In this article, the so-called superamplitude method for the calculation of MHV (Maximally Helicty Violating) amplitudes in $\mathcal{N} = 4$ super Yang-Mills theory, first developed by Nair in [1], is applied to less supersymmetric Yang-Mills theories, *i.e.*, to pure $\mathcal{N} < 4$ super Yang-Mills theories. For the cases of MHV and NMHV (Next-to-MHV) tree amplitudes, it is shown that the application can be carried out rather straightforwardly by simple truncations of the $\mathcal{N} = 4$ superamplitudes. On the other hand, at loop level the application is not so trivial as the tree level. In this article, consulting the conventional unitary method but not directly utilizing its results, the authors develop calculatory techniques for one-loop MHV amplitudes in $\mathcal{N} = 1, 2$ super Yang-Mills theory based on Nair's superamplitude method. More explicitly, the authors calculate bubble contributions to the one-loop amplitudes and show, for the case of four-point amplitudes, the relation between the MHV bubble coefficient and the one-loop beta-function coefficient.

This article includes other intriguing applications of the superamplitude method. For example, it provides a solution to the supersymmetric Ward identities in $\mathcal{N} < 4$ super Yang-Mills theory, a useful tool for the description of six-dimensional super Yang-Mills theories in connection to the four-dimensional theories, and also a natural framework for the calculations of pure $\mathcal{N} < 8$ supergravity amplitudes.

# References

[1] V. P. Nair, "A CURRENT ALGEBRA FOR SOME GAUGE THEORY AMPLITUDES," Phys. Lett. B **214**, 215 (1988).