Report

Brief Report on Modeling Neutrinos

B. G. Sidharth[1]
G.P. Birla Observatory & Astronomical Research Centre
B.M. Birla Science Centre, Adarsh Nagar, Hyderabad - 500 063 (India)

Abstract

In Graphene there are quasi particles that behave like nearly luminal fermions. In this model as argued below, we could think of the universe to be a two dimensional entity in which neutrinos play the role of these quasi particles.

Ever since Wolfgang Pauli postulated the existence of a new particle called the Neutrino way back in 1930, this particle has remained an enigma. Though Pauli himself had regretted that he had invented a particle that could never be detected, in fact the neutrino was detected in the context of weak interactions. Amongst the many weird features of this ghostly particle are its appearance in three flavours and its near super luminal motion. It now appears that there may be slight differences between neutrinos and their anti particles – a feature which was anticipated by the author a few years ago [1]. The author points out that many of these enigmatic features can be explained if we can model the neutrino as a two dimensional fermion. Indeed if we construct the Dirac equation in two rather than three space dimensions, we get the Weyl equation that describes neutrinos, which are two component objects. This was pointed out by the author nearly twenty years ago, but more recently it has come back in a dramatic manner in a context of Graphene which is loosely speaking a two dimensional sheet of graphite [2, 3]. In Graphene there are quasi particles that behave like nearly luminal fermions. In this model as argued below, we could think of the universe to be a two dimensional entity in which neutrinos play the role of these quasi particles.

It has also been argued by the author that a collection of nearly mono energetic fermions has anomalous bosonic features including two dimensionality [4, 5]. Indeed this is the case for the neutrinos that form a cosmic background [6]. In this case the temperature is of the order of one degree K, so that the neutrinos are ultra cold and the virial distribution of velocities is absent, a feature otherwise descriptive of three dimensionality.

Indeed astrophysical studies indicate that over very large distances R the mass content varies nearly as the square of the distances [7]. This is indicative of two dimensionality. Finally it has been pointed out that for ultra relativistic fermions, localization and sub luminal velocities require wave packets made up of both positive energy and negative

[1]Correspondence: E-mail: iiamisbgs@yahoo.co.in

energy components. Whereas the neutrino can be described by massless, luminal packets of a single sign of the energy [4]. This would also explain features like the handedness or chirality of the neutrino or even their different flavours (rather like the same galaxy appearing like a flat spiral or elliptical disc depending on the perspective).

References

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