Contribution ID: **103** Type: **not specified**

Automating scattering amplitudes with chirality flow

The chirality-flow method, which recasts the Lorentz calculations of special relativity to create an entirely graphical representation of the standard model of particle physics, has proven to make analytic calculations very simple. With the development of a numerical chirality-flow implementation for massless quantum electrodynamics, based on a standard program for calculating probabilities in particle physics (MadGraph5_aMC@NLO), it has been shown that these simplifications are also found for numerical computations. Here, we find speed gains from both the simplified spacetime structures of chirality flow, and from an ability to see whether a given configuration of particles will contribute zero to the full probability already at compile time. Comparing the evaluation time for different processes, Feynman diagrams with many external photons (> 5) are evaluated a factor 10 faster in this implementation than in MadGraph5_aMC@NLO.

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Session Classification: Plenary session

Track Classification: Posters