Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Fractional Angular Momentum in Cold-Atom Systems YUHE ZHANG, Pennsylvania State Univ, SREEJITH GANESH JAYA , NORDITA, Roslagstullsbacken 23, 10691 Stockholm, Sweden, NATHAN D GEMELKE, JAINENDRA K JAIN, Pennsylvania State Univ — The quantum statistics of bosons or fermions are manifest through the even or odd relative angular momentum of a pair. We show theoretically[1] that, under certain conditions, a pair of certain test particles immersed in a fractional quantum Hall (FQH) state possesses, effectively, a fractional relative angular momentum, which can be interpreted in terms of fractional braid statistics. We propose that the fractionalization of the angular momentum can be detected directly through the measurement of the pair correlation function in rotating ultracold atomic systems in the fractional quantum Hall regime. Such a measurement will also provide direct evidence for the effective magnetic field resulting from Berry phases arising from attached vortices, and of excitations with a fractional particle number, analogous to the fractional charge of the electron fractional quantum Hall effect. We extend our work to investigate the quasiholes in 5/2 FQH state which are believed to obey non-Abelian statistics. We will study the effect of non-Abelian statistics for test particles binding quasiholes in a Moore-Read Pfaffian state, which is produced for bosons subject to a three-body contact interaction, and also for bosons with two-body contact interaction.

[1]Zhang et al., PRL 113, 160404.

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Date submitted: 14 Nov 2014 Electronic form version 1.4