Rosenkranz, Osborn, and Van Wezel Reply

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Rosenkranz, Osborn, and Van Wezel Reply: We offer a reply to the preceding Comment [1] on our earlier work [2] concerning the chiral phase transition in charge ordered $1T$-$TiSe_2$. We argue the interpretation in the Comment to be inconsistent both with the data presented in the original work and with more recent direct observations of broken inversion symmetry in $1T$-$TiSe_2$. The Comment offers an alternative interpretation that addresses part of the x-ray data in our original work, but it is incompatible both with the behavior of other physical observables that we presented [2] and with recent direct observations of the broken inversion symmetry in $1T$-$TiSe_2$ [3].

The fact that isolated experimental observations are generically open to interpretation is not in and of itself an indication that any particular interpretation is flawed. Multiple ways of interpreting the one figure reproduced in this Comment may exist. However, the reproduced figure contains only part of the data presented in Ref. [2]. The alternative interpretation the authors of the Comment give for the one isolated figure is in fact inconsistent with the rest of the data presented in the original article [2]. That is, assuming their alternative interpretation that there is only a single transition in $1T$-$TiSe_2$, it is not possible to explain the two kinks in the specific heat or the two anomalies in the resistance, both measured on the same sample as used for the x-ray experiment, and both occurring at the same second transition temperature 7 K below the main transition temperature.

Our original interpretation [2] was based on three sets of different physical properties (x-ray data, specific heat, electrical resistance), providing a consistent explanation for that entire set of observations. In contrast, the alternative interpretation presented in the Comment [1] does not give a consistent explanation of the entire dataset.

Finally, we would like to point out that direct evidence for the breakdown of inversion symmetry in $1T$-$TiSe_2$, consistent with the presence of a chiral charge density wave, was recently reported on the basis of circularly polarized photogalvanic effect measurements [3].

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