



Elementos de Antenas

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¿De qué se trata?

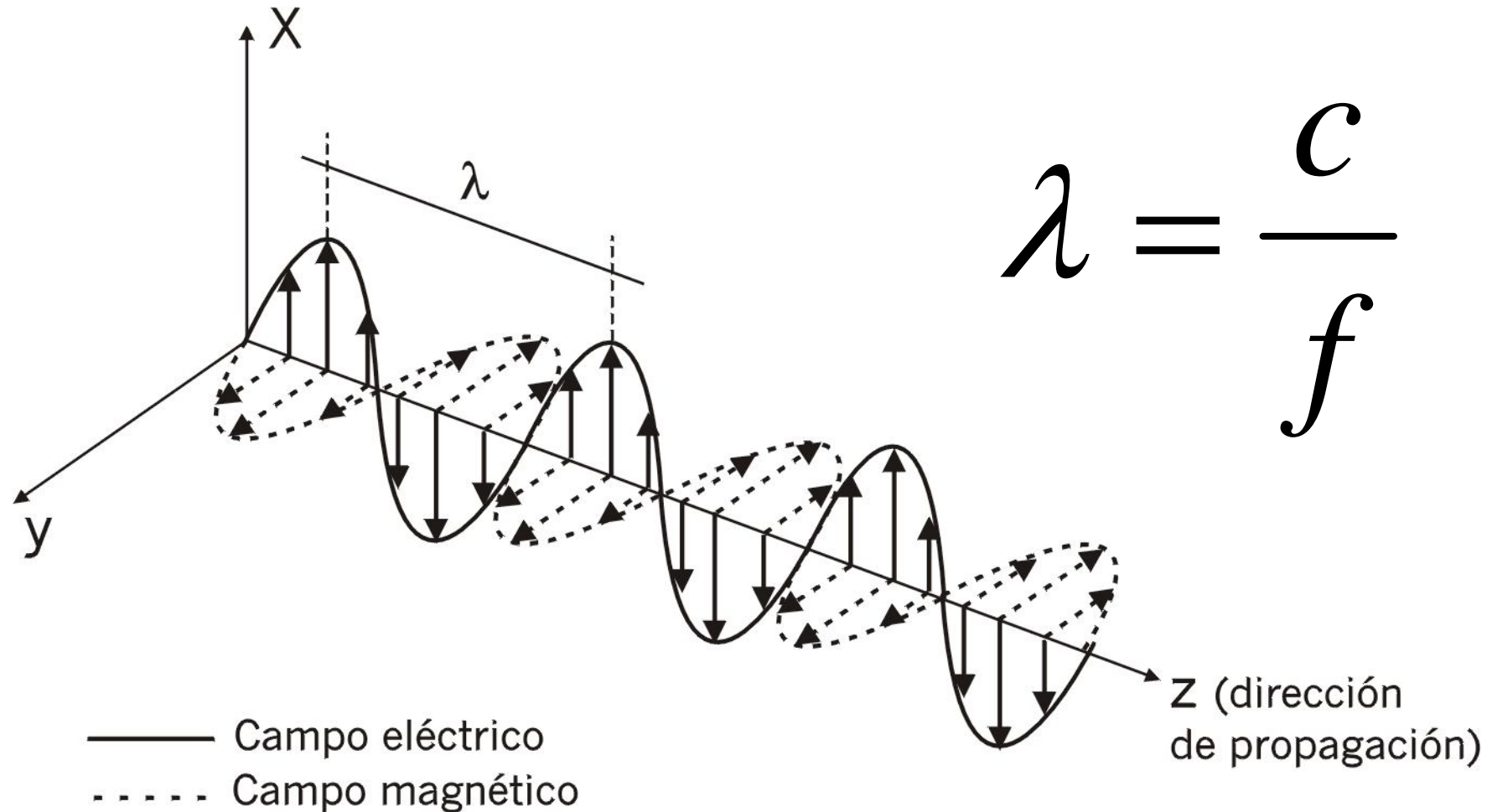
- Radiación electromagnética
- Elementos radiantes
- Parámetros de las antenas
- Tipos de antenas
- Conceptos Avanzados

Parte I

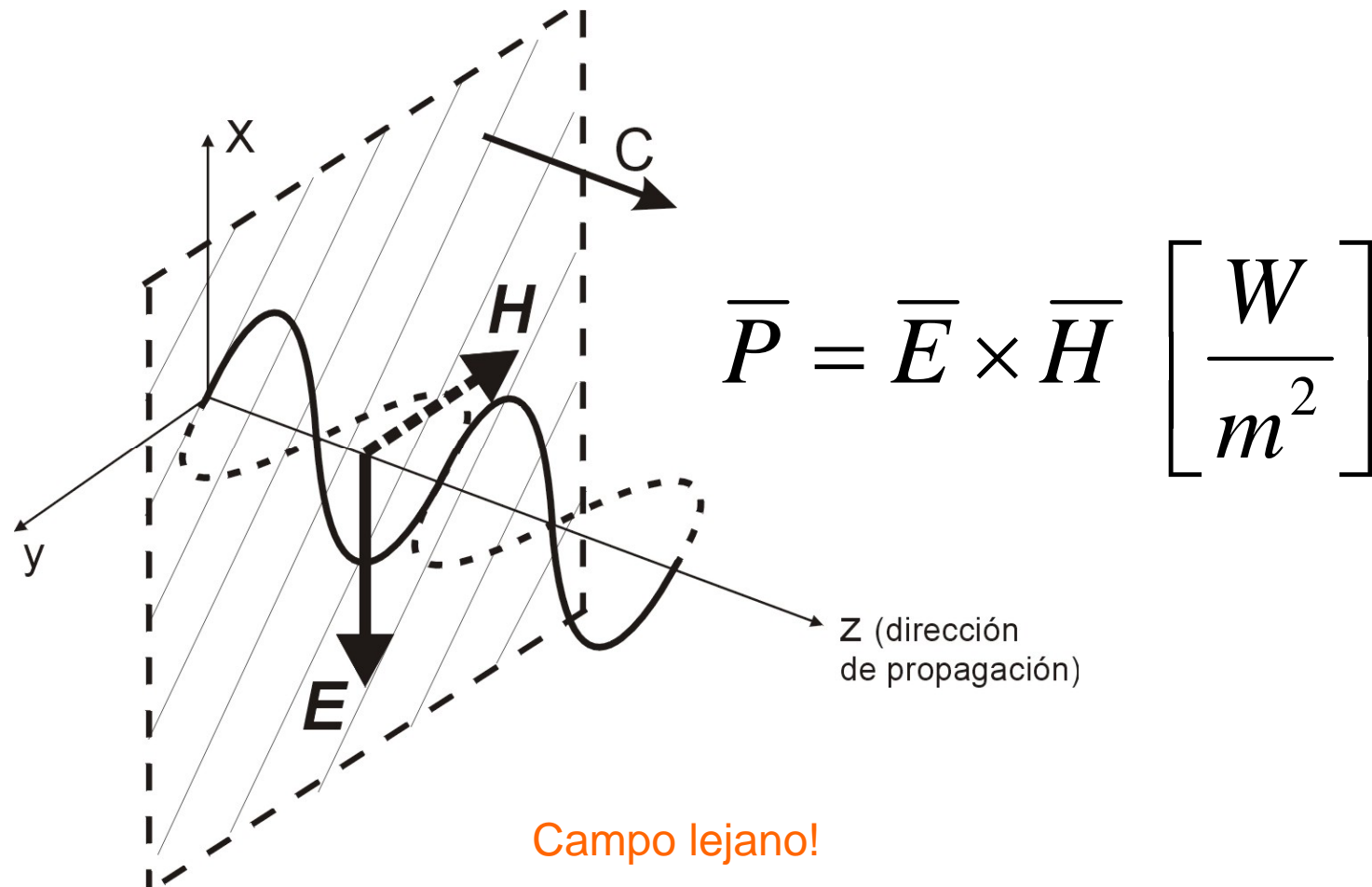


Parámetros de las Antenas

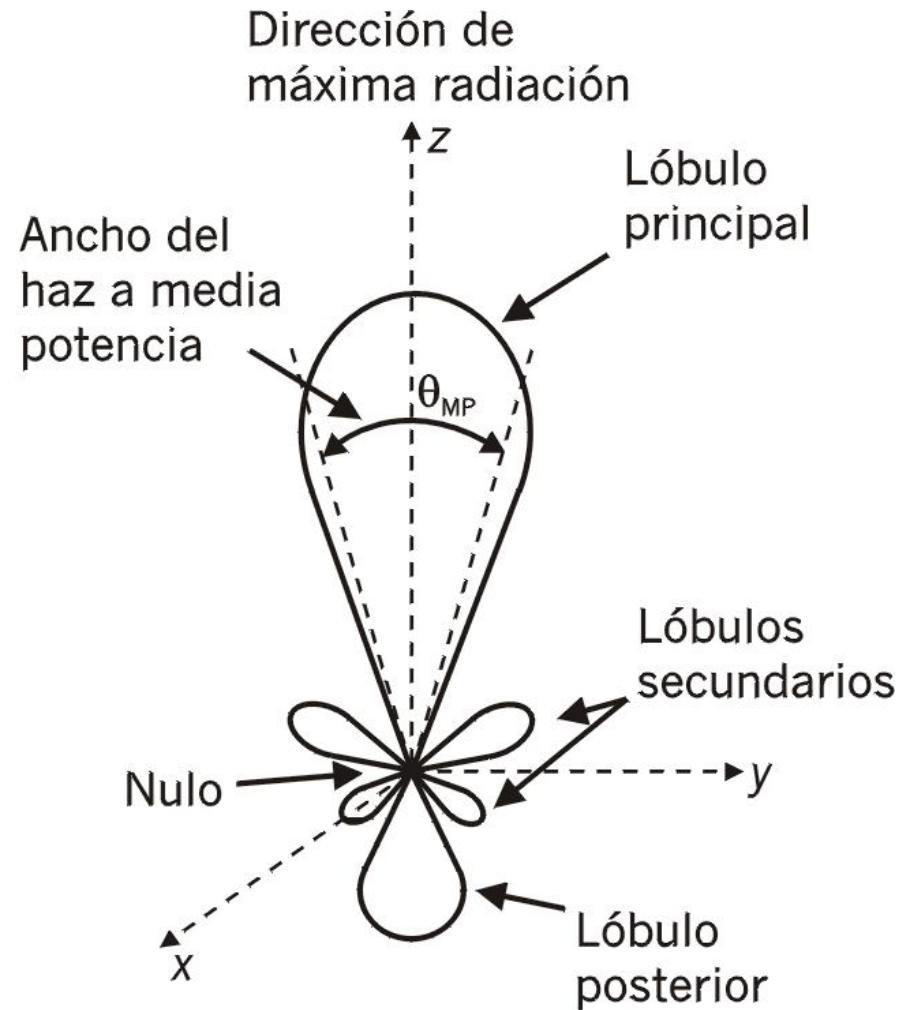
Ondas Electromagnéticas



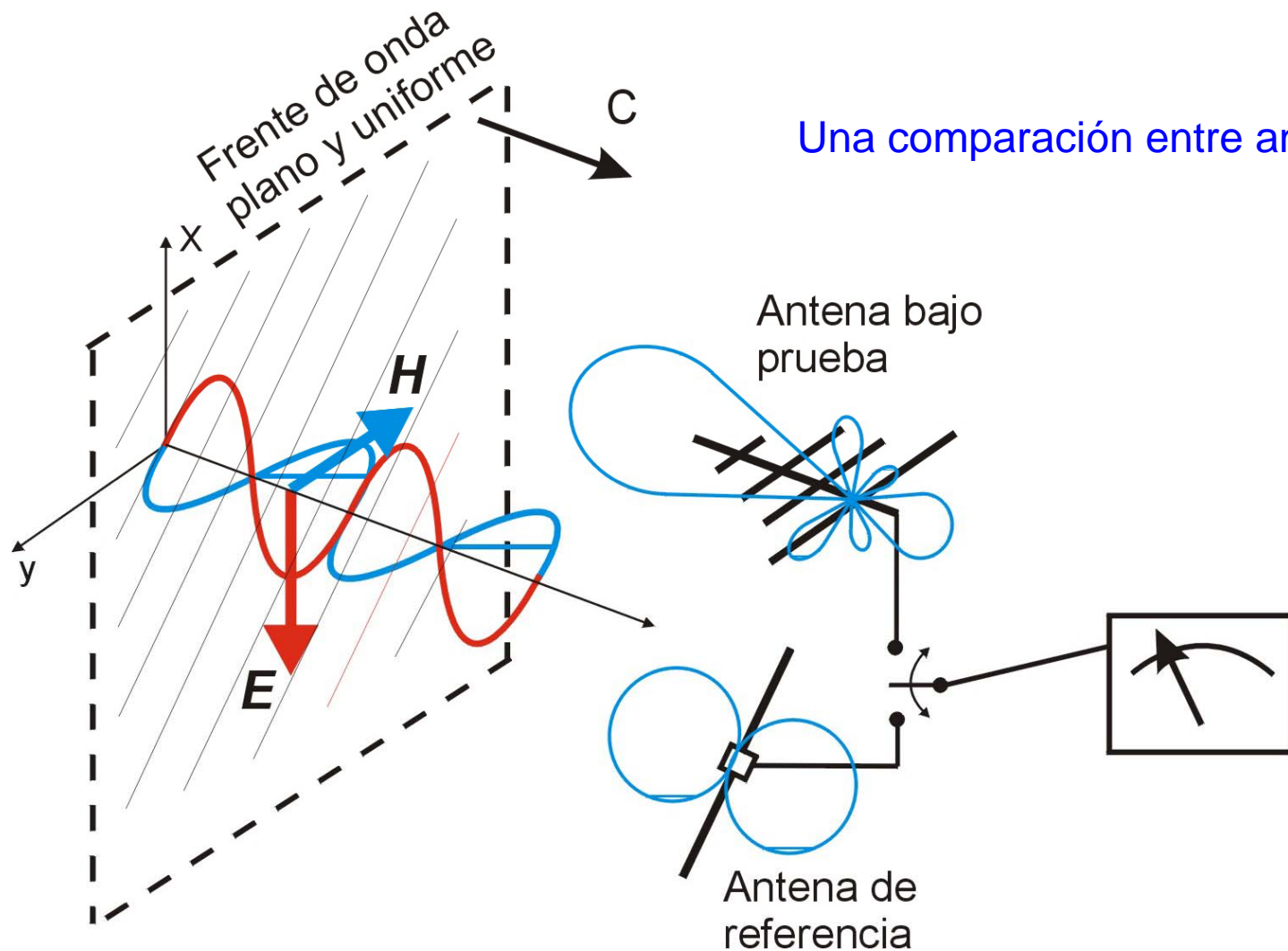
Densidad de Potencia



Patrón de Radiación

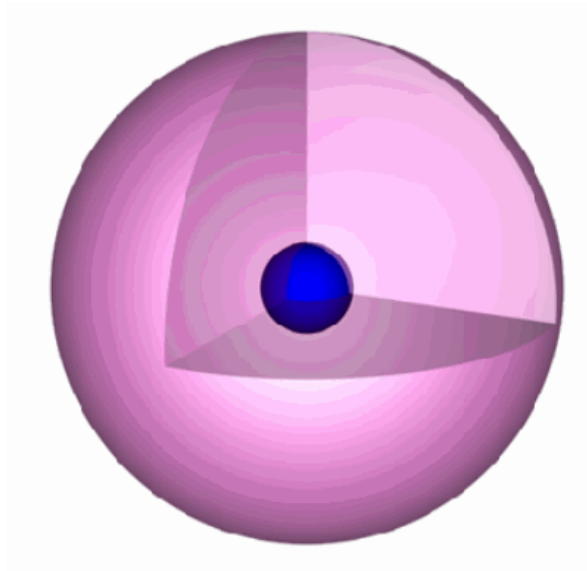


Directividad

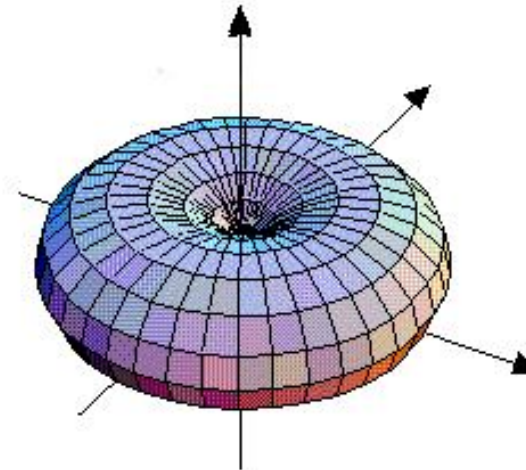


Directividad

$$D(\theta, \varphi) = \frac{P(\theta, \varphi)}{P_{av}}$$



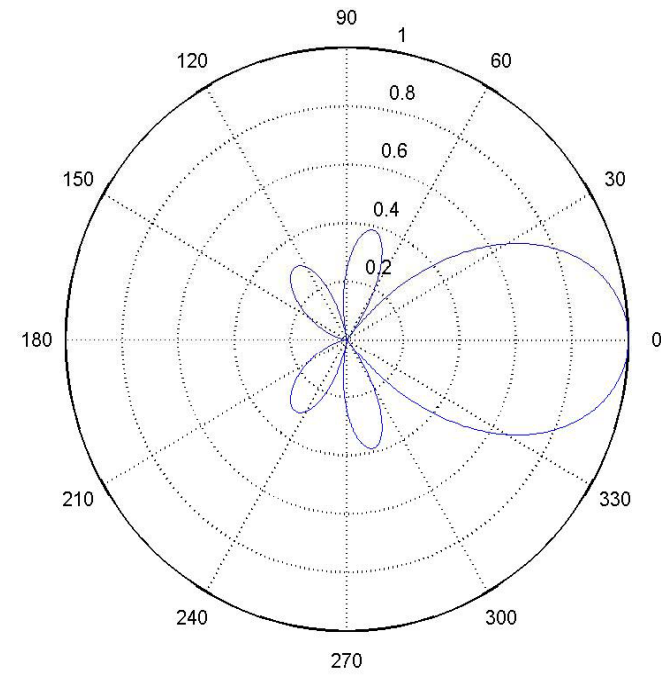
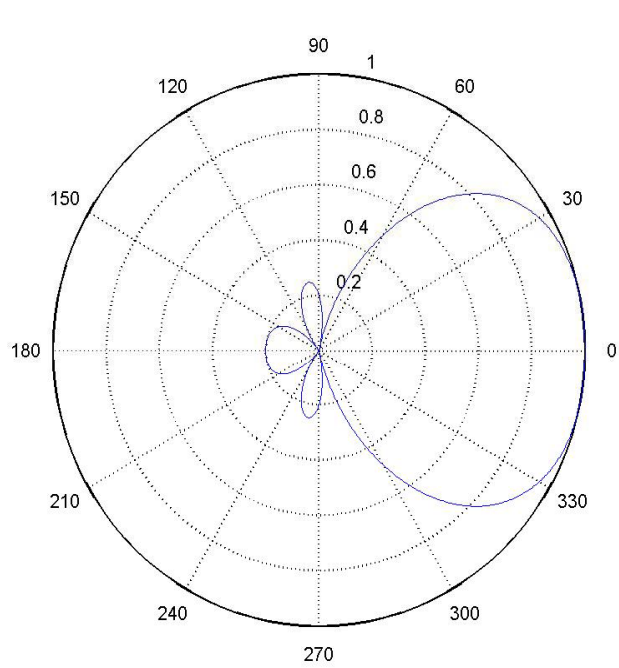
- Antenas de referencia
 - Isotrópica (dBi)
 - Dipolo de $\frac{1}{2}$ onda (dBd)



- 0 dBd = 2.15 dBi

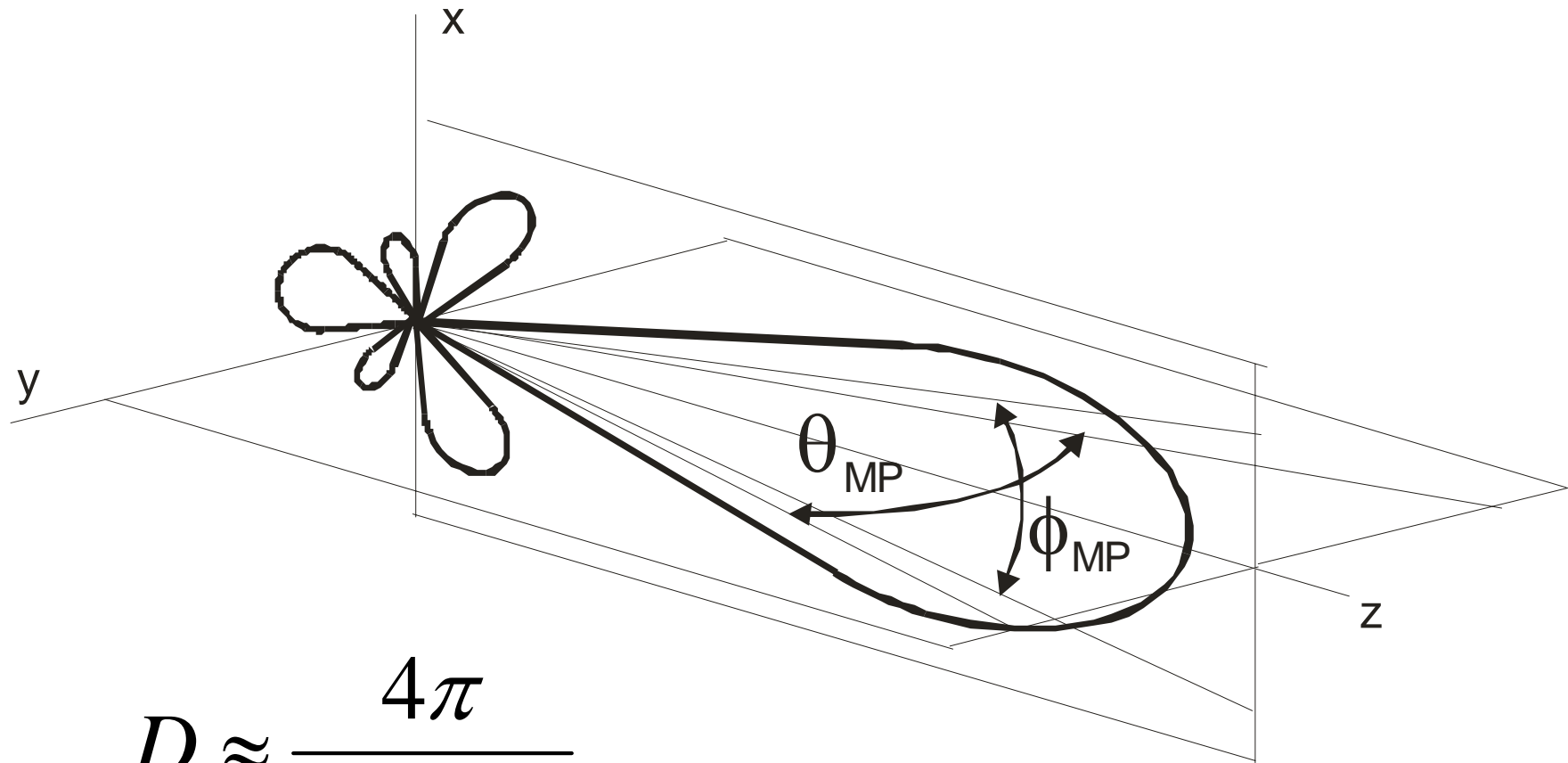


Directividad



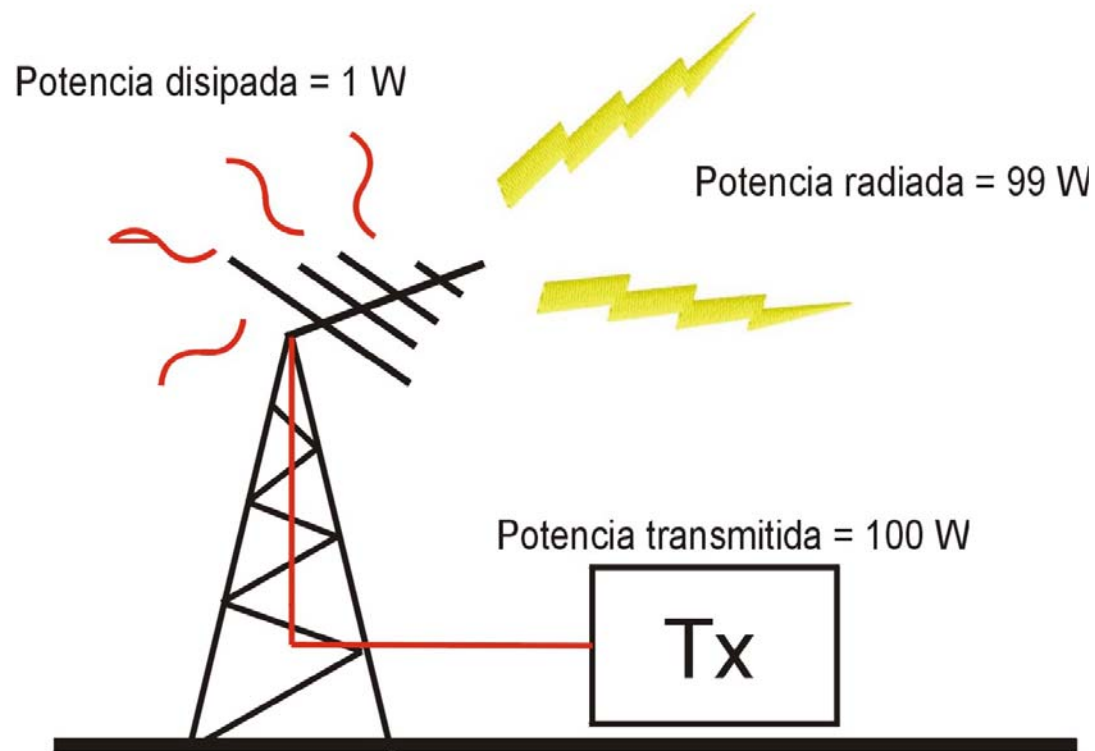


Ancho del Haz a Media Potencia



$$D \approx \frac{4\pi}{\theta_{MP} \phi_{MP}}$$

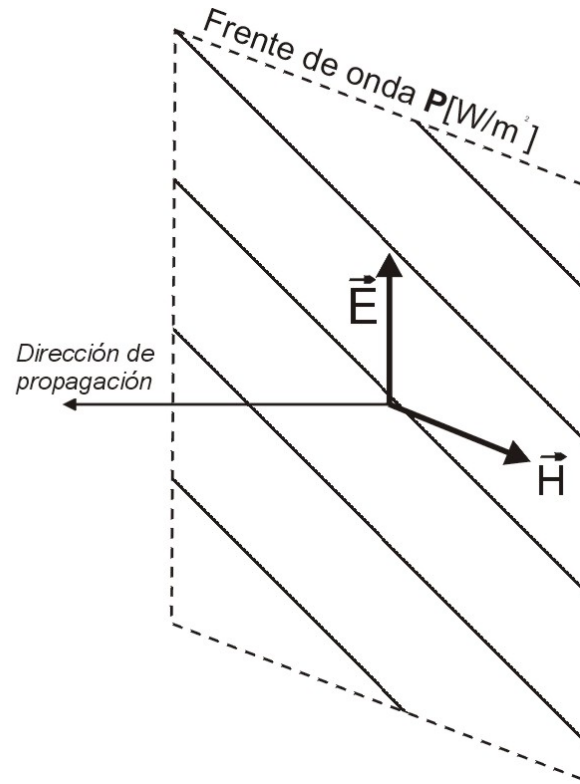
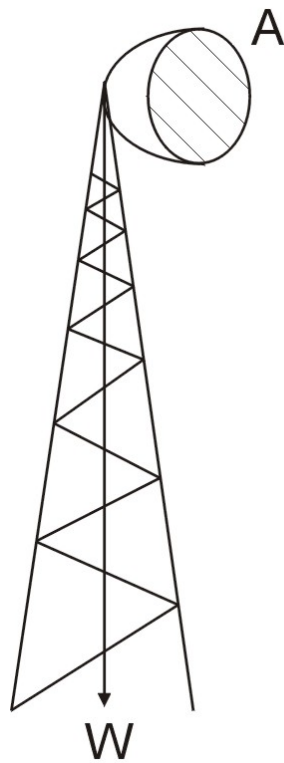
Eficiencia y Ganancia



$$e = \frac{W_r}{W_r + W_d} = \frac{W_r}{W_T}$$

$$G = eD$$

Area Efectiva



$$A_{ef} = \frac{\lambda^2}{4\pi} G$$

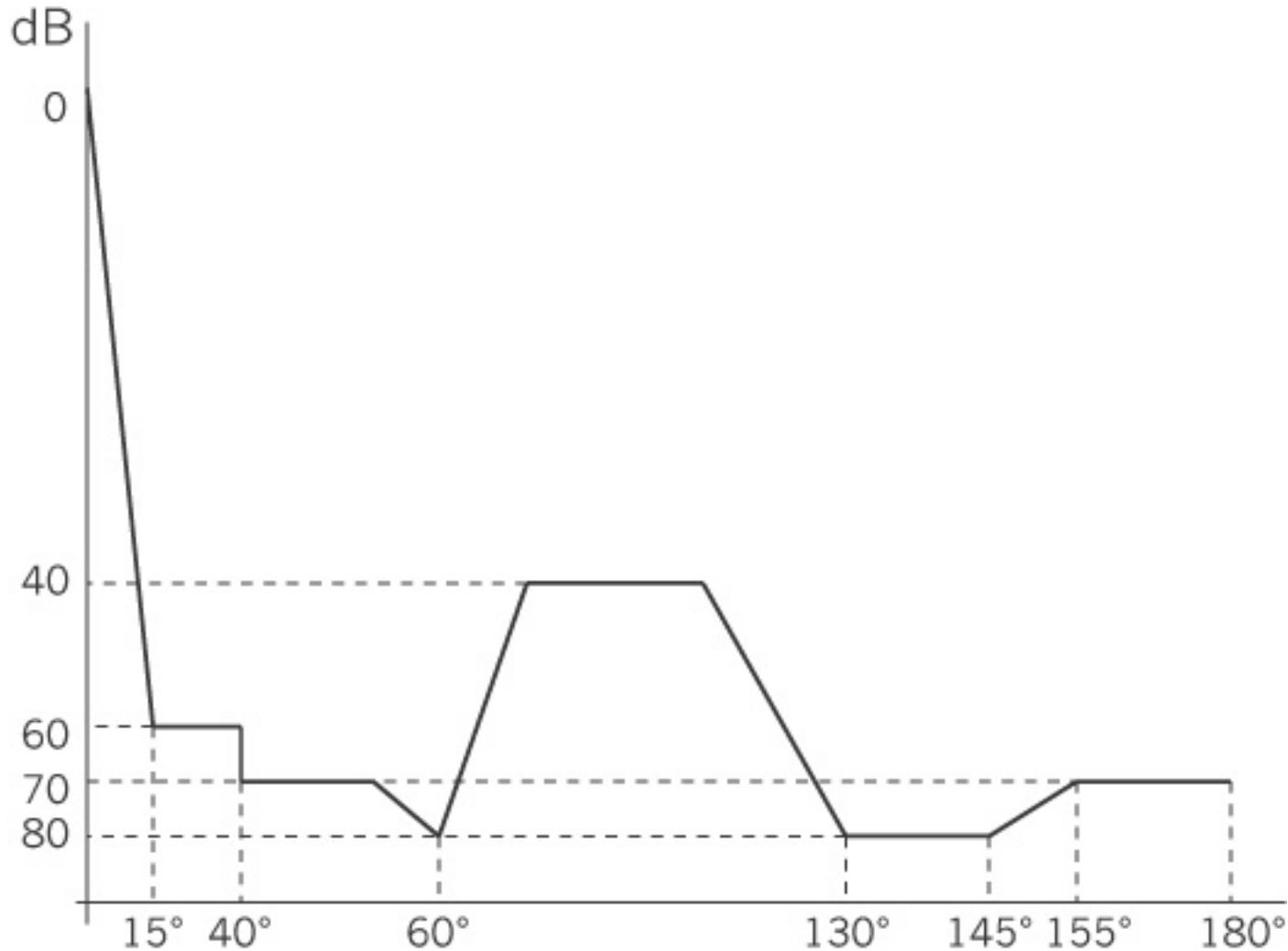


Ejemplo: Antenas Satelitales

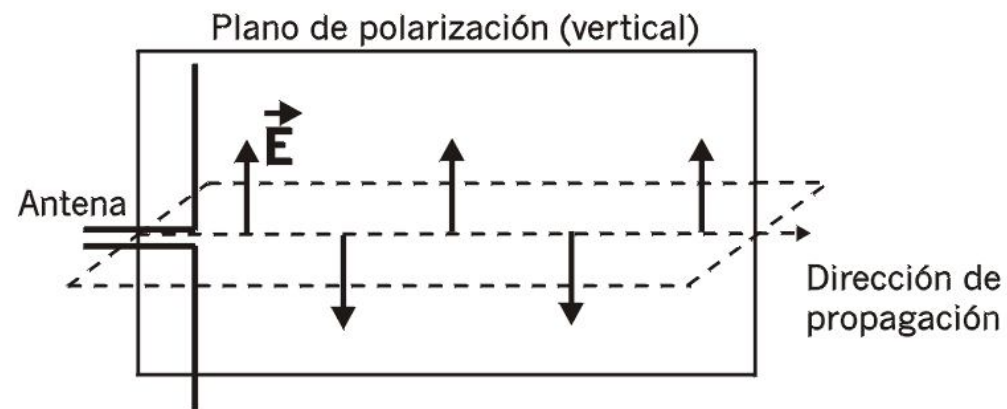
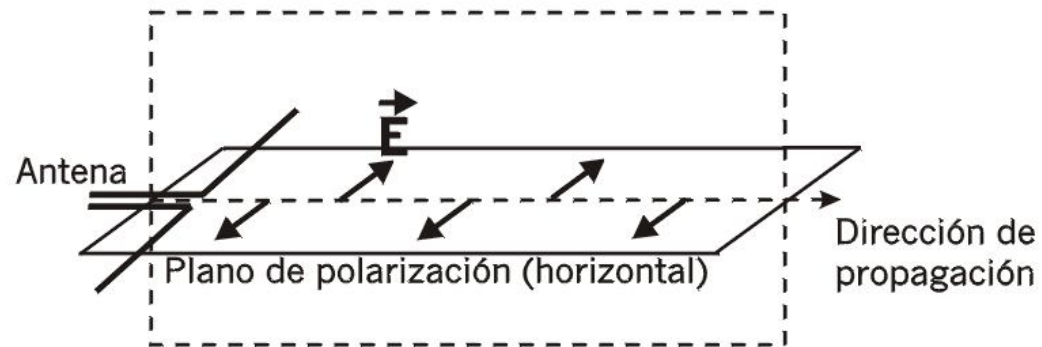




Patrón de Discriminación

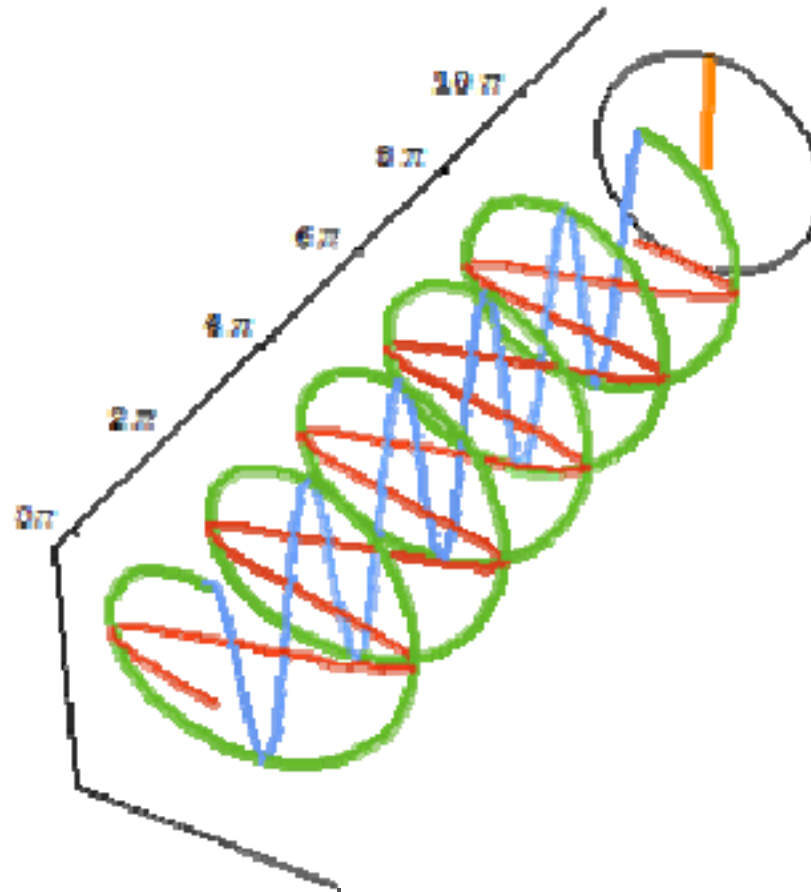


Polarización

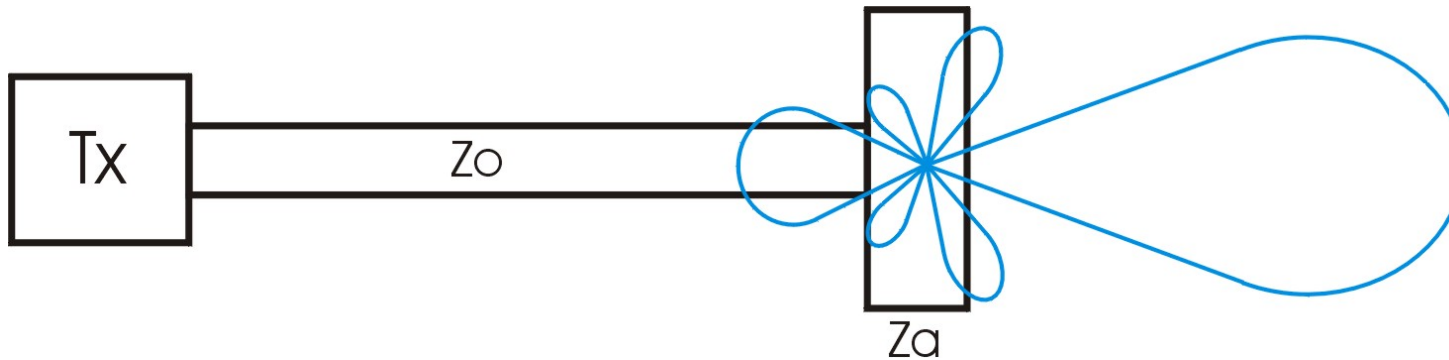




Polarización Circular



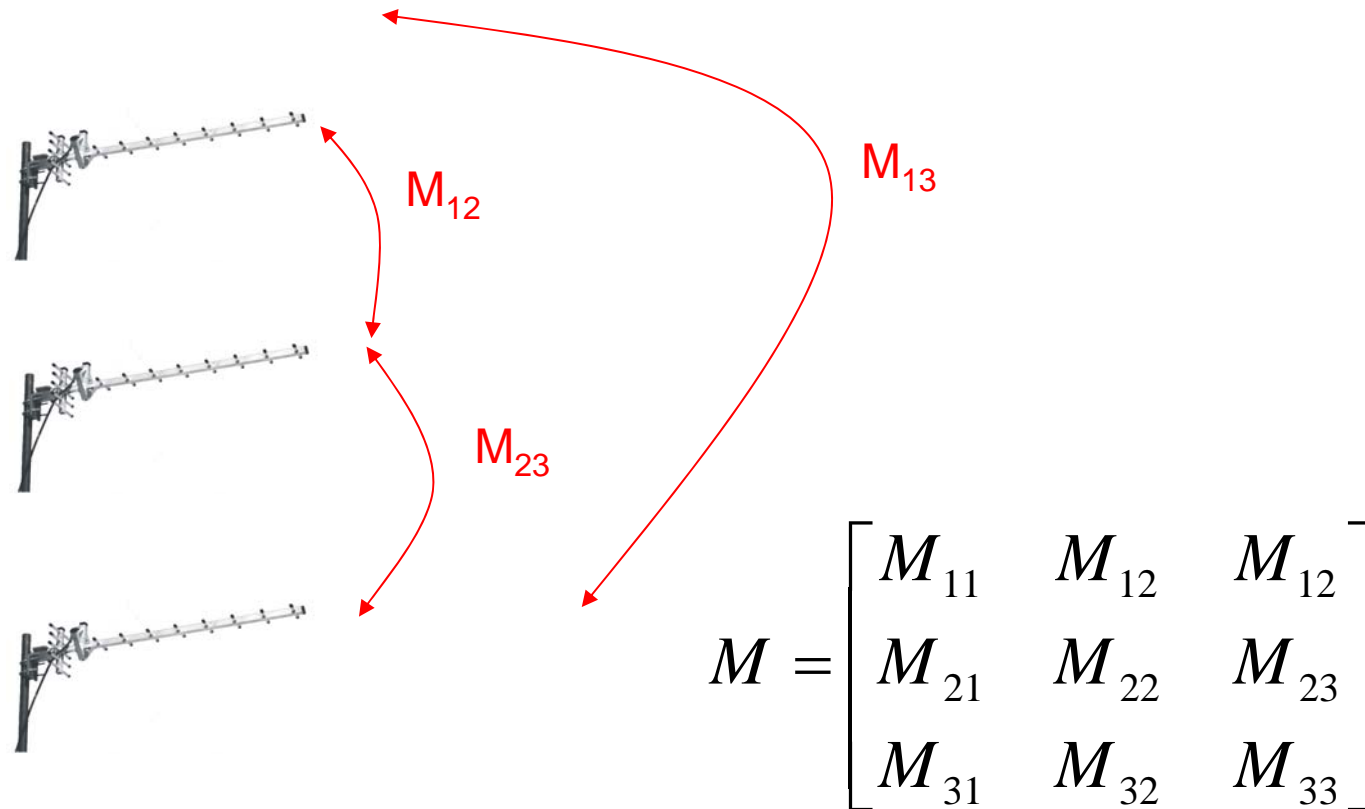
Impedancia de Antena



$$Z_A = R_r + jX_A$$

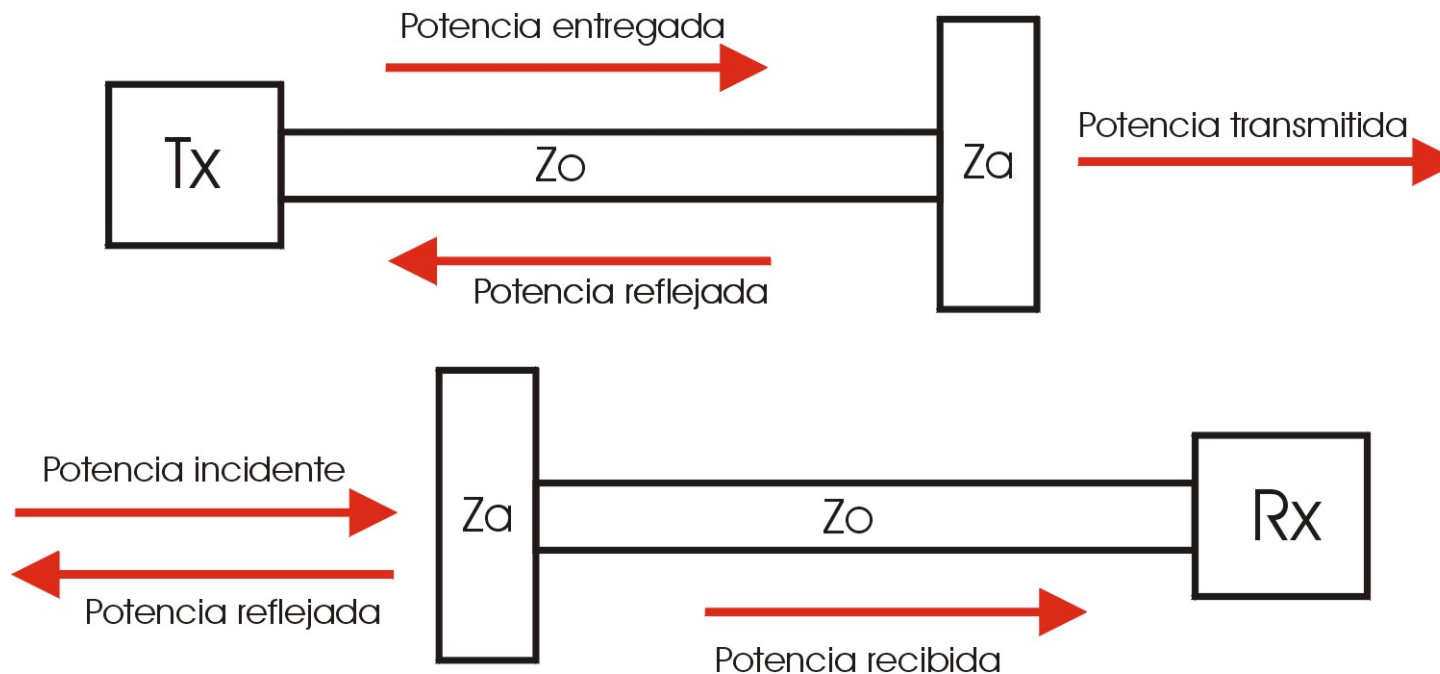
$$W_T = \frac{1}{2} I_0^2 R_r$$

Impedancia Mutua



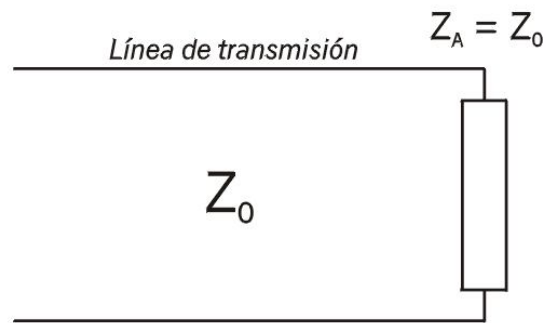
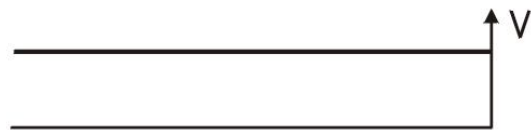


Acople a la Línea de Transmisión

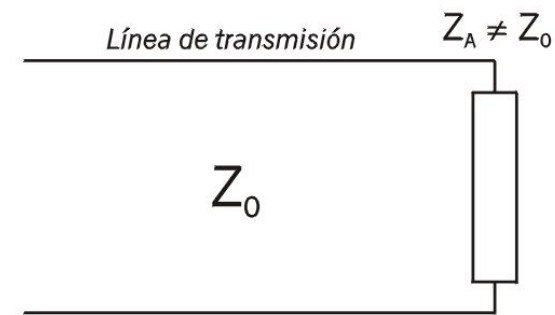
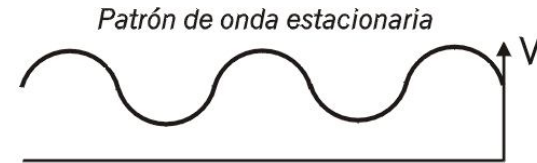


$$Z_A = Z_0$$

Relación de Onda Estacionaria (SWR)



(a)

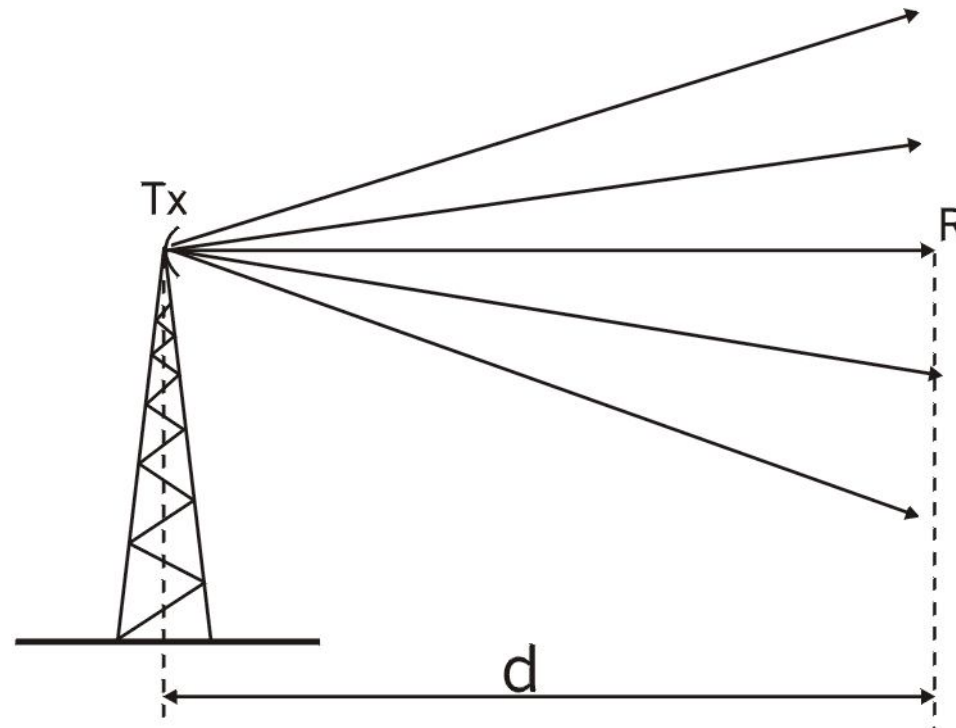


(b)

$$\Gamma = \frac{V_r}{V_f}$$

$$SWR = \frac{1 + |\Gamma|}{1 - \Gamma}$$

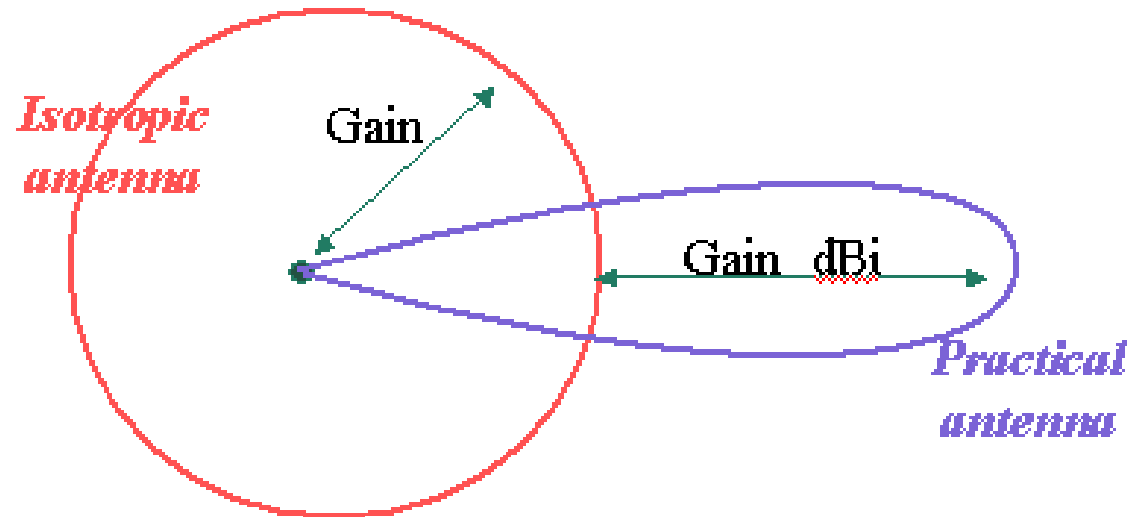
El Concepto de Trayectoria



- Cada trayectoria tiene asociada una cierta cantidad de energía

EIRP

Effective Isotropic Radiated Power



$$EIRP = W_t G_t$$