OBSERVATION AND ANALYSIS OF LINE WIDTH OF $Q_1(1)$ IMPURITY PAIR SPECTRUM IN SOLID PARAHYDROGEN

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The $Q_1(1)$ $(v = 1 \leftarrow 0, J = 1 \leftarrow 1)$ rovibrational spectrum of the $J = 1$ $ortho$-H_2 impurities in solid $para$-H_2, recorded in our laboratory using a color center laser spectrometer, shows a variety of line widths, spanning nearly two orders of magnitude. The sharpest line width observed, 10 MHz HWHM for 0.2% o-H_2 at around 4.2 K, belongs to certain Q type transitions, which preserve the F, M quantum number in the ground and excited state resulting in minimum inhomogeneous broadening. Despite the tone burst modulation used in the data recording, which distorts the line shape, true line width is derived for Lorentzian line profile. Our results relate to the previous work in microwave region very well[a]. The broadening mechanism will be discussed including phonon relaxation and inhomogeneous broadening.

[a] B. W. Statt, W. N. Hardy, and R. Jochemsen *Can. J. Phys.* **58**, 1326 (1980).