



Colloquium Dahlem Center for Complex Quantum Systems

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From Majorana to parafermion quantum wires.

Location: Hörsaal A (1.3.14)

Time: Monday, June 18th, 2012, 13:00 c.t.

Abstract:

Non-Abelian anyons are widely sought for the exotic fundamental physics they harbour as well as for their possible applications for quantum information processing. Currently, there are numerous blueprints for stabilizing the simplest type of non-Abelian anyon, a Majorana zero energy mode bound to a vortex or a domain wall. One such candidate system, a so-called “Majorana wire” can be made by judiciously interfacing readily available materials; the experimental evidence for the viability of this approach is presently emerging. Following this idea, we introduce a device fabricated from conventional fractional quantum Hall states, s-wave superconductors and insulators with strong spin-orbit coupling. Similarly to a Majorana wire, the ends of our “quantum wire” would bind “parafermions”, exotic non-Abelian anyons which can be viewed as fractionalized Majorana zero modes. These modes can be experimentally identified (and distinguished from Majoranas) using Josephson measurements.

I will also describe a practical recipe for braiding parafermions, which obey non-Abelian statistics.