**Communication** or passing (one way communication) information from one person to another. The basic electronic communication system consists of these components such as transmitter, receiver and communication channel.

A **transmitter** is a group of [electronic circuits](https://www.elprocus.com/electronic-circuits-for-engineering-students/) designed to convert the information into a signal for transmission over a given communication medium.

A **receiver** is a group of electronic circuits designed to convert the signal back to the original information.

**Baseband** refers to the original frequency range of a transmission **signal** before it is converted, or modulated, to a different frequency range.

**Bandwidth** is the difference between the upper and lower frequencies in a continuous set of frequencies. It is typically measured in [hertz](https://en.wikipedia.org/wiki/Hertz),

**Modem:** A box that we call a modem thus contains two different kinds of translators. There's a modulator (for transmitting digital signals out down the phone line in analog form) and a demodulator (for receiving analog signals from the phone line and turning them back into digital form)—and that's why it's called a modem.

Modulation **is the process of changing the parameters of the carrier signal, in accordance with the instantaneous values of the modulating signal.**

## Demodulation:

Demodulation is the opposite process of modulation.

**http://www.equestionanswers.com/notes/modulation-analog-digital.php**

**Need for Modulation Baseband signals (Message or Modulating Signal) are incompatible for direct transmission.** For such a signal, to travel longer distances, its strength has to be increased by modulating with a high frequency carrier wave,

**Modulated Signal /** Resultant or combination of modulating signal and carrier signal.

Analog modulation - **with the voice, video and regular waves as base band signals.** Sensitive to noise. Baseband signal is always analog for this modulation. There are three properties of a carrier signal amplitude, frequency and phase thus there are three basic types of analog modulations.

1. Amplitude Modulation (AM) - AM radio broad cast ,  computer modems, VHF aircraft radio and portable two way radio
2. Frequency Modulation (FM) - FM radio broad cast , radar, radio and telemetry, EEG, used for broadcasting music and speech, magnetic tape recording systems, two way radio systems and video transmission systems.
3. Phase modulation (PM) - Satellite communication. GSM, Wi-Fi,

Digital modulations - **with bit streams or symbols from computing devices as base band signals.** Have high bandwidth and noise immunity. The carrier wave is switched on and off to create pulses such that the signal is modulated. Digital modulation in somewhat similar to the analog modulation except base band signal is of discrete amplitude level. For binary signal it has only two level, either high or logic 1 or low or logic 0. The modulation scheme is mainly three types.

1. ASK or Amplitude shift Key - infrared remote controls, fibre optical tranmitter and receiver.
2. FSK or Frequency shift key - modems used FSK in telemetry systems
3. PSK or Phase shift key - satellite communication, mobile phones

**The fundamental** difference is, baseband input signal for Analog modulation is analog and for digital modulation it is digital. **The carrier is analog for both the cases.**

# Broadcasting:

Originally all broadcasting was composed of [analog signals](https://en.wikipedia.org/wiki/Analog_signal) using [analog transmission](https://en.wikipedia.org/wiki/Analog_transmission) techniques but in the 2000s, broadcasters have [switched](https://en.wikipedia.org/wiki/Digital_switchover) to [digital signals](https://en.wikipedia.org/wiki/Digital_signal_(broadcasting)) using [digital transmission](https://en.wikipedia.org/wiki/Digital_transmission). In general usage, broadcasting most frequently refers to the **transmission of information and entertainment programming from various sources to the general public.**

Broadcasting is the [distribution](https://en.wikipedia.org/wiki/Distribution_(business)) of [audio](https://en.wikipedia.org/wiki/Sound) or [video](https://en.wikipedia.org/wiki/Video) content or other messages to a dispersed [audience](https://en.wikipedia.org/wiki/Audience) via any electronic [mass communications medium](https://en.wikipedia.org/wiki/Medium_(communication)) /using the [electromagnetic spectrum](https://en.wikipedia.org/wiki/Electromagnetic_spectrum) ([radio waves](https://en.wikipedia.org/wiki/Radio_wave)), in a [one-to-many](https://en.wiktionary.org/wiki/one-to-many) model.

-OTA (terrestrial)

-Cables (cable tv)

***Transmission of radio and television programs from a radio or television station to home receivers by***[**radio waves**](https://en.wikipedia.org/wiki/Radio_wave)***is referred to as "over the air" (OTA) or***[**terrestrial**](https://en.wikipedia.org/wiki/Terrestrial_television)***broadcasting*** and in most countries requires a [broadcasting license](https://en.wikipedia.org/wiki/Broadcast_license).

**Transmissions using a wire or cable, like**[**cable television**](https://en.wikipedia.org/wiki/Cable_television)(which also retransmits OTA stations with their [consent](https://en.wikipedia.org/wiki/Retransmission_consent)), are also considered broadcasts, but do not necessarily require a license

OTA TV **(Terrestrial television** or **broadcast television)** is a type of [television](https://en.wikipedia.org/wiki/Television) [broadcasting](https://en.wikipedia.org/wiki/Broadcasting) in which the television signal is transmitted by [radio waves](https://en.wikipedia.org/wiki/Radio_wave) from the terrestrial (Earth based) [transmitter](https://en.wikipedia.org/wiki/Transmitter) of a [television station](https://en.wikipedia.org/wiki/Television_station) to a [TV receiver](https://en.wikipedia.org/wiki/Television_receiver) having an [antenna](https://en.wikipedia.org/wiki/Television_antenna). The term "terrestrial" is used to distinguish this type from the newer technologies of [satellite television](https://en.wikipedia.org/wiki/Satellite_television) ([direct broadcast satellite](https://en.wikipedia.org/wiki/Direct_broadcast_satellite) or DBS television), in which the television signal is transmitted to the receiver from an overhead [satellite](https://en.wikipedia.org/wiki/Satellite_(spacecraft)), and [cable television](https://en.wikipedia.org/wiki/Cable_television), in which the signal is carried to the receiver through a [cable](https://en.wikipedia.org/wiki/Electrical_cable). You can take advantage of these free channels with **a Mohu antenna and an HD-ready television**. If you do not have this kind of television, you can still receive the signals **by using an HD converter box.**

Analog television is the original [television](https://en.wikipedia.org/wiki/Television) technology that uses [analog signals](https://en.wikipedia.org/wiki/Analog_signal) to transmit video and audio. ---- The ***brightness, colors and sound are represented by rapid variations of either the***[**amplitude**](https://en.wikipedia.org/wiki/Amplitude)***,***[**frequency**](https://en.wikipedia.org/wiki/Frequency)***or phase of the signal.***

Analog TV broadcasting transmits audio and video signals over the air waves, just as radio broadcasts send only audio. Each station uses a single frequency over which it broadcasts analog television signals. You know these frequencies as channels. When these broadcasts experience interference with their frequencies, what you get is a channel with noisy static and annoying "snow" disrupting the program you are attempting to view. Also, because analog TV broadcasting signals vary and fluctuate depending on several factors, you may experience instable color, brightness and sound quality.

Digital television (DTV) is the transmission of audio and video by digitally processed and **multiplexed signal,**- - **Digital TV can support more than one program in the same channel**[**bandwidth**](https://en.wikipedia.org/wiki/Bandwidth_(signal_processing)).

 Digital TV broadcasting uses "packets" of compressed data to transmit television programs. The audio and video components of a program are packaged together into these packets of data and broadcast to your digital TV (or analog television with a converter, cable, or satellite box). The code used to transmit sound, picture and even text (such as Closed Captioning) in digital TV broadcasting is very similar to the way pictures and sounds are transmitted to your computer via the Internet.

# TV signal sources

The signal source might be an [Ethernet](https://en.wikipedia.org/wiki/Ethernet) cable, a [satellite dish](https://en.wikipedia.org/wiki/Satellite_dish), a [coaxial cable](https://en.wikipedia.org/wiki/Coaxial_cable) (see [cable television](https://en.wikipedia.org/wiki/Cable_television)), a [telephone](https://en.wikipedia.org/wiki/Telephone) line (including [DSL](https://en.wikipedia.org/wiki/Digital_Subscriber_Line) connections), [broadband over power lines](https://en.wikipedia.org/wiki/Broadband_over_power_lines) (BPL), or even an ordinary [VHF](https://en.wikipedia.org/wiki/Very_high_frequency) or [UHF](https://en.wikipedia.org/wiki/Ultra_high_frequency) [antenna](https://en.wikipedia.org/wiki/Antenna_(radio)).

**Receiving digital signal**

There are several different ways to receive digital television. One of the oldest means of receiving DTV (and TV in general) is from terrestrial transmitters using an [antenna](https://en.wikipedia.org/wiki/Television_antenna) (known as an aerial in some countries). This way is known as [Digital terrestrial television](https://en.wikipedia.org/wiki/Digital_terrestrial_television) (DTT). With DTT, viewers are limited to channels that have a terrestrial transmitter in range of their antenna

# Set-top

Set-top Box - (STB) -  set-top box, set top box, STB, Receivers, Converters, Decoders, Intelligent Set-top Boxes, Set-top Decoders, Smart Encoder, Digital TV Converter, DTV Converter, DTV Tuner, Digital Set-top Box, Addressable Converter, Demodulator, Smart TV Set-top Box, ITV enabled Set-top Box, Internet-enabled Set-top Box, ITV enabled Set-top Cable Box, Satellite-enabled Set-top Box, Cable-enabled Set-top Box, Thin Boxes, Thick Boxes, Smart TV Set-top Box, Super Box, All-in-one Set Top Box, Integrated Set Top Box, Hybrid Cable Box, Media Center. Associated with Digital Media Adapters, Digital Media Receivers, Windows Media Extender Set-top Boxes

A set-top box is a computerized device that processes digital information and converts the digital signal to audio or video formats. an [information appliance](https://en.wikipedia.org/wiki/Information_appliance) device that generally contains a [TV-tuner](https://en.wikipedia.org/wiki/Tuner_(radio)#Television) input and displays output to a [television set](https://en.wikipedia.org/wiki/Television_set) and an external source of [signal](https://en.wikipedia.org/wiki/Signal_(information_theory)), turning the source signal into [content](https://en.wikipedia.org/wiki/Content_(media_and_publishing)) in a form that can then be displayed on the [television screen](https://en.wikipedia.org/wiki/Television_screen) or other [display device](https://en.wikipedia.org/wiki/Display_device). They are used in [cable television](https://en.wikipedia.org/wiki/Cable_television), [satellite television](https://en.wikipedia.org/wiki/Satellite_television), and [over-the-air television](https://en.wikipedia.org/wiki/Over-the-air_television) . The STB is placed between the TV and the provider such as satellite, cable or terrestrial operator. One of the advantages of STB is that it provides more TV channels on the less number of frequencies.

1) **Broadcast TV Set-top Boxes - (a.k.a. Thin Boxes) - A** more primitive set-top box with ***no***[***back channel***](http://www.itvdictionary.com/b.html)***(return path.)*** These might come with interface ports,some memory and some processing power.

(2**) Enhanced TV Set-top Boxes - (May be known as: Smart TV Set-top Box, Thick Boxes) -** These ***have a***[***back channel***](http://www.itvdictionary.com/b.html)***(return path),*** often through a phone line. These may be capable of [*Video on Demand*](http://www.itvdictionary.com/vod.html)*, e-commerce, Internet browsing, e-mail communications, chat and more.*

(3) **Advanced Set-top Boxes - (a.k.a. advanced digital Set-top boxes, Smart TV Set-top Box, Thick Boxes, All-in-one Set Top Box, Media Center)** - A fully integrated set-top box.  These have good processors, memory, [middleware](http://www.itvdictionary.com/definitions/middleware_system_software_or_platform_software_definition.html), software applications and optional hard-drives.  They're often used with high-speed (broadband) connections. Features could include high-speed Internet access, [Interactive TV](http://www.itvdictionary.com/itv.html), digital video recording & gaming. As advanced set-top boxes now typically are integrated units, the sidecar is not often used. **Slidecar** set-top box provides an additional transport stream of data from the network operator to compliment the main stream

4) **Hybrid Digital Cable Box –** A Hybrid Digital Cable Box is a specialized cable TV set-top box with high end functions. Motorola Broad band’s DCP501 home theater system is/was an example (depending on when you read this.) It has/had a DVD player and high-end stereo output.

(5) **Over-the-top Boxes** - Electronic device manufacturers are providing DVD players, video game consoles and TVs with built-in wireless connectivity. These devices piggy back on an existing wireless network and pull content from the Internet and deliver it to the TV set. Typically these devices need no additional wires, hardware or advanced knowledge in how to operate. Content suited for TV can be delivered via the Internet.

# DVB:

Digital Video Broadcasting (DVB) is a **set of internationally**[**open standards**](https://en.wikipedia.org/wiki/Open_standard)**for**[**digital television**](https://en.wikipedia.org/wiki/Digital_television)**.**

It uses coded orthogonal frequency-division multiplexing ([OFDM](https://en.wikipedia.org/wiki/OFDM))

DVB systems distribute data using a variety of approaches, including:

* [Satellite](https://en.wikipedia.org/wiki/Satellite_television): [DVB-S](https://en.wikipedia.org/wiki/DVB-S), [DVB-S2](https://en.wikipedia.org/wiki/DVB-S2) and [DVB-SH](https://en.wikipedia.org/wiki/DVB-SH)
  + [DVB-SMATV](https://en.wikipedia.org/w/index.php?title=DVB-SMATV&action=edit&redlink=1) for distribution via [SMATV](https://en.wikipedia.org/wiki/SMATV)
* [Cable](https://en.wikipedia.org/wiki/Cable_television): [DVB-C](https://en.wikipedia.org/wiki/DVB-C), [DVB-C2](https://en.wikipedia.org/wiki/DVB-C2)
* [Terrestrial television](https://en.wikipedia.org/wiki/Digital_terrestrial_television): [DVB-T](https://en.wikipedia.org/wiki/DVB-T), [DVB-T2](https://en.wikipedia.org/wiki/DVB-T2)
  + Digital terrestrial television for [handhelds](https://en.wikipedia.org/wiki/Handheld): [DVB-H](https://en.wikipedia.org/wiki/DVB-H), [DVB-SH](https://en.wikipedia.org/wiki/DVB-SH)
* [Microwave](https://en.wikipedia.org/wiki/Microwave): using [DTT](https://en.wikipedia.org/wiki/Digital_terrestrial_television) ([DVB-MT](https://en.wikipedia.org/w/index.php?title=DVB-MT&action=edit&redlink=1)), the [MMDS](https://en.wikipedia.org/wiki/MMDS) ([DVB-MC](https://en.wikipedia.org/w/index.php?title=DVB-MC&action=edit&redlink=1)), and/or [MVDS](https://en.wikipedia.org/wiki/MVDS) standards ([DVB-MS](https://en.wikipedia.org/wiki/DVB-MS))

These distribution systems differ mainly in the [modulation](https://en.wikipedia.org/wiki/Modulation) schemes used and error correcting codes used , due to the different technical constraints.

# Band

In telecommunication, a band - sometimes called a [frequency](http://searchcio-midmarket.techtarget.com/definition/frequency) band - **is a specific range of frequencies in the radio frequency (RF) spectrum**, which is divided among ranges from very low frequencies (vlf) to extremely high frequencies (ehf). Each band has a defined upper and lower frequency limit.

High frequencies (hf) - also called shortwaves - radio broadcasting

Very high frequencies (vhf) range from 30 to 300 MHz. - television and radio broadcasting

Super high frequencies (shf) range from 3 to 30 gigahertz (GHz). -space and satellite communication

Extremely high frequencies (ehf) range from 30 to 300 GHz. - satellite, and earth and space exploration

Bands, Frequency Ranges, and Allocations:

Very low frequencies (vlf) range from 3 to 30 kilohertz ([kHz](http://searchnetworking.techtarget.com/definition/kHz)). Time signals and standard frequencies are among the users of this band.

Low frequencies (lf) range from 30 to 300 kHz. Fixed, maritime mobile and navigational systems and radio broadcasting are among the users of this band.

Medium frequencies (mf) range from 300 to 3000 kHz. Land, maritime mobile and radio broadcasting are among the users of this band.

High frequencies (hf) - also called shortwaves - range from 3 to 30 megahertz (MHz). Fixed, mobile, aeronautical and marine mobile, amateur radio, and radio broadcasting are among the users of this band.

Very high frequencies (vhf) range from 30 to 300 MHz. Fixed, mobile, aeronautical and marine mobile, amateur radio, television and radio broadcasting, and radio navigation are among the users of this band.

Ultra high frequencies (uhf) range from 300 to 3000 MHz. Fixed, mobile, aeronautical and marine mobile, amateur radio, television, radio navigation and location, meteorological, and space communication are among the users of this band.

Super high frequencies (shf) range from 3 to 30 gigahertz (GHz). Fixed, mobile, radio navigation and location, and space and satellite communication are among the users of this band.

Extremely high frequencies (ehf) range from 30 to 300 GHz. Amateur radio, satellite, and earth and space exploration are among the users of this band.

# Electromagnetic spectrum

**describe the entire range of light that exists**. From radio waves to gamma rays, most of the light in the universe is, in fact, invisible to us!

**The larger the frequency, the smaller the wavelength**

***The electromagnetic spectrum is a collective term; referring to the entire range and scope of frequencies of electromagnetic radiation and their respective, associated***[**photon**](https://en.wikipedia.org/wiki/Photon)***wavelengths.***

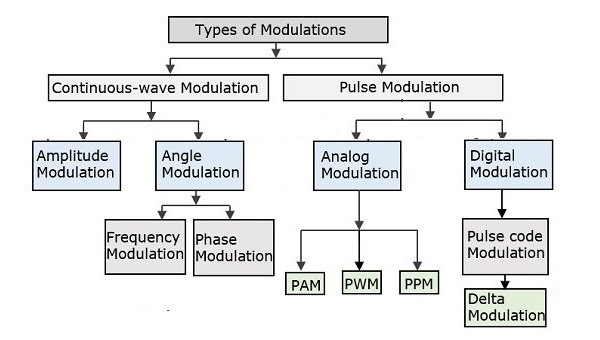
Regions of the spectrum

The types of electromagnetic radiation are broadly classified into the following classes:[[5]](https://en.wikipedia.org/wiki/Electromagnetic_spectrum#cite_note-em-spectrum-5)

1. Gamma radiation (high freq : 300 EHZ, low wavelength: 1 pm (petameters))
2. X-ray radiation
3. Ultraviolet radiation
4. Visible radiation (3PHZ – 3 THZ, 100 nm – 100um)
5. Infrared radiation
6. Terahertz radiation
7. Microwave radiation (Ku band -12–18 GHz portion [satellite communications](https://en.wikipedia.org/wiki/Satellite_communication),)
8. Radio waves (low freq 3 KHZ, high wavelength 100 KM) –( **I Band** 8 000 to 10 000 [MHz](https://en.wikipedia.org/wiki/MHz) )

# **Electromagnetic radiation**

*Electromagnetic waves are produced whenever*[charged particles](https://en.wikipedia.org/wiki/Charged_particle)*are*[accelerated](https://en.wikipedia.org/wiki/Acceleration)*, and these waves can subsequently interact with other charged particles*. ***Refers to the waves of the***[**electromagnetic field**](https://en.wikipedia.org/wiki/Electromagnetic_field)***, propagating (radiating) through space carrying electromagnetic***[**radiant energy**](https://en.wikipedia.org/wiki/Radiant_energy). EM waves carry [energy](https://en.wikipedia.org/wiki/Energy), [momentum](https://en.wikipedia.org/wiki/Momentum) and [angular momentum](https://en.wikipedia.org/wiki/Angular_momentum) away from their source particle and can impart those quantities to [matter](https://en.wikipedia.org/wiki/Matter) with which they interact. Propagate at the [speed of light](https://en.wikipedia.org/wiki/Speed_of_light) through a [vacuum](https://en.wikipedia.org/wiki/Vacuum).



- Continuous-wave modulation, a high frequency sine wave is used.

E.g. radio and TV broadcasting

- Pulse modulation, a periodic sequence of rectangular pulses, is used as a carrier wave.-

E.g. [satellite communication](http://www.polytechnichub.com/satellite-communication/).

**Charter Communications (Founded 1993 (24 years ago))** is an American [telecommunications](https://en.wikipedia.org/wiki/Telecommunications) company, which offers its services to consumers and businesses under the branding of **Spectrum**. Providing services to over 25 million customers in 42 states,[[1]](https://en.wikipedia.org/wiki/Charter_Communications#cite_note-CharterProfile-1)[[4]](https://en.wikipedia.org/wiki/Charter_Communications#cite_note-latimes-chartercompletespurchase-4) it is the second-largest [cable](https://en.wikipedia.org/wiki/Cable_television) operator in the United States by subscribers, just behind [Comcast](https://en.wikipedia.org/wiki/Comcast), and third largest pay TV operator behind Comcast and [AT&T](https://en.wikipedia.org/wiki/AT%26T) [U-verse](https://en.wikipedia.org/wiki/AT%26T_U-verse)/[DirecTV](https://en.wikipedia.org/wiki/DirecTV).[[5]](https://en.wikipedia.org/wiki/Charter_Communications#cite_note-5) It is the fifth largest telephone provider based upon residential subscriber line count.

Products: Broadband, Cable television, Digital cable, Digital telephone, HDTV, Home security, Internet, Internet security, VoIP phone