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Phase diagram of the Nambu–Jona-Lasinio model in the presence of explicit symmetry-breaking interactions

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A recently developed extension of the Nambu–Jona-Lasinio model includes all the explicit chiral symmetry breaking interactions which contribute at the same order in the large $1/N_c$ counting as the $U_A(1)$ 't Hooft flavor determinant [1]. In addition to the usual 4, 6, 8 fermion vertices this generalization includes the relevant interaction terms proportional to the current quark masses. It has shown an unprecedented success in the correct description of the low lying mesonic spectra; in particular an accurate ordering and magnitude of the splitting of states in the low lying pseudoscalar nonet [2] can be achieved.

As has been shown [3] a correct thermodynamical behavior can be achieved with careful and thoroughly consistent implementation of the regularization procedure thus avoiding the pitfalls resulting from the inclusion of arbitrarily high momentum states in unregularized contributions to the thermodynamical potential.

The phase diagram of strongly interacting matter as a function of temperature, chemical potential and magnetic field has been a very active topic of research in recent times, both from the theoretical and experimental sides, with implications ranging from heavy ion collisions to astrophysics.

Here we will present the latest results obtained with this powerful model extension.

References

[1]

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[2]

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[3]

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Summary

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