

Spectrum: The Basics



Wireless is made possible by spectrum – the invisible airwaves that fuel access to the mobile broadband internet, smartphones, TVs, radio stations, GPS mapping, location services, and more.

Governments use spectrum as well for public safety needs, pilot communications, radar, military communications on training bases and battle fields, drones, precision guided missiles, air combat training, robotics, and much more.

Look at your radio to better understand spectrum. When you tune your radio to 93.9 FM, you are tuning into a station broadcasting at 93.9 megahertz (MHz). If you want to listen to a different station, you turn the dial to another frequency like 104.7 FM. No two stations transmit over the same spectrum at the same time in the same area, because if they did, they would interfere with one another. Spectrum, however, can be reused in different areas because the signal fades over distance.

Terms Used in the World of Spectrum:



Propagation – refers to **how far radio waves travel and their penetration through foliage and walls** – a key characteristic of spectrum. **Generally, the lower the frequency – for example, below 1 GHz – the superior the propagation.** The higher the frequency, the lower the propagation. Lower frequencies can more easily travel and penetrate foliage and walls.



Capacity – refers to **the amount of data that can be carried** – it's influenced by bandwidth – where a 20 MHz channel, for example, carries more data than a 10 MHz channel. Capacity can also be increased by adding additional cell sites. In addition, because **radio waves don't travel as far with higher frequencies, the spectrum can be reused more often and has less potential for interference.** Greater bandwidth is also generally available at higher frequencies.

The Federal Communications Commission ([FCC](#)) is the government agency that keeps track of who's using commercial spectrum. The agency grants companies licenses to use the spectrum. In the mobile phone market, the FCC typically auctions off spectrum, generating billions of dollars in revenue for the government.

The Commerce Department's National Telecommunications and Information Administration ([NTIA](#)) manages Federal Government spectrum use.