

Honours Project 2008

Enhanced nonlinearity and spatial nonlinear effects of coherent atomic media

In modern telecommunication there is significant interest for all-optical buffers and delay lines, which can accelerate information processing. Direct all-optical image processing may have even greater potential. In July 2007 a two-dimensional image carried by an optical pulse was stored and retrieved using long-lived atomic coherences. This makes our ongoing research of low-intensity Kerr nonlinearity of coherently prepared media very topical because nonlinear effects can impose serious limitations on such image processing. We have demonstrated efficient wave mixing and new field generation at very low light intensity, as the refractive index of an atomic medium with ground-state coherence is very sensitive to light intensity.

The aim of the project in this untouched area of quantum optics is the study of spatial nonlinear effects, such as self-focusing, diffraction and waveguiding, in atomic media with light-induced ground-state coherences. There is a room for modelling and theory within this mainly experimental project. Through involvement in the project you will learn fundamental aspects of atomic physics and quantum mechanics and will obtain hands-on experience with high-resolution laser spectroscopy.

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