Abstract Submitted
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Derivation of the cosmological constant from the physics of neutrino oscillations ERVIN GOLDFAIN, OptiSolve Consulting — Neutrinos are the lightest known leptons in the Universe. We start from the hypothesis that neutrinos are the predominant contributor to the cosmological vacuum and their oscillations are the sole detectable evidence for vacuum fluctuations on the cosmic scale. Let $\Delta m_{12}^2 = m_1^2 - m_2^2$ represent the difference in mass squares for two consecutive neutrino mass eigenstates. Considering that there is roughly one quasi-particle of mass Δm_{12} per each Compton wavelength cubed ($\lambda_c^3 \sim \Delta m_{12}^{-3}$), the quantum expectation value of the vacuum density is given by

$$\rho_{\mathrm{Vac}} \approx 10^{13} (\Delta m_{12}/m_{proton})^4 (g/cc)$$

Inserting the upper bounds on Δm_{12} from neutrino physics experiments ($\Delta m_{12,sol}^2 < 9.5 \times 10^{-5} eV^2$, $\Delta m_{12,atm}^2 < 4.8 \times 10^{-3} eV^2$), we derive

$$\rho_{\mathrm{Vac},sol} < 1.165 \times 10^{-31} (g/cc)$$

$$\rho_{\mathrm{Vac},atm} < 2.973 \times 10^{-28} (g/cc)$$

These predictions agree well with recent supernova results [$\rho_{\mathrm{Vac}} < 6 \times 10^{-30} (g/cc)$] and latest astrophysical data that place the "observed" cosmological constant at $\Lambda/8\pi G \approx (2 \times 10^{-3} eV)^4$.

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