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Time and frequency resolved detection of quantum coherences in systems, driven by strong ultrashort laser fields STANISLAV KONOROV, Departments of Chemistry, The University of British Columbia, JOHN HEPBURN, VALERY MILNER, Departments of Chemistry and Physics & Astronomy, The University of British Columbia — Laser-induced coherences between the quantum states of atoms and molecules are the main ingredient in many optical processes, such as stimulated Raman or coherent anti-Stokes Raman scattering. In the regime of weak-field interaction in which the states are not modified by the applied fields, the coherences are simply defined by the resonant frequency components of the excitation field and can be easily controlled. With the increasing strength of atom-photon coupling, the quantum states are dressed by the driving field, resulting in strong dependence of the induced coherences on time, frequency and field amplitude. This complicates the ability to follow and control the coherent response of a system in the strong-field regime. We experimentally study the effects of the strong field on atomic coherence using four-wave mixing of high-power ultrashort laser pulses in the gas of Rubidium atoms. Utilizing the technique of frequency resolved optical gating, we detect both the amplitude and phase of the induced atomic coherence. This enables us to reconstruct the coherent response with high time and frequency resolution, understanding its complex dynamics and its dependence on the parameters of the driving fields.

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