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Electric conductivity in finite-density SU(2) lattice gauge theory with dynamical fermions

We study the dependence of the electric conductivity on chemical potential in finite-density SU(2) gauge theory with Nf=2 flavours of rooted staggered sea quarks, in combination with Wilson-Dirac and Domain Wall valence quarks. The pion mass is reasonably small with $m\pi/m\rho \approx 0.4$. We concentrate in particular on the vicinity of the chiral crossover, where we find the low-frequency electric conductivity to be most sensitive to small changes in fermion density. Working in the low-density QCD-like regime with spontaneously broken chiral symmetry, we obtain an estimate of the first nontrivial coefficient of the expansion of conductivity $\sigma(T,\mu)=\sigma(T,0)(1+c(T)(\mu/T)2+O(\mu4))$ in powers of μ, which takes its maximal value $c(T)\approx 0.15\pm 0.05$ around the critical temperature. At larger densities and lower temperatures, where the diquark condensation takes place, the conductivity quickly grows with chemical potential, and also becomes closer to the free quark result. As a by-product of our study we confirm the conclusions of previous studies with heavier pion that for SU(2) gauge theory the ratio of crossover temperature to pion mass $Tc/m\pi$ is significantly smaller than in real QCD.

Is this abstract from experiment?

No

Internet talk

Yes

Name of experiment and experimental site

N/A

Is the speaker for that presentation defined?

Yes

Details

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