SUB-DOPPLER SPECTRA OF INFRARED HYPERFINE TRANSITIONS OF NITRIC OXIDE USING A PULSE MODULATED QUANTUM CASCADE LASER

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Using a low power modulated quantum cascade laser, collective coherent effects in the 5 μm spectrum of NO have been demonstrated by the observation of sub- Doppler hyperfine splitting. For nitrous oxide, experiments and model calculations have demonstrated that two main effects occur with chirped pulse modulated quantum cascade (QC) lasers, these are free induction decay signals, and those induced by rapid passage during the chirped modulation pulse. In the open shell molecule, NO, in which both lambda-doubling splitting and hyperfine structure occur, laser field induced coupling between the hyperfine levels of the two lambda-doublet components can induce a large AC Stark effect. This may be regarded as an extension of the types of behaviour observed, using the same apparatus fitted with an 8 μm QC laser, in the closed shell molecule nitrous oxide.