

Set of histograms referenced as "Optical diffraction from array of various number of objects"

Contributors

Fuller, Watson, 1935-

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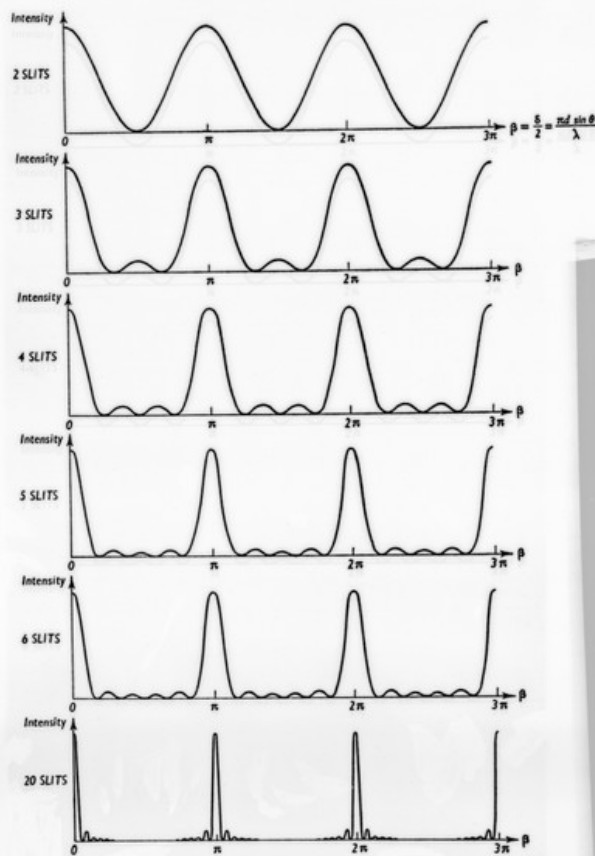
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and the corresponding value of $d\theta$ is half the angular width of the maximum.
 Since $d(\sin \theta) = \cos \theta d\theta$ one has

$$d\theta = \frac{\lambda}{N d \cos \theta} \quad (12-2)$$



Intensity distributions with narrow slits.

adjacent principal maxima.
 Between these various minima lie $(N-2)$ in number and their intensity is much less than that of the principal maxima. Complete intensity distributions for a grating with finite width were used and, as will be seen, the slow variation of intensity across the principal maxima of Fig. 12-3 are contained within a single principal maximum. It is proved in the case of two slits (see § 12-2) that the 8th, 12th, etc., orders are missing in gratings where the grating elements were three times as wide as the wavelength.

In Fig. 12-3 and Plate II, the same is seen for larger N and it is seen at once that, as N increases, the principal maxima become narrower and sharper. Other results derived above show that the $(N-1)$ minima and $(N-2)$ secondary maxima become much weaker (see § 12-2) as N increases. When N is large, the principal maxima become very large and most of the intensity is concentrated in them. When N is large, the patterns of increasing N are very similar. This corresponds to the effect of increasing the number of slits. (12-2) then show that as N increases, the principal maxima become narrower but retain the same position. The width of the principal maxima depends upon the number of lines per centimeter of the diffracting elements.

12-2. Intensity Distribution

The separation of the principal maxima approaches Nd . It was shown that when $\cos \theta = 1$, the angular width of the central maximum is $d\theta = \lambda / Nd$. The overall width of the grating is Nd . The secondary maxima also approach the principal maxima as N increases. The reason for this is that the vibration polygon for a large value of N will approximate, in general, a circle corresponding to the single aperture minima. For example, at the center