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The Phase Structure of the Two-Dimensional $N = 2$ Wess–Zumino Model*

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Abstract. We construct a convergent cluster expansion for the two-dimensional $N = 2$ Wess–Zumino model, in a region of parameter space where there are multiple phases. As a result of this expansion, we are able to construct the infinite volume field theory and demonstrate exponential decay of correlations. We are also able to investigate the different phases of the model, develop the phase diagram, and show that the free energy of each phase vanishes.

1. Introduction

In the series of papers [10–13] a series of two-dimensional quantum field models were constructed, in finite space-time volume, and some of their properties studied. One of the main results of [10–13] was the existence in these theories, in addition to the usual symmetries of quantum field theory, of an additional symmetry – the supersymmetry. The existence of supersymmetry has important consequences for the behavior of these quantum field models.

The purpose of the present work is of investigate the properties of some of these quantum field models in an infinite space-time volume, and to ascertain to the extent possible the persistence of some of the consequences of supersymmetry in this limit. The main technical tool used in this investigation is the Glimm–Jaffe–Spencer [5, 6] cluster expansion, which allows control of correlation functions in the infinite volume limit. This expansion is applied to our model using methods

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