Radio Frequency (RF) Of The Electromagnetic Spectrum

Radio frequency (**RF**) is a frequency, or rate of oscillation, of electromagnetic radiation within the range of about 3 Hz to 300 GHz. This range corresponds to the frequency of Alternating Current (AC) electrical signals used to produce and detect radio sine waves. Since most of this range is beyond the vibration rate that most mechanical systems can respond to, RF usually refers to oscillations in electrical circuits.

Radio communication

In order to receive radio signals, for instance from AM or FM broadcast radio stations, a radio antenna must be used. However, since the antenna will pick up thousands of sine waves at a time, a radio tuner is necessary as well to **tune in** to a particular frequency (or frequency range). This is typically done via a resonator (in its simplest form, a circuit with a capacitor and an inductor). The resonator is configured to resonate at a particular frequency (or frequency band), thus amplifying sine waves at that radio frequency, while ignoring other sine waves. Usually, either the inductor or the capacitor of the resonator is adjustable, allowing the user to change the frequency it resonates at.

Special properties of RF electrical signals

Electrical currents that oscillate at RF have special properties not shared by direct current signals. One such property is the ease with which they can ionize air to create a conductive path through air. This property is exploited by 'high frequency' units used in electric arc welding, although strictly speaking these machines do not typically employ frequencies within the HF band. Another special property is an electromagnetic force that drives the RF alternating current to the surface of conductors, known as the skin effect. Another property is the ability to appear to flow through paths that contain insulating material, like the dielectric insulator of a capacitor. The degree of effect of these properties depends on the frequency of the signals.

Frequencies

Name	Symbol	Frequency	Wavelength	Applications
Extremely low frequency	ELF	3–30 Hz	100–10 Mm	Directly audible when converted to sound (above ~20 Hz), communication with submarines
Super low frequency	SLF	30–300 Hz	10–1 Mm	Directly audible when converted to sound, AC power grids (50–60 Hz)
Ultra low frequency	ULF	300–3000 Hz	1000–100 km	Directly audible when converted to sound, communication within mines
Very low	VLF	3–30 kHz	100–10 km	Directly audible when converted to

frequency				sound (below ~20 kHz; or *ultrasound* otherwise)
Low frequency	LF	30–300 kHz	10–1 km	AM broadcasting, navigational beacons, low FER, Amateur Radio
Medium frequency	MF	300–3000 kHz	1000–100 m	Navigational beacons, AM broadcasting, **Amateur Radio**, maritime and aviation communication
High frequency	HF	3–30 MHz	100–10 m	Shortwave, **Amateur Radio**, Citizens' Band Radio, skywave propagation
Very high frequency	VHF	30–300 MHz	10–1 m	FM broadcasting, **Amateur Radio**, broadcast television, aviation, GPR, MRI
Ultra high frequency	UHF	300–3000 MHz	100–10 cm	Broadcast television, **Amateur Radio**, mobile telephones, cordless telephones, wireless networking, remote keyless entry for automobiles, microwave ovens, GPR
Super high frequency	SHF	3–30 GHz	10–1 cm	Wireless networking, satellite links, **Amateur Radio**, microwave links, satellite television, door openers
Extremely high frequency	EHF	30–300 GHz	10–1 mm	Microwave data links, radio astronomy, **Amateur Radio**, remote sensing, advanced weapons systems, advanced security scanning