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Baryonic Vortex and Magnetic Field Generation

We propose a vortex carrying baryon number in low energy dense QCD with finite baryon and isospin chemical potentials. The isospin chemical potential is responsible for the charged pion condensate, among which Abrikosov vortex could arise with quantized magnetic flux. Our discovery is that when the winding of neutral pion is added, such a vortex carries a baryon number conserved by the homotopy of Skyrmion. Then the energy is reduced by a finite baryon chemical potential through the gauged Wess-Zumino-Witten term. As a result, we reveal that at high baryon density, a baryonic vortex state features energy lower than the homogeneous pion condensates. Such a vortex bears a self-generated magnetic field indicating applicable scenarios among Magnetar cores.

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