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Negative-energy and Tachyonic Solutions of Relativisti Equations

Abstract
We analyzed the recent controversies in the definitions of the Feynman-Dyson propagator for the field operator. In this work we present some insights with respect to this for spin 1/2. Both algebraic equation $Det(\hat{p}-m)=0$ and $Det(\hat{p}+m)=0$ for u– and v– 4-spinors have solutions with $p_0=\pm E_p=\pm\sqrt{p^2+m^2}$. The same is true for higher-spin equations (or they may even have more complicated dispersion relations, tachyons). The Fock space can be doubled on the quantum-field (QFT) level. In this talk we give additional bases for the development of the correct theory of spin particles in QFT. It seems, that it is imposible to consider the relativistic quantum mechanics appropriately without negative energies, tachyons and appropriate forms of the discrete symmetries, and their actions on the corresponding physical states.

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