

CDE laboratory_01

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October 15, 2017



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L^AT_EX

1 Verificarea îndeplinirii legilor lui Ohm si Kirchhoff pentru circuitele electrice neramificate si ramificate.

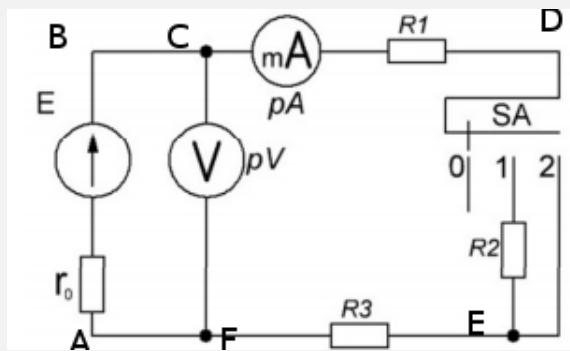


Figure 1: Circuit 1.1

1.1

$R_1(\Omega)$	$R_2(\Omega)$	$R_3(\Omega)$	$I_1(mA)$	$I_2(mA)$	$U_{t1}(V)$	$U_{t2}(V)$
99.8	198	53.7	42.1	96.0	15.01	15.01

1.2

$$r_0 = \frac{U_{t2} - U_{t1}}{I_1 - I_2} = \frac{0}{I_1 - I_2} = 0$$

Aparatele nu au fost destul de fixe si r_0 este o valoare prea mica pentru a fi masurata exact.

1.3

$$I = \frac{E}{R_1 + R_2 + R_3 + r_0} = \frac{15}{351.5} = 42.67 \text{ mA}$$

$$U_1 = IR_1 = 42.67 \cdot 99.8 = 4.26 \text{ V}$$

$$U_2 = IR_2 = 42.67 \cdot 198 = 8.45 \text{ V}$$

$$U_3 = IR_3 = 42.67 \cdot 53.7 = 2.29 \text{ V}$$

1.4

R (Ω)	$I_c(\text{mA})$	$U_c (\text{V})$	$I_m (\text{mA})$	$U_m (\text{V})$
R_1 99.8		U_1 4.26		U_1 4.24
R_2 198	42.67	U_2 8.45	42.1	U_2 8.43
R_3 53.7		U_3 2.29		U_3 2.26

1.5

$$U_{c1} + U_{c2} + U_{c3} = 4.26 + 8.45 + 2.29 = 15 \text{ V}$$

$$U_{m1} + U_{m2} + U_{m3} = 4.24 + 8.43 + 2.26 = 14.93 \text{ V}$$

1.6

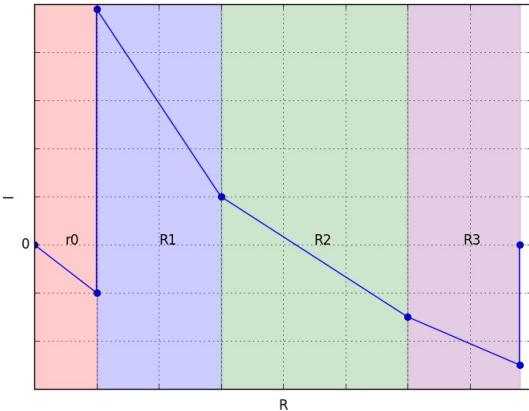


Figure 2: Potential Chart of Circuit 1

1.7

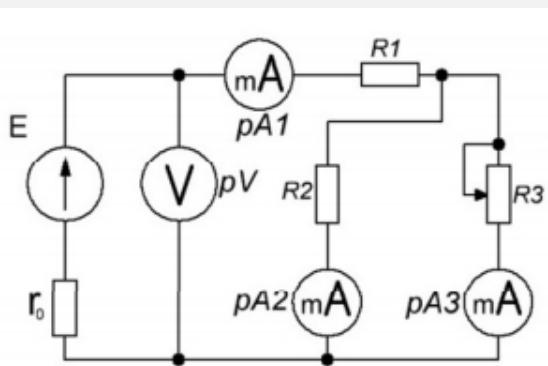


Figure 3: Circuit 1.2

$$R_E = R_1 + \frac{R_2 R_3}{R_2 + R_3} = 99.8 + \frac{198 \cdot 473}{198 + 473} = 239.37 \Omega$$

$$I_1 = \frac{E}{r_0 + R_E} = \frac{15}{0 + 239.37} = 62.66 \text{ mA}$$

$$U_2 = U_3 = I_1 \frac{R_2 R_3}{R_2 + R_3} = 62.66 \cdot \frac{198 \cdot 473}{198 + 473} = 8.75 \text{ V}$$

$$U_1 = I_1 \cdot R_1 = 61.7 \cdot 99.8 = 6.16 \text{ V}$$

$$I_2 = \frac{U_2}{R_2} = \frac{8.75}{198} = 44.19 \text{ mA} \quad | \quad I_3 = \frac{U_3}{R_3} = \frac{8.75}{473} = 18.50 \text{ mA}$$

R (Ω)	I_c (mA)	U_c (V)	I_m (mA)	U_m (V)
R_1	99.8	I_1	62.66	U_1
R_2	198	I_2	44.19	U_2
R_3	473	I_3	18.50	U_3

1.8

Kirchhoff's Law

$$\sum_1^n I_k = 0 \Rightarrow I_2 + I_3 - I_1 = 0 \Rightarrow 43.2 + 18.6 - 61.7 = 0.10 \approx 0$$

Power Balance

$$E \cdot I_1 = I_1^2(r_0 + R_1) + I_2^2R_2 + I_3^2R_3 \Rightarrow$$

$$15 \cdot 61.7 = \frac{1}{10^3} \cdot (61.7^2 \cdot (0 + 99.8) + 43.2^2 \cdot 198 + 18.6^2 \cdot 473) \Leftrightarrow$$

$$925.50 \text{ W} \approx 913.08 \text{ W}$$

1.9

R_3	Measured						Calculated		
	Ω	U	U_1	U_2	I_1	I_2	I_3	$U_1 + U_2$	$I_2 + I_3$
		V			mA			V	mA
0		14.93	0.06	144.3	0.2	143.5		14.99	143.7
100		9.06	5.88	88.4	29.4	59.2		14.94	88.6
200		7.57	7.42	74	37.1	36.7		14.99	73.8
300	15	6.9	8.0	67.2	40.5	26.7		14.9	67.2
467		6.35	8.64	62	43.3	18.6		14.99	61.9

$$P_{R_3} = U \cdot I_{R_3}$$

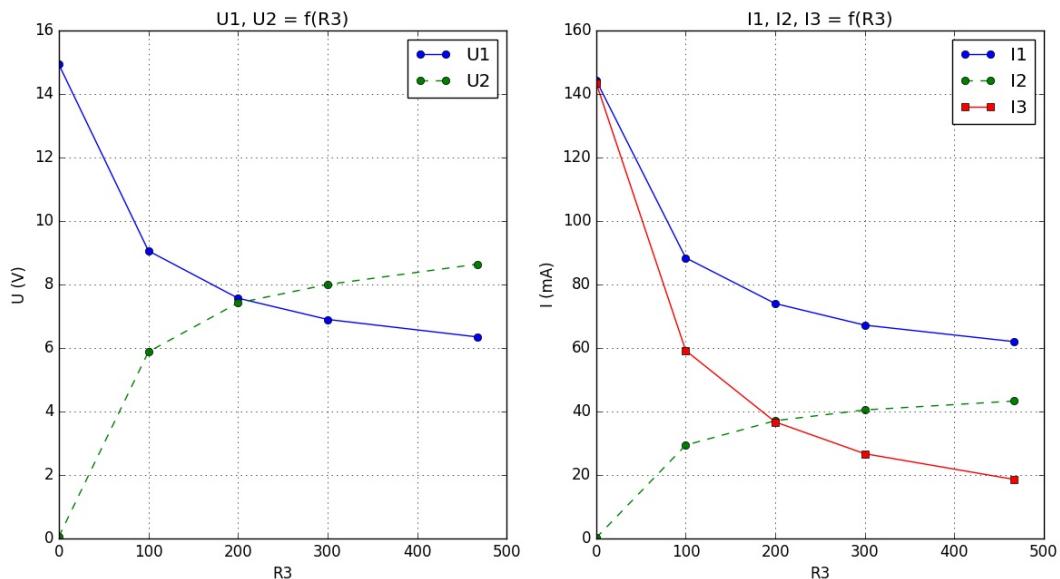


Figure 4

2 De cercetat proprietatile elementelor pasive (R, L, C) în circuitul de curent alternativ.

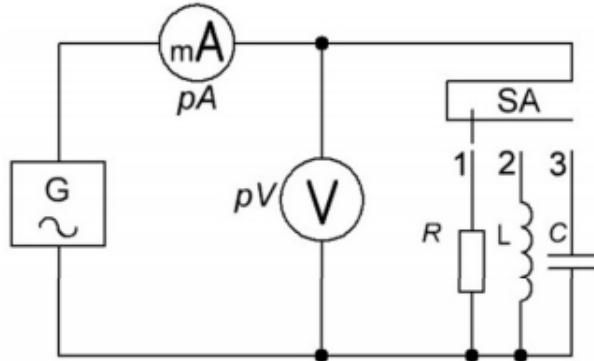


Figure 5: Circuit 2.1

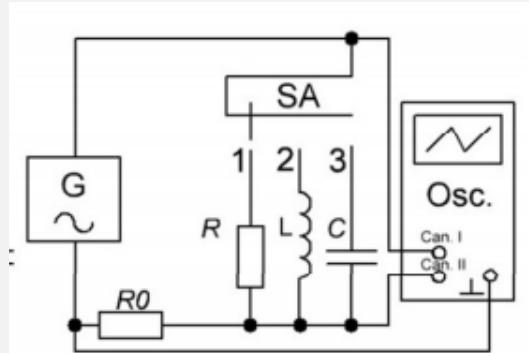


Figure 6: Circuit 2.2

Element	U	U_m	I	I_m	ϕ	Q	S	P	R	C	L	X_C	X_L
	V		mA	mA	o	VAR	VA	W	Ω	nF	mH	Ω	Ω
$R = 510\Omega$		10.3		20									
$C = 56 \text{ nF}$		4.43		186.3									
$L = 3.64 \text{ mH}$		11.34		510									

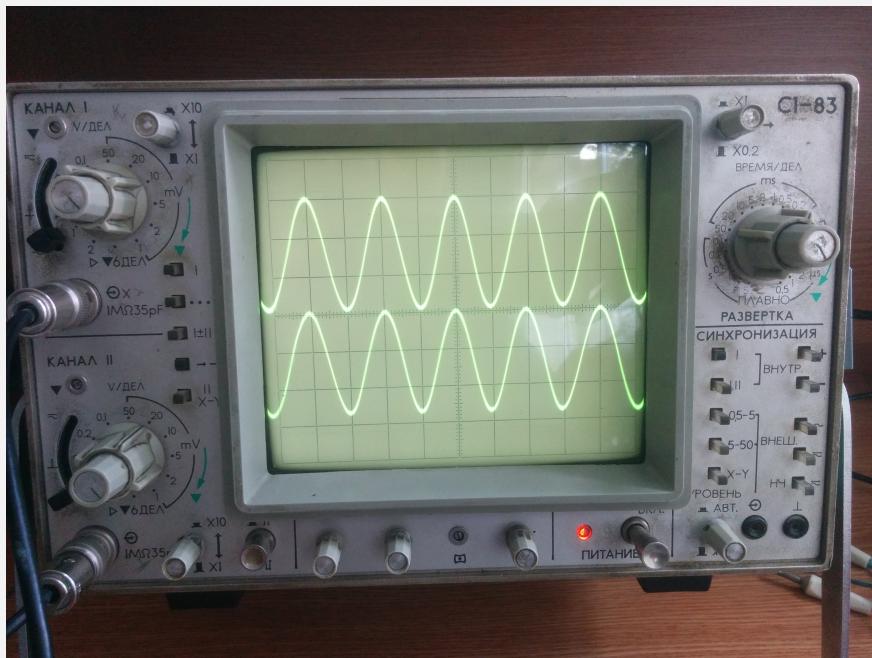


Figure 7: Oscilograph pos 1

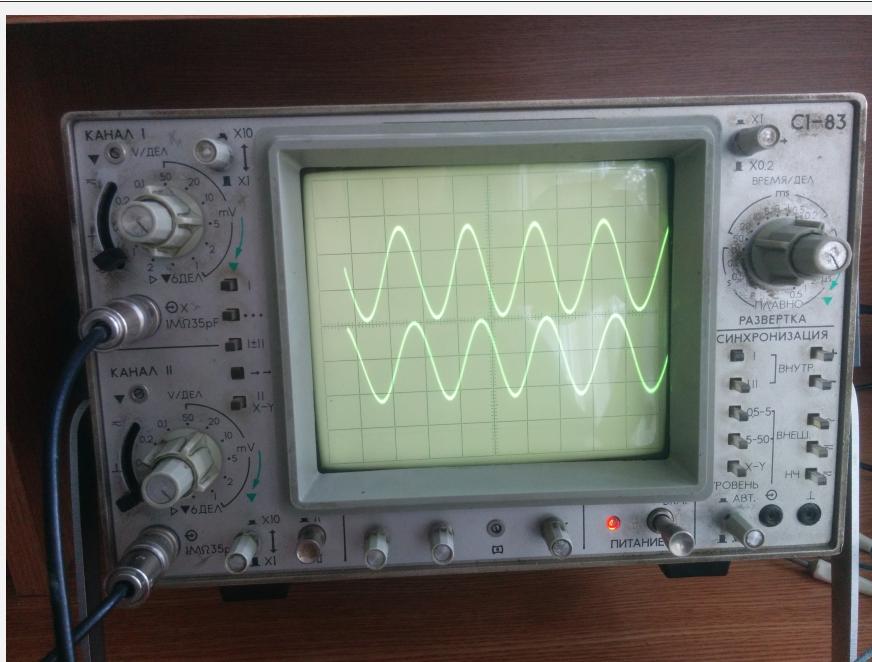


Figure 8: Oscilograph pos 2

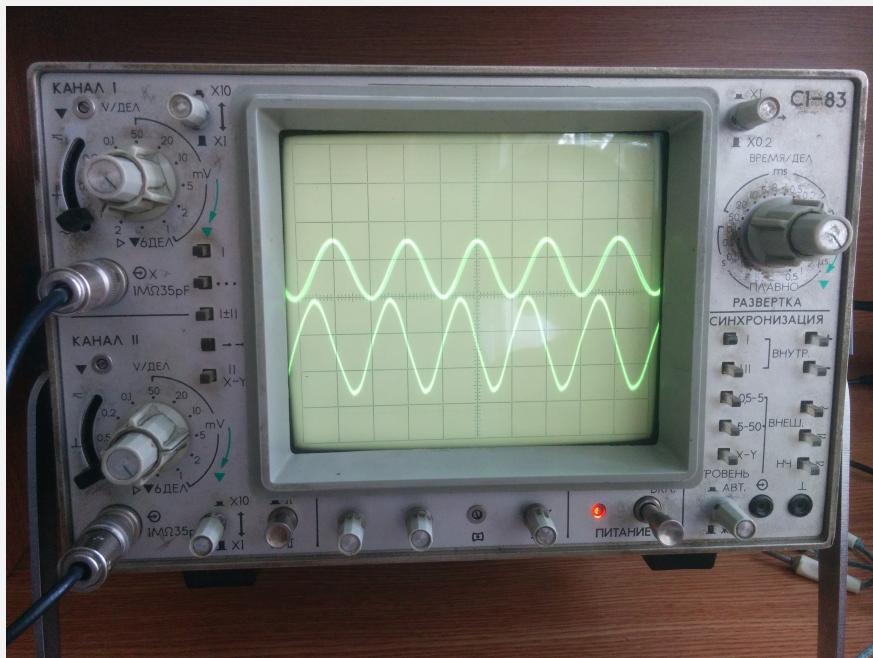


Figure 9: Oscilograph pos 3