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Status of the Atlas Calorimeters: their performances after two years of LHC operation and plans for future upgrades.

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The ATLAS experiment is designed to study the proton-proton collisions produced at the Large Hadron Collider (LHC) at CERN. Its calorimeter system measures the energy and direction of final state particles with pseudo rapidity $|\eta| < 4.9$. Accurate identification and measurement of the characteristics of electromagnetic objects (electrons/photons) are performed by liquid argon (LAr)-lead sampling calorimeters in the region $|\eta| < 3.2$, using an innovative accordion geometry that provides a fast, uniform azimuthal response without gaps. The hadronic calorimeters measure the properties of hadrons, jets, and tau leptons, and also contribute to the measurement of the missing transverse energy and identification of muons. This is done in the region $|\eta| < 1.7$ with a scintillator-steel sampling calorimeter, and in the region $1.4 < |\eta| < 3.2$ with a copper-LAr sampling calorimeter. The coverage is extended to $|\eta| < 4.9$ by an integrated forward calorimeter (FCal) based on LAr with copper and tungsten absorbers.

Following installation in 2004-2006, the calorimeters were extensively commissioned prior to first collisions in 2009. Since then, over 5 fb^{-1} of data have been collected. Results on the calorimeters' operation and performance will be presented, including the calibration, stability, absolute energy scale, uniformity, and time resolution. These results demonstrate that the calorimeters are performing well within the design requirements and are giving reliable input to the physics analyses.

Although LHC data-taking is expected to continue for a number of
years, plans are already under way for operation at an instantaneous luminosity about 5 times the original design of 10^{34} cm^{-2} s^{-1}, referred to as the HL-LHC. The calorimeter upgrade involves two phases. In the first, upgrades to the LAr calorimeter electronics will provide more granular information to the trigger and hence reduce the effects of the high pile-up noise. The second phase will be devoted to the complete replacement of the readout electronics of both the scintillator and LAr calorimeters. An additional complication may also arise in the case of the liquid argon hadronic calorimeter, where a replacement of the cold preamplifiers may be needed to cope with the radiation levels. Finally, for the FCal, the increased ionization
load at the HL-LHC poses a number of problems that may degrade its performance. These include beam heating, space charge effects in the LAr-gaps, and HV losses due to increased current draws through the current-limiting resistors. A number of proposed solutions will be discussed.

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