Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Nuclear quadrupole resonances and their effect on NMR sensors[1] ELIZABETH DONLEY, TARA CUBEL-LIEBISCH, JONATHAN LONG, ELEANOR HODBY, TED FISHER, JOHN KITCHING, NIST — Nuclear quadrupole resonances (NQR) have persistent relevance in the field of precision measurements and are generating renewed interest for applications of remote sensing – particularly in the case of explosives detection. NQR resonances are also relevant to the application of building better rotation sensors based on nuclear magnetic resonance (NMR), since NQR interactions cause frequency shifts that complicate the realization of such sensors. In this talk, the basic concepts of NMR rotation sensing will be introduced, and an analysis of the NQR shift for ^{131}Xe atoms (I = 3/2) will be presented in detail. In particular, a recent study of the transformation of nuclear quadrupole resonances from the pure nuclear quadrupole regime to the quadrupole-perturbed Zeeman regime will be presented [1]. This transformation presents an interesting quantum-mechanical problem, since the quantization axis changes from being aligned along the axis of the electric-field gradient tensor to being aligned along the magnetic field.

[1] E.A. Donley, J.L. Long, T.C. Liebisch, E.R. Hodby, T.A. Fisher, and J. Kitching, Phys. Rev. A 79, 013420 (2009).

[1]This work was funded by DARPA and NIST.

Elizabeth Donley
NIST

Date submitted: 23 Jan 2009 Electronic form version 1.4