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Mixmaster Universe in a 2D non-commutative GUP framework

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In this work, we examine the dynamical aspects of the cosmological Mixmaster model within the framework of a non-commutative Generalized Uncertainty principle (GUP) theory.

The theory is formulated classically by introducing a well-defined symplectic form that differs from the ordinary one, thereby inducing a deformation of the Poisson brackets.

We first investigate the behavior of the Bianchi I and Bianchi II models using Misner variables. Then, we study the Bianchi IX model in the Mixmaster approximation, which is well-known for accurately reproducing the dynamics of the point-particle Universe approaching the cosmological singularity.

We derive the corresponding Belinsky-Khalatnikov-Lifshitz (BKL) map and explore its resulting features, shaped by the effects of the non-commutative GUP scheme.

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