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LHC-ATLAS Phase-I upgrade: Calibration and simulation of new trigger readout system of the Liquid Argon calorimeter

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LHC-ATLAS experiment is in the middle of Phase-I upgrade for Run3 from 2021 and High-Luminosity LHC run from 2026, which instantaneous luminosity is going to be higher than it's ever experienced. In order to achieve lower trigger rate than required at the first stage trigger, 100 kHz, Liquid Argon Calorimeter group is working on an upgrade of its trigger readout electronics. Granularity of the calorimeter cell for trigger readout, so-called Super Cell to be introduced from Run3, is going to have 10 times finer granularity than that for Run2. While the production of new electronics and those installation, calibration framework for the energy and timing measurement of the SC readout is also developed. We established it using data taken by calibration runs with pulsing system to set Super Cell specific wave form and constants, i.e. pedestal level, equivalent transverse energy for 1 bit of ADC and coefficients for Optimal Filter for energy calculation. In July 2019, we have obtained them for the first installed digitizer board in the endcap part of the calorimeter. Based on it we have verified the new hardware has performance as its design. We also developed a new simulator of the calorimeter to implement the calibrated constants obtained during commissioning of new trigger readout system. New simulation is taking into account the long bipolar pulse shape for any number of interaction per bunch crossing, which makes highly realistic out-of-time pileup effect. We discuss how the simulator can be used and give some examples of the application.

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