Report

On Some Expected Novel Results from the LHC

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Abstract

The LHC has now achieved its maximum energy of $14TeV$, after it was re-started recently. We look at some interesting possibilities arising in this context.

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We observe that according to Pauli and Weisskopf, the positive and energy solutions of the Klein-Gordon and Dirac equations represent particles and antiparticles or positive and negative charge states. On the other hand the Feshbach Villar approach,

$$\Psi = \begin{pmatrix} \phi_0(p) \\ \chi_0(p) \end{pmatrix} e^{\imath/\hbar(p\cdot x - Et)}$$

$$\Psi = \Psi_0(p) e^{\imath/\hbar(p\cdot x - Et)} \tag{0.1}$$

gives a particle description of the above two equations [1]:

$$\imath\hbar(\partial\phi/\partial t) = (1/2m)(\hbar/\imath\nabla - eA/c)^2(\phi + \chi) + (e\phi + mc^2)\chi$$

$$\imath\hbar(\partial\chi/\partial t) = (1/2m)(\hbar/\imath\nabla - eA/c)^2(\phi + \chi) + e\phi - mc^2\phi). \tag{0.2}$$

We also know that as the velocity increases we can deduce the Snyder-Sidharth dispersion relation [2],

$$E^2 = p^2 + m^2 - \alpha l^2 p^4 \tag{0.3}$$

where l is a suitable, but small constant. The last term, it may be observed resembles the Darwin term which is a small contribution arising because the particle encounters a smeared Coulomb potential arising out of Zitterbewegung effects [3].

From here it was argued [3] that at very high energies approaching the speed of light, the particle would disintegrate. This would happen if the last term in (0.3), for example, would dominate the other terms, as has been shown in detail elsewhere (Cf.ref.[3]).

On the other hand it is known that at such high energies, the wave function $\begin{pmatrix} \phi \\ \chi \end{pmatrix}$ where both ϕ and χ the two component spinors becomes skewed in the following sense. At normal to high energies, the so called positive energy spinor ϕ dominates over the negative energy spinor χ but at ultra high energies, it is the other way around, as in fact can be shown using the Cini Toushek transformation [4, 5]. The implication is that the Fermions will begin to behave like two component, neutrino like particles. In fact we know that quarks themselves have neutrino like handedness. So this would be another possible consequence.

Finally, at even higher energies, though perhaps beyond the LHC energies, the χ components would dominate completely – this is like particle-antiparticle transmutations and they would appear like the Weyl Fermions that is "charged" neutrino like particles, that have been reported recently from Princeton.

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