



Escuela Politécnica Superior

Asignatura

Prop y Trans

PRUEBA 1

Nombre y Apellidos

Fecha

Curso

Grupo

$$\begin{aligned} \textcircled{1} \quad \Omega_A &= \int_0^{2\pi} \int_0^{\pi/2} \cos^2 \theta \sin \theta \, d\theta \, d\phi \\ &= \int_0^{2\pi} \left[-\frac{\cos^3 \theta}{3} \right]_0^{\pi/2} d\phi = \frac{1}{3} \cdot 2\pi = \frac{2\pi}{3} \text{ (sr)} \end{aligned}$$

$$D = \frac{4\pi}{\Omega_A} = 4\pi \left(\frac{3}{2\pi} \right) = 6$$

$$s = 3 = \frac{1 + |\rho|}{1 - |\rho|} \quad 3 - 3|\rho| = 1 + |\rho|$$

$$2 = 4|\rho| \quad |\rho| = \frac{2}{4} = \frac{1}{2}$$

$$e_r = 1 - \left(\frac{1}{2} \right)^2 = \frac{3}{4}$$

$$G = e_r \cdot e_{cd} D = \frac{3}{4} \cdot 0,87 \cdot 6 \approx 3,915$$

$$10 \log_{10} G = 5,927 \text{ dB}$$

$$\textcircled{2} \quad 10^{\frac{5}{10}} = D \quad D \approx 3,16$$

$$\frac{P_{rad}}{4\pi R^2} \cdot D = \frac{1}{2} \frac{|E|^2}{\eta}$$

Cartagena99

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hipertermia 9,15 MHz, 2,95 GHz.

Aceleradores de partículas, tubo de onda progresiva.
 Radio astronomía
 Espectroscopía.

Calentamiento de plasma, dispositivos que emiten 3,7 GHz
 110 GHz.

GPS 1575 MHz ~~1575 MHz~~ Galileo 1164 - 1215 MHz

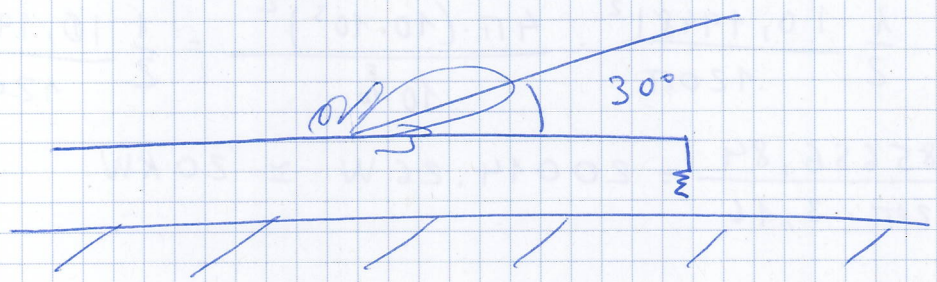
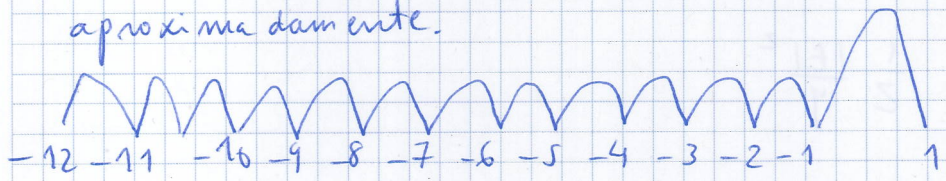
Trazabilidad radio, control ganado, etc.

(4) $\cos 30^\circ = \frac{\sqrt{3}}{2}$ $u = k \frac{L}{2} \left(\cos \theta - \frac{\sqrt{3}}{2} \right)$

$\theta \in [0, \pi]$ $u = \frac{2\pi}{\lambda} \cdot \frac{L}{2} \left(\cos \theta - \frac{\sqrt{3}}{2} \right)$

$\left[-1,86 \pi \frac{L}{\lambda}, \pi \frac{L}{\lambda} 0,13 \right]$

$L = 6,5 \lambda$ $[-12\pi, -11\pi, -10\pi, \dots, 0,85\pi]$
 aproximadamente.



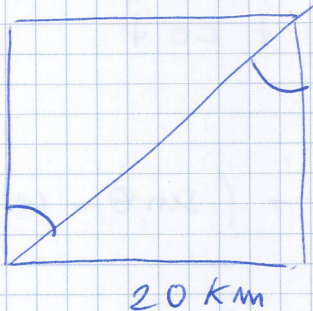


$$(5) \quad f = 6,856 \text{ Hz} \quad \lambda_0 = \frac{c}{f} = \frac{3 \cdot 10^8}{6,85 \cdot 10^9} = 0,04379 \text{ m.}$$

$$P_t = 120 \text{ W} \quad 10 \log_{10} 120 = 20,79 \text{ dB}$$

$$10 \log_{10} 0,92 = -0,362$$

$$D = 24 \text{ dB} \quad 10 \frac{24}{10} = 251,1886$$



$$\arctg \frac{20}{37,5} \approx 28,07^\circ \Rightarrow 0,49 \text{ rad}$$

$$\sin^2(28^\circ) = 0,22$$

$$R = 42500 \text{ m} = 42,5 \text{ km.}$$

$$\left(\frac{\lambda_0}{4\pi R}\right) = 8,20 \cdot 10^{-8} \quad \left(\frac{\lambda_0}{4\pi R}\right)^2 = 6,72 \cdot 10^{-15} \Rightarrow -141,72 \text{ dB}$$

$$\frac{3}{2} \sin^2 28^\circ = \frac{33}{100} \Rightarrow -4,814 \text{ dB} \quad \left| \hat{\theta} \cdot \frac{9\hat{\theta} + 2\hat{\phi}}{\sqrt{85}} \right|^2 = \left| \frac{9}{\sqrt{85}} \right|^2$$

$$= \frac{81}{85} \Rightarrow -0,2093 \text{ dB}$$

En dB

$$P_2 = 20,79 - 0,362 + 24 - 141,72 - 4,814 - 0,2093$$

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$$\vec{I} = I_0 \hat{z} \quad \vec{A} = \frac{\mu_0}{4\pi} \int_{-L/2}^{L/2} I_0 \hat{z} \frac{e^{-jkz}}{r} dz$$

$$\hat{z} = -\hat{\theta} \sin \theta$$

$$\vec{E} = -j\omega \vec{A} = -j\omega \frac{\mu_0 L I_0}{4\pi} \frac{e^{-jkz}}{r} [(-\sin \theta + \cos \theta \sin \phi) \hat{\theta} + \cos \theta \sin \phi \hat{\phi}]$$

V/m.

$$\vec{H}_{rad} = \frac{\hat{z} \times \vec{E}}{\eta_0} = \begin{vmatrix} \hat{z} & \hat{\theta} & \hat{\phi} \\ 1 & 0 & 0 \\ 0 & E_\theta & E_\phi \end{vmatrix} = -E_\phi \hat{\theta} + E_\theta \hat{\phi}$$

$$\vec{H}_{rad} = \frac{1}{\eta_0} \frac{\omega \mu_0 L I_0}{4\pi} \frac{e^{-jkz}}{r} [\cos \phi \hat{\theta} + (\sin \theta - \cos \theta \sin \phi) \hat{\phi}]$$

A/m.

Pol

o/e \hat{y} $\theta = 90^\circ$ $\vec{E} = \hat{\theta}$ lineal,
 $\phi = 90^\circ$

o/e \hat{x} $\theta = 90^\circ$ $\vec{E} = \hat{\theta} + \hat{\phi}$ lineal a 45°
 $\phi = 0^\circ$

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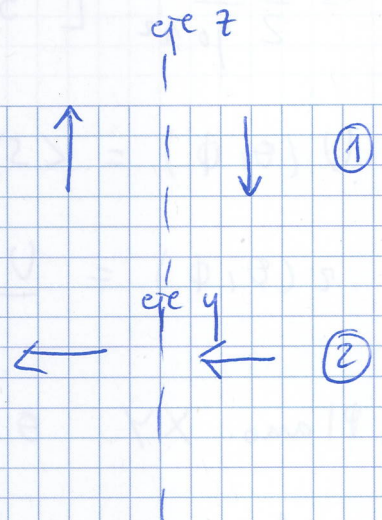
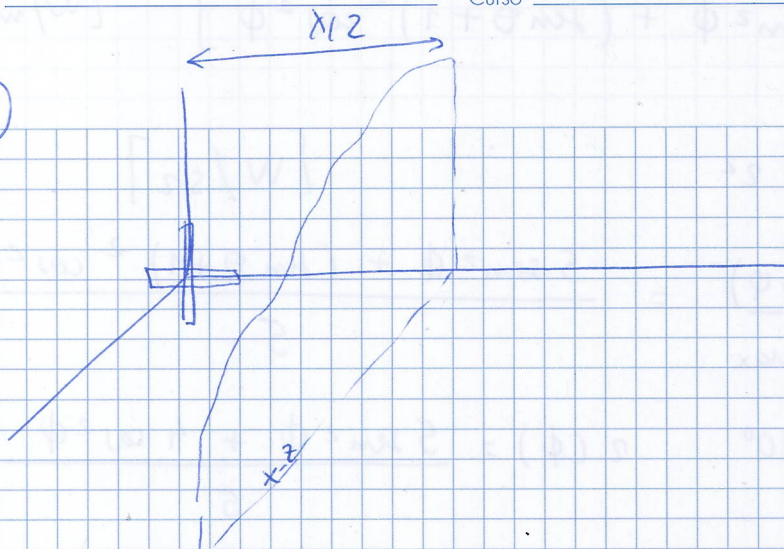
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(7)



$$\begin{aligned} \vec{r}_1 &= -\frac{\lambda}{2} \hat{y} & FA_1 &= e^{jk\vec{r}_1 \cdot \hat{z}} - e^{jk\vec{r}_2 \cdot \hat{z}} \\ \vec{r}_2 &= \frac{\lambda}{2} \hat{y} & &= e^{-j\frac{2\pi}{\lambda} \cdot \frac{\lambda}{2} \hat{y} \cdot \hat{z}} - e^{j\frac{2\pi}{\lambda} \cdot \frac{\lambda}{2} \hat{y} \cdot \hat{z}} \\ & & &= e^{-j\pi \sin\theta \sin\phi} - e^{j\pi \sin\theta \sin\phi} \end{aligned}$$

$$= 2j \sin(\pi \sin\theta \sin\phi) \quad (E_{\theta} \text{ e } z)$$

$$FA_2 = e^{jk\vec{r}_1 \cdot \hat{z}} + e^{jk\vec{r}_2 \cdot \hat{z}}$$

$$= 2 \cos(\pi \sin\theta \sin\phi) \quad (E_{\phi} \text{ e } y)$$

$$\vec{E}_{\text{total}} = -\frac{j\omega\mu L I_0}{4\pi} \frac{e^{-jkz}}{z} \cdot [$$

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(8)

$$F(r, \theta, \phi) = (z+1) \cos \phi \hat{\theta} + e^{\frac{\pi}{4}} (z+1) \cos \phi \hat{\phi}$$

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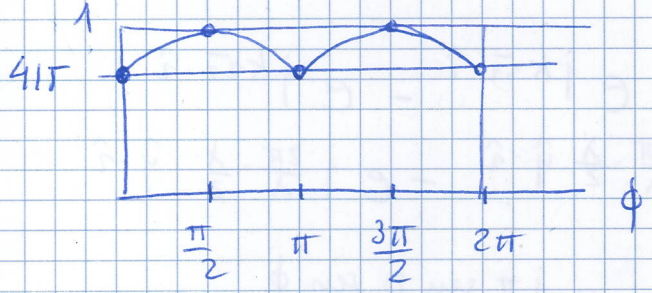
$$V(\theta, \phi) = \langle S \rangle \cdot z^2$$

$$[W/s^2]$$

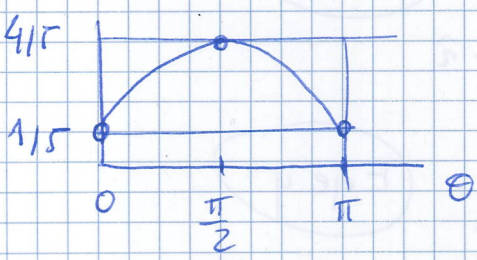
$$z(\theta, \phi) = \frac{V(\theta, \phi)}{V_{max}} = \frac{5 \sin^2 \phi + (\cos \theta + 1)^2 \cos^2 \phi}{5}$$

adimensional

Plano XY $\theta = 90^\circ$ $z(\phi) = \frac{5 \sin^2 \phi + 4 \cos^2 \phi}{5}$



Plano XZ $\Rightarrow \phi = 0$ $z(\theta) = \frac{(\sin \theta + 1)^2}{5}$



Plano YZ $\Rightarrow \phi = \frac{\pi}{2} = 90^\circ$ $z(\theta) = \frac{5}{5} = 1$

