

Physics 9B Fall 2013 - Discussion #10

1. Suppose we have a double slit setup with slit separation d and slit widths a . (a) What is the largest ratio of d to a that causes diffraction to exactly eliminate the fourth order maximum? (b) What other maxima are eliminated? (c) How many other ratios of d to a exactly eliminate the fourth order maximum?
2. Consider a two-dimensional square lattice, with unit cell size a_0 . If we consider X-ray diffraction from the crystal with the largest interplanar spacing equal to a_0 (no skipping planes), it can be shown that the distances between other families of planes are given by the formula

$$d = \frac{a_0}{\sqrt{h^2 + k^2}}$$

for h and k coprime integers (they only share 1 as a factor). (a) Draw a few representative planes from the 5 widest-spaced families of planes on square lattices. (b) Compute the distance between these planes. (c) For X-rays of wavelength 0.33 nm on a 2D NaCl lattice with $a_0 = 0.28$ nm, what is the largest first order diffraction angle we could observe?

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