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**Coherent Ro-vibrational Revivals in a Thermal Molecular Ensemble** MARTIN BITTER, EVGENY A. SHAPIRO, VALERY MILNER, University of British Columbia, Vancouver, ULTRAFAST COHERENT CONTROL GROUP TEAM — We report an experimental and theoretical study of the evolution of vibrational coherence in a thermal ensemble of nitrogen molecules. Rotational dephasing and rephasing of the molecular vibrations is detected by coherent anti-Stokes Raman scattering. The existence of weak ro-vibrational coupling and the discrete nature of the rotational bath lead to a whole new class of full and fractional ro-vibrational revivals. Following the rich dynamics on a ns time scale with sub-ps resolution enables us to determine the rotational constant  $\gamma_e$ , as well as the intensity ratio between the different Raman transitions.

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