Avviso di Seminario

Venerdì 10 Aprile, alle ore 11.00 in aula 603

Dipartimento di Fisica, Via Dodecaneso 33, 16146, Genova

Prof. Thomas L. SCHMIDT

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terrà il seminario dal titolo:

Z₄ parafermions in time-reversal invariant topological insulators

We investigate the effect of superconductivity on the helical edge states of two-dimensional topological insulators. In the noninteracting limit, it was shown several years ago that this can lead to the emergence of Majorana bound states at the ends of the edge state, and a 4π periodic Josephson effect was proposed as a possible experimental signature.

In contrast, our theory focuses on systems with electron-electron interactions. We show that the interplay between bulk spin-orbit coupling and electron-electron interactions produces umklapp scattering in the helical edge states of a two-dimensional topological insulator. If the chemical potential is at the Dirac point, umklapp scattering can open a gap in the edge state spectrum even if the system is time-reversal invariant.

We determine the zero-energy bound states at the interfaces between a section of a helical liquid which is gapped out by the superconducting proximity effect and a section gapped out by umklapp scattering. We show that these interfaces pin charges which are multiples of e/2, giving rise to a Josephson current with 8π periodicity. Moreover, the bound states, which are protected by time-reversal symmetry, are fourfold degenerate and can be described as Z₄ parafermions. We determine their braiding statistics and show how braiding can be implemented in topological insulator systems.

Bibliography: