a) Dla wszystkich badanych obwodów wykonać wykresy punktowe Usk(Isk).

$R_1L_3$

| Lp. | $U_{sk}$[V] | $I_{sk}$[mA] | $I_{sk}$[A] | $f$[Hz] |
|---|---|---|---|---|
| 1 | 0.01 | 0.25 | 0.00025 | 50 |
| 2 | 1.971 | 13.12 | 0.01312 | $R_{L3}$[Ω] |
| 3 | 3.89 | 25.6 | 0.0256 | 1.3 |
| 4 | 6.11 | 40.1 | 0.0401 | $u(R_{L3})$[Ω] |
| 5 | 7.95 | 52.3 | 0.0523 | 0.1 |
| 6 | 9.7 | 63.7 | 0.0637 | |
| 7 | 12.08 | 79.3 | 0.0793 | |
| 8 | 14.23 | 93.5 | 0.0935 | |
| 9 | 16 | 105.1 | 0.1051 | |
| 10 | 17.92 | 117.9 | 0.1179 | |
| 11 | 20.24 | 133.3 | 0.1333 | |
| 12 | 22.28 | 146.9 | 0.1469 | |
| 13 | 24.11 | 159.1 | 0.1591 | |

Tabelka 1.1 Wartości zmierzonych dla obwodu RL

*b) Określanie metodą regresji liniowej współczynnika kierunkowego* $Z_L$ i u($Z_L$)

$U_{sk} = Z_L I_{sk}$

$Z_L = 151.80\ \Omega$

$u(Z_L) = 0.165367794 \approx 0.17\Omega$

*e) Dla szeregowego obwodu RL, z zależności* (15) *wyznaczyć indukcyjność L oraz jej niepewność* $uc(L)$. Obliczenia dla punktu nr 6

$R = 150\Omega$ $u_C(R) = 3\Omega$

$L_3 = L_3(Z_L, R, R_L, f)$

$u(f) = 0.87[Hz]$

$$\frac{\partial L_3}{\partial Z_L} = \frac{Z_L}{2\pi f\sqrt{Z_L{}^2-(R+R_L)^2}} = \frac{151.8}{314*\sqrt{23043.24-22891.69}} = \frac{151.8}{314*12.31056} = 0.03927$$

$$\frac{\partial L_3}{\partial f} = \frac{\sqrt{Z_L{}^2-(R+R_L)^2}}{2\pi f^2} = \frac{12.31056}{15700} = 0.000784 = 7.9E\text{-}04$$

$$\frac{\partial L_3}{\partial R} = \frac{\partial L}{\partial R_L} = -\frac{(R+R_L)}{2\pi f\sqrt{Z_L{}^2-(R+R_L)^2}} = -\frac{151.3}{314*12.31056} = -\frac{151.3}{3865.517} = -0.039141$$

$$u_C(L_3) = \sqrt{\left(\frac{\partial L}{\partial Z_L}*u(Z_L)\right)^2+\left(\frac{\partial L}{\partial R}*u(R)\right)^2+\left(\frac{\partial L}{\partial R_L}*u(R_L)\right)^2+\left(\frac{\partial L}{\partial f}*u(f)\right)^2} =$$

$$\sqrt{(0.03927*0.17)^2+(-0.03914*3)^2+(-0.03914*0.1)^2+(7.90E\text{-}04*0.87)^2} =$$

$$\sqrt{4.45676E\text{-}05+0.013788161+1.53202E\text{-}05+4.72E\text{-}07} = \sqrt{1.38E\text{-}02}$$

$$= 0.11767974 \approx 0.12[H]$$

$$L_3 = \frac{\sqrt{Z_L{}^2-(R+R_L)^2}}{2\pi f} = \frac{12.31056}{314} = 0.03921 \approx 0.04[H]$$