Dipartimento di Fisica
Università di Cagliari
INFN, Sezione di Cagliari

High Energy Physics Colloquia

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Holographic Entanglement Entropy

Abstract

In quantum systems, the entanglement entropy is a non local quantity which gives a measure of how much information is lost by an observer who does not have access to a particular region of spacetime. Alternatively, one can also say it represents how two systems are correlated to each other. It is defined as the von Neumann entropy of the above mentioned observer who does not access to all degrees of freedom. Motivated by black hole entropy, people have also studied entanglement entropy in quantum field theories and found it proportional to area of the accessible region. To have a better understanding of this concept, it would be worthy to study it in the background of holography, through the AdS/CFT correspondence — a conjectured duality between $\mathcal{N} = 4$ super Yang Mills in 4 dimensions and type IIB superstring theory on $AdS_5 \times S^5$. This duality clearly showcases the holographic principle as it relates a conformal field theory on the boundary of the AdS spacetime. In the background of this duality, Ryu and Takayanagi proposed the holographic entanglement entropy by the definition of a subsystem on the boundary and then extending this boundary inside the bulk such that it results in a minimal surface area. The holographic entanglement entropy is then proportional to the area of this minimal surface. This simple prescription to calculate entanglement entropy from a gravitational side becomes very useful when one deals with strongly coupled QFT on the boundary.

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