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The QCD Anderson transition with Nf=2+1+1 twisted mass Wilson quarks

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Chiral Random Matrix Theory has proven to describe the spectral properties of low temperature QCD very well. However, at temperatures above the chiral symmetry restoring transition it can not provide a global description. The level-spacing distribution in lower part of the spectrum of the Dirac operator is Poisson-like. The eigenmodes are localized in space-time and separated from the rest of the spectrum by a so-called mobility edge. In analogy to Anderson localization in condensed-matter systems with random disorder this has been called the QCD-Anderson transition.
Here, we study the localization features of the low-lying eigenmodes of the massless overlap operator on Nf=2+1+1 twisted mass Wilson sea quarks and present results concerning the temperature dependence of the mobility edge and the mechanism of the quark-mode localization. We have used various methods to fix the spectral position of the delocalization transition and verify that the mobility edge extrapolates to zero at a temperature within the chiral transition region.

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