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Creating Unique Parton Shower Histories with Sector Showers

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In conventional parton showers, including dipole/antenna ones, a given (Born+ $\mathcal{O}(\alpha_s)$)-parton configuration can typically be reached via $\mathcal{O}(\alpha_s)$ different shower histories. In the context of matrix-element-correction and merging procedures, accounting for these histories mandates fairly complex and resource-intensive algorithms. A so far little explored alternative in the shower context is to divide the branching phase spaces into distinct “sectors”, each of which only receives contributions from a single branching kernel. This effectively makes the shower operator bijective, i.e., each parton configuration now has a single unique “history”. Sector showers can therefore be regarded as offering the ultimate potential to alleviate the bottlenecks of conventional techniques to match or merge shower predictions and multi-leg matrix elements.

I will here present the sector formalism for antenna showers, including initial- and final-state radiation with mass and helicity dependence, and give an outlook on dedicated matching and merging schemes utilising its bijective nature.

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