Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Scattering theory of chiral Majorana fermion interferometry[1]
JIAN LI, Department of Theoretical Physics, University of Geneva, Switzerland, GENEVIÈVE FLEURY, CEA-Saclay, France, MARKUS BUTTIKER, Department of Theoretical Physics, University of Geneva, Switzerland — Using scattering theory, we investigate interferometers composed of chiral Majorana fermion modes coupled to normal metal leads. We advance an approach in which also the basis states in the normal leads are written in terms of Majorana modes. As a consequence the scattering at the junctions of the lead to the Majorana mode couples modes effectively only pair-wise irrespective of the number of normal scattering modes. We demonstrate that the charge current can also be expressed in terms of interference between pairs of Majorana modes. These two basic facts permit a treatment and understanding of current and noise signatures of chiral Majorana fermion interferometry in an especially elegant way. As a particular example of applications, in Fabry-Perot-type interferometers where chiral Majorana modes form loops, resonances (anti-resonances) upon such loops always lead to peaked (suppressed) Andreev differential conductances and negative (positive) cross-correlations originate purely from two-Majorana-fermion exchange. These investigations are intimately related to current and noise signatures of Majorana bound states.

[1]Swiss NSF and the NCCR Quantum Science and Technology

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Date submitted: 01 Dec 2011 Electronic form version 1.4