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Positivity properties of five-point two-loop Wilson loops with Lagrangian insertion

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I will discuss the geometric integrand expansion of the pentagonal Wilson loop with a Lagrangian insertion in maximally supersymmetric Yang-Mills theory. I will focus on the integrand corresponding to an all-loop class of ladder-type geometries, and then investigate the known two-loop observable from this geometric viewpoint. To do so, we evaluate analytically the new two-loop integrals corresponding to the negative geometry contribution, using the canonical differential equations method. Inspecting the analytic result, we present numerical evidence that in this decomposition, each piece has uniform sign properties, when evaluated in the Amplituhedron region. Finally, I will report the recent progress of bootstrap approach for the ladder-type geometries based on geometric Landau analysis, which determines which singularities are actually present in the integrals. We successfully implement this procedure and compute the six-point two-loop and five-point three-loop ladder negative geometries at the symbol level. We found that five-point ladder geometries involve novel pentagon alphabet letters, which also appear in planar three-loop Feynman integrals.

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