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Madgraph on GPUs and vector CPUs: towards production

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The effort to speed up the Madgraph5_aMC@NLO generator by exploiting CPU vectorization and GPUs, which started at the beginning of 2020, is expected to deliver the first production release of the code for QCD leading-order (LO) processes in 2024. To achieve this goal, many additional tests, fixes and improvements have been carried out by the development team in recent months, both to carry out its internal workplan and to respond to the feedback from the LHC experiments about the current and required functionalities of the software. Several new physics processes, including both Standard Model and Beyond Standard Model calculations, have been tested and extensively debugged. Support for AMD GPUs via native HIP has been added to the CUDA/C++ baseline implementation of the code; work is in progress to also add support for Intel GPUs to this CUDA/C++ plugin, based on the parallel SYCL implementation developed in the past. The user interface and packaging of the software, and the usability challenges coming from the large number of events that must be generated in parallel on a GPU, have also been an active area of development. In this contribution, we will report on these activities and on the status of the LO software at the time of the CHEP2024 conference. The status and outlook for one of the main further directions of our development effort, notably the support of next-to-leading-order (NLO) processes, is described in a separate contribution to this conference.

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