Erratum: Ground-state factorization and quantum phase transition in dimerized spin chains [Phys. Rev. B 79, 060405 (2009)]

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There are some formulas that are incorrect.

In the calculation of the factorizing field for the nearest-neighbor Hamiltonian (1), I wrote (page 2, first column) $h_F=[(J_1+J_2)/2]\sqrt{1-\gamma^2}$. Actually, the correct version is $h_F=[(J_1+J_2)/2]\sqrt{1-\kappa^2}$ (the parameter γ does not exist).

The conditions for the existence of the factorized ground state in the presence of long-range interaction are not correct in the antiferromagnetic scenario. When $(J^x_{1,i}+J^y_{1,i})>0$, the scaling conditions as a function of the interaction distance are $J^{x,y}_{r,i}=(-1)^r\gamma_r J^{x,y}_{1,i}$ and $J^z_{r,i}=\gamma_r J^z_{1,i}$. As a consequence, the factorized point amounts to $h_F=(1+\kappa)\sqrt{(\mathcal{J}^z_1-\mathcal{J}^x_1)(\mathcal{J}^z_1-\mathcal{J}^y_1)}$, with $\mathcal{J}^z_1=\Sigma_r J^z_{r,1}$ and $\mathcal{J}^{x,y}_1=\Sigma_r(-1)^r J^{x,y}_{r,1}$.

In the hybrid case, the scaling conditions are correct, while the value of the factorizing field is, as in the other cases, $h_F=(1+\kappa)\sqrt{(\mathcal{J}^z_1-\mathcal{J}^x_1)(\mathcal{J}^z_1-\mathcal{J}^y_1)}$ (the difference is in the definition of $\mathcal{J}^\alpha_1$).

In a recent work,[1] Giampaolo and coworkers claimed that it would not be possible to formulate a general theory of ground state factorization without defining a very specific measure (the so-called extremal single-qubit unitary operation), on the basis of an example showing the wrongness of my results. Their counterexample being based on the incorrect formulas I amended here, all the conclusions of the paper are valid.

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[1] S. M. Giampaolo, G. Adesso, and F. Illuminati, Phys. Rev. B **79**, 224434 (2009).

