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Temperature dependence of the properties of open heavy-flavor mesons

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Mesons carrying heavy flavor (charm and beauty) are valuable probes of the quark-gluon plasma (QGP) created in heavy-ion collisions. Therefore a proper theoretical understanding of their modification in a thermal medium is required for a better description of the experimental data collected at RHIC and LHC. The modification of open heavy-flavor mesons in a hot medium of light mesons can be investigated theoretically with effective theories. In particular our approach is built upon chiral and heavy-quark spin-flavor symmetries and the use of the imaginary-time formalism to introduce the non-zero temperature effects to the theory [1,2]. The unitarized scattering amplitudes, the ground-state self-energies and the corresponding spectral functions are calculated self-consistently. I will show that the heavy ground states acquire a width induced by the interactions with the light mesons and the in-medium masses drop with increasing temperatures, which also implies the thermal modification of the excited mesonic states generated dynamically in our heavy-light molecular model. The thermal ground-state spectral functions obtained with this methodology can be further used to calculate meson Euclidean correlators, which are the quantities directly accessible in lattice QCD simulations. I will show that the comparison of the Euclidean correlators resulting from the effective theory with recent open-charm lattice correlators is fairly good well below T_c [3].

[1] G. Montaña, A. Ramos, L. Tolos and J. M. Torres-Rincon, Phys. Lett. B 806 (2020), 135464 doi:10.1016/j.physletb.2020.

[2] G. Montaña, A. Ramos, L. Tolos and J. M. Torres-Rincon, Phys.Rev.D 102 (2020) 9, 096020 doi:10.1103/PhysRevD.102.096020

[3] G. Montaña, O. Kaczmarek, L. Tolos and A. Ramos, Eur.Phys.J.A 56 (2020) 11, 294 doi:10.1140/epja/s10050-020-00300-y

Collaboration

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