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Dynamics of hydrogen-like atom bounded by maximal acceleration

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The existence of a maximal acceleration for massive objects was conjectured by Caianiello 30 years ago based on the Heisenberg uncertainty relations. Many consequences of this hypothesis have been studied, but until now, there has been no evidence that boundedness of the acceleration may lead to quantum behavior. In previous research, we predicted the existence of a universal maximal acceleration and developed a new dynamics for which all admissible solutions have an acceleration bounded by the maximal one. Based on W. K\"{u}ndig's experiment, as reanalyzed by Kholmetskii et al, we estimated its value to be of the order $10^{19}m/s^2$.

We present here a solution of our dynamical equation for a classical hydrogen-like atom and show that this dynamics leads to some aspects of quantum behavior. We show that the position of an electron in a hydrogen-like atom can be described only probabilistically. We also show that in this model, the notion of "center of mass" must be modified. This modification supports the non-existence of a magnetic moment in the atom and explains the relevance of the conformal group in the quantum region.

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