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Antipodal (Self)-Duality in Planar N=4 Super-Yang-Mills Theory

Thursday, February 16, 2023 9:00 AM (1 hour)

In planar N=4 super-Yang-Mills theory, some scattering amplitudes and form factors that evaluate to multiple polylogarithms can be bootstrapped, or constructed without knowing the precise Feynman integrals, in some cases through eight loops. This allows a window into high orders of perturbation theory for certain scattering processes. Remarkably, the 6-gluon amplitude and the 3-gluon form factor of the chiral stress tensor multiplet are related by a mysterious "antipodal"duality. This duality incorporates the antipode map of the Hopf algebra for multiple polylogarithms, which reverses all the entries in the symbol, thus exchanging the role of branch cuts and derivatives. It has been checked now through eight loops. Moreover, it is a consequence of an antipodal self-duality (ASD) of the 4-gluon form factor. Although ASD has only been checked through two loops, it reduces to the previous duality in (multi)-collinear limits, suggesting that it too holds to all orders. The underlying physical reason for the duality is still a mystery, and it remains unclear whether any version of it holds in more general theories or processes.

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