Prof. Dr. Jairo Sinova
Institut für Physik, SPICE
sinova@uni-mainz.de

JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Theory of Condensed Matter: Hard Condensed Matter

Sept. 24, 2019 at 2 p.m.
Lorentz Room 05-127 (Staudingerweg 7)

Nikolai A. Sinitsyn
Theoretical Division, Los Alamos National Laboratory (LANL)

Integrable Time-Dependent Quantum Hamiltonians

Time-dependence of parameters provides a whole new dimension for engineering quantum systems with unusual behavior. The limits of fast and slow (adiabatic) time-dependence are well studied. However, the intermediate regime is very poorly understood today because of the lack of proper theoretical methods and efficient numerical algorithms. This is the place where robust and unusual effects are still waiting to be uncovered.
In this talk I will describe the method to study dynamics of interacting spins with simple, e.g., ~t or ~1/t time-dependence of some of the parameters without any approximation. I define what it means for such systems to be integrable and then show three examples that reveal robust dynamic effects. One is the BCS model with decaying superconducting gap, which shows nonadiabatic emergence of a fully thermalized state. Another is the model of cavity QED with linear optical frequency chirp, which demonstrates a sharp phase transition between fast and slow phases. The third model shows the effect of dynamic spin localization in a hysteresis loop of interacting spins. This effect has no counterpart in any known classical or quantum spin model.

References:
[1] NA Sinitsyn, EA Yuzbashyan, VY Chernyak, A Patra, C Sun. Integrable time-dependent quantum Hamiltonians, Phys. Rev. Lett. 120 190402 (2018)
[2] F Li, VY Chernyak, and NA Sinitsyn. Quantum annealing and thermalization: insights from integrability, Phys. Rev. Lett. 121, 190601 (2018)

Contact:
Hjördis Pusch
hjopusch@uni-mainz.de