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The ϕ meson in dense matter from a theoretical perspective

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Content

There is presently no consensus on how the ϕ meson mass and width will change once it is put in a dense environment such as nuclear matter. In this presentation, the status of recent theoretical research related to the properties of the ϕ meson in nuclear matter is reviewed, focusing on observables that were or will be measured at the KEK E325 [1] and J-PARC E16 [2] and E88 [3] experiments, including dilepton and K^+K^- decay modes and their angular distributions. The relation of these observables to fundamental properties of nuclear matter, such as chiral symmetry, its partial restauration in nuclear matter, in-medium Lorentz and charge symmetry violation and the resultant modification of hadronic dispersion relations, will be discussed. Recent results [4] of an ongoing collaboration with the goal of simulating the pA reactions probed in the abovementioned experiments to produce ϕ mesons in nuclei, making use of modern transport theory, will also be presented.

Reference

[1] R. Muto, et al. (KEK-E325 Collaboration), Phys. Rev. Lett. 98, 042501 (2007).
[2] K. Aoki, et al., J. Subatomic Part. Cosmol. 3, 100019 (2025).
[3] H. Sako, et al., J. Subatomic Part. Cosmol. 1-2, 100012 (2025).
[4] P. Gubler, M. Ichikawa, T. Song and E. Bratkovskaya, Phys. Rev. C 111, 034908 (2025).

Field of Research: Strange mesons in nuclei
Experiment / Theory: Theory
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