SFB/TRR 21 - Seminar
27. Oktober 2009, Stuttgart

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Cold atoms inside a hollow core fiber - a novel medium for few-photon nonlinear optics

Typically, interactions of light beams in nonlinear media are very weak at low light levels. Strong interactions between few-photon pulses require a combination of large optical nonlinearity, long interaction time, low photon loss, and tight confinement of the light beams. Here, we present an approach to overcome these issues that makes use of an optically dense medium containing a few hundred cold atoms trapped inside the hollow core of a photonic crystal fiber (PCF). We show how this system can be used to implement an all-optical switch that is activated at tiny energies corresponding to few hundred optical photons per pulse. We also discuss how further improvement of the system and the use of more advanced quantum optical techniques can push the number of required switch photons down to the ultimate limit of one.

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