Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Dynamics of spinor condensates in a microwave dressing field LICHAO ZHAO, JIE JIANG, TAO TANG, MICAH WEBB, YINGMEI LIU, Oklahoma State University — We experimentally study dynamics in a sodium antiferromagnetic spinor condensate as a result of spin-dependent interactions c and microwave dressing field interactions characterized by the net quadratic Zeeman effect $q_{\rm net}$. In contrast to magnetic fields, microwave dressing fields enable us to access both negative and positive values of $q_{\rm net}$. We find an experimental signature to determine the sign of $q_{\rm net}$, and observe harmonic spin population oscillations at every $q_{\rm net}$ except near each separatrix in phase space where spin oscillation period diverges. Our data in the negative $q_{\rm net}$ region exactly resembles what is predicted to occur in a ferromagnetic spinor condensate in the positive $q_{\rm net}$ region. This observation agrees with an important prediction derived from the mean-field theory: spin dynamics in spin-1 condensates substantially depends on the sign of $q_{\rm net}/c$. This work may be the first to use only one atomic species to reveal mean-field spin dynamics, especially the remarkably different relationship between each separatrix and the magnetization, of spin-1 antiferromagnetic and ferromagnetic spinor condensates.

Lichao Zhao
Oklahoma State University

Date submitted: 29 Jan 2014 Electronic form version 1.4