EXP 1

Observation table: 1 Horn Antenna

Sr. No.	Stepping Angle	Received signal strength RSS	Sr. No.	Stepping Angle	Received signal strength RSS
1.	0	28	13		
2.	45°	22	14		
3.	56°	25	15		
4.	135°	13	16		
5.	150°	11	17		
6.	225°	19	18		
7	270°	9	19		
8	315°	16	20		
9	360°	21	21		
10			22		
11			23		
12			24		

Graph:

Observe radiation pattern of dipole antenna in Azimuth & Elevation planes on log & linear scales on polar and Cartesian plots.

Self test:

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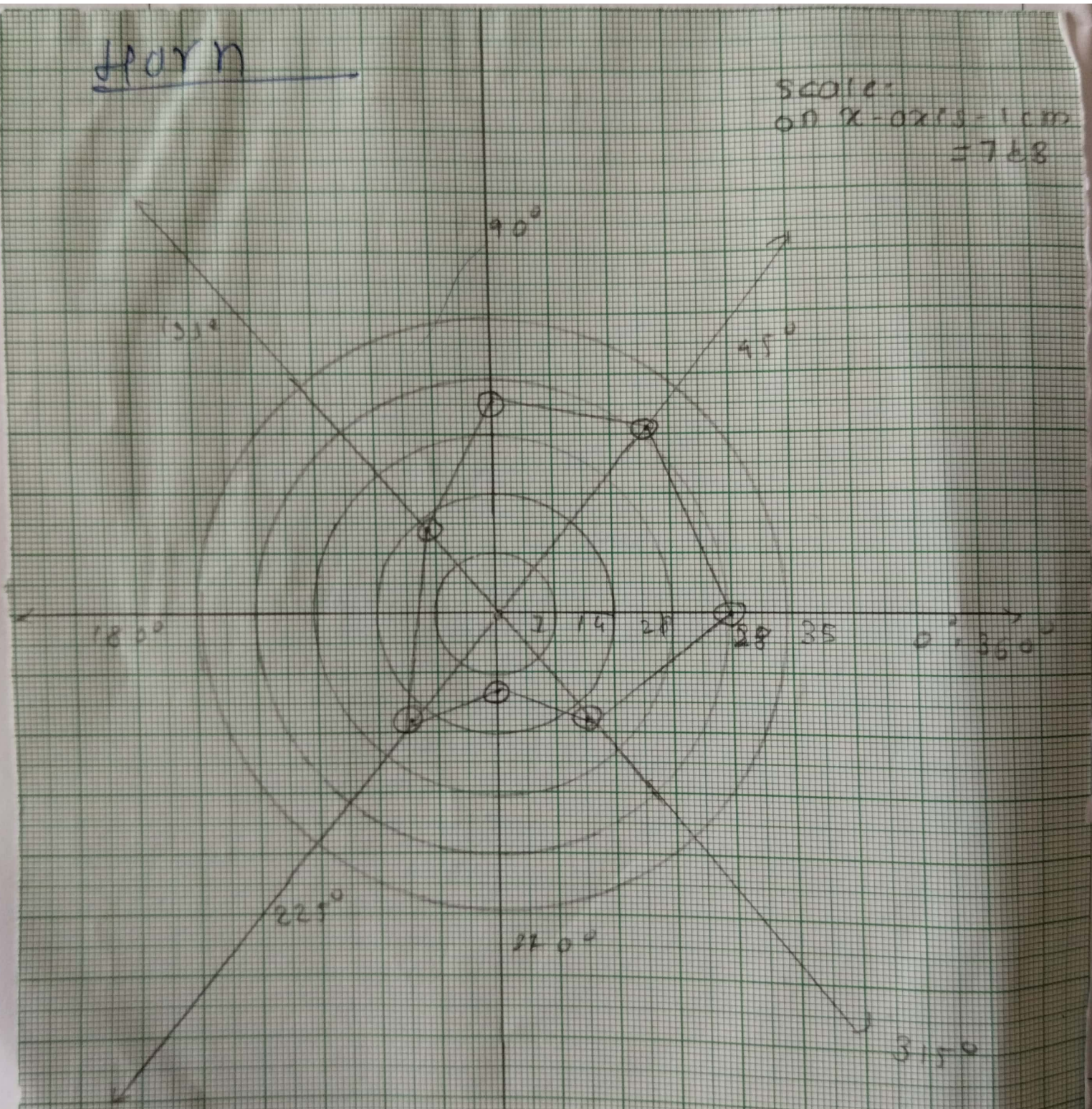
Horn

scale:
on x-axis = 1 cm
= 7 dB



Horn antenna

18. Measure the angle when this reading is

19. The difference between the angular positions of the -3dB points is the Azimuth beam width of the dipole antenna

Observation table: EXP 2 parabolic dish

Sr. No.	Stepping Angle	Received signal strength RSS	Sr. No.	Stepping Angle	Received signal strength RSS
1.	0	61dB	13		
2.	45°	64dB	14		
3.	90°	43dB	15		
4.	135°	56dB	16		
5.	180°	50.1dB	17		
6.	225°	52dB	18		
7	270°	54dB	19		
8	315°	41dB	20		
9	360°	61dB	21		
10			22		
11			23		
12			24		

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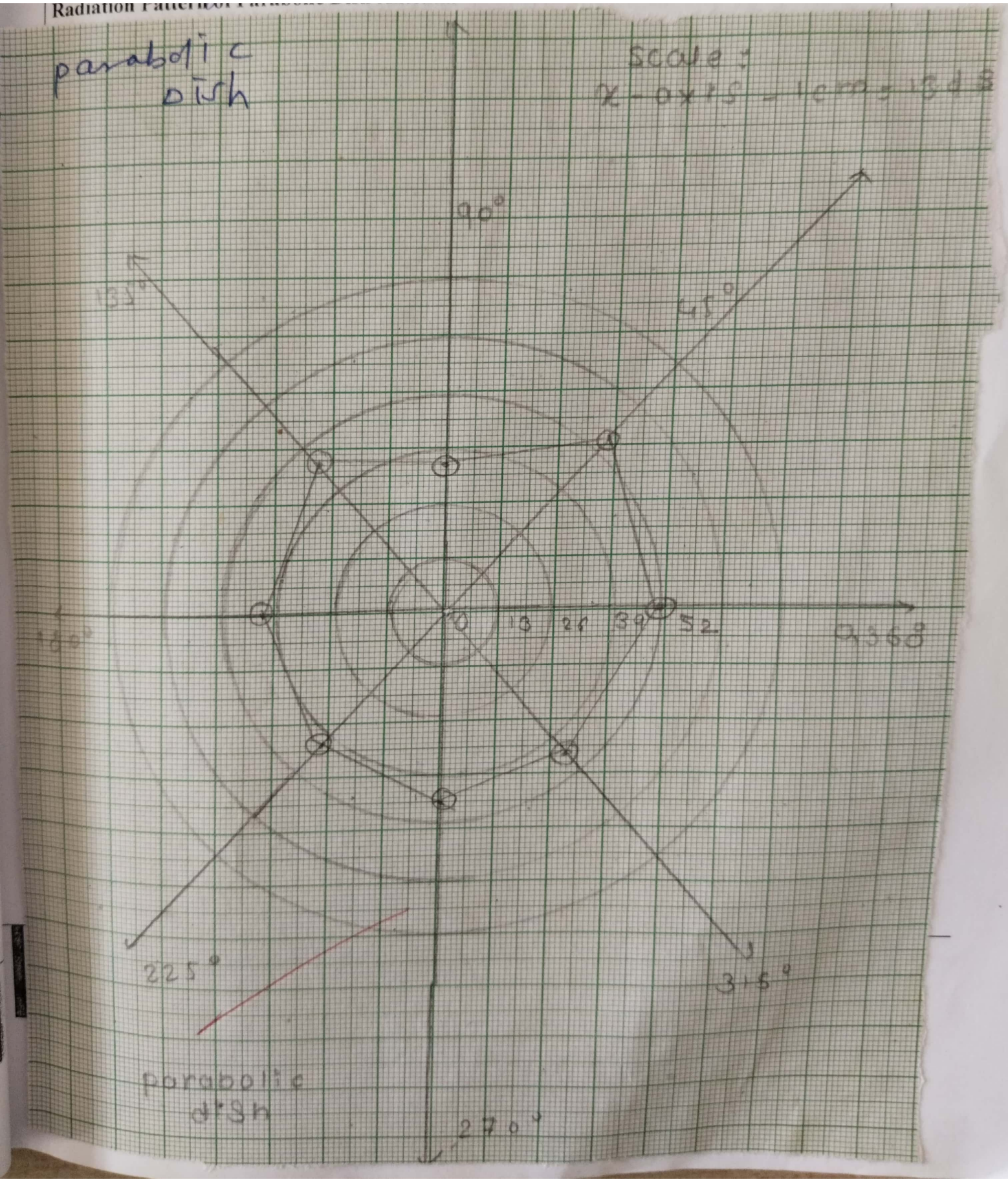
parabolic dish
Scale :
x-axis - 1cm = 10 dB
90°
135°
45°
180°
0
13
26
39
52
0/360
225°
315°
parabolic dish
270°

14. Measure the angle when this reading ...
45dBmsay).
15. The difference between the angular position of the -3dB points is the beam width of the antenna.
16. Side lobe's angular position and level can be inferred from the plot.

Observation table: EXP3. Microstrip patch

Sr. No.	Stepping Angle	Received signal strength RSS	Sr. No.	Stepping Angle	Received signal strength RSS
1.	0°	39	13		
2.	45°	51	14		
3.	90°	47	15		
4.	135°	53	16		
5.	180°	54.5	17		
6.	225°	55.6	18		
7	270°	52.9	19		
8	315°	57.5	20		
9	360°	53.3dB	21		
10			22		
11			23		
12			24		

Graph:

Observe radiation pattern of microstrip patch in Azimuth & Elevation planes on log & linear scales on polar and Cartesian plots.

Conclusion:

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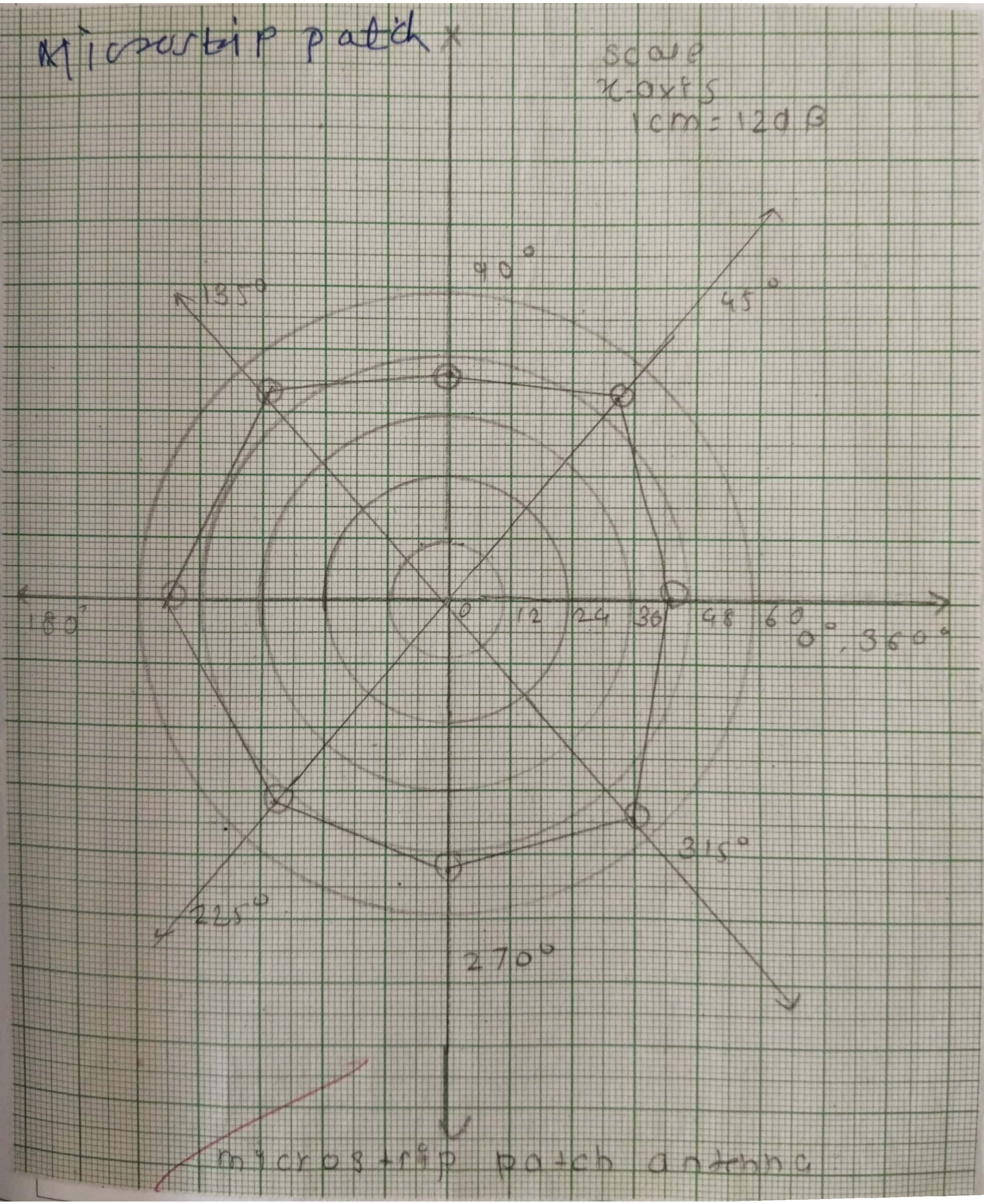
Microstrip patch



microstrip patch antenna

Observation table:

Beam voltage: 250 V

Beam current: 13mA

Least Count of Direct Frequency readout meter

$\frac{0.02}{4} = 0.005$ Expt 5 Reflex Klystron ch.

Sr.No.	Repeller voltage(V)	Reading from CRO MAX(mm) or MIN	Frequency at Direct Frequency Readout meter
1	231 V	0	
2	218	0.04	
3	216	0.24	
4	209	0.4	9.37 HZ
5	204	0.2	
6	194	0	
7	155	0.24	
8	150	0.36	
9			
10			

RESULT: 9.38 - 9.36 = 0.02

$\frac{0.02}{4} = 0.005 = 0.01$

9.38 + 0.01 = 9.39

9.36 + 0.01 = 3.37

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(17) Verify what happens if the guide is filled with dielectric.

(18) Above experiment can be verified at different frequencies.

OBESERVATIONS AND CALCULATIONS: Exp. 6 Mes. of Free space wavelength

Least Count Of Venire scale: $\frac{0.1}{10} = 0.01$

Sr.No	Minima	Main scale Reading	Vernier scale Reading	D1/D2 Value
1	1st minima	11 cm	9 x 0.01 = 0.09	11.09
2	2nd minima	13.3 cm	8 x 0.01 = 0.08	13.38

1. Guided wavelength $\lambda_g = 2*(D2 - D1)$

$= 2 \times (13.38 - 11.09)$

$= 4.46$

2. Cutoff wavelength $\lambda c = 2*a$ (wave guide inner broad dimension)

$= 2 \times 2.286$

$= 4.572$

3. Free Space wavelength $\lambda 0 = c\sqrt{\left(\frac{1}{(\lambda_g)^2} + \frac{1}{(\lambda_c)^2}\right)}$

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$$3\times10^{10}\sqrt{\frac{1}{4.56}+\frac{1}{(4.572)^2}} = 3\times10^{10} * (0.3096)$$

$$= 0.929\times10^{10}$$

4. Frequency $\mathbf{f} = \dfrac{c}{\lambda 0}$ $= 9.29$ GHz

5. Frequency Measured on Direct Frequency Read out meter = 9.39 GHz

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OBSERVATIONS:-

Beam voltage: 250 V Beam current: 13mA Expt 7 Gunn Diode + PIN modulator

V_T =

Sr. No.	Voltage (Volts)	Current (mA)
1	0.19	0.019
2	0.29	0.029
3	1.28	0.105
4	1.65	0.126
5	2.16	0.152
6	3.03	0.171
7	3.33	0.180
8	3.69	0.181
9	4.58	0.155
10	4.72	0.155
11	5.26	0.147
12	6.10	0.149
13	7.20	0.141
14	8.19	0.145
15	8.17	0.143
16	9.26	0.142

GRAPH (Paste Graph)

V- Current)

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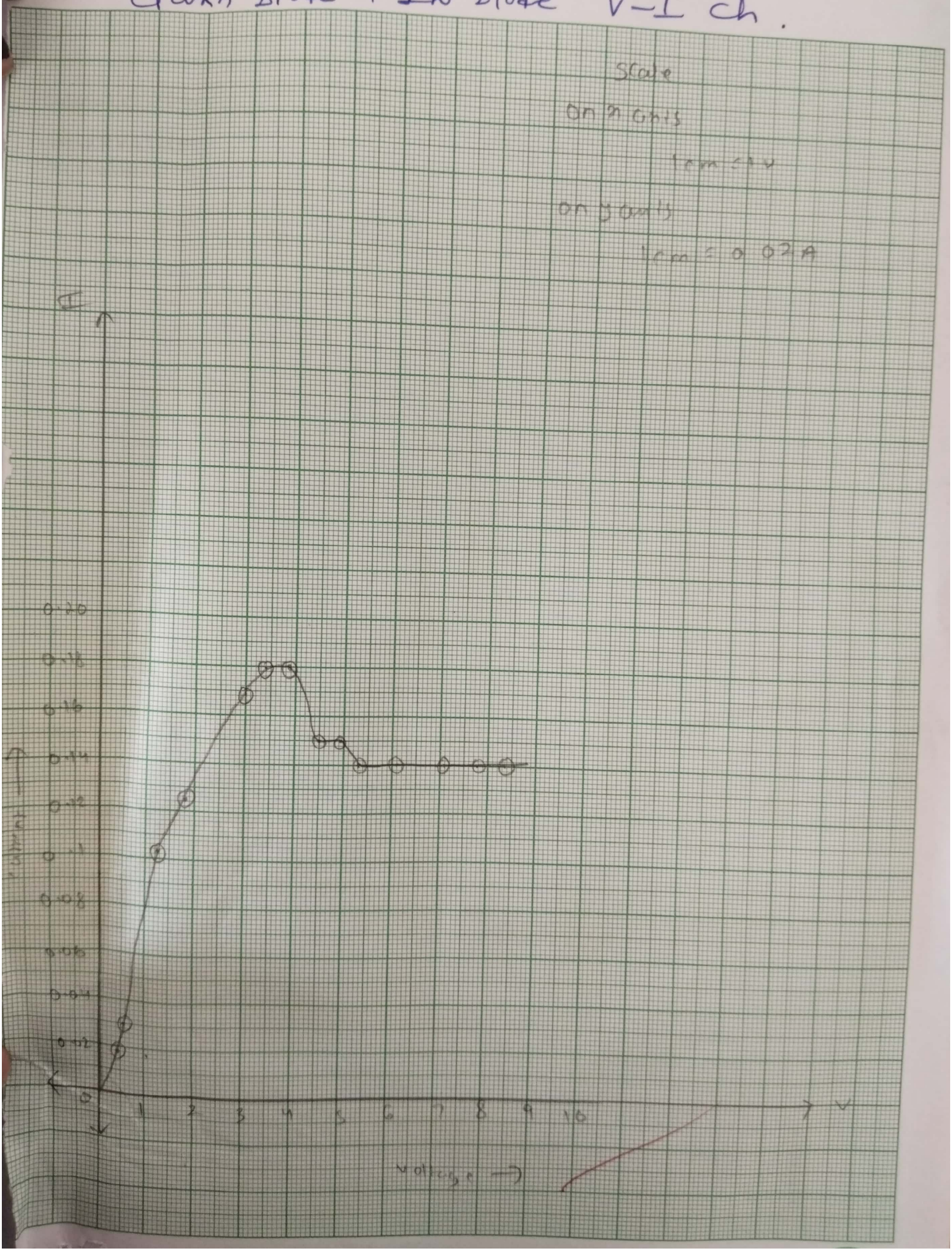
Expt 7

Gunn diode PIN diode V–I ch.



OBESERVATION TABLE:

Beam voltage: 250 V

Beam current: 13mA

Exrt No 8 verification of E, H & magic tee

Sr.No.	Tee	Port 1 (P1)	Port 2 (P2)	Insertion loss P1 – P2
1	E-plane Tee	0.4	0.4	0
2	H-plane Tee	0.5	0.5	0
3	Magic Tee (i/p at port 3)	0.2	0.2	0
4	Magic Tee (i/p at port 4)	0.5	0.5	0

Result: After calculating the insection is

E - plane = 0

H - plane = 0

magic tee (P_3) = 0

magic tee (P_4) = 0

Conclusi

P1 = 41 dB
P2 = 41.9 dB
P3 = 41.6 dB
P4 = 43 dB

Calculations: Expt 1 Directional Coupler

Sr.No	Parameter	Formula	Putting Values	Final result (dB)
1	Coupling factor	P3-P1	43 - 41	2 dB
2	Directivity	P3-P4	41.6 - 43	-1.4 dB
3	Isolation	P4-P1	41.6 - 41	0.6 dB
4	Insertion loss	P2-P1	41.9 - 41	0.9 dB

Result: coupling factor = (P4 - P1)
= 43 - 41
= 2 dB

Conclusion:

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setting as A_{21} dB.

Expt 10 post ch. of Isolater circulater

Observations: Beam voltage: 250 V Beam current: 13mA

Sr.No.	Circulator	P1 dB	P2 dB	P3 dB
1	T-Circulator	41	41.2	42.1
2	Y-Circulator	41	42.5	42.1
3	Isolator	31	31.4	42.5 or 39.5

Calculations:

1) **T-Circulator:**

Parameter	Formula	Inserting values	Final Answer (dB)
Insertion Loss (dB)	P_2-P_1	41.2 - 4	0.2
Isolation (dB)	P_3-P_1	42.1 41	1.9

Scanned with OKEN Scanner

 Exp t 10 - Isolater circulater

2) **Y-Circulator:**

Parameter	Formula	Inserting values	Final Answer (dB)
Insertion Loss (dB)	P_2-P_1	42.5 - 41	1.5
Isolation (dB)	P_3-P_1	42.1 - 41	1.1

3) **Isolator:**

Parameter	Formula	Inserting values	Final Answer (dB)
Insertion Loss (dB)	P_2 (forward) - P_1	31.4 - 31	0.4
Isolation (dB)	P_2(inverse) - P_1	34.5 - 31	3.5

Result:

Eg: - T - circulator

i) insertion loss (dB)

$P_2 - P_1 = 41.2 - 41$

$= 0.2$

(ii) isolation (dB)

$= P_3 - P_1$

$= 42.1 - 41$

$= 1.1$

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4. Repeat the above step for change of S-S. Tuner probe depth and record the corresponding SWR.

5. If the VSWR is between 3.2 and 10, change the range dB switch to next higher position and read the VSWR on second VSWR scale is 3 to 10.

Expt 11 – VSWR Measurement

Observation:

Beam voltage=250V

Beam current=13mV

Sr.No	Parameters	VSWR
1	For open termination	1.12
2	For short termination	1.5
3	For Matched termination	1

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Radiation and Microwave Techniques (Lab practice I)

Result:

$$1.2 - 1.1 = \frac{0.1}{4} = 0.025$$

$$= 1.1 + 0.025$$

$$= 1.125 \text{ (practically)}$$

Scanned with OKEN Scanner