

Setting time as purely imaginary in regime of space-time before Causal Barrier and Planckian Space-time

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Abstract

We start where we use an inflaton value due to use of a scale factor $a \sim a_{\min} t^\gamma$. In doing so, using the approximations brought up in the case of an early universe generation of a magnetic field, we come up with the stunning datum of a Pre Planckian space-time with purely imaginary time. The consequences of such are brought up in our document. We use what is brought up in a prior article as to Pre Planckian to Planckian generation of Magnetic fields to make our point. Here, we assume, in the Pre Planckian space-time, a singular injection of space-time. Which we argue, if there is no spatial variation of the Inflaton field, so used, and we just have ONE Pre Planckian time instant, that this will be imaginary valued time, hence leading to pure Tunneling behavior,. To whatever we are channeling from say a Penrose cosmology style CCC universe recycling, in terms of energy, is transferred to Planckian space-time

Key words **Inflaton physics, Causal structure,**

I. Examining the Pre Planckian Inflaton, and its relationship to as Hamiltonian

We begin with using the inflaton as given by [1] with the result that we will be looking at the Pre Planckian potential and inflaton system as looking like

$$\begin{aligned}
 a &\approx a_{\min} t^\gamma \\
 \Leftrightarrow \phi &\approx \sqrt{\frac{\gamma}{4\pi G}} \cdot \ln \left\{ \sqrt{\frac{8\pi G V_0}{\gamma \cdot (3\gamma - 1)}} \cdot t \right\} \\
 \Leftrightarrow V &\approx V_0 \cdot \exp \left\{ -\sqrt{\frac{16\pi G}{\gamma}} \cdot \phi(t) \right\}
 \end{aligned} \tag{1}$$

Using the approximation of a log expansion of the inflaton, this leads to, for approximate small space-time

$$\phi \approx \sqrt{\frac{\gamma}{4\pi G}} \cdot \left\{ 1 - 1 / \sqrt{\frac{8\pi G V_0}{\gamma \cdot (3\gamma - 1)}} \cdot t \right\} \tag{2}$$

We next then, as discussed in [1] make the assumption of a modified CCC Penrose style cyclic conformal cosmology recycling of Space-time into the interior bubble where Eq. (1) holds, and we use the following Hamiltonian system [2]

$$H(\text{inf}) = \int d^{(n-1)}x \cdot \left[\frac{\dot{\phi}^2 + (\nabla\phi)^2 + m^2\phi^2}{2} \right] \tag{3}$$

The approximation we use is that there is, in the Pre Planckian space-time no spatial variation of the Inflaton, and that in addition, that we just have imposed, due to our modified CCC Penrose style cyclic conformal cosmology recycling of Space-time into the interior bubble, just ONE instant of time. I.e. then what we work with is, with approximations.

$$H(\text{inf}) = \left(\int d^{(n-1)}x \right) \cdot \left[\frac{\dot{\phi}^2 + m^2\phi^2}{2} \right] \tag{4}$$

Using the assumption that if there is just ONE time instant, as similar to the Hamiltonian being TIME independent, we re write the above as $H = E$ (energy), [3] We then , Using Eq. (4), for $H=E$, Eq. (2) for an Inflaton, and $\left(\int d^{(n-1)}x \right) = V(n-1 \text{ dim})$, reduce our time Equation to looking like the following, i.e. we will define m , after we set the square of Time in the Pre Planckian regime

$$\begin{aligned}
& (t^2)^2 - (1 + m^2(t^2)) \cdot \left(\frac{\gamma \cdot (3\gamma - 1) \cdot V(n-1 \text{ dim})}{16\pi^2 G^2 V_0 E} \right) = 0 \\
& \&A = \frac{\gamma \cdot (3\gamma - 1) V(n-1 \text{ dim})}{16\pi^2 G^2 V_0 E} \\
& \Rightarrow (t^2) = \frac{m^2 A}{2} \cdot \left(1 \pm \sqrt{1 + \frac{1}{m^4 A}} \right) \\
& \&(t^2) \sim -\frac{1}{4m^2}
\end{aligned} \tag{5}$$

This last line of Eq. (5) is for the Pre Planckian regime of space – time, and in it we will by [1] make the following identification.

$$m \sim N(\text{Entropy} - \text{count}) \cdot m_g \tag{6}$$

We will in our conclusion elaborate as to what this may be leading to

II. Imaginary time ? In Pre Planckian space?

It is a truism, that in Field theory, imaginary time inverts potentials. Moreover it is also a way to discuss barrier penetration problems, i.e. this is done time and time again in Quantum Mechanics, [4], and in field theory [5]

Without further ado, we state that this imaginary time designation, as forced, for ONE instant of space-time is equivalent to reducing the problem, in terms of Pre Planckian space-time for ONE given instant of time, put into our H=E identification, is the same as having a barrier penetration forced from Pre Planckian to Planckian Space time.

III. Conclusion? The transformation from Imaginary time, in Pre Planckian to Planckian space time real time, presages why we have a Causal barrier, and is profoundly important

What we need to do, in our work, is to work in terms of generalizing what we took from [6] as far as our modification of Penrose, that we are assuming a Pre Planckian space-time to be the recipient of energy from Multiverse contributions.

I.e. to finalize our approximations used in this note, we need to delineate further, what this is saying, as it also relates to the issues brought up in [1] as to a Pre- Planckian to Planckian Universe generated magnetic field.

However, if the characterization for time varies this radically between the Pre Planckian to Planckian Universe, and this is upheld, then we have more basis as to forming appropriate conditions as to early universe magnetic fields, and may afterwards answer the questions raised in [6],[7] and [8] as well as

[1]. Also the issues of [9], [10] [11] can be reviewed again. I.e. for [9] the issue of if we can or cannot devise filters can be reviewed again, due to what was said in [1] and of course we should not have hypothesis which flatly contradict what was seen experimentally in [10, 11] either.

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