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Heavy-dense QCD at fixed baryon number without a sign problem

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QCD at fixed baryon number can be formulated in terms of transfer matrices explicitly defined in the canonical sectors. In the heavy-dense limit, the fermionic contributions to the canonical partition functions can be calculated analytically in terms of Polyakov loops. It turns out that at low temperatures and infinitely strong coupling the sign problem is exponentially reduced by many orders of magnitude for any baryon number, that is, essentially absent. We show how this can be used for the construction of cluster algorithms which achieve a similar improvement away from the strong coupling limit.

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