MP 1: Entanglement; Thermalization

Time: Monday 9:30–11:00 Location: MP-H5

Invited Talk MP 1.1 Mon 9:30 MP-H5

Long-range entanglement and the split property — •Pieter Naaijkens[1] and Yoshiko Ogata[2] — [1]School of Mathematics, Cardiff University, United Kingdom — [2]Graduate School of Mathematical Sciences, The University of Tokyo, Japan

Long-range entanglement has been crucial in understanding topologically ordered phases of matter. In particular, it is believed to be a necessary condition for the existence of non-trivial anyons in 2D. In this talk I will explain how we can prove this statement in the context of superselection sector theory. In particular, we show that if a ground state is not long-range entangled, in a way that we make precise, then we only have the trivial superselection sector. I will also indicate how this is related to the split property of certain von Neumann algebras generated by the observables of the system.

Invited Talk MP 1.2 Mon 10:00 MP-H5

Symmetry-resolved quantum information measures for AdS gravity and beyond — •René Meyer, Suting Zhao, Christian Northe, and Konstantin Weisenberger — Institut für Theoretische Physik und Astrophysik, Julius-Maximilians-Universität Würzburg, Am Hubland, 97074 Würzburg

Quantum entanglement is the key resource employed in modern quantum computation. Different entanglement measures such as the entanglement entropy and Renyi entropies also provide useful information about the entanglement structure of quantum field theories, in particular at critical points. I will discuss the symmetry resolved entanglement and Renyi entropies, a fine-grained version of the usual entanglement and Renyi entropies, both in the context of quantum field theory and AdS/CFT. In the presence of global conserved charges, they quantify the entanglement content of the reduced density matrix in a fixed charge sector. These entanglement measures can in particular be calculated in two-dimensional conformal field theories with U(1) Kac-Moody structure at level k, and are found to not depend on the value of the charge. This charge independence is called equipartition of entanglement, and implies that no charge sector is distinguished in terms of its entanglement content. Finally, I will discuss the symmetry resolved entanglement in the AdS3/CFT2 dual of the U(1) Kac-Moody CFT. Agreement with CFT results provides a further test of the AdS3/CFT2 correspondence. I finish with some results about the violation of the equipartition property in CFTs with W3 symmetry. This talk is based on hep-th/2012.11274 and hep-th/2108.09210.

Invited Talk MP 1.3 Mon 10:30 MP-H5

Rapid thermalization of spin chain commuting Hamiltonians — •Angela Capel — Universität Tübingen

In this talk, we will show that spin chains weakly coupled to a large heat bath thermalize rapidly at any temperature for finite-range, translation-invariant commuting Hamiltonians, reaching equilibrium in a time which scales logarithmically with the system size. From a physical point of view, this result establishes the absence of dissipative phase transition for Davies evolutions over translation-invariant spin chains. The result also applies in the case of Symmetry Protected Topological phases where the evolution is respecting the symmetry of the phase. We will comment on the possible extensions of this result to higher dimensions, as well as on some applications to the study of many-body in and out-of-equilibrium quantum systems.