Formation of skyrmion lattice in a rapidly-quenched and fast-rotating ferromagnetic spinor Bose-Einstein condensate

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We predict the formation of skyrmion lattice in a rapidly rotating ferromagnetic spinor Bose-Einestein condensate. The dynamics of an $F = 1$ spinor Bose-Einstein condensate of ^{87}Na during the rotating evaporative cooling is investigated by numerically solving the stochastic projected Gross-Pitaevskii equation. We show that, when the rotating cloud reaches equilibrium at very low temperatures, very three vortices in each condensate component would closely bind up and form a triplet. These vortex triplets arrange themselves into some repeated spatial structures but do no form vortex lattices. On the other hand, the local spin textures of the rotating spinor BEC do form lattice strucutre. Our numerical results suggest that when the system reaches thermal equilibrium, a triangular lattice of skyrmions with unit topolocal charge can be generated in the condensate. The dynamical stability of this lattice structure is examined.