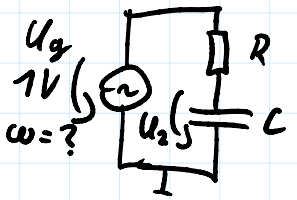
Einheit 15

Mittwoch, 22. Oktober 2025 19:54

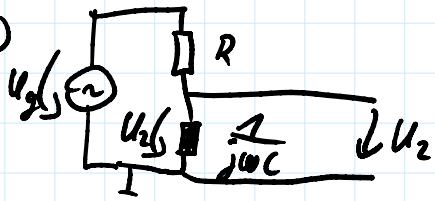
$$U_g \cdot \frac{Z_2}{Z_1 + Z_2} = \frac{U_2}{U_g}$$

$$Z_c = \frac{1}{j\omega C}$$

$\omega = 2\pi f$



$\Rightarrow$



$$\frac{a}{\frac{b}{c}} = \frac{ac}{b}$$

$$U_2 = \frac{\frac{1}{j\omega C} \cdot U_g}{R + \frac{1}{j\omega C}} = \frac{\frac{1}{j\omega C} \cdot U_g}{\frac{j\omega RC + 1}{j\omega C}} = \frac{1}{j\omega RC + 1} \cdot U_g$$

$$U_2 = H(\omega) \cdot U_g$$

$$\Leftrightarrow H(\omega) = \frac{U_2}{U_g}$$

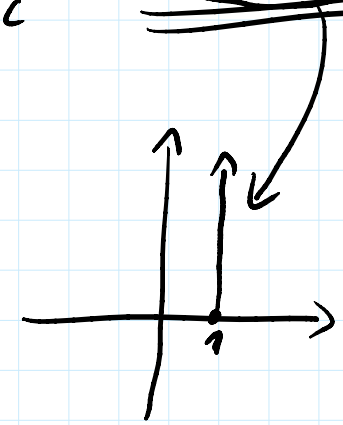
Übertr.

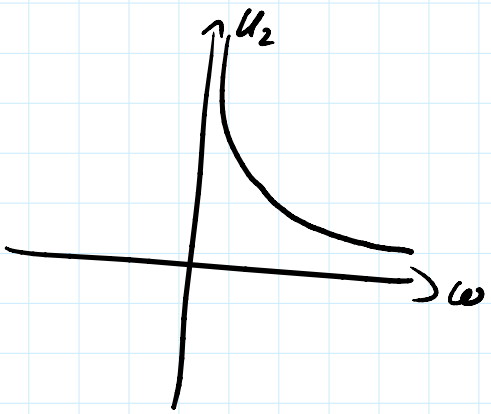
$\omega \to \infty \Rightarrow U_2 = 0$

$\omega \to 0 \Rightarrow U_2 = U_g$

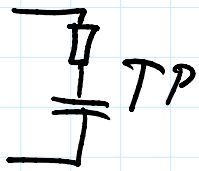
$\omega \to 0 \Rightarrow \varphi_2 = 0°$

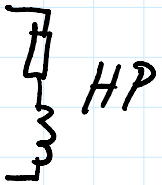
$\omega \to \infty \Rightarrow \varphi_2 = -90°$

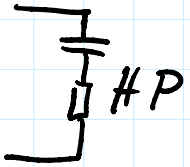




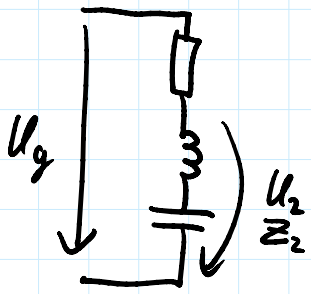
$$Z_L = j\omega L$$

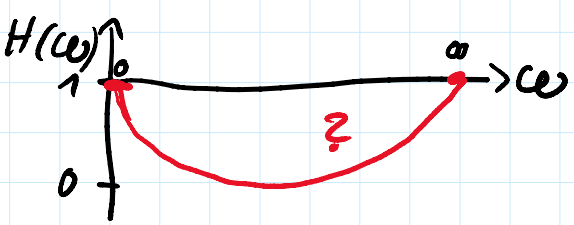






$Z_L = j\omega L \quad Z_c = \frac{1}{j\omega C}$



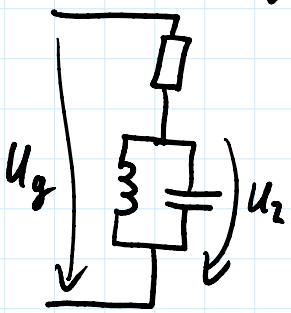


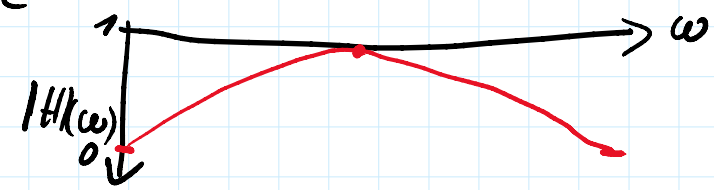
$$Z_2 = j\omega L + \frac{1}{j\omega C} = j\omega L - j\frac{1}{\omega C} = j\left(\omega L - \frac{1}{\omega C}\right)$$

$$\omega L = \frac{1}{\omega C}$$

$$\Leftrightarrow \omega = \frac{1}{\sqrt{LC}}$$

$$Z_L = j\omega L \qquad Z_C = \frac{1}{j\omega C}$$

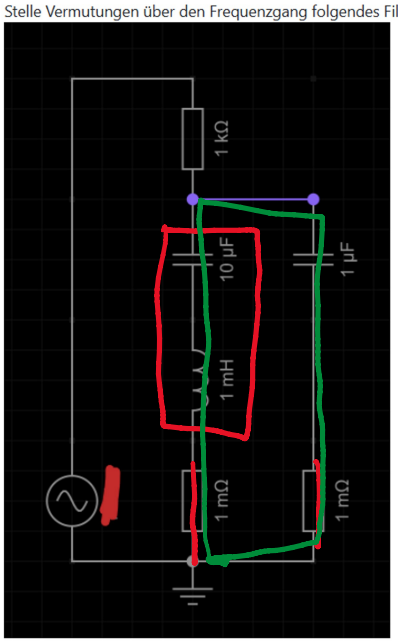


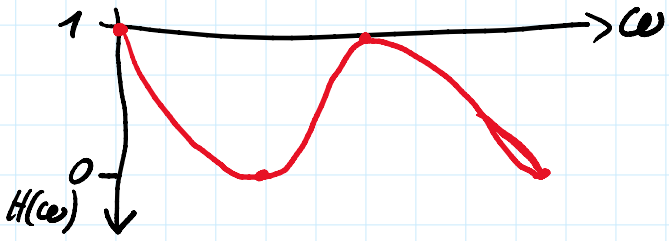


$$Z_2 = \frac{j\omega L \cdot \frac{1}{j\omega C}}{j\omega L + \frac{1}{j\omega C}} = \frac{\frac{L}{C}}{j\omega L + \frac{1}{j\omega C}}$$

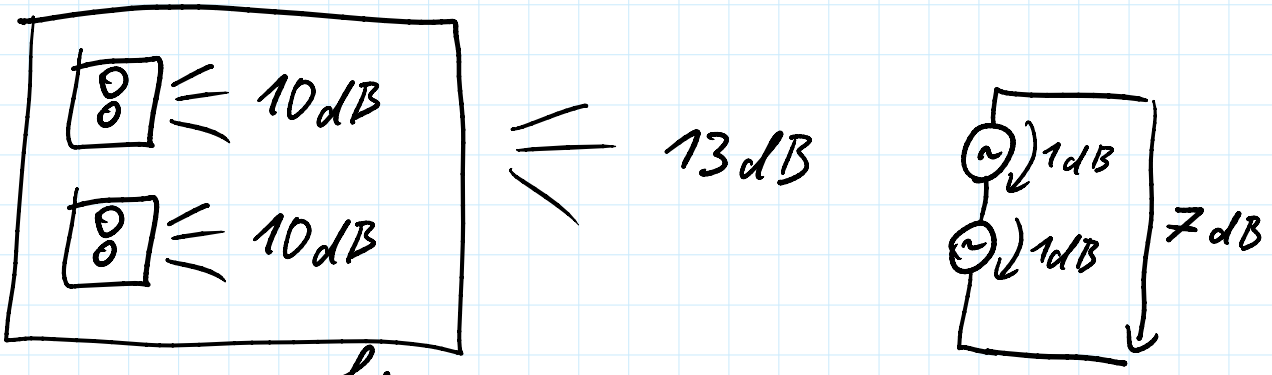
2. Passive Filter

Stelle Vermutungen über den Frequenzgang folgendes Filters auf:





Die unteren Widerstände sind nur da, um den Simulator zu beruhigen. Du kannst sie ignorieren.



$$\frac{a}{dB} = 10 \cdot \underbrace{\log_{10}}_{lg}\left(\frac{a}{1W}\right) \qquad \frac{a}{dBm} = \dots \frac{a}{1mW} = \dots \frac{a \cdot 1000}{1W}$$

$$10\, lg(2 \cdot a) = 10\, lg(a) + 10 \cdot lg(2) \approx 10\, lg(a) + 3$$

$$lg(a \cdot 1000) = lg(a) + lg(1000)$$

$$\Rightarrow \quad \frac{a}{dB} = \frac{a}{dBm} - 30\,dB$$

$$20\,dBm + 10\,dB = -10\,dB + 10\,dB = 0\,dB$$

$$= 30\,dBm$$

$$a = 10^{\frac{a\,dB}{10}}$$

$$P = \frac{U^2}{R} = U^2$$

$$\frac{P}{dB} = 10\, lg(U^2) = 20\, lg(U)$$

$$U = 10^{\frac{U\,dB}{20}}$$

$$P = -115\,dBm = -145\,dB = 10^{-\frac{145}{10}} = 10^{-14,5} = 10^{-2,5}\,pW$$

$$10^{-7} = 0,1\,\mu V$$