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Non-linear optics in cold ^{87}Rb atoms at ultralow powers via an optical nanofiber VANDNA GOKHROO[1], RAVI KUMAR[2], SILE NIC CHORMAIC, Okinawa Institute of Science and Technology Graduate University, Japan — Tight confinement of the evanescent field around subwavelength diameter optical nanofibers (ONF) presents a suitable tool for studying nonlinear optics in atomic media. Such ultrathin fibers integrated with cold atoms can also provide ideal building blocks for atom-photon hybrid quantum networks. Here, we study phenomena, e.g. Autler-Townes splitting (ATS) and electromagnetically induced transparency (EIT) using a ˜350 nm diameter ONF surrounded by laser-cooled rubidium atoms. We use a near or on-resonance two-photon excitation process in a three-level ladder type configuration to observe the effects. The impact of the high intensity light field on the ground and intermediate atomic states is studied in terms of ATS [1]. Multi-level cascaded EIT is demonstrated and exploited to make an all-optical switch [2]. Power levels needed to observe these nonlinear effects are in the range of nanoWatts. Apart from their fundamental importance, these studies will be useful for fiber based quantum networks with Rydberg atoms. Reference: [1] R. Kumar, V. Gokhroo, K. Deasy, and S. Nic Chormaic, Phys. Rev. A 91, 053842 (2015) [2] R. Kumar, V. Gokhroo, and S. Nic Chormaic, New J. Phys. 17, 123012 (2015)

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