

Stationary Solutions of the Bogoliubov Hierarchy Equations in Classical Statistical Mechanics, 1

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Abstract. This paper is the first part of the work whose subject is to investigate the set of stationary solutions of B - B - G - K - Y hierarchy. We state that under some conditions on the interaction any stationary solution obeying certain restrictions of a general type corresponds to an equilibrium state (in the sense of Dobrushin-Lanford-Ruelle).

0. Introduction

The first mathematically rigorous works related to the theory of non-equilibrium phenomena appeared in Statistical Mechanics at the end of the sixties and the beginning of the seventies. Lanford was the first who has obtained interesting general results in this direction for the case of one-dimensional classical systems [1–2]. The main result of Lanford consists in the construction a natural dynamical system which describes the motion of an infinite number of interacting particles. The next important step was made by Sinai [3–4]. In particular, Sinai has given the rigorous proof of the cluster character of the dynamics for a system of particles in a gas phase. The results of Lanford and Sinai were generalized in the one dimensional case by Zemliakov [5] and Presutti, Pulvirenti and Tirozzi [6]. Combining the methods of Lanford and Sinai, Marchioro, Pellegrinotti and Presutti [7] constructed the dynamics in the multidimensional case for an infinite system in any possible thermodynamic phase.

In connection with the construction of dynamical systems of Statistical Mechanics the problem of studying their ergodic properties arises. For several particular cases this problem was solved in the papers [8–14]. Another problem which is closely connected with the preceding one is that of describing the set of measures, invariant with respect to the constructed dynamics of an infinite system of particles. The last problem was considered in the one-dimensional case in [15] where it was demonstrated that in a natural class of probability measures, defined on the phase space, only the equilibrium states may be invariant with respect to the dynamics constructed in [3].