

AN EASY WAY TO CALCULATE A MICROWAVE WAVELENGTH IN INCHES

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MICROWAVE WAVELENGTH IN INCHES

A colleague, Mike Stasiowski, and I came up with this quick GHz wavelength formula while designing quad ridge circular polarized jamming antennas for the military when working at Nurad. The textbook formula (wavelength =

c/f) where: c = the speed of light 3.00×10^8 m/s, and f = frequency in Hz, was cumbersome at times to calculate, then convert, to inches for practical hardware design purposes; especially since we utilized the formula in the GHz ranges 90% of the time. Therefore, to calculate a microwave wavelength in inches, a useful approximate formula is as follows:

$11.8028 / \text{GHz} = \text{Wavelength } (\lambda) \text{ in inches. For MHz use the decimal equivalent to GHz, for example 250 MHz, use 0.250.}$

Examples:

Fixed Satellite Service:

Space to Earth = 19.790 GHz; the wavelength in inches is: $11.8028 / 19.790 = 0.596 \text{ in.}$

Earth to Space = 28.570 GHz; the wavelength in inches is: $11.8028 / 28.570 = 0.413 \text{ in.}$

Weather Radar:

5.475 GHz; $11.8028 / 5.475 = 2.156 \text{ in.}$

Microwave Oven:

2.450 GHz: $11.8028 / 2.450 = 4.818 \text{ in.}$ (divide by 2 and you have the half wavelength of 2.409 in., multiply by 0.02 and you have 0.048 in. which is the size of an aperture that will attenuate microwave oven emissions by approximately 40dB; the apertures in the window of microwave ovens are approximately 0.048 in. in diameter.)

A favorite – police radar:

10.550 GHz; $11.8028 / 10.550 = 1.119 \text{ in.}$ (any 12 GHz tuned RF absorber on your bumper???) we do not encourage driving over the speed limit but it may give you a few seconds to make sure you are adhering to the speed limit before a reading is shown on the radar gun ☺)

