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The spectrum of Feynman-integral geometries at two loops

In this talk, I will present the results of our recent paper arXiv:2512.13794 for a complete classification of the Feynman-integral geometries at two-loop order in four-dimensional Quantum Field Theory with standard quadratic propagators. Concretely, we consider a finite basis of integrals in the ’t Hooft–Veltman scheme, i.e. with D-dimensional loop momenta and four-dimensional external momenta, which belong to 79 independent topologies, or sectors. Then, we analyze the leading singularities of the integrals in those sectors for generic values of the masses and momenta, using the loop-by-loop Baikov representation. Aside from the Riemann sphere, we find that elliptic curves, hyperelliptic curves of genus 2 and 3 as well as K3 surfaces occur. Moreover, we find a smooth and non-degenerate Del Pezzo surface of degree 2, a particular Fano variety known to be rationalizable, resulting in a curve of geometric genus 3. These geometries determine the space of functions relevant for Quantum Field Theories at two-loop order, including in the Standard Model.

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