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Octupole Excitation of Trapped Ion Motion for Precision Mass Measurements G. BOLLEN, NSCL/MSU, R. RINGLE, NSCL/MSU, P. SCHURY, NSCL/MSU, S. SCHWARZ, NSCL, T. SUN, NSCL/MSU — National Superconducting Cyclotron Laboratory, Michigan State University, East Lansing, MI, USA An azimuthal octupole radiofrequency field has been used to excite the ion motion of $^{40}Ar^{+}$ ions stored in a Penning trap. A resonant response was observed at twice the ions' true cyclotron frequency ω_c=q/m·B. The experiment has been performed with the 9.4-T Penning trap system of the recently commissioned LEBIT facility at the NSCL at MSU [1]. Similar to the excitation with an azimuthal quadrupole field at ω_c [2,3], octupole excitation at $2\omega_c$ gives rise to a periodic beating of the ion motion between magnetron and reduced cyclotron motion. Differences are observed in the dependence of the excited ion motion on initial amplitudes and phases of the radial eigen motions. The observed behavior of the ions is found to be in good agreement with the results of numerical simulations. The technique still requires further testing but the first results indicate that $2\omega_c$ excitation may provide benefits that are similar to doubling the magnetic field strength B. In particular precision mass measurements of short-lived rare isotopes may benefit from this technique by being able to reach a given precision with shorter ion storage and observation times. [1] S. Schwarz et al, Nucl. Instr. Meth. B204 (2004) 507 [2] G. Bollen et al., J. Appl. Phys. 68 (1990) 4355 [3] M. König et al., Int. J. Mass Spec. Ion. Proc. 142 (1995) 95

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