PAUL SCHERRER INSTITUT

Particle Theory Seminar

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"A Higher Order Duality Relation between Loops and Trees"

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Abstract:
After the start of the LHC, theoretical predictions for scattering processes are needed with a large number of particles in the final state and to a very high precision. In perturbative QCD, the former leads to Feynman diagrams with a large number of external legs, while the latter corresponds to higher loop orders. Both requirements, especially when combined together, lead to an increasing complexity of the calculation. In the last years, various unitarity and recursive methods have been successfully used to address this issue and to calculate scattering amplitudes for multi-particle processes up to next-to-leading order (NLO).

In this talk, I will present the Duality Method. It provides a cutting-relation to calculate loop diagrams in a similar manner like the corresponding real-radiation tree diagrams. Building a modified extension of Feynman's Tree Theorem at one-loop order, it allows to calculate scattering amplitudes at this order by a sum of single-cut phase-space integrals only. I will show how this relation can be extended to higher loop orders beyond NLO and by doing this, which boundary conditions for the results can be maintained at higher orders.