

Aufgabe 5.1

$$r_b = 2 \text{ Mbs}^{-1}$$

$$\text{binär} \cdot m = 2$$

$$\hat{U} = 1 \text{ V}$$

$$Z_R = 50 \Omega$$

$$N_0 = 500 \text{ pW/Hz}$$

$$\text{a) } B_{\text{Nq}} = \frac{r_b / \text{Symbol}}{2} = \frac{r_b / \text{bit}}{2} = \frac{2 \text{ Mbs}^{-1} / \text{b}}{2} = 1 \text{ MHz}$$

$$\text{b) } \alpha = 0,3$$

$$f_g = (1 + \alpha) \cdot B_{\text{Nq}} = (1 + 0,3) \cdot 1 \text{ MHz} = 1,3 \text{ MHz}$$

$$\text{c) } P_N = N_0 \cdot B_N$$

$$B_N = \left(1 - \frac{\alpha}{4}\right) B_{\text{Nq}} = \left(1 - \frac{0,3}{4}\right) \cdot 1 \text{ MHz} = 0,925 \text{ MHz}$$

$$P_N = 500 \text{ pW/Hz} \cdot 0,925 \text{ MHz} = 462,5 \mu\text{W}$$

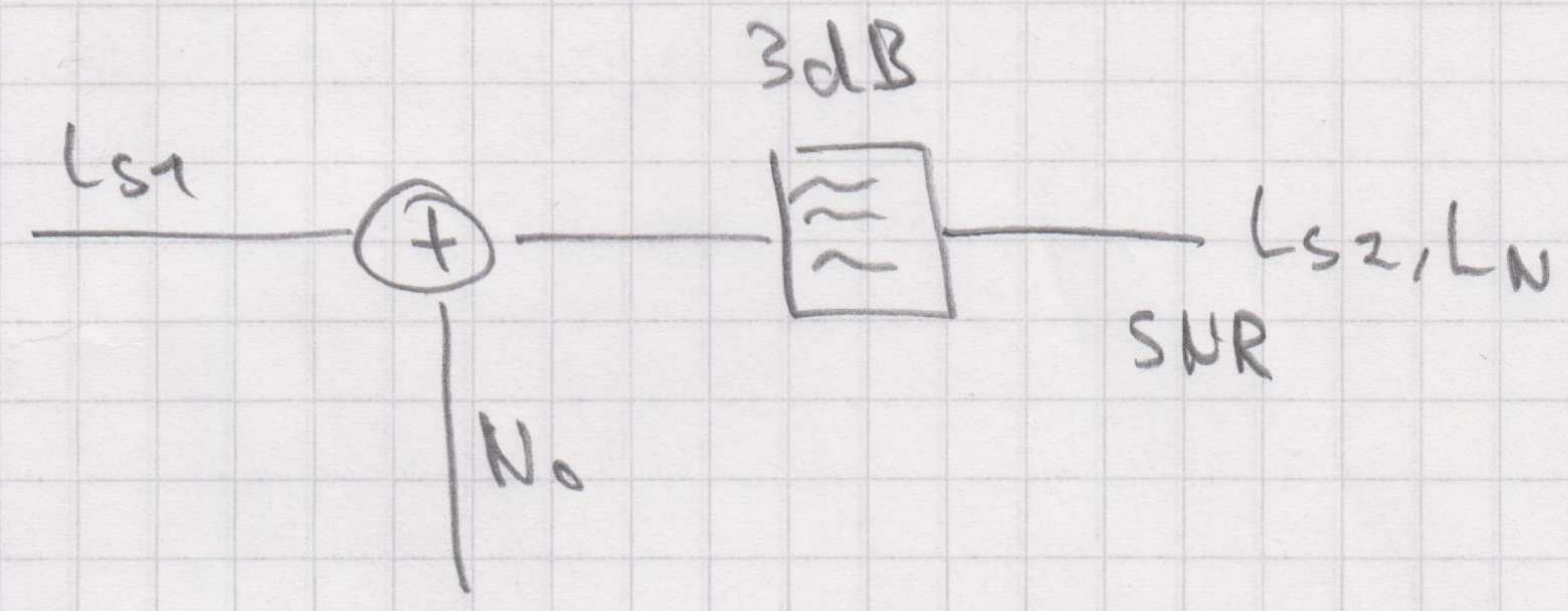
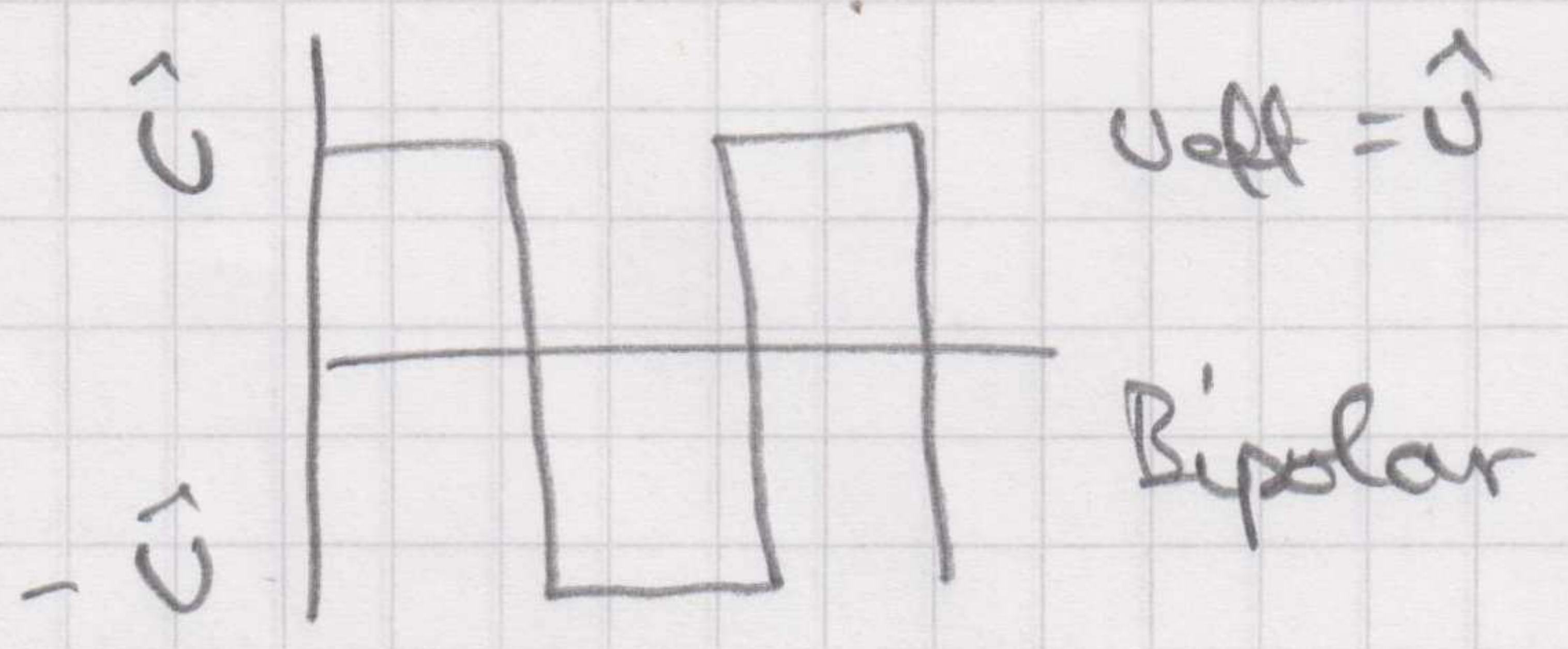
d) $\alpha_0 = 3 \text{ dB}$

$$P_{S1} = \frac{U_{\text{eff}}^2}{Z_R} = \frac{\hat{U}^2}{Z_R} = \frac{(1 \text{ V})^2}{50 \Omega} = 0,02 \text{ W}$$

$$L_{S1} = 10 \lg \frac{P_S}{1 \text{ mW}} \text{ dBm} = 10 \lg 20 \text{ dBm} = 13 \text{ dBm}$$

$$L_{S2} = L_{S1} - \alpha_0 = 13 \text{ dBm} - 3 \text{ dB} = 10 \text{ dBm}$$

$$L_N = 10 \lg \frac{P_N}{1 \text{ mW}} \text{ dBm} = 10 \lg \frac{462,5 \mu\text{W}}{1 \text{ mW}} \text{ dBm} = -3,35 \text{ dBm}$$



$$\begin{aligned} \text{SNR}_{\text{dB}} &= L_{S2} - L_N \\ &= 10 \text{ dBm} + 3,35 \text{ dBm} \\ &= 13,35 \text{ dB} \end{aligned}$$