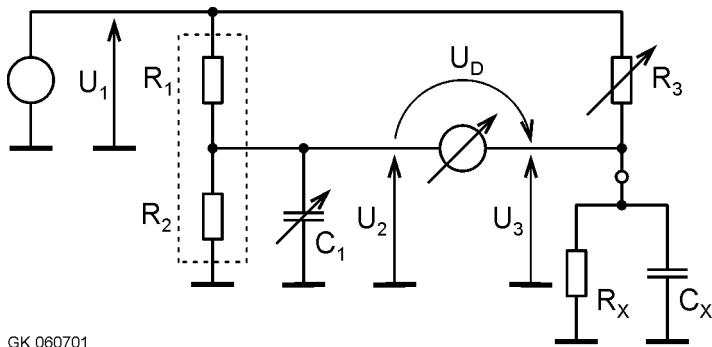


# Merenje impedanse mostom sa razdelnikom napona

Symmetry, Goran Kostic, 060703



GK 060701

Sa  $R_3$  i  $C_1$  podesiti 0 V na voltmetru. Tada se  $R_X$  i  $C_X$  odredjuje prema sledecem.

$G_{DC} := 0.9$       **Pojacanje razdelnika sa  $R_1$  i  $R_2$  za DC.**

$R_1 := 200$

$R_3 := 100 \cdot 10^3$

$C_1 := 350 \cdot 10^{-9}$

$R_X := \frac{R_3}{\frac{1}{G_{DC}} - 1}$        $R_X = 900 \times 10^3$        **$R_X$  preko  $G_{DC}$ .**

$C_X := C_1 \cdot \frac{R_1}{R_3}$        $C_X = 700 \times 10^{-12}$        **$C_X$  preko  $R_1$ .**

## Teorijska izvodjenja

Za DC:

$$U_2 := U_3 \quad \text{Pri } U_D = 0 \text{ (i } I_D = 0).$$

$$G := \frac{U_2}{U_1}$$

$$U_2 := G \cdot U_1$$

$$U_3 := U_1 \cdot \frac{R_X}{R_3 + R_X}$$

$$G \cdot U_1 := U_1 \cdot \frac{R_X}{R_3 + R_X}$$

$$\frac{1}{G} := 1 + \frac{R_3}{R_X}$$

$$R_X := \frac{R_3}{\frac{1}{G} - 1}$$

**R<sub>X</sub> preko G.**

$$G := \frac{R_2}{R_1 + R_2}$$

$$R_X := \frac{R_3}{\frac{1}{G} - 1}$$

$$R_X := \frac{R_3}{\frac{R_1 + R_2}{R_2} - 1}$$

$$R_X := \frac{R_3}{\frac{R_1}{R_2} + 1 - 1}$$

$$R_X := R_3 \cdot \frac{R_2}{R_1}$$

**R<sub>X</sub> preko R<sub>1</sub> i R<sub>2</sub>.**

Za AC:

$$U_2 := U_3 \quad \text{Pri } U_D = 0 \text{ (i } I_D = 0).$$

$$G := \frac{U_2}{U_1}$$

$$U_2 := G \cdot U_1$$

$$Z_X = R_X \parallel C_X$$

$$U_3 := U_1 \cdot \frac{Z_X}{R_3 + Z_X}$$

$$G \cdot U_1 := U_1 \cdot \frac{Z_X}{R_3 + Z_X}$$

$$\frac{1}{G} := 1 + \frac{R_3}{Z_X}$$

$$Z_X := \frac{R_3}{\frac{1}{G} - 1}$$

**Z<sub>X</sub> preko G.**

$$G := \frac{Z_2}{R_1 + Z_2}$$

$$Z_X := \frac{R_3}{\frac{1}{G} - 1}$$

$$Z_X := \frac{R_3}{\frac{R_1 + Z_2}{Z_2} - 1}$$

$$Z_X := R_3 \cdot \frac{Z_2}{R_1}$$

$$Z_X = R_X \parallel C_X \quad Z_X := \frac{1}{\frac{1}{R_X} + i \cdot \omega \cdot C_X}$$

$$Z_2 = R_2 \parallel C_1 \quad Z_2 := \frac{1}{\frac{1}{R_2} + i \cdot \omega \cdot C_1}$$

$$\frac{1}{\frac{1}{R_X} + i \cdot \omega \cdot C_X} := R_3 \cdot \frac{\frac{1}{\frac{1}{R_2} + i \cdot \omega \cdot C_1}}{R_1}$$

$$\frac{1}{R_X} + i \cdot \omega \cdot C_X := \frac{R_1}{R_3} \cdot \left( \frac{1}{R_2} + i \cdot \omega \cdot C_1 \right)$$

$$\frac{1}{R_X} + i \cdot \omega \cdot C_X := \frac{R_1}{R_2 \cdot R_3} + \frac{(i \cdot \omega \cdot R_1 \cdot C_1)}{R_3}$$

$$\frac{1}{R_X} := \frac{R_1}{R_2 \cdot R_3} \quad | \quad i \cdot \omega \cdot C_X := \frac{(i \cdot \omega \cdot R_1 \cdot C_1)}{R_3}$$

$$R_X := R_3 \cdot \frac{R_2}{R_1} \quad | \quad C_X := C_1 \cdot \frac{R_1}{R_3} \quad (i \quad C_X := C_1 \cdot \frac{R_2}{R_X}) \quad (i \quad C_1 := C_X \cdot \frac{R_X}{R_2}) \quad \mathbf{R_X \cdot i \cdot C_X}$$

## Podešavanje nule (na voltmetru)

$$f := 1000 \quad \omega := 2 \cdot \pi \cdot f$$

$$U_1 := 2$$

$$R_1 := 200$$

$$R_2 := 1800$$

$$C_X := 700 \cdot 10^{-12} \quad C_X := 0$$

$$R_X := 900 \cdot 10^3$$

$$k_1 := 1.00 \quad k_1 := 1.01$$

$$C_1 := k_1 \cdot 0.35 \cdot 10^{-6} \quad C_1 := 0$$

$$R_3 := 0,100 \dots 200 \cdot 10^3$$

$$Z_2 := \frac{1}{\frac{1}{R_2} + i \cdot \omega \cdot C_1}$$

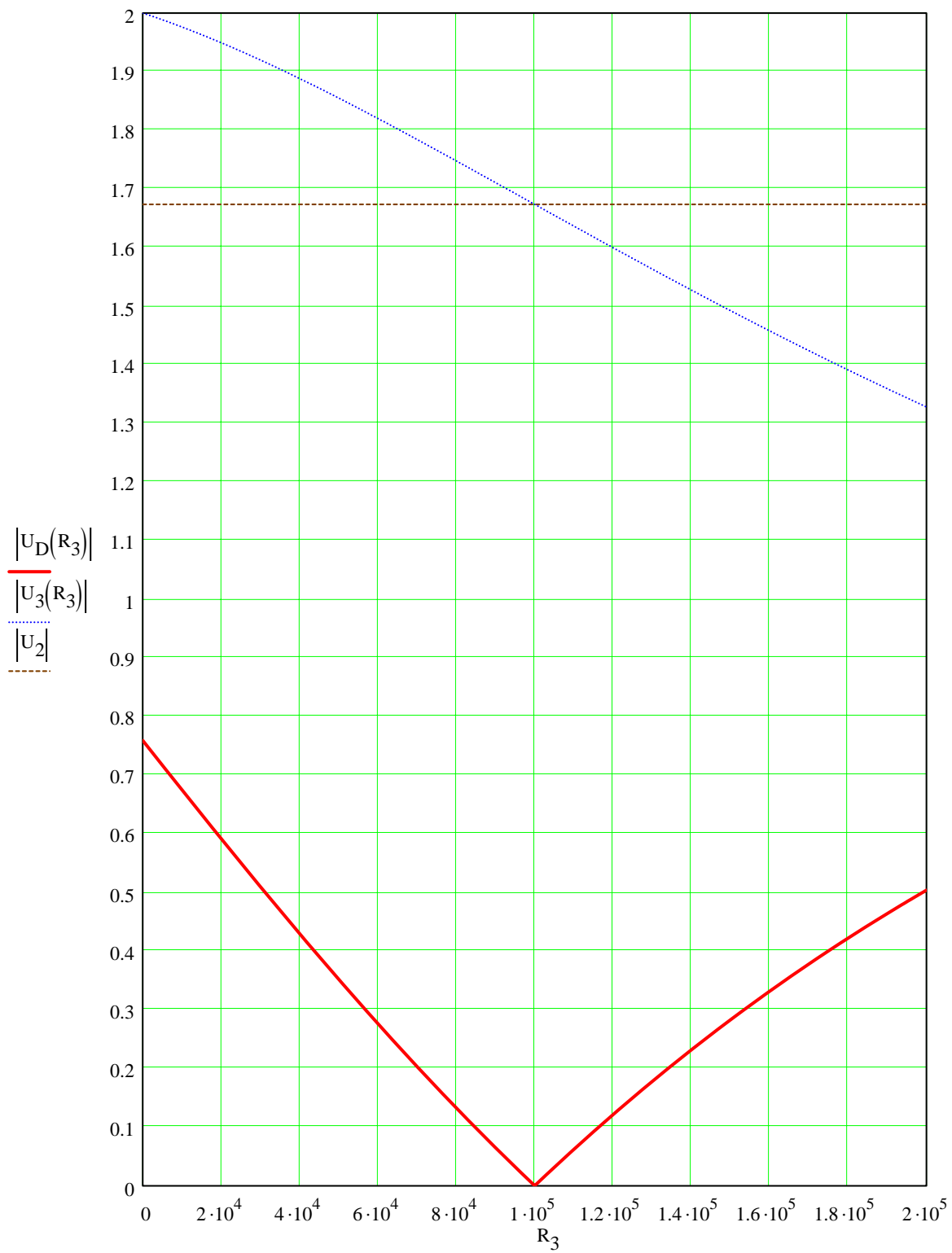
$$G := \frac{Z_2}{R_1 + Z_2}$$

$$U_2 := G \cdot U_1$$

$$Z_X := \frac{1}{\frac{1}{R_X} + i \cdot \omega \cdot C_X}$$

$$U_3(R_3) := U_1 \cdot \frac{Z_X}{R_3 + Z_X}$$

$$U_D(R_3) := U_3(R_3) - U_2 \quad (\text{Napon na voltmetru za podešavanje nule.})$$



$$C_1 := 0,1 \cdot 10^{-9} .. 1000 \cdot 10^{-9}$$

$$k_2 := 1.00 \quad k_2 := 1.01 \blacksquare$$

$$R_3 := k_2 \cdot 100 \cdot 10^3$$

$$Z_2(C_1) := \frac{1}{\frac{1}{R_2} + i \cdot \omega \cdot C_1}$$

$$G(C_1) := \frac{Z_2(C_1)}{R_1 + Z_2(C_1)}$$

$$U_2(C_1) := G(C_1) \cdot U_1$$

$$Z_X := \frac{1}{\frac{1}{R_X} + i \cdot \omega \cdot C_X}$$

$$U_3 := U_1 \cdot \frac{Z_X}{R_3 + Z_X}$$

$$U_D(C_1) := U_3 - U_2(C_1)$$

