Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Task – 5

Antenna and Microwave Lab

NAME: - Rahil Alawat

REG NO.: - 21BEC2427

SLOT - E2

SUBMITTED TO: - Prof. Poonkuzhali R

Date

Expt. No. 5 Card I

Page No.

Experiment - 5 Card I

Aim → Design an amplifier for the max gain at 4.0 GHz using single stub matching section. Calculate and plot the i/p return loss and the gain from 2 to 5 GHz. The GaAs FET has following S-parameters ($Z_0 = 50\,\Omega$)

f (GHz)	S_{11}	S_{21}	S_{12}	S_{22}
3.0	$0.80\angle -88°$	$2.86\angle 99°$	$0.03\angle 56°$	$0.76\angle -41°$
4.0	$0.72\angle -116°$	$2.60\angle 76°$	$0.02\angle 57°$	$0.73\angle -54°$
5.0	$0.66\angle -142°$	$2.39\angle 54°$	$0.03\angle 62°$	$0.72\angle -68°$

Substrate Specification →

$\varepsilon_r = 4.4$ $\quad \tan\delta = 0.0001$

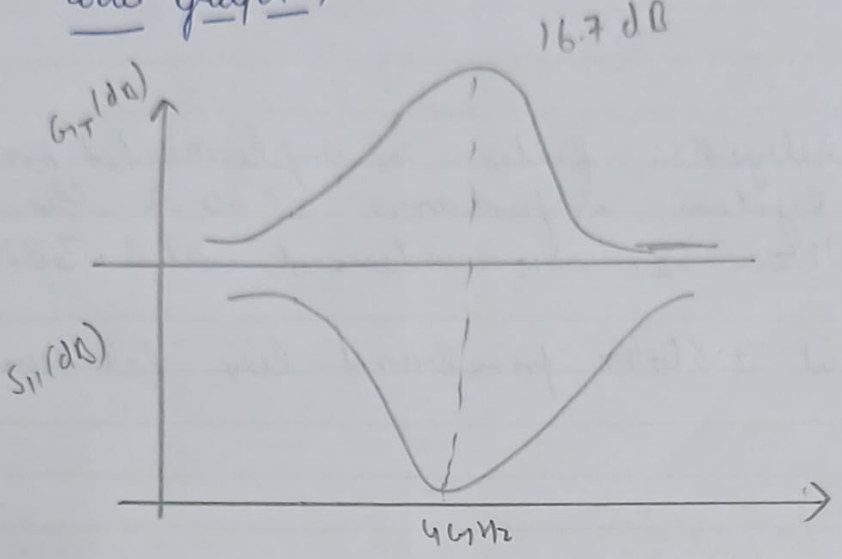
$H = 1.6$ mm $\quad T = 0.05$ mm

Theoritical gain :-

$G_T = 16.7$ dB

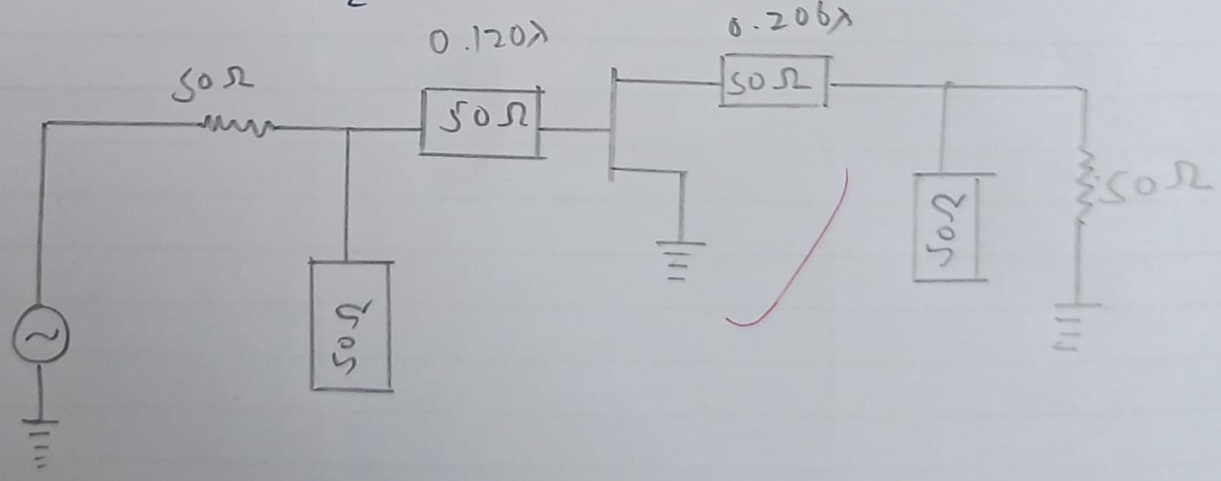
Teacher's Signature

Model graph →



$$\Gamma_S = \frac{B_1 \pm \sqrt{B_1^2 - 4|C_1|^2}}{2C_1} = 0.872 \angle 123^\circ$$

$$\Gamma_l = \frac{B_2 \pm \sqrt{B_2^2 - 4|C_2|^2}}{2C_2} = 0.876 \angle 61^\circ$$



Z		Electrical (βl) length	W(mm)	l (mm)
$z_0 = 50\Omega$	0.120λ	$0.120 \times 360^\circ = 43.2$	3.0282	4.87918
$z_0 = 50\Omega$	0.120λ	$0.206 \times 36^\circ = 74.16$	3.0282	8.37592

Date _____

Expt. No. 5 Part I

Page No. _____

Tabular Column →

Frequency (cycles)	DD(15(1,1)1)	DB(KrT(1,1)1)
1	1.5834	9.6184
2.5	0.73774	7.2994
2	0.11289	5.4817
2.5	-0.37491	4.4417
3	-0.82299	4.6108
3.5	-1.474	7.1838
→ 4	-33.652	16.534
4.5	-0.29542	-11.011
5	-0.641335	-22.537
5.5	-0.24236	-14
6.0	-0.71228	-7.2525
6.5	-0.47627	-2.21
7	-0.34567	2.4637

Teacher's Signature _____

Date _____

Expt. No. 1 Part I

Page No. _____

Inference →

(1) Min^m Return loss is obtained at 4 GHz as $S_{11}(dB) = -7.5$ in the simulation.

(2) Max gain of -16.534 is obtained at 4 GHz and the same as verified with theoritical value of -16.534.

(3) Input matching & O/P matching are designed using smith chart & the same are included in the simulation.

10/10/24.

Teacher's Signature _____

21BEC2427

Rahil Rawat

Exp 5 Part I

$l = 0.0206\lambda$

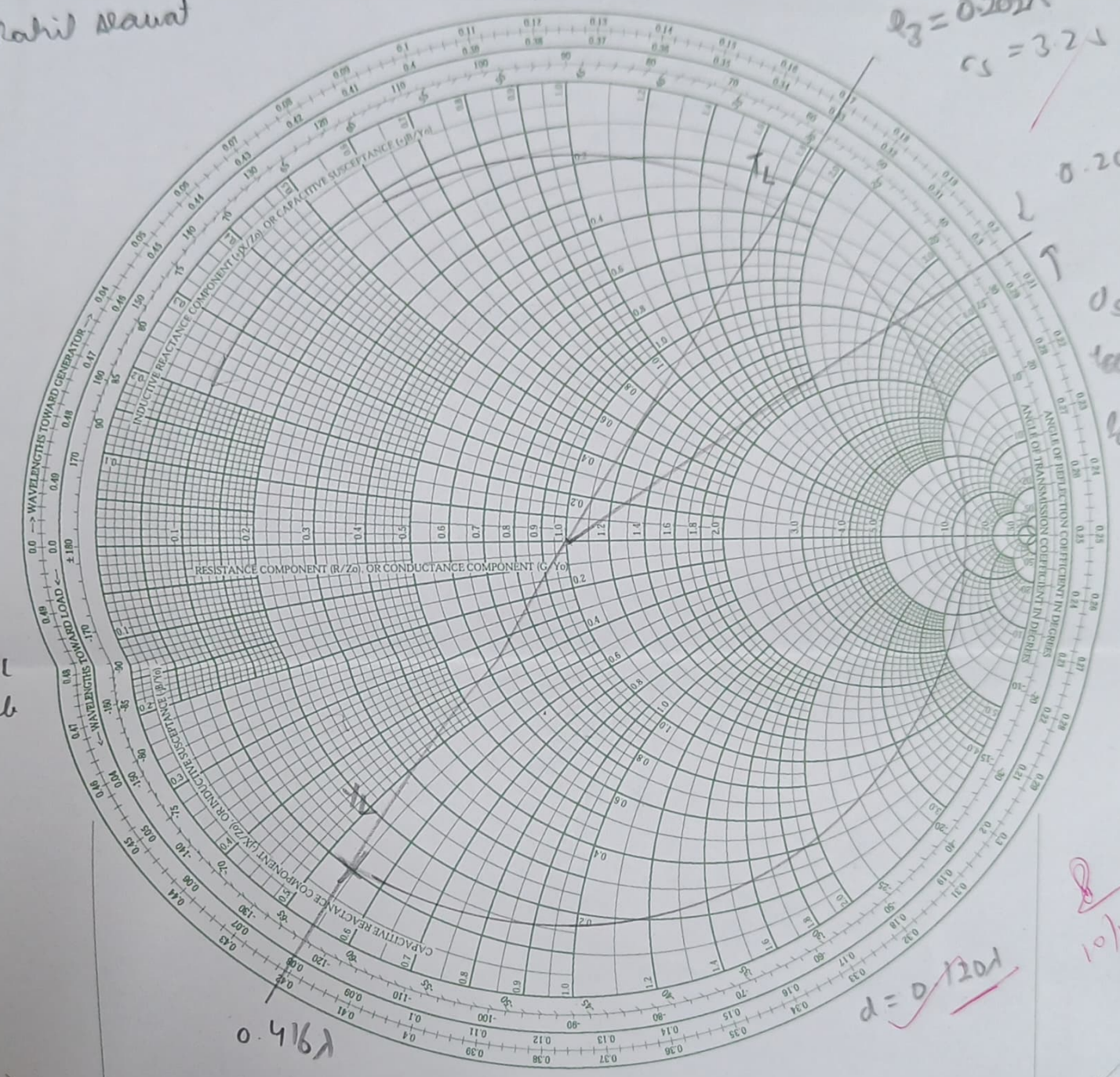
$l_3 = 0.203\lambda$

$c_s = 3.2$

0.208λ

$d_s = 0.21\lambda$ towards load

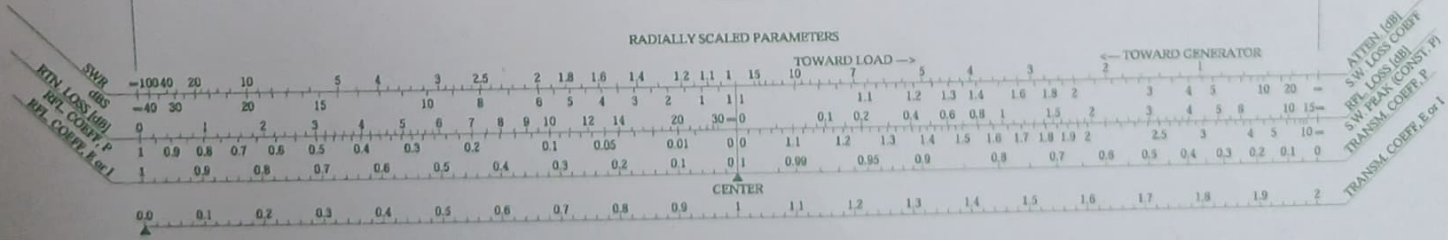
$y = 0$ for D.L stub



0.416λ

$d = 0.120\lambda$

10/10/24

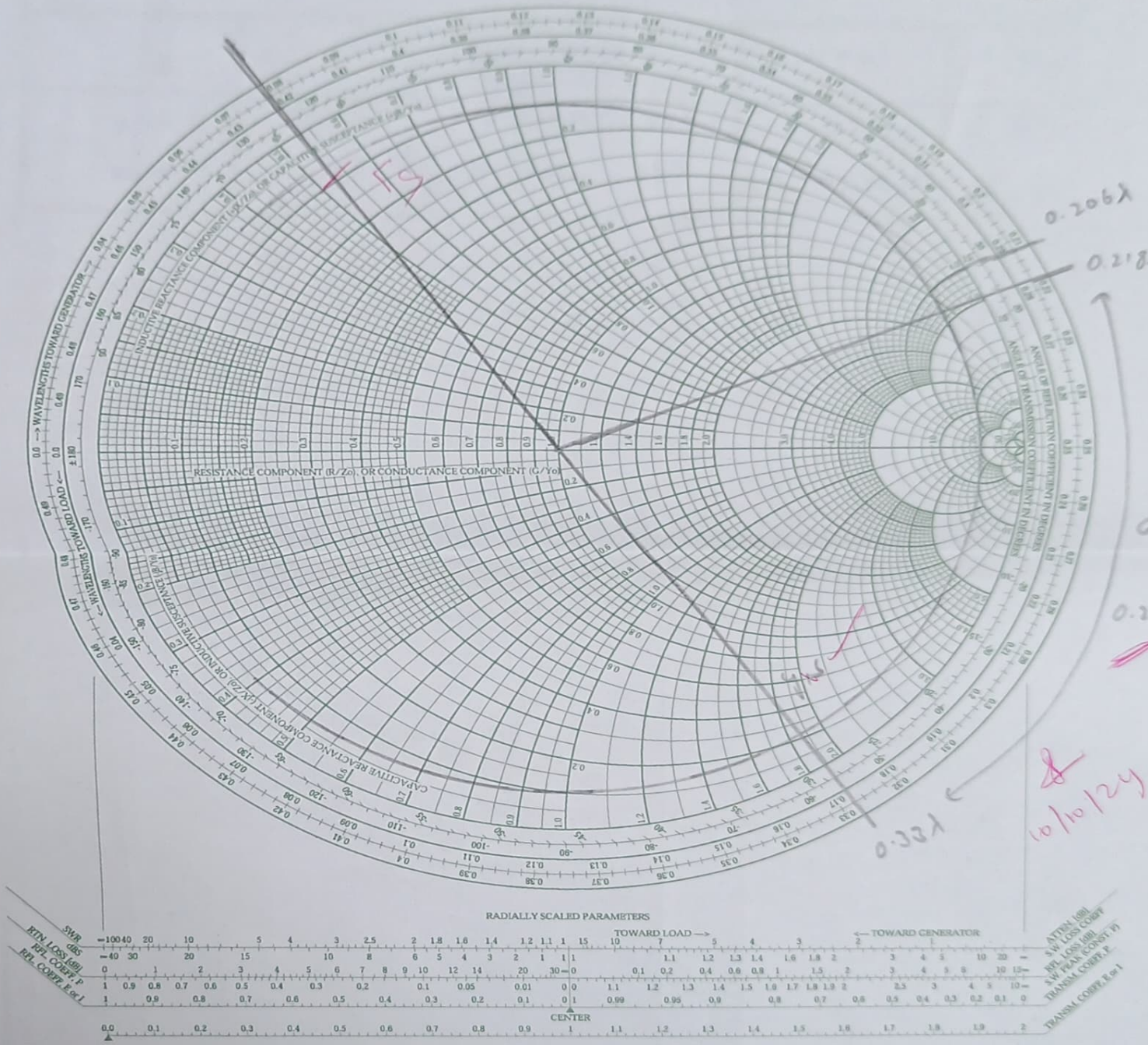


Smith Chart

l = 0.206λ

21ECC2427

Rahul Rawat



Smith Chart

21BEC2427

Scale

1 - one unit = 0.05cm

1 division unit = 0.06cm