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Deconfinement transition in two-flavour lattice QCD with dynamical overlap fermions in an external magnetic field

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We study the influence of an external magnetic field on the deconfinement transition in two-flavour lattice QCD
with physical quark charges. We use dynamical overlap fermions without any approximation such as fixed topology and
perform simulations on a 16^3×6 lattice and at a pion mass around 500 MeV.
The pion mass (as well as the lattice spacing) was determined in the independent runs on 12^3×24 lattices.
We consider two temperatures, one of which is close to the deconfinement transition and the other is above it.
Within our limited statistics the dependence of the Polyakov loop and chiral condensate
on the magnetic field supports the "inverse magnetic catalysis" scenario in which the transition
temperature decreases as the field strength grows.

Summary

In this talk we want to present the results of a lattice study of two-flavor lattice QCD with dynamical overlap fermions in an external magnetic field up to 0.68
$gevq$ and with a pion mass around 500
mev.
Due to the use of special Hybrid Monte-Carlo algorithms developed for overlap fermions we were able to perform fully
first-principle simulations without any restriction of topological charge fluctuations.
We have considered the dependence of the (non-renormalized) chiral condensate and the Polyakov loop
on the magnetic field at two fixed lattice spacings ($a = 0.15$
fm and $a = 0.12$
fm),
which correspond to the temperatures $T = 220$
mev and $T = 280$
mev for the $16^3 \times 6$ lattice.
The first value is likely to be very close to the deconfinement transition and the second value seems to be already in the deconfinement regime. Our results support the inverse magnetic catalysis scenario
in which the deconfinement temperature decreases with increasing magnetic field.
Finally, it is interesting to note that in the previous works
with staggered fermions inverse magnetic catalysis was observed only for sufficiently small pion masses.
In contrast, in our simulations with chiral lattice fermions the pion mass is quite large,
but nevertheless we find clear signatures of inverse magnetic catalysis.
This observation shows that it is important to use chiral fermions
for such simulations, and that good chiral properties seem to strengthen inverse magnetic catalysis.

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