

NATIONAL CENTRE FOR NUCLEAR RESEARCH

Abstract

κ -deformed scalar field

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In the following work we will introduce and discuss in detail a particular model of complex κ -deformed scalar field, whose behaviour under C , P , T transformation is particularly transparent from both a formal and phenomenological point of view. We will begin by introducing the key mathematical structure at the basis of our investigation, namely the κ -Poincaré (Hopf) algebra and the κ -Minkowski spacetime. We will then investigate the behaviour of general two-particle states under deformed boost. After this we will introduce the action of our κ -deformed complex scalar field. From it, we will derive the equations of motion, as well as the Noether charges due to the continuous symmetries. The peculiar features of κ -deformation in general, and of our model in particular, allow for very non-trivial interaction between discrete and continuous symmetries, of which we will investigate the phenomenological consequences (particularly in terms of difference of lifetime of decaying particles). To conclude, we will obtain the κ -deformed propagator of the κ -deformed complex scalar field, and the imaginary part of the 1-loop contribution to it, ending with additional phenomenological consequences. The third chapter is new, unpublished work.