ID de Contribution: **22** Type: **Non spécifié**

Polyakov-loop potentials for the phenomenological investigation of the QCD phase structure (45+15)

vendredi 10 novembre 2017 11:30 (1 heure)

Polyakov-loop-extended chiral models are useful to get a glimpse on the phase structure of strongly-interacting matter. However, these models rely on simple parameterisations of the Polyakov-loop potential and with present parameter sets different parameterisations give results for pure gauge theory that differ considerably. Of course this introduces even larger uncertainties when the potential is coupled to quarks in Polyakov-loop-extended chiral models. Therefore, it is important to find parameter sets for the different parameterisations such that they agree in their description of latest lattice data on Yang-Mills theory. Furthermore, these parametrised Polyakov-loop potentials miss so far any information on the slope of the potential away from its minimum. But this is the area which determines the expectation value of the Polyakov loop in Polyakov-loop–extended chiral models. Hence, we suggest to include to the existing parameterisations information about the global shape of the Polyakov-loop potential from calculations in nonperturbative, continuum approaches. We show how the existing parametrised Polyakov-loop potentials differ from the calculated ones and which information of the calculated potentials could be included to the parameterisations to increase the predictability of the phase structure of QCD with Polyakov-loop–extended chiral models.

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