

Abstract Submitted  
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**Conservation of momentum and the Aharonov-Bohm Effect<sup>1</sup>**

ADAM CAPREZ, HERMAN BATELAAN, University of Nebraska-Lincoln — The Aharonov-Bohm Effect serves as an example of a purely quantum mechanical phenomenon in which classical forces on the electron are thought to vanish. The presence of forces is still an ongoing debate [1,2]. Surprisingly, a complete special relativistic treatment of the forces in the electron-solenoid system has never been done [3]. We present our ongoing theoretical work on the issue, and explore a connection between Feynman's well-known example [3] of two moving point charges and the Aharonov-Bohm Effect. The relation between this theoretical work and our earlier experimental results [4] is also discussed. [1] T.H. Boyer, *J. Phys. A*, **39**, 3455 (2006). [2] G.C. Hegerfeldt and J.T. Neumann, [quant-ph] arXiv:0801.0799v1 (2008). [3] Y. Aharonov and D. Rohrlich, *Quantum Paradoxes: Quantum Theory for the Perplexed* (Wiley-VCH, Weinheim, 2005). [4] *The Feynman Lectures on Physics*. Vol. II, pp. 26-2-26-5 (1964). [5] A. Caprez, B. Barwick, and H. Batelaan. *Phys. Rev. Lett.* **99**, 210401 (2007).

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