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PID performance of the MRPC-based ALICE-TOF detector

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The ALICE Time Of Flight (TOF) detector is based on Multigap RPC. The TOF covers the ALICE central barrel by means of an array of 1638 MRPC strips for more than 150000 readout channels, for a total active area of 140 m^2. Thanks to its excellent time resolution and efficiency, the TOF provides a fundamental contribution regarding the Particle IDentification (PID) in p-p, p-Pb and Pb-Pb collisions for physics analyses. The TOF provides PID in the intermediate momentum range; it achieves a separation better than 3 σ, up to a particle momentum of $p \sim 2.5\ GeV/c$ and $p \sim 4\ GeV/c$ for π/K and K/p, respectively. The TOF has been fully operational since more than five years; we report on the outstanding detector performances observed. Moreover we present the results obtained via a new calibration which led to a significant improvement in the time resolution - down to 60 ps - very close to the value observed in beam test measurements. In addition we present the results of a dedicated study where the same performance was eventually reached also in multi-hit events. Finally we report on the performance reached for the determination of the event collision time: it is an important ingredient of the overall quality of the PID performance of the TOF. Efficiencies, resolution and the improvement of the particle identification separation power of the methods used are presented for the different LHC colliding systems (pp, p-Pb and Pb-Pb).

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