Hamiltonian Analysis of Non-Relativistic Covariant RFDiff Horava-Lifshitz Gravity

We perform the Hamiltonian analysis of non-relativistic covariant Horava-Lifshitz gravity in the formulation presented recently in arXiv:1009.4885. We argue that the resulting Hamiltonian structure is in agreement with the original construction of non-relativistic covariant Ho\v{r}ava-Lifshitz gravity presented in arXiv:1007.2410. Then we extend this construction to the case of RFDiff invariant Ho\v{r}ava-Lifshitz theory. We find well behaved Hamiltonian system with the number of the first and the second class constraints that ensure the correct number of physical degrees of freedom of gravity.

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