

Axionic Strings, Domain Walls and Baryons via Holography

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In single-flavor QCD, the low energy description of baryons as Skyrmions is not available. In this case, it has been proposed by Komargodski that baryons can be viewed as kinds of quantum Hall droplets, or “sheets”, charged under the baryon symmetry localized on their boundary.

These objects can be studied in the deconfined phase of holographic QCD. Within this setup, the axion can be regarded as the Goldstone boson of the breaking of the axial $U(1)_A$ acting on just an extra massless quark flavor condensing at a scale $f \gg \Lambda$, where Λ is the dynamical scale of the $SU(N)$ Yang-Mills (YM) sector responsible for confinement. In the Post-Inflationary scenario, the abundance of axions depends on the decay pattern of axionic strings and domain walls (DWs). However, in this scenario, some DWs could not decay completely, due to the baryonic charge localized on their boundaries, i.e. on the axionic strings. The charged DWs describe at low energies the baryons composed by the extra quark flavor. Basic properties of these particles, such as spin, mass scale, and size are discussed. The corresponding charged axionic strings are explicitly constructed in the holographic model. I will conclude by discussing potential phenomenological applications to Dark Matter.

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