Contribution ID: **9**   Type: **not specified**

Cosmology with compact phase space

Wednesday 13 November 2019 14:00 (1 hour)

The kinematical phase space of classical gravitational field is flat (affine) and unbounded. In consequence, field variables may tend to infinity leading to appearance of singularities, which plague Einstein's theory of gravity. During the talk the idea of generalizing the theory of gravity by compactification of the phase space will be discussed. We investigate the procedure of compactification of the phase space on a minisuperspace gravitational model with two dimensional phase space. In the affine limit, the model reduces to the flat de Sitter cosmology. The phase space is generalized to the spherical case, and the case of loop quantum cosmology is recovered in the cylindrical phase space limit. Analysis of the dynamics reveals that the compactness of the phase space leads to both UV and IR effects. In particular, the phase of re-collapse appears, preventing the universe from expanding to infinite volume. Furthermore, the quantum version of the model is investigated and the quantum constraint is solved. An exemplary transition amplitude between initial and final state of the classical trajectory is determined

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