Abstract Submitted
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Measuring the Berry Curvature of Optical Lattices HANNAH PRICE, NIGEL COOPER, University of Cambridge — New schemes propose how artificial gauge fields may be imprinted on ultracold atomic gases in optical lattices, allowing experiments to access strongly correlated phenomena. In particular, fractional quantum Hall physics may be explored in systems where the lowest energy band resembles a Landau level, as in the proposed "optical flux lattices". These energy bands have a nonzero Chern number and are topologically nontrivial. The physical properties of such a band are encoded not only in its energy spectrum over the Brillouin zone (the "bandstructure" in the usual sense) but also importantly, in its Berry curvature. When the Berry curvature is nonzero, it can have many important physical consequences; for example it can modify the semiclassical dynamics of a wave packet undergoing Bloch oscillations. We will explain how experimentalists may turn such physical consequences into new tools to determine the topological properties of a band. We will discuss how Berry curvature effects may be observed in ultracold gases and give examples in systems relevant to future experiments. [H. M. Price and N. R. Cooper, Phys. Rev. A 85, 033620 (2012)]

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