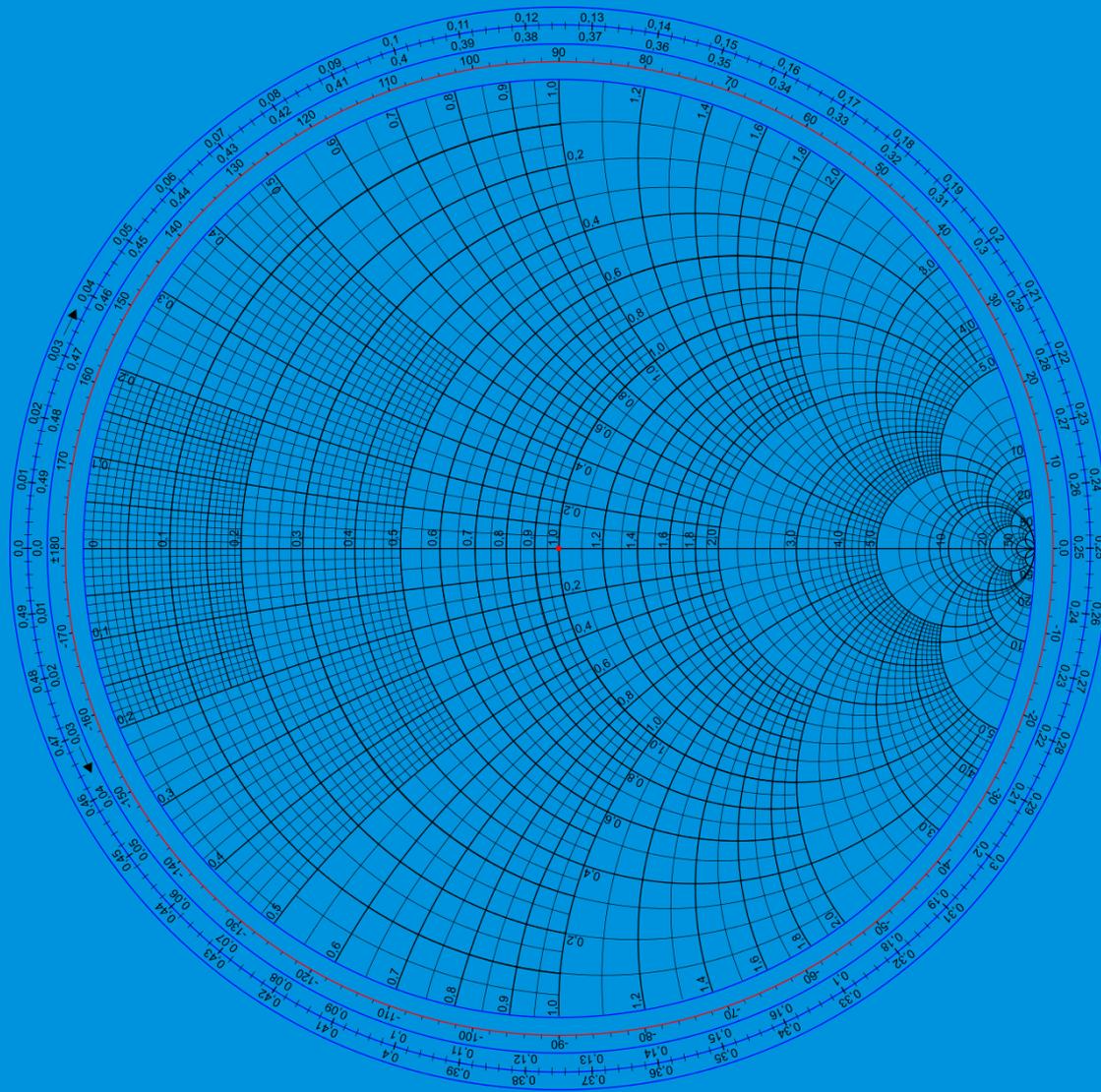


Workshop Anpassung Antennen

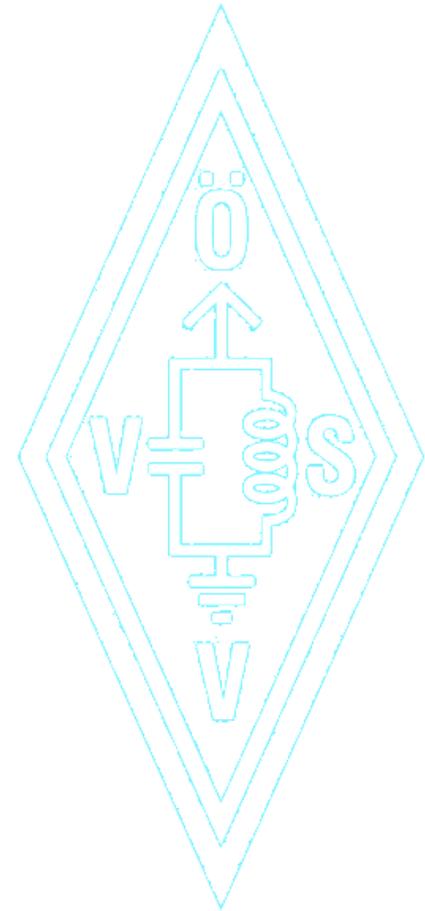


40 Smith Diagram

2014-09-20
OE3HBS

Agenda

- 1) Einleitung
- 2) Anwendungen
- 3) Programm SimSmith
- 4) Anwendungen mit SimSmith
- 5) Links



Einleitung

Normierung

Impedanz

$$Z = R + jX$$

Wirk-
widerstand Blind-
widerstand

normierte Impedanz

$$z = \frac{Z}{Z_L}$$

Z_L Leitungswellenwiderstand

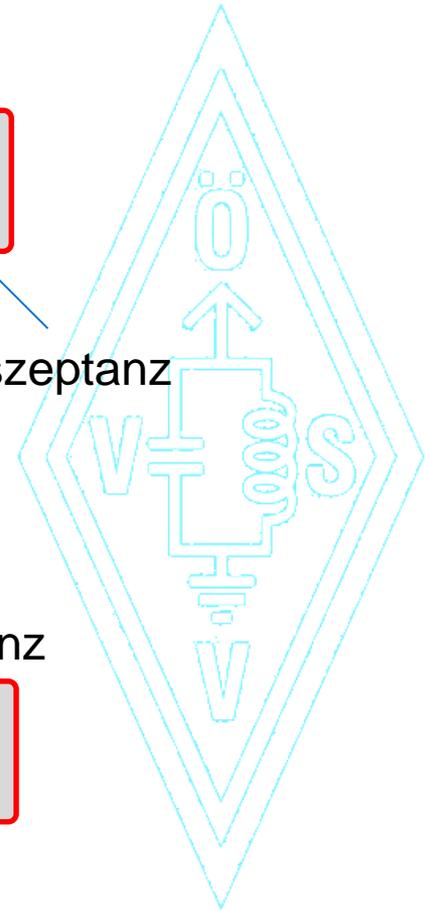
Admittanz

$$Y = G + jB$$

Konduktanz Suszeptanz

normierte Admittanz

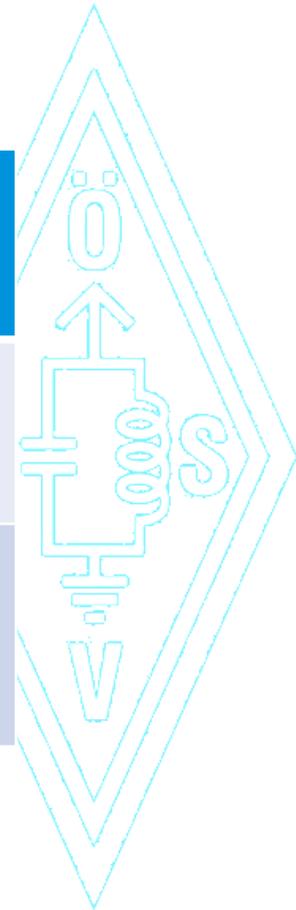
$$y = Y Z_L$$



Einleitung

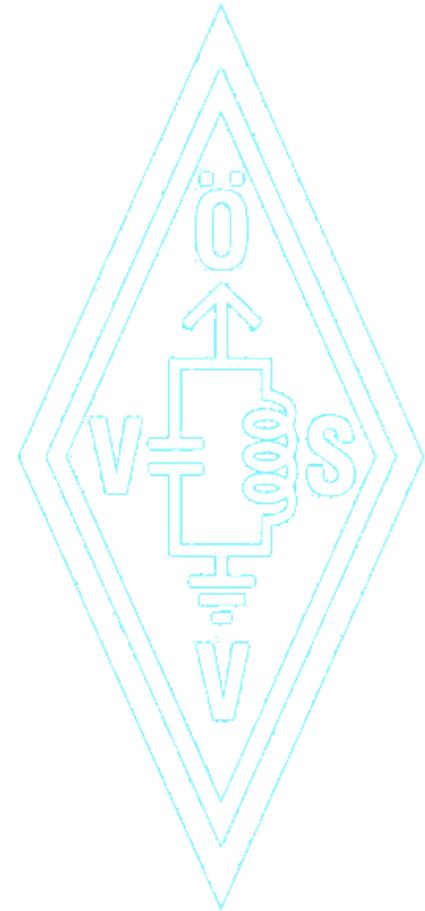
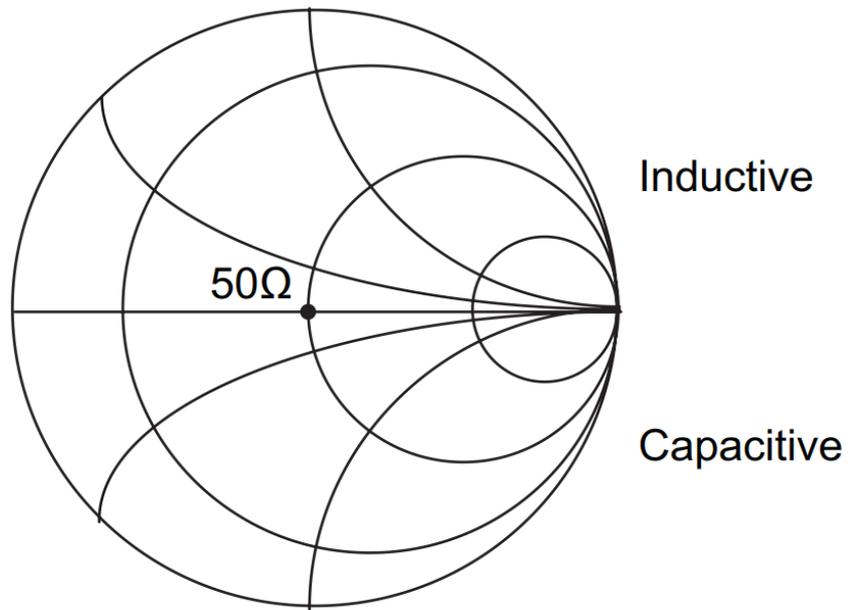
Normierung von **R**, **L** und **C**

Normierung	Element			Schaltung
	R	L	C	
$z = \frac{Z}{Z_L}$	$\frac{R}{Z_L}$	$\frac{j\omega L}{Z_L}$	$-j \frac{1}{\omega C Z_L}$	Serien
$y = Y Z_L$	$\frac{Z_L}{R}$	$-j \frac{Z_L}{\omega L}$	$j\omega C Z_L$	Parallel

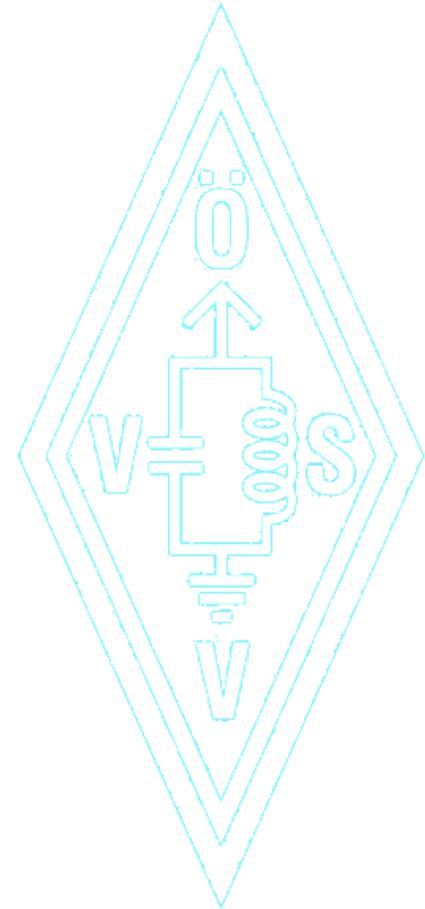
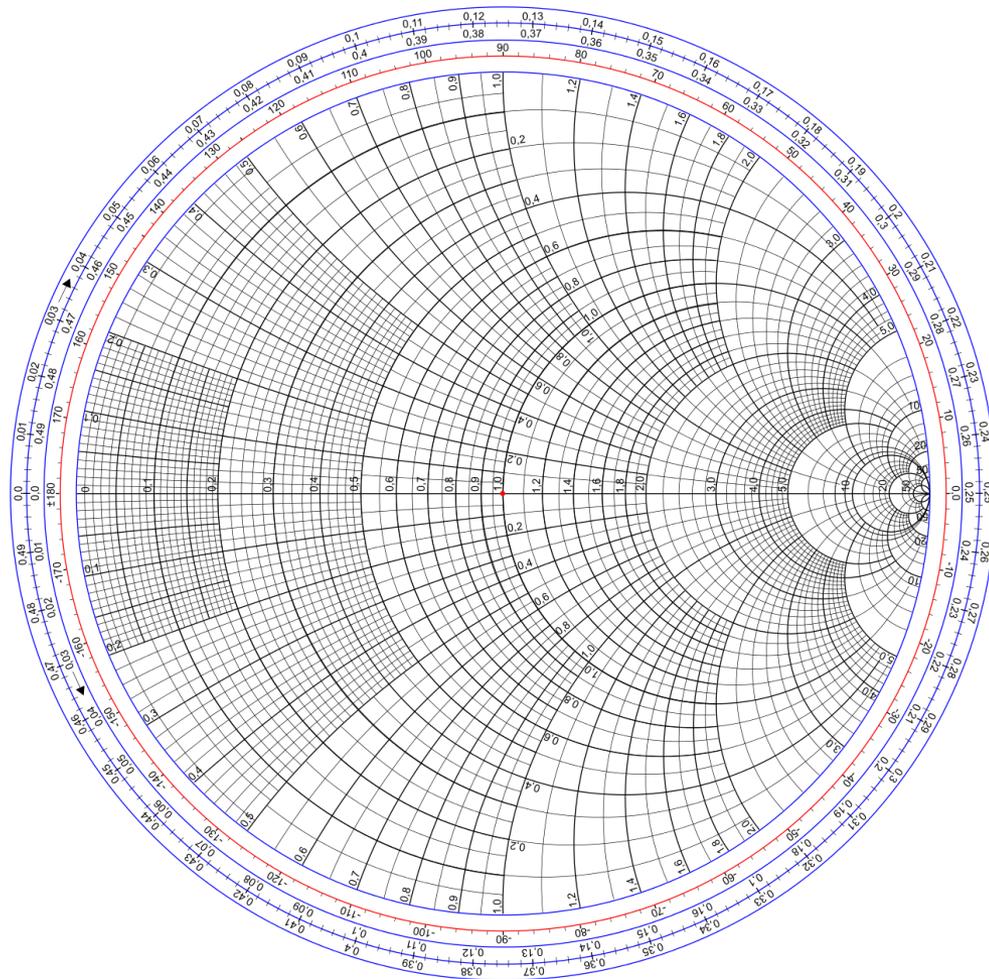


Smith Diagramm

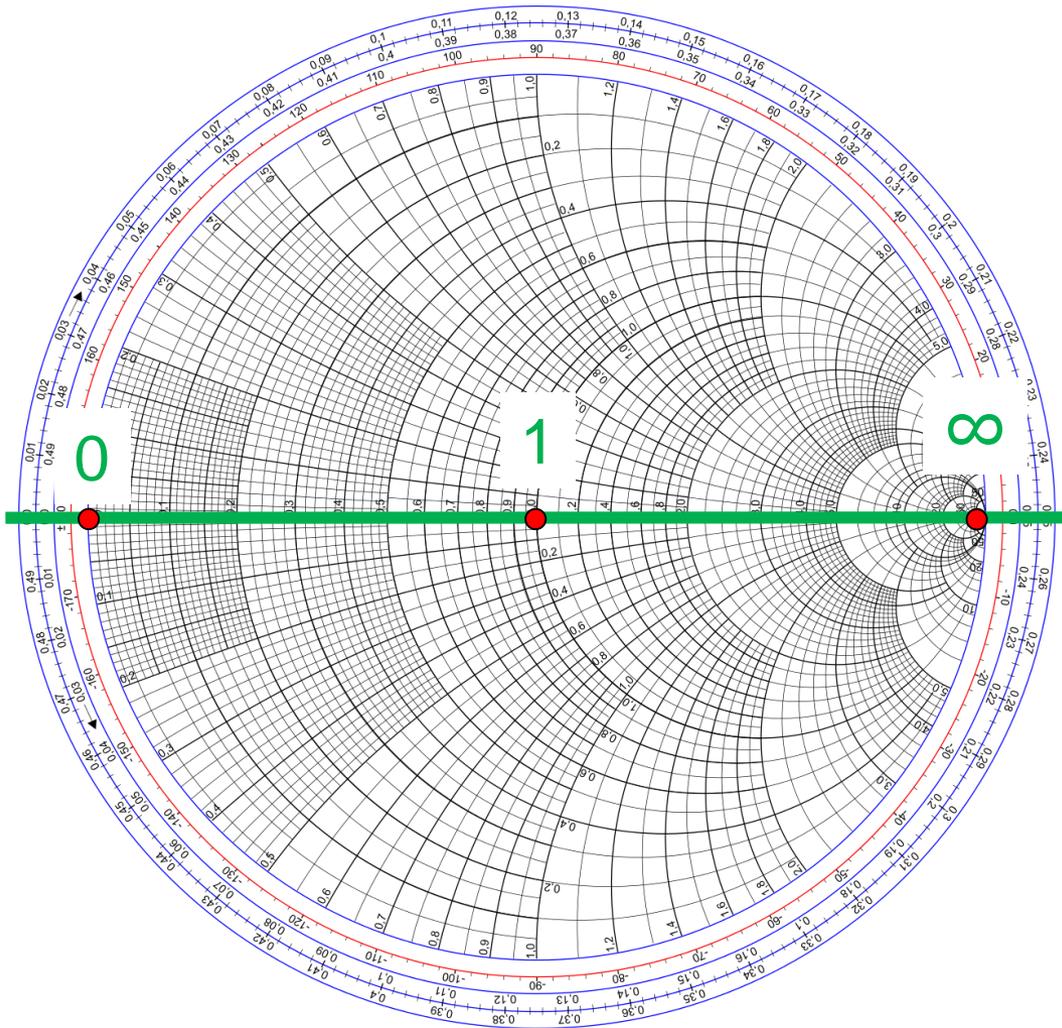
Smith Chart



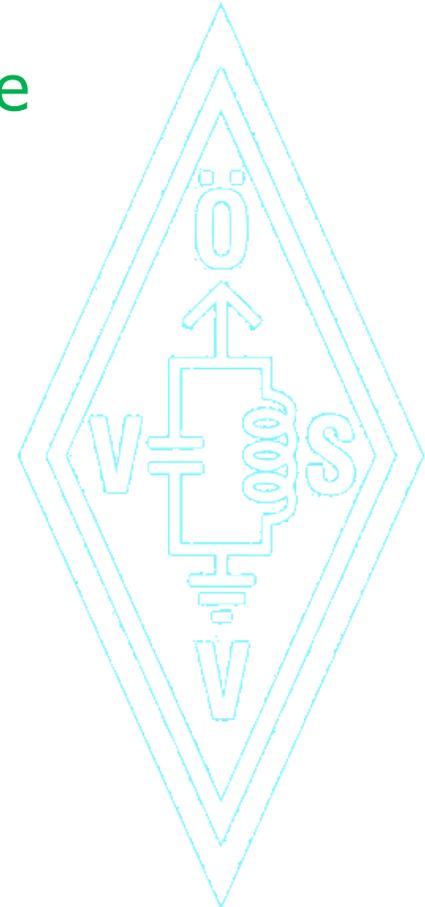
Smith Diagramm



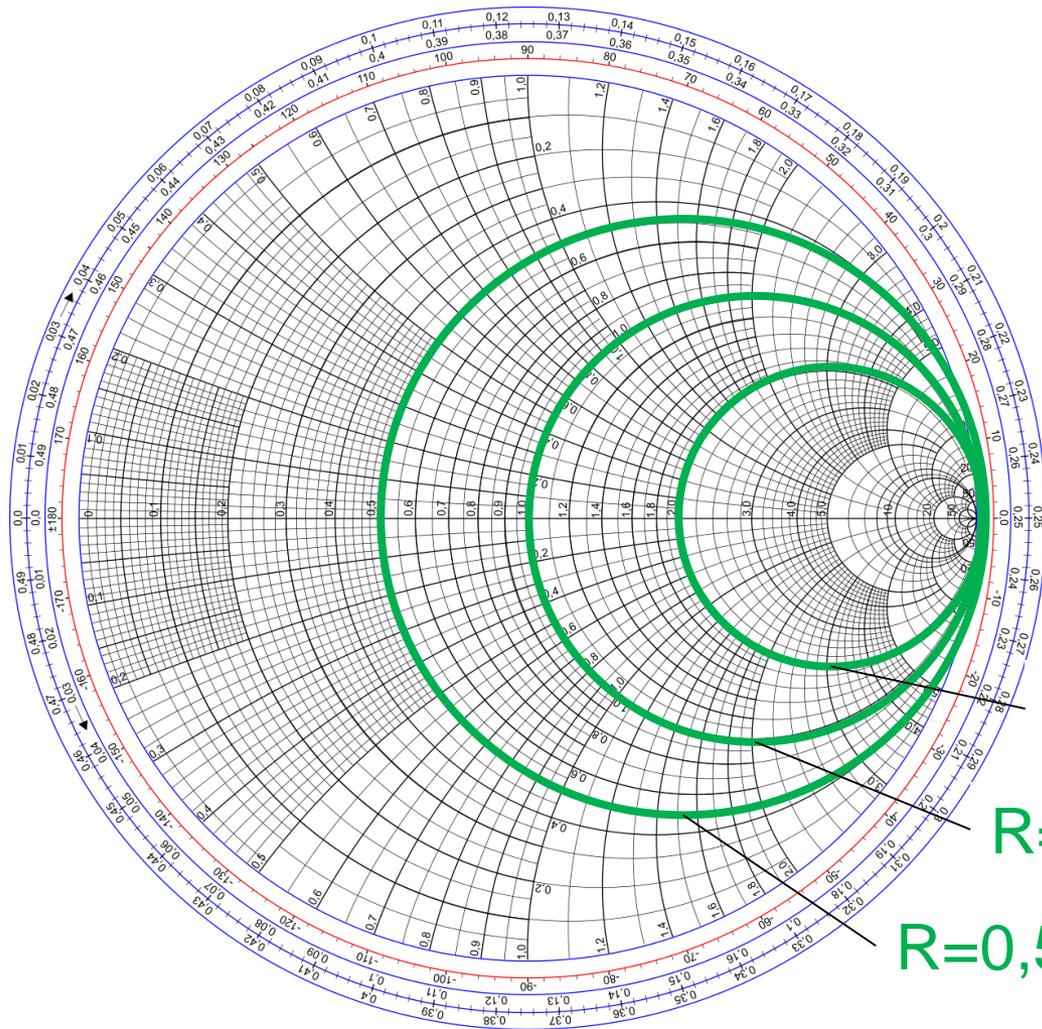
Smith Diagramm



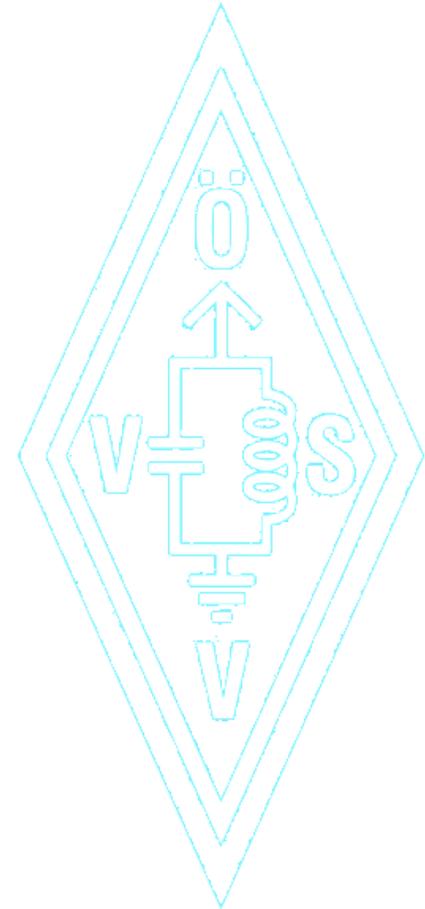
Widerstände



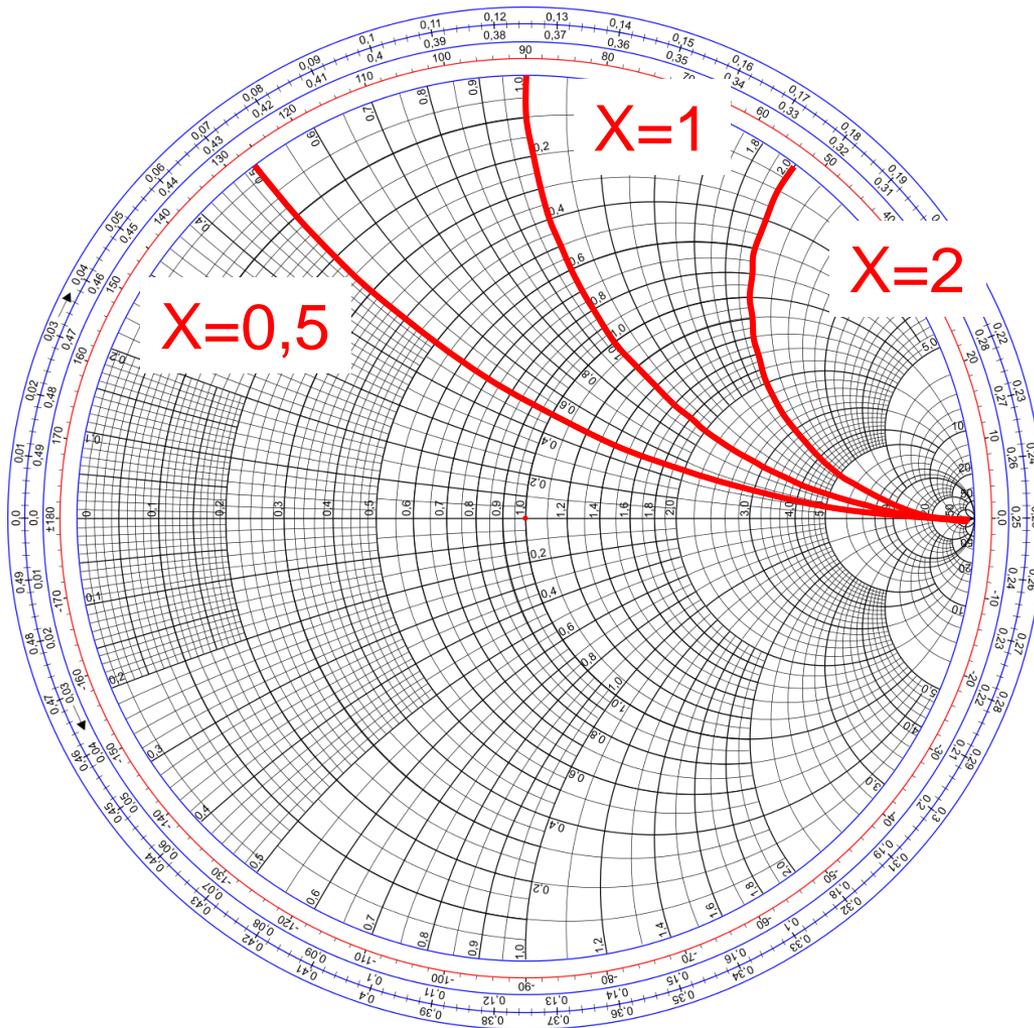
Smith Diagramm



konstanter
Realteil

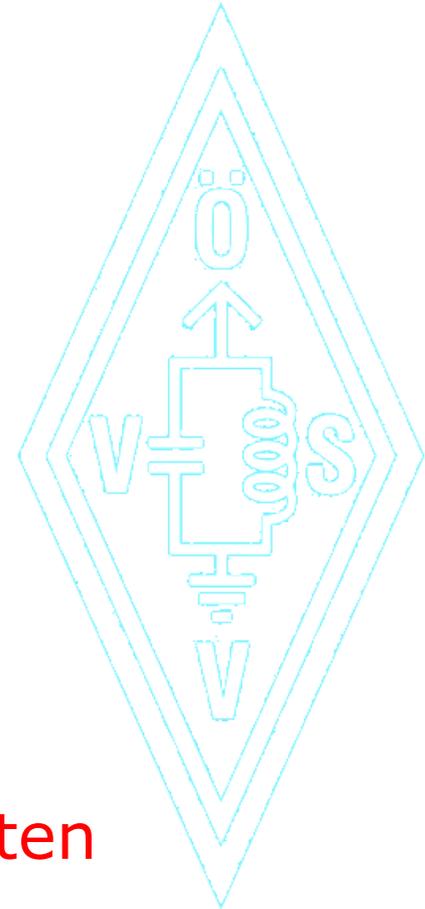


Smith Diagramm

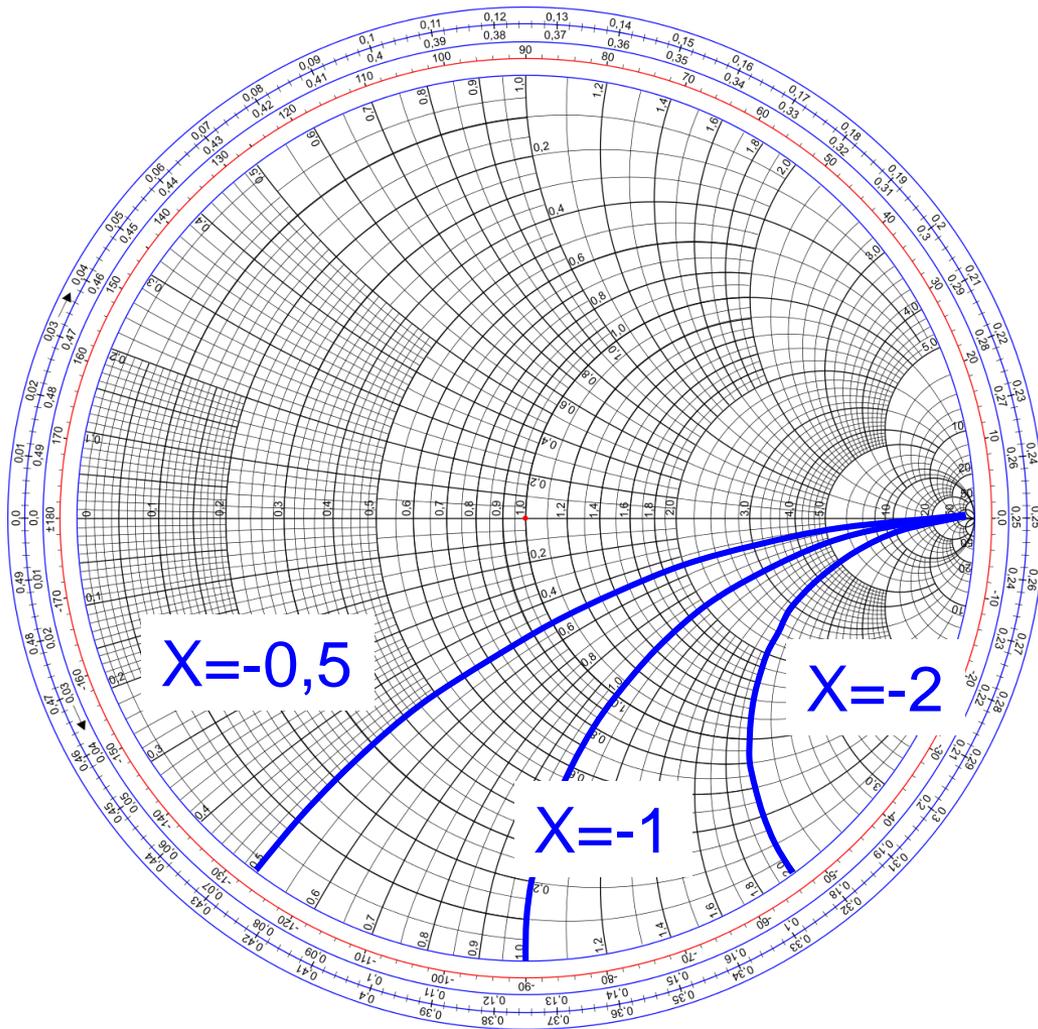


konstanter
positiver
Blindanteil

Induktivitäten

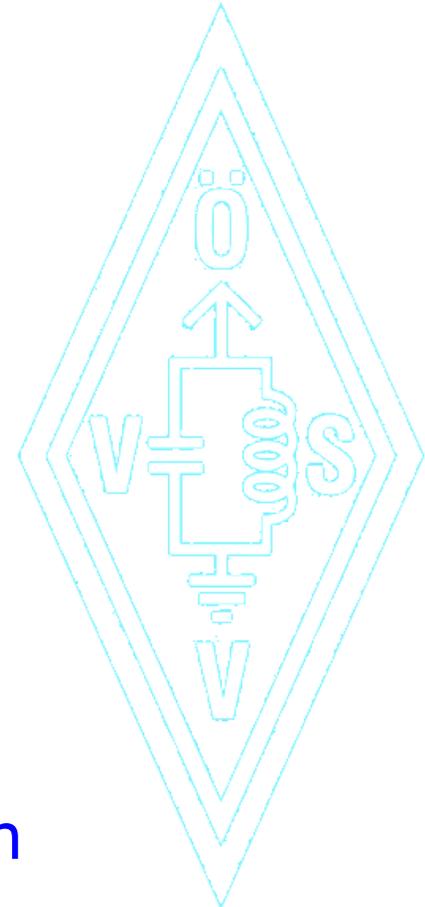


Smith Diagramm

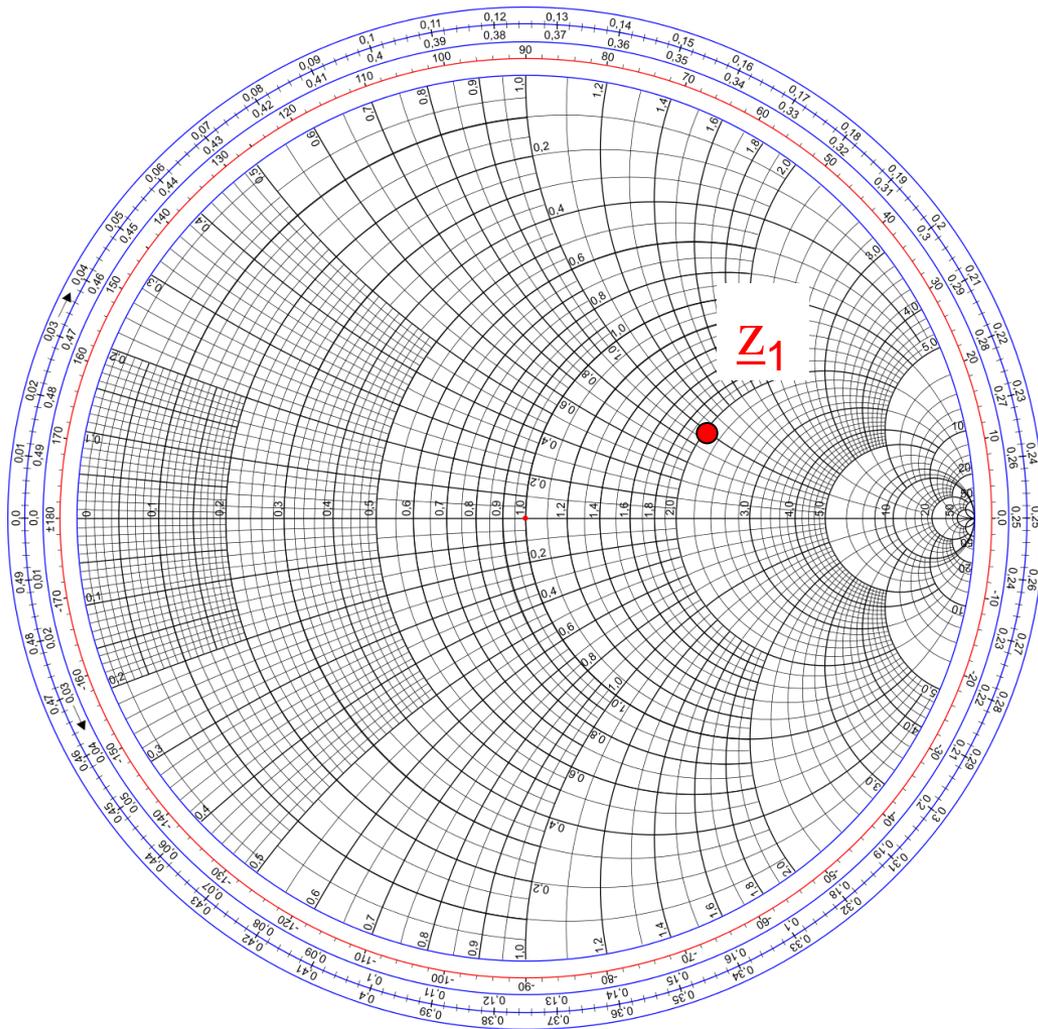


konstanter
negativer
Blindanteil

Kapazitäten



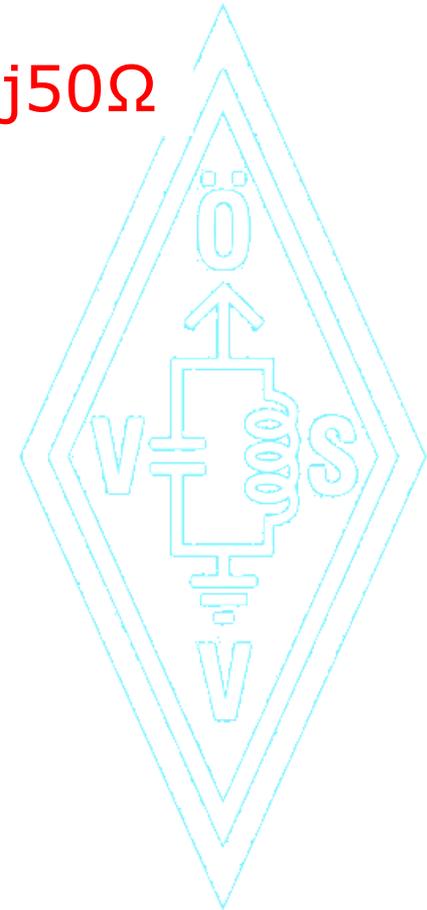
Smith Diagramm



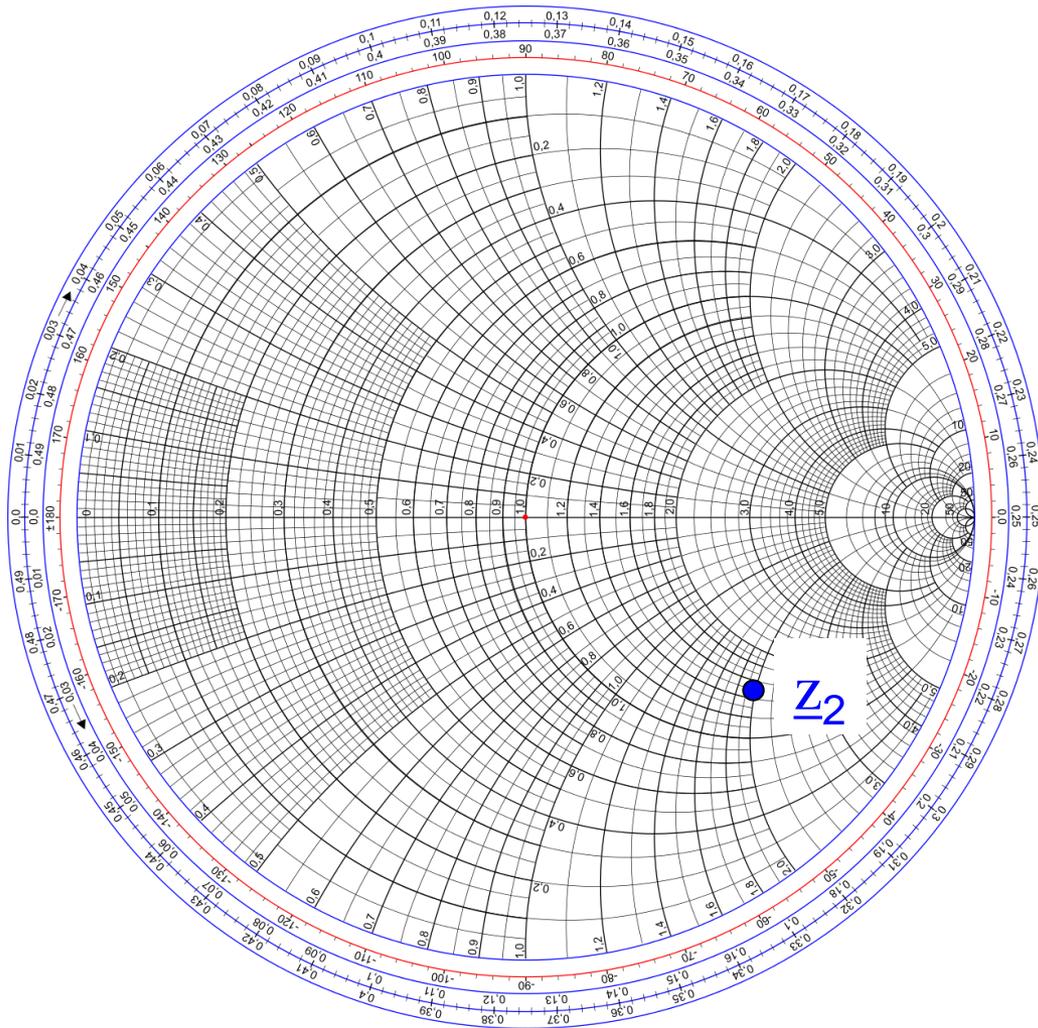
$$\underline{Z}_0 = 50\Omega$$

$$\underline{Z}_1 = 100 + j50\Omega$$

$$\underline{z}_1 = 2 + j1$$



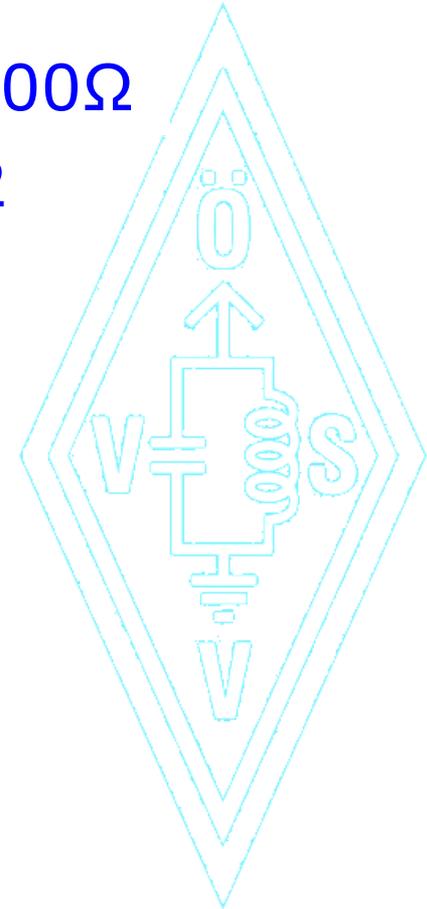
Smith Diagramm



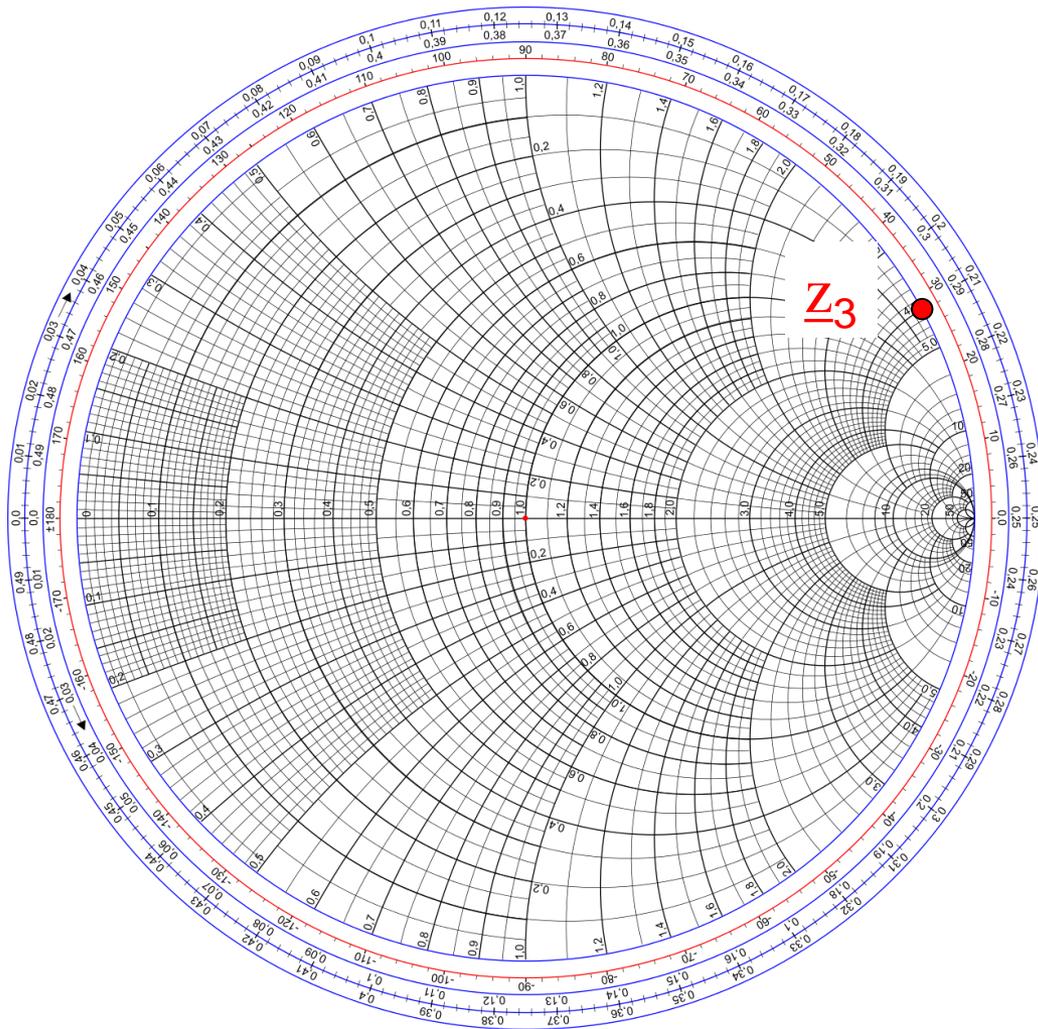
$$\underline{Z}_0 = 50\Omega$$

$$\underline{Z}_2 = 75 - j100\Omega$$

$$\underline{z}_2 = 1,5 - j2$$



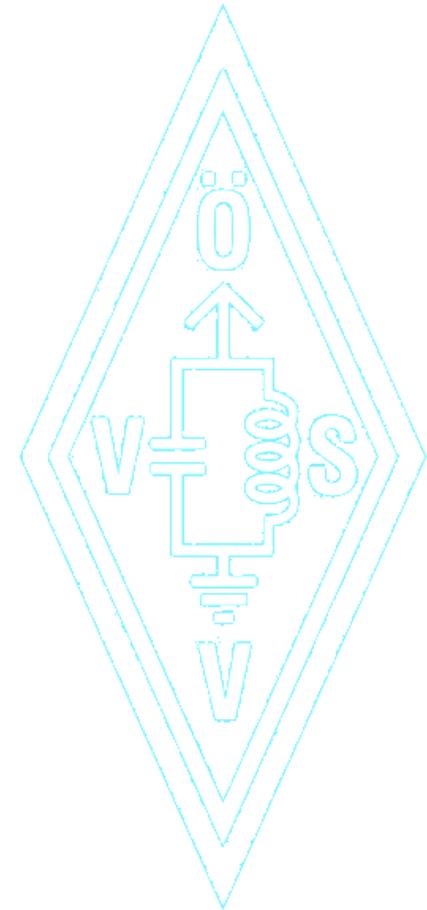
Smith Diagramm



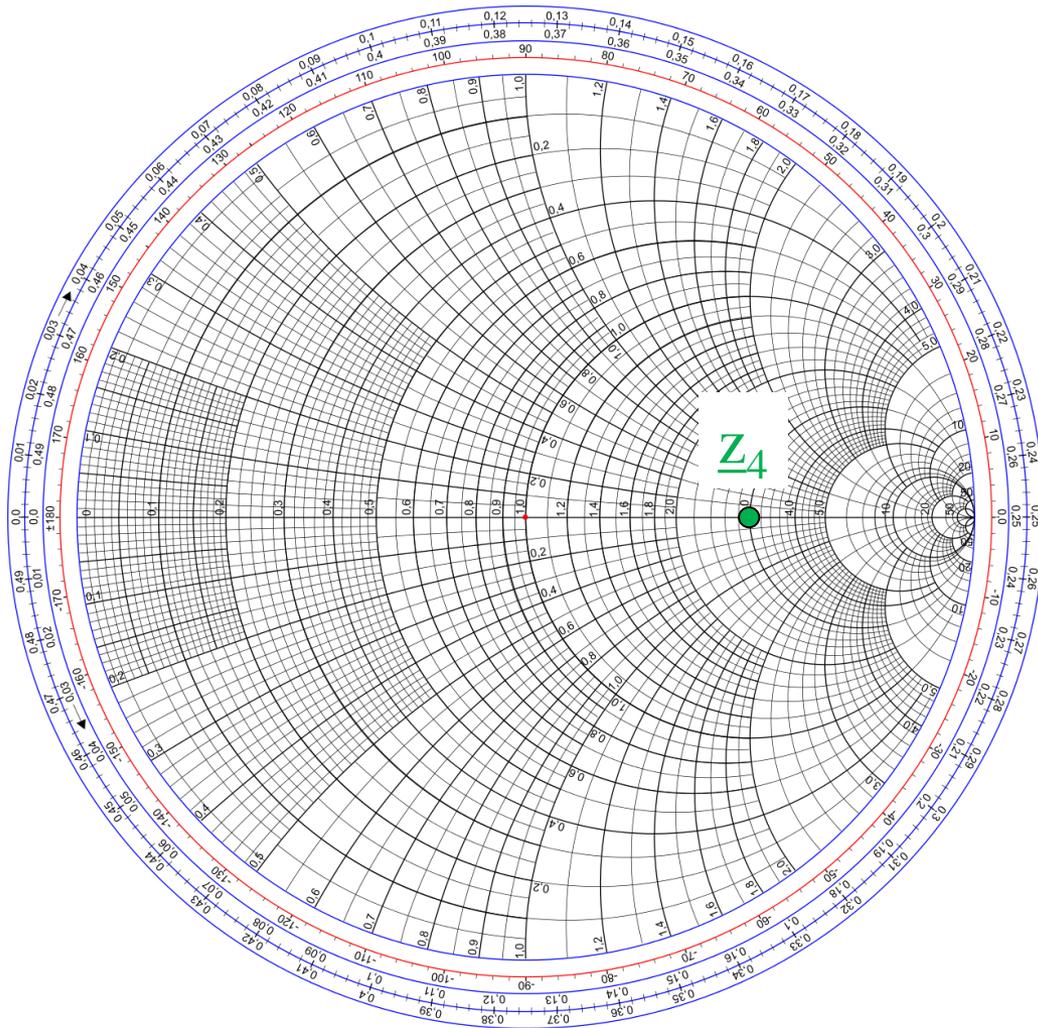
$$\underline{Z}_0 = 50\Omega$$

$$\underline{Z}_3 = j200\Omega$$

$$\underline{z}_3 = j4$$



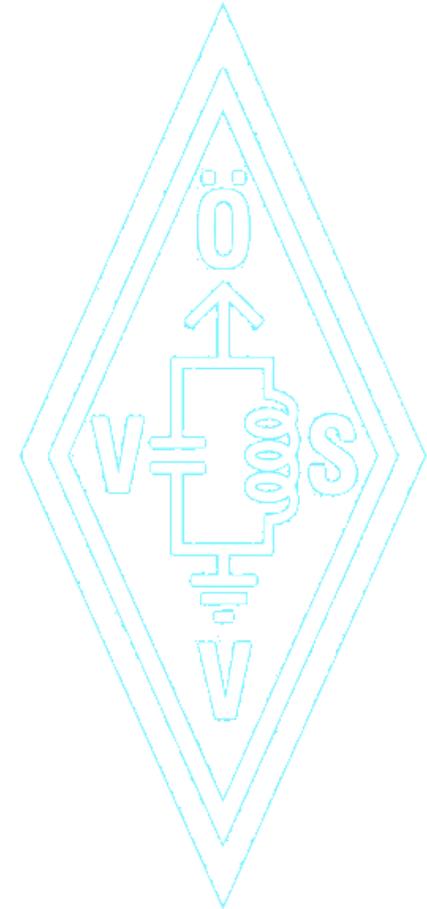
Smith Diagramm



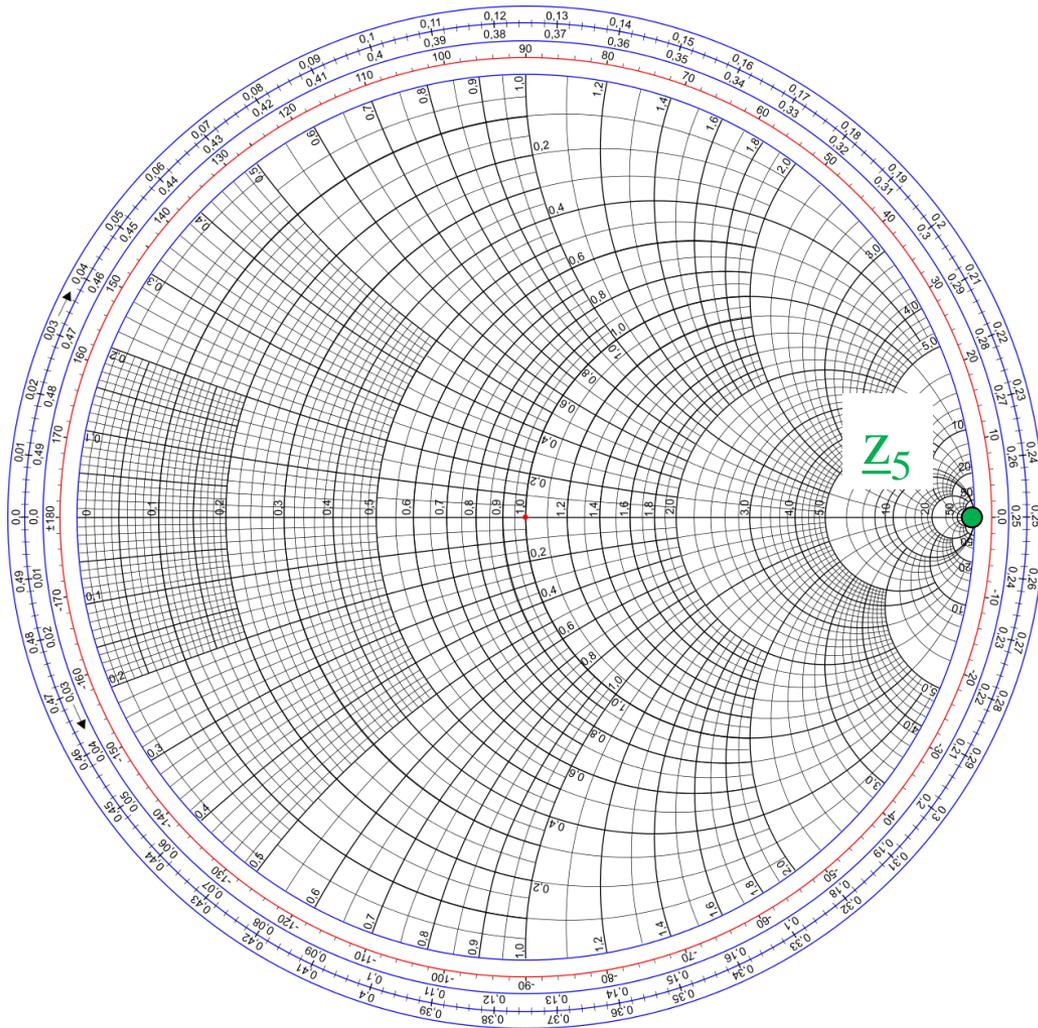
$$\underline{Z}_0 = 50\Omega$$

$$\underline{Z}_4 = 150\Omega$$

$$\underline{z}_4 = 3$$



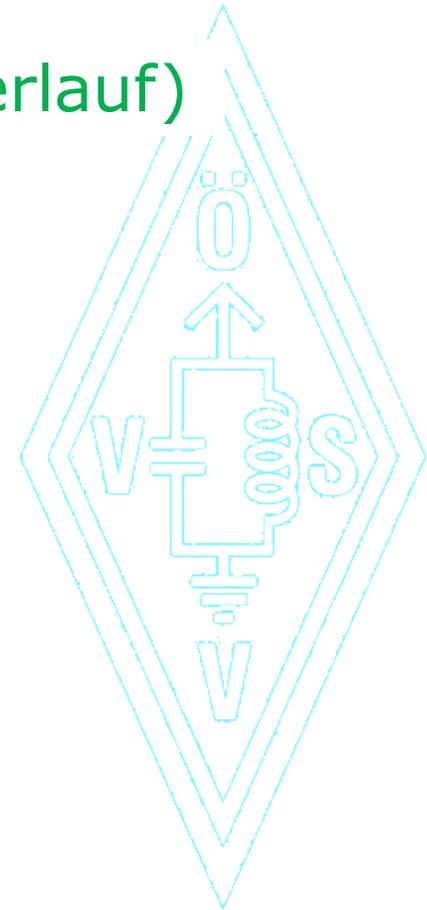
Smith Diagramm



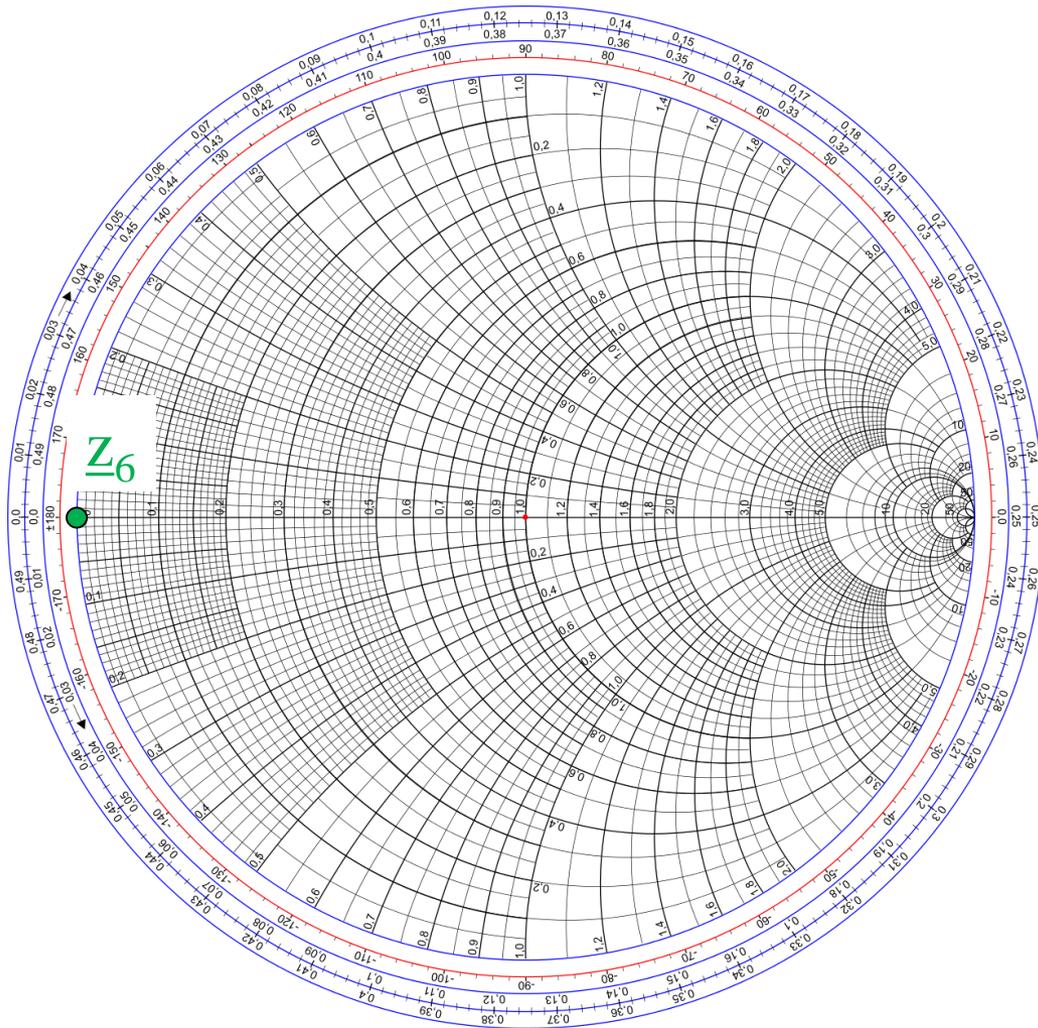
$$\underline{Z}_0 = 50\Omega$$

$$\underline{Z}_5 = \infty \text{ (Leerlauf)}$$

$$\underline{Z}_5 = \infty$$



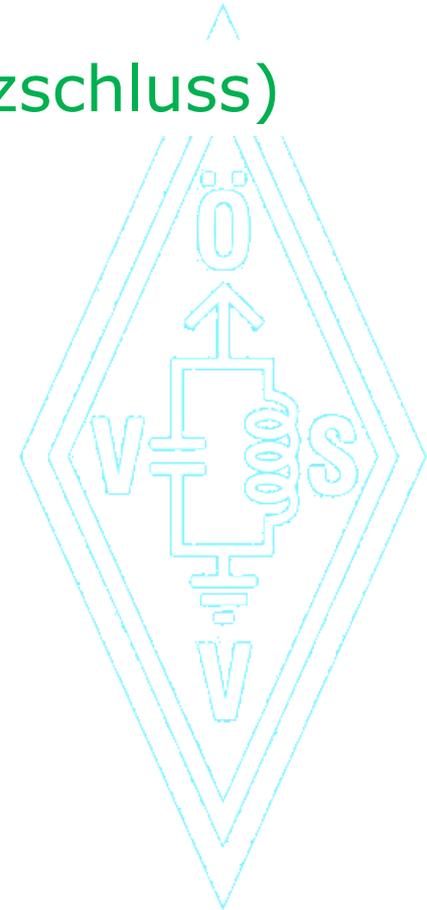
Smith Diagramm



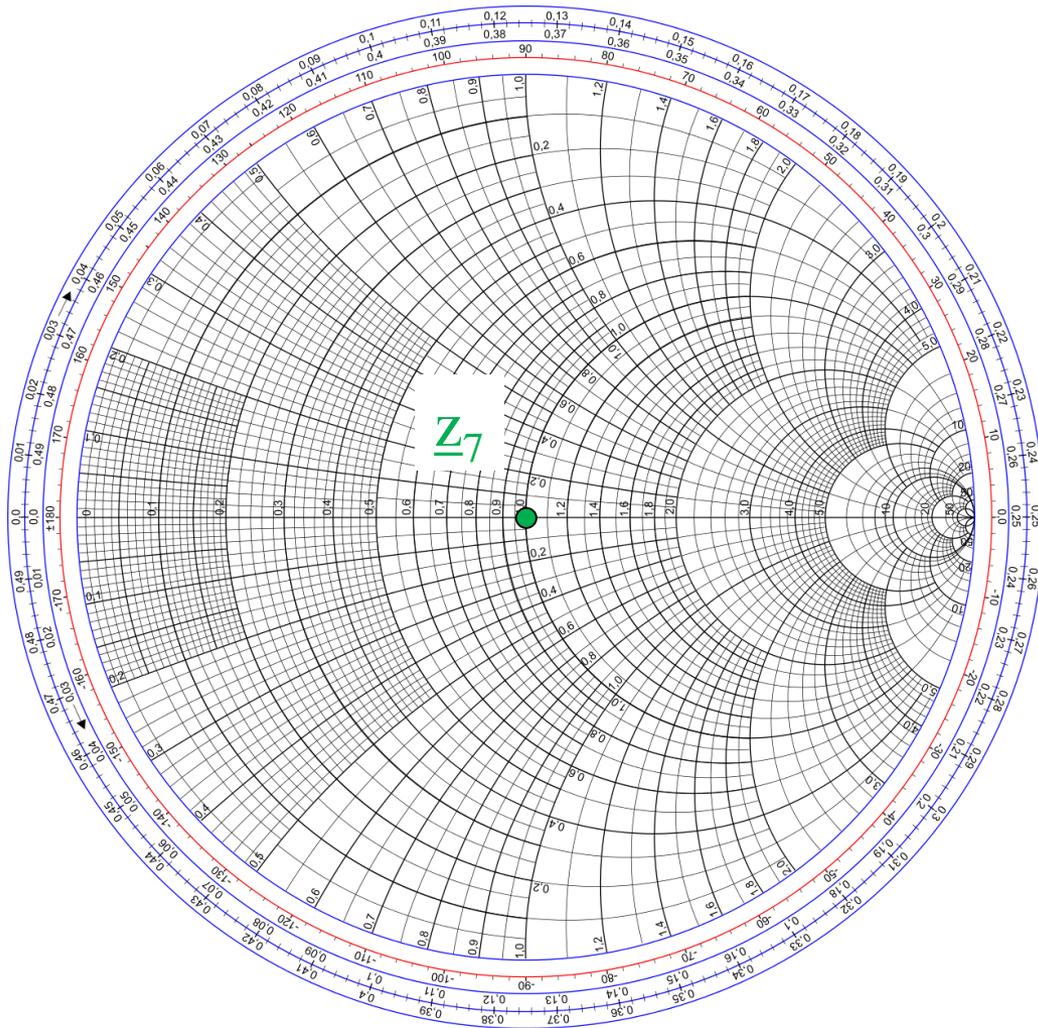
$$\underline{Z}_0 = 50\Omega$$

$$\underline{Z}_6 = 0 \text{ (Kurzschluss)}$$

$$\underline{z}_6 = 0$$



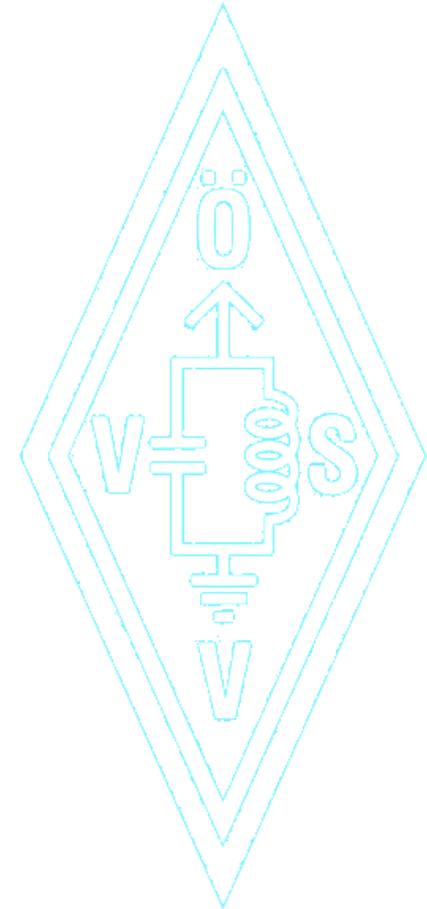
Smith Diagramm



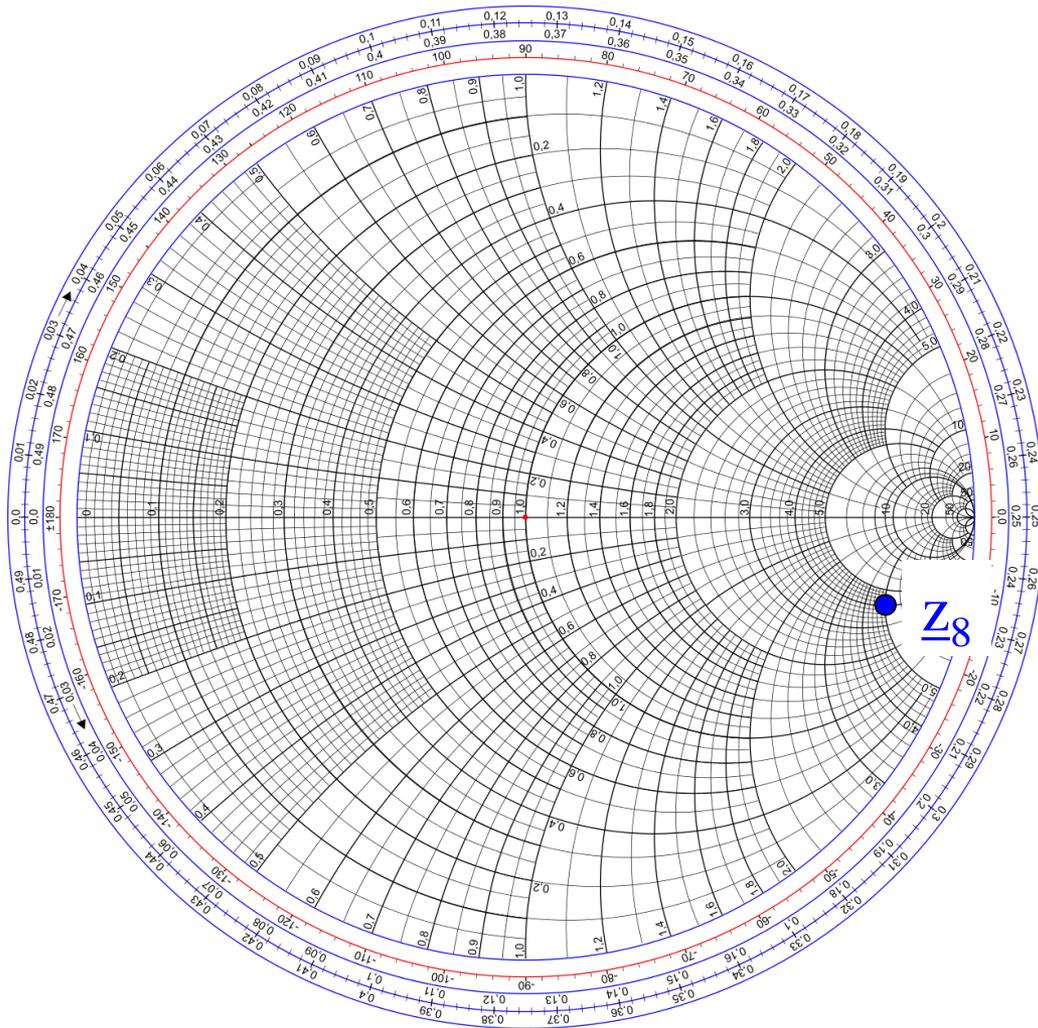
$$\underline{Z}_0 = 50\Omega$$

$$\underline{Z}_7 = 50\Omega$$

$$\underline{z}_7 = 1$$



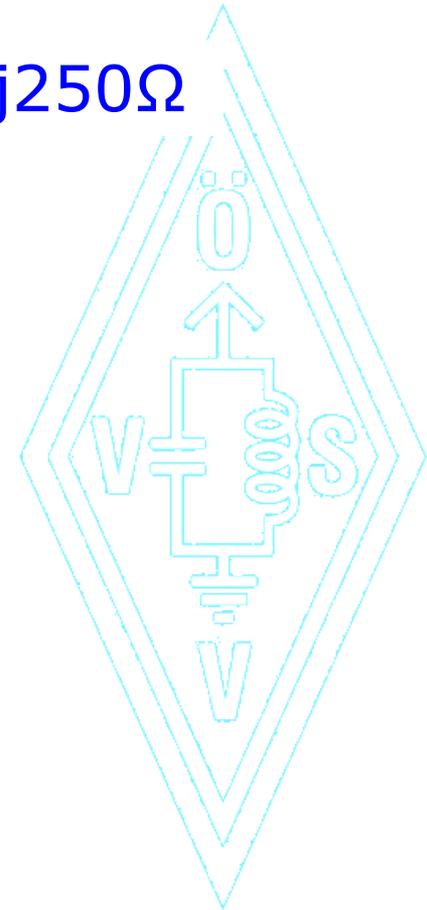
Smith Diagramm



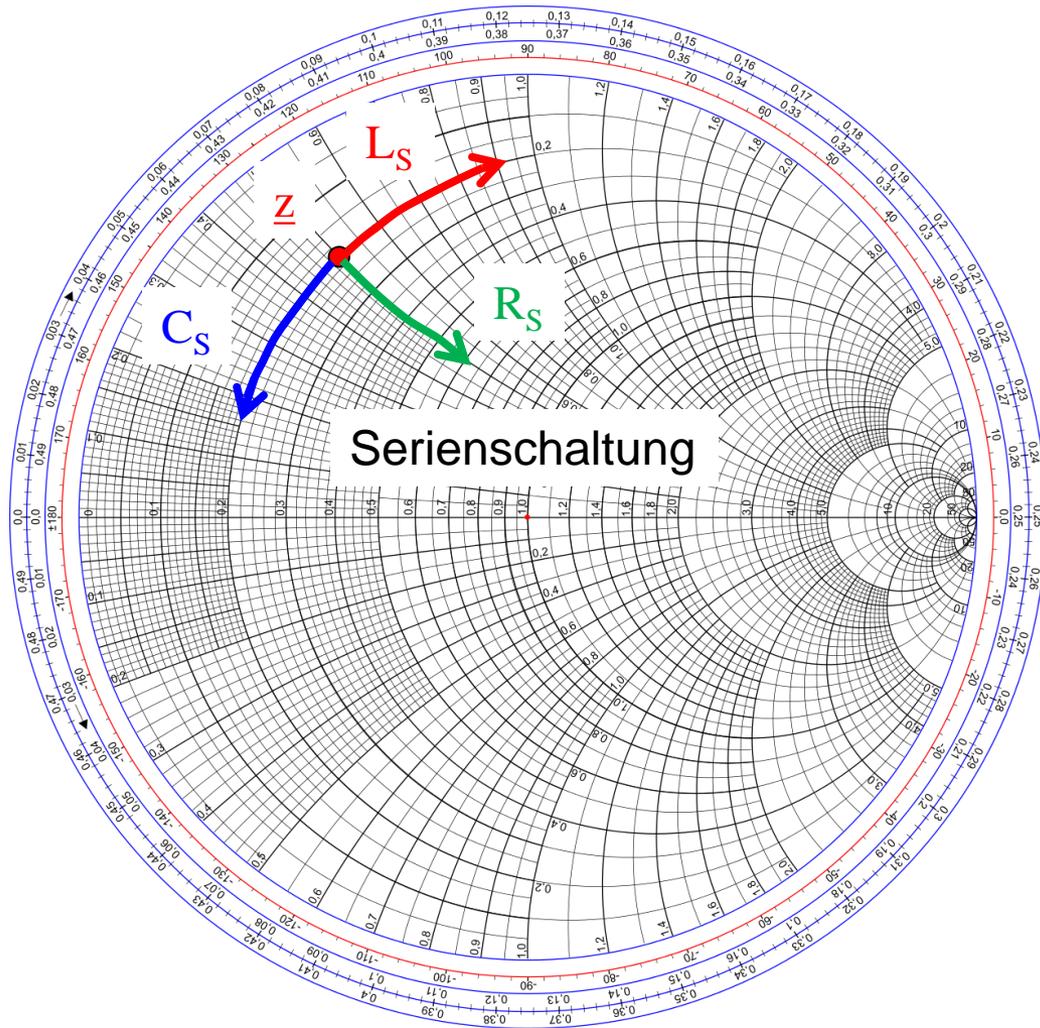
$$\underline{Z}_0 = 50 \Omega$$

$$\underline{Z}_8 = 200 - j250 \Omega$$

$$\underline{z}_8 = 4 - j5$$



Smith Diagramm

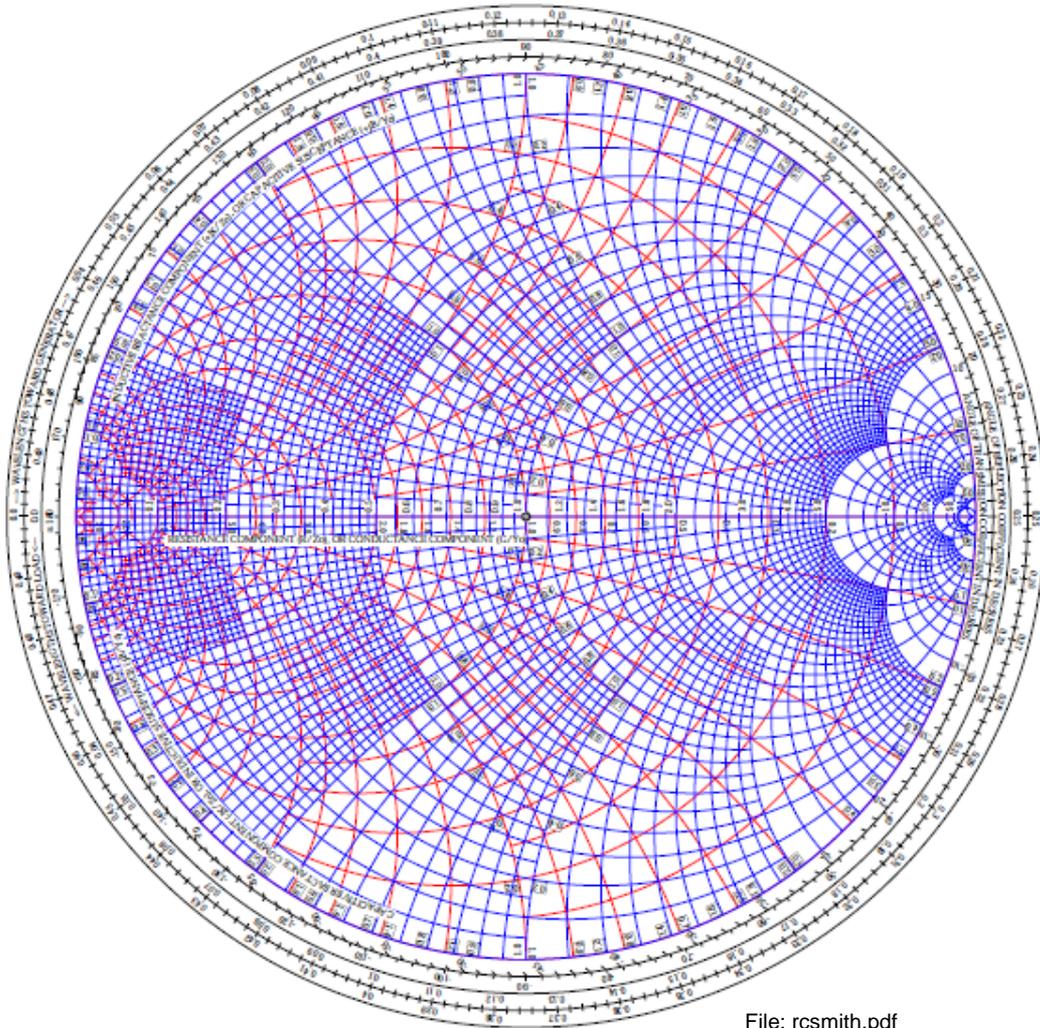


Serienschaltung

Verschiebungsrichtung im Smith Diagramm durch Zuschalten von konzentrierten Bauelementen R , L und C

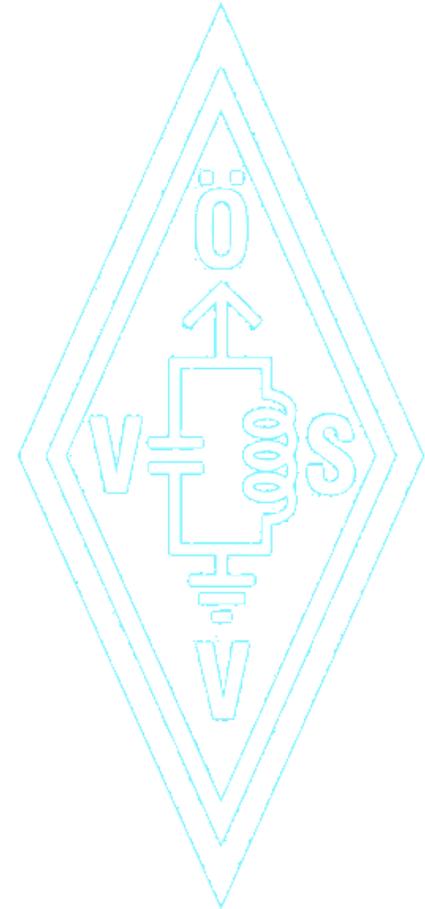


Smith Diagramm



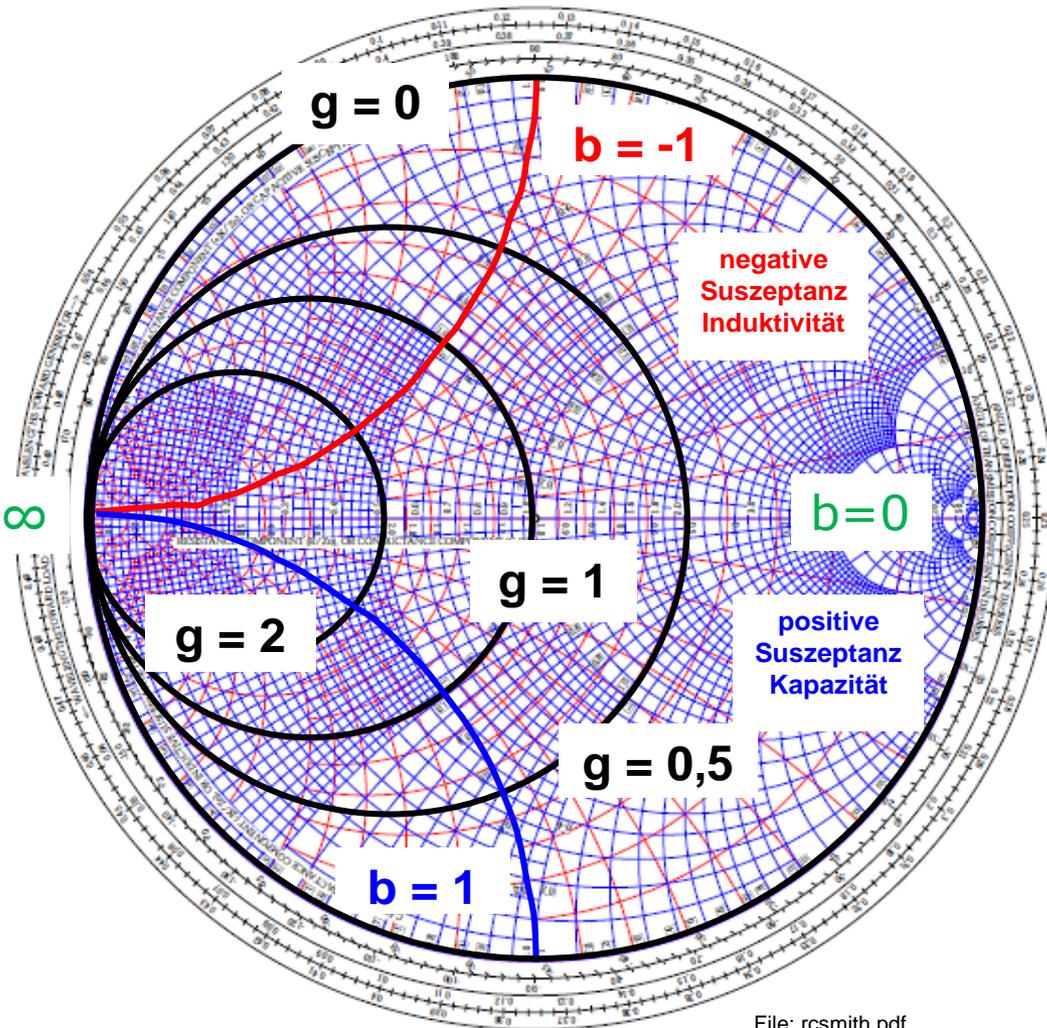
File: rcsmith.pdf

Impedanz
und
Admittanz
Chart



Smith Diagramm

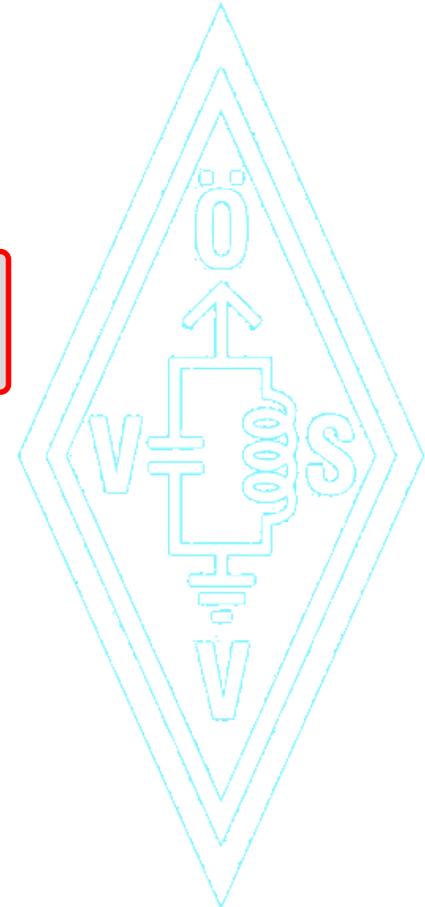
Parallelschaltung



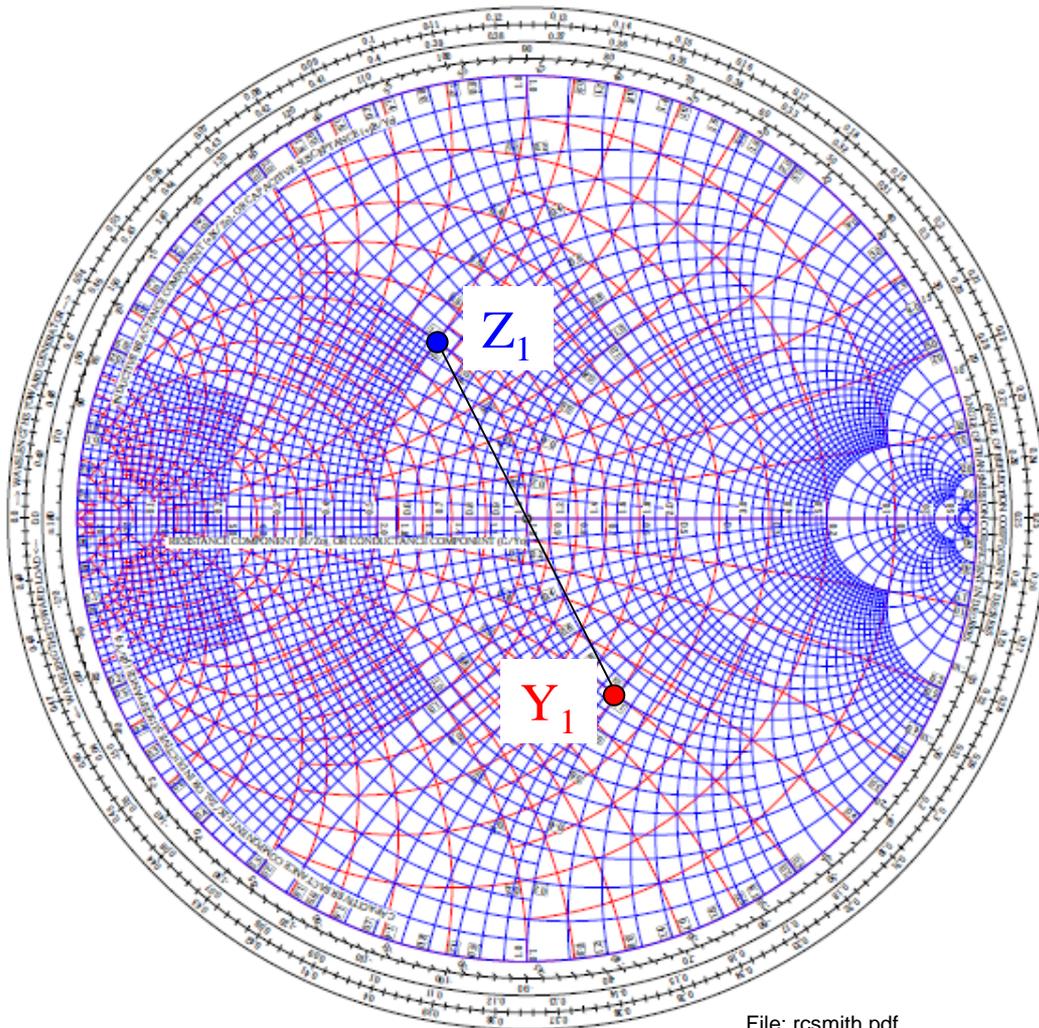
File: rcsmith.pdf

Admittanz

$$Y = G + jB$$



Smith Diagramm



File: rcsmith.pdf

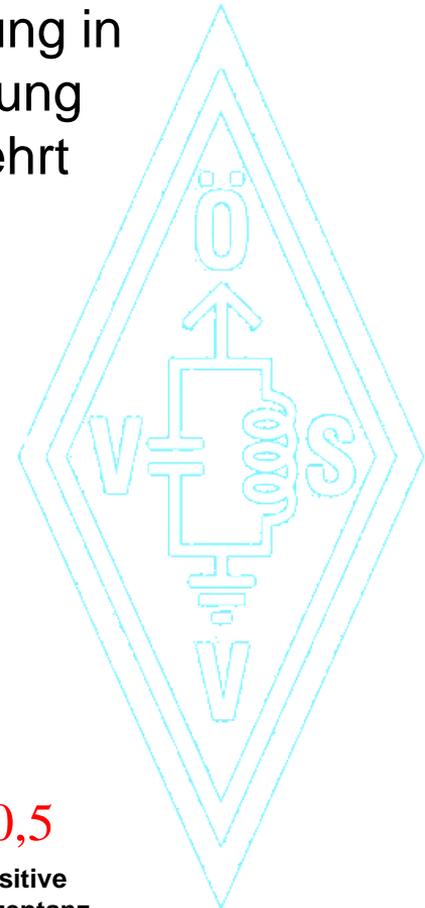
Umwandeln von
Parallelschaltung in
Serienschaltung
und umgekehrt

$$Z_1 = R + jX$$
$$Z_1 = 2 + j2$$

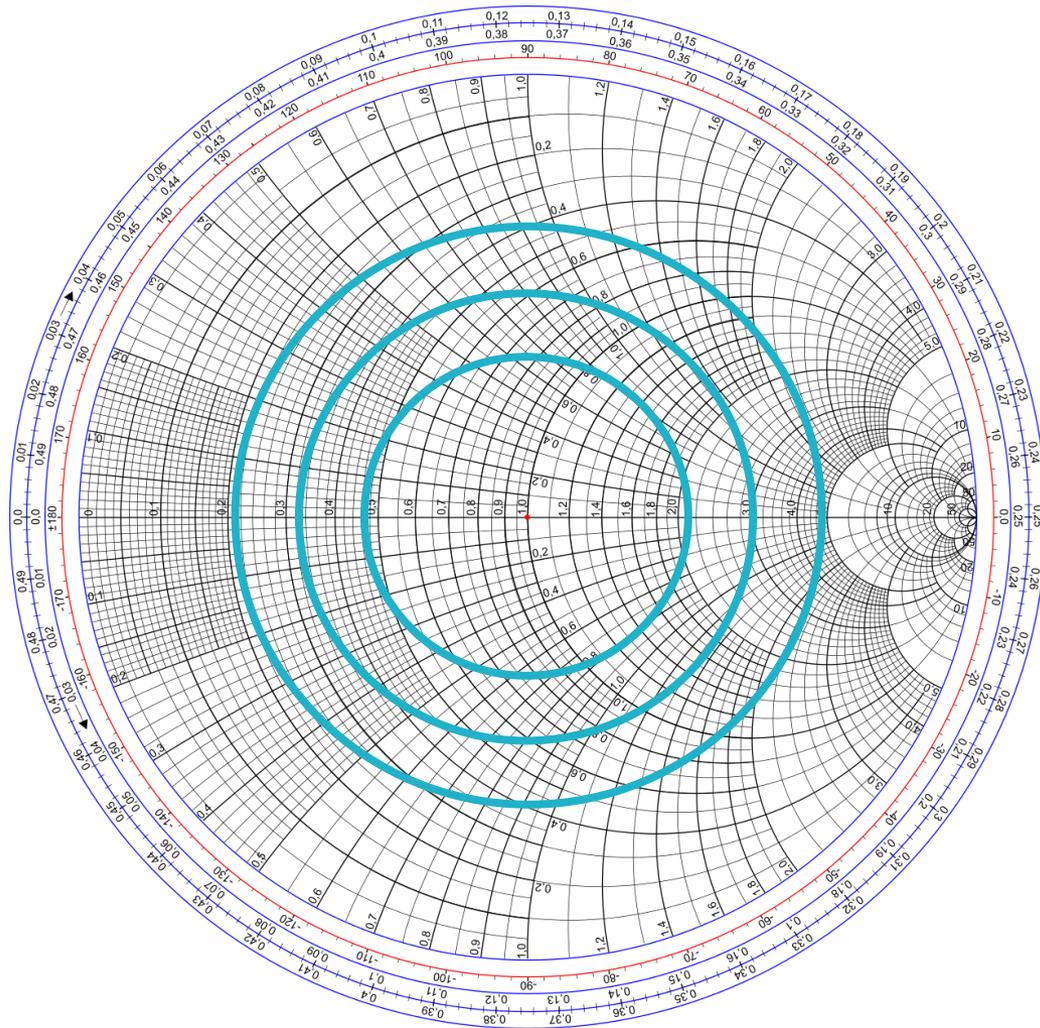
$$Z = \frac{1}{Y}$$

$$Y_1 = G + jB$$
$$Y_1 = 0,5 + j0,5$$

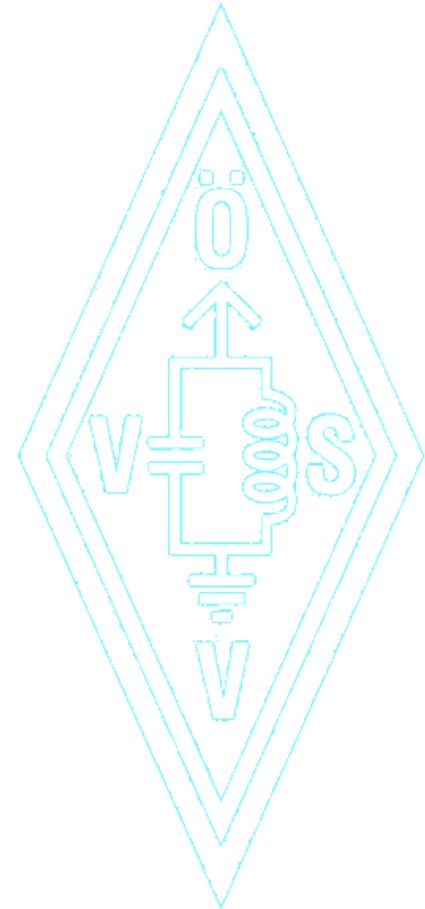
positive
Suszeptanz
Kapazität



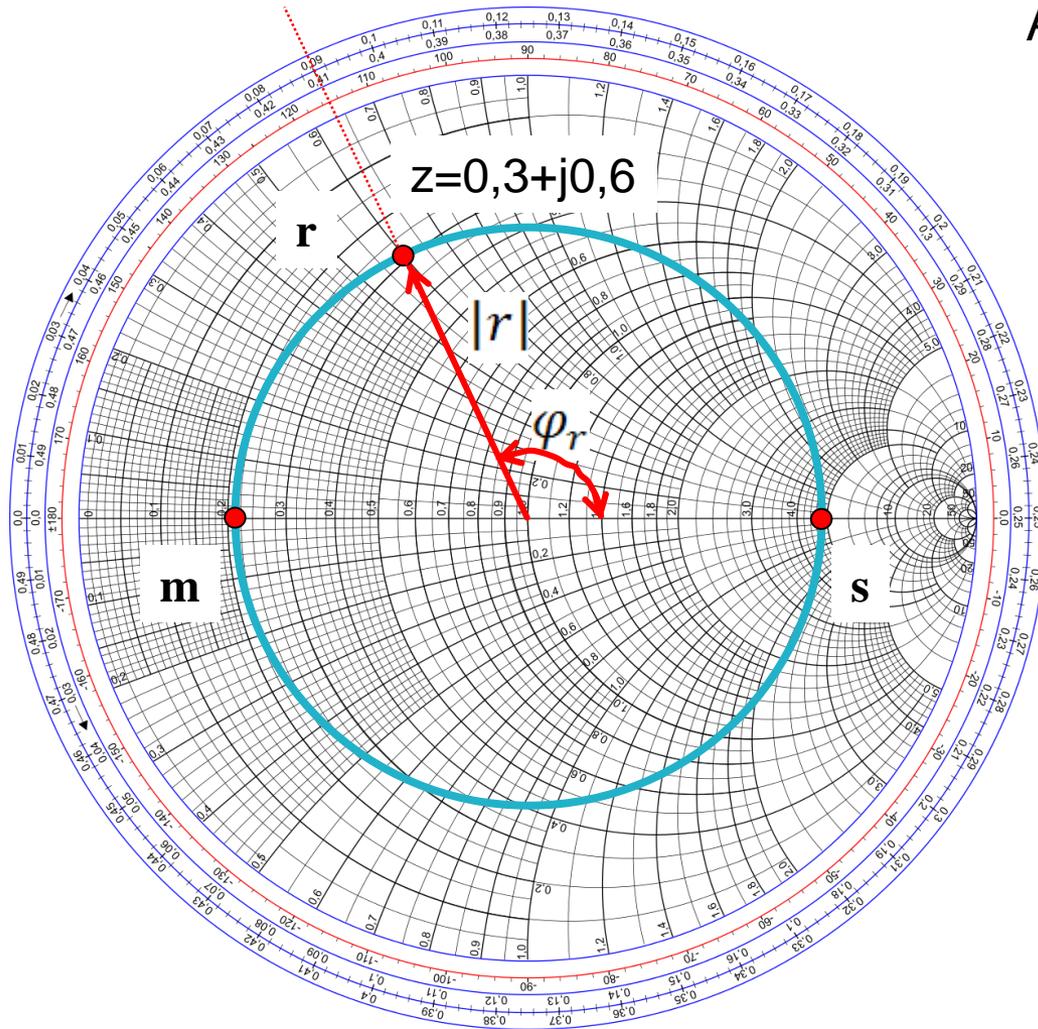
Smith Diagramm



Kreise konstanter SWR



Smith Diagramm



Ablezen von r , s und m

$$s = \frac{1}{m} = \frac{1 + |r|}{1 - |r|}$$

wir lesen ab:

$$\varphi_r = 115^\circ$$

$$m = 0,2$$

$$s = 5$$

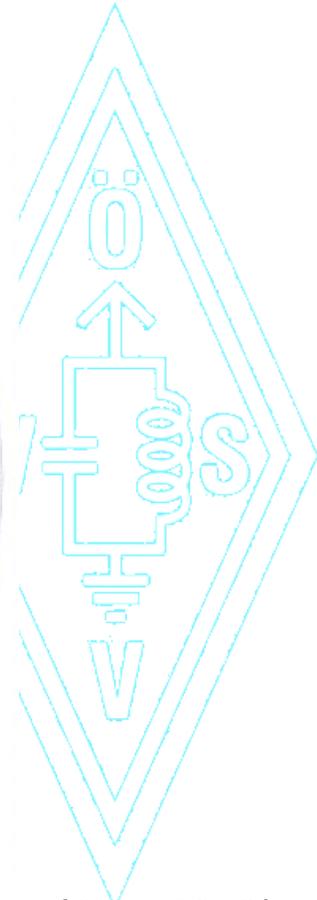
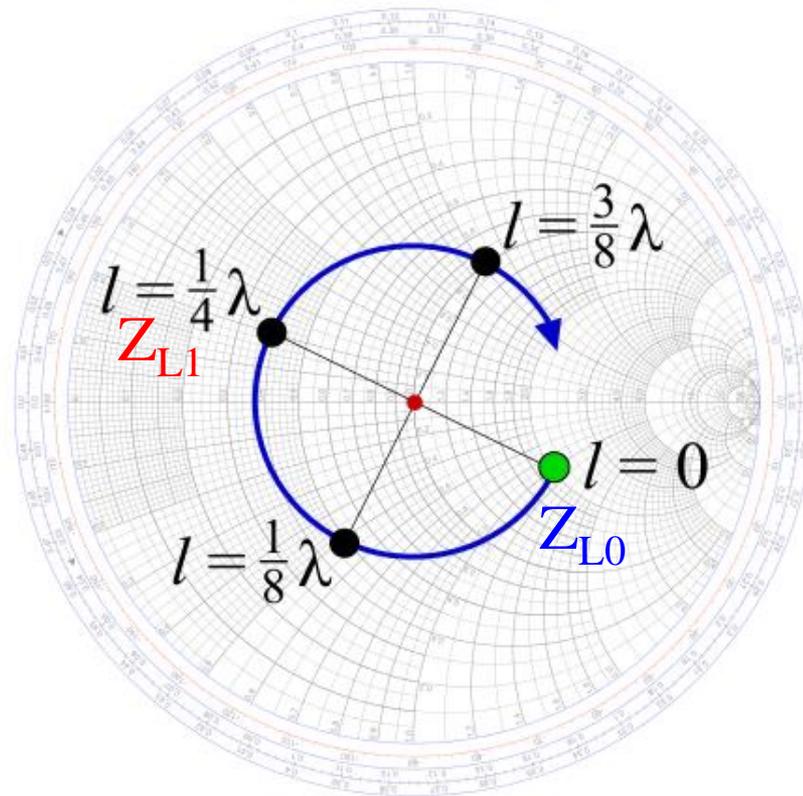
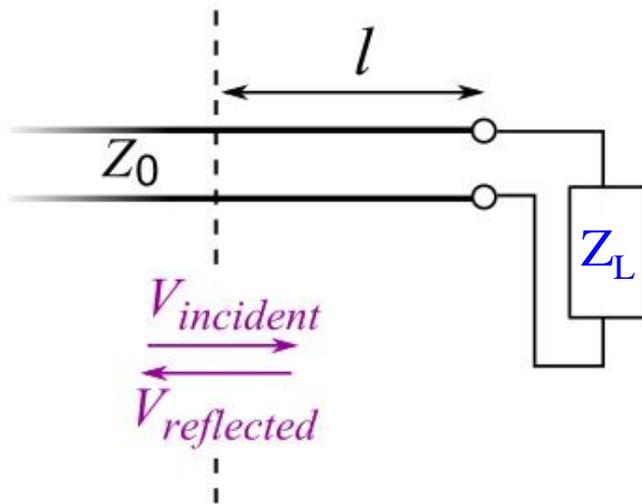
$$SWR = 1,5$$

$$VSWR = \frac{1 + |r|}{1 - |r|}$$

Reflexionsfaktor r
Stehwellenverhältnis s
Anpassungsfaktor m

Smith Diagramm

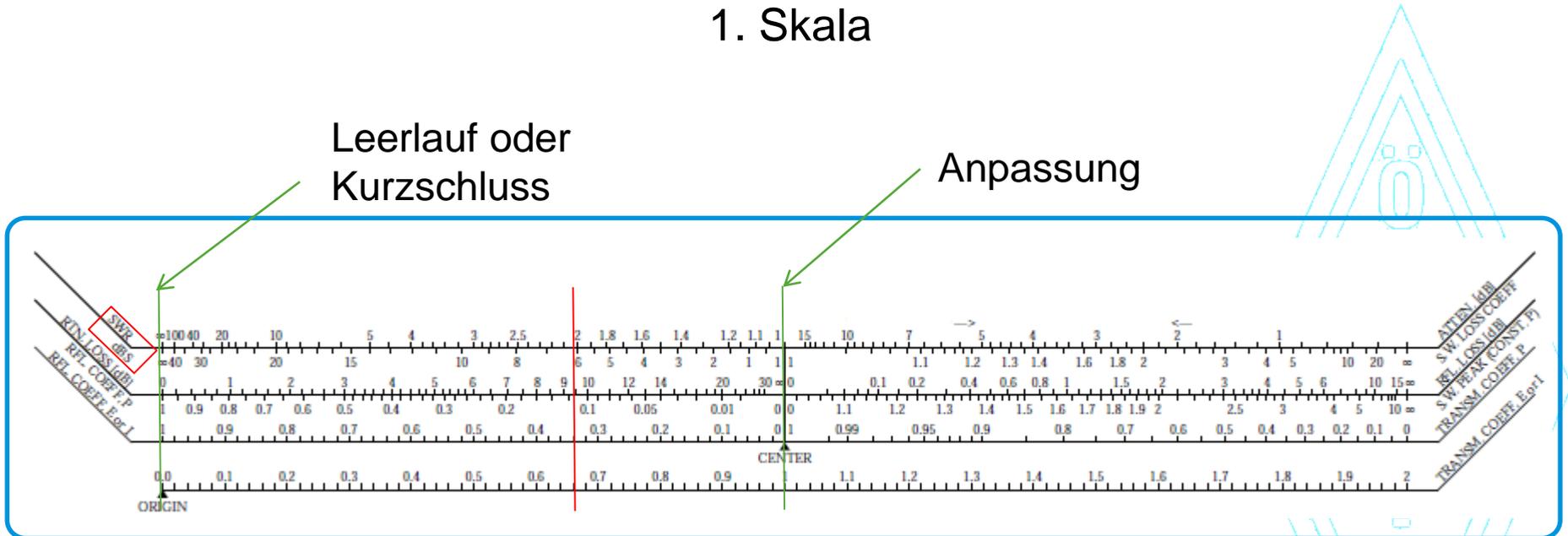
Einfluss der Leitungslänge auf die Eingangsimpedanz



Aus $Z_{L0} (2-j1)$ wird nach Zwischenschaltung einer $\lambda/4$ Leitung $Z_{L1} (0,4+j0,2)$

Smith Diagramm

Umrechnung SWR in Reflexionsdämpfung 1. Skala

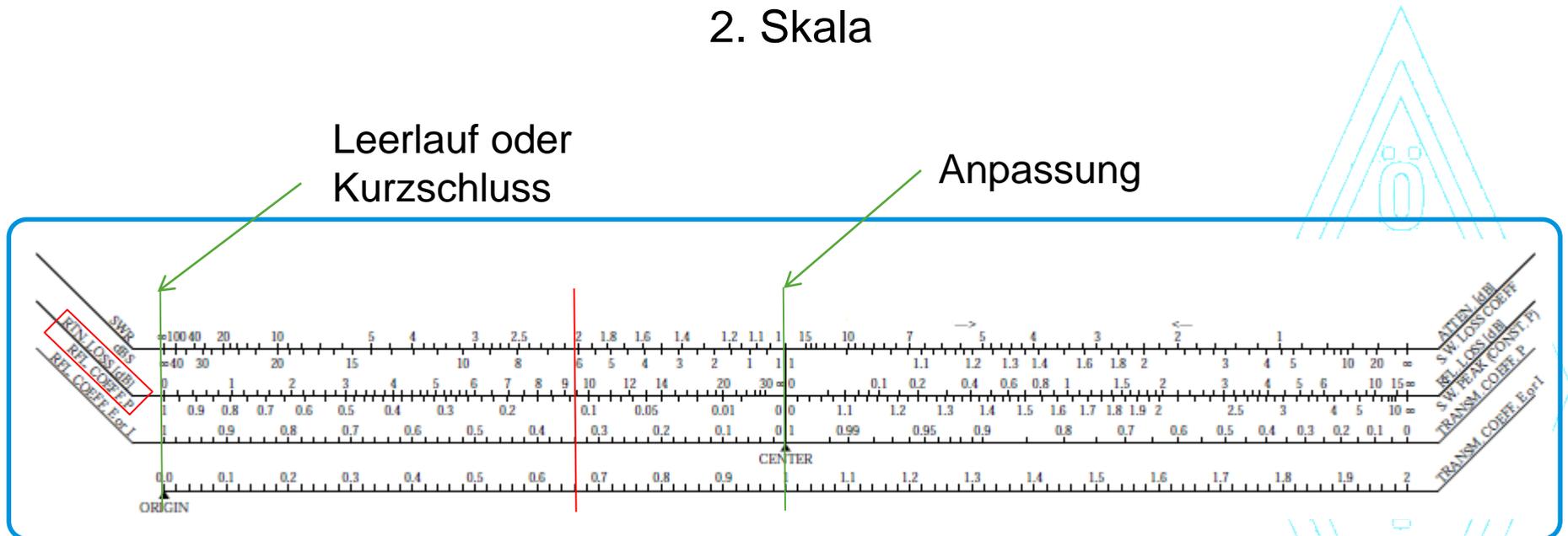


wir lesen ab:
bei einem $SWR = 2$
Reflexionsdämpfung = 6dB

$$dBS = 20 \log(SWR)$$

Smith Diagramm

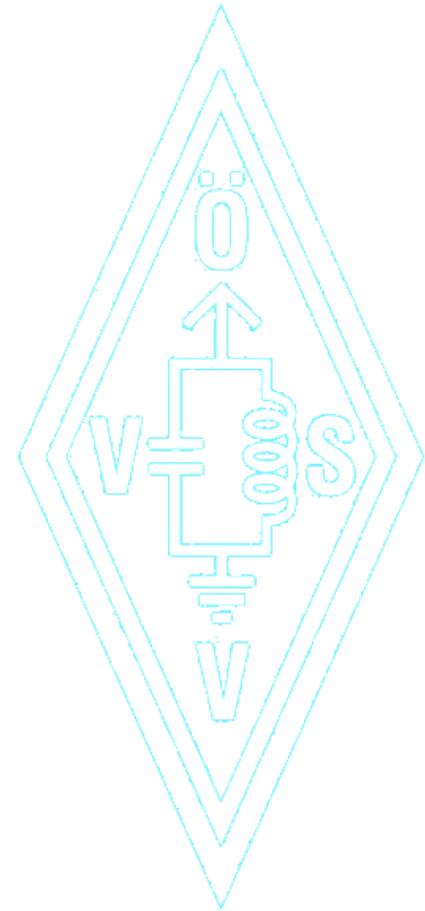
Umrechnung Reflexionskoeffizient in Reflexionsdämpfung 2. Skala



wir lesen ab:
bei einer Reflexionsdämpfung = 9,5dB
Reflexionskoeffizient = 0,15

Links

http://en.wikipedia.org/wiki/Smith_chart





Harald Böck, OE3HBS
oe3hbs@oevsv.at
Tel. 0676 / 545 78 11

Wohnadresse:
Rueppgasse 23 / 15 | A-1020 Wien
Tel. 01 / 212 92 52

Standort der Funkstelle:
Gilleisstraße 15 | A-2020 Hollabrunn
Tel. 02952 / 4668

ADL328
Bezirksstelle Hollabrunn
www.qth.at/adl328

- $R=0$
- $G=147$
- $B=221$

