Contribution ID: **10** Type: **not specified**

Mass Degeneration of Chiral Partner at J-PARC E16

Wednesday, April 2, 2025 2:30 PM (25 minutes)

The spectral functions of chiral partners should become degenerate when the QCD chiral symmetry is restored. The axial-vector spectra are experimentally more challenging to construct than those of vector mesons that directly couple to virtual photons and then to dileptons.
Chiral mixing of the vector with axial-vector mesons is thus a key phenomenon to probe in-medium modifications of vector spectrum due to the onset of chiral symmetry restoration carried by the axial-vector counterpart. The mixing effect is expected to be stronger at higher density due to a mechanism driven by chiral anomalies, in striking contrast to the vanishing mixing at chiral crossover driven by thermal pions. This feature encourages us to perform the experimental search in the high-density regime, where the recent experimental trend has begun to shift toward.

We propose that experiments at medium energies with paying attention to the new mixing mechanism, may provide a direct evidence of the chiral symmetry restoration. In this presentation, we focus on the density-induced mixing and the spectral functions of ϕ and its chiral partner $f_1(1420)$. We present the invariant mass distribution of dileptons using a transport approach under the conditions of the J-PARC E16 experiment as a prime example.

We find that the $f_1(1420)$ meson is visible with about 2 σ credibility in dilepton production in a range of mixing strength in our study when the expected statistics at E16 Run-2 are utilized. We advocate that the E16 experiment at J-PARC has discovery potential for the mass degeneracy of chiral partners at finite density as a signature of chiral symmetry restoration.

Presenter: EJIMA, Ren (Hiroshima University)

Session Classification: Parallel Session (A)