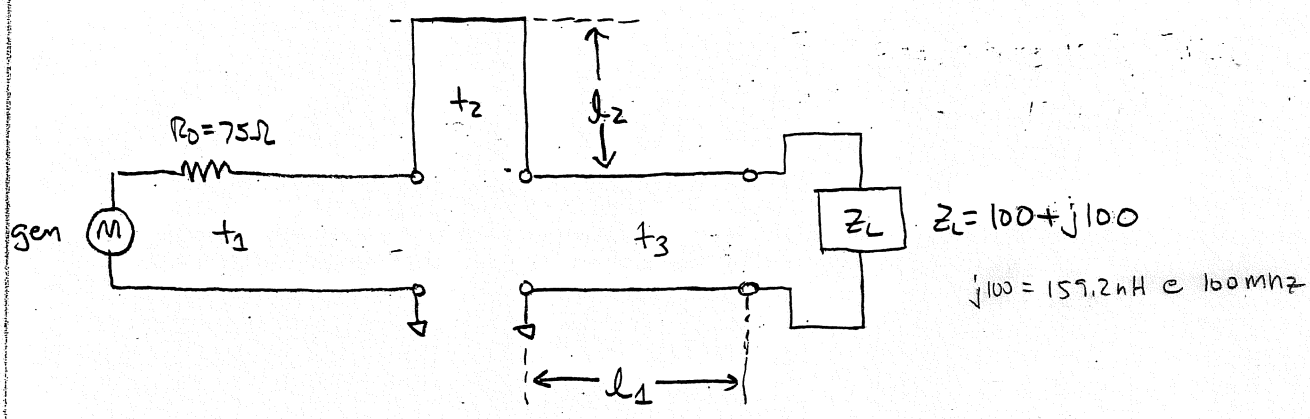
1. Consider the circuit below. A generator with $R_0 = 75\Omega$ is connected to a complex load of $Z_L = 100 + j100$ through a t-line of arbitrary length with $Z_0 = 75\Omega$ and velocity of propagation $V_p = (0.8 * c)$. Using a Smith chart, evaluate the line for stub tuning with a shorted series stub. Fill in all the blanks below. Clearly show your work on the smith chart.

Frequency of operation is 100Mhz
t_1, t_2, t_3 are all 75Ω lines



[3] The electrical length of λ on the t-line is 2.4 . (meters)

[2] The normalized load is 1.33 + 1.33 . (R ± jX format)

[5] The closest stub location (l_{1A}) is .352 meters from the load. $(.333 - .1862)2.4$

[5] The next stub location (l_{1B}) is 1.158 meters from the load. $(.1685 - .1862 + .5)2.4$

[5] The stub length (l_{2A}) at distance (l_{1A}) is .334 meters.

[5] The stub length (l_{2B}) at distance (l_{1B}) is .864 meters.

[5] The stub at l_{1A} could have been replaced with a lumped load of 143.2nH . $l = \frac{75(1.2)}{2\pi(100e^6)} = (1.194\times10^{-7})(1.2)$

[5] The stub at l_{1B} could have been replaced with a lumped load of 17.68pF . $C = \frac{1}{2\pi(100e^6)(1.2)(75)}$

elect. length $\lambda = \frac{(0.8 \times 300 \times 10^6)}{100 \times 10^6} = 2.4$ meters // load: $\frac{100 + j100}{75} = 1.33 + j1.33$

else $j1.2$ @ 100Mhz else $-j1.2$ @ 100mhz

$(75)1.2 = 2\pi(100\times10^6)l$ $\quad X_L = \frac{1}{2\pi FC}$

$l = 143.2nH$ $\quad (75)(1.2)(2\pi)(100\times10^6) = \frac{1}{C}$

$C = 17.68pF$

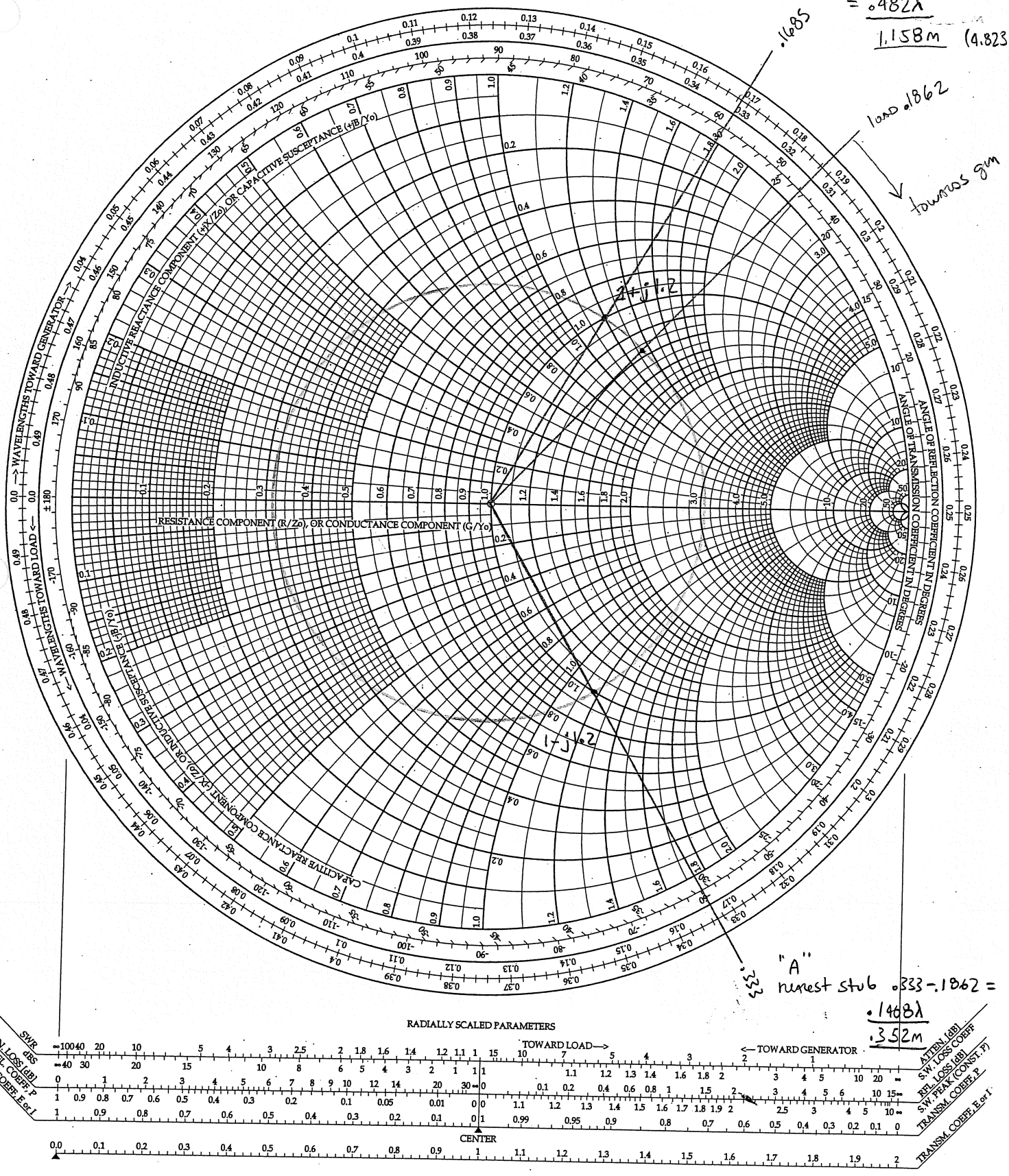
Smith Chart

distant stub:

$S = (.1862 - .1685)$

$= .0482\lambda$

1.158m (4.823n



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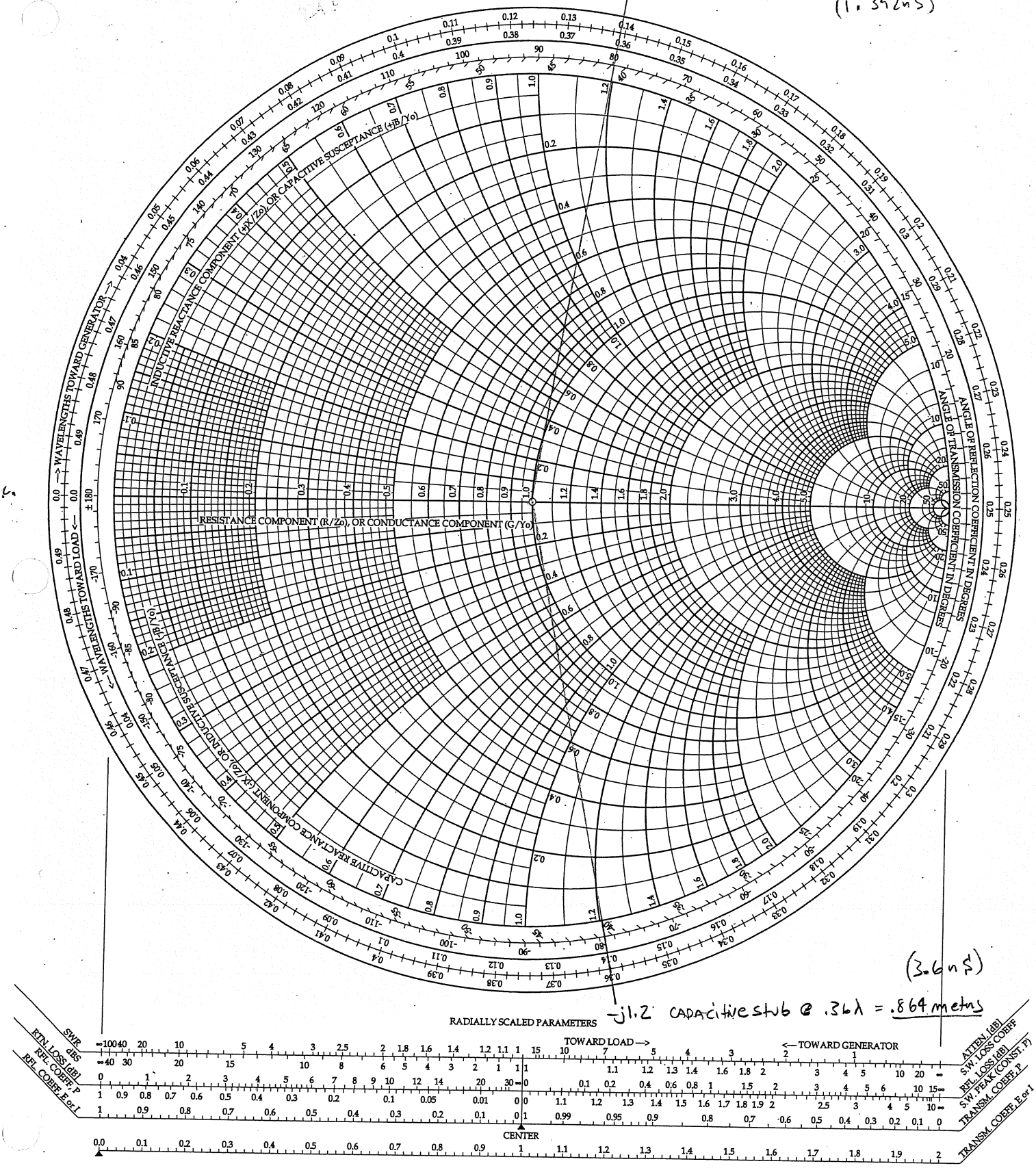
Smith Chart

+j1.2 inductive stub @ .139λ = .334 metres (1.392 ns)



(3.6 ns)

-j1.2 capacitive stub @ .36λ = .864 metres

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