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Existence of the critical endpoint in the vector meson extended linear sigma model

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In the framework of an $SU(3)$ (axial)vector meson extended linear sigma model with additional constituent quarks and Polyakov loops, we investigate the effects of (axial)vector mesons on the chiral phase transition. The parameters of the Lagrangian are set at zero temperature and we use a hybrid approach where in the effective potential the constituent quarks are treated at one-loop level and all the mesons at tree-level. We have four order parameters, two scalar condensates and two Polyakov loop variables and their temperature and baryochemical potential dependence are determined from the corresponding field equations. We investigate the thermodynamics of the system, and at zero temperature we compare our results with lattice calculations. We study, furthermore, the changes of the tree-level scalar meson masses in the hot and dense medium.

Primary author: SZÉP, Zsolt (MTA-ELTE Statistical and Biological Physics Research Group)

Co-authors: WOLF, Gyuri (KFKI RMKI); KOVACS, Peter (Wigner RCP)

Presenter: SZÉP, Zsolt (MTA-ELTE Statistical and Biological Physics Research Group)

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