

## MULTI-DIMENSIONAL COSMOLOGY AND DSR–GUP

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A multi-dimensional cosmology with FRW type metric having four-dimensional space-time and  $d$ -dimensional Ricci-flat internal space is considered with a higher-dimensional cosmological constant. The classical cosmology in commutative and Doubly Special Relativity–Generalized Uncertainty Principle (DSR–GUP) contexts is studied and the corresponding exact solutions for negative and positive cosmological constants are obtained. In the positive cosmological constant case, it is shown that unlike the commutative as well as GUP cases, in DSR–GUP case both scale factors of internal and external spaces after accelerating phase will inevitably experience decelerating phase leading simultaneously to a big crunch. This demarcation from GUP originates from the difference between the GUP and DSR–GUP algebras. The important result is that unlike GUP which results in eternal acceleration, DSR–GUP at first generates acceleration but prevents the eternal acceleration at late-times and turns it into deceleration.

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### 1. Introduction

The Generalized Uncertainty Principle (GUP) is a generalization of Heisenberg Uncertainty Principle in the Planck scale where the gravitational effects on quantum gravity may be considerable. This idea, was first considered by Mead<sup>1</sup> and then implemented in the context of string theory as a candidate of quantum gravity as

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