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How Radar Works

Radar stands for radio detection and ranging. Radar was first used on ships to detect icebergs and obstacles. The most common radar transmits a train of narrow, rectangular-shape pulses modulating a sin carrier. The echo signal is returned and evaluated on a cathode ray tube, CRT. Distance is measured by the time it takes the pulse to travel to and from the target.

A continuous waveform, CW, radar can also be used. This radar shows the doppler frequency shift to measure the velocity of a target.

Most radars operate at frequencies from about 220 MHz to 35 GHz. However, some radars have operated at 5 MHz and others at 94 GHz. Knowing the frequency the wave length is determined by dividing the frequency into 300 to give the wave length in meters. Usually the higher the frequency, the sharper the return signal and more accuracy can be obtained in determining distance and location.

Standard Radar Frequencies and Wave Length

Band designation	Wave length	Frequency range	Applications
HF (high frequency) Decametric	100 - 10 m	3-30 MHz	Radio, broadcast
VHF (very high frequency) Metric	10 - 1 m	30-300 MHz	Radio, television
UHF (ultra high frequency) Decimeter	1m - 30 cm	300-1000 MHz	RADAR, television
L, microwave region	30 - 15 cm	1000-2000 MHz	RADAR, satellite
S, microwave	15 - 7.5 cm	2000-4000 MHz	RADAR, satellite
C, microwave	7.5 - 3.8 cm	4000-8000 MHz	RADAR, satellite
X, microwave	3.8 - 2.5 cm	8000-12,000 MHz	RADAR, satellite
Ku, microwave	2.5 - 1.7 cm	12-18 GHz	RADAR, satellite
K, microwave	1.7 - 1.1 cm	18-27 GHz	RADAR, satellite
Ka, extremely high frequency	11 - 7.5 mm	27-40 GHz	RADAR, satellite
mm, extremely high frequency	7.5 - 1 mm	40-300 GHz	

Computer Classes and Books:

Two Computer Courses are available on CD-ROM disks that are intended to provide a basic understanding of the subjects of radar and microwave tubes. Many explanations of various items are presented with animations that describe the subject material. Test questions are available with scoring to assist in learning the subject material. Available from [CDtechware](#). One is **How to Speak Radar** and the other is **Fundamentals of Microwave**. Both are published by Arnold Acker who worked for over 30 years at Varian Brothers. Mr. Acker has taught classes on radar so he has a good feeling and understanding of how to explain this most interesting topic. CDtechware can be reached at 209-847-2304 or e-mail address: arnacker@jps.net.

A good book on radar is "Introduction to Radar Systems" by Merrill I. Skolnik. This book, in its second edition, is published by Mc GrawHill and can be purchased from [Borders](#).

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