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The fate of the circular Wilson Loops in N=4 dCFT

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We consider circular Wilson loops in a defect version of N=4 super-Yang-Mills theory which is dual to the D5-D3 brane system. When the loops are parallel to the defect, we can construct both BPS and non-BPS operators. At strong ‘t Hooft coupling we observe, in the non-BPS case, a Gross-Ooguri-like phase transition in the dual gravitational theory: the familiar disk solution dominates when the operator is far from the defect while a cylindrical string worldsheet, connecting the boundary loop with the probe D5-brane, is favourite below a certain distance. In the BPS case, the cylindrical solution does not exist for any choice of the physical parameters, suggesting that light-modes supergravity exchanges with the disk solution always saturate the expectation value at strong coupling. We study the double-scaling limit for large k and large ‘t Hooft coupling that allow us to compare perturbative and non-perturbative results.

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