Answer on Question #69270, Physics / Optics

c) Discuss the concept of missing orders with reference to double slit diffraction pattern.

Solution:

It is Fraunhofer diffraction by two slits.

A missing order occurs when the “diffraction minimum” overlaps with the “interference maximum”.

Analytical expression for diffraction by two slits:

$I(\theta) = I(0)\left(\frac{\sin\beta}{\beta}\right)^2 \cos^2\alpha$ (1), where I is the intensity of diffracted light, $\alpha = (\pi a / \lambda)\sin\theta$, $\beta = (\pi b / \lambda)\sin\theta$, b is the slit width, a is the slit separation, λ is the wavelength of light

Zeros: $\beta = \pm\pi, \pm 2\pi, \pm 3\pi$ ...

$\alpha = \pm\pi / 2, \pm 3\pi / 2, \pm 5\pi / 2$...