Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Molecule-molecule hyperfine Feshbach resonances ALISDAIR WALLIS, ROMAN KREMS, University of British Columbia — Magnetic Feshbach scattering resonances play a central role in experimental research of atomic gases at ultracold temperatures. A major thrust of current research is to create an ultracold gas of diatomic alkali-metal molecules in the ground rovibrational state of the ground electronic $^1\Sigma$ state. Can ultracold $^1\Sigma$ molecules be controlled by means of magnetic Feshbach resonances? Unlike alkali metal atoms, $^1\Sigma$ diatomic molecules have no unpaired electrons. The response of $^1\Sigma$ molecules to an external magnetic field is determined entirely by the spin structure of the atomic nuclei. We present the first calculations of molecule-molecule collisions for $^1\Sigma$ molecules in a magnetic field. In particular, we calculate the rates of hyperfine relaxation in molecule - molecule collisions and explore the possibility of tuning magnetic Feshbach resonances in an ultracold gas of ^{87}Rb^{133}Cs($X^1\Sigma^+$) molecules.

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Date submitted: 26 Jan 2012 Electronic form version 1.4