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The Role of Effective Event Reconstruction in the Higgs Boson Discovery at CMS

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In 2012 the LHC increased both the beam energy and intensity. The former made obsolete all of the simulation data generated for 2011; the latter increased the rate of multiple proton-proton collisions (pileup) in a single event, significantly increasing the complexity of both the reconstructed and matching simulated events. Once the pileup surpassed 10, the resources needed for the software to function created significant strain on CMS computing facilities. Problems with increasing memory and CPU use had to be alleviated in a way that did not sacrifice the physics performance of the reconstruction. In 2012 this was particularly important as the prompt calibration system was fully commissioned, making the data produced in the prompt reconstruction, the primary datasets used in 2012 physics publications on 8TeV data. This paper summarizes the changes applied to the CMS data reconstruction software, which was deployed successfully and delivered high quality data used in the Higgs boson discovery and many other physics results from CMS.

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