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Gauge theory correlators from non-critical string theory

S.S. Gubser^{1, 1} ... A.M. Polyakov^{3, 3}

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Abstract

We suggest a means of obtaining certain Green's functions in 3+1-dimensional $N=4$ supersymmetric Yang-Mills theory with a large number of colors via non-critical string theory. The non-critical string theory is related to critical string theory in anti-deSitter background. We introduce a boundary of the anti-deSitter space analogous to a cut-off on the Liouville coordinate of the two-dimensional string theory. Correlation functions of operators in the gauge theory are related to the dependence of the supergravity action on the boundary conditions. From the quadratic terms in supergravity we read off the anomalous dimensions. For operators that couple to massless string states it has been established through absorption calculations that the anomalous dimensions vanish, and we rederive this result. The operators that couple to massive string states at level n acquire anomalous dimensions that grow as $2ng_{YM}^2 N^{1/2}$ for large 't Hooft coupling. This is a new prediction about the strong



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