ELEKTRONIKA VAJE (13) 10.1.2007

1.)Koaksilni kabel
Imendanca takšnega kabla

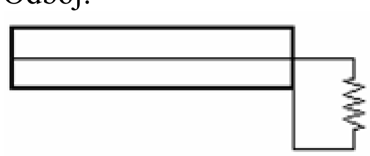
$$U = U_1 \exp(i\omega(t - \frac{x}{c})) + U_2 \exp(i\omega(t + \frac{x}{c}))$$

$$Z_0 = \sqrt{\frac{L}{C}} = 60\sqrt{\frac{\mu}{\varepsilon}} \ln(\frac{b}{a})[\Omega]$$

$$v = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{\mu\varepsilon}} c_0$$

Zaradi ln radijev so kabli omejeni na 50-200 Ohm!

Odboj:



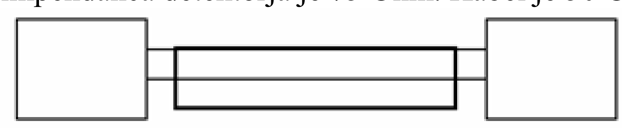
$$Z = \frac{U_0}{I_0} \quad , \quad Z = \frac{U_r}{|-I_r|}$$

$$R = \frac{U_0 + U_r}{I_0 - I_r}$$

$$\rho = \frac{U_r}{U_0} = \frac{R - Z}{R + Z}$$

$\rho = \frac{R - Z}{R + Z}$ refleksiski koeficient, določa amplitudo odbitega signala.

Da izmerimo dolžino kabla lahko merimo odboje. Kako velik mora biti vhodni signal, ce smo sposobni zaznati 0.05V velik signal. Izhodna impendanca odajnika in vhodna impendanca detektorja je 75 Ohm. Kabel je 50 Ohm.



1. korak:

$$\rho_1 = \rho_2 = 0.25$$

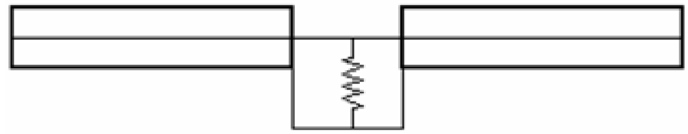
$$V_{t1} = V + \rho_2 V$$

$$V_{t2} = \rho_2\rho_1 V + \rho_1\rho_2{}^2 V$$

$$V = \frac{V_{t2}}{\rho_2\rho_1 + \rho_1\rho_2{}^2} = 0.64V$$

Kako moramo zaključiti koaksialni kabel v primeru, da Z_1 in Z_2 nista enaka. Npr, televizijski koaksialni kabel z karakteristično impendanco 75Ω bi radi zvezali na 50 Ω BNC kablel.

1.) 50 Ω (pošiljatelj) – 75 Ω (sprejemnik) ->vežemo paralelno upor

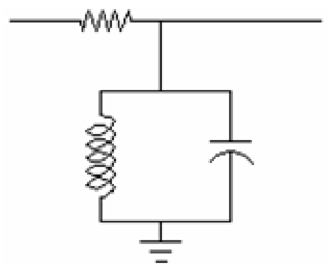


$$\frac{RZ_2}{R+Z_2}=Z_1$$

$$R=\frac{Z_1Z_2}{Z_2-Z_1}$$

2.) 75 Ω (pošiljatelj) – 50 Ω (sprejemnik) ->vežemo serijsko upor

$$Z_2+R=Z_1 \Rightarrow R=Z_1-Z_2$$



Nariši bodejev diagram za nihajni krog

$$\frac{x-z}{R}+\frac{-z}{L\hat{p}}-C\hat{p}z=0$$

$$(1+\frac{R}{L\hat{p}}+RC\hat{p})z=x$$

$$z=\frac{1}{1+\frac{R}{L\hat{p}}+RC\hat{p}}x$$

$$z=\frac{1}{1+\frac{R}{iL\omega}+iRC\omega}x$$

$$z=\frac{i\frac{L}{R}\omega}{1+i\frac{L}{R}\omega-LC\omega^2}x$$

$$20\log|z|=20\log|i\omega\tau_L|+20\log\left|\frac{1}{1+i\frac{L}{R}\omega-LC\omega^2}\right|$$

$$=20\log(\omega\tau_L)-20\log\sqrt{(1-LC\omega^2)^2+\tau_L^2\omega^2}$$

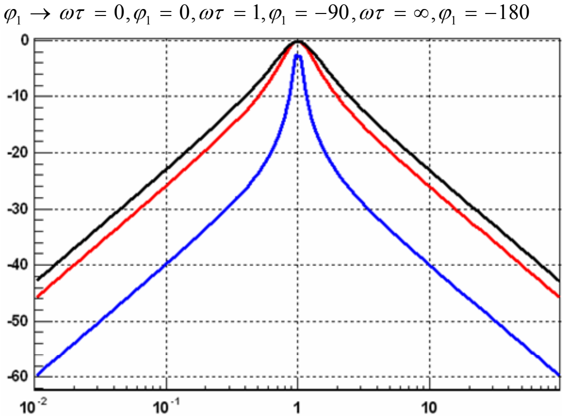
max :

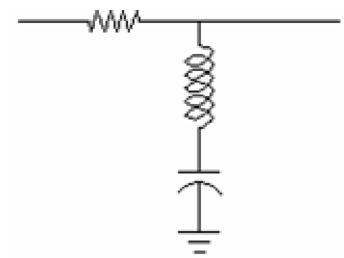
$$\left(\frac{\omega\tau_L}{\sqrt{(1-LC\omega^2)^2+\tau_L^2\omega^2}}\right)'=0$$

$$\frac{1}{\sqrt{LC}}=\omega_{\max}\Rightarrow 20\log|z|=0$$

$\varphi_1\to\omega\tau=0,\varphi_1=0,\omega\tau=1,\varphi_1=45,\omega\tau=\infty,\varphi_1=90$

$\varphi_1\to\omega\tau=0,\varphi_1=0,\omega\tau=1,\varphi_1=-90,\omega\tau=\infty,\varphi_1=-180$





Nariši bodejev diagram za nihajni krog

$$\frac{x-z}{R}+\frac{-z}{L\hat{p}+\frac{1}{C\hat{p}}}=0$$

$$L\hat{p}x+\frac{1}{C\hat{p}}x=(L\hat{p}+\frac{1}{C\hat{p}}+R)z$$

$$(CL\hat{p}^2+1)x=(CL\hat{p}^2+1+RC\hat{p})z$$

$$z=\frac{(CL\hat{p}^2+1)}{(CL\hat{p}^2+1+RC\hat{p})}x$$

$$z=\frac{(1-CL\omega^2)}{(1-CL\omega^2+iRC\omega)}x$$

$$20\log|z|=20\log|1+CL\omega|+20\log|1-CL\omega|-$$
$$-20\log\sqrt{(1-CL\omega^2)^2+R^2C^2\omega^2}$$

$\varphi_1\to\omega\tau=0,\varphi_1=0,\omega\tau=1,\varphi_1=45,\omega\tau=\infty,\varphi_1=90$

$\varphi_2\to\omega\tau=0,\varphi_2=0,\omega\tau=1,\varphi_2=-45,\omega\tau=\infty,\varphi_1=-90$

$\varphi_3\to\omega\tau=0,\varphi_1=0,\omega\tau=1,\varphi_1=-90,\omega\tau=\infty,\varphi_1=-180$