NEW MEASUREMENTS OF THE HYPERFINE INTERACTIONS AND DIPOLE MOMENT OF KI

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We have used a high-resolution, radio-frequency molecular beam spectrometer to observe some of the pure hyperfine transitions in KI. The only previous observations of the KI hyperfine structure were as a small splitting of rotational transitions, and therefore of much lower precision than ours. In order to locate the transitions we initially set the radio frequency and DC electric fields to produce lines that were not significantly stark-split. Once the spectrum began to fall into place the lines were rerun, first with an rf stark splitting to determine the effective strength of the rf field, and then with a larger dc splitting to allow for a determination of the dipole moment and hyperfine interaction constants. Multiple iterations of this process have produced a detailed map of the hyperfine transitions that permits us to obtain constants descriptive of the molecule's unique characteristics.

Preliminary results give the following values of the interaction parameters. Numbers in parentheses are estimated uncertainties in last two places, all units are kHz except for the dipole moment.

Iodine nuclear electric quadrupole interaction: $-85471.121(65) - 2860.13(10) \cdot (v+1/2) + 22.072(28) \cdot (v+1/2)^2 - -0.0319(28) \cdot (v+1/2)^3 - 0.6799(42) \cdot J(J+1) + 0.0270(53) \cdot J(J+1) \cdot (v+1/2)$
Potassium nuclear electric quadrupole: $-4294.64(16) + 27.21(37) \cdot (v+1/2) + 0.05(14) \cdot (v+1/2)^2$
Iodine spin-rotation: $0.8962(31) - 0.0125(42) \cdot (v+1/2) - 0.0002(12) \cdot (v+1/2)^2$
Potassium spin-rotation: $0.1160(58) - 0.0298(87) \cdot (v+1/2) + 0.00104(85) \cdot (v+1/2)^2$
Tensor spin-spin: $0.0228(57) - 0.0250(82) \cdot (v+1/2)$
Scalar spin-spin: $0.0226(20) + 0.0033(29) \cdot (v+1/2)$
Electric dipole moment: $11.064(14) + 0.049(23) \cdot (v+1/2)$ debye