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Strongly-ordered infrared limits for subtraction counterterms from factorisation

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In the context of infrared subtraction algorithms beyond next-to-leading order, it becomes necessary to consider multiple infrared limits of scattering amplitudes, in which several particles become soft or collinear in a strongly ordered sequence. We study these limits from the point of view of infrared factorisation, and we provide general definitions of strongly-ordered soft and collinear kernels in terms of gauge-invariant operator matrix elements. With these definitions in hand, it is possible to construct local subtraction counterterms for strongly ordered congurations. These are building blocks of infrared-finite soft and collinear cross sections, therefore, upon integration, they cancel virtual poles by construction. We test these ideas at tree level for multiple emissions, and at one loop for single emission, which is sufficient for NNLO subtraction.

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