Contribution ID: **40** Type: **Invited talk in a parallel session**

Raychaudhuri equation invariance in the presence of inflation-type fields

Monday, 8 July 2024 15:00 (30 minutes)

We demonstrate that the Raychaudhuri equation remains unchanged for certain solutions of scalar fields ϕ that have a non-canonical Lagrangian of the form $\mathcal{L}(X,\phi) = -V(\phi)F(X)$, with $X = \frac{1}{2}g_{\mu\nu}\nabla^{\mu}\phi\nabla^{\nu}\phi$ and $V(\phi)$ represents the potential. There are several solutions available for both homogeneous and inhomogeneous fields, which are reminiscent of inflation scenarios. Further, the existence of primordial inhomogeneities is provided by the quantum fluctuations that may exhibited by these inflaton-type solutions.

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Session Classification: Inflation: perturbations, initial singularities and emergent universes

Track Classification: Early Universe (EU): Inflation: perturbations, initial singularities and emergent universes