

Abstract Submitted
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Irrational vs. rational charge and statistics in graphene-like system CHANG-YU HOU, CLAUDIO CHAMON, Department of Physics, Boston University, ROMAN JACKIW, Department of Physics, Massachusetts Institute of Technology, CHRISTOPHER MUDRY, Condensed matter theory group, Paul Scherrer Institut, Switzerland, SO-YOUNG PI, Physics Department, Boston University, ANDREAS P. SCHNYDER, Department of Physics, University of California, Santa Barbara — Electron fractionalization is intimately related to topology. In one-dimensional systems, fractionally charged states exist at domain walls between degenerate vacua. In two-dimensional systems, fractionalization exists in quantum Hall fluids, where time-reversal symmetry is broken by a large external magnetic field. Recently, there has been a tremendous effort in the search for examples of fractionalization in two-dimensional systems with time-reversal symmetry. We will show that quasiparticle excitations with irrational charge and irrational exchange statistics exist in tight-binding systems, such as graphene-like structure, described, in the continuum approximation, by the Dirac equation in (2+1)-dimensional space and time. These excitations can be deconfined at zero temperature, but when they are, the charge re-rationalizes to the value $1/2$ and the exchange statistics to that of “quartons” (half-semions).

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