In this article the authors present computational techniques for polygon Wilson loop expectation values at two-loop level. The techniques are based on a recently introduced operator product expansion (OPE) for Wilson loops [1]. The two-loop expressions are obtained by applying the OPE expansion to one-loop analytic results. Since the polygon Wilson loops correspond to planar MHV amplitudes of gluons, the new techniques will be useful in two-loop computation of MHV amplitudes in four-dimensional planar Yang-Mills theory.

In this article the calculation is carried out for the polygonal Wilson loops that are embedded in a two-dimensional $\mathbf{R}^{1,1}$ subspace of the four-dimensional Minkowski space $\mathbf{R}^{1,3}$. Thus it has some limitation if we apply it to the computation of two-loop MHV amplitudes with full $\mathbf{R}^{1,3}$ kinematics, and even more so for the application to non-MHV, non-planar amplitudes. But the resultant expressions agree with previously known results and the new techniques are expected to invoke a new algebraic way of analyzing two-loop amplitudes in general.

# References

[1] L. F. Alday, D. Gaiotto, J. Maldacena, A. Sever and P. Vieira, JHEP **1104**, 088 (2011) [arXiv:1006.2788 [hep-th]].