Title:	Modern Methods for Amplitude Calculation
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Abstract:	Scattering amplitudes are the fundamental objects in particle physics in a sense that they serve as a connection between theoretical calculations and experimental observables. Hav- ing a knowledge of amplitude squared allows us to theoretically calculate the observables measured in particle colliders, therefore serving as a check for the theory. Feynman dia- grams were invented in 1948 to help physicists find their way out of a morass of calculations involved in scattering amplitudes. Since then, they have been essential bookkeeping devices in the calculation-rich realm of theoretical physics. As we move towards a precision era of collider measurements, we need to perform higher order calculations of these amplitudes in perturbative Quantum Field theories. Direct cal- culation using the standard feynman diagrammatics becomes inefficient. So in this thesis, we have reviewed the novel methods of amplitude calculation which are much more ef- ficient and insightful. We start with the tree level techniques known as "Spinor helicity techniques" and use them to calculate the result for three photon scattering. Then we move to the loop diagrams where we review "Generalized Unitarity", that enables one to calculate loop diagrams just by using the knowledge of tree diagrams. We apply these techniques to a BSM process in order to appreciate the efficiency and the power of these novel techniques as compared to the traditional approaches.
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