



# Radio

In 1916, an engineer from Westinghouse Electric began broadcasting programmes from his garage on an amateur<sup>1</sup> station in Pennsylvania. The broadcasts were so enthusiastically received by other radio amateurs who liked hearing wireless music that in 1920 Westinghouse decided to build the first broadcasting station called KDKA.

But how does radio transmission work? A radio transmitter transforms sounds and other signals into electromagnetic waves, also called radio waves. These waves are then changed back into the original sounds by a radio receiver.

Electromagnetic or radio waves travel at the speed of light, 299,792 kilometres per second. They travel through the air in a straight line or by reflection from the ionosphere<sup>2</sup> or from a communication satellite.

The magnetic field interacts with the receiving wires only if the wires are parallel to the field. The electric field acts on the electrons in the receiving wire, which must be in a loop, thus generating an alternating current. The reception will be improved if the plane of the loop is oriented perpendicularly to the plane of the magnetic field.

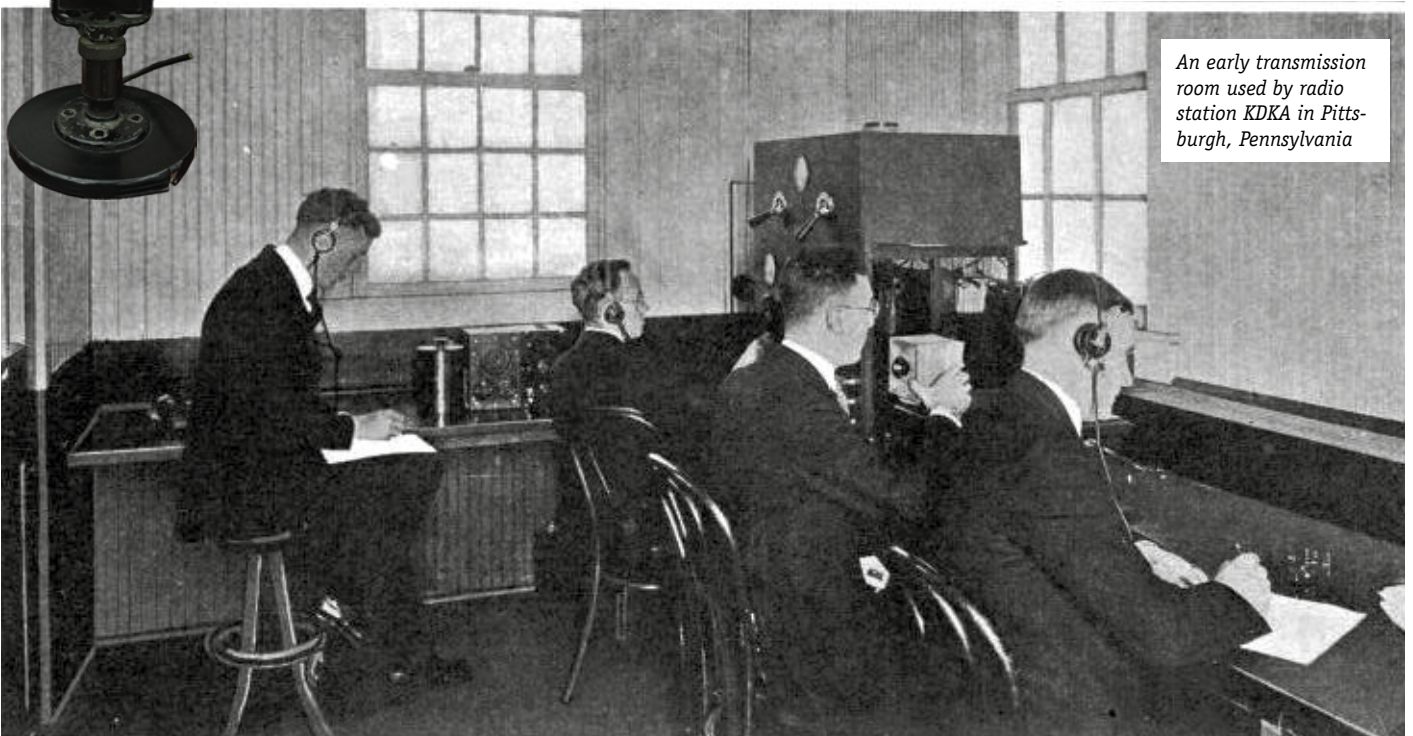
The two most significant characteristics of the electromagnetic wave's motion are the physical length of the wave and the number of times the wave cycle is repeated in a given period.

The unit used to measure cycles per second is the hertz; frequencies used in radio transmissions range up to 30 gigahertz. In order to limit the frequency of waves received by antennas, a variable capacitor and inductor can be used. In radios, the inductor is generally fixed, while the capacitor can be changed by turning a knob. As soon as the electric field comes into contact with the receiving wire, the wire is activated and an electrical impulse is sent across the receiving wire through other wires, until it finally reaches the radio, where it results in sound.

For radio transmission, information can be modified in amplitude, frequency or duration in a process called modulation. Amplitude modulation (AM) creates 'side-band' frequencies at the upper and lower limits of a carrier wave.<sup>3</sup> Frequency modulation (FM) varies the number of cycles the wave goes through, instead of its amplitude. Today, thanks to digital broadcasting systems, the analogue audio signal is digitized and compressed, using formats such as MP2, and transmitted using a digital modulation scheme. This increases the number of radio programmes in a given spectrum and improves the audio quality, eliminating fading<sup>4</sup> problems in mobile environments.

## GLOSSARY

- 1** a person who engages in an art, science, study or athletic activity more as a pastime rather than as a profession
- 2** a region of the Earth's atmosphere where ionization caused by incoming solar radiation affects the transmission of radio waves
- 3** a high-frequency electromagnetic wave modulated in amplitude or frequency to convey a signal
- 4** losing strength



An early transmission room used by radio station KDKA in Pittsburgh, Pennsylvania



**ACTIVITIES**

1 Read the text and underline the key words. Then answer the following questions.

- 1 Who built the first radio station?
- 2 How does a radio work?
- 3 What are the main features of radio waves?
- 4 How does the magnetic field interact with the receiving wires?
- 5 What is modulation?
- 6 How many kinds of modulation are there?
- 7 What are the advantages of digital radio?

2 Decide if the following statements are true or false, then correct the false ones.

- 1 The first radio broadcasting experiment was carried out by an electrician from Pennsylvania.
- 2 Radio waves are electromagnetic waves.
- 3 Radio waves travel at the same speed as sound.
- 4 Radio waves travel through the atmosphere.
- 5 The receiving wire must be perpendicular to the plane of the magnetic field.
- 6 Modulation is the change in duration, frequency and amplitude of radio waves.
- 7 AM means a change of frequency of a wave.
- 8 MP2 is an audio digitized format.

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3 Scan the text and find synonyms for the following words.

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| 1 Transmitting ..... | 5 Changing ..... |
| 2 Creating .....     | 6 Usually .....  |
| 3 Relevant .....     | 7 Range .....    |
| 4 Features .....     | 8 Enhances ..... |

4 Using the key words, summarize the text in 80 words.

5 Put the sentences in the correct order to form a short text on digital radio.

**The advent of digital radio**

- A .... But this method of transmission is inclined to signal distortion and interference.
- B .... Digital radio converts sound into binary digits which are then converted back into analogue before they reach the speakers.
- C .... At this point the waves are converted back into an audio signal.
- D .... The audio signal is converted back into sound waves by the loud speakers.
- E .... As you probably know, a conventional (AM/FM) transmitter sends radio waves into the air, and the receiver picks these waves up.
- F .... All these problems can be completely overcome by digital radio.