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**Optically controlled polarizer and waveplate at telecom wavelength for Quantum Zeno Effect based all-optical switch** SUBRAMANIAN KRISHNAMURTHY, YE WANG, YANFEI TU, SHIH TSENG, Dept. of Electrical Engineering and Computer Science, Northwestern University, SELIM SHAHRIAR, Dept. of Electrical Engineering and Computer Science, Dept. of Physics and Astronomy, Northwestern University — Quantum Zeno Effect (QZE) is the suppression of the evolution of a quantum state through the quantum measurement process. A manifestation of the QZE occurs when a series of N interlaced waveplates and polarizers prevents the polarization of the input beam from rotating as N approaches infinity. Such a scheme can be used to develop an ultra-low power all-optical switch, by using a tapered nano-fiber embedded in Rb vapor, of the type previously used by us to demonstrate an ultra-low power all-optical modulator. To achieve this goal, it is necessary to realize optically controlled waveplates and polarizers. We have realized both of these effects experimentally, by employing the $5S_{1/2}$ - $5P_{1/2}$- $6S_{1/2}$ ladder transition in $^{87}$Rb, for a probe beam at the telecom wavelength of 1323 nm. Furthermore, we have used a numerical simulation involving all the Zeeman sublevels and velocity averaging to produce results that agree well with experimental results. We have also used this model to identify ways to enhance the contrast for the polarizer and increase the amount of phase retardation for the waveplate while suppressing attenuation. In this talk, we present details of these studies, and discuss the prospect of realizing such a switch using a tapered nano-fiber in Rb vapor.

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