Contribution ID : **620** Type : **not specified**

Study of heavy quark-antiquark in-medium potentials

Wednesday, 23 November 2022 17:50 (20)

One of the greatest challenges in physics is to study quantum field theories (QFT) outside the perturbative regime. In particular, to better understand quantum chromodynamics (QCD), the theory that describes the strong nuclear force, in the non-perturbative regime, there are numerous tools available, among which the open quantum systems (OQS) formalism stands out. The quintessential case of this formalism of a subsystem interacting with the environment has a one-to-one equivalence in a system of a hadron immersed in a quark-gluon plasma (QGP). OQS requires the use of a potential and the study of how it is modified by the presence of a medium. Here, we present a general method for the derivation of in-medium potentials starting from its vacuum form. Using the generalised Gauss's law, together with the introduction of the concept of permittivity, the general form of a potential in the medium is derived by requiring the vacuum case to be recovered. The whole development will then be applied to a particular case, the particle X(3872), and it will be seen that the results obtained – especially the melting temperature of this state – are consistent with state-of-the-art calculations for similar systems.

Abstract

One of the greatest challenges in physics is to study quantum field theories (QFT) outside the perturbative regime. In particular, to better understand quantum chromodynamics (QCD), the theory that describes the strong nuclear force, in the non-perturbative regime, there are numerous tools available, among which the open quantum systems (OQS) formalism stands out. The quintessential case of this formalism of a subsystem interacting with the environment has a one-to-one equivalence in a system of a hadron immersed in a quark-gluon plasma (QGP). OQS requires the use of a potential and the study of how it is modified by the presence of a medium. Here, we present a general method for the derivation of in-medium potentials starting from its vacuum form. Using the generalised Gauss's law, together with the introduction of the concept of permittivity, the general form of a potential in the medium is derived by requiring the vacuum case to be recovered. The whole development will then be applied to a particular case, the particle X(3872), and it will be seen that the results obtained – especially the melting temperature of this state – are consistent with state-of-the-art calculations for similar systems.

Primary author(s) : LÓPEZ PARDO, Víctor (IGFAE - USC)

Presenter(s) : LÓPEZ PARDO, Víctor (IGFAE - USC)

Session Classification : Física Teórica

Track Classification : Física Teórica