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Fractional Angular Momentum in Cold-Atom Systems YUHE
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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 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 frac-
tional braid statistics. We propose that the fractionalization of the angular mo-
dentum 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 frac-
tional 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.

1Zhang et al., PRL 113, 160404.