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QCD phase diagram for finite imaginary chemical potential with HISQ fermions

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The QCD phase diagram at finite temperature and density has a very rich physical structure which can be explored with first principle lattice QCD calculations. We study the QCD phase diagram of (2+1)-flavor QCD with imaginary chemical potential using HISQ action which has reduced taste breaking effects compared to the unimproved staggered quark action and hence may allow us to get close to the continuum limit earlier. We will present results on the fate of the 2^{nd} order endpoint of the line of 1^{st} order phase transitions in the Roberge-Weiss (RW) plane. We perform calculations on lattices with temporal extend $N_t = 4$ and several spatial lattice sizes. The strange quark mass is tuned to its physical value and the degenerate light quark mass values are reduced towards the chiral limit to find the critical Goldstone pion mass at which this 2^{nd} order endpoint becomes a 1^{st} order triple point. At present we are exploring regions of pion masses $m_\pi \geq 90$ MeV.

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