

Fermions in Loop Quantum Cosmology

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ABSTRACT

In this talk I will present the quantization of primordial fermion perturbations in Loop Quantum Cosmology (LQC) [1]. More precisely, I will consider a Dirac field coupled to a spatially flat homogeneous and isotropic cosmology, sourced by a homogeneous scalar field, and treat the Dirac field as a perturbation, truncating the action of the system at quadratic perturbative order. I will motivate a convenient description of this symplectic system and adopt the hybrid LQC approach to quantize it. From the full Hamiltonian constraint, and considering a Born-Oppenheimer ansatz for physical states, I will derive a Schrödinger equation for the quantum evolution of the fermion perturbations. I will carefully analyze this quantum evolution, paying special attention to questions like evolution of the Fock vacuum, unitarity of the dynamics, and back reaction of the fermion perturbations onto the geometry.

References

- [1] B. Elizaga Navascués, M. Martín-Benito, G.A. Mena Marugán, Phys. Rev. D 96, 044023 (2017)