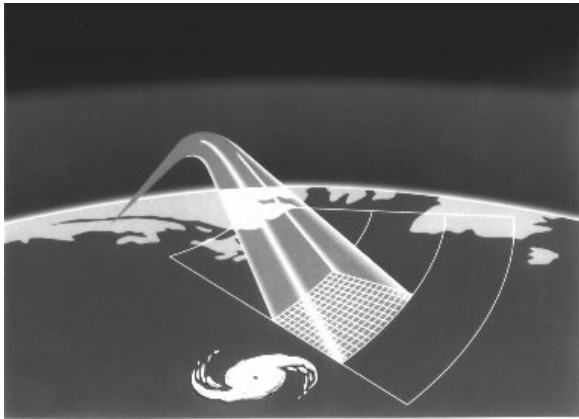


Over The Horizon Radar

OTHR

Over-the-horizon (OTH) radars were developed to detect military targets far beyond the optical horizon. They use 5 MHz -30 MHz radio waves, which reflect from the ionosphere, reaching up to 3,500 km in one "hop."



For example, a radar mounted on top of a 10 metre mast has a range to the horizon of about 13,000 m, taking into account atmospheric refraction effects. If the target is above the surface this range will be increased accordingly, so a target 10 metres high can be detected by the same radar at 26 km.

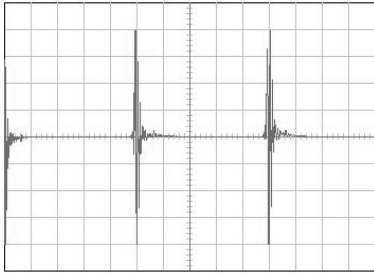
Picture 182: Over the horizon radar (OTHR)

The variability of the ionospheric propagation makes reliable target detection difficult. A practical system typically uses real-time monitoring of ionospheric characteristics by the reception of backscattered signals to continuously adjust the frequency of the transmitted signal.

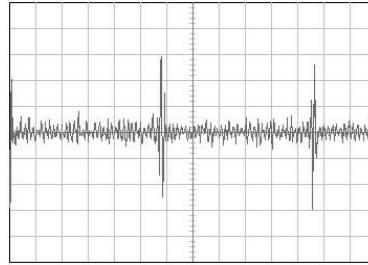
The resolution of any radar depends on the width of the beam and the range to the target. For example a radar with a 1/2 degree beamwidth with a target at 120 km range will show the target as 1 km wide. Because of the long ranges at which OTH radars are used, the resolution is typically measured in tens of kilometres. This makes the backscatter system almost useless for target engagement, although this sort of accuracy is adequate for the early warning role. In order to achieve a beamwidth of 1/2 degree at HF an antenna array several kilometres long is required. Since the ground and sea will also reflect these signals, some system needs to be used to distinguish the "targets" from the background noise. The easiest way to do this is to use the Doppler effect, noting that moving targets will shift the returned signal's frequency. By simply filtering out all the signal close to the original transmitted frequency, the moving targets become visible. This basic concept is used in almost all modern radars, but in the case of OTH systems it becomes considerably more complex due to similar effects introduced by movement of the ionosphere.

Different types of OTHR

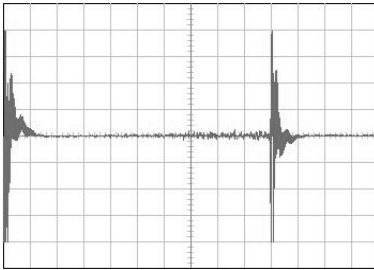
During the last year different type of OTHR'S have been monitored on shortwave. The following selection shows some of them and their parameter.



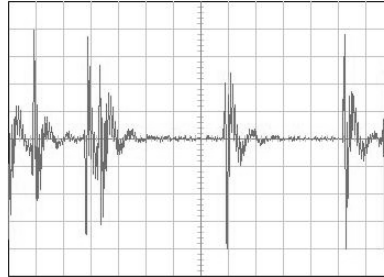
Picture 183: French OTHR Nostradamus with 25ms pulses or 40 pps



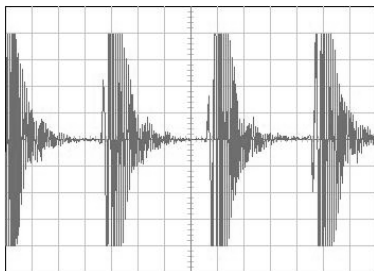
Picture 186: IRAN OTHR with 30ms pulses or 33 pps



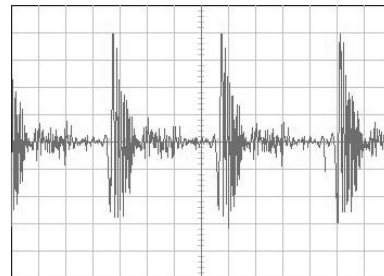
Picture 184: CIS OTHR ABM-2 with 100ms pulses or 10 pps



Picture 187: OTHR Superdarn 25ms or 40 pps



Picture 185: Cyprus OTHR with 20ms pulses or 50 pulses per second (pps)



Picture 188: Chirp OTHR with 20ms or 50 pps