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## Developing GPU-compliant algorithms for CMS ECAL local reconstruction during LHC Run 3 and Phase 2

The higher LHC luminosity expected in Run 3 (2022+) and the consequently larger number of simultaneous proton-proton collisions (pileup) per event pose significant challenges for CMS event reconstruction. This is particularly important for event filtering at the CMS High Level Trigger (HLT), where complex reconstruction algorithms must be executed within a strict time budget.

This problem will become even more acute during Phase 2 of the LHC (2027+), where significantly higher luminosity, pileup and input rates will be delivered to the HLT than foreseen during Run 3. The processing power required to perform online event reconstruction in this environment exceeds the expected increase in processing power for conventional CPUs, requiring an alternative approach.

CMS is investigating the widespread use of heterogenous architectures, including CPUs and GPU accelerators, to satisfy the needs of Phase 2 reconstruction. A prototype system, with both CPUs and GPUs, will be operated at the HLT during LHC Run 3 to validate the approach and to gain experience in optimising the reconstruction algorithms to the different processor architectures.

The local reconstruction algorithms of the CMS Electromagnetic Calorimeter for LHC Run 3 are among the first candidates to be considered for implementation in such heterogenous platforms. We will present the current development status of these algorithms and the first performance results comparing GPU and CPU-optimised code. We will also discuss the challenges faced during the development of GPU-compliant code for Run 3, together with the status and plans for developing Phase 2 reconstruction code that can run on both CPU and GPU architectures.

### Significance

### References

### Speaker time zone

Compatible with Europe

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