

XVth Quark Confinement and the Hadron Spectrum



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The QCD confining string and the world-sheet axion

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I will present the recent findings from an extensive investigation of the flux-tube spectrum and its implications for the axion on the worldsheet of the confining string. Specifically, I will discuss our latest results for both the closed and open flux tubes for 4D $SU(N)$ gauge groups. For the closed flux tube, employing the thermodynamic Bethe ansatz (TBA) method with certain approximations, we confirm that a significant portion of the low-lying energy states, characterized by different sets of quantum numbers, can be effectively described by the low-energy effective theory of a long string consisting of two Goldstone bosons known as phonons, along with a massive pseudoscalar referred to as the worldsheet axion. Regarding the open flux tube, our recent findings indicate that a substantial portion of the excited states can be adequately approximated by the Nambu-Goto (NG) spectrum. However, we also observe deviations from the NG spectrum in certain states, suggesting the presence of massive excitations. Notably, the mass of one of these excitations aligns with that extracted for the closed-flux tube.

Authors: ATHENODOROU, Andreas (Univesrity of Pisa); ATHENODOROU, Andreas

Presenter: ATHENODOROU, Andreas

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