

OBSERVATION OF QUANTUM BEATING IN Rb AT 2.1 THz AND 18.2 THz: LONG-RANGE Rb*-Rb INTERACTIONS.

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The interaction of Rb $7s\ ^2S_{1/2}$, $5d\ ^2D_{3/2,5/2}$ and $5p\ ^2P_{3/2}$ atoms with the background species at long range (100-1000 Å) has been observed by pump-probe ultrafast laser spectroscopy. Parametric four-wave mixing in Rb vapor with pairs of 50-70 fs pulses produces coherent Rb 6P-5S emission at 420 nm that is modulated by Rb quantum beating. The two dominant beating frequencies are 18.2 THz and 2.07 THz, corresponding to quantum beating between 7S and 5D states and to the $(5D-5P_{3/2})-(5P_{3/2}-5S)$ defect, respectively. Analysis of Rabi oscillations in these pump-probe experiments allows for the mean interaction energy at long range to be determined. The figure shows Fourier transform spectra of representative Rabi oscillation waveforms. The waveform and spectrum at left illustrate quantum beating in Rb at 2.1 THz. The spectrum at right is dominated by the 18.2 THz frequency component generated by 7S-5D beating in Rb. Insets show respective temporal behaviors of the 6P-5S line near the coherent transient (zero interpulse delay).

