独立行政法人理化学研究所　仁科加速器研究センター
第85回RIBF核物理セミナー
RIKEN Nishina Center for Accelerator Based Science
The 85th RIBF Nuclear Physics Seminar

Diamagnetic Shift of the Hyperfine Interaction in $^{9}Be^{+}$ - Experiment and Theory

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Abstract: The Breit-Rabi formula provides a good description of the energy levels of a J=1/2 state with hyperfine structure in a magnetic field B. However, for large enough B or high enough measurement precision, deviations from the Breit-Rabi formula can be observed. To lowest order, the deviations can be parameterized by a shift in the magnetic dipole hyperfine constant $A(B) = A(0) \times (1 + kB^2)$. The shift in A results from the distortion of the electronic wavefunction by the diamagnetic potential, which is proportional to the square of the distance of the electrons from the nucleus. The quadratic B dependence of A has been measured only for two cases: Rb and Be^{+}.
Recently, hyperfine separations have been measured in $^{9}Be^{+}$ by RF-optical double resonance of laser-cooled ions in a Penning trap at B = 4.5 T (Shiga et al., to be published). When combined with measurements made at low magnetic field (Wineland et al., 1983), this yields $k = (2.64 \pm 0.12) \times 10^{-11}\ T^{-2}$. The multiconfiguration Dirac-Hartree-Fock (MCDHF) method has been used to calculate k in Be^{+} (Itano, to be published). The result agrees with experiment to within the experimental error. The same calculational method, when applied to Rb, yields a result within 6% of the experiment.

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The seminar will be given in English.

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