Frequency and Wavelength

Refresher on Hz

kilo, Mega, Giga

Idea that 10 GHz = 10,000 MHz

Wavelength – all waves travel at same speed

Velocity of the waves = frequency x wavelength v=fλ – candidates are given the speed of light

Introduce triangle – do a couple of examples

The calling channel on 2m is on a frequency of 144.500 – what is the wavelength at that frequency?

A signal is analysed and found to have a wavelength of 84m – what frequency is the signal at?

What is the wavelength of a signal at 10.5GHz – converting to MHz

The Ionosphere

Ground wave and sky wave

Refresh idea of the ionosphere

Introduce the terms :-

ground wave and sky wave – diagram
Skip distance
Dead zone / skip zone

Ionosphere from 70 -150km

D, E, F1 and F2 layers

D Layer

During day tends to block signals below 6MHz – does not reflect. Molecules closer together.

Collapses quickly as the sun goes down

During day – Ground wave most usable on 80m – Inter G

F Layer

As D Layer collapses, signals can pass through to the F Layer – skip / sky wave becomes usable on the LF bands (80m) and long distance paths open on other HF bands

Slower to react – remains around for several hours after sundown

E Layer

Little effect on HF

Sporadic E, VHF – clouds of ionised gas which come and go quickly – late spring / summer

Signals not reflected as far as F Layer because of the height of the E Layer

Multiple skips possible

Sunspots

Sunspots – increased activity on the surface of the sun. More ionisation in the ionosphere. More sunspots, more activity – generally good for HF propagation.

Skip distance and skip zone

Refresh idea - During day on 80m D Layer absorption means local / Inter-G contacts possible. At night D-Layer collapses and F Layer propagation becomes possible.

Maximum Usable Frequency

Above 15MHz signals tend not to get reflected by F Layer. Maximum frequency this happens at is called the MUF. Changes as the ionosphere changes.

Angle

Low angle of radiation gives greater skip distance

VHF and UHF propagation

Higher frequencies pass through ionosphere

UHF / VHF tend to be line of sight

Temperature Inversion in troposphere – layer closest to the ground

Cold Air – Warm Air + humidity – Cold Air – tropospheric ducting

Summer months

Weather adversely affecting VHF and UHF – rain / hail absorb and scatter signals – e.g. Sky TV