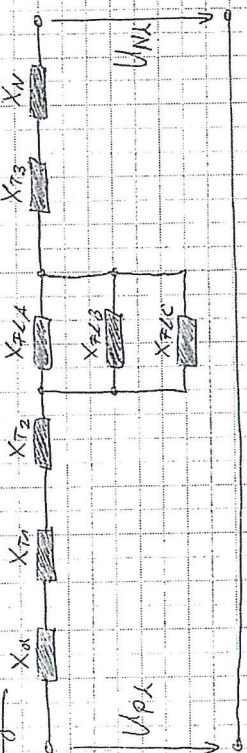


1. Aufgabe 6a

a)



$$X_d = \frac{U_1^2 \cdot x_d}{S_N} = \frac{(220 \text{ kV})^2 \cdot 1,2}{650 \text{ MVA}} = 89,35 \Omega$$

$$X_{T1} = \frac{u_k \cdot U_1^2}{S_N} = \frac{0,1 \cdot (220 \text{ kV})^2}{650 \text{ MVA}} = 7,45 \Omega$$

$$X_{T2} = \frac{0,12 \cdot (220 \text{ kV})^2}{700 \text{ MVA}} = 8,3 \Omega$$

$$X_{T3} = X_{T21} = X_{T22} = X_{T23} = \omega l \cdot l = 0,36 \frac{\Omega}{\text{km}} \cdot 250 \text{ km} = 90 \Omega$$

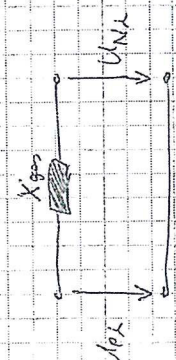
$$X_{T3} = \frac{0,15 \cdot (220 \text{ kV})^2}{720 \text{ MVA}} = 10,08 \Omega$$

$$X_N = 1 \Omega$$

$$X_{eq} = X_d + X_{T1} + X_{T2} + \frac{1}{\frac{1}{X_{2L1}} + \frac{1}{X_{2L2}} + \frac{1}{X_{2L3}}} + X_{T3} + X_N$$

$$= \frac{1}{3} X_{2L}$$

$$= 89,35 \Omega + 7,45 \Omega + 8,3 \Omega + 30 \Omega + 10,08 \Omega + 1 \Omega = 146,18 \Omega$$



b) $P_{WL} = 0,42 \cdot P_N$ also $P_{WL} = P_N \cdot \sin \varphi$

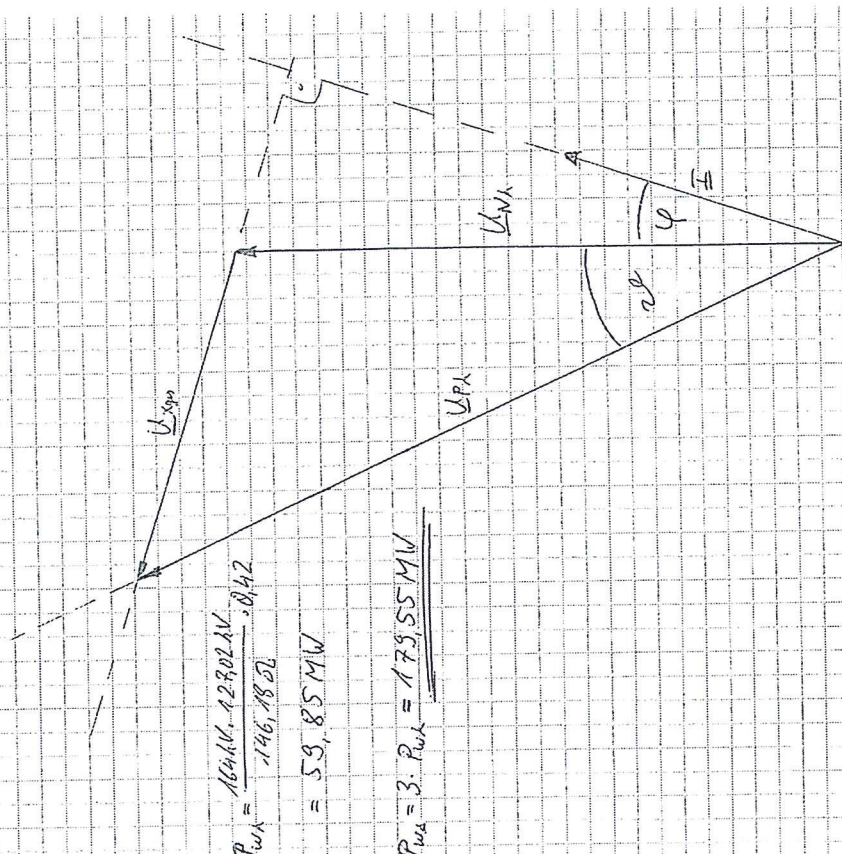
$$\Rightarrow 0,42 = \sin \varphi \Rightarrow \varphi = 24,83^\circ$$

$$P_{WL} = \frac{U_{PK} \cdot U_{NL} \cdot \sin \varphi}{X_{eq}} \quad , \quad \cos \varphi = 0,95 \Rightarrow \varphi = 18,19^\circ$$

$$U_{NL} = \frac{U_B}{\sqrt{3}} = \frac{220 \text{ kV}}{\sqrt{3}} = 127,02 \text{ kV}$$

$$U_{Xeq} = 7,2 \text{ cm} \quad U_{PK} = 164,4 \text{ cm}$$

$$U_{Lq2} = 72 \text{ kV} \quad U_{PK} = 164 \text{ kV}$$



$$P_{WL} = \frac{164,4 \cdot 127,02 \text{ kV}}{146,18 \Omega} \cdot 0,42$$

$$= 59,85 \text{ MW}$$

$$P_{WL} = 3 \cdot P_{WL} = 179,55 \text{ MW}$$