Abstract Submitted
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Quantum resonances in selective rotational excitation of molecules with a sequence of ultrashort laser pulses[1] SERGEY ZHDANOVICH, CASEY BLOOMQUIST, The University of British Columbia, JOHANNES FLOSS, ILYA AVERBUKH, The Weizmann Institute of Science, JOHN HEPBURN, VALERY MILNER, The University of British Columbia — The periodically kicked rotor is a paradigm system for studying classical and quantum chaos. In the quantum regime, the dynamics of the kicked rotor exhibit such phenomena as suppression of classical chaos, Anderson localization in angular momentum and quantum resonances in the accumulation of rotational energy. Even though these effects have been studied with ultracold atoms in optical fields and Rydberg atoms in microwave fields, they have never been observed in a real rotational system. In this work we study the effect of quantum resonance in the rotational excitation of a diatomic molecule. By using femtosecond pulse shaping and rotational state-resolved detection, we measure the rotational distribution of molecules interacting with a train of pulses. We show enhancement of population transfer from the ground to the excited rotational states at resonance, and demonstrate selective rotational excitation of two nitrogen isotopes. We utilize fractional quantum resonances for separating para- and ortho-nitrogen, paving the way to novel methods of coherent control of molecular rotation.

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