

This article deals with the studies of recursion relations among multi-loop scattering amplitudes in planar $\mathcal{N} = 4$ super Yang-Mills theory at the level of integrand. Inspired by the so-called BCFW recursion relations and their extensions to loop amplitudes, in this article the author obtains a new all-loop recursion relation within the framework of a recently developed formalism in momentum twistor space [1, 2]. The result shows that the recursion relation can be derived by the so-called MHV rules (or the CSW rules) applied to the loop amplitudes. Explicit examples of this result are provided for the cases of one- and two-loop integrands of MHV and next-to-MHV planar amplitudes. This article is significant in a sense that it shows that the correspondence between the BCFW recursion relations and the CSW rules in terms of tree-level calculation can properly be extended to loop-level calculations in general at least at the level of integrand in momentum twistor space.

References

- [1] M. Bullimore, L. J. Mason and D. Skinner, JHEP **1012**, 032 (2010) [arXiv:1009.1854 [hep-th]].
- [2] L. J. Mason and D. Skinner, JHEP **1012**, 018 (2010) [arXiv:1009.2225 [hep-th]].