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Volume dependence of the critical endpoint and the baryon number fluctuations

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While in field theoretical calculations, being performed in the thermodynamic limit, the volume is infinite, the heavy-ion collisions always carry the effects of finite system size. It is expected that a sufficiently small volume can affect the thermodynamics and the phase diagram of the strongly interacting matter. These effects can be studied in effective models by taking into account the finite spatial extent of the system via the restriction of the momentum integrals with discretization or simpler using a low momentum cutoff. We investigated the finite-size effects in a vector meson extended Polyakov quark-meson model with both scenarios. It was found that the resulting modification of the phase diagram is highly influenced not just by the chosen momentum space constraint and the boundary condition but more importantly by the treatment of vacuum size. Our results also explain certain differences between previous calculations on finite-volume effects within different effective approaches. Moreover, we also studied the volume dependence of the baryon fluctuations both at vanishing baryochemical potential and in the neighborhood of the critical endpoint.

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