Arrays

$$\vec{E}_{dipolo} = j\eta \frac{e^{-jkr}}{2\pi r} I \frac{\cos\left(\frac{\pi}{2}\cos(\theta)\right)}{\sin\theta} \hat{\theta}, \quad \eta = 120\pi$$

$$Z_{dip}^{\lambda/2} = 73 + j42 \ \Omega$$

$$|FA(\psi)| = \left| \frac{\sin\left(N\frac{\psi}{2}\right)}{\sin\left(\frac{\psi}{2}\right)} \right|$$

$$D_{max} = \frac{S_{max}}{P_{rad}} 4\pi r^2 = \frac{|E_{max}|^2}{P_{rad}} \frac{4\pi r^2}{\eta} = \frac{120}{R_{in-dip}^{tot}} N_{dip}^2$$

$$D_{boradside} \simeq 2N\frac{d}{\lambda}$$

$$D_{endfire} \simeq 4N\frac{d}{\lambda}$$

Margen visible: $[-kd + \alpha, \ kd + \alpha]$

$$\begin{cases} k_x = k\sin(\theta)\cos(\varphi) \\ k_y = k\sin(\theta)\sin(\varphi) \\ k_z = k\cos(\theta) \end{cases}$$

Distancia entre nulos: $\frac{2\pi}{N}, \frac{4\pi}{N}, \dots, 2\pi$

$$NLPS = 20\log_{10}\left(\frac{N}{|FA\left(\frac{3\pi}{2N}\right)|}\right) = 20\log_{10}\left(N\sin\left(\frac{3\pi}{2N}\right)\right) dB$$

$$RDA = 20\log_{10}\left(\frac{|FA(0)|}{|FA(-2kd))|}\right) dB$$

Acoplamientos mutuos: $\begin{cases} V_i = Z_{i1}I_1 + Z_{i2}I_2 + \cdots + Z_{ij}I_j \\ Z_i = \frac{V_i}{I_i} = Z_{i1}\frac{I_1}{I_i} + Z_{i2}\frac{I_2}{I_i} + \cdots + Z_{ij}\frac{I_j}{I_i} \end{cases}$

Bocinas

$$\vec{E}_{apertura} = E_0 \cos\left(\frac{\pi}{a_g}x\right)\hat{y}$$

$$s = \frac{b^2}{8\lambda L_E}, \quad s_{opt} = \frac{1}{4}$$

$$t = \frac{a^2}{8\lambda L_H}, \quad t_{opt} = \frac{3}{8}$$

Error de fase: $\begin{cases} 2\pi s \\ 2\pi t \end{cases}$

$$b_{opt} = \sqrt{2\lambda L_E}$$

$$a_{opt} = \sqrt{3\lambda L_H}$$

$$D_{pir} = \frac{4\pi}{\lambda^2} A_{eff} = \frac{4\pi}{\lambda^2} A_{geom} \eta_{il} = \frac{4\pi}{\lambda^2} a \, b \, \eta_{il_x} \eta_{il_y}$$

$$\eta_{il, \, pir}^{opt} \simeq 0.5188$$

$$\eta_{il, \, H}^{opt} = \eta_{il, \, E}^{opt} \simeq 0.6485$$
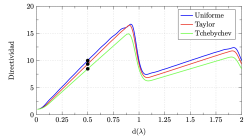
Reflectores

$$R = f + (f - R\cos(\alpha)) \Rightarrow R = \frac{2f}{1+\cos(\alpha)} = \frac{f}{\cos^2\left(\frac{\alpha}{2}\right)}$$

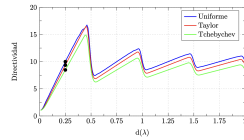$$\rho = R\sin(\alpha) = 2f\tan\left(\frac{\alpha}{2}\right)$$

$$\tau_c = 40\log_{10}\left(\cos\left(\frac{\beta}{2}\right)\right) dB$$

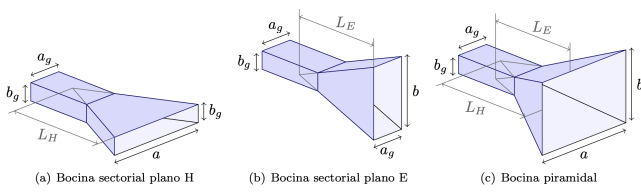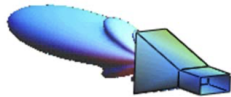$$\frac{f}{D} = \frac{1}{4\tan\left(\frac{\beta}{2}\right)}$$
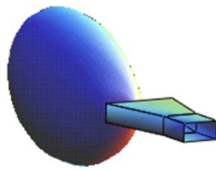
Broadside N = 10

Endfire N = 10
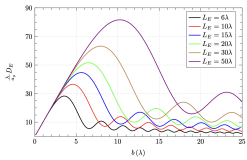

Bocinas

(a) Bocina sectorial plano H

(b) Bocina sectorial plano E
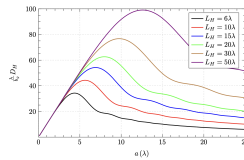
(c) Bocina piramidal

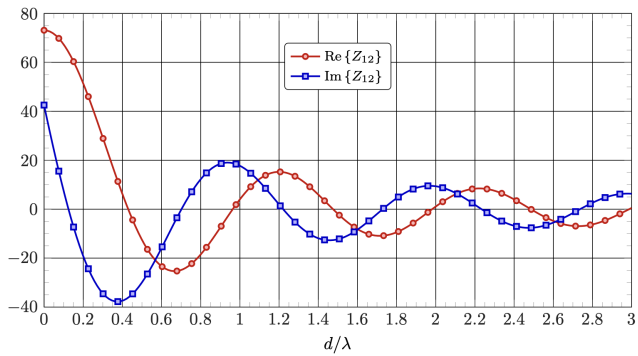## Bocina Plano E

Bocina Plano H
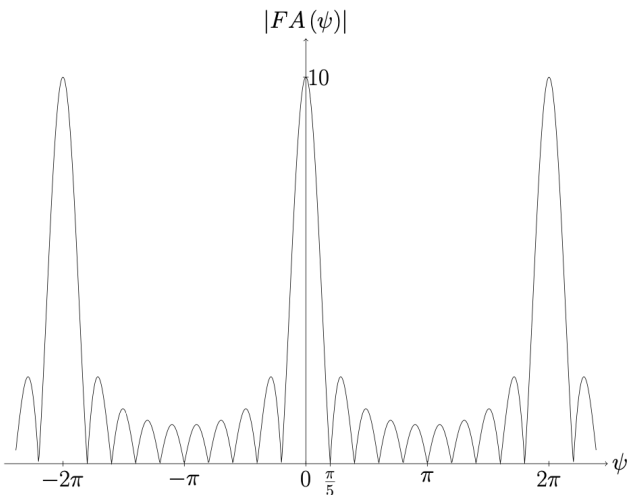

Directividad Bocina Plano E

Directividad Bocina Plano H
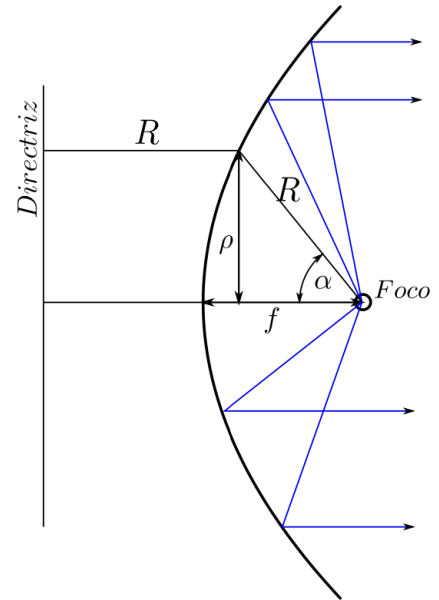

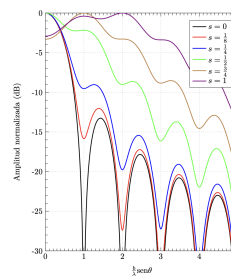### z_{12} de dipolos paralelos de $H = \lambda/4$

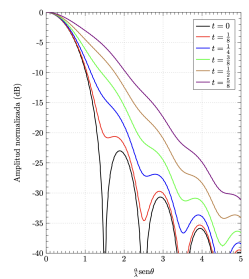## Factor de array para N = 10

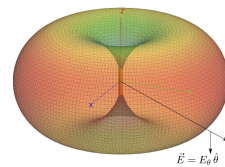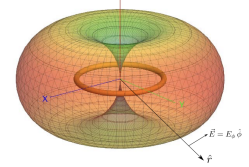## Reflector Parabolico

Reflector plano E

Reflector plano H

Dipolo $\frac{\lambda}{2}$

Espira elemental $(a \ll \lambda)$

Coordenadas esféricas

$$x = r\sin(\theta)\cos(\varphi)$$
$$y = r\sin(\theta)\sin(\varphi)$$
$$z = r\cos(\theta)$$