

## The chiral transition of $N_f = 2$ $QCD$ with fundamental and adjoint fermions

**Presenter: Juergen Engels**

*J. Engels, S. Holtmann, T. Schulze*

Abstract: We study QCD with two staggered Dirac fermions both in the fundamental ( $QCD$ ) and the adjoint representation ( $aQCD$ ) near the chiral transition. The intention is to find the universality class of the transition and to verify Goldstone effects below the transition. We investigate  $aQCD$ , because in that theory the deconfinement and the chiral transitions occur at different temperatures with  $T_d < T_c$ . Indeed, we can show that the scaling behaviour of the chiral condensate in the vicinity of  $\beta_c$  is in full agreement with that of the  $3d$   $O(2)$  universality class, and to a smaller extent comparable to the  $3d$   $O(6)$  class. In the region between the two phase transitions we explicitly confirm the quark mass dependence of the chiral condensate which is expected due to the existence of Goldstone modes like in  $3d$   $O(N)$  spin models. In fundamental  $QCD$  we use the  $p4$ -action, which is improved with respect to the cut-off dependence, the rotational invariance and flavour symmetry breaking. Here, we find Goldstone effects below  $T_c$  like in  $aQCD$  and the  $3d$   $O(N)$  spin models, however no  $O(2)/O(4)$  scaling near the chiral transition point. This result for  $QCD$  may come from the use of still too large quark mass values and/or the coincidence of the deconfinement transition with the chiral transition.