Non-Abelian Zero Modes on the Edge of Abelian Topological Phases

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Abstract

In certain 1D topological phases, there are exotic Majorana zero modes localized at the domain walls, which can be exploited for topological quantum computation. We show a generalization of Majorana zero modes, obeying parafermionic algebra, emerges on the 1D edge of 2D Abelian topological phases with fractionalized excitations, by forming domain walls on the edge between regions that are gapped differently. This is a consequence of the nontrivial topological order in the bulk. We propose an anyon model for the exotic non-Abelian zero modes and discuss the braiding statistics of these objects as well as the implications for topological quantum computation. We illustrate the theory with several examples, including double-layer fractional quantum Hall systems and Z_N toric code lattice models.

About the speaker

Dr Meng Cheng obtained his Bachelor in physics at Nanjing University in 2008 and PhD in physics at the University of Maryland under the supervision of Prof Sankar Das Sarma. He will move to Microsoft Research Station Q at Santa Barbara as a postdoctoral fellow.