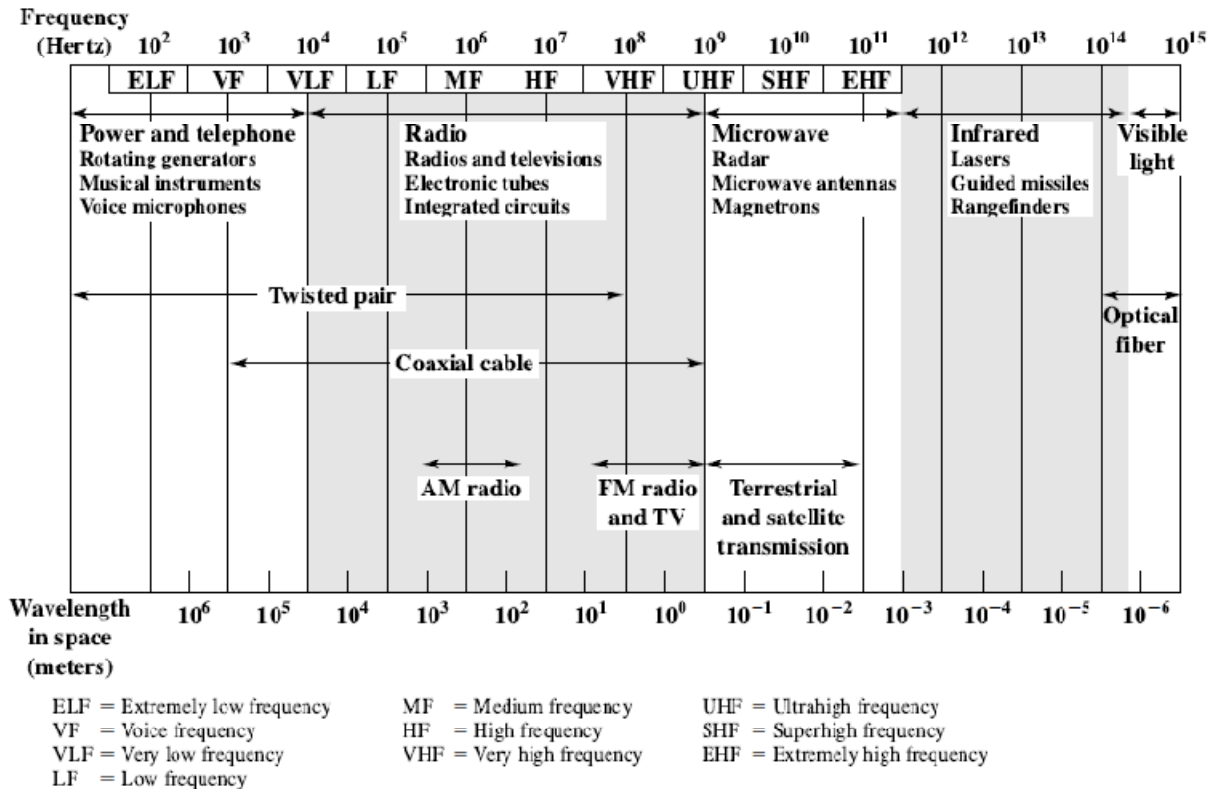


# FREQUENCY PLANNING



Electromagnetic Spectrum for Telecommunications

## Electromagnetic Spectrum

For wireless communication, antenna is needed. In transmission, antenna radiates electromagnetic energy in space and in reception, antenna picks up EM waves from surrounding medium. In general, there are three major ranges of frequencies which are used for wireless communication:

- i) Microwaves
- ii) Radio Waves
- iii) Infrared waves

When electrons move, they create electromagnetic waves that can propagate through free space even in a vacuum. By attaching an antenna of the appropriate size to an electrical circuit, the electromagnetic waves can be broadcast efficiently and received by a receiver some distance away. All wireless communication is based on this principle. The electromagnetic spectrum is shown in the following figure. The radio, microwave, infrared and visible light portion of the spectrum can all be used for transmitting information by modulating the amplitude, frequency, or phase of the wave. Ultraviolet light, X-Ray and gamma rays would be even better, due to their higher frequencies but they are hard to produce and modulate, do not propagate well through buildings and are dangerous to living things. The bands listed below at the bottom of electromagnetic spectrum are the official ITU names and based on the wave lengths. So the LF band goes from 1km to 10 km (approximately 30 KHz to 300 KHz). The terms LF, MF

and HF refer to low, medium and high frequency respectively. The amount of information that an electromagnetic wave can carry is related to its bandwidth.

### **Frequency band for communication**

Table: Frequency bands:

S. No.	Frequency Band	Frequency Range				
				to		
1	Extremely Low Frequency (ELF)	0		to	3	KHz
2	Very Low Frequency (VLF)	3	KHz	to	30	KHz
3	Low Frequency (LF)	30	KHz	to	300	KHz
4	Medium Frequency (MF)	300	KHz	to	3000	KHz
5	High Frequency (HF)	3	MHz	to	30	MHz
6	Very High Frequency (VHF)	30	MHz	to	300	MHz
7	Ultra-High Frequency (UHF)	300	MHz	to	3000	MHz
8	Super high Frequencies (SHF) (Microwave)	3	GHz	to	30.0	GHz
9	C-band	3600	MHz	to	7025	MHz
10	X-band:	7.25	GHz	to	8.4	GHz
11	Ku-band	10.7	GHz	to	14.5	GHz
12	Ka-band	17.3	GHz	to	31.0	GHz
13	Extremely High Frequencies (EHF) (Millimeter Wave Signals)	30.0	GHz	to	300	GHz
14	Infrared Radiation	300	GHz	to	430	THz
15	Visible Light	430	THz	to	750	THz
16	Ultraviolet Radiation	1.62	PHz	to	30	PHz
17	X-Rays	30	PHz	to	30	EHz
18	Gamma Rays	30	EHz	to	3000	EHz

Source : <http://msk1986.files.wordpress.com/2013/09/dsp-unit-1.pdf>