Calculating Pyramidal Horn Gain
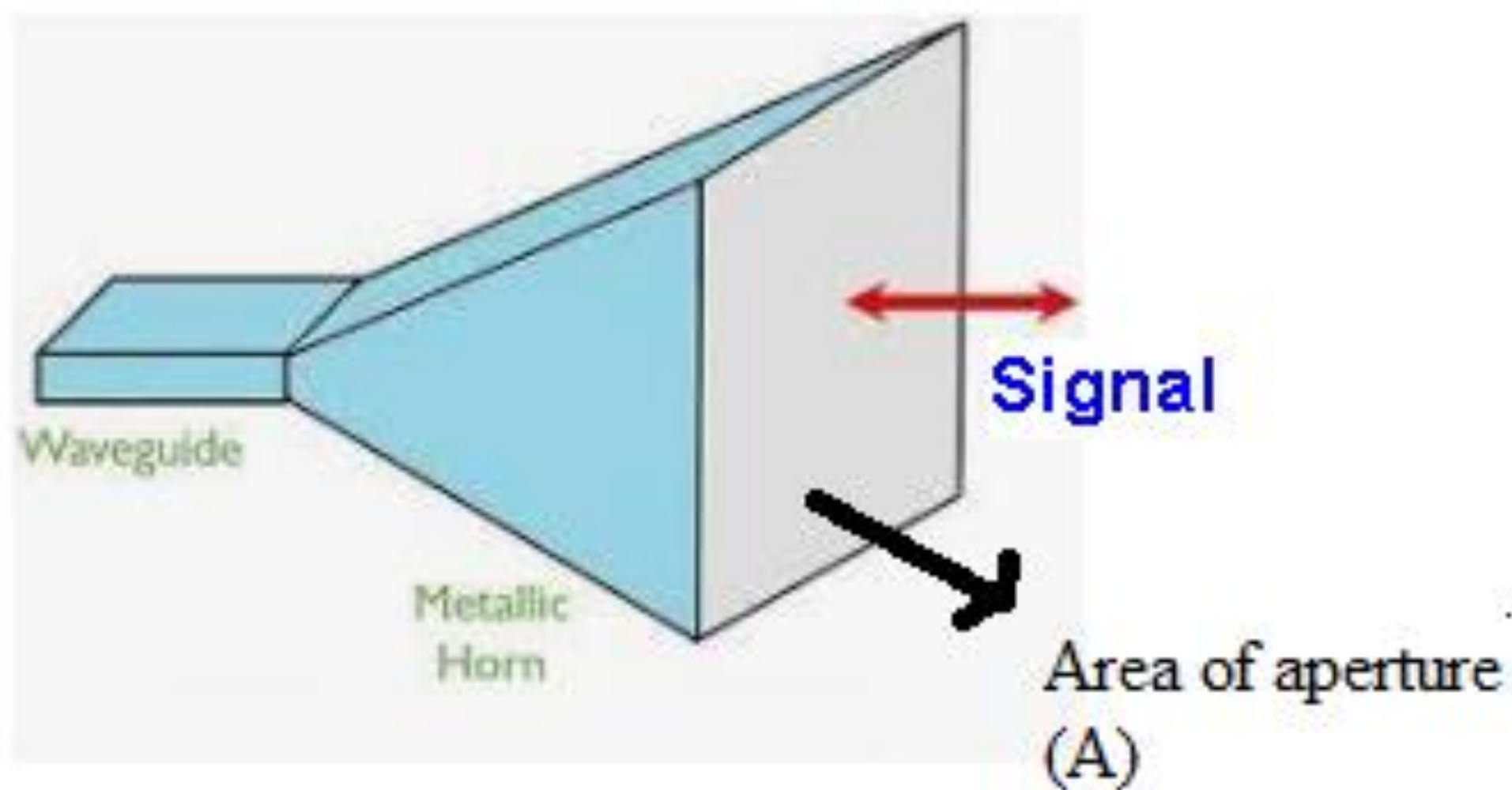
https://www.everythingrf.com/rf-calculators/pyramidal-horn-antenna-gain-calculator

Waveguide

Metallic Horn

Signal

Area of aperture (A)

What is the gain of the pyramidal horn antenna?

The gain of the pyramidal horn antenna represents the maximum radiation intensity in a given direction (or absorbs incident power from that direction) when compared with a theoretical isotropic antenna. The isotropic antenna (theoretical antenna) would radiate out RF waves equally in all directions with the same intensity.

The gain of the pyramidal horn antenna gain can be calculated by the following formula.

$$G = \frac{4 \cdot \pi \cdot A}{\lambda^2} \cdot e_A$$

$$\text{Gain (dB)} = 10 \, \text{Log (G)}$$

Where:

Gain (dB) = pyramidal horn antenna gain in dB (i.e., decibels)

$\pi = 3.14$

A = Area of aperture in m^2

e_A = Aperture efficiency (between 0 and 1)

λ = Wavelength of radio wave (mm/cm/µm/metre)

Pyramidal Horn Antenna Gain Calculator

Area of Aperture (A)

| 1250 | cm ⇕ |

Wavelength (λ)

| 1420 | cm ⇕ |

Calculate Wavelength from Frequency

Aperture Efficiency (e_A)

| 0.8 |

| Calculate | Reset |

Result

Gain

| **1.36** |

Gain

| **1** | dB |

Aperture 50 cm x 50cm

Pyramidal Horn Antenna Gain Calculator

Area of Aperture (A)

| 4900 | cm ⇕ |

Wavelength (λ)

| 1420 | cm ⇕ |

Calculate Wavelength from Frequency

Aperture Efficiency (e$_A$)

| 0.8 |

| Calculate | Reset |

Result

Gain

| 5.3312 |

Gain

| 6.93286067 | dB |

Aperture 70 cm x 70cm

Pyramidal Horn Antenna Gain Calculator

Area of Aperture (A)

| 10000 | cm ⇕ |

Wavelength (λ)

| 1420 | cm ⇕ |

Calculate Wavelength from Frequency

Aperture Efficiency (e$_A$)

| 0.8 |

| Calculate | Reset |

Result

Gain

| **10.88** |

Gain

| **10.03089987** | dB |

Aperture 100 cm x 100cm

Pyramidal Horn Antenna Gain Calculator

Area of Aperture (A)

| 40000 | cm ↕ |

Wavelength (λ)

| 1420 | cm ↕ |

Calculate Wavelength from Frequency

Aperture Efficiency (e_A)

| 0.8 |

| Calculate | Reset |

Result

Gain

| 43.52 |

Gain

| 16.05149978 | dB |

Aperture 200 cm x 200cm