Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

**The Invisible Quantum Tripwire: Analysis in the Presence of Photon Loss**[1] DANIEL LUM, PETR ANISIMOV, BLANE MCCRACKEN, JONATHAN DOWLING, Louisiana State University, QUANTUM INFORMATION GROUP TEAM — A quantum tripwire is a quantum interrogation technique based on single photon interference in a Mach-Zehnder interferometer (MZI). This interference is destroyed if one arm of the IFM is blocked, tripping an alarm. The original approach proposed by Elitzur and Vaidman gave an interaction free detection at 50% maximal efficiency [1]. Kwiat and collaborators improved scheme incorporated a quantum Zeno effect (ZE) [2]. Symmetric hypothesis testing, the Chernoff bound, and the Chernoff information provided error estimation to optimize the system with a limited number of photons. We introduce a controlled loss in the detection arm so that a partial ZE occurs and results in high photon loss. If the path is blocked then full ZE is achieved leading to low photon loss. System optimization has shown that detection can be exponentially small without the single photon being lost to the object. References: [1] M. A. Kasevich, P. Kwait, G. Weinfurter, T. Herzog, and A. Zeilinger. Interaction-free measurement, June 1995. [2] A. J. DeWeerd. Interaction-free measurement. American Journal of Physics, 70(3):272–275, March 2002.

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Date submitted: 22 Jan 2010 Electronic form version 1.4