

Performance of the ALICE electromagnetic calorimeters in LHC Run 1 and Run 2 and upgrade projects

Wednesday, 27 November 2019 09:00 (20 minutes)

ALICE (A Large Ion Collider Experiment) incorporates two kinds of electromagnetic calorimeters: highly granulated photon spectrometer PHOS and large acceptance calorimeter EMCAL/DCAL. Both are located in the central part of the ALICE detector.

The PHOS spectrometer is an electromagnetic calorimeter based on scintillating PbWO_4 crystals dedicated to the precise measurements of spectra, collective flow and correlations of thermal and prompt direct photons, and of neutral mesons in ultra-relativistic nuclear collisions at LHC energies. The choice of active media allowed for the operation in a high multiplicity environment, the ability to reconstruct neutral pions up to very high transverse momenta and to reach excellent energy and position resolutions. In order to increase light yield of crystals and even further improve the energy resolution, PHOS is cooled to a constant temperature of -25°C . Dedicated L0 and L1 triggers allowed for an increased collected integrated luminosity in data taking.

EMCAL/DCAL is a sampling calorimeter based on lead/scintillator layers used for the measurement of electrons from heavy flavour decays, and the electromagnetic component of jets, spectra and correlations of isolated direct photons and spectra of neutral mesons. EMCAL/DCAL provides single photon and jet triggers which are used for high transverse momentum measurements.

PHOS and EMCAL participated in LHC Run 1 (2009-2013) and Run 2 (2015-2018), and a large amount of physical data were collected for pp collisions at $\sqrt{s} = 0.9, 2.76, 5.02, 7, 8, 13\text{ TeV}$, p-Pb collisions at $\sqrt{s_{NN}} = 5.02, 8\text{ TeV}$ and Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76, 5.02\text{ TeV}$. We give an overview of their performance in Run 1 and Run 2 in low and high multiplicity environments as well as plans for respective upgrades for future LHC runs.

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Session Classification: Running performance, upgrade