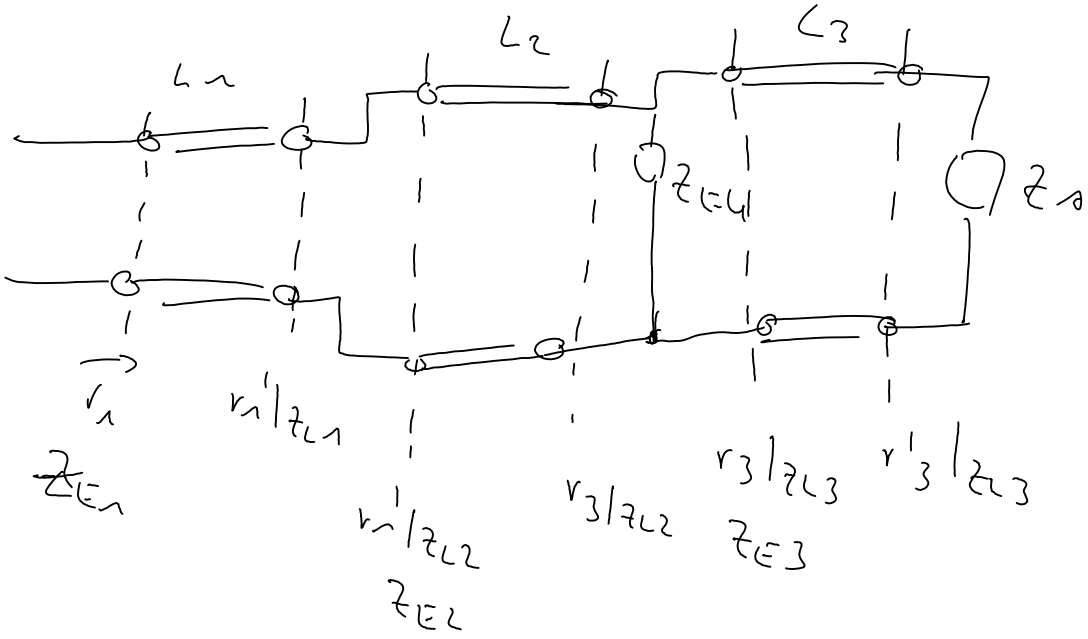
KGÜ 6

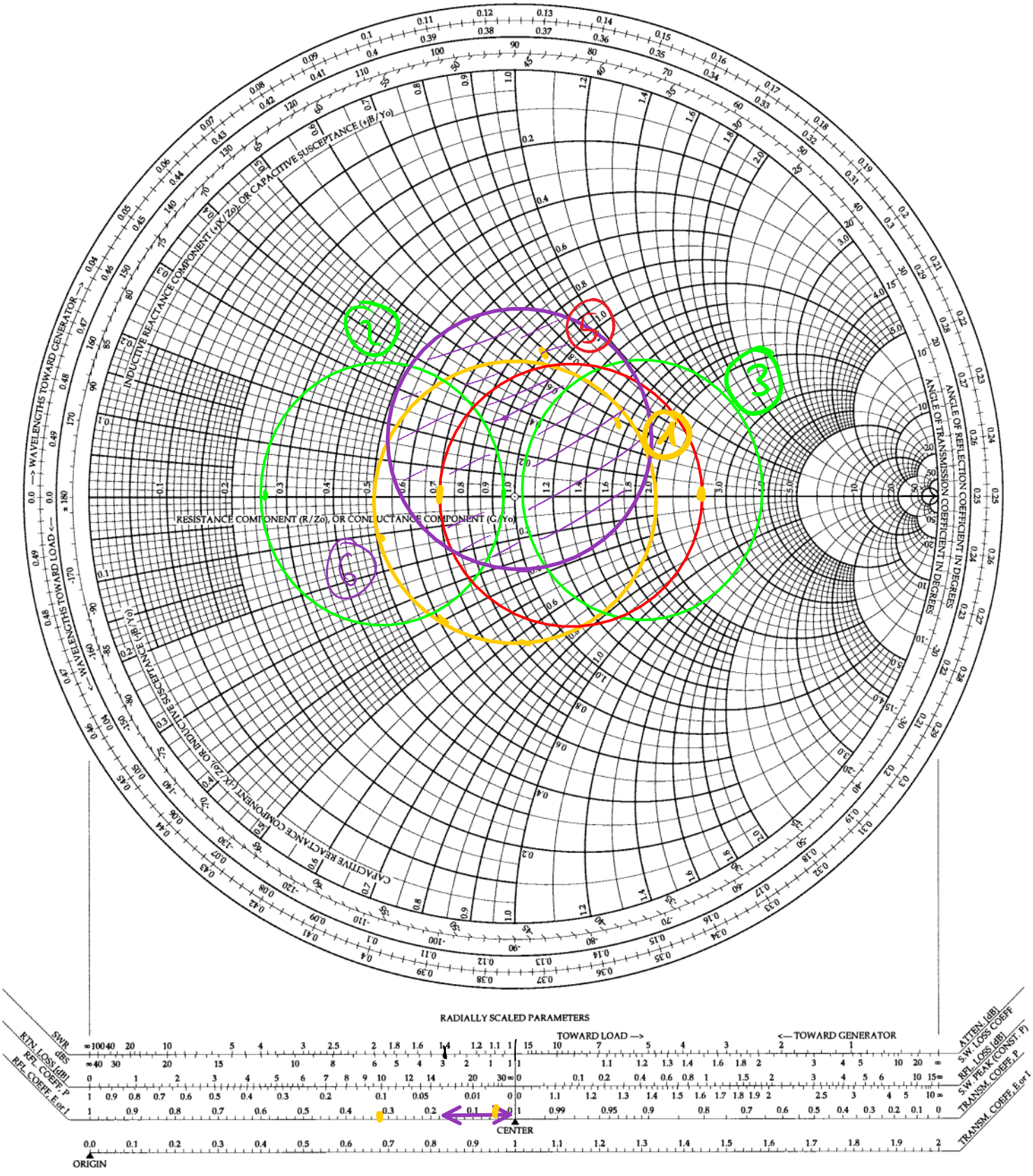
Montag, 23. Mai 2011
08:35

A 6



The Complete Smith Chart

Black Magic Design



Transformieren über L1 : $r_1 \rightarrow r_1'$

$|r_1'| \leq \frac{1}{6}$ schreiben

$|r_1'|_{z_{L1}} = |r_1| |e^{2\alpha_1 L_1}|$

$\underline{r}_1 = \underline{r}_1'|_{z_{L1}} \cdot e^{-2\gamma L_1}$

$\frac{L_1}{\lambda_0} = 60$

$L_1 = 60 \cdot \frac{c}{f_0} = 18\,m$

$|r_1'| = |r_1| \cdot |e^{2 \cdot \frac{1,5\,dB/m}{8,686\,dB/Np} \cdot 1,8\,m}|$

$1\,Np = 8,686\,dB$

$= 1,8621 \cdot |r_1|$

$|r_1| \leq \frac{1}{6}$

$|r_1'| = |r_1| \cdot 1,8621 \leq |\frac{1}{6}| \cdot 1,8621 \leq 0,3103$ (1)

Kreis $z_{L1} \rightarrow z_{L2}$ umnormieren

$r_1'|_{z_{L1}} \rightarrow r_1'|_{z_{L2}}$

$\underline{w}_{\varepsilon 2}^{L1} \rightarrow \underline{w}_{\varepsilon 2}^{L2} = \frac{z_{\varepsilon 2}}{z_{L2}} = \frac{1}{2} w_{\varepsilon 2}^{L1}$ $\quad (z_{L2} = 2 z_{L1})$

$\underline{w}_{\varepsilon 2}^{L1} = 1,9 \rightarrow w_{\varepsilon 2}^{L2} = 0,95$

$w_{\varepsilon 2}^{L1} = 0,525 \rightarrow w_{\varepsilon 2}^{L2} = 0,2625$ Kreis (2)

Transformation durch L2 ($\frac{\lambda}{4}$ - Trafo)

$\underline{r}_1' |_{Z_{L2}} \rightarrow \underline{r}_3 |_{Z_{L2}}$ Kreis (3) = Kreis (4)

Leitung 4

kurzgeschlossen $\Rightarrow r = -1$

$\frac{\lambda}{4}$ - Trafo $\Rightarrow$ Kurzschluss $\rightarrow$ Leerlauf

$\rightarrow$ ignorieren!

Umnormieren $\underline{r}_3 |_{Z_{L2}} \rightarrow \underline{r}_3 |_{Z_{L3}}$

$$\underline{w}_{\varepsilon 3}^{L3} = \frac{2}{3} w_{\varepsilon 3}^{L2}$$

$w_{\varepsilon 2}^{L2} = 3{,}9 \Rightarrow w_{\varepsilon 3}^{L2} = 2{,}6$

$w_{\varepsilon 3}^{L2} = 1{,}85 \Rightarrow w_{\varepsilon 3}^{L2} = 0{,}7$ Kreis (5)

Transformation über L3

$\frac{L_3}{Z_0} = \frac{1}{8} \Rightarrow 90°$ Drehung c^+ gegen Uhrzeigersinn

Kreis (6)

$$\underline{r}_3' \,|\, z_{L3} = \underbrace{j r_3}_{e^{j\frac{\pi}{2}}} \,|\, z_{L3}$$

3.1 $\quad 2 \cdot \lambda_n = \lambda_0$

$$\frac{L_n}{\lambda_0} = \frac{L_n}{2\lambda_n} = 60 \Rightarrow \frac{L_n}{\lambda_n} = 120 \qquad \frac{1}{2} \text{ Trafo}$$

$$\frac{L_2}{\lambda_0} = \frac{L_2}{2\lambda_n} = \frac{1}{4} \Rightarrow \frac{L_2}{\lambda_n} = \frac{1}{2} \qquad \frac{2}{2} \text{ Trafo}$$

$$\frac{L_3}{\lambda_0} = \frac{L_3}{2\lambda_n} = \frac{1}{8} \Rightarrow \frac{L_3}{\lambda_n} = \frac{1}{4} \qquad \frac{1}{4} \text{ Trafo}$$

$$\frac{L_4}{\lambda_0} = \frac{L_4}{2\lambda_n} = \frac{3}{4} \Rightarrow \frac{L_4}{\lambda_n} = \frac{3}{2} \qquad \frac{3}{2} \text{ Trafo}$$

$$\alpha_R \sim \sqrt{f} \qquad \alpha_S \sim f$$

L_4 $\frac{2}{2}$ → KS → KS

L_2 $\frac{2}{2}$ – Leitung KS → KS

$$|\underline{r}_1(f_n)| = \underbrace{|r_1' \,|\, z_{L1}|}_{\cdot} \cdot \underbrace{|e^{-2\alpha(f_n) L_n}|}_{} = 0{,}4175$$

$$|\underline{r}_1(f_1)| = \underbrace{|r_1|}_{|-1|=1} \cdot \underbrace{|e^{\dots}|}_{=0{,}4151} = \underline{\underline{0{,}4151}}$$

$$\alpha_1(f_1) = \sqrt{2}\;\alpha_1(f_0)$$

1.2) $|r| \approx 0{,}18$

$$S = \text{VSWR} = 1{,}4$$

$$\Rightarrow |r| = \frac{1}{6}$$

$$S = \frac{1+|r|}{1-|r|} \Leftrightarrow S(1-|r|) = 1+|r|$$

$$|r| = \frac{S-1}{S+1} = \frac{1}{6}$$

1.4) $\frac{\ell_1}{d_1} = 3{,}49$

1.5) $\varepsilon_r' = 5{,}427$