



# How does Bluetooth work?

**KS3** Ages 11-14 🕒 3 min read

Every time you connect your phone to a wireless speaker, or pair your earbuds without plugging anything in, you're using Bluetooth — a short-range radio technology that lets devices swap data without a cable. It's been quietly running our wireless lives since the late 1990s, and it's named after a 10th-century Viking king.

## It's radio waves, but tiny ones

Bluetooth uses radio waves, just like Wi-Fi or FM radio — but it operates at much lower power. That's why it only works over short distances (roughly 10 metres for standard Bluetooth, up to 100 metres for the stronger version). The radio waves carry the data — music, voice, sensor readings — between two paired devices.

The specific radio frequency Bluetooth uses is 2.4 GHz, which it shares with Wi-Fi and microwaves. To avoid interference, Bluetooth rapidly hops between 79 different channels within that frequency — up to 1,600 times per second. It's constantly changing channels so fast that it rarely clashes with anything else for long.

🗣️ Imagine two people trying to have a private conversation at a noisy party. Instead of shouting on one frequency where everyone can hear, they agree to keep swapping between different corners of the room every few seconds — saying a word here, a word there — so fast that they can piece together a full sentence but nobody else can follow the thread. That's frequency hopping: Bluetooth's way of sharing a crowded airspace without getting in everyone else's way.

## Pairing: how devices recognise each other

Before two Bluetooth devices can talk, they need to **pair** — a one-time handshake where they exchange a secret code and agree to recognise each other in future. That's why you press the button on your headphones the first time, find them in the list on your phone, and tap to connect. After that, your devices remember each other and connect automatically when they're in range.

## Why is it called Bluetooth?

The name comes from Harald Bluetooth, a Danish Viking king from around 958 AD who was famous for uniting warring Danish tribes and parts of Norway. The engineers who invented the technology chose the name as a joke — Harald united people, and Bluetooth unites devices. The logo is actually a combination of Harald's initials in runic letters: H and B.

## **Bluetooth Low Energy**

Modern devices often use **Bluetooth Low Energy (BLE)**, a version designed to use as little battery as possible. It's what powers fitness trackers, AirTags, smart home sensors, and hearing aids — devices that need to broadcast tiny bits of data occasionally without draining a small battery in a day. BLE is why your smartwatch can run for a week on a single charge even while constantly syncing with your phone.