Commun. math. Phys. 7, 138—151 (1968)

On a Class of Relativistic Invariant Distributions

G. V. Efimov

Joint Institute for Nuclear Research
Laboratory of Theoretical Physics

Received July 12, 1967

Abstract. Space-time properties of a class of relativistic invariant distributions of the type

$$K(x-x') = \sum_{n=0}^{\infty} \frac{c_n}{(2n)!} \Box^n \delta^{(4)}(x-x')$$

were considered for different sequences of coefficients c_n.

1. Introduction

The assumption of a character of distributions takes essential place among the basis postulates of the local quantum field theory. Such distributions are coefficient functions in the expansion of the S-matrix in a series of field operator normal products [1] or are Wightman's functions in his axiomatic approach [2]. This assumption is connected with a definition of local properties of distributions. The important class of the tempered distributions, becoming a traditional one in investigation of the quantum field theory, seems to be chosen because the concept of locality is introduced here by the most simple and natural manner. But lately it has become more clear that this class is not always an adequate instrument. It turns out that the class of local distributions can be extended essentially. The most significant results were received by Meiman [3] and Jaffe [4]. It is remarkable that the definition of concept of *micro-causality* by Meiman and *strict localizability* by Jaffe takes the basic place in the papers of these authors. They received the different classes of the test functions depending on the definitions introduced. Maiman's and Jaffe's idea is to choose the "minimum" class of test functions. It means the following. If one introduces a certain definition of locality then only such distributions must be defined on the "minimum" class of test functions which satisfy the definition introduced. The other distributions must not be defined on the whole class of test functions. The requirement of the "minimality" permits to get the important physical consequences from this purely mathematical hypothesis following from the definition of locality only. (For example, CPT-theorem, theorem of local commutativity, restriction on behaviour of amplitudes when energy goes to infinity and so on.)