Colloquium
Dahlem Center for Complex Quantum Systems

Coupling the wires - a deconstructivist approach to topological quantum states of matter

Prof. Dr. Ronny Thomale

Institute for Theoretical Physics I (TP1),
Julius Maximilian University of Wuerzburg

Time: **Tuesday, June 30, 2015, 16:00 c.t.**

Location: Hörsaal A (1.3.14)

Abstract:
Few topics in contemporary condensed matter physics have recently prospered and diversified as much as topological quantum states of matter, with far-reaching links to other vibrant fields such as quantum computation, spintronics, and quantum information. In this talk, we report on a new approach to topological quantum phases in two spatial dimensions by coupled quantum wires. Pioneered by Kane and collaborators for the fractional quantum Hall effect, we employ the approach to reproduce the periodic table of two-dimensional topological band structures, and expand it to long-range entangled phases with topological order and fractional excitations, as well as to effective band structures that lie outside the tenfold classification [1]. Furthermore, we generalize the coupled wire approach to Abelian and non-Abelian chiral spin liquids [2]. It allows for devising microscopic models with only two-body spin interactions and broken SU(2) symmetry that stabilize spin liquids with SU(2)k parafermionic spinon excitations [3].

References
[1] T. Neupert, C. Chamon, C. Mudry, and R. Thomale, ”Wire deconstructionism of twodimensional
topological phases”, Phys. Rev. B 90, 205101 (2014).
[2] M. Greiter and R. Thomale, ”Non-Abelian Statistics in a Quantum Antiferromagnet”,
Phys. Rev. Lett. 102, 207203 (2009).
[3] T. Meng, T. Neupert, M. Greiter, and R. Thomale, ”Coupled wire construction of chiral spin liquids”, arXiv:1503.05051.