Arrays

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

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

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

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

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

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

$D \simeq \frac{4\pi}{\Delta\theta_{-3db}^{E}\Delta\theta_{-3db}^{H}}$

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

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

Nulos del FA: $\pm\frac{2\pi}{N}, \pm\frac{4\pi}{N}, \pm\frac{6\pi}{N}, \ldots, \pm 2\pi\frac{N-1}{N}$

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

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

Acoplamientos mutuos: $\begin{cases} V_i = Z_{i1}I_1 + Z_{i2}I_2 + \cdots + Z_{ij}I_j \\ Z_i = \frac{V_i}{I_i} = Z_{i1}\frac{I_1}{I_i} + Z_{i2}\frac{I_2}{I_i} + \cdots + Z_{ij}\frac{I_j}{I_i} \\ I_1 = 1, I_2 = e^{j\alpha}, I_3 = e^{2\alpha}, \ldots, I_i = e^{j(i-1)\alpha} \end{cases}$

Bocinas

Distribución de corriente $\rightarrow E_0\cos\left(\frac{\pi}{a_g}x\right)\hat{y}$

$\vec{E}_x^{ap}(\theta,\varphi) = \frac{e^{-jkr}}{4\pi r}E_oF(K_x)G(K_y)\,(\cos(\theta{+}1))\,(\cos(\varphi)\hat{\theta}{-}\sin(\varphi)\hat{\theta})$

$\vec{E}_y^{ap}(\theta,\varphi) = \frac{e^{-jkr}}{4\pi r}E_oF(K_x)G(K_y)\,(\cos(\theta{+}1))\,(\sin(\varphi)\hat{\theta}{+}\cos(\varphi)\hat{\theta})$

Distribución	Función, $x' \in \left[-\frac{L}{2}, \frac{L}{2}\right]$	Transformada
Uniforme	$f(x') = 1$	$F(u) = L\ \text{sinc}(u)$
Triangular	$f(x') = 1 - \frac{\lvert x\rvert}{L/2}$	$F(u) = \frac{L}{2}\text{sinc}^2\left(\frac{u}{2}\right)$
Coseno	$f(x') = \cos\left(\frac{\pi}{L}x\right)$	$F(u) = \frac{2L}{\pi}\frac{\cos(\pi u)}{1-(2u)^2}$

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

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

Error de fase: $\begin{cases} \text{Plano E} \rightarrow 2\pi s \\ \text{Plano H} \rightarrow 2\pi t \end{cases}$

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

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

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

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

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

Reflectores

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

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

$\tau = \tau_d + \tau_c$

$\tau = 20\log_{10}(C)\ dB$

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

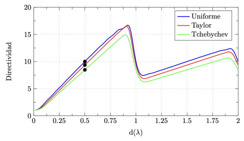
$\tau_d = 20\log_{10}(d_{boc}(\beta))\ dB$

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

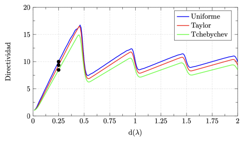
$D = \frac{4\pi}{\lambda^2}\eta_{il}$

$G = \frac{4\pi}{\lambda^2}\eta_{il}\eta_s,\ \eta_s = \frac{P_{refl}}{P_T}$

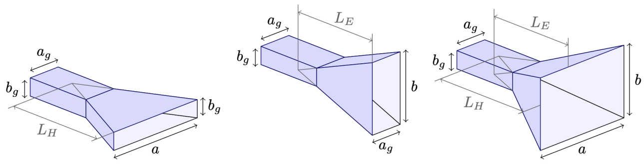
Broadside $N = 10$



Endfire $N = 10$

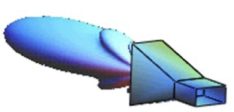


Bocinas

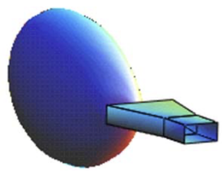


(a) Bocina sectorial plano H (b) Bocina sectorial plano E (c) Bocina piramidal

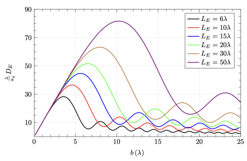
Bocina Plano E



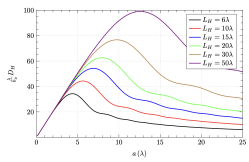
Bocina Plano H



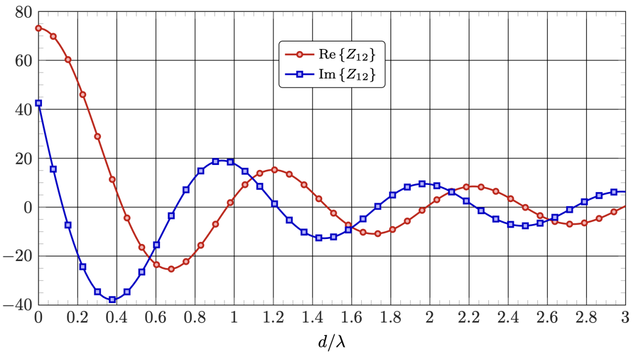
Directividad Bocina Plano E



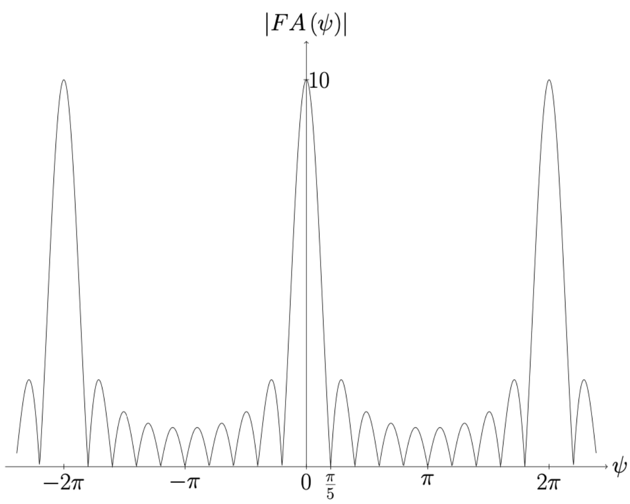
Directividad Bocina Plano H



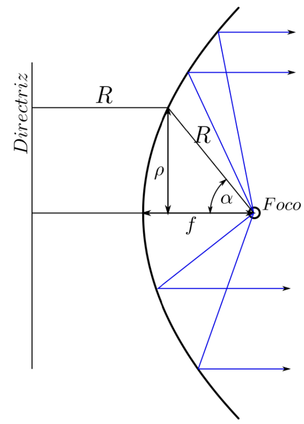
$\mathbf{z_{12}}$ de dipolos paralelos de $\mathbf{H = \lambda/4}$



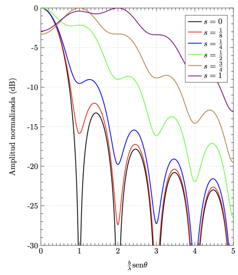
Factor de array para $N = 10$



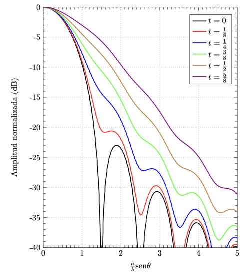
Reflector Parabolico



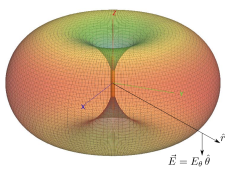
Reflector plano E



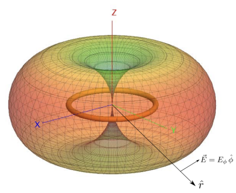
Reflector plano H



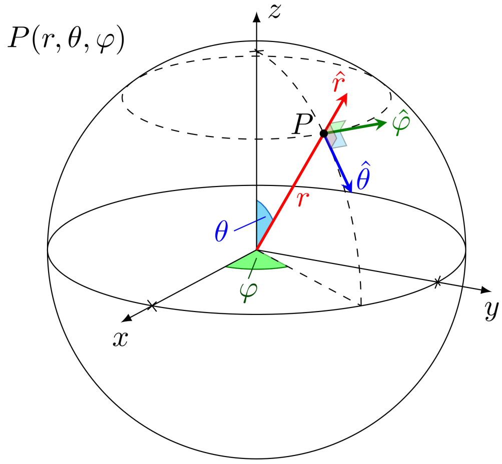
Dipolo $\frac{\lambda}{2}$



Espira elemental ($a \ll \lambda$)



Coordenadas esféricas



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

Teoría de las imágenes