Oleksandr KYRIIENKO, University of Exeter, UK

Title: "Quantum time crystals from Hamiltonians with long-range interactions"

Abstract:
"The concept of a quantum time crystal (TC) emerged from a question – can we break the time translational symmetry? Developing the analogy between a spatial crystalline order and time crystals, Watanabe and Oshikawa proposed to define TC behaviour through correlation functions that remain periodic in the thermodynamic limit. For this strict definition, they have proven that the TC phase is impossible for: 1) closed quantum system in equilibrium; 2) Hamiltonians with interactions limited to finite range. The violation of the first assumption has led to the flourishing field of Floquet time crystals.

In the talk I will discuss another possibility, where a Hamiltonian with long range multi-qubit couplings is considered. Bypassing the second assumption in the Watanabe-Oshikawa theorem, I will show that Hamiltonians in this class allow for the time crystalline behaviour, thus providing an example of TC in closed quantum systems. Discussing open questions and potential realization, I draw the connection between time crystals and quantum computers."