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A High-Granularity Timing Detector (HGTD) in ATLAS: Performance at the HL-LHC

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The expected increase of the particle flux at the high luminosity phase of the LHC (HL-LHC) with instantaneous luminosities up to L 7.5 × 1034 cm−2 s−1 will have a severe impact on the ATLAS deetctor performance. The pile-up is expected to increase on average to 200 interactions per bunch crossing resulting in a vertex density that can be larger than 1.5 per mm.
The reconstruction and performance for electrons, photons, jets and transverse missing energy will be severely degraded in the end-cap and forward region, where the liquid Argon based electromagnetic calorimeter has coarser granularity compared to the central region. The High Granularity Timing Detector (HGTD) is proposed in front of the liquid Argon end-cap calorimeters for pile-up mitigation. Using the high granularity and the excellent timing capabilities of the detector with 30 ps per MIP, electron and jet reconstruction (b tagging) are presented as well as the impact on the pileup jet suppression and missing ET. The expected improvement in performance is particularly relevant for vector-boson processes.

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