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NNLO matching in VINCIA

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Fixed-order matching of Monte Carlo showers remains a critical ingredient to push forward the precision frontier of collider phenomenology. Beyond the conceptually simple leading-order matching, the past two decades have seen multiple techniques to achieve next-to-leading order (NLO) matching which have further been fully automated and made available in public codes. This pushed the precision frontier to NNLO.

We outline a new technique to perform NNLO matching in which the shower Monte Carlo is used as the phase space generator. In the context of a simple process, Z decay to hadrons, we focus on the VINCIA sector shower which utilises the antenna formalism. In the sector approach, the phase space is partitioned into non-overlapping sectors which greatly simplifies the inclusion of 2->4 antenna functions. The matching formulae are derived by comparing the fully differential jet production cross section computed both in the shower and at fixed-order. We develop a technique to compute the complex sector integrals which control the NLO correction to the 3-jet production cross section. The latter is the only missing ingredient to achieve NNLO matching in the process Z decay to hadrons. Finally, we discuss the flowchart of the numerical implementation.

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