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Performance evaluation of LHCf-ATLAS ZDC joint measurement using proton beam

The LHCf experiment measures neutral particles emmitted to the very forward region of pp collisions at the Large Hadron Collider (LHC) with a detectors located 140 m away from the ATLAS Interaction point (IP1). Measurements of neutrons will allow us to investigate π-p cross-section via one-pion exchange process as well as inelasticity measurement, which are important for air shower development. However, the precision of these measurements is limited by the energy resolution of the LHCf detectors.
To improve it, a joint measurement with ATLAS-ZDC, which will be installed behind the LHCf detector, will be performed with pp collisions at $\sqrt{s}$ = 13.6 TeV in September 2022. In September 2021, a beam test was conducted at the H4 beam line of SPS to verify the performance of the joint measurement. This beam test used 350 GeV proton beams. Combining the LHCf data with the ZDC data, we confirmed that the energy resolution improved from about 40% to 21%.

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