

$$Z_L = 50 + j25 \Omega$$

$$Z_0 = 50$$

$$Z_{LN} = 1 + j0.5$$

$$Z_{LN} = 1 + j0.5$$

$$l = 40 \text{ cm} = 0.7 \text{ m}$$

$$V_g = 60 \text{ V}$$

$$f = 170 \text{ MHz} = 1.5 \times 10^8$$

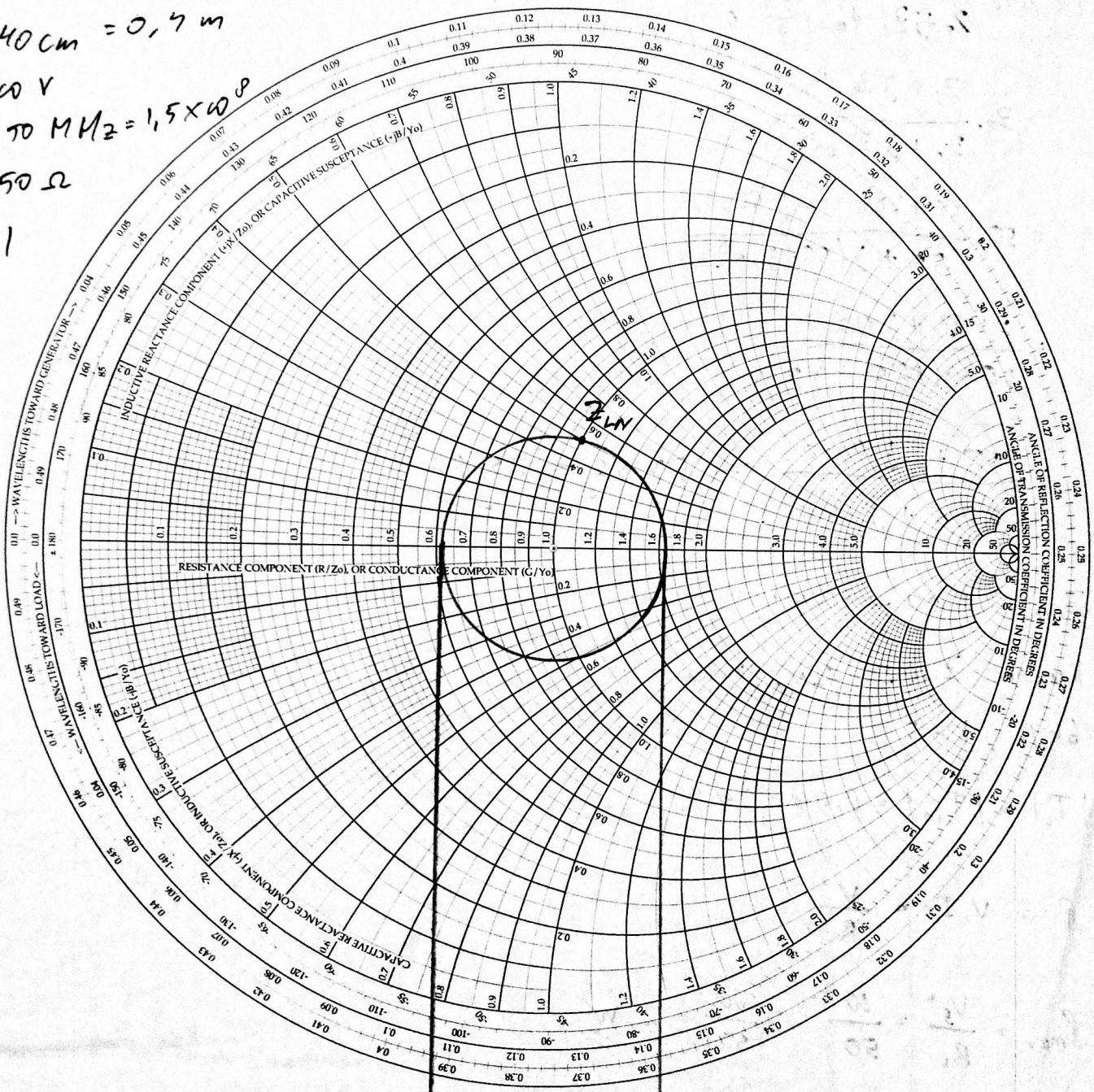
$$R_g = 50 \Omega$$

$$\epsilon_r = 1$$

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# The Complete Smith Chart

## Black Magic Design



### RADIIALLY SCALED PARAMETERS

TOWARD LOAD →										← TOWARD GENERATOR									
SWR	dB	ATTEN [dB]	RETN LOSS [dB]	REFL COEFF P	REFL COEFF V	LOSS [dB]	ATTEN [dB]	RETN LOSS [dB]	REFL COEFF P	REFL COEFF V	LOSS [dB]	ATTEN [dB]	RETN LOSS [dB]	REFL COEFF P	REFL COEFF V	LOSS [dB]	ATTEN [dB]	RETN LOSS [dB]	REFL COEFF P
100	40	20	10	5	4	3	2.5	2	1.8	1.6	1.4	1.2	1.1	1	0.9	0.8	0.7	0.6	0.5
10	20	10	5	4	3	2.5	2	1.8	1.6	1.4	1.2	1.1	1	0.9	0.8	0.7	0.6	0.5	0.4
1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.05	0.01	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.05	0.01	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
ORIGIN										CENTER									

a.  $SWR = 1.65$

b.  $|T| = 0.94 = 94\%$

$$\begin{aligned}
 c. Z_{in} &= Z_0 \cdot \frac{Z_L + j Z_0 \tan(\beta d)}{Z_0 + j Z_L \tan(\beta d)} \\
 &= Z_0 \cdot \frac{Z_L + j Z_0 \tan\left(\frac{2\pi}{\lambda} \cdot 0,4\right)}{Z_0 + j Z_L \tan\left(\frac{2\pi}{\lambda} \cdot 0,4\right)} \\
 &= Z_0 \cdot \frac{Z_L + j Z_0 \cdot 3,1}{Z_0 + j Z_L \cdot 3,1} \\
 &= 50 \cdot \frac{(50 + j 25) + j 50 \cdot 3,1}{50 + j (50 + j 25) \cdot 3,1} \\
 &= \frac{2500 + j 9000}{50 + j (155 + j 77,5)} \\
 &= \frac{2500 + j 9000}{-27,5 + j 155} = 53,52 - j 25,62
 \end{aligned}$$

$$\beta = \frac{2\pi}{\lambda} ; \lambda = \frac{c}{f \sqrt{\epsilon_r}} = \frac{3 \times 10^8}{1,5 \times 10^9} = 2$$

$$d. Z_{inN} = 1,07 - j 0,51$$

Karena  $Z_{inN} \approx Z_{LN}$ , maka

$$SWR = 1,65$$

$$e. |T_L| = |T_{in}| = 0,94 = 94\%$$

$$f. P = V \cdot I = \frac{V^2}{R}$$

$$P_{max} = \frac{V_s^2}{R_s} = \frac{10^2}{50} = \frac{100}{50} = 2 \text{ W}$$

$$\begin{aligned}
 g. P_L &= P_{in} \cdot |T_{in}| \cdot |T_L| = 2 \cdot 0,94 \cdot 0,94 \\
 &= 1,77 \text{ W}
 \end{aligned}$$