RECEIVED: January 15, 2015

ACCEPTED: January 15, 2015

PUBLISHED: February 3, 2015

Erratum: Four-point amplitudes in $\mathcal{N} = 2$ SCQCD

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ERRATUM TO: [JHEP09\(2014\)017](#)

ARXIV EPRINT: [1406.7283](#)

Due to a mistake while converting the conventions used in [1] into our notations, the expression of the two-loop correction to the chiral superfield propagators presented in equation (C.2) at page 24 must be replaced by

$$\text{---}\bullet\text{---} = 0 \quad (\text{C.2})$$

As a consequence the diagram (o) depicted in figure 7 at page 16 does not contribute anymore to the two-loop amplitude with fundamental fields as external legs. Thus the equation between (5.5) and (5.6) at page 18 must be corrected as follows

$$(o) = 0$$

and also equations (5.7), (5.8), (5.9) should be replaced by

$$(o) = 0 \quad (5.7)$$

$$\begin{aligned} \mathcal{A}_1^{(2)}(q\bar{q}\bar{q}\bar{q}) = & -2s \text{ (triangle)} + 4s \text{ (triangle)} - s^2 t \text{ (box)} - st^2 \text{ (box)} + \\ & -s^2 \text{ (box)} + 4st \text{ (box)} + 2s^2 \text{ (box)} + 2s \text{ (triangle)} \end{aligned} \quad (5.8)$$

$$\begin{aligned} \mathcal{A}_1^{(2)}(q\bar{q}\bar{q}\bar{q}) = & -s^2 t \text{ (box)} - st^2 \text{ (box)} + 2s^2 \text{ (box)} - 24at \text{ (box)} + \\ & -4(a+a^2) \text{ (bubble)} + \frac{4c-18ac}{as} \text{ (bubble)} - \frac{12c}{t} \text{ (bubble)} + \\ & + 4b \text{ (triangle)} - 12b \text{ (triangle)} + 12(s+t) \text{ (box)} \end{aligned} \quad (5.9)$$

The final result for the two-loop amplitude with fundamental fields as external particles now becomes

$$\begin{aligned} \mathcal{M}_1^{(2)}(q\bar{q}\bar{q}\bar{q}) = & \frac{e^{-2\gamma_E\epsilon}}{(4\pi)^{4-2\epsilon}t^{2\epsilon}} \left[\frac{2}{\epsilon^4} - \frac{1}{\epsilon^2} \left(\frac{13\pi^2}{6} + 2\ln^2 x \right) - \frac{1}{\epsilon} \left(2\pi^2 \ln(1+x) + \frac{19}{3}\zeta(3) + \right. \right. \\ & \left. \left. + \frac{2}{3}\ln^2 x (\ln x + 3\ln(1+x)) + 4\ln x \text{Li}_2(-x) - 4\text{Li}_3(-x) \right) + 4(3\ln x - \ln(1+x))\zeta(3) + \right. \\ & \left. + \frac{23}{60}\pi^4 + \frac{2}{3}\pi^2 \ln x \ln(1+x) - (\pi^2 + \ln^2 x)\ln^2(1+x) + 4S_{2,2}(-x) - 4\ln x S_{1,2}(-x) + \right. \\ & \left. + 4\ln(1+x)\text{Li}_3(-x) + \frac{2}{3}(\pi^2 - 6\ln x \ln(1+x))\text{Li}_2(-x) + \frac{1}{6}(4\pi^2 + \ln^2 x)\ln^2 x - 12\zeta(3) \right] \end{aligned} \quad (5.11)$$

It is important to stress that now the final expression of the two-loop amplitude does not preserve maximal transcendentality, due to the presence of the $\zeta(3)$ term in its finite part.

This contribution comes from the last integral of eq. (5.8), which is the only one that does not respect the maximum transcendentality principle. This term was not present in the original paper because it was cancelled by the diagram that contains the two-loop correction to the chiral propagator. Therefore the remarks about transcendentality have to be modified taking into account the fact that the two-loop amplitude does not respect the maximum transcendentality principle. All remarks concerning the maximum transcendentality of the one-loop amplitudes are unchanged.

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References

- [1] E. Pomoni and C. Sieg, *From $N = 4$ gauge theory to $N = 2$ conformal QCD: three-loop mixing of scalar composite operators*, [arXiv:1105.3487](#) [[INSPIRE](#)].