$$\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \cdot \begin{bmatrix} V_2 \\ I_2 \end{bmatrix} = \Phi \cdot \begin{bmatrix} V_2 \\ I_2 \end{bmatrix} \quad \text{or} \quad \begin{aligned} V_1 &= AV_2 + BI_2 \\ I_1 &= CV_2 + DI_2 \end{aligned}$$

$$T(f) = \frac{V_2}{V_1} = \frac{V_2}{A \cdot V_2 + B \cdot I_2} = \frac{1}{A + B\frac{I_2}{V_2}} \qquad T(f) = \frac{1}{A + B/Z_L} = \frac{Z_L}{A \cdot Z_L + B}$$

$$\frac{V_L(f)}{V_S(f)} = H(f) = \frac{V_L(f)}{V_1(f)} \cdot \frac{V_1(f)}{V_S(f)} = \frac{Z_1}{Z_1 + Z_S} \cdot T(f) \qquad Z_1 = \frac{V_1}{I_1} = \frac{A + B/Z_L}{C + D/Z_L} = \frac{AZ_L + B}{CZ_L + D}$$

$$\gamma = \alpha + j\beta = \sqrt{(R + j\omega L) \cdot (G + j\omega C)} = \sqrt{Z \cdot Y} \qquad \lambda = \frac{2\pi}{\beta} \qquad v_p = \frac{\omega}{\beta}$$

$$\beta = \omega\sqrt{LC} \qquad \begin{aligned} V(x) &= V_0^+ \cdot e^{-\gamma x} + V_0^- \cdot e^{\gamma x} \\ I(x) &= I_0^+ \cdot e^{-\gamma x} + I_0^- \cdot e^{\gamma x} \end{aligned} \qquad R = \Re\{\gamma \cdot Z_0\}$$

$$Z_0 = \frac{V_0^+}{I_0^+} = -\frac{V_0^-}{I_0^-} = \sqrt{\frac{R + j\omega L}{G + j\omega C}} = \sqrt{\frac{Z}{Y}} \qquad L = \frac{1}{\omega}\Im\{\gamma \cdot Z_0\}$$

$$\begin{aligned} V_0^+ &= \tfrac{1}{2}(V_L + I_L \cdot Z_0) \cdot e^{\gamma d} \\ V_0^- &= \tfrac{1}{2}(V_L - I_L \cdot Z_0) \cdot e^{-\gamma d} \end{aligned} \qquad \begin{bmatrix} V(0) \\ I(0) \end{bmatrix} = \begin{bmatrix} \cosh(\gamma d) & Z_0 \cdot \sinh(\gamma d) \\ \frac{1}{Z_0} \cdot \sinh(\gamma d) & \cosh(\gamma d) \end{bmatrix} \cdot \begin{bmatrix} V(d) \\ I(d) \end{bmatrix}$$

$$T = \frac{1}{\cosh(\gamma d) + \left(Z_0/Z_L\right) \cdot \sinh(\gamma d)} \qquad Z_1 = Z_0 \cdot \frac{Z_L + Z_0 \cdot \tanh(\gamma d)}{Z_0 + Z_L \cdot \tanh(\gamma d)} = \frac{Z_L + Z_0 \cdot \tanh(\gamma d)}{1 + \frac{Z_L}{Z_0}\tanh(\gamma d)}$$

$$P(f) = \tfrac{1}{2}|I|^2 R_L = \tfrac{1}{2}\left|\frac{V}{Z_L}\right|^2 R_L = \tfrac{1}{2}\Re\{VI^*\}$$

$$\rho = \frac{V_0^- \cdot e^{+\gamma d}}{V_0^+ \cdot e^{-\gamma d}} = \frac{Z_L - Z_0}{Z_L + Z_0} \qquad \text{return loss} = 10\log_{10}\left(\frac{1}{\rho}\right)^2 \text{ dB}$$

$$\Phi_2 = \begin{bmatrix} 1 & 0 \\ 1/Z_{bt} & 1 \end{bmatrix} \qquad Z_{bt} = Z_{0t} \cdot \frac{\cosh(\gamma d)}{\sinh(\gamma d)}$$

$$H = V_L/V_S = Z_L/(A \cdot Z_L + B + C \cdot Z_S \cdot Z_L + D \cdot Z_S)$$

$$T_{IL}(f) = \frac{V_L(f)}{V_{no}(f)} = \frac{Z_S + Z_L}{A \cdot Z_L + B + C \cdot Z_S \cdot Z_L + D \cdot Z_S} \qquad H(f) = \frac{V_{no}}{V_S} \cdot \frac{V_L}{V_{no}} = \frac{Z_L}{Z_S + Z_L} \cdot T_{IL}(f)$$

$$f(x,\sigma,\mu) = \frac{1}{2\sigma\sqrt{2\pi}} \cdot e^{-\frac{(x-\mu)^2}{2\sigma^2}} \qquad F(x,\sigma,\mu) = \int_{-\infty}^{x} f(x,\sigma,\mu)dx$$

$$\mu = \frac{1}{n}\sum_{i=1}^{n} x_i\ , \qquad \sigma = \frac{1}{n}\sqrt{\sum_{i=1}^{n}(\mu - x_i)}\ . \qquad JB = \frac{n}{6}\left(S^2 - \frac{(K-3)^2}{4}\right)$$

$$S = \frac{\frac{1}{n}\sum_{i=1}^{n}(x_i - \overline{x})^3}{\left(\frac{1}{n}\sum_{i=1}^{n}(x_i - \overline{x})^2\right)^{\frac{3}{2}}}, \qquad K = \frac{\frac{1}{n}\sum_{i=1}^{n}(x_i - \overline{x})^4}{\left[\frac{1}{n}\sum_{i=1}^{n}(x_i - \overline{x})^2\right]^2} - 3,$$

$$F_{\chi^2}(2,x) = 1 - e^{-x/2}\ .$$

$$\left|H_{FEXT}(l,N,f)\right|^2 = N^{0,6} K_{FEXT} f^2 l \left|H_{CHANNEL}(f,l)\right|^2 \qquad \left|H_{CHANNEL}(f,l)\right|^2 = e^{-2\alpha(f)l}$$

$$\left|H_{FEXT}(l_0,N,f)\right|^2 = \frac{l_0 e^{-2\alpha(f)l_0}}{l e^{-2\alpha(f)l}} \cdot \left|H_{FEXT}(l,N,f)\right|^2 \qquad IL(f,l_1) = IL(f,l_2) \cdot \frac{l_1}{l_2}.$$

$$\left|H_{NEXT}(f,l,N)\right|^2 = N^{0,6} K \cdot f^{1,5}\left(1 - \left|H_{channel}(f,l)\right|^4\right) = N^{0,6} K \cdot f^{1,5}\left(1 - e^{-4a(f)\cdot l}\right)$$

$$\left|H_{NEXT}(f,l_2,N)\right|^2 = \left|H_{NEXT}(f,l_1,N)\right|^2 \frac{1 - e^{-4a(f)\cdot l2}}{1 - e^{-4a(f)\cdot l1}}\ .$$

$$Šum_{ukupno} = \left(\sum_{i=1...N} Šum_i^{1/0,6}\right)^{0,6} \qquad R = 4000\sum_{i=n1}^{n2} r_i \text{ [bit/s]}$$