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Analog and digital signal processing in the liquid argon calorimeter trigger system of ATLAS detector in the High-Luminosity LHC

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The forthcoming high-luminosity environment of the Large Hadron Collider (LHC) implies the redesign of several subsystems in the ATLAS detector. In particular, an improvement of the calorimeter trigger system has to be done to match the data acquisition rate with the expected increase of the collisions rate. The strategy is to increase the calorimeter spatial resolution and to use the longitudinal shape information of the energy deposits to better identify electromagnetic particles, and so, enhance the efficiency of the triggers. The aim of our work is to study the performances of one of the most essential parts of the calorimeter trigger upgrade: the Liquid Argon Trigger Digitizer Board (LTDB), which will digitize the signals coming from the calorimeter at very high precision and will transmit them to the energy real-time calculators. We are currently designing precision instrumentation boards that will allow us to test in depth the analog stages, and also exercise digital conversion part as well as in the data serialization and data transmission. Furthermore, we are analyzing physics data taken during LHC Run 2 last year with a LTDB demonstrator installed on the detector. These analyses allow to understand analog signals properties and actual board performance.

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