

Theta dependence in holographic Yang Mills

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Effects of the theta parameter are studied in Witten’s model of holographic 4d Yang-Mills, where theta is the coefficient of the CP-breaking topological term. First, the gravity background, including the full backreaction of the RR form dual to the theta parameter, is revisited. Then, a number of observables are computed holographically: the ground-state energy density, the string tension, the ’t Hooft loop, the light scalar glueball mass, the baryon mass scale, the critical temperature for deconfinement ? and thus the whole (T, θ) phase diagram ? and the entanglement entropy. A simple rule is provided to derive the theta corrections to (at least) all the CP-neutral observables of the model. Some of the observables we consider can and have been in fact studied in pure 4d Yang-Mills on the lattice. In that framework the results, obtained in the small theta regime, are given up to very few powers of theta. The corresponding holographic results agree qualitatively with available lattice data and signal an overall mass scale reduction by theta. Moreover, being exact in theta, they provide a benchmark for higher order corrections in Yang-Mills.

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