19th International Conference on
QCD in Extreme Conditions (XQCD 2023)

Contribution ID: **76** Type: **Talk**

Magnetic enhancement of baryon confinement modeled via a deformed Skyrmion

Thursday, 27 July 2023 10:30 (25 minutes)

The gigantic magnetic field, B, is expected in the heavy-ion collision and in the neutron star cores. The phase structure under B has been well investigated, but the hadron properties are not fully understood. Recently, the lattice QCD found that even neutral meson masses are significantly affected by the B effects. Then, what about baryons?

In this talk, I would like to emphasize that the B-modified baryon properties are far more nontrivial than naively thought. In particular, I propose a new approach to think about the baryon confinement based on our paper, e-Print:2303.04692 [hep-th].

– *Confinement from the Pressure Balance* –

The pressure distribution inside the proton is measurable by the deeply virtual Compton scattering, and the confinement means that the inner positive pressure is balanced by the outer confining negative pressure, i.e.,
$\int d^3x\, p(x) = 0,$
which can be confirmed in concrete calculations, e.g., in the Skyrme model. This pressure balance is guaranteed by the virial theorem.

– *Magnetic Enhancement of Confinement* –

The above sum rule is changed by B, in an intriguing way as
$\int d^3x\, p(x) = -\frac{2}{3}$
$boldsymbol{\mu} \cdot$
$boldsymbol{B},$
where μ is the magnetic moment. Using the deformed Skyrmion under B, we found that
$boldsymbol{\mu} \cdot$
$boldsymbol{B} < 0$, which means that confinement is assisted by an extra pressure from the magnetic field!

In this talk, I will report this novel view of confinement as well as exciting results for the quantization (protons and neutrons), the mass changes, and the magnetic moments as functions of B.

Primary authors: Prof. FUKUSHIMA, Kenji (The University of Tokyo); CHEN, Shi (The University of Tokyo); QIU, Zebin (The University of Tokyo)

Presenter: Prof. FUKUSHIMA, Kenji (The University of Tokyo)

Session Classification: Plenary session