

In this article some analytic aspects of one-loop calculations in $\mathcal{N} = 4$ super Yang-Mills theory are reviewed. More specifically the author focuses on one-loop calculations in all orders of the dimensional regularization parameter ϵ , refining the standard unitary cut methods. Particularly the one-loop six-point next-to-MHV (NMHV) planar amplitude is obtained to all orders in ϵ . Using this expression and others, the article reviews two interesting new results in detail.

One is the connection between the one-loop amplitudes of $\mathcal{N} = 4$ super Yang-Mills theory and α' corrections to corresponding tree-level open string amplitudes. The stringy side calculations are carried out by use of the non-Abelian Born-Infeld action and the α' corrections are considered at the orders of $\mathcal{O}(\alpha'^2)$ and $\mathcal{O}(\alpha'^3)$.

The other result is obtained by direct use of the one-loop six-point NMHV planar amplitudes in all orders of ϵ , providing an alternative confirmation of the dual superconformal invariance for the amplitude in question. The author also derives a new expression for the ratio of the two-loop six-point planar NMHV and MHV superamplitudes, a quantity under attentive investigation in recent studies.