CORRELATION FUNCTIONS OF A CHARGED SCALAR FIELD IN THE BACKGROUND OF NONCOMMUTATIVE $U(1)$ GAUGE FIELD

A. Solovyov

Bogolyubov Institute for Theoretical Physics,
Nat. Acad. of Sci. of Ukraine
(*14b, Metrolohichna Str., Kyiv 03680, Ukraine;*
e-mail: avs2132@columbia.edu)

S u m m a r y

We consider a complex charged scalar field coupled to a constant background non-commutative $U(1)$ gauge field and calculate the correlation function of two gauge-invariant composite operators. This calculation illustrates an interplay between the gauge transformations in gauge theories on noncommutative spaces and a space-time geometry. We show that the noncommutative gauge invariance is restored for higher-order correlators, though the Green's function itself is not invariant. The correlation functions reveal a singular behavior in the case where the Seiberg–Witten map becomes singular; i.e., there is no equivalent commutative description.