# A STUDY OF LINEWIDTH AND LINESHAPE: THE APPLICATION OF CONDON MODULATION TO PURE VIBRATIONAL TRANSITIONS OF SOLID HYDROGEN

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As first pointed out by Condon,[a] a strong electric field can induce new features in the infrared spectra of molecules, which will follow the Raman selection rules. Following our observation of the pure vibrational $Q_1(0)$ transition induced by the electric field of ionic species in solid parahydrogen, a new modulation technique with much improved sensitivity based on the Condon effect has been established.[b] Using this technique, we have systematically studied the linewidth, frquency shift, and lineshape of the pure vibrational transitions of samples of parahydrogen crystals (with less than 0.07% of orthohydrogen) at various temperature. Results from this work provide information on the relaxation process in this system, which will lead to a better understanding of the origin of the sharpness of the transitions in solid hydrogens. In this paper, the analysis of our results will be presented.

[a] E. U. Condon, *Phys. Rev*. **41**, 759 (1932).
[b] K. E. Kerr, T. Momose, W. P. Weliky, C. G. Gabrys, and T. Oka, *Phys. Rev. Lett*. **72**, 3957 (1994).