

Montana State University
Physics Department
PhD Oral Comprehensive Exam

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April 6, 2017

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1 Fresnel Diffraction

The general Kirchhoff integral in 2D is given as

$$\psi = C_0 \int_{-\infty}^{\infty} q(X) \frac{e^{ik(s_0+s)}}{s_0 s} (\cos \theta_0 - \cos \theta) dX \quad (1)$$

where C_0 is some constant, $q(X)$ is the transmission function of the grating, s_0 and s are distances from the point source P' to the point Q on the grating and from Q to the test point P , respectively, and are defined by

$$\begin{aligned} s_0 &= \sqrt{X^2 + z_0^2} \\ s &= \sqrt{(x - X)^2 + z^2} \end{aligned} \quad (2)$$

where we have taken the source point to be on the z -axis. If we use the small-angle approximation, where $z \gg x$

2 Self-imaging

3 Gratings

3.1 Small Ripples in Amplitude

3.2 Small Ripples in Phase