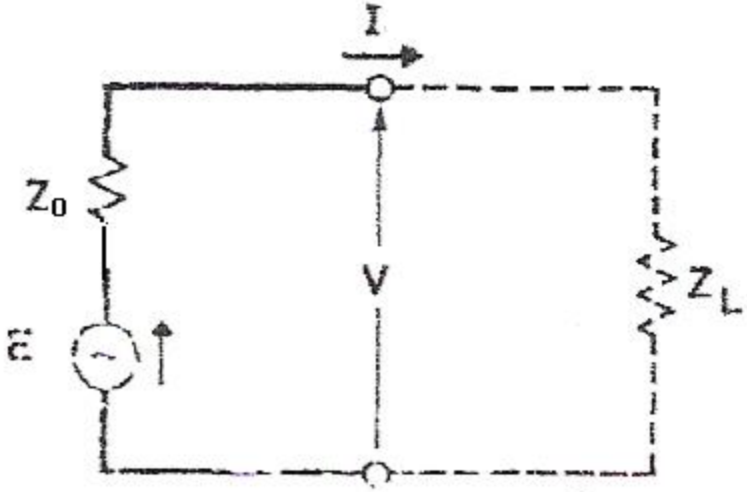
MATRICEA DE REPARTIŢIE

ADAPTAREA IN PUTERE



$$I = \frac{E}{Z_0 + Z_L} \qquad V = \frac{E Z_L}{Z_0 + Z_L}$$

$$\Re e\left(Z_L \left| I \right|^2 \right)$$

$$P_L = \Re e Z_L \left| \frac{E}{Z_L + Z_0} \right|^2 = \frac{R_L \left| E \right|^2}{\left(R_L + R_0 \right)^2 + \left(X_L + X_0 \right)^2}$$

$$P_L = \frac{\left| E \right|^2}{4R_0 + \frac{\left(R_L - R_0 \right)^2}{R_L} + \frac{\left(X_L + X_0 \right)^2}{R_L}}$$

Conditia de adaptare

$$R_L = R_0 \quad X_L = -X_0$$

$$P_a = \frac{|E|^2}{4R_0} \qquad (R_0 > 0)$$

$$P_e = \frac{|E|^2}{4R_0} \qquad (R_0 \neq 0)$$

Unde de putere

$$a = \frac{V + Z_0 I}{2\sqrt{\left|\Re e Z_0\right|}}$$

$$b = \frac{V - Z_0^* I}{2\sqrt{\left|\Re e Z_0\right|}}$$

$$V = \frac{p}{\sqrt{\Re e Z_0}}\left(Z_0^* a + Z_0 b\right)$$

$$I = \frac{p}{\sqrt{\Re e Z_0}}\left(a - b\right)$$

$$p = \begin{cases} 1, & \Re e Z_0 > 0 \\ -1, & \Re e Z_0 < 0 \end{cases}$$

Unde de putere - 2

$$|a|^2 = \frac{|E|^2}{4|R_0|} \qquad P_e = p|a|^2$$

$$|a|^2 - |b|^2 = \frac{(V + Z_0 I)(V^* + Z_0^* I^*) - (V - Z_0^* I)(V^* - Z_0 I^*)}{4|R_0|} =$$

$$= \frac{(Z_0 + Z_0^*)(VI^* + V^* I)}{4|R_0|} = p\Re e\{VI^*\}$$

$$\Re e\{VI^*\} = p\left(|a|^2 - |b|^2\right)$$

Coeficienţi de reflexie

$$\Gamma = \frac{b}{a}$$

$$\Gamma = \frac{Z_L - Z_0^*}{Z_L + Z_0}$$

$$\Gamma = \frac{R_L + j\left(X_L + X_0\right) - R_0}{R_L + j\left(X_L + X_0\right) + R_0}$$

$$\left|\Gamma\right|^2 = \left|\frac{Z_L - Z_0^*}{Z_L + Z_0}\right|^2$$

$$\Gamma' = \frac{Z_0 - Z_L^*}{Z_0 + Z_L}$$

$$\left|\Gamma'\right|^2 = \left|\frac{Z_0 - Z_L^*}{Z_0 + Z_L}\right|^2$$

$$\left|Z_0 - Z_L^*\right| = \left|Z_0^* - Z_L\right| = \left|Z_L - Z_0^*\right|$$

Matricea de repartiţie

$$a = F\left(v + Gi\right) \qquad b = F\left(v - G^{+}i\right)$$

$$v = Zi$$

,

$$b = Sa$$

$$F\left(Z - G^{+}\right)i = SF\left(Z + G\right)i$$

$$S = F\left(Z - G^{+}\right)\left(Z + G\right)^{-1} F^{-1}$$

Propietati ale matricei de repartitie

- Circuite reciproce

$$[S] = [S]^T$$

- Circuite fara pierderi

$$[S]^*[S] = [S][S]^* = [1]$$

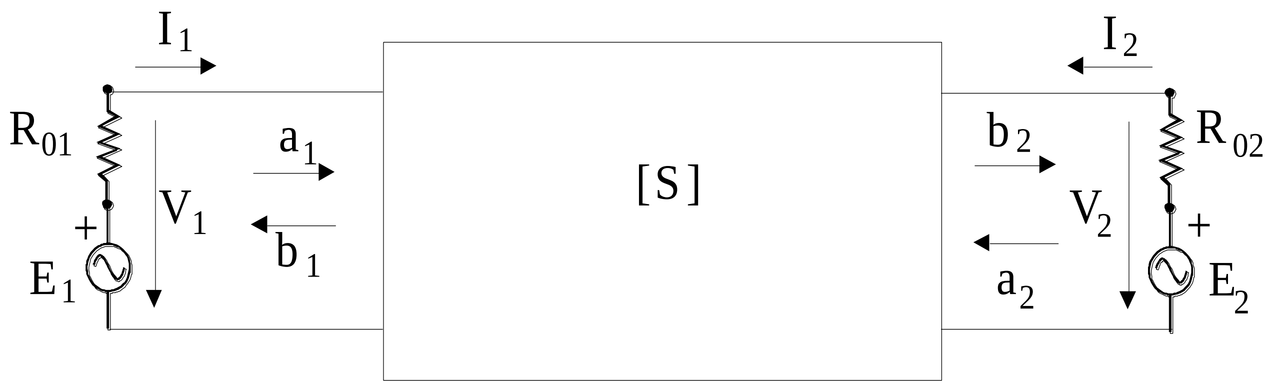
Exemplu

cuadripol reactiv

$$\begin{cases} |S_{11}|^2 + |S_{12}|^2 = 1 & (a) \\ S_{11}^* S_{12} + S_{12}^* S_{22} = 0 & (b) \\ S_{12}^* S_{11} + S_{22}^* S_{12} = 0 & (c) \\ |S_{12}|^2 + |S_{22}|^2 = 1 & (d) \end{cases}$$

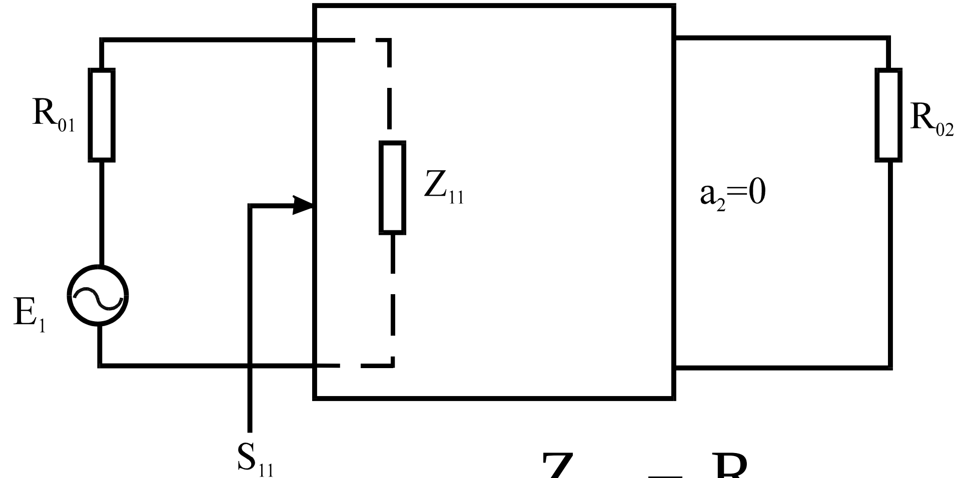
$$[S] = \begin{bmatrix} a \cdot e^{j\varphi_{11}} & \pm j\sqrt{1-a^2} \cdot e^{j\frac{\varphi_{11}+\varphi_{22}}{2}} \\ \pm j\sqrt{1-a^2} \cdot e^{j\frac{\varphi_{11}+\varphi_{22}}{2}} & a \cdot e^{j\varphi_{22}} \end{bmatrix}$$

Semnificatia parametrilor S pentru un cuadripol



$$S_{11} = \frac{Z_{11} - R_{01}}{Z_{11} + R_{01}}$$

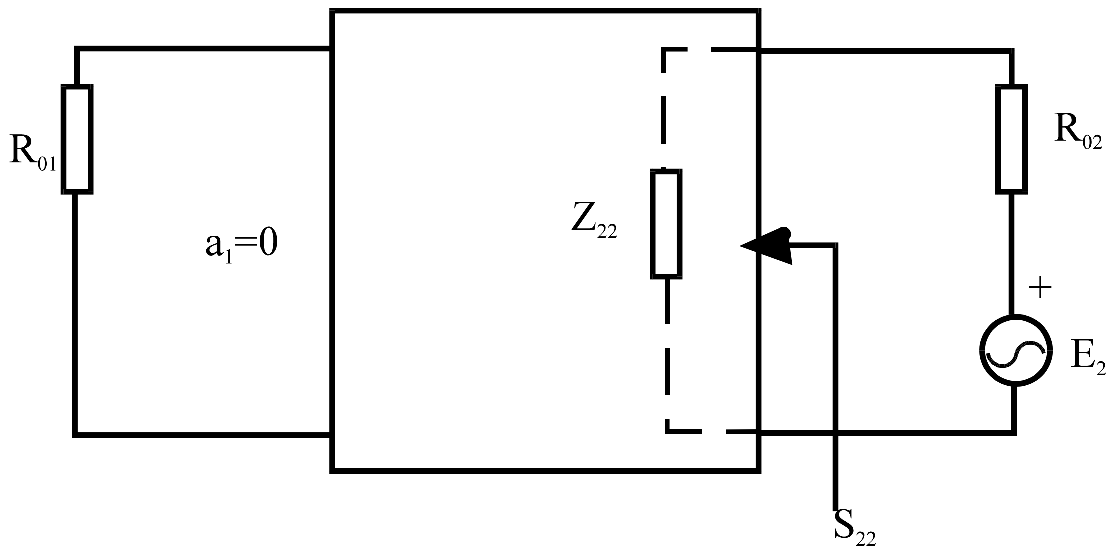
$$S_{11} = \left.\frac{b_1}{a_1}\right|_{a_2=0}$$



$$S_{11} = \frac{Z_{11} - R_{01}}{Z_{11} + R_{01}}$$

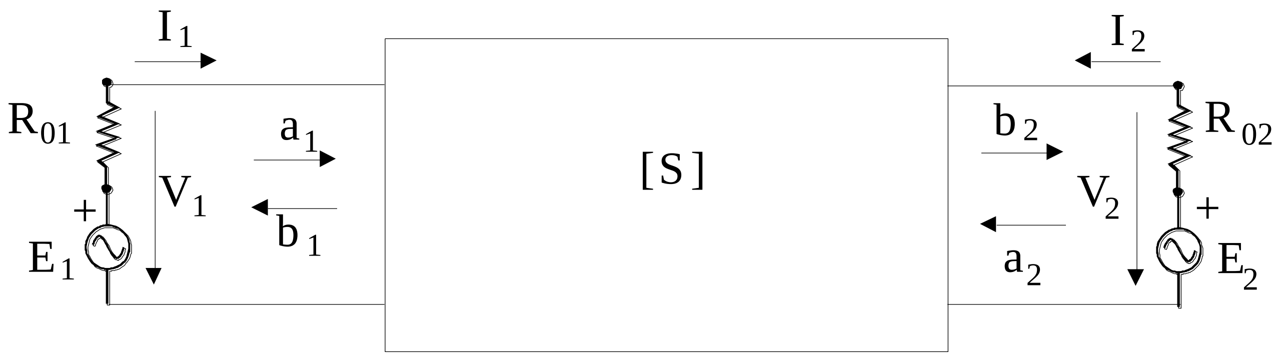
S22

$$S_{22} = \left.\frac{b_2}{a_2}\right|_{a_1=0}$$



$$S_{22} = \frac{Z_{22} - R_{02}}{Z_{22} + R_{02}}$$

S21



$$S_{21} = \left.\frac{b_2}{a_1}\right|_{a_2=0}$$

$$S_{21} = \frac{V_2 / \sqrt{R_{02}}}{\frac{1}{2} E_1 / \sqrt{R_{01}}}$$

$$\left|S_{21}\right|^2 = \frac{P_{L2}}{P_{A1}}$$

S12

$$S_{12} = \left.\frac{b_1}{a_2}\right|_{a_1=0},$$

$$|S_{12}|^2 = \frac{P_{L1}}{P_{A2}} =$$

$$S_{12} = \frac{V_1 / \sqrt{R_{01}}}{\frac{1}{2} E_2 / \sqrt{R_{02}}}$$

Legatura intre matricea S si matricea Y

$$S_{11} = \frac{(1 - y_{11})(1 + y_{22}) + y_{12}y_{21}}{(1 + y_{11})(1 + y_{22}) - y_{12}y_{21}}$$

$$S_{12} = \frac{-2y_{12}}{(1 + y_{11})(1 + y_{22}) - y_{12}y_{21}}$$

$$S_{21} = \frac{-2y_{21}}{(1 + y_{11})(1 + y_{22}) - y_{12}y_{21}}$$

$$S_{22} = \frac{(1 + y_{11})(1 - y_{22}) + y_{12}y_{21}}{(1 + y_{11})(1 + y_{22}) - y_{12}y_{21}}$$

Legatura dintre matricea S si matricea ABCD

$$S_{11} = \frac{AZ_{02} + B - CZ_{01}Z_{02} - DZ_{01}}{AZ_{02} + B + CZ_{01}Z_{02} + DZ_{01}}$$

$$S_{12} = \frac{2(AD - BC)\sqrt{Z_{01}Z_{02}}}{AZ_{02} + B + CZ_{01}Z_{02} + DZ_{01}}$$

$$S_{21} = \frac{2\sqrt{Z_{01}Z_{02}}}{AZ_{02} + B + CZ_{01}Z_{02} + DZ_{01}}$$

$$S_{22} = \frac{-AZ_{02} + B - CZ_{01}Z_{02} + DZ_{01}}{AZ_{02} + B + CZ_{01}Z_{02} + DZ_{01}}$$