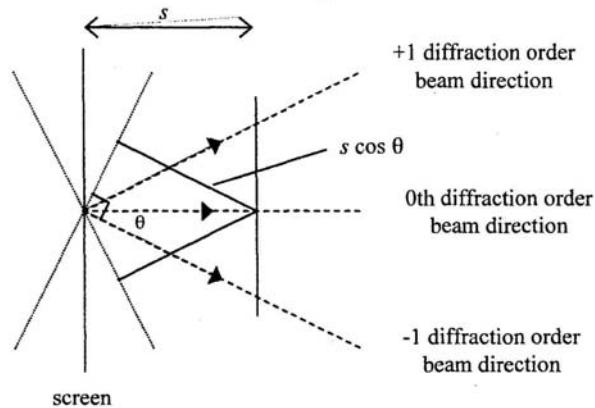


Supplementary questions

The answer as to what happens at — and multiples of that distance is called Talbot self-imaging. At the distance, all the diffraction orders have the same relative phase as they did at the screen, and the intensity pattern is therefore the same as it would be at the screen itself. Hence an image of the screen would appear if we put a piece of white card at this distance. To see how this happens at this specific distance, see the figure below.



In this figure, we see the first diffraction orders (both positive and negative) and the “straight through” beam (i.e., the zeroth diffraction order). The path length for the +1 (or -1) diffraction order phase front to hit the center of the observing screen at distance s is

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Hence the path length difference between that and the zero order path is

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Now, the diffraction angle θ is

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and so we have

.....

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Hence, for the first order diffraction beams to be in phase with the zeroth order beam, we must have