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(G*) POS-H75 – Holographic and Localization Calculations of Boundary F for N=4 SUSY Yang-Mills Theory

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$\mathcal{N}=4$ Supersymmetric Yang-Mills (SYM) theory can be defined on a half-space with a variety of boundary conditions preserving scale invariance and half of the original supersymmetry; more general theories with the same symmetry can be obtained by coupling to a 3D SCFT at the boundary. Each of these theories is characterized by a quantity called “boundary F”, conjectured to decrease under boundary renormalization group flows. In this paper, we calculate boundary F for $U(N)$ $\mathcal{N}=4$ SYM theory with the most general half-supersymmetric boundary conditions arising from string theory constructions with D3-branes ending on collections of D5-branes and/or NS5-branes. We first perform the calculation holographically by evaluating the entanglement entropy for a half-ball centered on the boundary using the Ryu-Takayanagi formula in the dual type IIB supergravity solutions. For boundary conditions associated with D3-branes ending on D5 branes only or NS5-branes only, we also calculate boundary F exactly by evaluating the hemisphere partition function using supersymmetric localization. The leading term at large N in the supergravity and localization results agree exactly as a function of the t' Hooft coupling λ .

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