Non Linear Electrodynamics Contributing to a Minimum Vacuum Energy , "cosmological constant", Allowed in Early Universe cosmology

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This summary of results poses the question of a minimum cosmological constant, i.e. vacuum energy at the start of the cosmological evolution from a near singularity. We pose this comparing formalism as given by Berry (1976) as to a minimum time length, and compare that with a minimum time length at the start of cosmological space-time evolution. This we use a minimum time length a way of specifying a magnetic field dependence of the cosmological constant. The presented results are a summary of results in JHEPGC, and is referencing the JHEPGC article. The cited results use the idea of a magnetic monopole charge to start with.

1.Introduction

Citing [1] we use a minimum magnetic monopole charge as given by

$$e = \frac{m}{4\pi n c^2 \cdot (\Delta t)^2} \ln \frac{\xi_{init}}{\xi_{final}} = e_{E\&M} \sim \sqrt{\frac{B^2 \cdot r_{\min}}{\mu_0 \cdot \left[1 - 2 \cdot \frac{B^2 \cdot r_{\min}}{c} \cdot \mathrm{X}_0 \left(\frac{B_c}{B} \right) \right]}} \qquad (1)$$

Eq. (1) has a deeper meaning. That that not only is there a net 'magnetic' monopole charge, as given in Eq. (1), that there is a minimum non zero E and M 'energy density, as given by either ξ_{init} or ξ_{final} for an emergent 'magnetic monopole' charge from an initial space-time configuration. This energy density value will lead to, to first order a minimum upper time step which we will characterize as

$$(\Delta t)^2 = \frac{m}{4\pi n c^2 \cdot e} \ln \frac{\xi_{init}}{\xi_{final}} \sim \sqrt{\frac{B^2 \cdot r_{\min}}{\mu_0 \cdot e^2 \cdot \left[1 - 2 \cdot \frac{B^2 \cdot r_{\min}}{c} \cdot \mathrm{X}_0\left(\frac{B_c}{B}\right)\right]}} \quad (2)$$

We present the minimum time step above, citing a JHEPGC article [1] findings which will then go to the issue of the Vacuum energy next. Here, the function given above is explained in [1] with the minimum radius assumed to be of the order of Planck length, and a minimum magnetic field given in the cited Next, will link this above to the

2. Vacuum energy as given in terms of Minimum time step (Planck time).

Begin with the starting point of , from [1] of

$$\begin{aligned}
&(\Delta t)^2 \sim \frac{m_e}{2nc^2 \cdot e} \\
&\xrightarrow[\omega \to small]{} t_{Planck}^2 \propto \left(5.39 \times 10^{-44}\right)^2 \sec^2 \\
&\xrightarrow[\omega \to much-l\arg er]{} \# \cdot t_{Planck}^2 > \left(5.39 \times 10^{-44}\right)^2 \sec^2
\end{aligned} \quad (3)$$

I.e. for low frequency, we have a collapse to the Planck time frequency value, whereas, the minimum time step rises as frequency ω rises. Furthermore Eq. (3) is formed in a way independent of a changing vacuum energy, as given by [1]

$$\Lambda(t) \sim \left(H_{\text{inflation}}\right)^2 \quad (4)$$

Whereas this may tie into a massive graviton mass as given by the author as spin off of massive gravitons given in [1]

$$m_g^2 = \frac{\tilde{\kappa} \cdot \Lambda_{\max} \cdot c^4}{48 \cdot h \cdot \pi \cdot G} \quad (5)$$

Note the time step is then independent upon elementary arguments as to massive graviton mass. Furthermore, from [1]

3.Conclusion: GW generation due to the Thermal output of Plasma burning

The easiest case to consider is, if the Λ is not overly large, and the initial scale factor $a(t)$ is small. Then we have [1]

$$t \sim \frac{2}{\sqrt{3\Lambda}} \cdot \left(a(t) \cdot \sqrt{\frac{\Lambda}{8\pi G \rho}} - \frac{a^3(t)}{2.3} \left(\frac{\Lambda}{8\pi G \rho}\right)^{3/2} + HOT \right) \quad (6)$$

Then we are looking at a minimum vacuum energy of

$$\Lambda \sim \frac{8\pi G \rho_{galaxies}}{a^2(t)} \cdot \left[1 - \sqrt{\frac{3}{4}} \frac{m^2 \mu_0 \omega}{e^2 a(t)} \sqrt{8\pi G \rho_{galaxies}} \cdot 10^{2\tilde{\beta}} \right] \quad (7)$$

Here, $a(t_{initial}) \sim 10^{-30}$ is very small, but we are also assuming an ultra low $\rho_{galaxies}$ and ω, and small m.

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References

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