

ENGINEERING PHYSICS

PHYSICS LAB MANUAL

EN14103(P)



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# EXPERIMENT No. -1

## GRATING - NORMAL INCIDENCE - SPECTROMETER

### AIM

To standardise the grating using the green line of the mercury spectrum and hence to determine the wavelength of the other prominent lines of mercury spectrum by the normal incidence method.

### APPARATUS

Spectrometer, the given grating, mercury vapour lamp, etc.

### PRINCIPLE

At normal incidence,

$$\sin \theta = N n \lambda \quad \text{Where,}$$

$\theta$  = the angle of diffraction,

$N$  = the number of lines per metre of the grating

$n$  = the order of the spectrum

and  $\lambda$  = the wave length of light used in metre.

If  $\lambda$  of green line is known,  $N$  can be calculated, i.e. the grating can be standardised.

$$N = \frac{\sin \theta_1}{n \lambda}$$

Having found the value of  $N$ , the wave lengths of the other prominent lines can be determined using the formula,

$$\lambda = \frac{\sin \theta}{N n}$$



## PROCEDURE

### i) To arrange the grating for normal incidence

The preliminary adjustments of the spectrometer are made. The slit is made narrow. The telescope is brought in line with the collimator. The telescope is adjusted so that the point of intersection of the cross-wires coincides with the fixed edge of the image of the slit. The telescope is then clamped. The vernier table is unclamped and adjusted so that the reading of vernier I is  $0^\circ$  and the reading of vernier II is  $180^\circ$ . The vernier table is then clamped. The telescope is then unclamped and rotated exactly through  $90^\circ$  and then clamped. The grating is then mounted on the grating table, with its ruled surface facing the collimator. The grating table alone is rotated so that the reflected image of the slit coincides with the point of intersection of the cross-wires. The reflected image will be white in colour. (There may be two reflected images. The brighter one is chosen.) Now the angle of incidence is  $45^\circ$ . The vernier table is now unclamped and rotated exactly through



