UNIT-VI

Measurement of Voltage Standing Wave Ratio (VSWR):

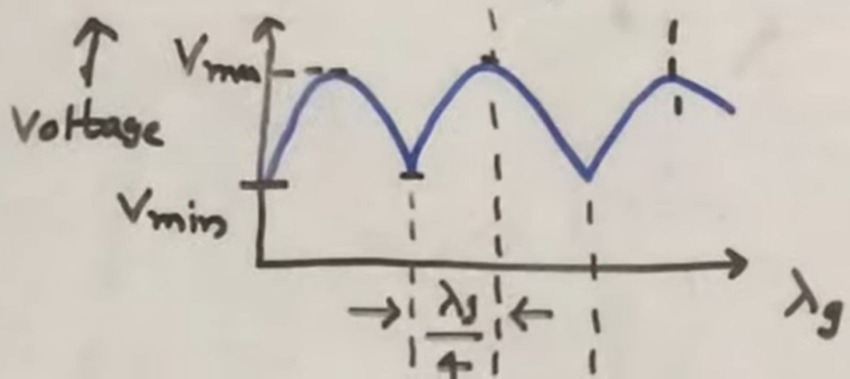
(i) If Load is not properly matched to the transmission line the [re]flections will occur. the incident & reflected waves ... produce a standing wave along the waveguide.

... 'Vmax' to 'Vmin' gives VSWR.

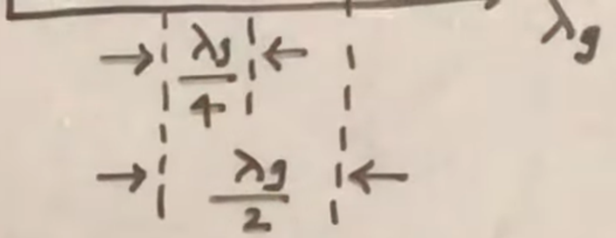
$$\boxed{S = \frac{V_{max}}{V_{min}} = \frac{1+|\rho|}{1-|\rho|}}$$

magnitude of Reflection coefficient.

standing wave



from 1 to ∞

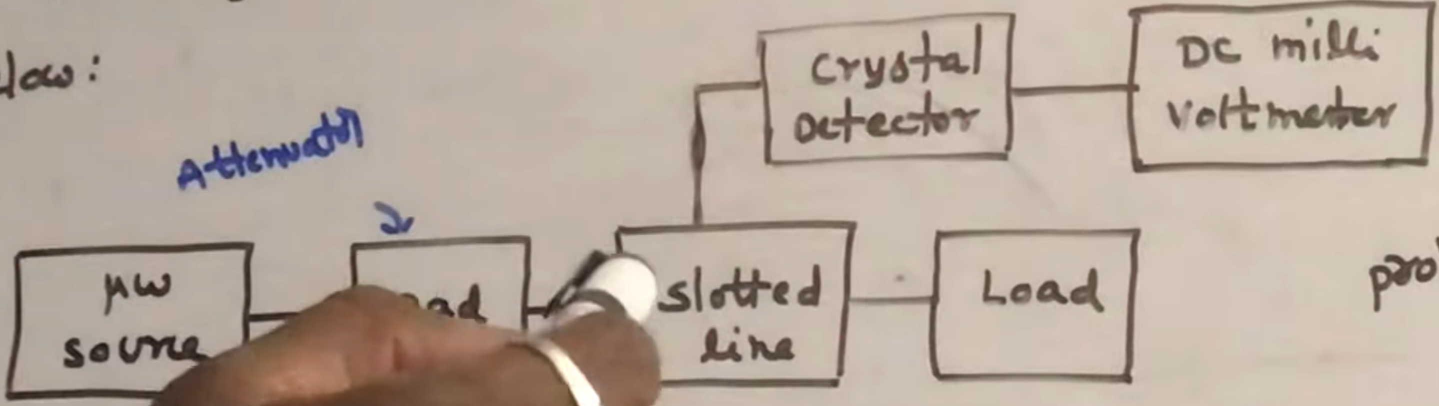


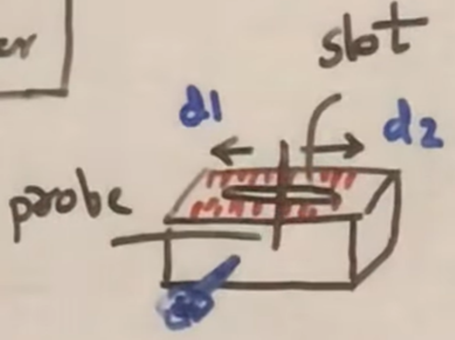
'S' varies from 1 to ∞

whereas 'ρ' varies from 0 to 1.

ii) measurement of Low VSWR ($S<10$):

(i) the values of VSWR less than '10' can be measured with the setup shown below:



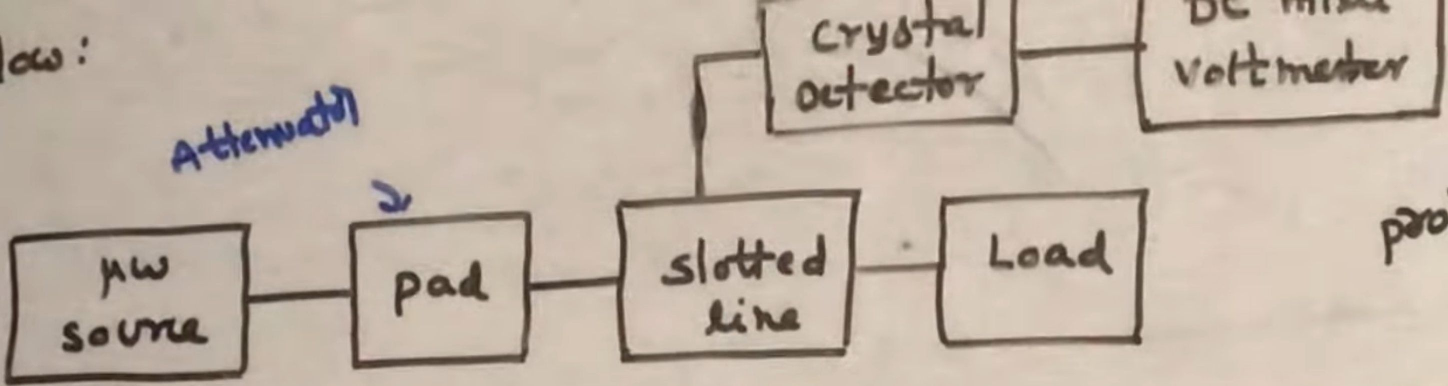


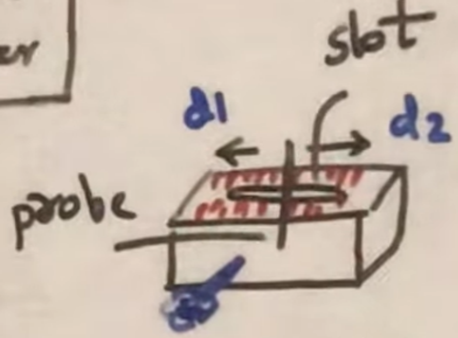
(ii) Initiall ... adjusted to give an adequate

readin ... ter.

... is moved to get maximum reading

shown below:

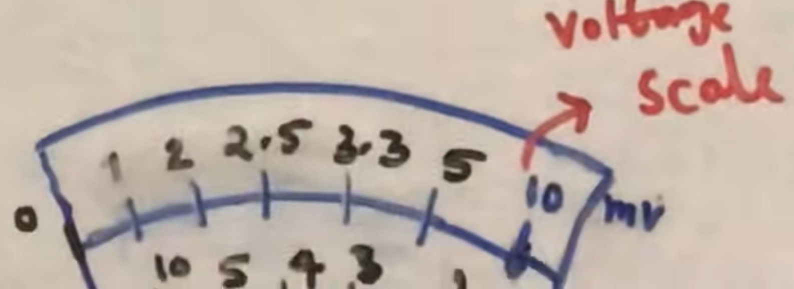




(ii) Initially the attenuator is adjusted to give an adequate reading on the DC millivolt meter.

(iii) The probe on the slotted line is moved to get maximum reading on the meter, V_{max}. Next the probe on the slotted line is adjusted to get minimum reading on the meter, V_{min}.

the ratio of $\frac{V_{max}}{V_{min}}$ gives VSWR.



(v) The meter can be calibrated interms of VSWR. In this case, the probe on the slotted line & pad are adjusted to give maximum deflection on VSWR meter. This full scale deflection (FSD) corresp... VSWR value of 1.

(vi) As ...le, a FSD of 10mV corresponds to a VSWR of '1'. Now th... adjusted to get minimum reading on the meter. If this ... to 5mV, then VSWR = $\frac{10mV}{5mV} = 2$. If it is 3.3mV then VS... $= 3$. If it is 1mV then VSWR = $\frac{10mV}{1mV} = 10$.

(vi) this m... ll not give accurate results when VSWR > 10 is measur...

voltage scale

...asurement ... VSWR (S>10):

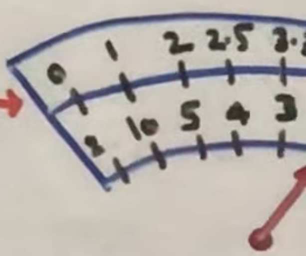
... use double minimum method.

(v) The meter can be calibrated in terms of VSWR. In this case, the probe on the slotted line & pad are adjusted to give maximum deflection on VSWR meter. This full scale deflection (FSD) corresponds to VSWR value of 1.

(vi) As an example, a FSD of 10 mV corresponds to a VSWR of '1' on the meter. Now the probe is adjusted to get minimum reading on the meter. If this corresponds to 5 mV, then $VSWR = \frac{10mV}{5mV} = 2$. If it is 3.3 then $VSWR = \frac{10mV}{3.3} = 3$. If it is 1mV then $VSWR = \frac{10mV}{1mV} = 10$.

(vii) This method will not give accurate results when VSWR > 10 is mea

voltage scale



B) Measurement of High VSWR (S

(i) For VSWR > 10, we use ... mum method.

corresponds to ...

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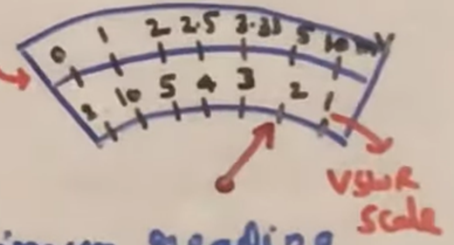

B) measurement of High VSWR (S>10):

(i) For VSWR > 10, we use double minimum method.

(ii) In this method, the probe is adjusted to find minimum reading (Vmin) on the meter.

(iii) The probe ... then moved to a point where the power is twice the minimum. ... this position is denoted by 'd1'. The probe is then moved to twice ... power point on the other side of minimum, say 'd2'.

... $2V_{min}^2$ & V_x^2

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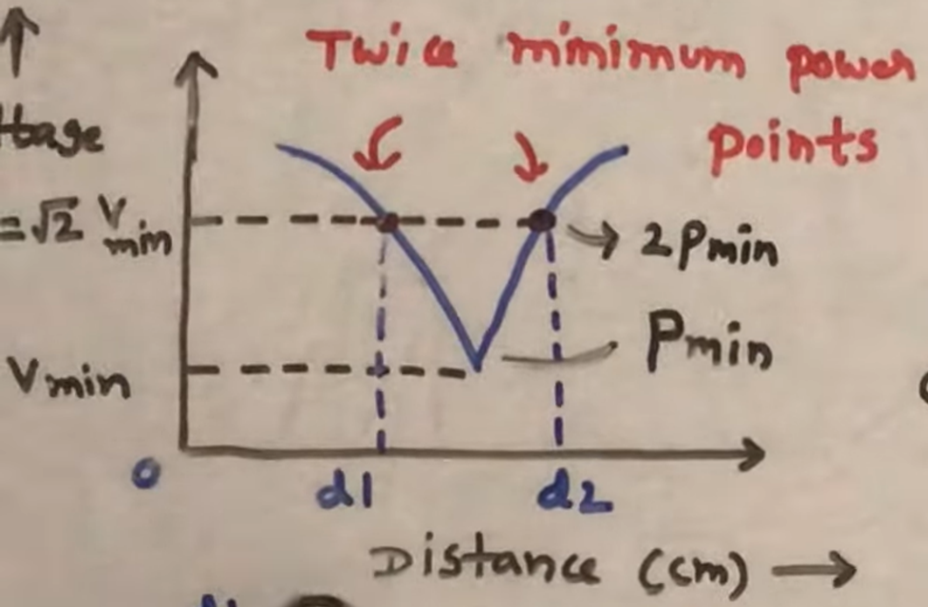
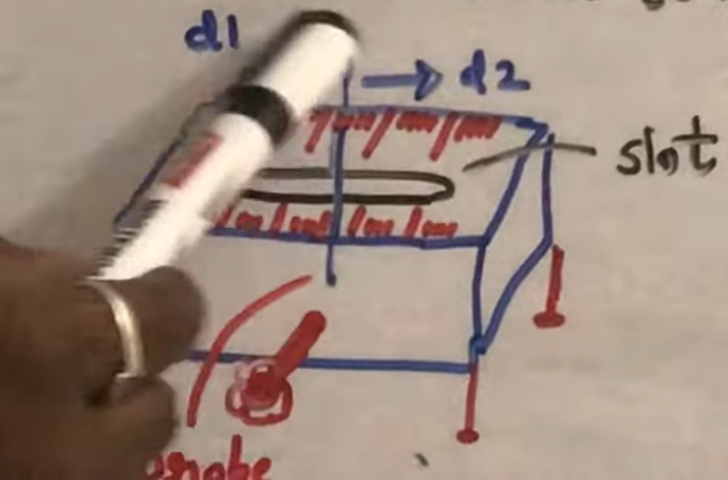


$$2P_{min} \propto V_x^2 \Rightarrow 2V_{min}^2 \propto V_x^2$$

$$\boxed{V_x = \sqrt{2}\,V_{min}}$$



(iv) The VSWR can be calculated using the formula;

$$** \quad \boxed{VSWR = \frac{\lambda_g}{\pi(d_2-d_1)}}$$

$$\boxed{\lambda_g = \frac{\lambda_0}{\sqrt{1-(\lambda_0/\lambda_c)^2}}}, \quad \lambda_0 = c/f$$

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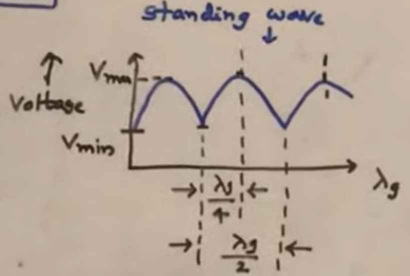

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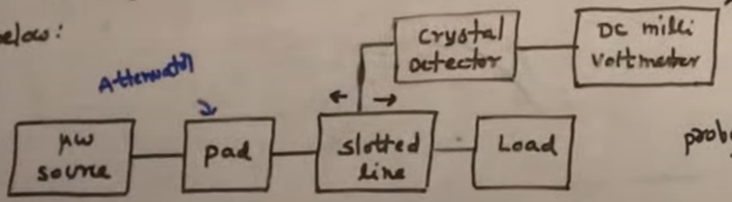

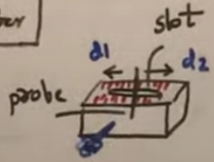

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(iii) The probe on the slotted line is moved to get maximum reading on the meter, V_{max}. Next the probe on the slotted line is adjusted to get minimum reading on the meter, V_{min}.

(iv) The ratio of V_{max} / V_{min} gives VSWR.

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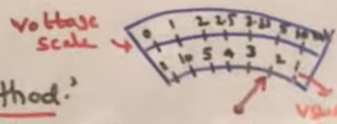

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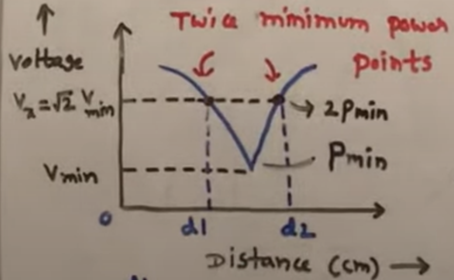

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