Contribution ID: **60** Type: **Oral presentation**

Baryonic Vortex and Magnetic Field Generation

Thursday 18 July 2024 11:30 (25 minutes)

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 a baryonic vortex state above critical baryon density featuring energy lower than homogeneous pion condensates. Our vortex bears a self-generated magnetic field, which indicates applicable scenarios for Magnetar cores.

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