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Recent developments in the fast reproduction of QCD calculations with the APPLgrid project

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Recent developments in the fast reproduction of the results of QCD calculations using the APPLgrid project are presented. The calculation of cross-sections at Next-to-Leading order in QCD involves the integration over the final state phase space in order to cancel the infra-red divergences. For the calculation of cross sections for observables at hadron-hadron colliders this integration requires the Monte Carlo generation of a large number of event weights. These calculations typically need to be repeated if a different choice of parton densities within the proton are required or a different choice of factorisation or renormalisation scales. This makes the full calculation with many of the available parton density function error sets, and indeed the inclusion of these calculations in iterative fits to the proton parton densities, computationally prohibitive. The APPLgrid project allows the *a posteriori* inclusion of the parton densities in the calculation of the cross section by storing the weights from the Monte Carlo integration over the hard-subprocess phase space from the underlying QCD Calculation code in a look-up table so that the full calculation need be performed only once, after which the cross section can be recreated with any parton density set using a fast convolution over the stored weights. This reduces the time required to obtain the cross section from many days, down to a few milliseconds. Detailed examples from the increasingly large menagerie of QCD calculations of physics processes interfaced to APPLgrid will be presented.

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