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3.2.2

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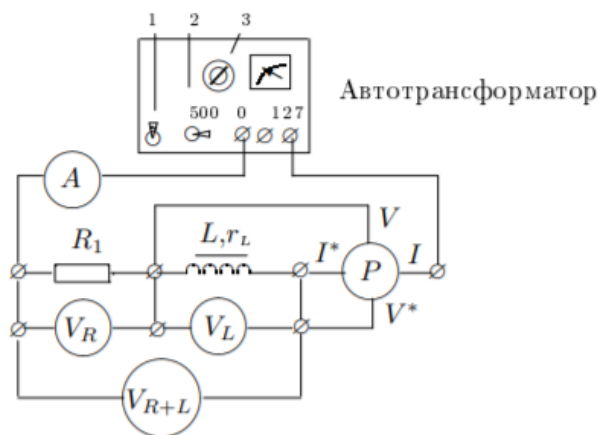
: , .

: , , , , , , , , .

1

Z , : . , - , - , . , . .

$$Z = R + i(\omega L - \frac{1}{\omega C}) \quad (1)$$



. 1:

.1 R L $Z_L = r_L + i\Omega L$, , Ω .
 U_R , U_L , U_{R+L} .
, , , U_R, U_L, U_{R+L} , , r_L, L, P_L .

$$U_R = IR \quad (2)$$

$$U_L = I\sqrt{r_L^2 + (\Omega L)^2} \quad (3)$$

$$U_{L+R} = I\sqrt{(r_L + R)^2 + (\Omega L)^2} \quad (4)$$

, , .

$$P_L = U_L \cdot I \cdot \cos(\psi) = I^2 \cdot r_L \quad (5)$$

и, следовательно, r_L и R (2). Тогда Ω ($\omega_0 = \Omega$), тогда:

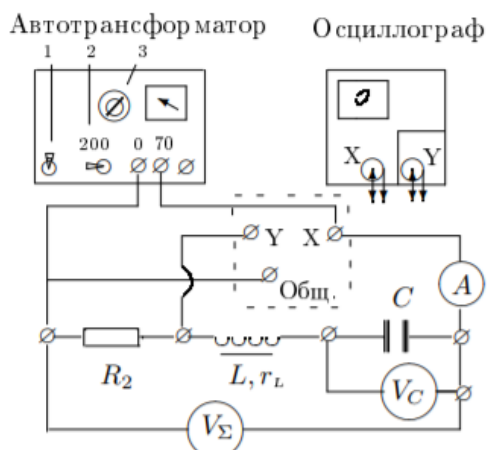
$$\omega_0 \cdot L = \frac{1}{\omega_0 \cdot C} \quad (6)$$

и Q , R_{sum} ,:

$$Q = \frac{\omega_0 L}{R_{sum}} = \frac{1}{\omega_0 C R_{sum}} \quad (7)$$

R_{sum} R r_L

$$R_{sum} = R + r_L \quad (8)$$



. 2:

2

. 1., $R \approx 100 \Omega$, $L = 0.127 \text{ Гн}$. Тогда V_R, V_L, V_{L+R} .

. 2. $R \approx 5 \Omega$, $L = 0.127 \text{ Гн}$, V_C , V_{Σ} . Тогда X , Y , R_2 , $U_{\Sigma, res}$, U_C .

$$U_{\Sigma, res} = I_{res} \cdot R_{\Sigma} \quad (9)$$

$$U_{C, res} = \frac{I_{res}}{\Omega \cdot C} \quad (10)$$

(6), (7) (8), , :

$$Q = \frac{U_{C,res}}{U_{\Sigma,res}} \quad (11)$$

(8) , . , R_{Σ} (6), r_L

3

3.1 .

1) , , (2) (3) r_L L .

$$r_L = \frac{P_L}{I^2} \quad (12)$$

$$L = \frac{1}{\Omega} \cdot \sqrt{\left(\frac{U_L}{I}\right)^2 - r_L^2} \quad (13)$$

:

$$\sigma_{r_L} = r_L \cdot \sqrt{\left(\frac{\sigma_{P_L}}{P_L}\right)^2 + 4 \cdot \left(\frac{\sigma_I}{I}\right)^2} \quad (14)$$

$$\sigma_L = L \cdot \sqrt{\left(\frac{\sigma_{P_L}}{P_L}\right)^2 + 4 \cdot \left(\frac{\sigma_I}{I}\right)^2} \quad (15)$$

1.

:

$$r_L = 9.2 \text{ } Om, \text{ } L = 1.09 \text{ } H$$

:

$$\sigma r_L = 0,27 \text{ } Om, \text{ } \sigma_L = 0.03 \text{ } H.$$

$$L(x) \text{ } r_L(x)$$

3.2

:

1:

| x_{disp} | I, | U_R , | U_L , | U_{L+R} , | P_L , | L, H |
|------------|--------|---------|---------|-------------|---------|------|
| 0,5 | 0,825 | 73 | 77 | 115 | 11,25 | 2,40 |
| 0,7 | 0,875 | 78,5 | 68 | 113 | 10 | 2,10 |
| 0,9 | 0,925 | 82,5 | 63 | 112 | 9,5 | 1,87 |
| 1,1 | 0,95 | 85,5 | 58 | 111 | 9 | 1,69 |
| 1,3 | 0,975 | 88 | 54 | 110,5 | 8,75 | 1,58 |
| 1,5 | 1,0125 | 90 | 51 | 110 | 8,25 | 1,46 |
| 1,7 | 1,02 | 91 | 48,5 | 110 | 8 | 1,38 |
| 1,9 | 1,025 | 92 | 46 | 109 | 7,75 | 1,31 |
| 2,1 | 1,028 | 92,5 | 44 | 109 | 7,5 | 1,24 |

2: r_L L (3) (5)

| L, H | r_L , Om |
|------|------------|
| 1,84 | 16,53 |
| 1,53 | 13,06 |
| 1,34 | 11,1 |
| 1,2 | 9,97 |
| 1,09 | 9,2 |
| 0,99 | 8,05 |
| 0,94 | 7,69 |
| 0,89 | 7,38 |
| 0,84 | 7,1 |

$\psi :$

$$\cos\psi = 0.88$$

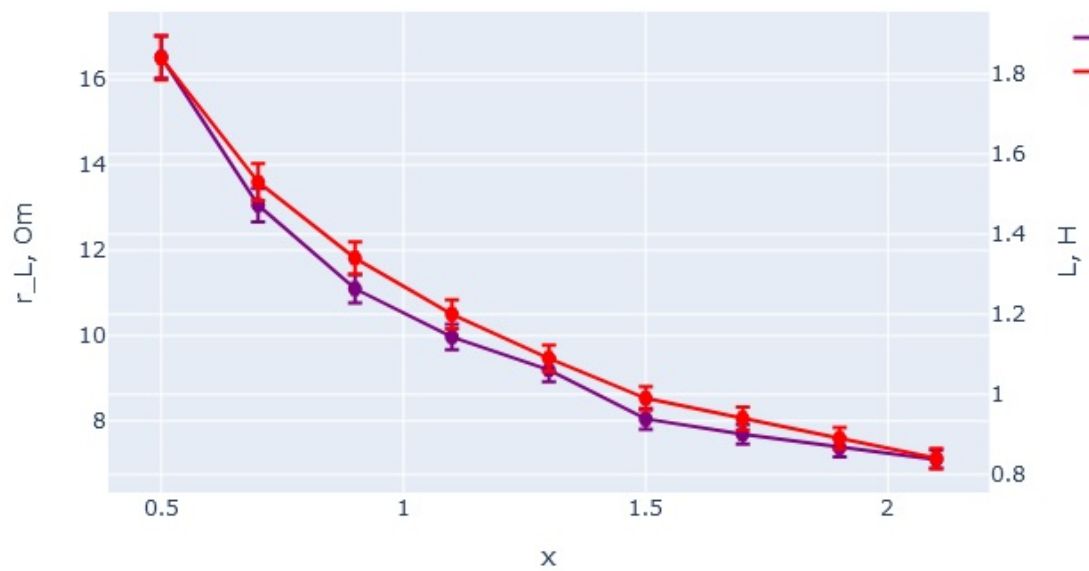
:

$$U_{L,act} = U_{L+R} \cdot \cos\psi - U_R = 9,24V$$

$$U_{L,react} = U_{L+R} \cdot \sin(\psi) = 52,47V$$

:

$$L = \frac{U_{L,react}}{I\Omega} = 1,02H$$



(1).jpg (1).bb

. 3:

$$r_L = \frac{U_{L,act}}{I} = 9,48Om$$

:

$$\sigma_{r_L} = r_L \cdot \sqrt{\left(\frac{\sigma_{U_{L,act}}}{U_{L,act}}\right)^2 + \left(\frac{\sigma_I}{I}\right)^2} \tag{16}$$

.

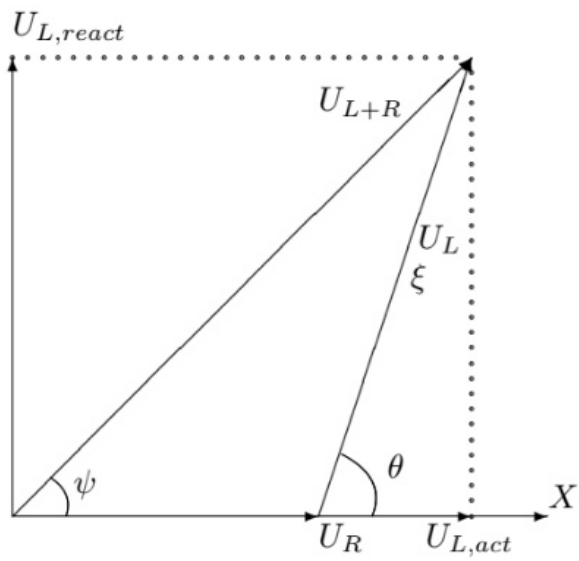
$$\sigma_L = \sigma_{U_{L+R}} + \sigma_{U_R} \tag{17}$$

(16), (17) , :

3.3

P_L
 P_L :

$$P_L = I \cdot U_L \cdot \cos(\theta)$$



. 4:

,

$$I = \frac{U_R}{R_1} \approx 0.89 \text{ A}$$

$$U_L \cdot \cos(\theta) = U_{L,act}$$

, :

$$P_L = 0.89 \text{ A} \cdot 9.24 \text{ V} \approx 8.22 \text{ Watt}$$

$$P_{L,Vect} \approx 8.22 \text{ Watt.}$$

$$P_L = 8.75 \text{ Watt.} \quad , \quad 5- \quad .$$

3.4

r_L

$$r_L = \frac{U_{\Sigma, res}}{I_{res}} - R_2 = 12.67 \text{ Om}$$

3: r_L

| I, | $U_{\Sigma},$ | $r_L, \text{ Om}$ |
|------|---------------|-------------------|
| 3,35 | 62 | 12,67 |

3.5

$L \approx r_L \approx Q \cdot (Q \approx 8))$

$$L = \frac{1}{\omega_0^2 \cdot C} \approx 12.8 \text{ H}$$

$$r_L = \frac{\omega_0 L}{Q} - R = 12,8 \text{ Om}$$

3.6

$L \approx r_L$

4: $L \approx r_L$

| | .(0 Hz) | LCR | .. | $f(I, U_{\Sigma})$ | $f(Q)$ |
|--------------------|----------|-----|------|--------------------|----------|
| $r_L \text{ , Om}$ | 2.09 | 9.2 | 9.48 | 12.67 | 12.8 |
| L , H | - | 1.6 | 1.02 | - | 1.8 |

4

$$L = (1,47 \pm 0,04) \text{ H} \quad r_L = (11,04 \pm 0,27) \text{ Om} \quad (\quad).$$