

Conformal field theory and energy-momentum tensor on the lattice

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Some non-abelian gauge theories coupled with many massless fermions show the conformal behavior in the low energy limit.

The range of the number of fermions, where the theory has the nontrivial infrared fixed point, is called “conformal window”.

Recent lattice studies confirm the existence of the conformal window from the first-principle calculation, and clarify those conformal properties, e.g. the scaling behavior, the values of the anomalous dimension and the other critical exponents.

In this talk, I briefly review of these recent lattice works.

Next, one of the important tasks is to determine the central charge of the conformal field theory nonperturbatively.

An approach to this aim is give by the calculation of the multi-point function of the energy-momentum tensor. However, to calculate EMT using the lattice simulations is a nontrivial task due to the explicit breaking of the Poincaré invariance on the lattice.

I also introduce the recent challenges to calculate the energy-momentum tensor using the lattice gauge theory on the basis of the Yang-Mills gradient flow is proposed.

Furthermore, I may show alternative trial to determine the central charge, namely the measurement of the entanglement within the lattice simulations, if I have a time.

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