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The Massless Thirring Model: Positivity of Klaiber's *n*-Point Functions

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Abstract. We present a simple solution to the problem of proving positivity of Klaiber's *n*-point functions for the massless Thirring model. The corresponding fields are obtained as strong limits of explicitly given approximate fields, obviating reconstruction. By invoking recent results on the boson-fermion correspondence it is shown how the model can be formulated on the charged fermion Fock space. It is pointed out that the question of cyclicity of the vacuum is open, and that an affirmative answer is necessary to confirm the superselection sector picture of the model.

1. Introduction

The first question we have to answer is: why another paper on the massless Thirring model? In order to do this, we should begin by pointing out that there are two versions of the massless Thirring model.

First, there is the model introduced and partially solved by Thirring [1]. His results were extended by Glaser [2], who found an explicit expression for the quantum fields of the model. However, this version of the model (also studied by Berezin [3]) fell into disrepute after certain inconsistencies were encountered. These were ascribed to formal manipulations but, as we see it, the real cause of the difficulty was only found recently by one of us: the fields of this "Thirring–Glaser model" do not define operator-valued distributions [4], so that arguments based on non-existent *n*-point functions are non-existent too. Nevertheless, this version does describe a consistent positive energy relativistic quantum mechanics, with asymptotically complete in- and out-fields in the sense of LSZ scattering theory [5, 6].

In this paper it is the second version, initiated by Johnson [7] and culminating in the well-known Boulder lectures of Klaiber [8], which is at issue. In contrast to the "Thirring–Glaser" model, which is a particle theory, but not a field theory, and which depends on the coupling constant only, the "Thirring–Klaiber model"

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