

Abstract Submitted  
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**Lowering the upper bound on the photon mass** DMITRI RYUTOV,  
Lawrence Livermore National Laboratory, Livermore, CA 94551 — The photon mass in the framework of the Proca equations can be constrained by analyzing large-scale magnetic fields in space physics and astrophysics (Goldhaber A S, Nieto M M, Rev. Mod. Phys., v. 43, p. 277, 1971). The value of the photon mass currently recommended by the bi-annual compendium of the Particle Data Group (Yao W-M, and Particle Data Group, J. Phys. G v. 33, p. 1, 2006) is based on the analysis of the Solar wind at the Earth orbit (Ryutov D D, Plasma Phys. Control. Fusion, v. 39, p. A73, 1997). The present paper describes 100-fold reduction of the upper limit by analyzing the Solar wind at the Pluto orbit. Potential improvements related to the analysis of magnetic fields of even larger objects, ranging from Herbig-Haro jets to galaxy clusters, are discussed. The use of the virial theorem for such an analysis is found to be problematic. On the other hand, direct comparison of the observed dynamics of stellar outflows and dense molecular clouds with the predictions of magnetohydrodynamic equations accounting for the finite photon mass may lead to further improvements.

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