

Ten things to do, with a handheld radio

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This series of articles are intended to give the newcomer to ham radio an insight into some of the things you can do with a handheld dual band radio.

3: Propagation experiments

A handheld transmitter in a built up area will be able to communicate over a relatively short distance, unless a repeater is used. The "art" of radio communication over large point to point distances is known as "DX" and can sometimes be achieved even with a low power handheld.

A "curved" line of sight

An over-simplified approach to VHF and UHF propagation is to treat it as a light ray, which would be limited by the curvature of the earth. Hence, when standing on a beach, the visual horizon on a clear day will be under 5km, but will be four times further when standing on a hill 30m high.

However, radio signals can be bent, or refracted by different densities in the lower layers of the atmosphere, allowing them to travel many times the horizon distance. Alternatively there can be patchy areas of E layer that will refract VHF frequencies. As an example, the Christchurch VHF ham radio beacon has been heard in Australia, with the Alps in the way.



Simple experiments

Experiments can be made with simple antennas, but the first thing to do is "get high" on a hill! Although DX does not use repeaters for communication, they are useful as a receiving station for your experiments. Try accessing a repeater a great distance away from a hill top. As an example, one can sometimes access the Kaikoura, or even Wellington repeaters from Mount Pleasant in Christchurch, with a sea path for much of the way. Another simple test of propagation is to listen for distant ham radio beacons that transmit continuously.

From home

Height is the best friend to good DX working, and even a home station with an antenna on a tall pole can provide surprising results sometimes. When operating from a permanent setup, the results of atmospheric and tropospheric changes can be monitored over time using distant ham beacons and known fixed transmitters.

Temperature inversions, especially when the upper warm air is moist, will cause refraction and enhance signals over many hundreds of km. This often leads to onward refraction called "ducting". There are many other modes of VHF/UHF propagation, such as troposphere scatter, rain scatter, ice crystal scatter, lightning scatter, aircraft scatter and aurora scatter. In fact anything in the atmosphere, it would seem, can be used for propagation enhancement!

The subject of VHF/UHF propagation is immense, and we suggest this site <http://rsgb.org/main/technical/propagation/vhf-propagation/> is a good starting point to learn the basics.

Modes and frequencies

Most low cost handhelds can only transmit and receive FM, which is not the best mode for reception of weak signals buried in the noise. However, it will be a good start to the hobby, and many DX contacts have been made when conditions are just right.

A simplex frequency of 144.500 MHz has been designated by the VHF/UHF community as a calling and field day frequency for FM, so at least you know you will be heard if the god of propagation smiles on you.

Ways to improve....

- To get better radiation from your handheld, use some kind of reflector such as a metal fence post behind the antenna.
- It will help to choose sites overlooking the sea in the direction of the DX, as this acts as a reflector to enhance the signal.
- A proper Yagi beam antenna will give huge improvements, even when pointed by hand. Remember to keep the polarisation of your antenna the same as the other end, normally vertical for repeaters, horizontal for beacons.
- Change mode. FM is OK, but SSB is better. Use it for casual hilltop DXing, or there are some digital modes that do very well, but these probably need a computer.
- Hilltop to hilltop will be the best terrain setup, and the "Summits On The Air" program <https://www.sota.org.uk/Association/ZL3> will get you many contacts will like minded hill walkers.



Further Info

A list of NZ beacons can be found here:

<http://www.nzart.org.nz/assets/maps/2011/bea.pdf>