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Essler, Korepin, and Schoutens reply

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Link to publication

Essler, Korepin, and Schoutens Reply: We agree with the Comment [1] by Angelucci and Sorella (AS) that Sutherland's statement (SS) on the equality of the ground-state energies of the $B^x F^y$ and $B^{x-1} F^y$ models has not rigorously been established in [2]. It also appears that counterexamples to the statement can be found. [As far as the statement by AS that SS is violated in the two boson sector of the BBF model on lattices with $L > 2$ is concerned, we would like to remark that SS is valid (i.e., $E_{B^2 F} = E_{BF}$) for finite rings with appropriate (local) boundary conditions and also for the infinite chain. We would like to stress that the analysis in [2] is carried out in the thermodynamic limit.]

The fact that our phase diagram for the model in $d = 1$ is rigorously valid was already clear from our Bethe ansatz solution [4,5], which relied in no way on SS. As for dimensions $d \geq 2$, the presence of a superconducting phase for $U < 0$ was rigorously established in our paper (and by different methods again in [6]) and has never been questioned. In fact, the only region of the phase diagram that is possibly affected by the criticism of AS is region II (which is the region with zero chemical potential and values of U between 0 and U_c). All other aspects of the phase diagram are correct and were proved rigorously in [3] for any number of dimensions.

For region II the analysis of [3] still proves that local electron pairs are present in the ground state. Only the precise form of the wave function was inferred by using SS. The analysis of AS clearly suggests that, if for $d \geq 2$ any changes of the phase diagram need to be made, these will happen at values of U close to U_c, where the density of local electron pairs that carry the supercurrent becomes low. Such changes would not affect the presence of a superconducting condensate at values $U > 0$ that are well below U_c.

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