RF

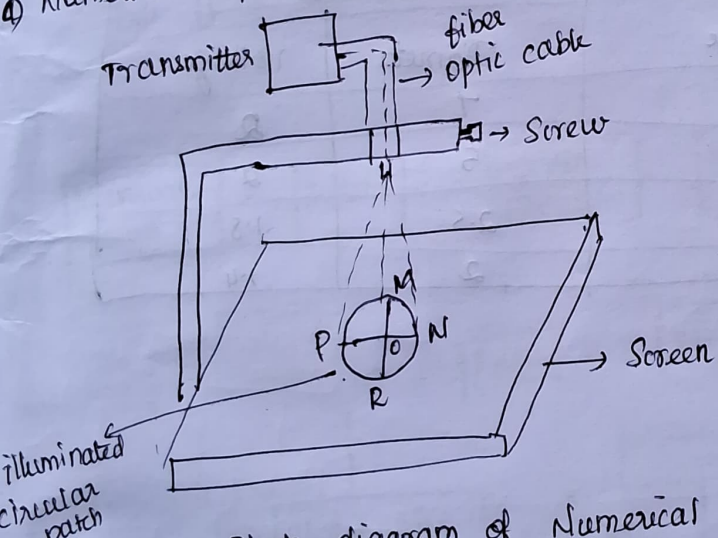
1) Measurement of Numerical aperture & bending losses in optical fiber

Aim:

Apparatus Required:

- Experimenter kit 4
- 1 meter fiber cable
- Fiber holding fixture
- Ruler

4) Numerical aperture



Block diagram of Numerical aperture Setup

Tabulation:

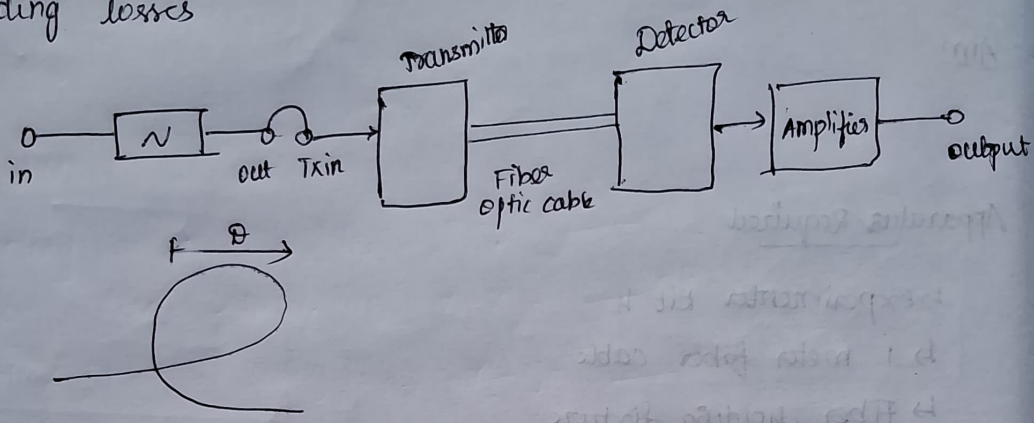
S.No	PN (cm)	MR (cm)	Radius (cm)	Distance (cm)	NA	θ_{max}
1		1	0.5	0.9		
2	1.2	1.2	0.6	1.3		
3	1.8	1.8	0.9	1.8		

$r = (PN + MR)/4$, $NA = \sin\theta_{max} = r/\sqrt{d^2 + r^2}$ $\theta_{max} = \sin^{-1}(NA)$

(NO graph)

Calculation: NA and θmax calculation

b) Bending losses

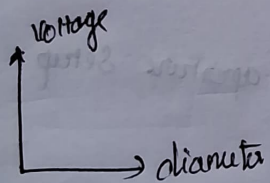


Tabulation

1m Fiber		3m Fiber	
Diameter	Voltage	Diameter	Voltage
25	1.2	7	2
16	1	5	2
6	0.8	2.5	1.8
3.5	0.6	2	1.4

(NO Calculation)

Graph:



2)

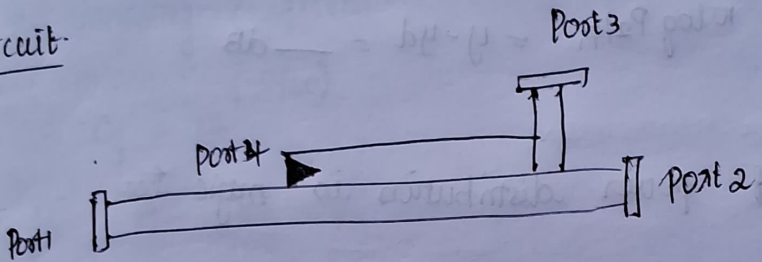
Measurement of power distribution in directional coupler

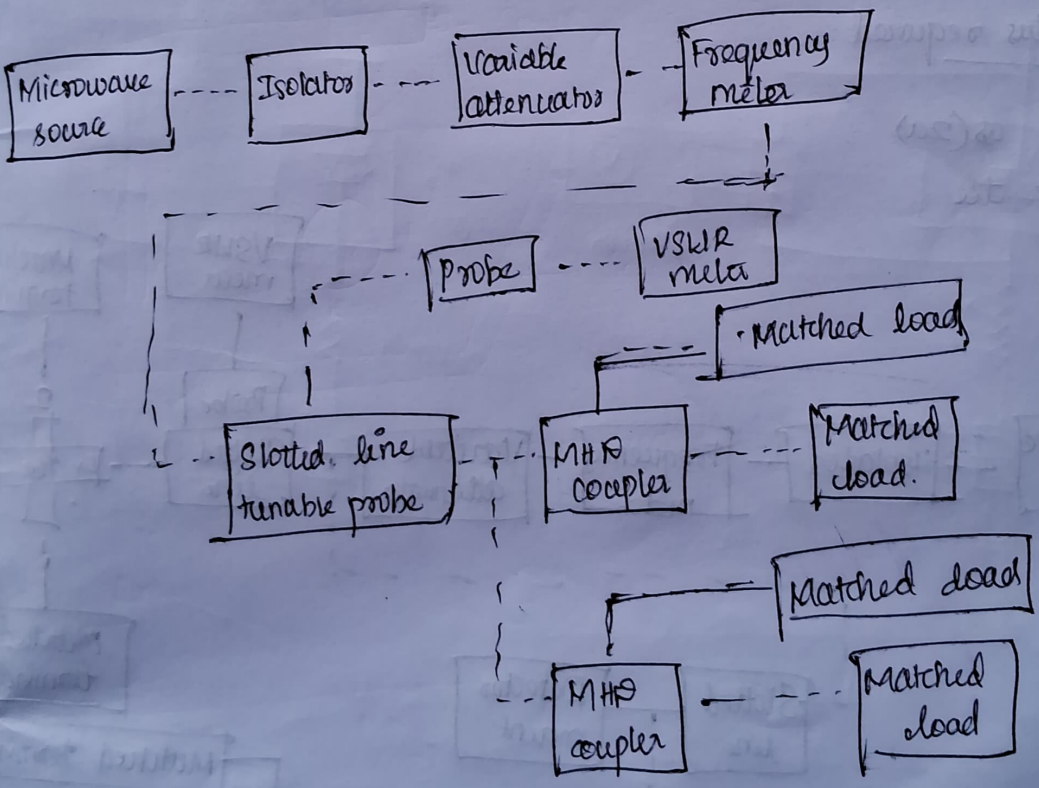
Aim

Apparatus required:

- Microwave source
- Isolator
- Frequency meter
- Variable attenuator
- Slotted line, tunable probe
- Detector mount, matched termination
- MHO Coupler
- Waveguide stand
- Cables & Accessories
- VSWR meter

Circuit:





(No graph)

Readings:

$x = 15$ (P_1)

$z = 16$ (P_2)

$y = 27$ (P_3)

$y_d = 51.8$

Calculation

1) Coupling factor : $10 \log P_1/P_3 = x - y =$ ____ dB

2) Insertion loss : $10 \log P_1/P_2 = x - z =$ ____ dB

3) Isolation factor : $10 \log P_2/P_3 = x - y_d =$ ____ dB

4) Directivity : $10 \log P_2/P_1 = y - y_d =$ ____ dB

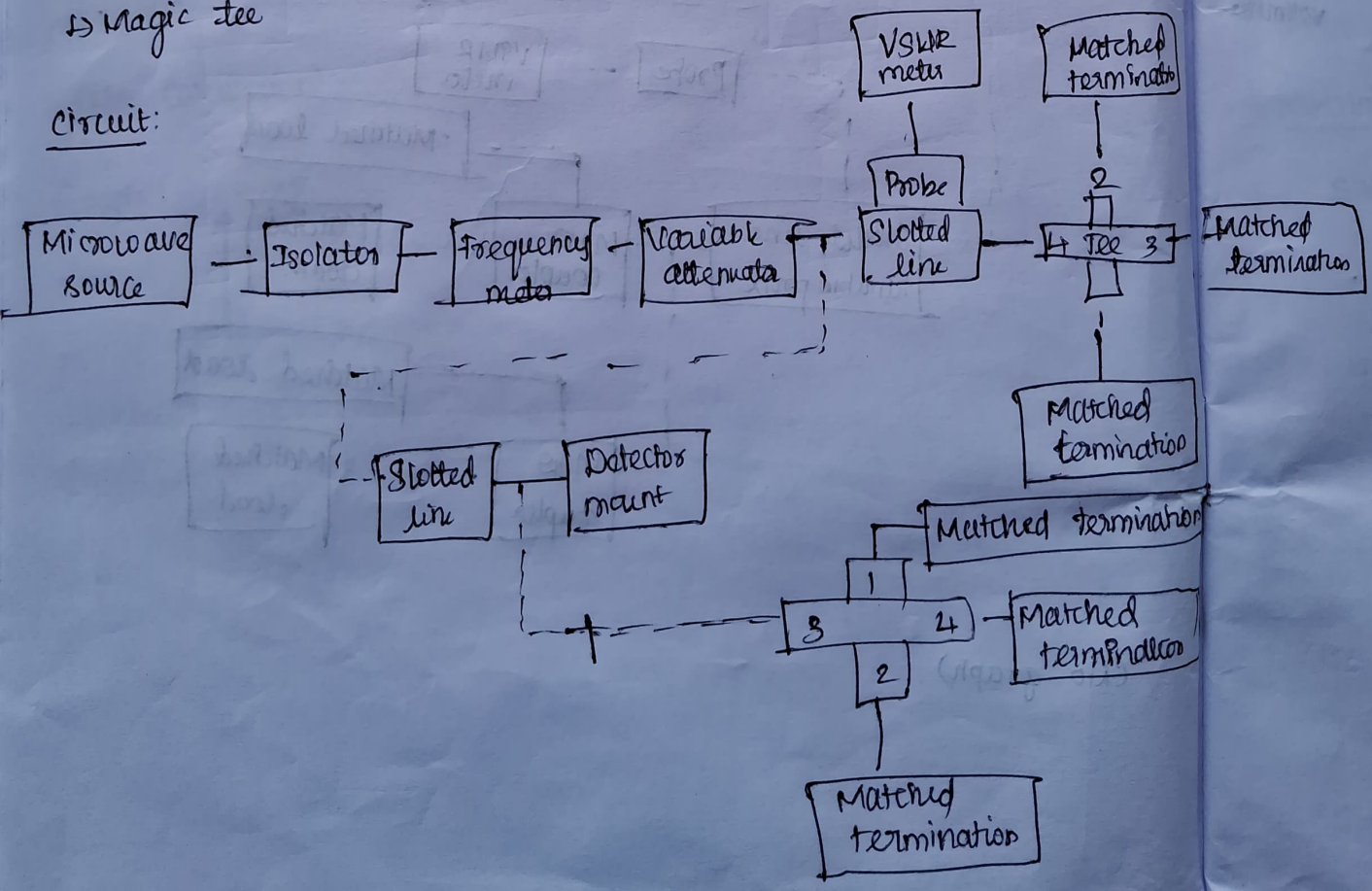
b) Measurement of power distribution in magic tee

Aim:

Apparatus required:

- Same as (2a)
- Magic tee

Circuit:



CNO graph)

Readings

$P_3 = 14.5$

$P_4 = 31.1$

Calculation:

1) Isolation $= -(10 \log_{10} P_4/P_3)$

$= P_3 - P_4$

$=$ ___ dB

2) Coupling coefficient

$$a_j = 10^{(-a/20)}$$

where, $a = 10 \log P_3/P_4$

$a_{ij} =$ ___ (no unit)

2) VI Characteristics of LED and LASER diode

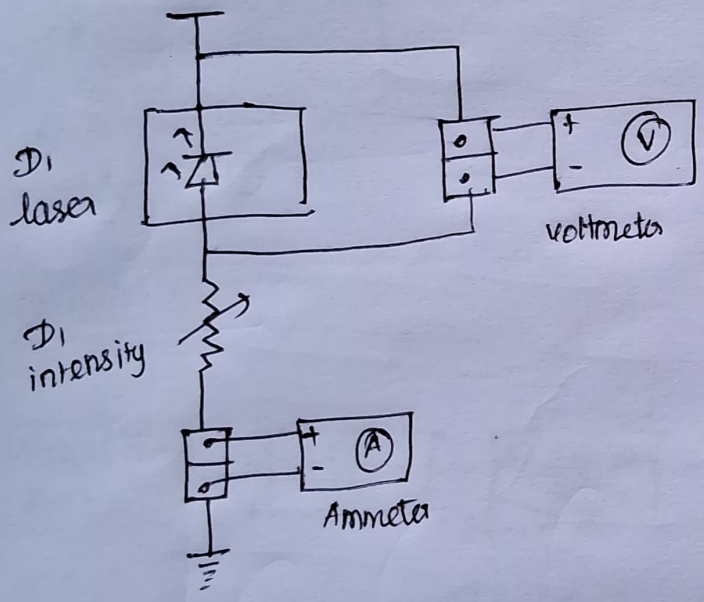
Aim:

Apparatus required:

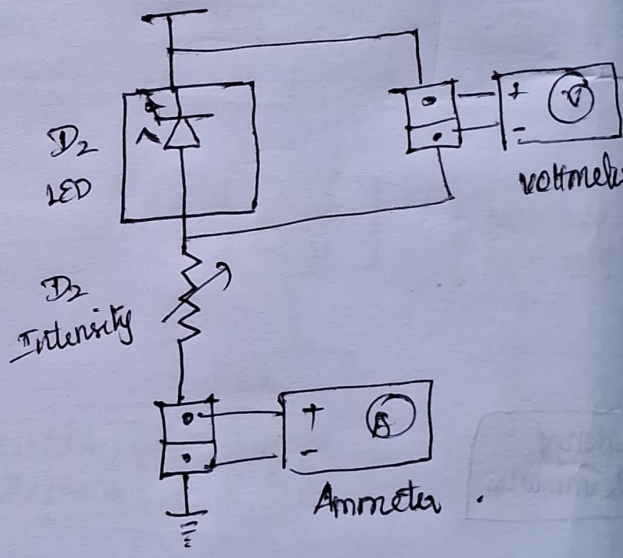
↳ Experiment kit, LED, Laser
↳ jumpers
↳ Voltmeter, Ammeter, potentiometer

Circuit:

a) Laser



b) LED



Tabulation:

a) Laser

S.No.	Voltage(V)	current (mA)	power (mW) = V x Current
1			
:			
:			
:			
10.			

b) LED

Same table

Graph:

a) & b)

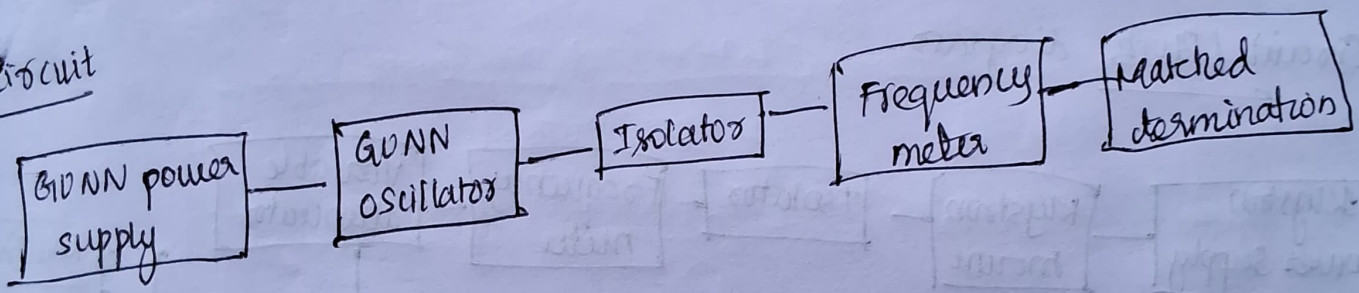
4) Characteristics of GUNN Diode Oscillator

Aim:

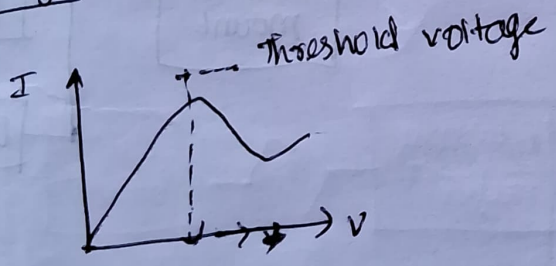
Apparatus required

- GUNN diode
- GUNN oscillator
- Isolator
- Frequency meter
- Matched termination
- Gunn Power supply.

Circuit



Model graph:



Tabulation

S.No.	Voltage (V)	Current (mA)
1		
:		
12		

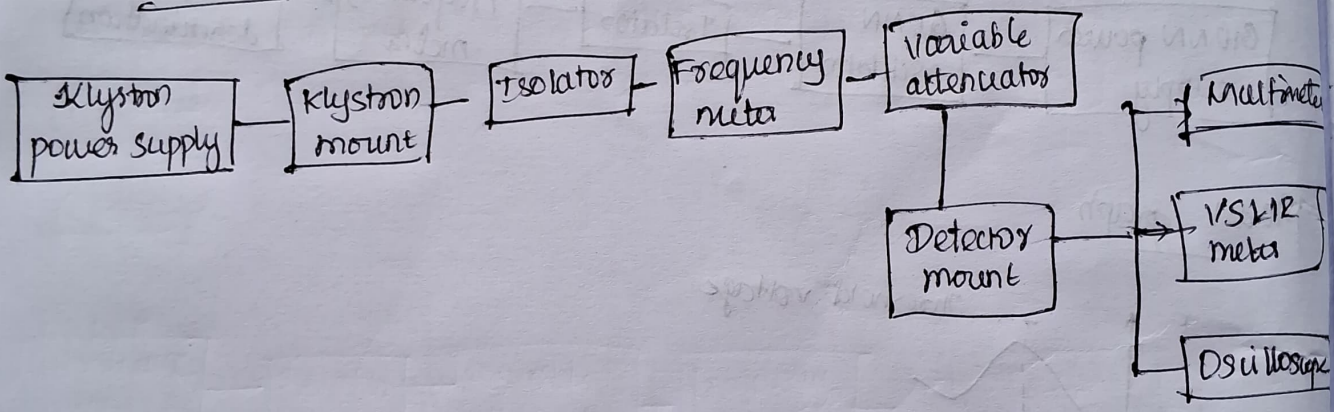
5) Characteristics of Reflex Klystron Oscillator

Aim

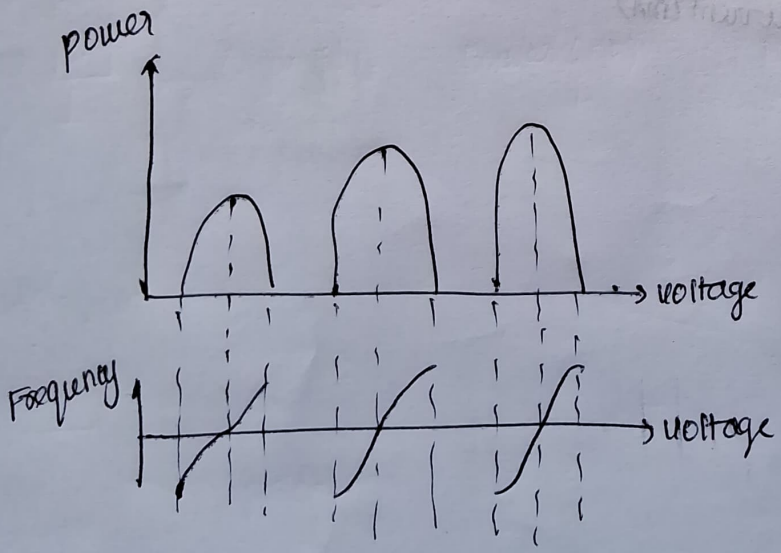
Apparatus required:

- Klystron power supply
- Klystron tube and mount
- Isolator
- Frequency meter
- Variable attenuator
- Waveguide stand
- Detector mount
- VSWR meter
- Oscilloscope & BNC cable

Circuit / Block diagram



Model Graph



Tabulation

Current = 16mA

S.No	Minimum voltage	Maximum voltage	Minimum voltage	Amplitude	Frequency	Power (mW)
1	-142	-130	-122	0.3	9.39	16X0.3
2	-94	-90	-86	0.16	9.41	16X0.16
3	-53	-47	-37	0.12	9.39	16X0.12

6) Measurement of Antenna parameters and RF passive component characteristics using vector network analyzer

Aim:

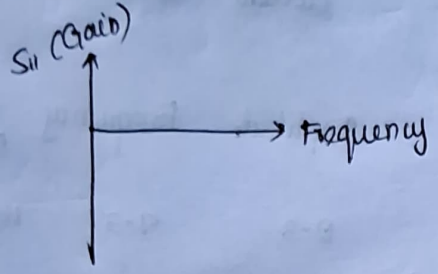
Apparatus required:

S.No	DUT, Equipments & Accessories	Model Name	Quantity
1.	Circulator	Circulator	1
2	Vector network analyzer/ Spectrum analyzer	Obzer 1300	1
3	Matched termination	50Ω with SMA connector	1
4	Measuring coaxial cable	Standard 50Ω type N male to SMA female	2

Tabulation

S.No	Frequency (MHz)	S_{11} (dB)
1	954.99 MHz	-6.2 dB
2	967.22	-8.5
3	984.62	-15.9
4	998.62	-21.7
5	1.01 GHz	-17.2
6	1.02	-14.9
		-8.1

Graph:



1) Radiation pattern measurement of Horn Antenna

Aim

Apparatus required:

- Klystron power supply
- Klystron Oscillator
- Variable attenuator
- Horn antenna
- VSWR meter
- Detector mount

Circuit

Tabulation

S.No.	Angle (ϕ)	Power (dB)	Power (watts) $= \frac{10^{P(dB)/10}}{1000}$
1			
⋮			
20			

Graph

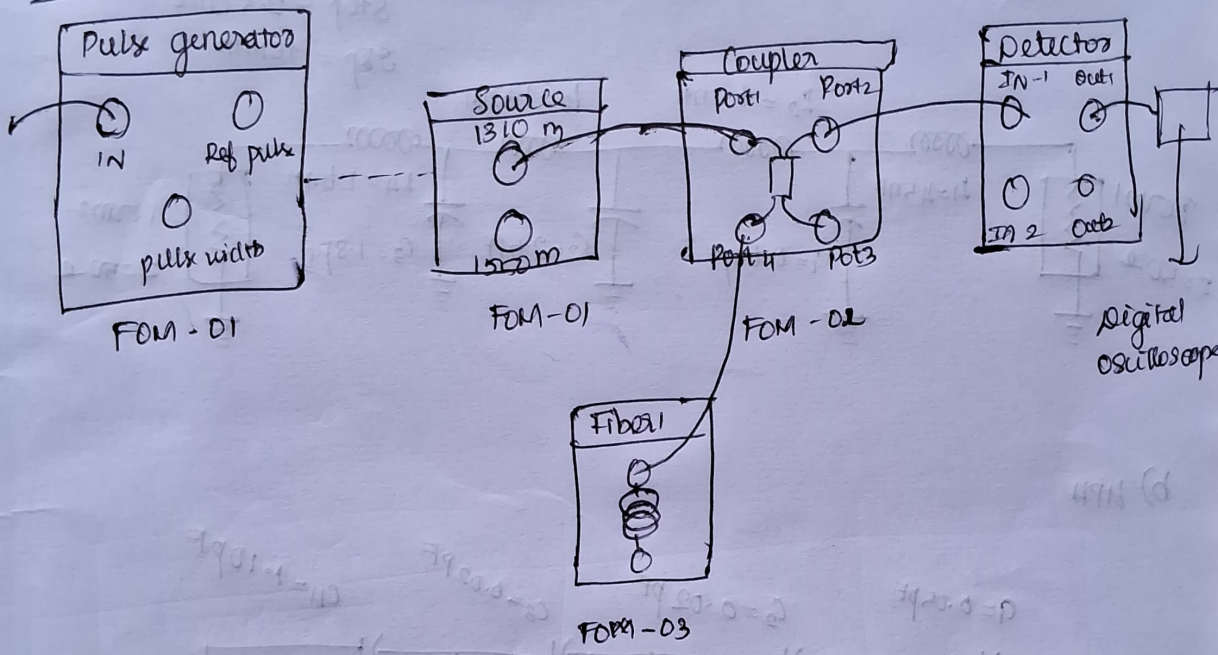
polar graph

Aim:

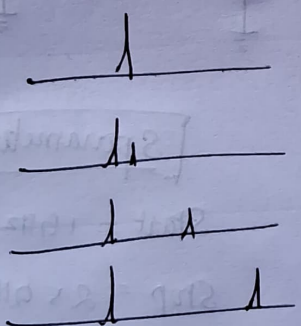
Apparatus required

- FOM - 01, FOM - 02, FOM - 03
- 1 meter ST-ST glass fiber cables - 05
- Dual channel Digital Storage Oscillator 100MHz
- Function Generator 1MHz

Circuit:



Model graph



Tabulation:

Ref pulse : 7 x 200 mV

S.N	Time period	Amplitude
1	1 μs	2.5 x 200 mV
2	5 μs	2.2 x 200 mV
3	10 μs	2 x 200 mV

Reflection

$R = \frac{3 \times 10^8 \times (\text{Time period})}{3}$

$R = 100\ m$

$R = 500\ m$

$R = 1000\ m$

9) Design of low pass and high pass filter using ADS

Aim:

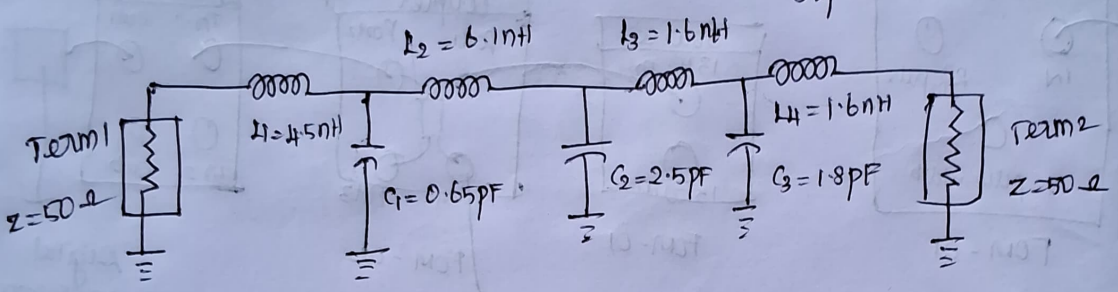
Apparatus required

PC with ADS software installed

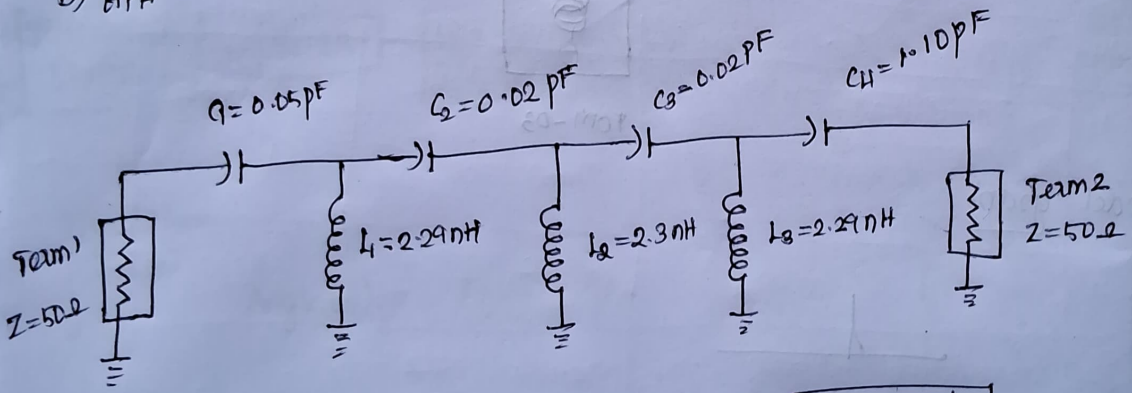
Circuit

a) LPF

S parameters
Start = 1GHz
Stop = 2.5GHz
Step = 10MHz



b) HPH



S parameters
Start = 1GHz
Stop = 2.5GHz
Step = 50MHz

Graph

10) Discover the sources of EMI Emission with near field probes

Aim

Apparatus required

- Spectrum analyzer
- Near field probe
- RF PCB board