

Arrays

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

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

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

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

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

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

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

$$\text{Margen visible: } [-kd+\alpha,\; kd+\alpha]$$

$$\left\{\begin{array}{l} k_x=k\sin(\theta)\cos(\varphi)\\ k_y=k\sin(\theta)\sin(\varphi)\\ k_z=k\cos(\theta) \end{array}\right.$$

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

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

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

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

Bocinas

$$\text{Distribuci3n de corriente} \rightarrow E_0 \cos\left(\frac{\pi}{a_g}x\right)\hat{y}$$

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

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

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

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

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

$$\text{Error de fase: } \left\{\begin{array}{l} \text{Plano E} \rightarrow 2\pi s \\ \text{Plano H} \rightarrow 2\pi t \end{array}\right.$$

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

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

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

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

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

Reflectores

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

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

$$\tau = \tau_d + \tau_c$$

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

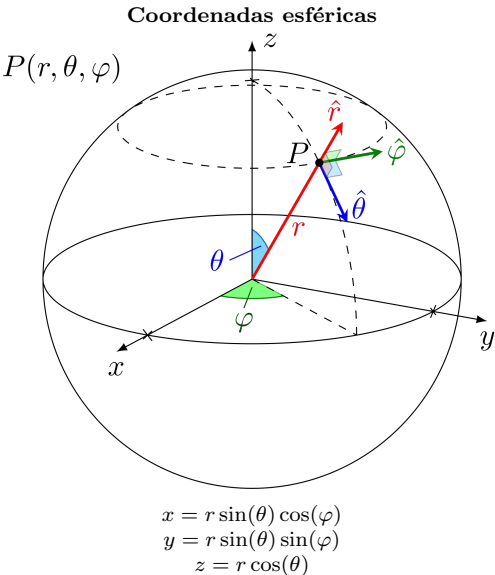
$$\tau_c = 40 \log_{10} \left(\cos \left(\frac{\beta}{2} \right) \right) dB$$

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

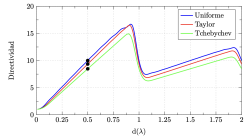
$$\frac{f}{D} = \frac{1}{4 \tan\left(\frac{\beta}{2}\right)}$$

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

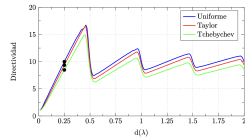
$$G=\frac{4\pi}{\lambda^2}\eta_{il}\eta_s,\;\eta_s=\frac{P_{refl}}{P_T}$$



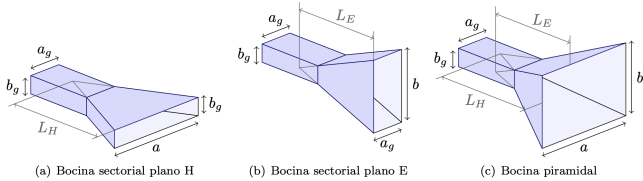
Broadside N = 10



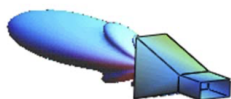
Endfire N = 10



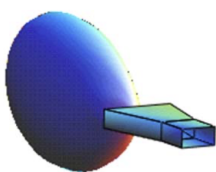
Bocinas



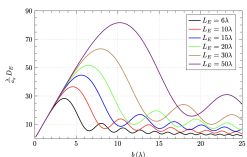
Bocina Plano E



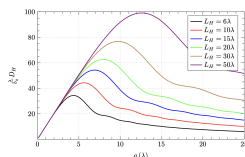
Bocina Plano H



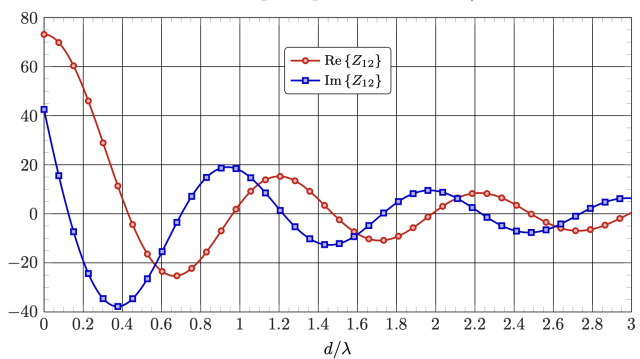
Directividad Bocina Plano E



Directividad Bocina Plano H

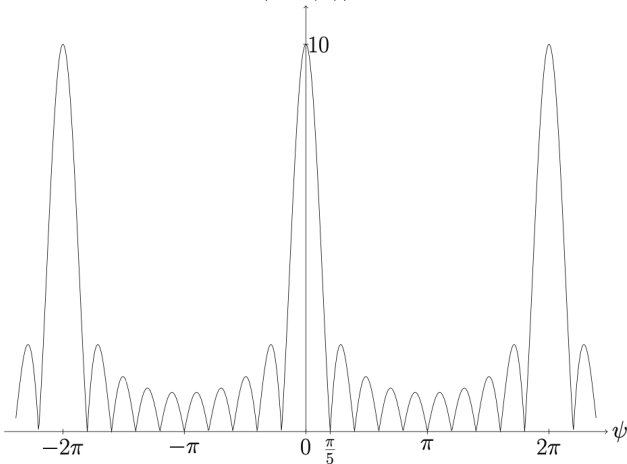


z₁₂ de dipolos paralelos de H = λ/4

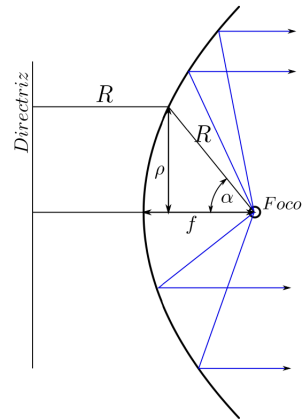


Factor de array para N = 10

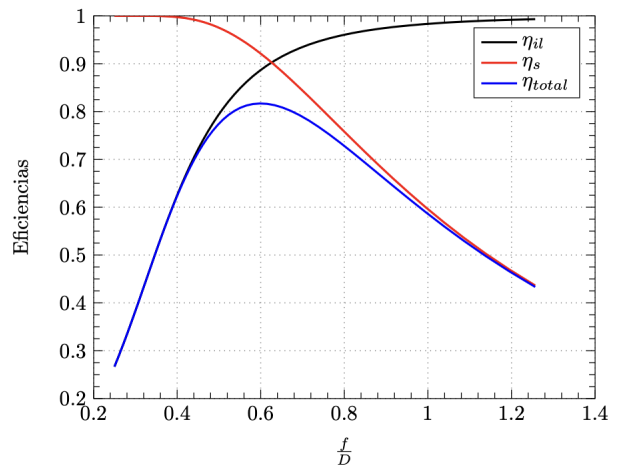
$$|FA(\psi)|$$



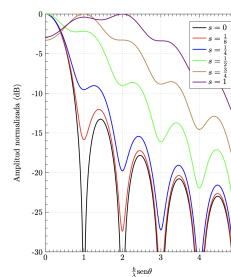
Reflector Parabolico



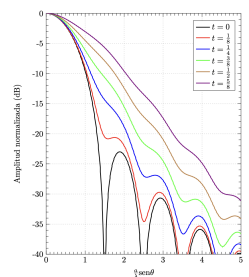
Eficiencias reflector



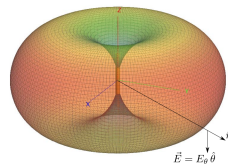
Reflector plano E



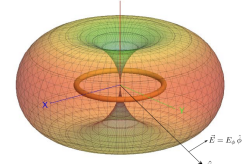
Reflector plano H



Dipolo λ/2



Espira elemental (a ≪ λ)



Teoría de las imágenes

