



ICTS String Seminar

Title : The ins and outs of cosmological correlators and the de Sitter S-matrix

Speaker : Enrico Pajer (University of Cambridge)

Date : Wednesday, 17th April 2024

Time : 3:00 PM (IST)

Abstract : Cosmological correlators, the natural observables of the primordial universe, have been extensively studied in the past two decades using the in-in formalism pioneered by Schwinger and Keldysh for the study of dissipative open systems. Ironically, most applications in cosmology have focused on non-dissipative closed systems. We show that, for non-dissipative systems, correlators can be equivalently computed using the in-out formalism with the familiar Feynman rules. In particular, the myriad of in-in propagators is reduced to a single (Feynman) time-ordered propagator and no sum over the labelling of vertices is required. In de Sitter spacetime, this requires extending the expanding Poincare' patch with a contracting patch, which prepares the bra from the future. Our results are valid for fields of any mass and spin but assuming the absence of infrared divergences.

I will present three applications of the in-out formalism: a representation of correlators in terms of a sum over residues of Feynman propagators in the energy-momentum domain; an algebraic recursion relation that computes Minkowski correlators in terms of lower order ones; and the derivation of cutting rules from Veltman's largest time equation, which we explicitly develop and exemplify for two-vertex diagrams to all loop orders.

The in-out formalism leads also to a natural definition of a de Sitter scattering matrix, which I will discuss in simple examples. Remarkably, I will show that our scattering matrix satisfies the standard optical theorem and the positivity that follows from it in the forward limit.

Venue : Online

Zoom link: <https://icts-res-in.zoom.us/j/88092766911?pwd=R3ZrVk9yeW96ZmQ4ZG9KRzVhenRKZz09>

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