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Blow-up of magnetized T^2/Z_N and index theorem

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The number of zero modes of magnetized T^2/Z_N orbifold have been obtained in previous paper. However, due to the existence of singularities in the orbifold, the Atiyah-Singer index theorem cannot be applied, and hence the physical/geometrical meaning of the zero mode number has not been clear. To apply the Atiyah-Singer to the model, we replace the T^2/Z_N orbifold by a smooth manifold without singularities, by cutting out the singularities of the magnetized T^2/Z_N orbifold and attaching smooth manifolds (part of S^2) to them. The Atiyah-Singer index theorem can be then applied directly to the smooth manifold to reveal the geometric interpretation of the number of zero modes.

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