Measuring the strangeness content of the nucleon by observing the ϕ meson mass shift in nuclear matter

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The behavior of the φ meson at finite density is studied, making use of a QCD sum rule approach in combination with the maximum entropy method [1]. It is demonstrated that a possible mass shift of the φ in nuclear matter is strongly correlated to the strangeness content of the nucleon, which is proportional to the strange sigma term, σ_{sN} [2]. Our results furthermore show that, depending on the value of σ_{sN}, the φ meson could receive both a positive or negative mass shift at nuclear matter density. We find that these results depend only weakly on potential modifications of the width of the φ meson peak and on assumptions made on the behavior of four-quark condensates at finite density.

This result is relevant for the E16 experiment to be performed at the J-PARC facility, where the behavior of the φ meson will be measured and which will hopefully provide precise information on the modification of the φ meson spectrum at finite density [3].

References

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