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Contribution ID: 4082 Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Origins of thermalization in quantum cosmology

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We aim to provide the effect of accelerated frames in cosmology and identify the origins of thermalization in the evolution of the universe. We begin our discussion by discussing general relativity and cosmology, as well as their successes and failures, which leads to the need for quantum cosmology. We then discuss the canonical formulation of general relativity, which is the basis of quantum cosmology, and its issues. We constructed a wavefunction for the universe whose dynamics are governed by the Wheeler-Dewitt equation. Semiclassical approximations simplify assumptions and approximations that bring the equation closer to a form that can be more easily analyzed. The WKB method is used to approximate the wave function. We constructed a transformation that is similar to the Rindler transformation motivated by the Klein-Gordon equation in Minkowski spacetime. We performed the Bogoliubov transformation and obtained a result which suggested thermalization. However, we were not using creation and annihilation operators. To interpret this result, we calculated the density matrix and the square of the density matrix to see if the WKB state is a pure or mixed state. The result from the density matrix calculation suggested that the WKB state is a mixed state, which suggested that the result we obtained from the Bogoliubov transformation can be interpreted as thermalization.

Keyword-1

Thermalization

Keyword-2

Canonical quantization

Keyword-3

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