Finding minimum spatial uncertainty requirements for space time which can distinguish between LQG, and brane world scenarios. Applications of Euclidian Snyder geometry to the foundations of space time physics

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Abstract This thought experiment supposition will be raised in the ACGRG5, in Christchurch, New Zealand, December 2009, as a way to start investigations as to being able to choose either LQG, or string theory, as an initial space time template for emergent gravity . The author was exposed to Batisti's talk as of the 12 Marcel Grossman conference, and intends to explore the applications of deformed Euclidian space to questions as of the role of either string theory and/or LQG as to what degree the fundamental constants of nature are preserved between different cosmological cycles, and also the degree that gravity is an emergent field which is either partly/ largely classical, with extreme non linearity, or a far more quantum phenomenon.

Introduction

Recent papers in LQG which the author was exposed to in the 12 Marcel Grossman conference, presented that a big bounce replaced the singularity conditions Hawkings , Ellis, and others use . In particular, Batistini, in a PRD article as of 2009 uses Snyder geometry to find a common basis in which to make a limiting approximation as to how to either derive either brane world, or LQG conditions for cosmological evolution. The heart of what Batistini works with is a defomed Euclidian synder space, when we use the $\hbar = c = 1$ units, obtaining then $[q, p] = i \cdot \sqrt{1 - \alpha \cdot p^2} \Leftrightarrow \Delta q \Delta p \geq \frac{1}{2} \cdot \left| \left\langle \sqrt{1 - \alpha \cdot p^2} \right\rangle \right|$. The LQG condition is $\alpha > 0$, and Brane worlds have, instead $\alpha < 0$. As Batistini indicated, in PRD, 2009, it is possible to obtain a string theory limit of $\Delta q \geq \left[(1/\Delta p) + l_s^2 \cdot \Delta p \right] \equiv (1/\Delta p) - \alpha \cdot \Delta p$. We will use this result explicitly in the document as to differentiating between criteria as to information transfer from a prior to a present universe, as a way to distinguish, on falsifiable experimental grounds, how to determine if minimum spatial uncertainty requirements for space time can distinguish between LQG, and brane world scenarios.

How much information needs to be maintained to preserve the cosmological constants? From cosmological cycle to cycle?

No clear answer really emerges, YET. It is useful to note, that de La Peña in 1997 proposed an order-of-magnitude estimate to derive a relation between Planck's constant (as a measure of the strength of the field fluctuations) and cosmological constants. If , as an example, the fine structure constant has input parameter variance, as was explored by Livio, et al (1998), with an explanation of why fine structure constant has $\Delta\tilde{\alpha}/\tilde{\alpha} \leq 10^{-5} - 10^{-6}$ when traveling from red shift values Z ~ 1.5 to the present era, and there is, as an example, from QED a proportional argument that $\tilde{\alpha} \equiv e^2/\hbar \cdot c$, with , in CGS units

$$\tilde{\alpha} \equiv e^2/\hbar \cdot c \equiv \frac{e^2}{d} \times \frac{\lambda}{hc} \tag{1}$$

With a now commonly accepted version of $\dot{\tilde{\alpha}}/\tilde{\alpha} \leq (-1.6 \pm 2.3) \times 10^{-17}\ year$. The supposition which the author will be investigating, as an example, will be if the energy needed to overcome the electrostatic repulsion between two electrons when the distance between them is reduced from infinity to some finite *d*, and (ii) the energy of a single photon of wavelength λ = 2π*d* has limiting grid values as to, in earlier conditions of cosmological expansion where the limits

$\Delta q \geq [(1/\Delta p) + l_s^2 \cdot \Delta p] \equiv (1/\Delta p) - \alpha \cdot \Delta p$ could be investigated, and at least given limiting values.. This is where the LQG condition is $\alpha > 0$, and Brane worlds have, instead $\alpha < 0$. The author is fully aware of the inappropriateness of extrapolating eqn. (1) before Z ~ 1100, and is, instead, looking for an equivalent statement as to what $\tilde{\alpha} \equiv e^2/\hbar \cdot c$ would be at the onset of the big bang. Furthermore, the planck length, as given by $l_P \equiv \sqrt{\hbar G/c^3}$ would be, if followed through, a ay to make linkage between minimum length $\Delta q \geq [(1/\Delta p) + l_s^2 \cdot \Delta p] \equiv (1/\Delta p) - \alpha \cdot \Delta p$, and ways to obtain $\tilde{\alpha} \equiv e^2/\hbar \cdot c$. If minimum uncertainty could be argued so as to look at

$$\Delta q \equiv 10^\beta \cdot l_P \sim [(1/\Delta p) + l_s^2 \cdot \Delta p] \equiv (1/\Delta p) - \alpha \cdot \Delta p \tag{2}$$

Which was advanced by Gasperini and Veneziano, (1993), i.e. $10^\beta \cdot l_P \equiv l_{string}$ as a minimum length, it may be a way as to link choices of how much information could be stored in $\Delta q \equiv 10^\beta \cdot l_P$, with values of both the value $\tilde{\alpha} \equiv e^2/\hbar \cdot c$, and $l_P \equiv \sqrt{\hbar G/c^3}$. The author is looking as to different algorithms of how to pack 'information' into minimum quantum lengths, $\Delta q \equiv 10^\beta \cdot l_P$, with the supposition that the momentum variance Δp could come from prior universe inputs into the present cosmos.

Conclusion, one needs a reliable information packing algorithm!

The author is working on it. Specifically one of the main hurtles is in finding linkage between information, as one can conceive of it, and entropy. If such a parameterization can be found, and analyzed, then Seth Lloyds short hand for entropy can then possibly be utilized. Namely as given by Lloyd (2002)

$$I = S_{total}/k_B \ln 2 = [\#operations]^{3/4} = [\rho \cdot c^5 \cdot t^4/\hbar]^{3/4} \tag{3}$$

The author's supposition is that eqn (3) is basic, but that there could be a variance of inputs into eqn. (3) as far as inputs into the Planck's constant, $\hbar$ based upon arguments present at and after eqn (2)

Once resolution of the above ambiguities is finalized, one way or another, choices of inputs into eqn (2) and eqn. (3) will commence, with ways of trying to find how to select between the following. : the LQG condition is $\alpha > 0$, and Brane worlds have, instead $\alpha < 0$

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