

Measurements and Crossing

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Crossing symmetry in interacting quantum field theory suggests that particles and antiparticles traveling back in time are indistinguishable. To rigorously prove this property, it is necessary to show that on-shell observables across different channels are boundary values of the same analytic function. Known non-perturbative proofs in specific cases heavily rely on fundamental physical principles (e.g., causality, locality, and unitarity), as well as on a significant amount of complex analysis in several variables. This makes their extension to cases of arbitrary multiplicity very challenging. In this talk, we review recent progress regarding the implications of crossing symmetry in quantum field theory, assuming analyticity. Towards the end, we discuss possible complications arising from anomalous thresholds and elaborate on strategies for managing them. To illustrate the main points, we focus on the specific example of the expectation values of gravitational bremsstrahlung.

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