Contribution ID: 72

Second Order Cosmological Perturbation Theory over the Geodesic Light-Cone Background

Wednesday, July 9, 2025 9:00 AM (25 minutes)

Using the Geodesic Light-Cone (GLC) coordinates, one can obtain fully non-linear expressions for light-like cosmological observables. Indeed, by exploiting the intrinsic nature of these coordinates, one can construct an exact, non-perturbative metric that contains all the information about the inhomogeneities and anisotropies present in the observed universe. Meanwhile, it is also interesting to study a perturbation theory on top of the background metric expressed in terms of the GLC coordinates. In this talk, I will tackle this issue at the second perturbative order, going beyond the first order analysis already present in the literature. In particular, I will describe the gauge transformations of second order perturbative functions on the light-cone. Then, after a proper matching with standard perturbation theory, I will find the standard second order gauge fixing corresponding to the GLC gauge. The latter is called the observational synchronous gauge, and I will highlight its conceptual differences with respect to the extension to the second order of the standard synchronous gauge. Finally, within this new perturbation theory, I will evaluate the angular distance-redshift relation up to the second perturbative order as seen by a free-falling observer.

Primary authors: Prof. MAROZZI, Giovanni (University of Pisa and INFN, Section of Pisa); Prof. FANIZZA, Giuseppe (Università LUM, S.S. 100 km 18, Bari); Dr RODRIGUES MEDEIROS SILVA, Matheus (INFN, Section of Pisa); BÉCHAZ, Pierre (University of Pisa and INFN, Section of Pisa)

Presenter: BÉCHAZ, Pierre (University of Pisa and INFN, Section of Pisa)

Session Classification: Contributions