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## Is there physics underling the relativistic quantum mechanics?

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During eighties of last century, Horodecki proposed Three Wave Hypothesis (TWH). This hypothesis is based on

- the Paris school interpretation of quantum mechanics, which is related to de Broglie's particle-wave duality, Vigier's and others' works, and
- the assumption of covariant æther.

TWH implies that a massive particle is an intrinsically spatially as well as temporally extended non-linear wave phenomenon [1,2]. The three waves of this model are the superluminal de Broglie wave, a subluminal dual wave, and a transformed Compton wave. For these waves, there are two dispersion relations. However, the TWH faces lack of experimental evidence.

In 2007, Sanduk considered angular form instead of wave form for these waves, and combine the two dispersion relations in only one. These considerations for the TWH transfer the three wave system to a system of two perpendicular rolling circles [3, 4].

In an attempt to find a relationship between the classical form of two rolling circles and complex function form, Sanduk in 2012 showed a possibility to transform position vector of a point in a system of two rolling circles to a complex vector under an assumption of an effect called partial observation [5]. That work is out of the scope of quantum mechanics, but leads to the concept of introducing of the Hilbert space via a classical a classical model.

In 2018, Sanduk formulated an analogy for the relativistic quantum mechanics [6]. This analogy is based on the two rolling circles system and the concept of the partial observation. Analogous forms of relativistic quantum mechanics can be obtained without base on quantum axioms. Many other analogies has been found, and are listed in a comparison table. The work shows that both of the quantum mechanics and the special relativity are of same origin and are emergent. The system offers explanations for the fine structure constant, and the high dimensional wave function, etc. The similarities with the quantum mechanics suggest analogies and propose questions of interpretation for the standard quantum theory, without any possible causal claims.

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5. Sanduk, M., A kinematic model for a partially resolved dynamical system in a Euclidean plane, Journal of Mathematical Modelling and Application , 1, No.6, 2012, pp. 40-51. ISSN: 2178-2423.
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