

Second Quantization of Classical Nonlinear Relativistic Field Theory*

Part II. Construction of Relativistic Interacting Local Quantum Field**

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Abstract. The construction of a relativistic interacting local quantum field is given in two steps: first the classical nonlinear relativistic field theory is written down in terms of Poisson brackets, with initial conditions as canonical variables: next a representation of Poisson bracket Lie algebra by means of linear operators in the topological vector space is given and an explicit form of a local interacting relativistic quantum field $\hat{\Phi}$ is obtained. The construction of asymptotic local relativistic fields $\hat{\Phi}_{in}$ and $\hat{\Phi}_{out}$ associated with $\hat{\Phi}$ is also given.

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I. Introduction

The construction of an interacting local quantum scalar field is given in two steps. First in the previous paper [1] (hereafter denoted as I) we have shown that the classical nonlinear relativistic field theory written down in terms of Poisson brackets, with initial conditions as canonical variables is a local field theory with local asymptotic fields: in particular we have

$$\{\Phi(x), \Phi(y)\} = 0 \quad \text{if } (x - y)^2 < 0 \tag{1.1}$$

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** In this work we consider the prequantized level of the theory only. However for the sake of simplicity we use adjective quantum instead of prequantum.