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Comment

Comment on Faizal et al EPJC 76:30

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Abstract In a recent paper in EPJC January 2016, Faizal, Khalil and Das have proposed time crystals with duration several orders of magnitude greater than Planck scale. We comment on this paper and shed further light on this aspect.

Recently Faizal et al., in this journal [1] described time crystals which are several orders of magnitude greater than the Planck scale. The discreteness and hence noncommutativity of spacetime has been considered in the literature from the 1940s. In the earlier attempts the scale at which this discreteness takes place has been the Planck scale. Several authors like Snyder, Schild, Kadyshevskii, Ginsburg, Caldirola and others have considered this discreteness, as also in very recent quantum gravity approaches [2,3]. However the author considered discreteness at the Compton Scale to develop his successful cosmology of 1997 [4–6]. This predicted in advance a slowly accelerating universe driven by what we today call dark energy, when the standard big bang model said exactly the opposite. It was of course argued at length by Wigner and Salecker [7] in the late fifties that there cannot be a physical time within the Compton Scale. Further the author showed more than 12 years ago in several papers in Foundation of Physics and Chaos, Solitons and Fractals, how the coherent Compton Scale arises from the Planck Scale through a coherence approach including the Landau-Ginsburg phase transition [8,9]. So, even though as in the Prigogine cosmology a Big Bang event would lead to the Planck scale or Wheeler's Quantum Foam [10], this would lead to a several order of magnitude higher scale through phase transition. In fact just prior to the phase transition we would have

$$-\frac{\hbar^2}{2m}\nabla^2\psi + \beta|\psi|^2\psi = -\alpha\psi \tag{1}$$

In (1) ψ denotes the wave function of the particle at a point which is in the impenetrable Planck length. Its derivation is explained in [3,9] – but basically it stems from a simple two or more state model of probability amplitudes first worked out by Feynman.

Equation (1) leads to the Landau-Ginsberg phase transition with coherence length

$$\xi = \left(\frac{\gamma}{\alpha}\right)^{\frac{1}{2}} \tag{2}$$

ξ which is in the left side is the coherence length, γ is $\hbar^2/2m$ is in the landau theory and $\alpha = mc^2$ is the energy.

This is the Compton scale (Cf. Ref. [3]) in our case.

More recently this was also shown by Beck and Murray [11] and even more recently it was argued in The European Physical Journal C by Faizal, Khalil and Das [1].

On the contrary sticking to the Planck Scale without such a phase transition could prove disastrous as recently articulated by Harry Cliff of Cambridge University and the LHC Collaboration – it would lead to the end of physics, particularly because of the cosmological constant being, in this case 10^{120} times its observed value [12,13].

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