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Simulation studies for the ATLAS track counting luminosity measurement

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A precise measurement of the luminosity is a key component of the ATLAS physics programme. ATLAS uses several detectors and algorithms to determine the luminosity. The absolute calibration of these algorithms is carried out in LHC runs with special beam conditions at low luminosity. The track counting luminosity measurement is used to determine the calibration transfer from the low-luminosity regime to the high-luminosity conditions typical of standard physics data taking, and to monitor the long term stability of the default luminosity method.

The track counting method works by counting the number of reconstructed tracks from charged particles inside the Inner Detector. The average number of charged particles in randomly-triggered bunch crossings is proportional to the average number of inelastic collisions per bunch crossing and can therefore be used to compute the luminosity. This poster presents simulation studies for the ATLAS track counting luminosity measurement. A toy simulation model is used to study the underlying distribution of the number of tracks and to illustrate the linearity between the average number of tracks and the luminosity. Full ATLAS MC simulation is used to assess effects related to the reconstruction of the tracks and their effect on the linearity.

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