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Cosmic inflation and Muon ($g-2$) in minimal gauged $L_\mu-L_\tau$ mode

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Abstract: The minimal $U(1)_{L_\mu-L_\tau}$ gauge symmetry extended Standard Model (SM) is a well motivated framework that resolves the discrepancy between the theoretical prediction and experimental observation of muon anomalous magnetic moment. We envisage the possibility of identifying the beyond Standard Model Higgs of $U(1)_{L_\mu-L_\tau}$ sector, non-minimally coupled to gravity, as the inflaton in the early universe, while being consistent with the $(g-2)_\mu$ data. Although the structure seems to be trivial, we observe that taking into consideration of a complete cosmological history starting from inflation through the reheating phase to late-time epoch along with existing constraints on $U(1)_{L_\mu-L_\tau}$ model parameters leave us a small window of allowed reheating temperature. This further results into restriction of $(n_s - r)$ plane which is far severe than the one in a generic non-minimal quartic inflationary set up.

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