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Geometrical Validation of ATLAS New Small Wheel Simulation Software

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The Large Hadron Collider (LHC), the largest hadron accelerator ever built, began operations in 2009 at centre-of-mass energies of 0.9, 7 and 8 TeV (Run I). After a long shutdown (LS1) of two years (2013-2014), the LHC resumed operations in 2015 (Run II) at a centre-of-mass energy of 13 TeV and reached a record luminosity of 1.37 x 10ˆ34 cm-2 s-1, exceeding its design luminosity of 10ˆ34 cm-2 s-1. In addition, it is expected to reach a centre-of-mass energy of 14TeV by the end of Run II (2018). Thereafter, the LHC will undergo another shutdown (LS2) in preparation for even higher luminosity scenarios during Run III. Such high luminosities are anticipated to affect, among other things, the tracking and triggering of muons in the ATLAS detector's muon spectrometer due to high counting rates (mostly from increased cavern background) and fake high transverse momentum tracks. To address this issue, the ATLAS collaboration will replace the innermost stations in the muon spectrometer end caps (Small Wheels) with a set of precision tracking and trigger detectors capable of handling high rates - the New Small Wheels (NSW). The NSW design is proposed to have two types of detector technologies: Small Strip Thin Gap Chambers for triggering and Micro Mesh Gas Structures for precision tracking. The performance of the NSW at these high rates is currently being studied in simulations. A validation study to check how well the simulation software depicts the geometry of the NSW detector planes is presented here.

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