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The design and performance of the ATLAS Inner Detector trigger in high pileup collisions at 13 TeV at the Large Hadron Collider

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The design and performance of the ATLAS Inner Detector (ID) trigger algorithms running online on the high level trigger (HLT) processor farm for 13 TeV LHC collision data with high pileup are discussed. The HLT ID tracking is a vital component in all physics signatures in the ATLAS Trigger for the precise selection of the rare or interesting events necessary for physics analysis without overwhelming the offline data storage in terms of both size and rate. To cope with the high expected interaction rates in the 13 TeV LHC collisions the ID trigger was redesigned during the 2013-15 long shutdown. The performance of the ID Trigger in the 2016 data from 13 TeV LHC collisions has been excellent and exceeded expectations as the interaction multiplicity increased throughout the year. The detailed efficiencies and resolutions of the trigger in a wide range of physics signatures are presented, to demonstrate how the trigger responded well under the extreme pileup conditions. The performance of the ID Trigger algorithms in the first data from the even higher interaction multiplicity collisions from 2017 are presented, and illustrates how the ID tracking continues to enable the ATLAS physics program currently, and will continue to do so in the future.

Author: KILBY, Callum (on behalf of the ATLAS collaboration)

Presenter: KILBY, Callum (on behalf of the ATLAS collaboration)

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