University of Crete
Department of Physics

Physics Colloquium

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A glimpse on the dynamics of relativistic quantum fields through the prism of classical and quantum simulation

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ABSTRACT

Recent advances in quantum many-body physics have raised expectations for the simulation of relativistic Quantum Field Theories (QFTs) and their dynamics, a subject of central importance for some of the most fundamental questions in theoretical physics, like the black hole information paradox or the early dynamics of the universe. In this colloquium, I will talk about an analog quantum field simulator based on ultra-cold atom experiments and its theoretical description by means of a numerical technique based on Renormalisation Group and Conformal Field Theory. Focusing on QFT models in one spatial dimension, which offer the possibility of efficient classical simulation using this technique, I will present an investigation of equilibrium and dynamical effects of topological excitations, observation of the dynamics and relaxation process after a sudden parameter change, and analysis of signatures of quantum chaos. Some of these results suggest that the dynamics of QFTs exhibit extraordinary features not typically seen in lattice models of condensed matter.