Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Electron Matter Optics and the Quantum Electron Stern-Gerlach Magnet[1] SCOT MCGREGOR, ROGER BACH, XIAOLU YIN, SY-HWANG LIOU, HERMAN BATELAAN, University of Nebraska-Lincoln, GLEN GRONNIGER, Honeywell — We explore electron interferometry for the purpose of performing fundamental quantum mechanical experiments and sensing applications. To this end electron matter optics elements, in particular, a diffraction limited single slit, a double slit, and a nano-fabricated grating diffraction apparatus as well as a Mach-Zehnder IFM [1] were previously developed. The double slit diffraction pattern has been recorded one electron at a time. Furthermore, the capability of closing each slit on demand has been developed, in that way realizing the thought experiment that Feynman explains in his lectures. The capability of the Mach-Zehnder interferometer to sense DC and AC electromagnetic fields for industrial applications is currently under investigation. Also, the construction of a new type of interferometer that has the potential to significantly increase the enclosed area and thus its sensitivity is in progress. Finally an idea to separate an electron beam fully into its two spin component using an electron interferometer is presented [2].

[1] G Gronniger *et al* 2006 *New J. Phys.* 8 224
[2] S. McGregor *et al*, Submitted for publication in NJP (2010)

[1]We gratefully acknowledge funding by NSF Grant No. 0969506 and R. B. and S. M. acknowledge DOE-GAANN fellowships.

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Date submitted: 08 Feb 2011 Electronic form version 1.4