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Fate of Topology in Spin-1 Spinor Bose-Einstein Condensate[1]
YUN-TAK OH, PANJIN KIM, JIN-HONG PARK, JUNG HOON HAN, Sungkyunkwan University — One of the excitements generated by the cold atom systems is the possibility to realize varied topological phases stemming from multi-component nature of the condensate. Popular examples are the antiferromagnetic (AFM) and the ferromagnetic (FM) phases in the three-component atomic condensate with effective spin-1. It follows, from consideration of homotopy, that different sorts of topological defects will be stable in each manifold. Countering such common perceptions, here we show on the basis of a new wave function decomposition scheme that there is no physical parameter regime wherein the temporal dynamics of spin-1 condensate can be described solely within AFM or FM manifold. Initial state of definite topological number prepared entirely within one particular phase must immediately evolve into a mixed state. Accordingly, the very notion of topology and topological stability within the sub-manifold of AFM or FM become invalid. Numerical simulations of the Gross-Pitaevskii equation confirms our claim.

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