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Micro-disk resonator based all-optical switch[1] DAVE CLADER, SCOTT HENDRICKSON, The Johns Hopkins University Applied Physics Laboratory, RYAN CAMACHO, Sandia National Laboratories, BRYAN JACOBS, The Johns Hopkins University Applied Physics Laboratory — We present theoretical results of a low-loss all-optical switch based on a micro-disk resonator coupled with warm atomic vapor. We examine three and four-level electromagnetically induced transparency control schemes. We show that a control beam can modify the atomic absorption of the evanescent field suppressing the cavity field buildup and altering the path of a weak signal beam. Both schemes should allow for high-contrast all-optical switching of greater than 20 dB with losses below 0.5 dB. Furthermore, our results suggest that in the four-level scheme we can achieve strong optical nonlinearities with control fields corresponding to less than a single photon on average in the cavity. This is due to the strong field confinement of the cavity and quantum coherent effects in the atoms, and does not require strong atom-cavity coupling or cold atoms typically needed to observe nonlinearities with single-photon level intensities.

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