Exercise for Scattering Amplitude (F, T6)

Problem set 5, due to 12 June, 2019

1) Determine the large z–behaviour for the following amplitudes with the BCFW shifts $[n,1\rangle$, i.e.: $\hat{\lambda}_1 = \lambda_1 - z\lambda_n$ and $\hat{\tilde{\lambda}}_n = \tilde{\lambda}_n + z\tilde{\lambda}_1$?

a) $A_n(\hat{1}^-, 2^+, \ldots, (n-1)^+, \hat{n}^-)$, $(--)$–shift

b) $A_n(\hat{1}^-, 2^-, 3^+ \ldots, \hat{n}^+)$, $(-+)$–shift

c) $A_n(\hat{1}^+, \ldots, (n-2)^+, (n-1)^-, \hat{n}^-)$, $(+-)$–shift

d) $A_n(\hat{1}^+, 2^-, 3^-, 4^+ \ldots, \hat{n}^+)$, $(++)$–shift

2) Consider the six–gluon split–helicity NMHV amplitude $A_6(1^-, 2^-, 3^-, 4^+, 5^+, 6^+)$

For the BCFW shifts $[3,4\rangle$, i.e.: $\hat{\tilde{\lambda}}_3 = \tilde{\lambda}_3 + z\tilde{\lambda}_4$ and $\hat{\lambda}_4 = \lambda_4 - z\lambda_3$ determine the large z–behaviour of the following amplitude

$$A_6(1^-,2^-,3^-,4^+,5^+,6^+) = g_{YM}^4 \left\{ \frac{\langle 1|p_2+p_3|4]^3}{[23][34]\langle 56\rangle\langle 61\rangle\langle 5|p_3+p_4|2]} \frac{1}{(p_5+p_6+p_1)^2} + \frac{\langle 3|p_4+p_5|6]^3}{[12][61]\langle 34\rangle\langle 45\rangle\ \langle 5|p_3+p_4|2]} \frac{1}{(p_6+p_1+p_2)^2} \right\} .$$