On form factors in N=4 sym

In this paper we study the form factors for the half-BPS operators $\mathcal{O}^{(n)}_I$ and the $\mathcal{N}=4$ stress tensor supermultiplet current W^{AB} up to the second order of perturbation theory and for the Konishi operator $\mathcal{K}$ at first order of perturbation theory in $\mathcal{N}=4$ SYM theory at weak coupling. For all the objects we observe the exponentiation of the IR divergences with two anomalous dimensions: the cusp anomalous dimension and the collinear anomalous dimension. For the IR finite parts we obtain a similar situation as for the gluon scattering amplitudes, namely, apart from the case of W^{AB} and $\mathcal{K}$ the finite part has some remainder function which we calculate up to the second order. It involves the generalized Goncharov polylogarithms of several variables. All the answers are expressed through the integrals related to the dual conformal invariant ones which might be a signal of integrable structure standing behind the form factors.

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