ANTENNA MEASUREMENTS -
RADIATION PATTERN & IMPEDANCE MEASUREMENT

NEED

- To ensure that the antenna meets specifications
- To characterize it

Typical Parameters

- Gain
- Bandwidth
- Radiation Pattern
- Beamwidth
- Impedance etc…

Measurement of Radiation pattern

- Graphical representation of radiation as a function of direction

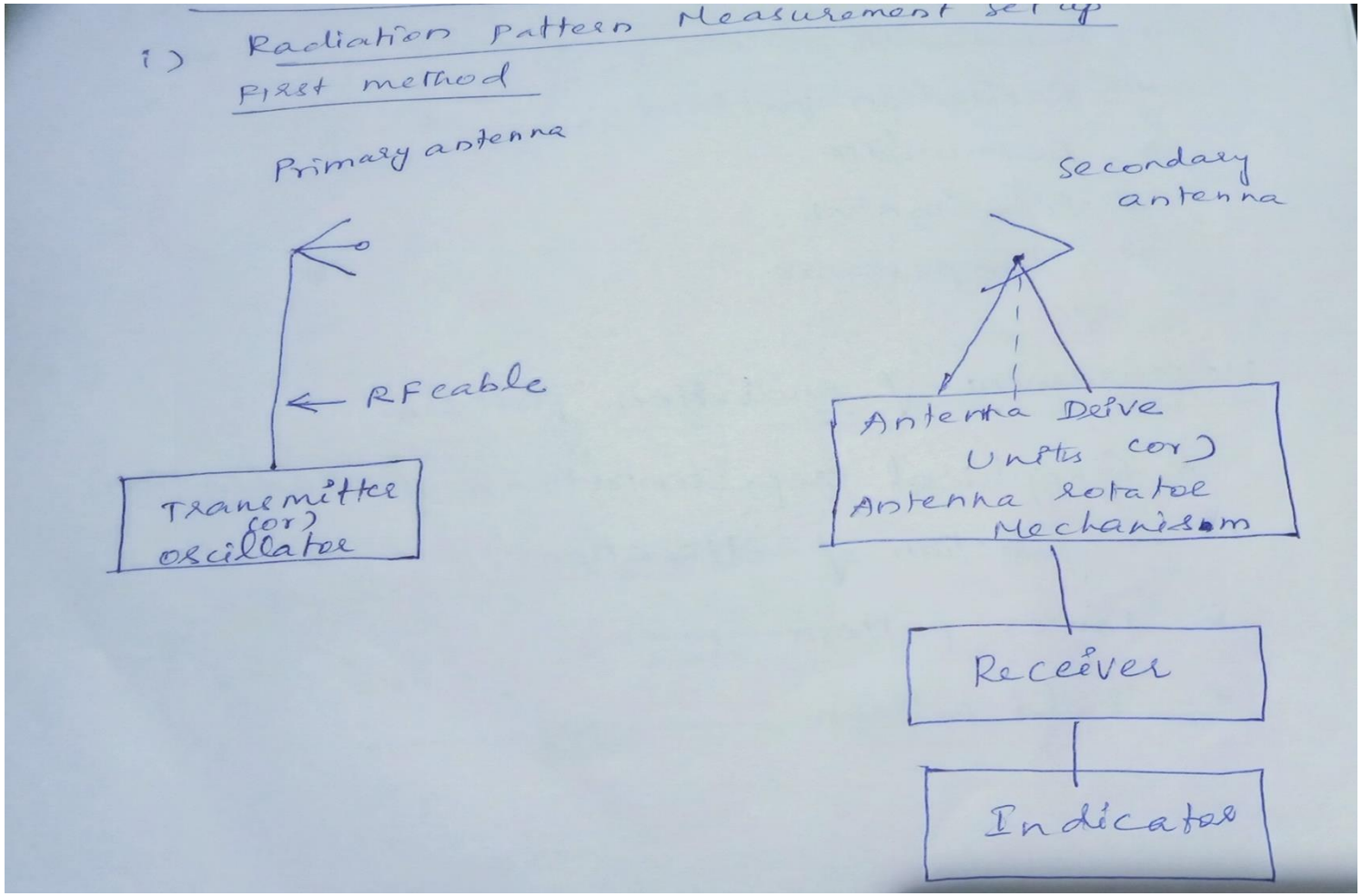
Types

- Power pattern
- Field pattern

Requirements

1. Antenna Under Test (AUT)
2. Other antenna at some distance away from the first antenna
3. Mount for Rotating the antenna
4. Receiver or Detector
5. Indicator

Radiation pattern Measurement set up



Radiation pattern Measurement

- **Two methods**

First Method

Primary antenna – stationary

Secondary antenna – rotated

Second Method

Primary antenna – rorated

Secondary antenna – stationary

Radiation pattern Measurement

- **To get accurate far field radiation pattern, the distance between the primary & secondary antenna should be,**

$$r >= 2D^2/\lambda$$

Impedance Measurement

- **Two methods**

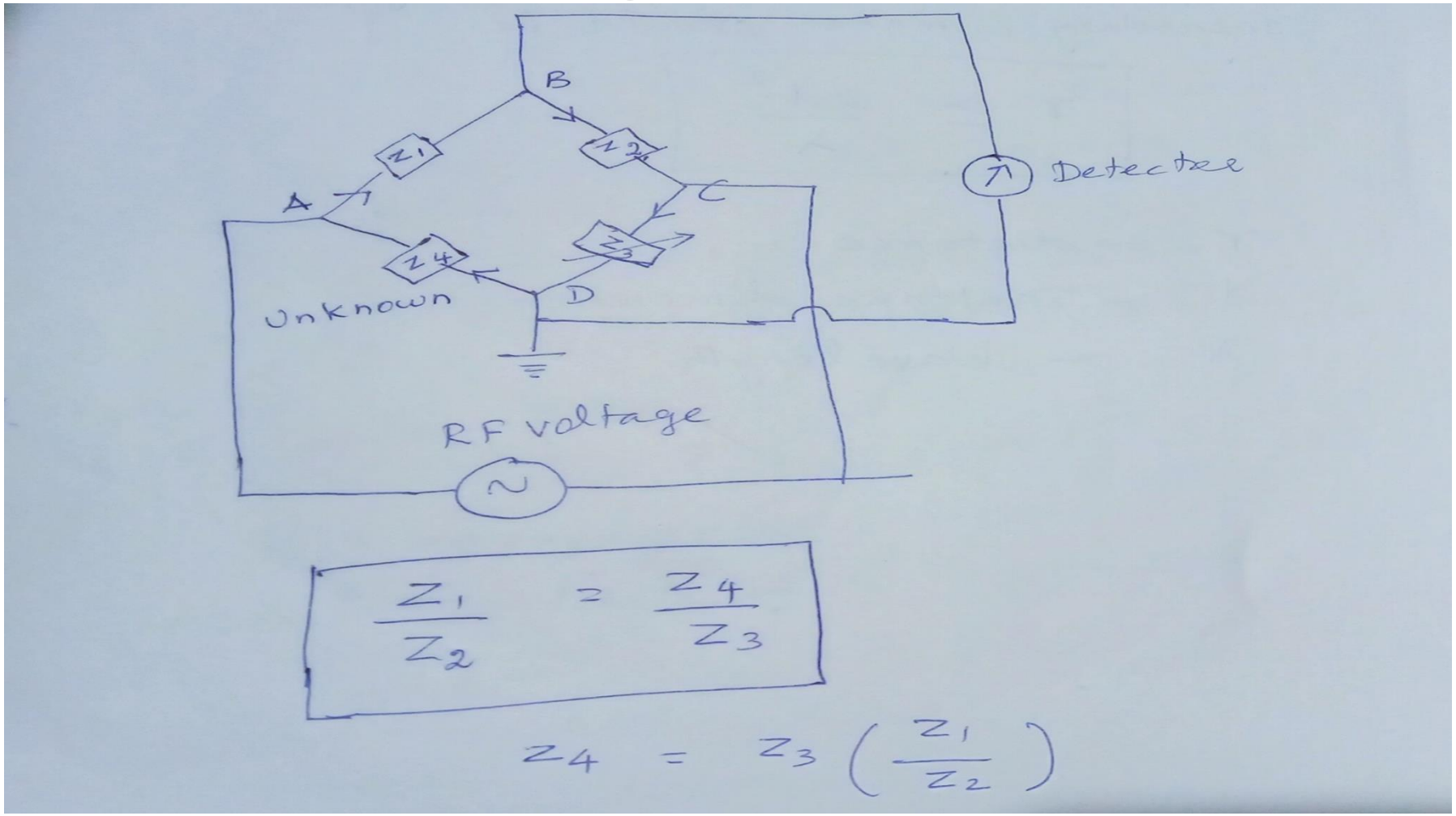
First Method

Bridge method – Low frequency

Second Method

Slotted line method – High frequency

Bridge Method



Slotted line Method

$$VSWR = \frac{1+|\Gamma|}{1-|\Gamma|}$$

$$\Gamma = \frac{V_{reflected}}{V_{incident}} = \frac{Z - Z_0}{Z + Z_0},$$

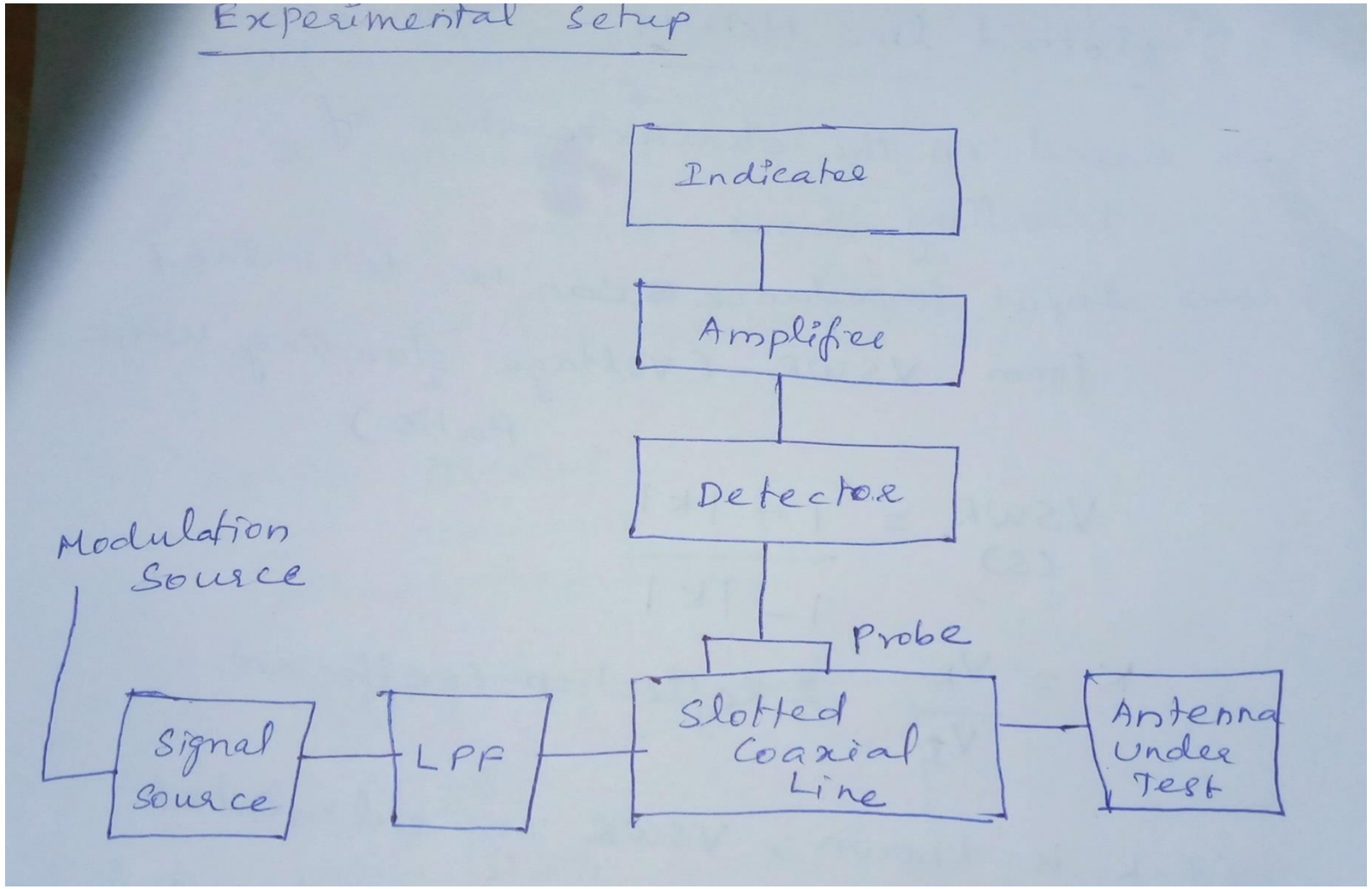
$$Z_{IN} = Z_0 \left[\frac{Z_L + j\, Z_0 \tan(\beta\ell)}{Z_0 + j\, Z_L \tan(\beta\ell)} \right]$$

- Z_L *is the termination impedance*
- ℓ *is line length.*
- $\beta = 2\pi f / (V_P)$

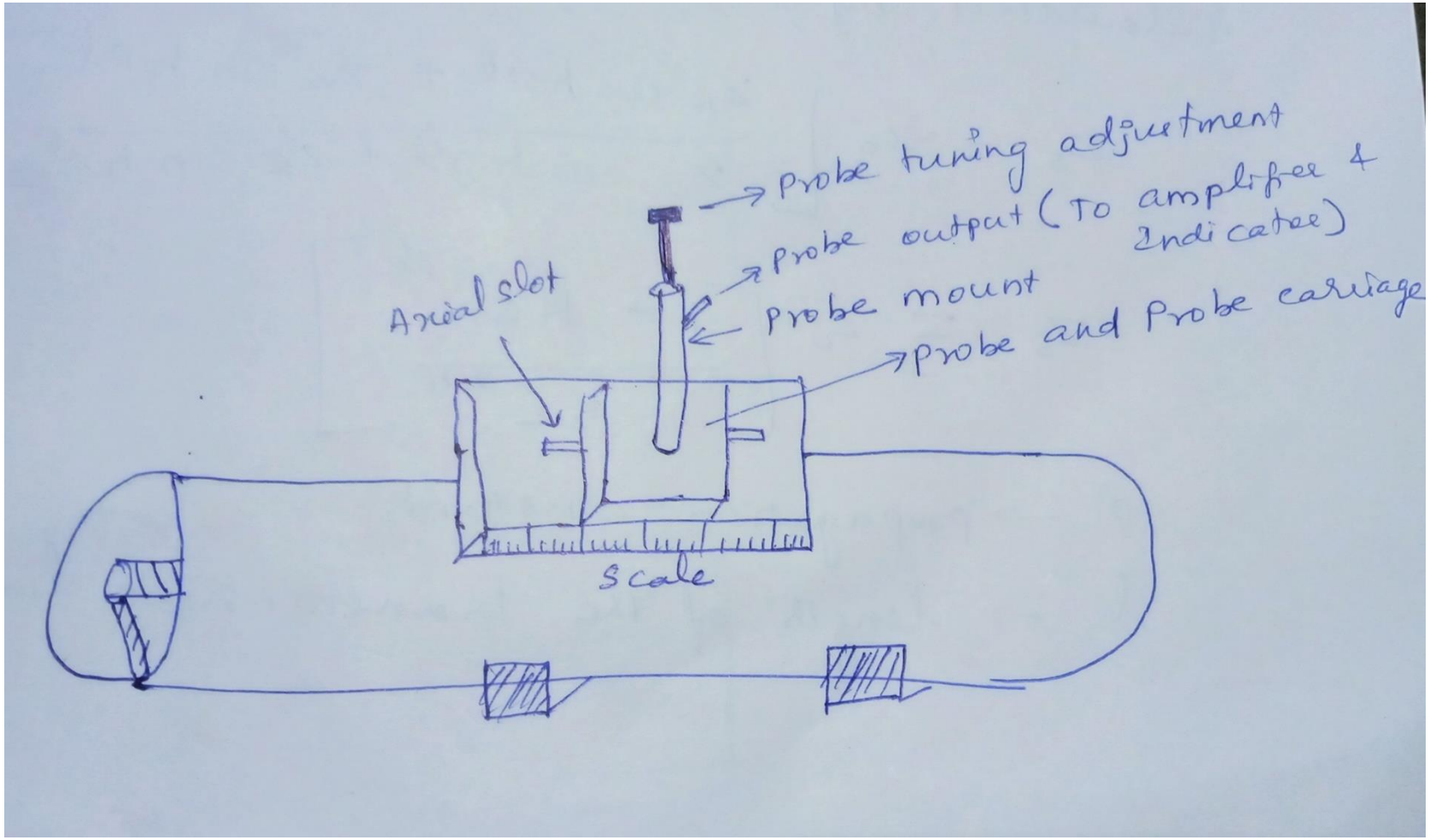
Slotted line Method

Under balanced condition

Slotted line Method



Slotted line Method



THANK YOU