

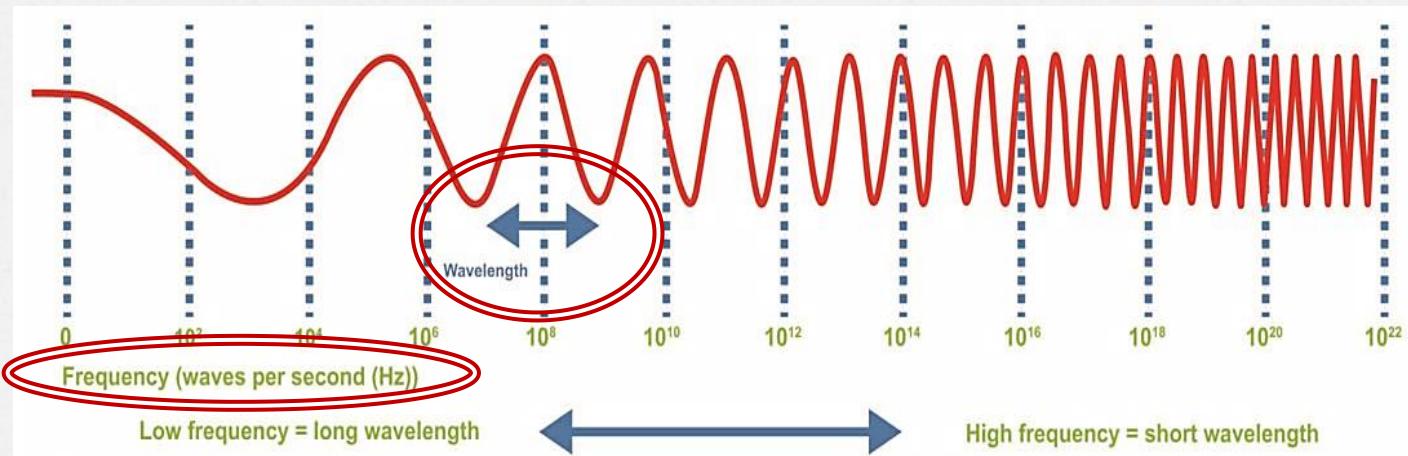
Mobile phones, radio frequency waves and electromagnetic fields

Why are we interested in electromagnetic fields?

- **Mobile phones** and other **wireless technologies** (e.g. cordless phone, tablets, and laptops) are sources of **electromagnetic fields**.
- It is exposure to these electromagnetic fields when using a mobile phone that is of scientific interest in this study.

Electromagnetic fields

- Arise from both **natural** and **man-made** sources
- Have two key characteristics:
 - Wavelength
 - Frequency (measured in hertz (Hz))

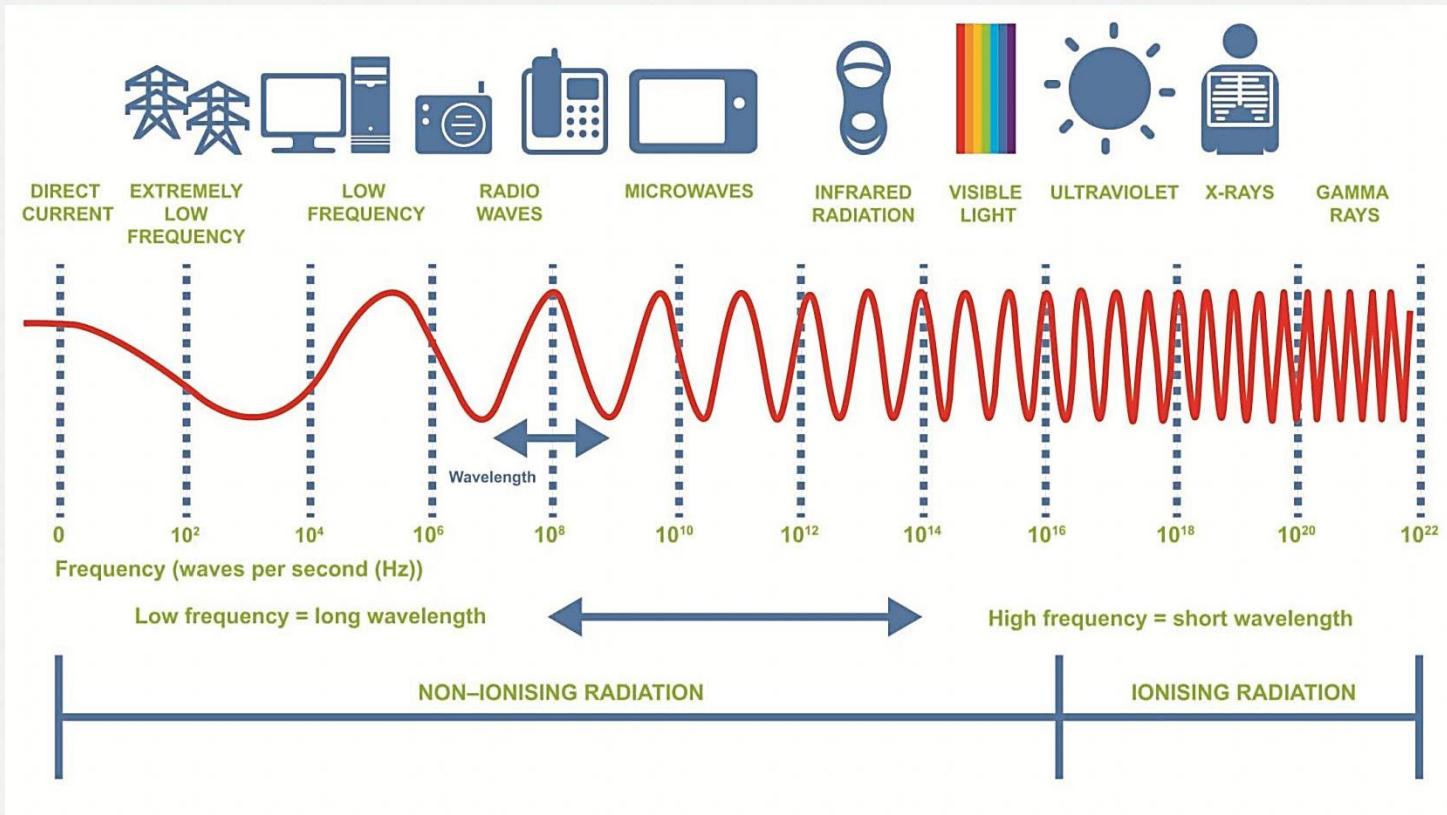


Frequency & wavelength

- You will probably all have heard of ‘Hz’ and ‘frequency’ before - just think of when you have tuned in a radio to an FM or AM radio station – in doing so you will have been searching for a particular frequency e.g. BBC Radio 1 on 97.7 MHz - 99.7 MHz
- The frequency of radiation, is the number of waves that travel through a certain point in a given length of time
- **Low frequency = Long wavelength; High frequency = short wavelength**

The electromagnetic spectrum

Electromagnetic fields span a range of frequencies and wavelengths forming an **electromagnetic spectrum**

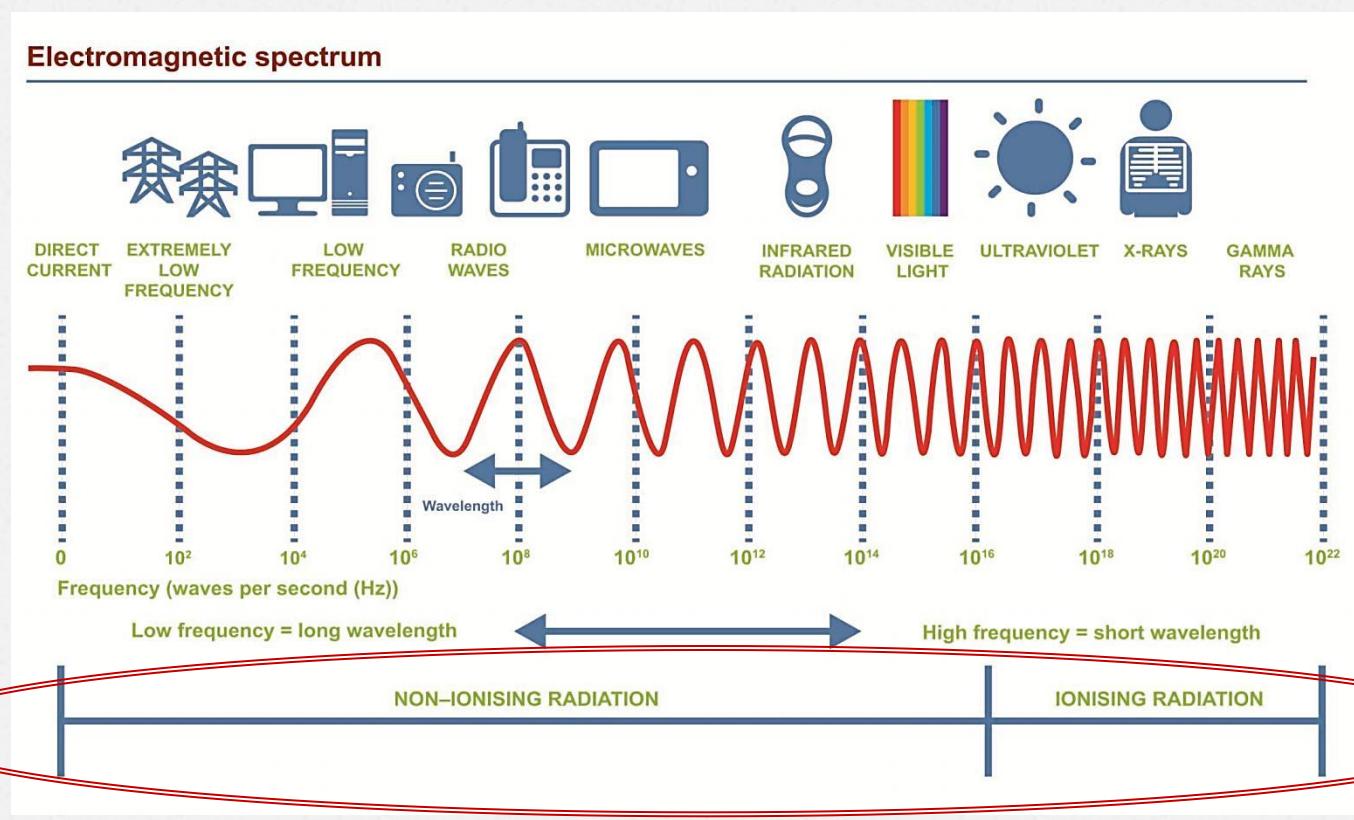


The electromagnetic spectrum

- The electromagnetic spectrum is a range of all possible frequencies of electromagnetic fields.
- The electromagnetic spectrum extends from **extremely low frequencies** (e.g. from overhead electricity power lines) with wavelengths that can be hundreds of metres long to **very high frequencies** (e.g. X-rays) where the wavelengths can be smaller than an atom.
- The electromagnetic spectrum is divided into different parts (e.g. visible light, radio waves, microwaves, ultraviolet) according to the use that is made of various frequencies.

Ionising and non-ionisation radiation

- Another way to divide up the electromagnetic spectrum is into ionising and non-ionising radiation



Ionising radiation

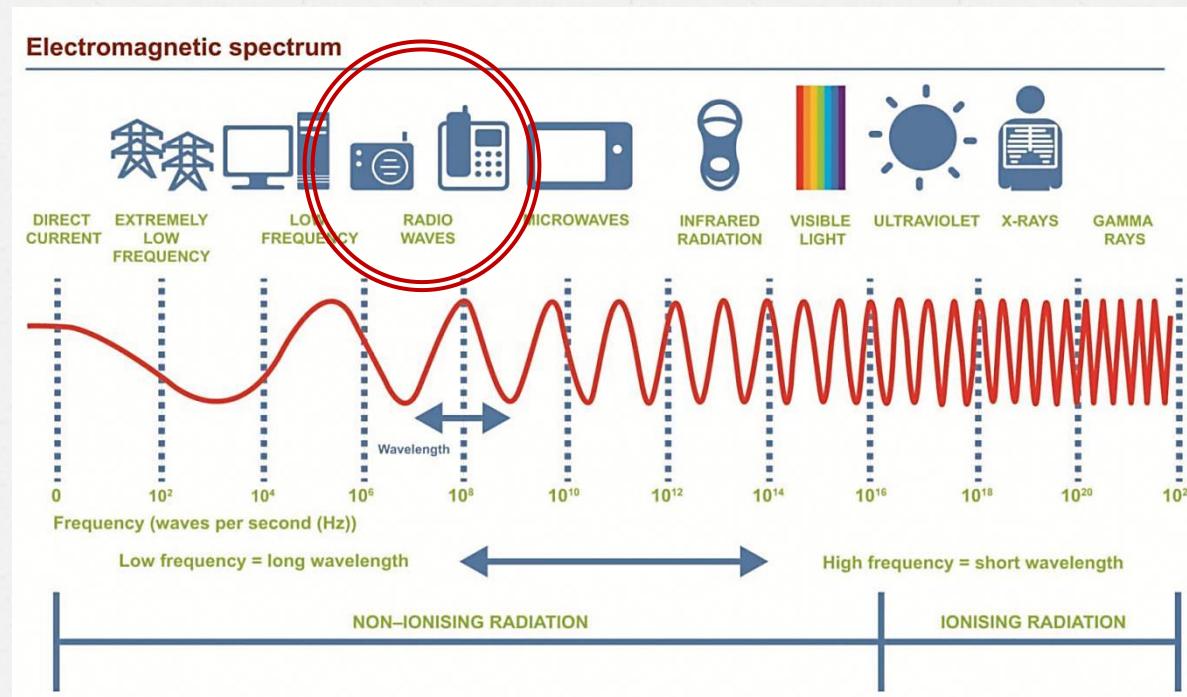
- Ionising radiation includes gamma rays, X-rays, and ultraviolet rays.
- These rays can break chemical bonds between atoms to produce ions – which is why they are called ‘ionising’.
- Scientific evidence is clear that exposure to ionising radiation can cause cancer, with risk to health depending on the dose of ionising radiation received. Risks from low doses are actually small and ionising radiation is widely used in cancer therapy.

Non-ionising radiation

- Non-ionising radiation cannot break chemical bonds, but can cause heating.
- Scientists remain uncertain as to possible health effects from non-ionising radiation.

Mobile devices and radio frequency waves

- Mobile phones belong to the **radio (radio frequency (RF)) wave** part of the spectrum which is so called because these radio-frequencies are typically used for communications, e.g. radio and TV broadcasting.
- RF waves belong to the category of non-ionising radiation



Mobile devices and radio frequency waves

- Your mobile relies on RF waves sent to and from base stations for communication.
- When people are exposed to RF waves, they absorb some of the transmitted energy into their heads and bodies.
- The further away the mobile phone is from the user, the lower the RF exposure.
- A person texting/using the internet/using a hands free device (i.e. using the mobile phone away from the head) will have much lower exposure to RF waves than someone holding the handset against their head when making a voice call