# Green Functions in the Theory of Local Unrenormalizable Interactions

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**Abstract.** The method suggested earlier for the description of unrenormalizable interactions of massless particles [1–4] is generalized to the case of interactions of particles with non-zero rest mass.

## 1. Introduction

In a number of previous papers [1–4] the problem of the construction of the Green functions in the momentum space in theories describing unrenormalizable interactions was investigated. In the x-space these functions have an essential singularity when their argument is zero. Therefore the construction of the Fourier transforms of these functions is a non-trivial problem.

In the case when the rest masses of particles are zero the problem conserve all its characteristic features while the calculations become essentially‚ simpler. This just explains the fact that in previous papers one investigated the interactions of massless particles. The attention was focussed on the main problem, the transition from the Green functions constructed in the x-space to those in the momentum space. A method has been developed which allows one to perform such a transformation. It may be used in theories which describe a wide class of unrenormalizable interactions. The Green functions constructed by this method satisfy the conditions of causality and unitary of the S-matrix.

However, to complete the investigations performed it is necessary to generalize the methods developed for the case of unrenormalizable interactions of massless particles to the general case of unrenormalizable interaction of particles with arbitrary rest mass. This paper is just devoted to this problem.

A two-point Green function which depends exponentially in the x-space on the propagator of a free scalar particle with rest mass m is investigated. Such functions are often found in theories describing local unrenormalizable interactions [1–8]. The calculations were carried