Are There Hidden Variables, or a Hidden Structure in a Classical Underpinning of Relativistic Quantum Mechanics?

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Based on de Broglie wave concept, Horodecki proposed Three Wave Hypothesis (TWH) where the particle is related to waves. This hypothesis implies that a massive particle is an intrinsically spatially as well as temporally extended non-linear wave phenomenon (Horodecki, 1981, 1983). Within this model, there are three waves, the superluminal de Broglie wave, a subluminal dual wave, and a transformed Compton wave, and there are two dispersion relations, the de Broglie wave and a proposed dual wave dispersion relation. But the TWH faces lack of experimental evidence. In considering angular form instead of wave form, and combine the two are two dispersion relations in only one, the system is of the three-wave system is transferred to a system of two perpendicular rolling circles (Sanduk, 2007, 2009). In 2012, Sanduk showed a possibility to transform position vector of a point in a system of two rolling circles to a complex vector under an assumed effect called partial observation (Sanduk, 2012). That work is out of the scope of quantum mechanics. The concept of the partial observation may be explained as a lab observer condition. Using this condition with the real position vector and equation of velocity of a point in that system of two rolling circles shows transformations to complex vector and an equation of complex velocity. The structure of the complex velocity has a similar form as that of Dirac equation. Thus, for the lab observer there is no rolling circles system, but an abstract form of two equivalent representations (moving of point or sinusoidal wave in complex plane). Solving this problem of observation may lead the lab observer to deal with the complex vector in a statistical way (Born rule). Analogous forms of relativistic quantum mechanics can be obtained without base on quantum axioms. The work shows that both of the quantum mechanics and the special relativity are of same origin and are emergent. The system exhibits a fine structure and shows an explanation for the fine structure constant. This approach shows that there is no need for hidden variables, and the use of statistical approach is no more than a technique to obtain physical information. The problem of complexity arises from a hidden structure.

References

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