Radio waves

Radio waves are a type of electromagnetic radiation especially used in communication technologies such as television, mobile phones, and radios. Radio waves have the longest wavelengths in the electromagnetic spectrum, ranging from about 1 millimetre to more than 100 kilometes. They also have the lowest frequencies, from about 3,000 cycles per second (or 3 kilohertz), up to about 300 billion hertz (or 300 gigahertz). The National Telecommunications and Information Administration divides the radio spectrum into nine bands.

Band	Frequency	Wavelength Range
Extremely Low Frequency (ELF)	<3 kHz	> 100 km
Very Low Frequency (VLF)	3 to 30 kHz	10 to 100 km
Low Frequency (LF – including AM)	30 to 300 kHz	1 m to 10 km
Medium Frequency (MF – including AM)	300 kHz to 3 MHz	100 m to 1 km
High Frequency (HF – including FM)	3 to 30 MHz	10 to 100 m
Very High Frequency (VHF)	30 to 300 MHz	1 to 10 m
Ultra High Frequency (UHF)	300 MHz to 3 GHz	10 cm to 1 m
Super High Frequency (SHF)	3 to 30 GHz	1 to 1 cm
Extremely High Frequency (EHF)	30 to 300 GHz	1 mm to 1 cm

Low to medium frequencies

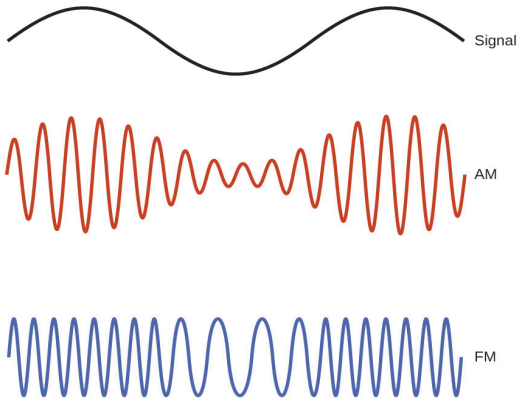
ELF VLF, LF and MF radio waves (which also include AM waves), the lowest of all radio frequencies, have a long range and are useful in penetrating water and rock for communication with submarines and inside mines and caves. LF waves are also used in atomic clock time signal because it receives signals at the constant frequency of 60kHz.

Shortwave radio waves

There is no official definition of this band, however, shortwave radio uses frequencies in the HF band which extend from 3 to 30MHz. These waves are reflected from the ionosphere, which is a layer of electrically charged atoms in the atmosphere, back to Earth at great distances. This phenomenon is called “sky propagation”. For this reason, shortwave radio can be used for communication over very long distances.

Higher frequencies

HF, VHF, and UHF bands include FM radio waves, and are used for broadcasting television, cellphones, and GPS. These bands typically use “frequency modulation” (FM) to encode an audio



or data signal onto the carrier wave, which is a wave that carries signals from one location to another on the surface of earth. FM has a better signal quality than AM because environmental factors do not affect the frequency the way they affect amplitude. UHF bands operate at an even higher frequency, which is ideally suited for wireless communications that need to penetrate buildings, walls, concrete, or other barriers.

Highest frequencies

SHF and EHF represent the highest frequencies in the radio band and are sometimes considered to be part of the microwave band, which is the next stage of the spectrum. Molecules in the air absorb these frequencies, and this limits their range and applications. SHF is used for short-range applications such as Wi-Fi, Bluetooth and wireless USB.

cave: *cava*
concrete: *cemento*
to encode: *codificare*
mine: *miniera*
policy: *politica*
to snatch: *catturare, afferrare*

1 Complete the map with the missing words.

RADIO WAVES

type of **1.** ..... radiation used in communication technologies divided into nine **2.** .....

low medium **3.**	**7.** ..... radio waves	higher frequency	highest frequencies
• ELF and VLF radio waves • **4.** ..... of all radio frequencies • long **5.** ..... • LF and MF include **6.** ..... waves	• frequencies in the HF band • reflected through sky **8.** ..... so can be used over **9.**	• HF, VHF and **10.** ..... radio waves • use frequency **11.** ..... • include **12.** ..... radio waves • UHF suitable for **13.** ..... communications	• SHF and EHF waves • **14.** ..... frequencies in radio band • **15.** ..... range applications

2 Match the beginnings and endings.

1.	Radio waves…	**a.**	have a long range and include AM radio waves.
2.	ELF waves…	**b.**	use frequencies in the HF.
3.	Carrier waves…	**c.**	may be considered part of the microwave band.
4.	Shortwave radio waves…	**d.**	are used for Wi-Fi, Bluetooth, and wireless USB.
5.	SHF and EHF bands…	**e.**	are electromagnetic radiation mainly used in telecommunications.
6.	SHF waves…	**f.**	transfer signals from one location to another.

3 PAIR WORK Read the text then ask and answer the questions with your partner.

What is "Radio"?

Radio means sending energy with waves. In other words, it's a method of transmitting electrical energy from one place to another without using any kind of wired connection. When you extend the antenna (aerial) on a radio receiver, this snatches some of the electromagnetic energy passing by. Tune the radio into a station and an electronic circuit inside the radio selects only the programme you want from all those that are broadcasting. How does this happen? The electromagnetic energy, which is a mixture of electricity and magnetism, travels past you in waves like those on the surface of the ocean. Radio waves have a certain speed, length, and frequency. The speed is simply how fast the wave travels between two places. Their wavelength is typically hundreds of metres, so that's the distance between one wave crest and the next. But their frequency can be in millions of hertz, so millions of these waves arrive each second. If the waves are hundreds of metres long, how can millions of them arrive so often? It's simple. Radio waves travel at the speed of light.

Adapted from: *https://www.explainthatstuff.com/radio.html*

1. What does "radio" mean?
2. What happens when you extend the antenna of a radio?
3. What selects a specific programme inside a radio?
4. What is electromagnetic energy?
5. How does electromagnetic energy travel?
6. What is the wavelength?
7. How can radio frequency be?
8. How fast do radio waves travel?