Response to "Comment on 'Equivalence of two approaches for quantum-classical hybrid systems' " [J. Chem. Phys. 131, 127101 (2009)]

Fei Zhan,[1] Yuan Lin,[2] and Biao Wu[3]

[1]*Institut für Physik, Universität Augsburg Universitätsstr, 1 D-86135 Augsburg, Germany*
[2]*Department of Physics, Duke University, Durham, North Carolina 27701, USA*
[3]*Institute of Physics, Chinese Academy of Science, Beijing 100190, China*

The comment by Gerasimenko[1] on our paper[2] is completely off the mark. In most of the comment, Gerasimenko was describing an approach that he and his co-worker had developed for a quantum-classcial hybrid system.[3–6] He then went on to say that the mean-field theory and the quasiclassical approach that we studied in Ref. 2 are not fundamental. However, what we have done in Ref. 2 is just to prove that the mean-field theory and the quasiclassical approach, which have already been introduced in literature,[7–13] are equivalent. We have never intended to show whether these two approaches are "fundamental".

In our paper, there is a statement, "we prove that the mean-field theory and the quasiclassical bracket approach are equivalent." This statement when viewed without any context is not very accurate due to the diversity of the quasiclassical brackets which have been discussed in literature. However, in the process of our proof, there is no ambiguity as what we meant by the mean-field theory and what we meant by the quasiclassical bracket approach. In other words, this statement has to be read in context.

In summary, the comment by Gerasimenko[1] is not very relevant to our paper.[2]

[1] V. I. Garasimenko, J. Chem. Phys. **131**, 127101 (2009).
[2] F. Zhan, Y. Lin, and B. Wu, J. Chem. Phys. **128**, 204104 (2008).
[3] V. I. Garasimenko and D. Ya. Petrina, Theor. Math. Phys. **42**, 88 (1980).
[4] V. I. Garasimenko, Kiev: Inst. Theor. Phys. Rep. No. 80-92P, 1980.
[5] V. I. Garasimenko, Reports of Acad. Sci. Ukrainian SSR. **10**, 65 (1981).
[6] V. I. Garasimenko, Theor. Math. Phys. **50**, 77 (1982).
[7] R. Kapral, Annu. Rev. Phys. Chem. **57**, 123 (2006).
[8] G. Ciccotti, D. Coker, and R. Kapral, in *Quantum Dynamics of Complex Molecular Systems*, edited by D. A. Micha and I. Burghardt (Springer, New York, 2007), p. 275.
[9] O. V. Prezhdo and P. J. Rossky, J. Chem. Phys. **107**, 825 (1997).
[10] Q. Zhang and B. Wu, Phys. Rev. Lett. **97**, 190401 (2006).
[11] I. V. Aleksañdrov, Z. Naturforsch., A: Phys. Sci. **36**, 902 (1981).
[12] O. V. Prezhdo and C. Brooksby, Phys. Rev. Lett. **86**, 3215 (2001).
[13] J. J. Halliwell, Phys. Rev. D **57**, 2337 (1998).