

## Quantum Physics

# Reply to Comment on "Regional Versus Global Entanglement in Resonating-Valence-Bond States"

Dagomir Kaszlikowski, Aditi Sen De, Ujjwal Sen, Vlatko Vedral

(Submitted on 31 Dec 2008)

In Phys. Rev. Lett. 99, 170502 (2007) ([arXiv:quant-ph/0703227](https://arxiv.org/abs/quant-ph/0703227)), we prove that resonating-valence-bond (RVB) states on arbitrary lattices possess genuine multiparty entanglement, and provide bounds on two-particle entanglement (and correlators). We also conjecture on the entanglement in large and small portions of the whole lattice. The proof, bound, and conjecture are not considered in the Comment in Phys. Rev. Lett. 101, 248901 (2008) ([arXiv:0812.1932v1](https://arxiv.org/abs/0812.1932v1) [quant-ph]).

Next we take two examples: "RVB gas" and "RVB liquid". RVB liquid for arbitrary lattice size is not considered in the Comment. Two-party entanglement of RVB gas for relatively large lattice size is derived by an independent method in the Comment, and it agrees with our result. Multi-party entanglement of RVB gas is not considered in the Comment.

Lastly, we consider an RVB liquid on a 4x4 square lattice and there was an error in the calculation of two-party entanglement in the second decimal place, as noted in the Comment. Note that this calculation was nowhere used in our Letter to derive other results. Moreover, the conclusion of "no two-particle entanglement" is still true for the RVB liquid on a 4x4 square lattice.

Comments: 1 page, RevTeX4; answers Phys. Rev. Lett. 101, 248901 (2008) as well as [arXiv:0812.1932v1](https://arxiv.org/abs/0812.1932v1) [quant-ph]

Subjects: **Quantum Physics (quant-ph)**; Strongly Correlated Electrons (cond-mat.str-el)

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