Reply to the comment by A. A. Zvyagin and H. Johannesson on our paper "Quantum coherence in an exactly solvable one-dimensional model with defects"

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The comment [1] by Zvyagin and Johannesson (ZJ) discusses some of the issues raised in our recent letter [2] in which we construct an exactly solvable one-dimensional quantum model, which corresponds to a Heisenberg-XXZ model or spinless fermions on a ring, with defects. In particular, we presented results for the finite-size corrections to the ground-state energy as well as for its flux sensitivity, as a function of a parameter ν which characterizes the strength of the defects.

Indeed, in a *very* wide sense, our model is similar to other models studied earlier (see ref. [2] in ZJ). It must be emphasized, however, that our model is different by construction: We consider the $\mathcal{L}$-matrices of the Heisenberg-XXZ model to be dependent on a local (random) parameter ν_n, while earlier studies (see ref. [2] in ZJ) introduce spin-S defects into the Heisenberg chain using the $\mathcal{L}$-matrix of the Kondo problem. Thus, in particular, our defects can be tuned by a *continuous* parameter, in contrast to the *discrete* parameter S of the spin-S defects. In view of this marked difference, we cannot see how earlier results (see ref. [2], [4], [5] in ZJ) can be mapped on ours. Again, in a *very* wide sense only, are the Bethe ansatz equations of the models similar, and the independence of the spectrum from the defect distributions follows. Note also that for $S = 1/2$, the model mentioned by ZJ (see ref. [2], [4] in ZJ) becomes *defect-free*.

In addition, ZJ point out that the conformal dimensions of the model are not changed by adding (this type of) defect, which in our opinion is an important remark (also very recently made in [3]); we were not aware that this property persists for a finite defect concentration x. (Certainly this is not obvious when studying the Hamiltonian [4]). Thus the non-linear dependence of the finite-size corrections on x can be interpreted as a rescaling of the "Fermi velocity".

Two final remarks. i) For half-filling and with increasing ν, we find the phase sensitivity, *i.e.* the persistent current, to be *suppressed* (ref. [2], fig. 4), while the results for low filling can be reasonably well explained neglecting the interaction, as discussed by us. ii) An important feature of our defects is the absence of backscattering, as discussed in detail in [3] (see also [4]).

REFERENCES

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[3] PUNNOOSE A., ECKLE H.-P. and RÖMER R. A., preprint, December 1995 (condmat/9512139).

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