



Department of Electronics & Telecommunication Engineering

CLASS: B.E. E &TC

EXPT. NO.: 7

Roll No.: 42428

SUBJECT: RMT

DATE: 5/11/2020

TITLE: To plot standing wave pattern and measure SWR for open, short and matched termination at microwave frequency using slotted section with probe carriage.

OBJECTIVE: To determine V_{\max} and V_{\min} at open, short and match termination.

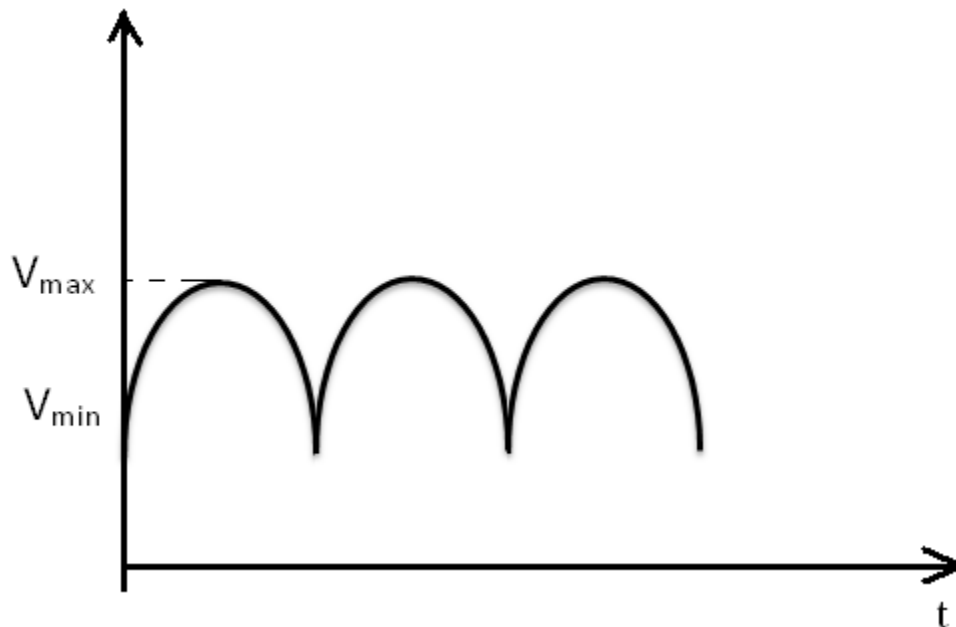
EQUIPMENTS:

1. Klystron Power Supply
2. Reflex Klystron with mount
3. Cooling Fan
4. Isolator
5. Variable Attenuator
6. Cavity Resonator
7. X-Band diode detector
8. BNC-to-BNC cable
9. Cathode Ray Oscilloscope
10. Slotted waveguide
11. Tunable Probe
12. Waveguid Stand
13. Matched Termination

THEORY:

Voltage standing wave ratio (VSWR) is define as the ratio of V_{\max} and V_{\min} .

$$\text{VSWR} = V_{\max} / V_{\min}$$



Reflection coefficient:

In term of reflection coefficient we can define VSWR as

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

The amplitude of reflected and incident waves are equals thus VSWR is infinite i.e. al energy is reflected.

The standing wave ratio (SWR) is dimensionless and value of VSWR lies in the range $1 \leq S \leq \infty$.

PROCEDURE:

1. Set up the components and equipments as shown in fig below.

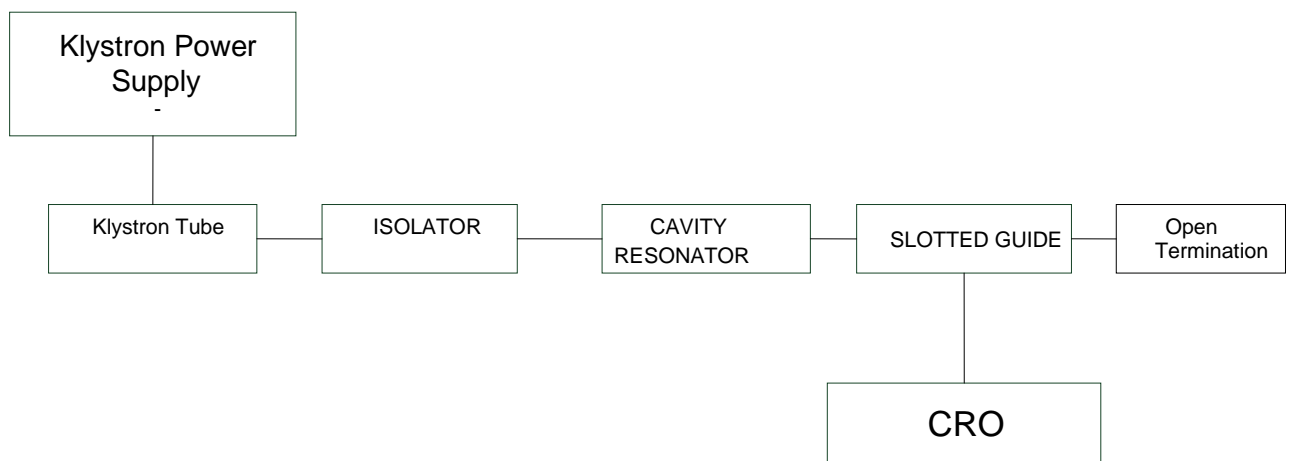


Fig. 1 Measurement of VSWR with open termination

2. Keep the control knobs of klystron power supply as bellow :

| | |
|-------------------|------------------------|
| Meter Switch | 'OFF' |
| Mod-Switch | AM |
| Beam Voltage | Fully anti-clockwise |
| Reflector voltage | Fully clockwise |
| AM-Amplitude Knob | Around fully clockwise |
| AM-Frequency Knob | Around Mid position |

3. 'ON' the Klystron Power Supply, VSWR Meter and Cooling Fan.
4. Turn the meter switch of Power Supply to beam voltage position and set beam voltage at 300V with the help of beam voltage knob.
5. Adjust the reflector voltage to get some deflection in VSWR Meter.
6. Tune the reflector voltage knob for maximum deflection.



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7. Tune the probe in slotted line section for maximum deflection, keep slotted section open.
8. Tune the frequency meter knob to get the 'dip' on the CRO scale and note down the frequency directly from frequency meter.
9. Detune the Frequency Meter
10. Move the probe to next minimum position and record the probe position again.
11. Do the above procedure for short and match termination.

OBSERVATION AND CALCULATIONS:

Beam Voltage: 246 V

Beam Current: 14 mA

Repeller Voltage: 246 V

Frequency: 11.75 GHz

Observation Table:

| Termination | V_{\max} | V_{\min} | VSWR |
|-------------|------------|------------|------|
| Match | 162 mV | 106 mV | 1.52 |
| Open | 164 mV | 44 mV | 3.72 |
| Short | 168 mV | 6 mV | 28 |



CONCLUSION:

In this experiment, we studied practical method to calculate VSWR. For matched termination VSWR was found to be 1.52 which is close to ideal value. For open and short termination, we found the value of VSWR to be 3.72 and 28 respectively which ideally should be infinite.

REFERENCES:

1. Microwave and Radar Engineering — M.Kulkarni
2. Basic Microwave Lab Manual — Sisodia