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Canonical Analysis of Brans-Dicke Theory Addresses Hamiltonian Inequivalence between Jordan and Einstein Frames

Tuesday, September 7, 2021 10:30 AM (30 minutes)

We analyze the Brans-Dicke theory with a Gibbons-Hawking-York(GHY) boundary term and perform ADM decomposition both in Jordan and Einstein frames. For $\omega \neq -3/2$, we show that, at the Hamiltonian level, the Weyl (conformal) transformations from the Jordan to Einstein frames are not canonical transformations (in Hamiltonian sense). A set of canonical transformations is found. These are Anti-Gravity or Anti-Newtonian transformations and are different respect to the transformations from the Jordan to the Einstein frames. The case for $\omega = -3/2$ with GHY boundary term is studied as well. The presence of the conformal invariance too in the Jordan frame, the Dirac's constraint algebra of secondary first-class constraints is different in the Jordan frame respect to the Einstein frame. This inequivalence of the Dirac's algebra between the two frames addresses, more strongly respect to the case $\omega \neq -3/2$, the non (Hamiltonian)-canonicity of the transformations from the Jordan to the Einstein Frames.

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