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Reply to comment on "Noise in the helical edge channel anisotropically coupled to a local spin" (Pis'ma v ZhETF 108, 700 (2018))

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The authors of comment [1] claim that our recent results [2] on the noise in the helical edge channel of a 2D topological insulator coupled to a spin-1/2 impurity are incorrect. Their argument is that the expression for the average backscattering current that follows from our Eq. (7) differs from Eq. (22) of their own paper [3]. They state that it is illegal to assume that the density matrix of the impurity spin is diagonal in the basis of S_z, which is the cornerstone of our calculations and the calculations of a previous paper [4].

The authors of the comment reason that the dephasing of the impurity spin arises not only from the term $J_z S_z s_z$ in the Hamiltonian, but also from the term $2J_a S_x s_z$. However this depends on the relative magnitude of the parameters J_z and J_a. In our paper we clearly state that the dephasing of the impurity spin is due to the term $J_z S_z s_z$, and this implies that J_z is large. This does not mean that the exchange matrix is diagonal as stated in [1], but only means that J_{33} in Eq. (1) of the comment is much larger than all the other elements of the matrix. Note that this parameter does not enter into any of the transition rates $\Gamma_0^{\pm}$, Γ_a, Γ_1, or Γ_2 and its large value does not impose any restrictions on the relations between these quantities.

The authors of the comment admit that in this approximation, their Eq. (5) crosses over to Eq. (7) of our paper [2] written for $J_2 = J_a = 0$. In addition, it is clearly seen that the voltage-proportional current in the limit of $J_2 = J_1 = 0$ and $eV \gg T$, Eq. (3) of the comment, vanishes in this case. Hence there is no contradiction between papers [2] and [3].

To summarize, our results are correct within the limits of applicability of our model, and their critique by the authors of the comment is irrelevant.

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3. P. D. Kurilovich, V. D. Kurilovich, I. S. Burmistrov, and M. Goldstein, Pis'ma v ZhETF **106**, 575 (2017) [JETP Lett. **106**, 593 (2017)].
4. L. Kimme, B. Rosenow, and A. Brataas, Phys. Rev. B **93**, 081301 (2016).

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