



THE STOCHASTIC LIMIT OF THE OPEN BCS MODEL OF SUPERCONDUCTIVITY

FABIO BAGARELLO

Communicated by Syed Twareque Ali

Abstract. We review some recent results concerning the open BCS model of superconductivity as originally proposed by Buffet and Martin. We also briefly analyze some possible generalizations.

1. Introduction

In a recent paper, [2], we have analyzed the open BCS model as first proposed in [6, 7] using the techniques of the **stochastic limit** (SL), [1]. Among the other results, we have shown that the same values of the critical temperature and of the order parameters can be found using the SL, in a significantly simpler way. This procedure suggested us to use this approach in order to generalize the original model in the attempt to obtain some control on the critical temperature T_c . This has been done in [3], where we have discussed the role of a second reservoir in the definition of the model and its consequences on the value of T_c .

In this paper we review the results of these two papers: in particular, we devote the next section to summarize our results concerning the original model, [2], while in Section 3 we introduce different models with more reservoirs, [3].

2. The Model

The model discussed in [2] consists of the *system*, which is described by means of spin variables, and the *reservoir*, which is given in terms of bosonic operators. It is contained in a box of volume $V = L^3$, with N lattice sites. We define, following [6, 7],

$$H_N^{(\text{sys})} = \tilde{\epsilon} \sum_{j=1}^N \sigma_j^0 - \frac{g}{N} \sum_{i,j=1}^N \sigma_i^+ \sigma_j^-. \quad (1)$$