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Classical geometry to quantum behavior correspondence in a Virtual Extra Dimension

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In the Lorentz invariant formalism of compact space-time dimensions the assumption of periodic boundary conditions represents a consistent semi-classical quantization condition for relativistic fields. In [arXiv:1110.0315, Ann. Phys. (2012)] we have shown, for instance, that the ordinary Feynman path integral is obtained as interference between the classical paths with different winding numbers associated to the cyclic dynamics of the field solutions. Through the boundary conditions, the kinematical information of interaction is encoded on the relativistic geometrodynamics of the boundary. Furthermore, such a purely four-dimensional theory is manifestly dual to an extra-dimensional field theory. The resulting correspondence between extra-dimensional geometrodynamics and ordinary quantum behavior yields an unconventional interpretation of the AdS/CFT correspondence in terms of wave-particle duality. By applying this approach to a simple Quark-Gluon-Plasma freeze-out model we retrieve basic aspects of AdS/QCD phenomenology.

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