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Time-domain Ramsey interferometry with interacting Rydberg atoms CHRISTIAN SOMMER, Max Planck Institute for the Science of Light — Many-body effects govern a variety of important quantum phenomena such as the emergence of superconductivity and magnetism in condensed matter physics. Here, we present a theoretical investigation of a many-body system formed by interacting Rydberg atoms. We follow the evolution of the electronic coherence of the atoms in Rydberg states by a time-domain Ramsey-interferometry protocol [1]. An Ising-type Hamiltonian with long range interactions is employed to describe the many-body dynamics. We show that fully analytic expressions for the coherence and the Ramsey-interferometry signal can be obtained in an ultracold gas under a continuous limit assumption and that this treatment can be further extended to correlation functions of the system. From the Ramsey signal a characteristic contrast degradation and phase accumulation signal is obtained which is showing corresponding scaling laws for different ensemble densities and dimensionalities. Good agreement is found between the theoretical analysis and recent experimental results [2]. References [1] C. Sommer et al. Phys. Rev. A. 94, 053607 (2016) [2] N. Takei et al. Nat. Commun. 7, 13449 (2016)

Christian Sommer
Max Planck Institute for the Science of Light

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