Universal Aspects of Deconfinement: Interfaces, Flux Tubes and Self-Duality in 2+1 Dimensions

Abstract

In pure SU(N) gauge theory, 't Hooft's twisted boundary conditions fix the number mod N of center vortices of various orientations in a finite volume. The free energy of a spacelike vortex, or temporal center flux, is then an order parameter for the deconfinement transition. We study this on the lattice in 2+1 dimensions, where SU(2) for example, is in the universality class of the 2d Ising model. This places a wealth of exact results at our fingertips. In particular, spacelike center vortices in SU(2) near criticality correspond to spin interfaces in the 2d Ising model, whose universal scaling functions are known exactly. By exploiting the known value of the free energy at criticality, we are able to locate the deconfinement transition with unprecedented precision. Knowledge of the critical lattice couplings then allows for a finite size scaling analysis, where the self-duality of the 2d spin model is reflected in a duality between the spacelike vortices and confining electric fluxes.