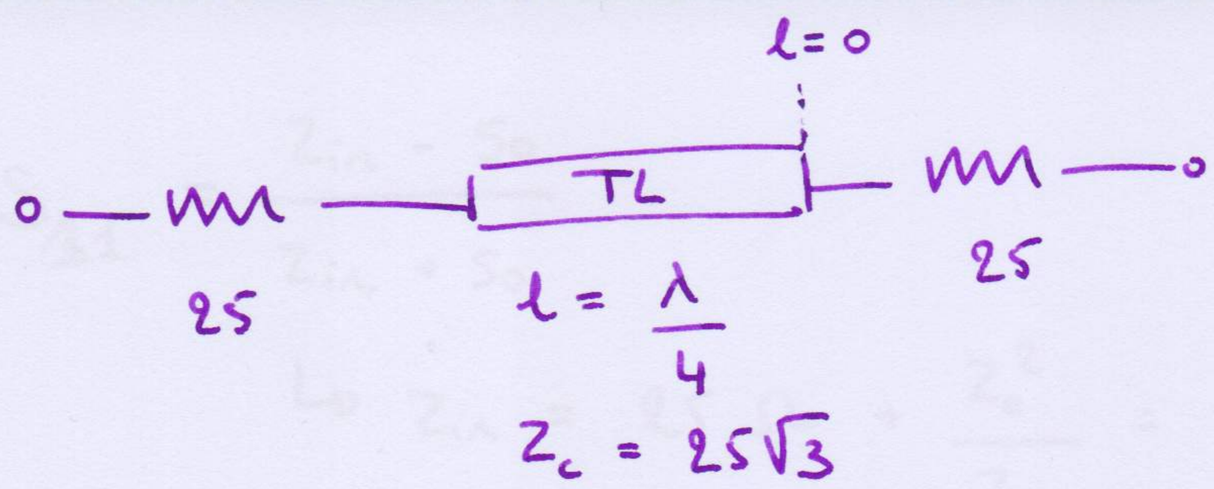
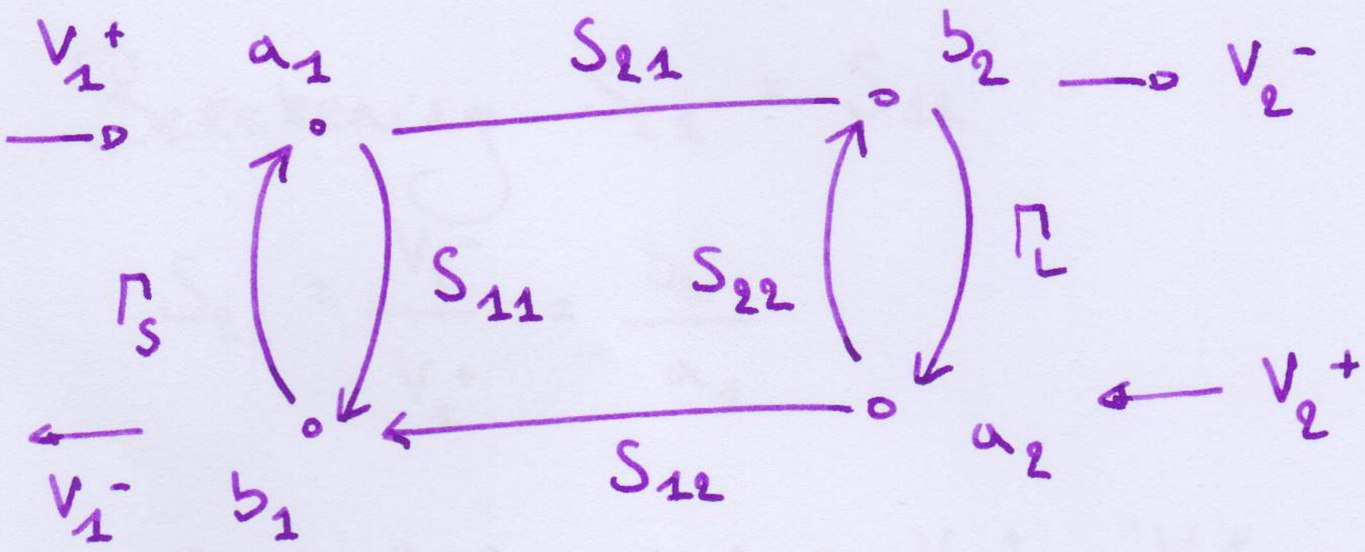


Oplossingsmethode met even - oneven methode

→ oneven mode = kortsluiting in het midden van de TL

→ even mode = "doormidden knippen", dus open in het midden van de TL



$V_{1o}^{+} = 0,5$ → oneven

$V_{2o}^{+} = -0,5$

$V_{1e}^{+} = 0,5$ → even

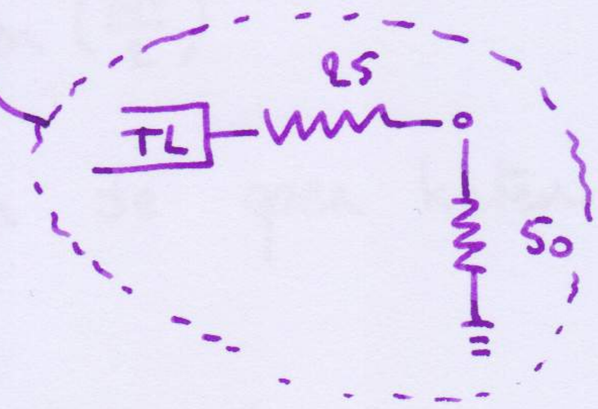
$V_{2e}^{+} = 0,5$

⇒ Circuit is reciproog dus $S_{11} = S_{22}$ en $S_{12} = S_{21}$

$$S_{11} = \frac{Z_{in} - 50}{Z_{in} + 50}$$

Lo $Z_{in} = 25\,\Omega + \frac{Z_o^2}{Z_L} = \frac{25^2 \cdot 3}{75} + 25 = 50$

(Voor een $\lambda/4$ TL wordt Z_{in} gelijk aan $\frac{Z_o^2}{Z_L}$)



$$\Rightarrow S_{21} = \frac{50 - 50}{50 + 50} = 0$$

① Dus S_{11} en $S_{22} = 0$

Berekening $S_{21} = S_{12}$

$$S_{21} = \frac{V_2^-}{V_1^+} = \frac{b_2}{a_1}$$

$$a_1 = a_{1o} + a_{1e} = V_{1o}^+ + V_{1e}^+ = 0{,}5 + 0{,}5 = 1$$

$$b_2 = b_{2e} + b_{2o}$$

$$= b_{1e} - b_{1o} = S_{11e} \cdot a_{1e} - S_{11o} \cdot a_{1o}$$

$$= S_{11e} \cdot 0{,}5 - S_{11o} \cdot 0{,}5$$

$$S_{11e} = \frac{Z_{in} - 50}{Z_{in} + 50}$$

$$L_0 \; Z_{in} = 25 + Z_0 \cdot \frac{\frac{Z_L}{Z_0} - j \tan\left(\frac{\beta l}{2}\right)}{1 - \frac{Z_L}{Z_0} \cdot j \tan\left(\frac{\beta l}{2}\right)}$$

⇒ De lengte is nu de helft door de open keten of kortsluiting (symmetrie)

$$Z_{in} = 25 + 25\sqrt{3} \cdot \frac{\frac{\infty}{25\sqrt{3}} - j \tan\left(\frac{\beta l}{2}\right)}{1 - \frac{\infty}{25\sqrt{3}} \cdot j \tan\left(\frac{\beta l}{2}\right)}$$

$$= 25 + 25\sqrt{3} \cdot \frac{\frac{\infty}{25\sqrt{3}}}{-j \tan\left(\frac{\beta l}{2}\right) \cdot \frac{\infty}{25\sqrt{3}}}$$

$$= 25 + 25\sqrt{3} \cdot \frac{1}{-j \tan\left(\frac{\beta l}{2}\right) \frac{\infty}{25\sqrt{3}} \cdot \frac{25\sqrt{3}}{\infty}}$$

$$= 25 + 25\sqrt{3} \cdot \frac{1}{-j \tan\left(\frac{2\pi}{\lambda} \cdot \frac{-\lambda}{8}\right)}$$

$$= 25 - 43{,}30j$$

$$\Rightarrow S_{11e} = \frac{25 - 43{,}30j - 50}{25 - 43{,}30j + 50} = -0{,}577j$$

$$S_{110} = \frac{Z_{in} - S_0}{Z_{in} + S_0}$$

$$L_D \; Z_{in} = 25 + Z_0 \cdot \frac{\frac{Z_L}{Z_0} - j \tan\left(\frac{\beta l}{2}\right)}{1 - \frac{Z_L}{Z_0} j \tan\left(\frac{\beta l}{2}\right)}$$

$$= 25 + 25\sqrt{3} \cdot \frac{\frac{0}{25\sqrt{3}} - j \tan\left(\frac{\beta l}{2}\right)}{1 - \frac{0}{25\sqrt{3}} j \tan\left(\frac{\beta l}{2}\right)}$$

$$= 25 + 25\sqrt{3} \cdot \left(-j \tan\left(\frac{2\pi}{\lambda} \cdot \frac{-\lambda}{8}\right)\right)$$

$$= 25 + 43{,}30\,j$$

$$\Rightarrow S_{110} = \frac{25 + 43{,}30j - S_0}{25 + 43{,}30j + S_0} = 0{,}577j$$

$$b_2 = S_{11e} \cdot 0{,}5 - S_{110} \cdot 0{,}5$$

~~$= -0{,}57$~~

$$= (-0{,}577j \cdot 0{,}5) - (0{,}577j \cdot 0{,}5)$$

$$= -0{,}577j$$

$$\Rightarrow S_{21} = S_{12} = -0{,}577j \qquad S = \frac{\begin{bmatrix} 0 & -0{,}577j \\ -0{,}577j & 0 \end{bmatrix}}{2}$$