Beccaria, M.; Tseytlin, A. A.
On the structure of non-planar strong coupling corrections to correlators of BPS Wilson loops and chiral primary operators. (English) Zbl 1459.81059

Summary: Starting with some known localization (matrix model) representations for correlators involving 1/2 BPS circular Wilson loop $W$ in $\mathcal{N} = 4$ SYM theory we work out their $1/N$ expansions in the limit of large 't Hooft coupling $\lambda$. Motivated by a possibility of eventual matching to higher genus corrections in dual string theory we follow S. Giombi and A. A. Tseytlin [J. High Energy Phys. 2020, No. 10, Paper No. 130, 27 p. (2020; Zbl 1456.83100)] and express the result in terms of the string coupling $g_s \sim g_{YM}^2 / \lambda/N$ and string tension $T \sim \sqrt{\lambda}$. Keeping only the leading in $1/T$ term at each order in $g_s$ we observe that while the expansion of $\langle W \rangle$ is a series in $g_s^2 / T$, the correlator of the Wilson loop with chiral primary operators $O_J$ has expansion in powers of $g_s^2 / T^2$. Like in the case of $\langle W \rangle$ where these leading terms are known to resum into an exponential of a “one-handle” contribution $\sim g_s^2 / T^2$, the leading strong coupling terms in $\langle WO_J \rangle$ sum up to a simple square root function of $g_s^2 / T^2$. Analogous expansions in powers of $g_s^2 / T$ are found for correlators of several coincident Wilson loops and they again have a simple resummed form. We also find similar expansions for correlators of coincident 1/2 BPS Wilson loops in the ABJM theory.

MSC:
81R15 Operator algebra methods applied to problems in quantum theory
81T15 Perturbative methods of renormalization applied to problems in quantum field theory
81T60 Supersymmetric field theories in quantum mechanics
70S15 Yang-Mills and other gauge theories in mechanics of particles and systems

Keywords:
AdS-CFT correspondence; $1/N$ expansion

Full Text: DOI arXiv

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