This article under review is one of the series of papers on the study of dual superconformal symmetry in $\mathcal{N} = 4$ super Yang-Mills theory which is recently discovered by the authors of this article and others [1]. In this article, manifest realizations of the dual superconformal symmetry as well as the ordinary superconformal symmetry in $\mathcal{N} = 4$ super Yang-Mills scattering amplitudes are investigated by use of an integral representation of the dual superconformal invariants [2]. The integral is taken over differential forms, with the integrand being holomorphic delta-functions in terms of the so-called momentum supertwistors. The article shows that, after a Fourier transform of the integral to the twistor space, the ambiguities in the choice of the integrand measure can uniquely be fixed by the imposition of the ordinary superconformal symmetry. The resultant form of dual superconformal invariants lead to the known tree-level and one-loop expressions. The result is expected to be useful to obtain a master expression for the amplitudes at all loop levels.

References

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