

Name:

Control 19.12.13

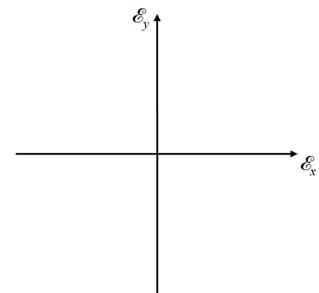
- La copia en un examen se considera una falta de respeto al trabajo del resto de compañeros y será penalizada con un suspenso en la asignatura. No se permitirá, bajo ninguna circunstancia, tener teléfonos móviles durante el examen.

Duración del control: 45 minutos

- The electric field intensity phasor of a wave propagating towards the negative z-axis has the following formula:

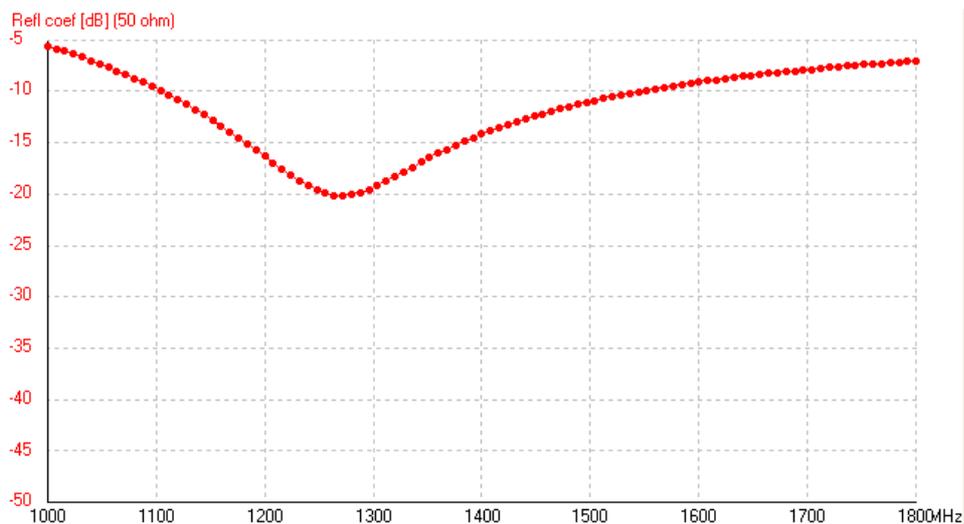
$$\vec{E}(z) = (j\hat{x} - j\hat{y})e^{+jkz}$$

- Find the equation of the instantaneous electric field vector.
- Plot the variation of the electric field vector (in the plane z=0) as a function of ωt .
- Which is the polarization of the wave? (RHCP, LHCP, RHEP, LHEP, or linear) Justify your response.



- A $\lambda/4$ monopole has been simulated when mounted on the fuselage of an aircraft. The reflection coefficient is shown in the figure below.

- Find: the matching frequency, the -10dB bandwidth, and the -10dB fractional bandwidth of the antenna.
- Estimate the length of the antenna.
- If the antenna has to be matched at 1.5 GHz, how many millimeters must we add or subtract to get the requested performance?



Name:

- A DME transponder is connected to the antenna of the figure. Which is the peak power that could return to the source as a consequence of antenna mismatch when the chosen channel is at 1025 MHz? Assuming that the antenna efficiency is 100%, which could be the radiated power? Provide your results in Watts and dBW.



DME/Transponder • CI 105

MODEL		CI 105 DME / Transponder
Electrical		
Frequency	960 to 1220 MHz 1030 to 1090 MHz	
VSWR	1.5:1 960 to 1220 MHz 1.3:1 1030 to 1090 MHz	
Polarization	Vertical	
Radiation Pattern	Equivalent of $\lambda / 4$ Stub	
Impedance RF	50 Ohms	
Resistance DC	Open Circuit	
Power RF	2.5 KW Peak	
Mechanical		
Weight	0.24 lb. Maximum	
Height	3.23 in. Maximum	
Material	Molded Radome	
Finish	Polyurethane Enamel	
Connector	BNC (female)	
Environmental		
Temperature	-54°C to +55°C	
Altitude	70,000 ft.	
Air Speed	400 Knots TAS at 25,000 ft.	

- Mark the statements as true or false. Each incorrect mark cancels a correct one.

	TRUE	FALSE
a) The realizable gain of a mismatched antenna is smaller than its gain.		
b) If a GPS satellite transmits RHCP signals, a GPS receiver should use a RHCP antenna or a linear antenna to catch the waves.		
c) Reducing the beamwidth of the E-plane antenna pattern increases the antenna directivity (let's assume that the beamwidth of the H-plane pattern does not change).		
d) The axial ratio (AR) is a measure of the directivity of an antenna.		
e) An elliptically polarized wave always has a PLF of 0.5.		
f) Increasing 3 dB the power delivered to an antenna increases 3 dB its gain.		
g) The half-power beamwidth (HPBW) of an antenna is different if we consider a field pattern or a power pattern.		
h) Antenna directivity is always greater or equal than its gain.		
i) A spectrum analyzer is used to measure the input impedance of an antenna (magnitude and phase).		
j) In general, the beamwidth of an antenna changes with frequency.		