

1.)Koaksilni kabel**Nariši kabel****Napiši valovno enačbo.****Imendanca takšnega kabla**

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

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

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

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

Odboj:



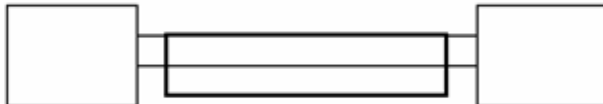
$$Z = \frac{U_0}{I_0}, \quad Z = \frac{U_r}{|-I_r|}$$

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

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

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

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



1. korak:

$$\rho_1 = \rho_2 = 0.25$$

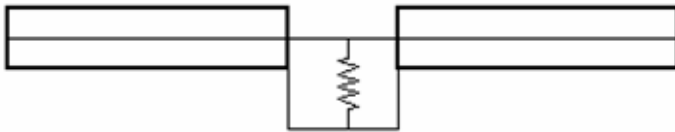
$$V_{t1} = V + \rho_2 V$$

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

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

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

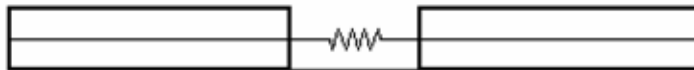
1.) 50Ω (pošiljatelj) – 75Ω (sprejemnik) ->vežemo paralelno upor



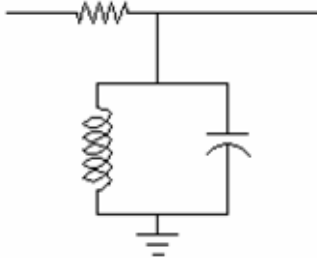
$$\frac{RZ_2}{R + Z_2} = Z_1$$

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

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



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



Nariši bodejev diagram za nihajni krog

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

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

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

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

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

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

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

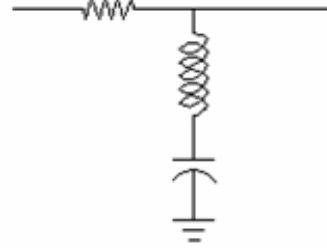
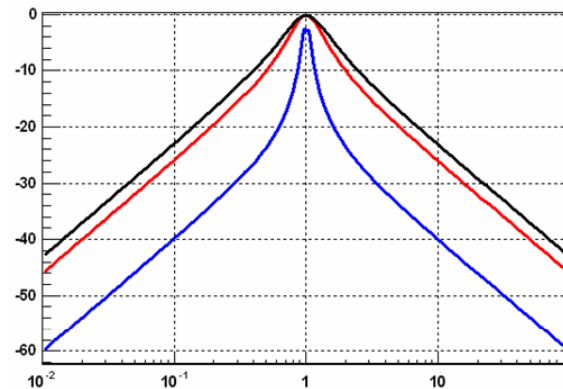
max :

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

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

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

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



Nariši bodejev diagram za nihajni krog

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

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

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

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

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

$$20 \log |z| = 20 \log |1 + CL\omega| + 20 \log |1 - CL\omega| -$$

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

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

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

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