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The BFV quantization of the nonprojectable 2+1 Horava theory and the measure of the second-class constraints

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The nonprojectable version of the Horava theory has a dynamics closer to general relativity than the projectable case, since it possesses the so-called Hamiltonian constraint. But the nonprojectable version is a field theory with second-class constraints, the Hamiltonian constraint being one of them. This feature poses challenges in understanding its quantization. The main unanswered question is to proof its renormalization. Due to the second-class constraints, adopting the Hamiltonian formalism seems appropriate. We present the quantization of the 2+1 dimensional nonprojectable theory in the BFV Hamiltonian scheme, considering explicitly all the terms in the potential up to the z=2 order required for power-counting renormalization. The BFV scheme allows to impose noncanonical gauge conditions, as the one used in the proof of renormalization of the projectable case. This scheme is compatible with the second-class constraints and exhibits a BRST symmetry. The effect of the measure associated to the second-class constraints on the propagators is studied. We obtain that the auxiliary fields associated to the second-class constraints get nonregular propagators.

[1] J. Bellorin and B. Droguett, BFV quantization of the nonprojectable (2+1)-dimensional Horava theory, Phys. Rev. D 103 (2021) no.6, 064039 doi:10.1103/PhysRevD.103.064039 [arXiv:2102.04595 [hep-th]].

[2] J. Bellorin and B. Droguett, Quantization of the nonprojectable 2+1D Horava theory: The second-class constraints, Phys. Rev. D 101 (2020) no.8, 084061 doi:10.1103/PhysRevD.101.084061 [arXiv:1912.06749 [hep-th]].

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