Contribution ID: **38** Type: **Poster**

Entanglement Hamiltonian and orthogonal polynomials

The entanglement Hamiltonian, defined as the logarithm of the reduced density matrix, is a central concept in many-body quantum physics, since it provides a full characterisation of the entanglement of a quantum state. In this seminar, I will present the results for the EH of free-fermion chains with a particular form of inhomogeneity, namely the hopping amplitudes and chemical potentials are chosen such that the single particle eigenstates are related to discrete orthogonal polynomials of the Askey scheme. The bispectral properties of these functions allow the construction of an operator which commutes exactly with the EH. We show that for these systems the commuting operators have the form of a spatial deformation of the physical Hamiltonian, with a deformation term identified as the local inverse temperature derived from a CFT treatment of the problem in the continuum limit. This result allows to obtain a very good approximation of the entanglement spectrum and entropy, using the properly rescaled eigenvalues of the commuting operator.

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Session Classification: Poster