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Corrigendum

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The discussion on page 9 including figures 3 and 4 needs to be corrected. The last paragraph ('In the present system...') of section 2.2.2 should be replaced by the following.

'When the system becomes gapless, a monopole (charge $q = 1$) and an antimonopole ($q = -1$) are created in pairs. Because of the T-symmetry, the distribution of monopole charges is symmetric with respect to $\mathbf{k} = \mathbf{G}/2$. Hence for the simplest case, two monopole-antimonopole pairs are created at $\mathbf{k} = \pm \mathbf{k}_0 + \mathbf{G}/2$ ($\mathbf{k}_0 \neq 0$) simultaneously when $m = m_1$, and the system becomes gapless. When m is increased further, the monopoles and antimonopoles move in the \mathbf{k} space, while the distribution of the monopole charges remains symmetric with respect to $\mathbf{G}/2$. This system can open a gap again only when all the monopoles and antimonopoles annihilate in pairs. This occurs at $m = m_2$ as shown in figure 6. Thus the overall feature of the phase transition is schematically expressed as in figure 7.'

Correspondingly, figures 3 and 4 should be replaced by figure 6 and figure 7 respectively. These corrections do not affect the main conclusions of the article.

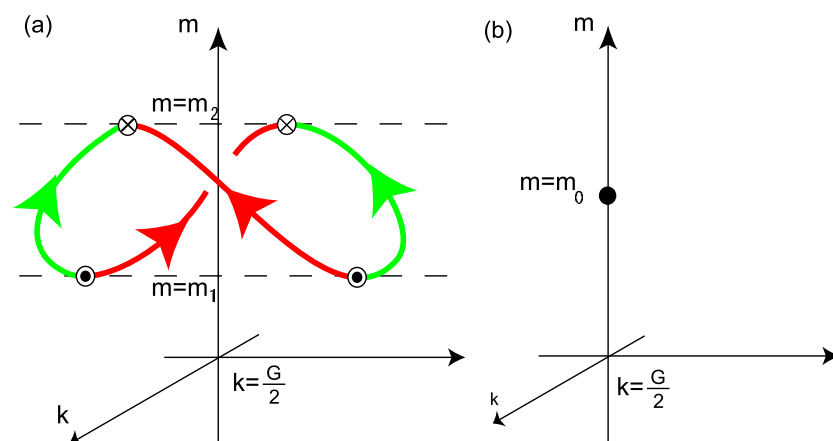


Figure 6. Location of the the gapless points by changing the external parameter m in (a) I-asymmetric systems and (b) I-symmetric systems. In (a) the green and the red denotes trajectories of the monopole and antimonopole, respectively.

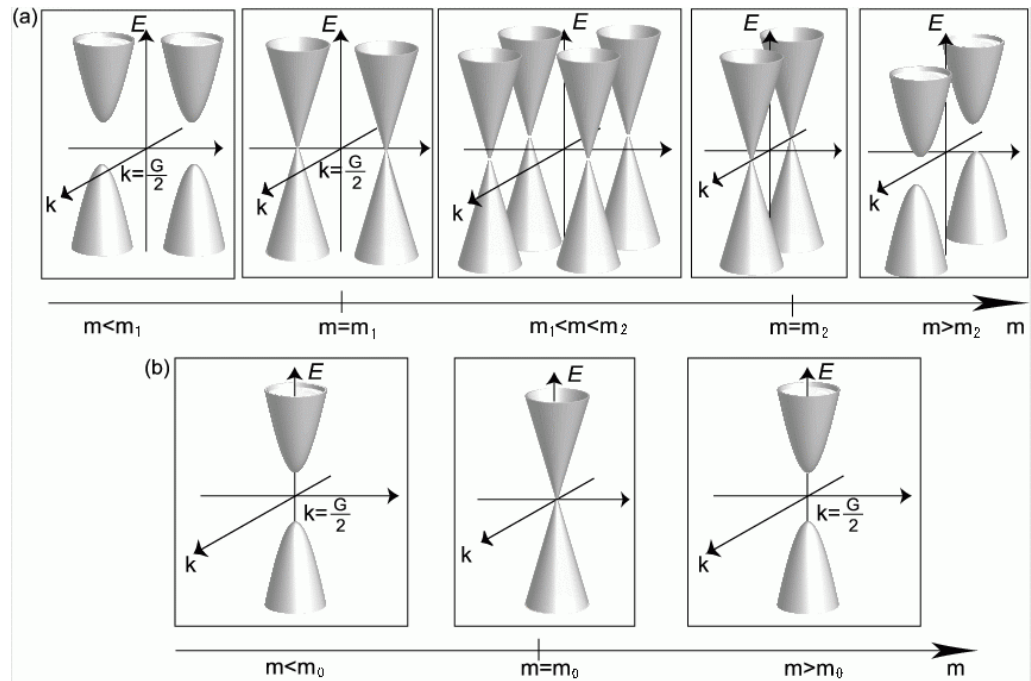


Figure 7. Phase transition in 3D between the quantum spin Hall (QSH) and insulating phases for (a) I-asymmetric and (b) I-symmetric cases. In the case (b) all the states are doubly degenerate.