver was moved to a small hill at Wycheproof. There was some take-off restriction due to nearby bushes but by choosing the receiver location these effects were minimized and take-off was close to zero degrees. There were no lights in the foreground and external light was again due to moonlight. Cloud cover and height were similar to that for the 111 km path. A dark test was not conducted but would be expected to be similar to that for the 111 km path.

Initially signal levels were 20 dB S/N in 20 MHz bandwidth and 25 to 26 dB on the WSJT scale. After some careful adjustment of the elevation from around 1 degrees to around 0 degrees WSJT signal levels improved to typically -19 dB and peaked at -18 dB. Azimuth was far less critical with signal levels dropping significantly only after about plus/minus 5 degrees variation – consistent with a 10 degree transmitter beamwidth.

The peak signal level on WSJT of -18 dB was only 7 dB lower than the peak or -11 dB for the shorter 111 km path. Inverse square law losses in electrical terms would be around 7 dB implying zero extinction loss, which is unlikely so we can perhaps explain the reduced loss as due to the effort made to optimize elevation which seems to be extremely critical on these long paths – presumably due to cloud height and geometry limitations.

The fact that the azimuth angle appears to me limited only by the TX beamwidth suggests that the scattering angle is not a significant factor at least up to 5 degrees.

Conclusions

- Excellent cloudbounce signals peaking -18 dB on the WSJT have been demonstrated on a 165 km path giving 10 dB to spare.
- On the longer paths elevation adjustment is critical and needs to be optimized to within less than half a degree
- Azimuth adjustment is less critical and seems to be controlled only by the TX beamwidth suggesting that scattering angle is not a factor up to 5 degrees.