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Casual thresholds and infrared singularities in the forest

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We present the first comprehensive analysis of the unitarity thresholds and anomalous thresholds of scattering amplitudes at two loops and beyond based on the loop-tree duality, and show how non-causal unphysical thresholds are locally cancelled in an efficient way when the forest of all the dual on-shell cuts is considered as one. We also prove that soft and collinear singularities at two loops and beyond are restricted to a compact region of the loop three-momenta, which is a necessary condition for implementing a local cancellation of loop infrared singularities with the ones appearing in real emission; without relying on a subtraction formalism.

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