OBSERVATION AND ANALYSIS OF THE $K=0 \leftarrow 0$ ROTATION-TUNNELING TRANSITIONS IN $(HI)_2$

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K=0 $\leftarrow$ 0 rotation-tunneling transitions of $(HI)_2$ has been observed with resolved iodine quadrupole structure using the TAMU fast scan submillimeter spectrometer with a pulsed jet. The accuracy of the measurements for well resolved lines with appropriate signal to noise ratio are estimated to be better than 1 kHz. A preliminary fit was calculated with a root mean square deviation of $\approx$ 85 kHz for transitions from P(6) to R(6) using the SPFIT package. The constants determined include the rotation-tunneling frequency, ν_{Tunn} = $511931.459860(79)$ MHz, rotational constants B' = $370.803275(11)$ MHz and B'' = $378.296441(16)$ MHz, iodine nuclear quadrupole constants, χ'_{aa} = $-377.34915(44)$ MHz and χ''_{aa} = $-389.98593(44)$ MHz, and rotational distortion constants, D'_J = $0.2814(2)$kHz and D''_J = $0.3648(4)$ kHz, using a simple Hamiltonian. While the determined fit is quite good the possibilities of perturbations due to Coriolis interaction or Fermi resonance involving the two tunneling states may account for the relatively large root mean square deviation. For comparison in the case of the HBr dimer rotation-tunneling spectrum which was fitted with a similar Hamiltonian the root mean square deviation was only $\approx$ 10 kHz. The $(HI)_2$ parameters determined in this study are combined with results from infrared slit-jet spectroscopy to generate a four dimensional morphed potential.