

QUANTUM MECHANICS I

PHYS 516

Problem Set # 6

Distributed: February 13, 2013

Due: Feb. 22, 2013

1. Aharaonov-Bohm Grating: A multi-slit diffraction grating is fabricated. The slits are parallel. Each is of width a . The separation between adjacent slit centerlines is d . Hidden behind each obstructing region there is an iron whisker of diameter D with $D \ll d - a$. The iron whiskers channel a magnetic field \mathbf{B} which does not bleed into the slit regions. Electrons passing through the slits do not see any magnetic field at all for any observation angles involved in this experiment.

Compute and plot the far-field interference pattern on an observation plane parallel to the grating along a line perpendicular to the slits. This is energy-dependent. Disentangle the magnetic field contributions that are independent of the slit width from the energy-dependent contributions that depend on the slit width.