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Space-time variation of the electron-to-proton mass ratio in a Weyl model

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(Submitted on 29 Oct 2010)

We consider a phenomenological model where the effective fermion masses depend on the local value of Weyl tensor as a possible explanation for the recent data indicating a space-time variation of the electron-to-proton mass ratio ($\Delta \mu/\mu$) within the Milky Way. We also contrast the required value of the model's parameters with the bounds obtained for the same quantity from modern tests on the violation of the Weak Equivalence Principle (WEP). We obtain the theoretical expression for the variation of $\Delta \mu/\mu$ and for the violation of the WEP as a function of the model parameters. We perform a least square minimization in order to obtain constraints on the model parameters from bounds on the WEP. The bounds obtained on the model parameters from the variation of $\Delta \mu/\mu$ are inconsistent with the bounds obtained from constraints on the violation of the WEP. The variation of nucleon and electron masses through the Weyl tensor is not a viable model.

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