電磁波與天線導論HW6

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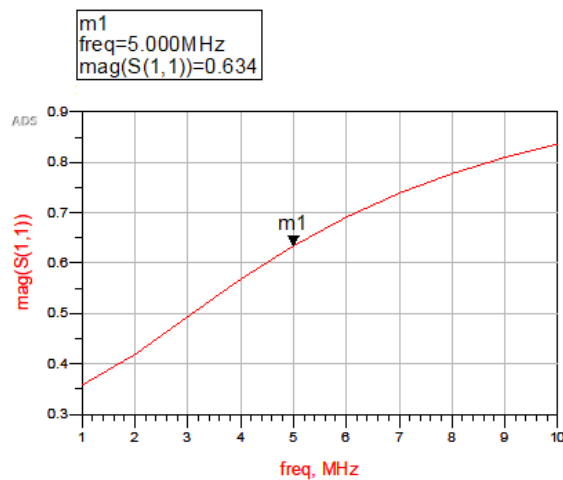
1

(a)

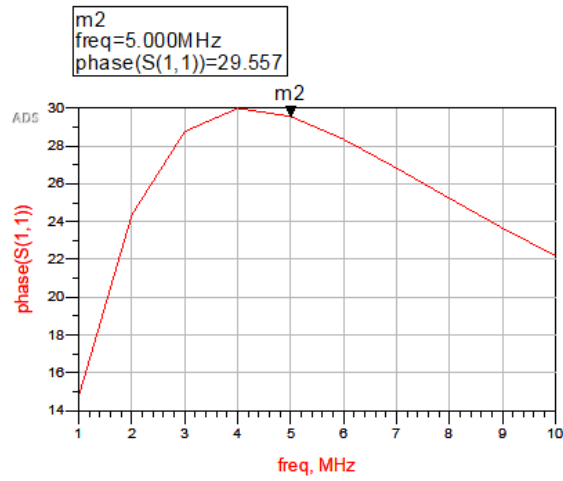$$Z_L = R + jwL = 600 + j2\pi(5*10^6)(0.02*10^{-3}) = 600 + j200\pi$$

$$\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0} = \frac{300 + j200\pi}{900 + j200\pi} = 0.634e^{j0.5159} - <ans>$$

(b)

magnitude

phase

2

(a)

$$s = \frac{0.001}{0.01} = 0.1$$

$$x = 0.56\left(\frac{\epsilon_r - 0.9}{\epsilon_r + 3}\right)^{0.05} = 0.56\left(\frac{2.5 - 0.9}{2.5 + 3}\right)^{0.05} = 0.5265$$

$$y = \left[1 + 0.02 ln\left(\frac{s^4 + 3.7 * 10^{-4} s^2}{s^4 + 0.43}\right) + 0.05 ln(1 + 1.7 * 10^{-4} s^3)\right]\big|_{s=0.1} = 0.8334$$

$$\epsilon_{eff} = \frac{\epsilon_r + 1}{2} + \left(\frac{\epsilon_r - 1}{2}\right)\left(1 + \frac{10}{s}\right)^{-xy} = 1.849 - <ans>$$
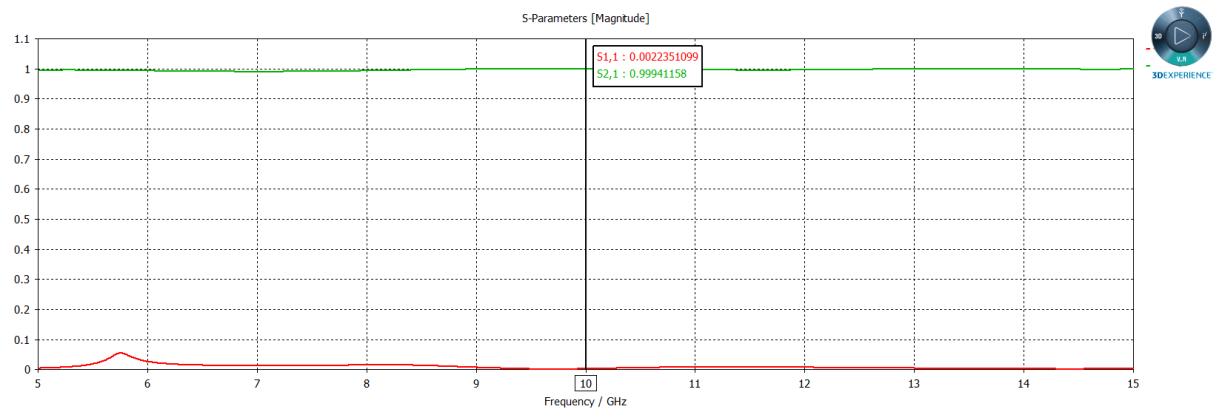
$$t = \left(\frac{30.67}{s}\right)^{0.75} = 73.2884$$

$$Z_0 = \frac{60}{\sqrt{\epsilon_{eff}}} ln\left(\frac{6 + (2\pi - 6)e^{-t}}{s} + \sqrt{1 + \frac{4}{s^2}}\right) = 193.3698(\Omega) - <ans>$$

$$\beta = \frac{\omega}{c}\sqrt{\epsilon_{eff}} = \frac{2\pi 10^{10}}{3 * 10^8}\sqrt{1.849} = 284.7915(rad/m) - <ans>$$

(b)

CST

S-Parameters [Magnitude]

S1,1 : 0.0022351099
S2,1 : 0.99941158

Frequency / GHz

3DEXPERIENCE

ADS

m1

mag(S(2,1))
mag(S(1,1))

m1
freq=10.00GHz
mag(S(1,1))=0.030
mag(S(2,1))=1.000

freq, GHz