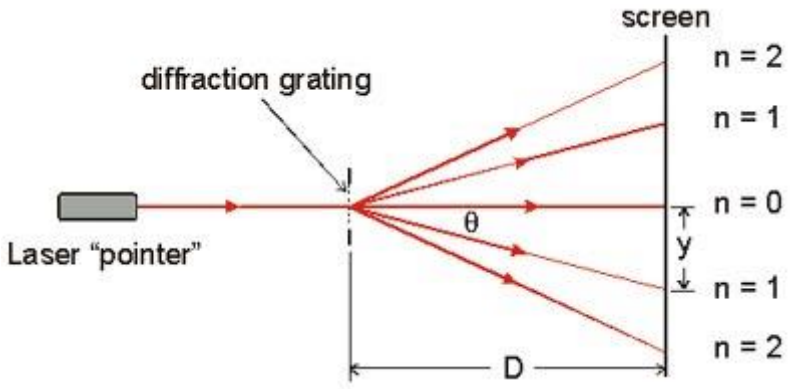
Answer on Question #46039, Physics, Optics

Why the rays must fall on the grating surface normally in measurement of laser wavelength?

Answer:



When light is normally incident on the grating, the diffracted light will have maxima at angles θ given by:

$$d \sin\theta = n\lambda$$

where n = the order of the image (0, 1, 2…)

d = the distance between two lines of the grating

θ = the angular position of the image (measured from the normal to the grating)

By measuring D and y, θ can be found.

We can then calculate the wavelength, λ

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

If a plane wave is incident at any arbitrary angle θ_i, the grating equation becomes:

$$d(\sin\theta + \sin\theta_i) = n\lambda$$

Thus, in that case to obtain the wavelength λ we need to solve equation

$$\lambda = \frac{d(\sin\theta + \sin\theta_i)}{n}$$