



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35**  
**An Autonomous Institution**



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade  
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## **DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

### **OPTICAL AND MICROWAVE ENGINEERING**

III YEAR/ VI SEMESTER  
1

#### **UNIT 3 – MICROWAVE MEASUREMENTS**

#### **TOPIC– MICROWAVE POWER MEASUREMENT**



**Guess the Topic????**

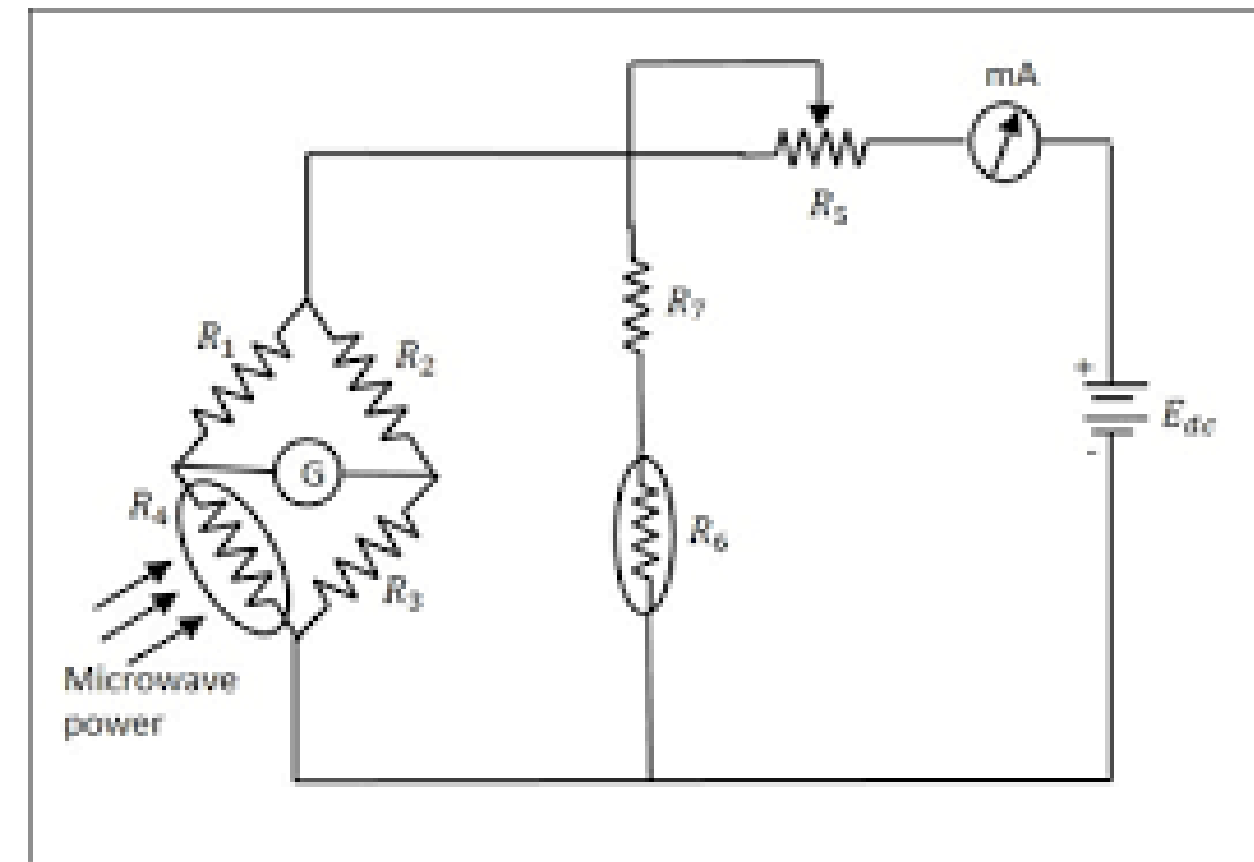




# LOW POWER MEASUREMENT



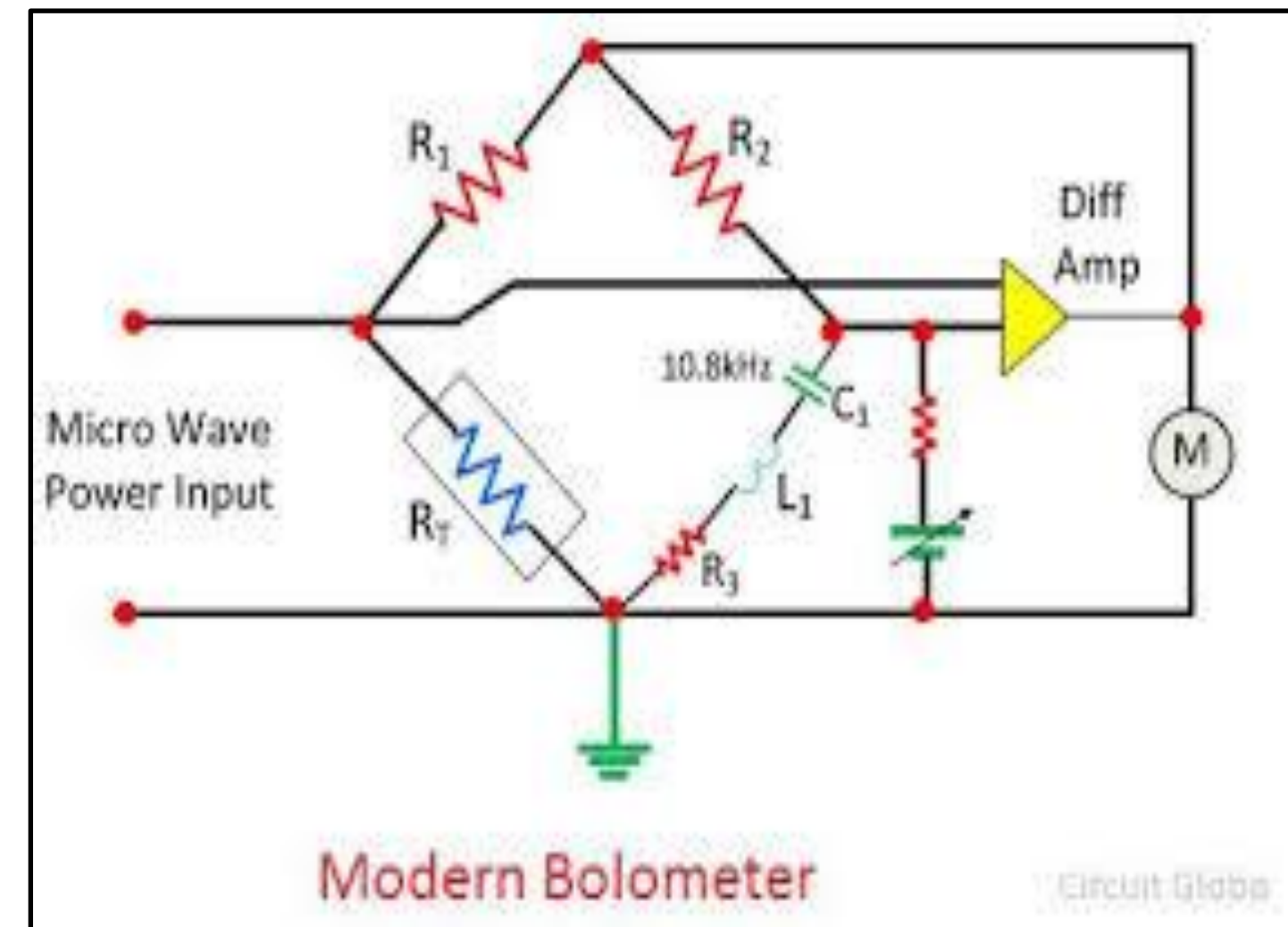
The measurement of Microwave power around 0.01mW to 10mW, can be understood as the measurement of low power.





# BOLOMETER

- Bolometer is a device which is used for low Microwave power measurements.
- The element used in bolometer could be of positive or negative temperature coefficient.
- For example, a barrater has a positive temperature coefficient whose resistance increases with the increase in temperature

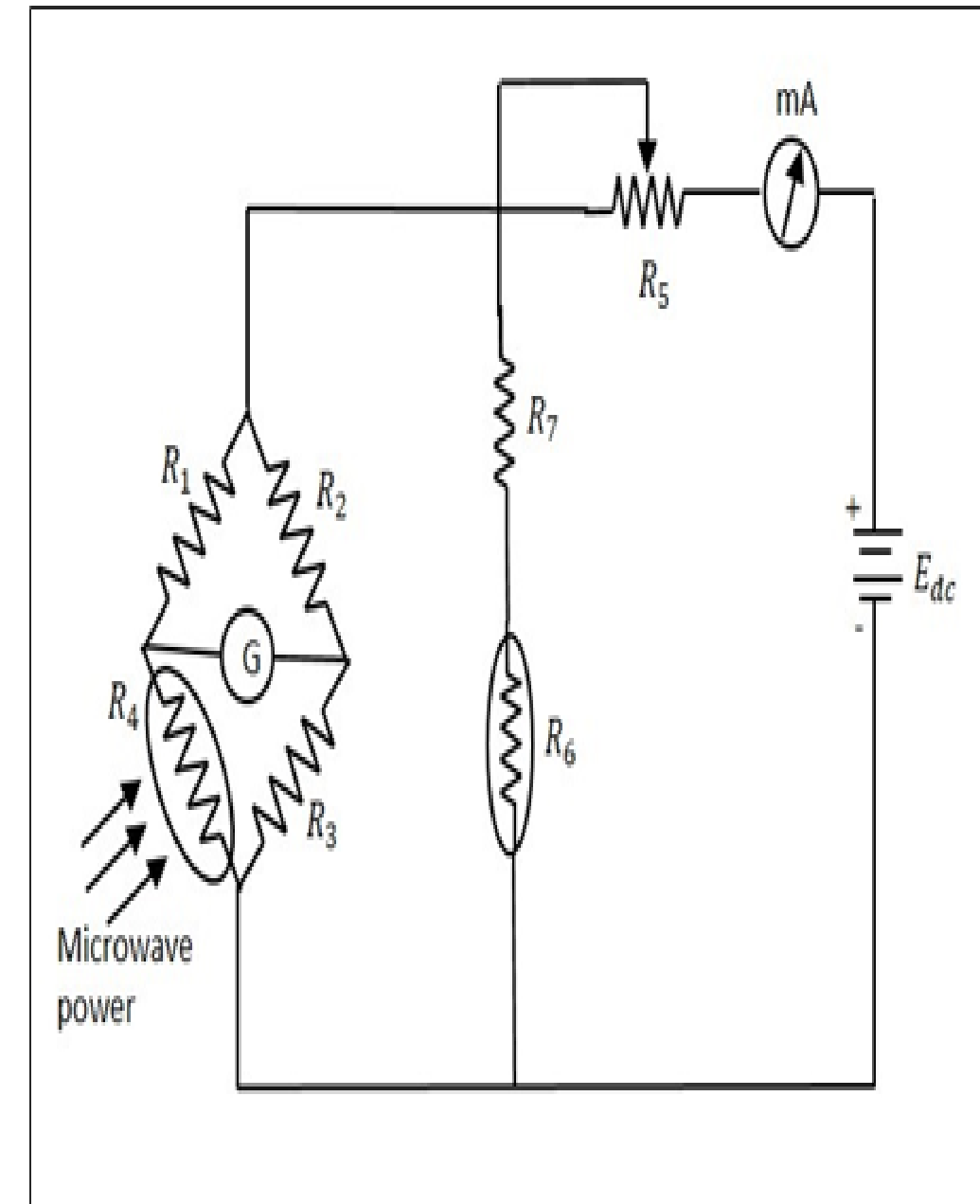




# BOLOMETER



Any of them can be used in the bolometer, but the change in resistance is proportional to Microwave power applied for measurement. This bolometer is used in a bridge of the arms as one so that any imbalance caused, affects the output.

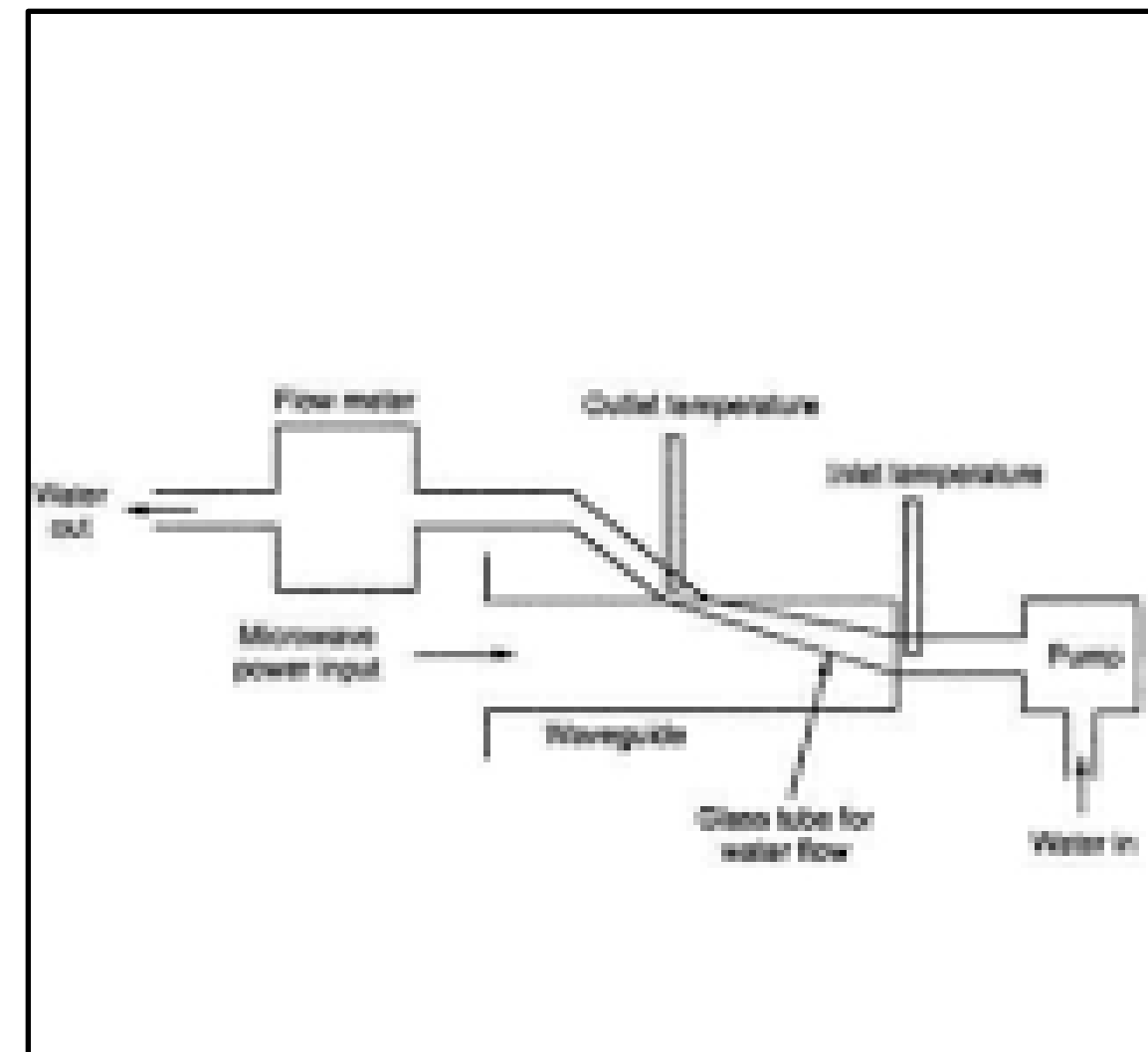




# CALORIMETRIC METHOD



The measurement of Microwave power around 10mW to 1W, can be understood as the measurement of medium power.





## ACTIVITY TME



$$\begin{array}{r} \square + \square = 14 \\ + \\ \square - \square = 10 \\ \parallel \quad \parallel \\ 15 \quad 16 \end{array}$$



# MICROWAVE POWER MEASUREMENTS



- > The measurement of Microwave power around 10W to 50KW, can be understood as the measurement of high power.
- >The change in temperature of the liquid before and after entering the load, is taken for the calibration of values.
- >The limitations in this method are like flow determination, calibration and thermal inertia, etc.

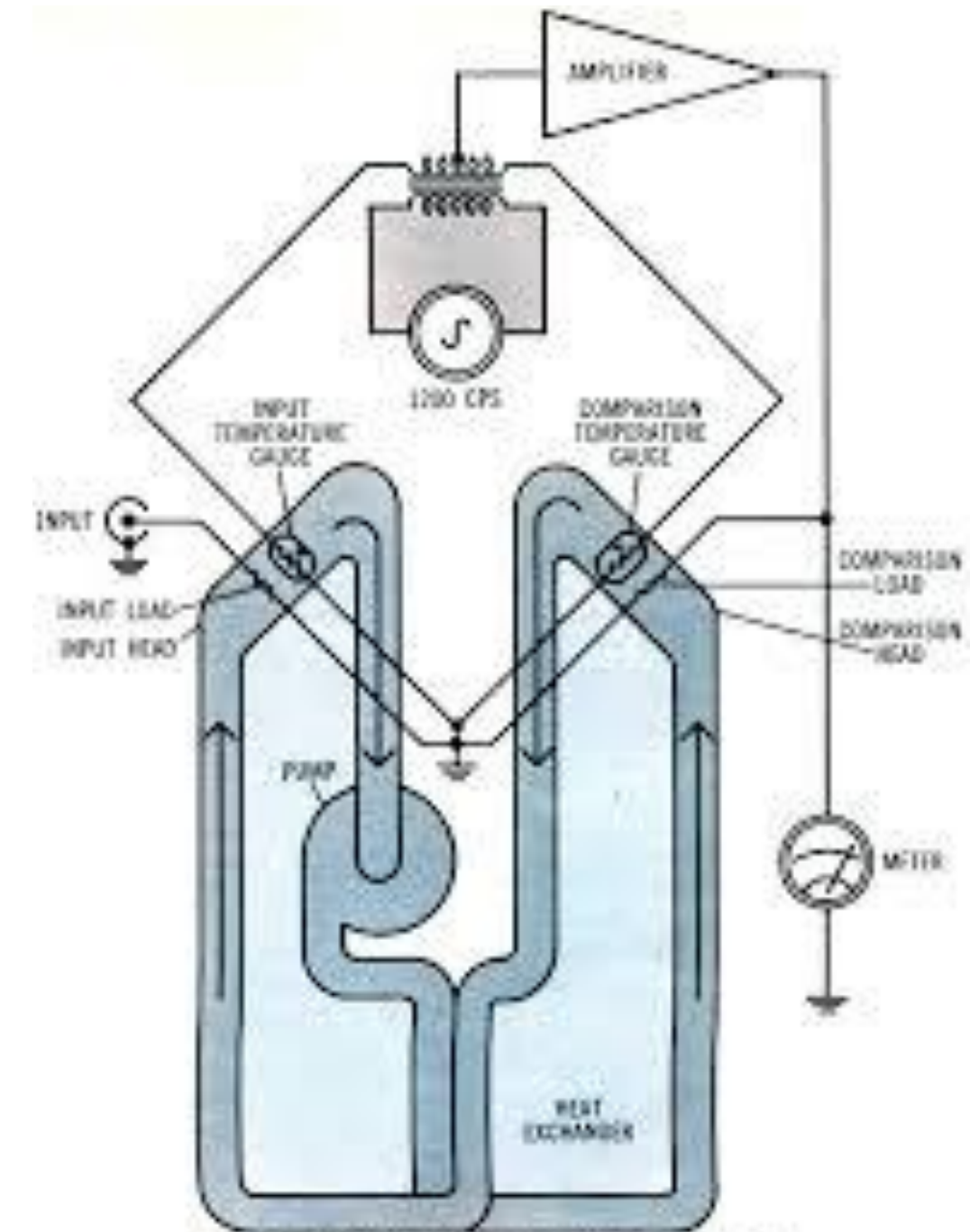
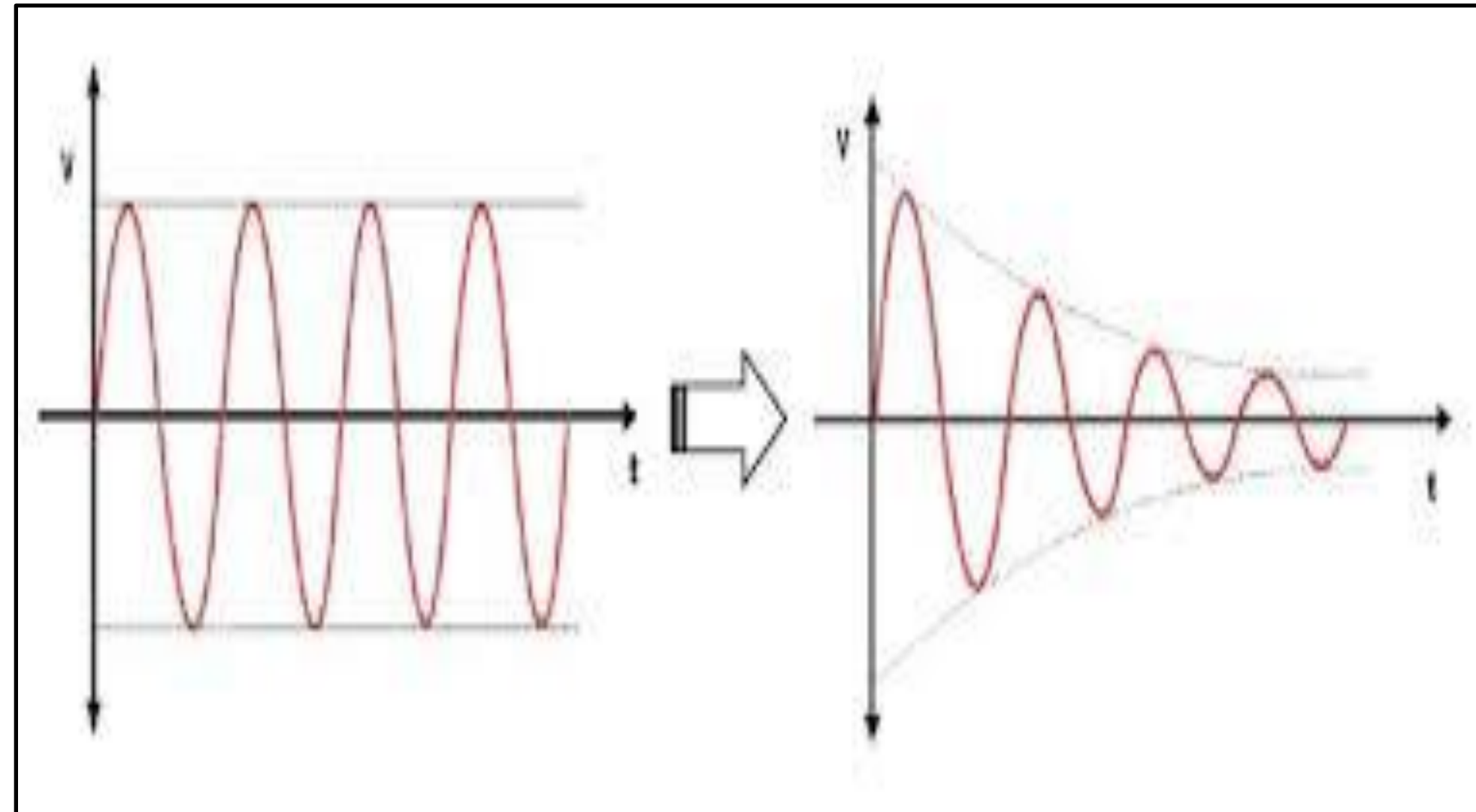


Fig. 1. Simplified diagram of a calorimetric power meter.





# GUESS THE TOPIC????



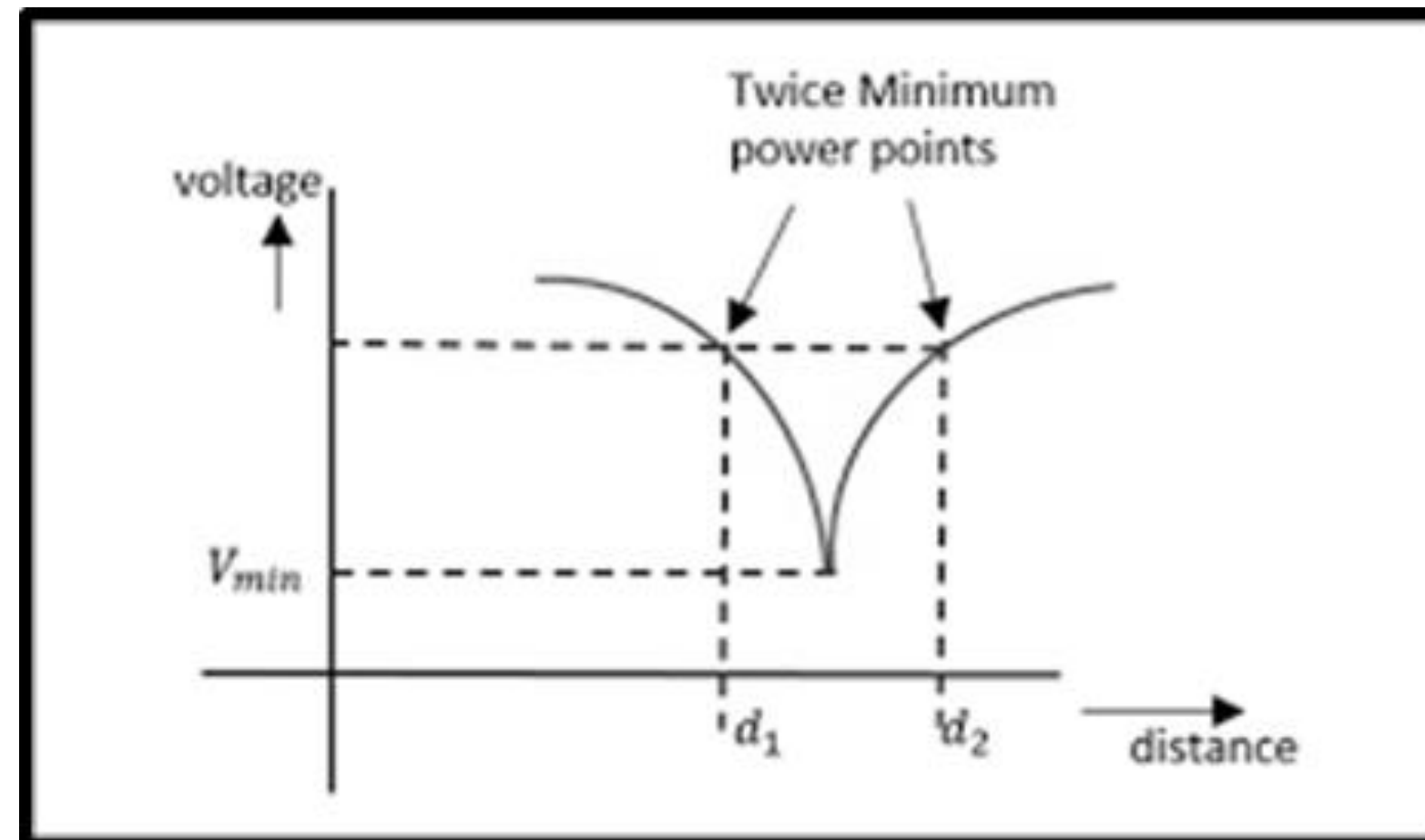
5/9/2024



# ATTENUATION MEASUREMENT



Microwave components and devices often provide some attenuation. The amount of attenuation offered can be measured in two ways. They are – Power ratio method and RF substitution method.



5/9/2024



## ATTENUATION MEASUREMENT



Attenuation is the ratio of input power to the output power and is normally expressed in decibels.

$$\text{Attenuation in dBs} = 10 \log \frac{P_{in}}{P_{out}}$$

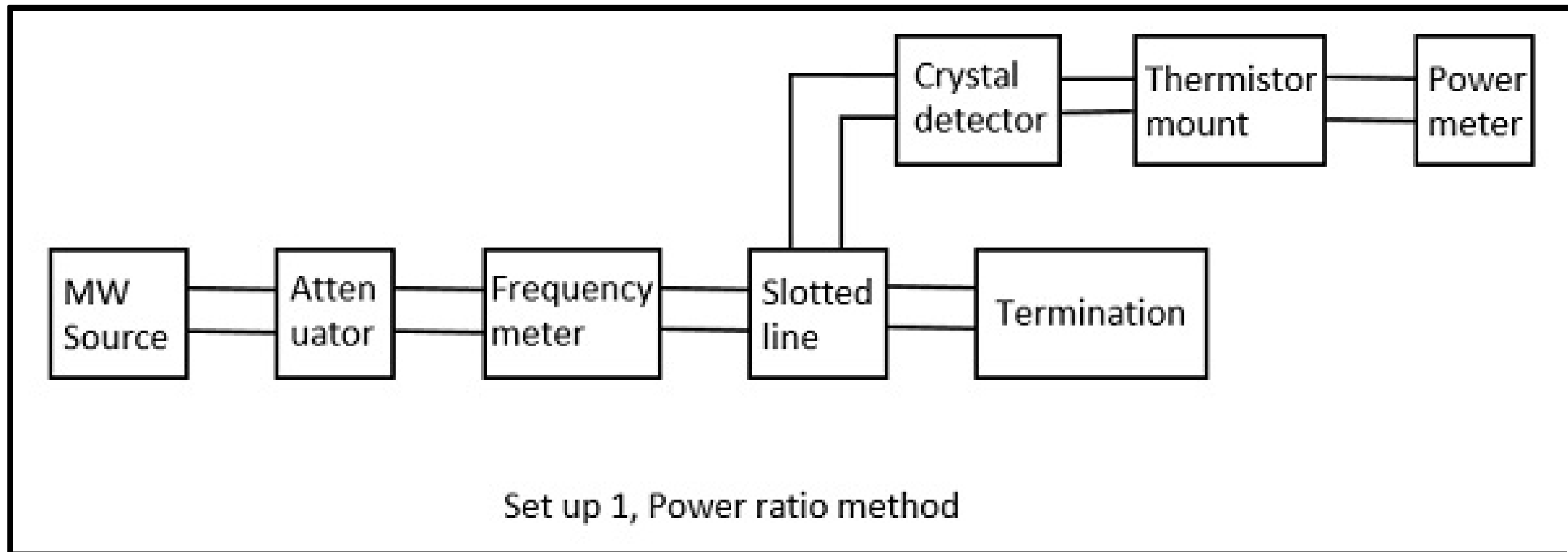
Where  $P_{in}$  = Input power and  $P_{out}$  = Output power



# ATTENUATION MEASUREMENT



## Power Ratio Method



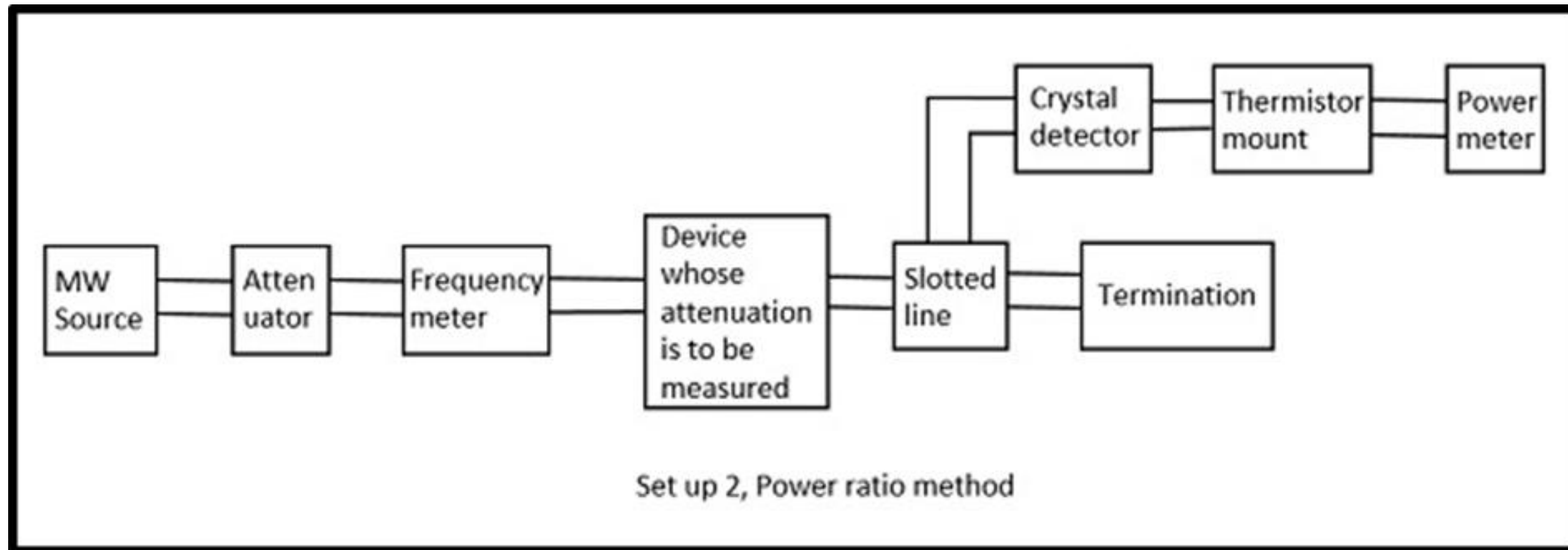
5/9/2024



# POWER RATIO METHOD



The input and output power of the whole Microwave bench is done with the device whose attenuation has to be calculated.



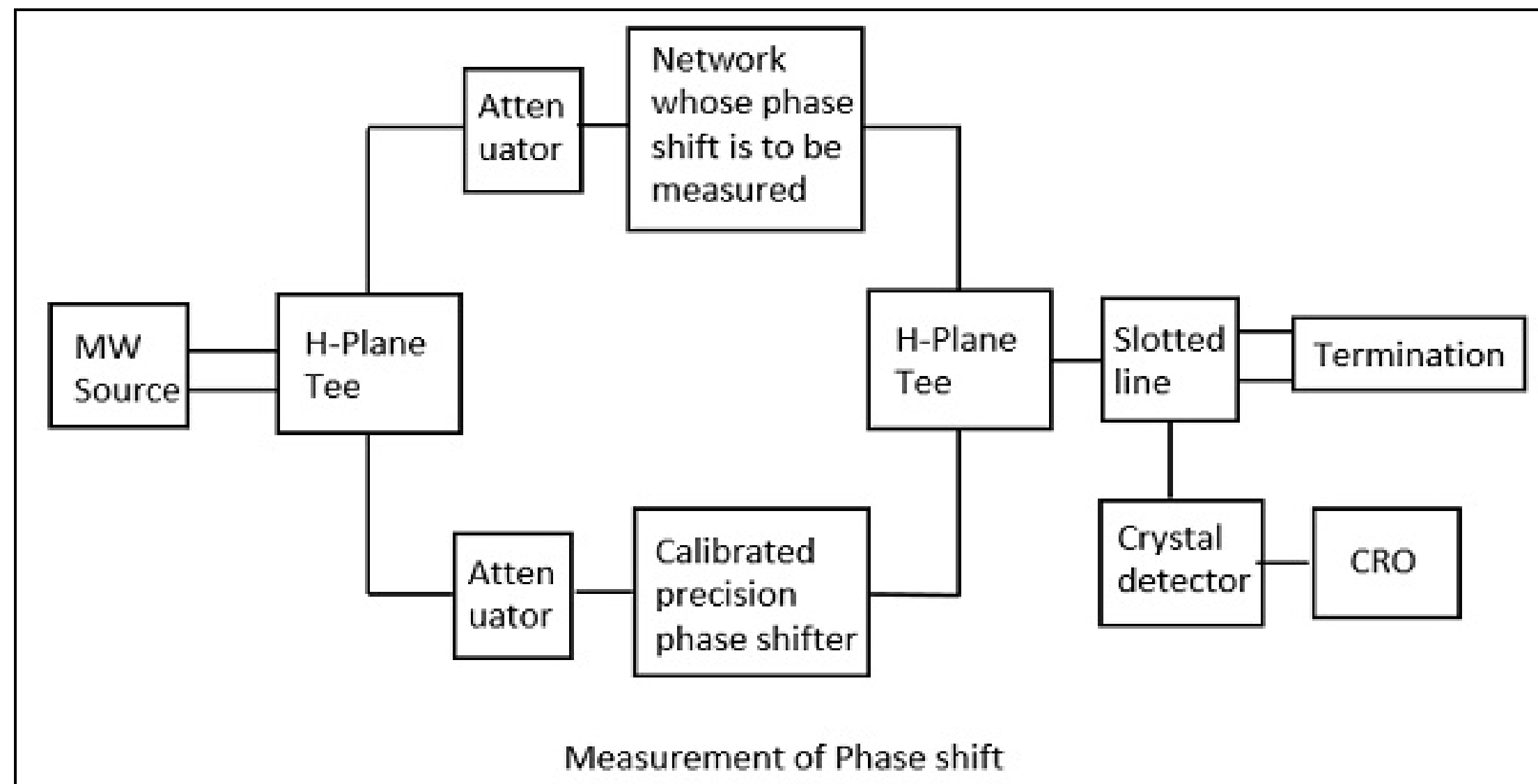
5/9/2024



# MEASUREMENT OF PHASE SHIFT



To measure such phase shift, we use a comparison technique, by which we can calibrate the phase shift.






# ASSESSMENT TIME



## Think, Pair, Share

What's the issue / question / topic?	What do I think about it?	What does my partner think?	What will we share?
			



**THANK YOU**