Erratum: Theory of Raman response in three-dimensional Kitaev spin liquids: Application to β - and γ -Li₂IrO₃ compounds [Phys. Rev. B **92**, 094439 (2015)]

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In our continuing investigation of the Raman response in various Kitaev spin liquids, we realized that some results presented by us in this paper hold only on the level of model calculations. The Raman response of the Kitaev model on the 3D harmonic honeycomb lattices $\mathcal{H}$ -0 and $\mathcal{H}$ -1 will be partly modified when applied to real materials, i.e., β - and γ -Li₂IrO₃.

Namely, the derivation of our central result Eq. (16) was based on the assumption that the photon couples to the direct electronic hoppings between magnetic sites. However, in order to compute the Raman response in real materials, one needs to consider the microscopic origin of the superexchange coupling between magnetic ions. In β - and γ -Li₂IrO₃ compounds, the Kitaev interaction is generated by fourth-order processes which include intermediate oxygen ions. These processes happen via a 90-degree pattern as shown in Fig. 1. Thus, the computation of the Raman vertex describing the coupling of light to electron hopping requires summing over all possible ways in which the incoming photon couples to one “leg” and the outgoing photon to another “leg” of the processes, each multiplied by the corresponding polarization-dependent factor.

Incorporating the additional oxygen-mediated processes in the Raman vertex gives qualitatively very similar results, but alters the polarization dependence on the 3D harmonic honeycomb lattices. Most notably, the ab channel, which was argued to be gapped even in the gapless spin liquid phase, vanishes for β - and γ -Li₂IrO₃. Note, the polarization dependence for the honeycomb lattice is unaffected within the honeycomb plane.

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FIG. 1. An example path with the photon involved in the first and last legs.