
MAGIC

Science of the Cosmos

Contribution ID: 108

Type: not specified

A Natural Explanation for the Speed of Sound Peak in Isospin QCD via the Medium Separation Scheme

We investigate the zero-temperature equation of state at finite isospin density using the Nambu–Jona-Lasinio (NJL) model implemented within the Medium Separation Scheme (MSS), which cleanly separates medium effects from ultraviolet-divergent vacuum terms. Recent lattice QCD results reveal a nonmonotonic behavior of the speed of sound c_s^2 as a function of the isospin chemical potential μ_I , with a clear violation of the conformal bound $c_s^2 = 1/3$. This unexpected feature, not predicted by conventional approaches—including standard NJL calculations—has drawn significant theoretical attention. We show that the NJL model, when consistently regularized via MSS, quantitatively reproduces state-of-the-art lattice data for isospin QCD, providing a natural explanation for the observed peak in c_s^2 and resolving artifacts typically associated with cutoff sensitivity in non renormalizable models.

Author: LUCIANO SONEGO FARIAS, RICARDO (Departamento de Física, Universidade Federal de Santa Maria)

Co-authors: LOPES, Bruno S. (Departamento de Física, Universidade Federal de Santa Maria); DUARTE, Dyana C. (Departamento de Física, Universidade Federal de Santa Maria); RAMOS, Rudnei O. (Departamento de Física Teórica, Universidade do Estado do Rio de Janeiro)

Presenter: LUCIANO SONEGO FARIAS, RICARDO (Departamento de Física, Universidade Federal de Santa Maria)