

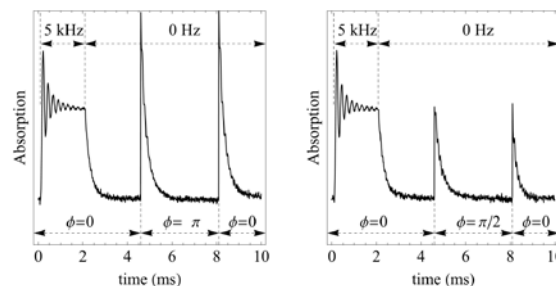


Quantum Efficiency Seminar und Colloquium

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Phase control and diagnostic of quantum mechanical superposition states



We study the transient response of the refractive index to changes of the external electro magnetic field and to changes of the magnetic field vector under conditions of electromagnetically-induced transparency (EIT). Under these conditions the superposition state $\Psi = (|1\rangle - e^{i\eta}|2\rangle) / \sqrt{2}$ is called dark state, it is barred from fluorescence. This state develops by spontaneous emission in the presence of two phase-stable laser fields $E_j (\omega_j, \varphi_j)$. The dark state phase fulfils the requirement $\eta = \varphi_1 - \varphi_2$ and is thus sensitive to the laser phases. When the dark state has formed and the lasers are suddenly detuned from EIT resonance the atoms undergo Rabi floppings between dark and bright state. When changing the magnetic field, the lasers are also detuned from resonance due to Zeeman shifts and the dark state atoms pick up a dynamic phase. When the magnetic field is not changed in strength but rotated in space the system acquires a Berry phase. We discuss measurements of the dynamic phase and the Berry phase of Rb-atoms in a buffered gas cell at room temperature.

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Location: Lecture Hall 1, Hermann-Herder-Str. 3, Freiburg

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