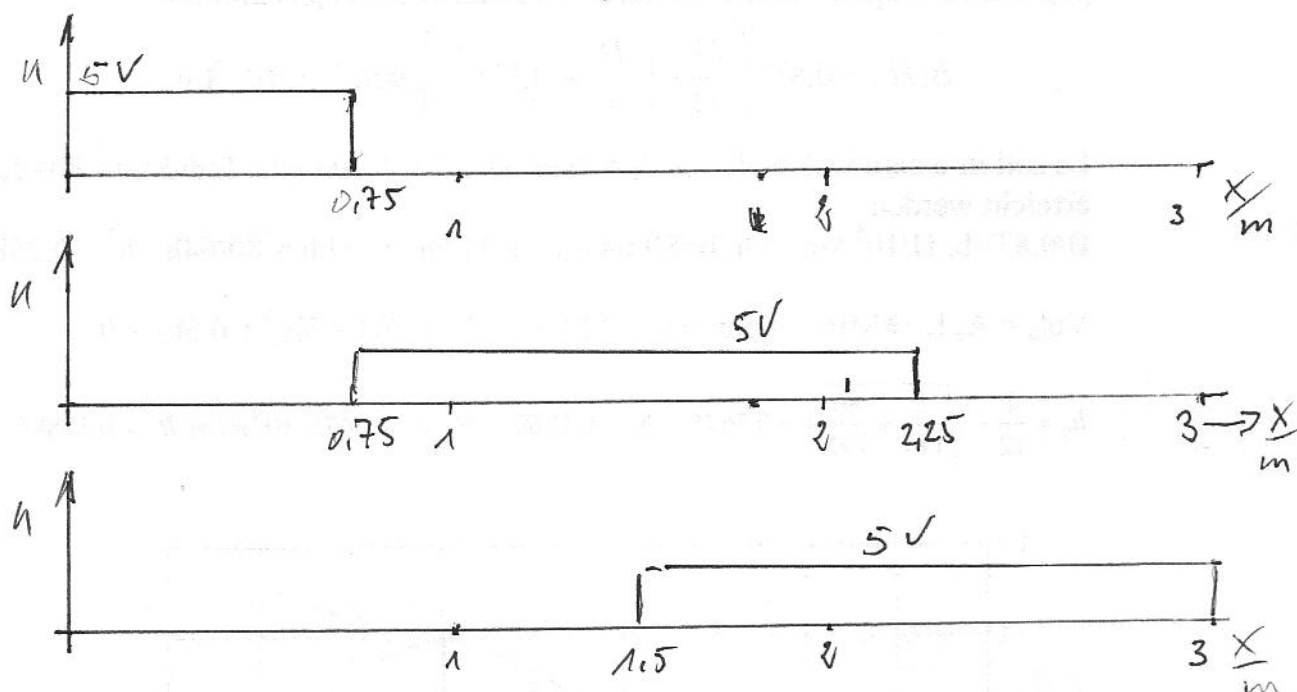


$$(1) \quad u(x, t) = 5V \cdot \text{rect}\left(\frac{x}{x_0} + \frac{1}{2} - \frac{t}{10\text{ms}}\right)$$

$$x_0 = v \cdot 10\text{ms} = \frac{c}{\sqrt{\epsilon_r}} \cdot 10\text{ms} = 1,5\text{m}$$



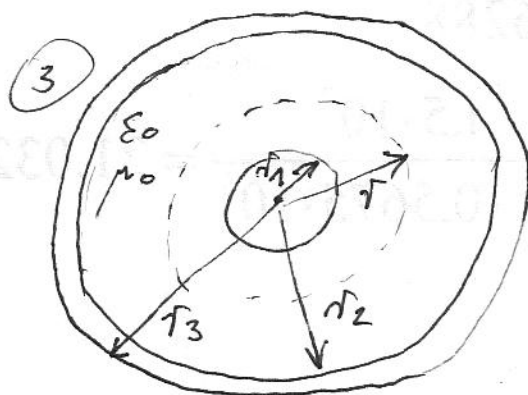
$$(2) \quad E_x(x, t) = \frac{10V}{1\text{mm}} = 10^4 \frac{V}{m}, \quad H_z = \frac{E_x}{\eta} = 26,526 \frac{A}{m}$$

$$S = E \cdot H = 2,6526 \frac{W}{m^2} \cdot 10^5; \quad A = 100 \cdot 10^{-6} m^2$$

$$P = S \cdot A = 2,6526 \cdot 10 W = 26,526 W$$

$$P = U_w \cdot I_w \Rightarrow I_w = 2,6526 A$$

$$Z = \frac{U_w}{I_w} = \underline{\underline{3,775 \Omega}}$$



$$D(r) = \frac{Q}{2\pi r l} \rightarrow E(r) = \frac{Q}{2\pi r l \epsilon_0}$$

$$U_{12} = \int_{r_1}^{r_2} E(r) dr = \frac{Q}{2\pi l \epsilon_0} \cdot \ln \frac{r_2}{r_1}$$

$$C = \frac{Q}{U} = \frac{2\pi \epsilon_0}{\ln \frac{r_2}{r_1}} \cdot l, \quad C' = \frac{C}{l} = \frac{2\pi \epsilon_0}{\ln \frac{r_2}{r_1}}$$

HF 2. Übung - Lösungen

$$W_m = \frac{L}{2} I^2, \quad W_m = \int_{(V)} \mu_0 \frac{H(r)^2}{2} dV, \quad H(r) = \frac{I}{2\pi r}$$

$$dV = 2\pi r l dr$$

$$W_m = \frac{\mu_0 \cdot \ln \frac{r_2}{r_1}}{4\pi} \cdot l \cdot I^2 = \frac{L}{2} I^2$$

$$\rightarrow L = \frac{\mu_0 \ln \frac{r_2}{r_1}}{2\pi} \cdot l; \quad L' = \frac{L}{l} = \frac{\mu_0 \ln \frac{r_2}{r_1}}{2\pi}$$

$$L' \cdot C' = \frac{\mu_0 \ln \frac{r_2}{r_1}}{2\pi} \cdot \frac{2\pi \epsilon_0}{\ln \frac{r_2}{r_1}} = \mu_0 \cdot \epsilon_0 = \frac{1}{c^2}$$

allgemein: $L' \cdot C' = \mu \cdot \epsilon \left(= \frac{\epsilon_r}{c^2}, \mu_r = 1 \right)$

$$R = R_i + R_{ex}, \quad R' = \frac{R}{l};$$

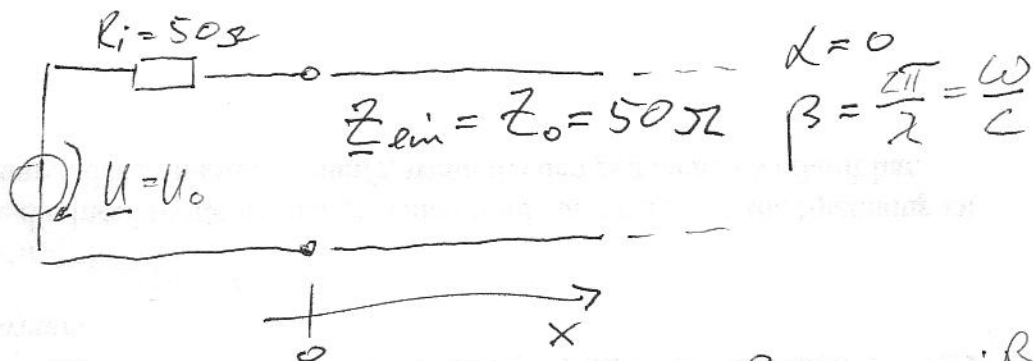
bei hohen Frequenzen findet Stromfluß nur in einer dünnen Schicht δ statt.

$$R_i = \frac{l}{\kappa_{en} \cdot 2\pi r_1 \cdot \delta_{en}}, \quad R_{ex} = \frac{l}{\kappa_{en} \cdot 2\pi r_2 \cdot \delta_{en}}$$

$$R' = \frac{1}{2\pi \kappa_{en} \cdot \delta} \left(\frac{1}{r_1} + \frac{1}{r_2} \right) = \sqrt{\frac{\pi f \mu_0 \kappa_{en}}{4\pi^2 \kappa_{en}^2}} \left(\frac{1}{r_1} + \frac{1}{r_2} \right)$$

$$= \frac{1}{2} \cdot \sqrt{\frac{f \cdot \mu_0}{\pi \kappa_{en}}} \left(\frac{1}{r_1} + \frac{1}{r_2} \right) \quad (R' \sim \sqrt{f})$$

④



$$\underline{U}(x) = \underline{Z}_0 \underline{I}(x) = \underline{U}(0) \cdot e^{-j\beta x} = \frac{U_0}{2} \cdot e^{-j\beta x}$$

$$\underline{U}(1.5, 10 \text{ m}) = 5 \text{ V} \left(e^{j147^\circ}, e^{j15.2^\circ}, e^{j30.42^\circ} \right)$$

$$\underline{I}(1.5, 10 \text{ m}) = 0.1 \text{ A} \left(e^{j147^\circ}, e^{j15.2^\circ}, e^{j30.42^\circ} \right)$$