Contribution ID: **21** Type: **Oral Presentation**

Continuous and field tensor network sates

Tensor network methods have provided us with a powerful set of tools with which to study strongly interacting many-body systems on the lattice. Understanding the limitations of this approach is paramount for the success of both numerical algorithms and exact analytical representations of the many-body wavefunction. In recent years, several generalizations making use of different notions of the continuum have appeared in the literature to tackle different limitations of tensor networks.

Firstly, continuous tensor network states (cTNS) is an ansatz that allows us to work directly in the continuum to answer questions related to quantum field theories, removing the need for sending the lattice spacing to zero in standard tensor network approaches. Secondly, field tensor network states (fTNS) aim to provide an exact tensor network approach to the analytical description of chiral gapped topological states in two spatial dimensions, such as the Laughlin wavefunction. While these states had been previously considered to be out of reach for the most prominent two dimensional tensor network, projected entangled pair states, by upgrading the virtual space of the network to an infinite dimensional one, we circumvent the previous no-go theorems to provide the first exact representations.

In this talk, I will present an overview of both cTNS and fTNS. I will present the main ideas behind both generalizations and relation to quantum field theories. I will also showcase some of the applications that we are currently working on, as well as some of the problems that one encounters along the way. Ongoing work with Arkadiusz Bochniak, Germán Sierra and Ignacio Cirac.

Authors: GASULL, Albert (Lorentz Institute); BOCHNIAK, Arkadiusz (Max Planck Institute of Quantum Optics)

Co-authors: Mr SIERRA, Germán (Center for Theoretical Physics and Mathematics); CIRAC, Ignacio (Max Planck Institute of Quantum Optics)

Presenter: GASULL, Albert (Lorentz Institute)

Session Classification: B - Contributed Talk