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Measurement of the long-range pseudorapidity correlations and associated Fourier harmonics in 5.02 TeV proton-lead collisions with the ATLAS detector

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Detailed measurement of the Fourier harmonics (v_n) associated with the azimuthal modulation of two-particle correlation structures over $-5 < \delta\eta < 5$ in 31 nb^{-1} p + Pb collisions are presented. The v_n results are presented as a function of p_T, \eta, and event activity characterized by the number of reconstructed tracks in $-2.5 < \eta < 2.5$, and the total transverse energy on the Pb-going side ($3.2 < \eta < 4.9$). The elliptic, triangular, and quadrangular coefficients, v_2, v_3 and v_4, are extracted for $0.5 < p_T < 15$ GeV, significantly extending the previous measurements. The v_n values are found to reach a maximum around 3-5 GeV and then decrease to a finite positive values at $p_T > 10$ GeV, similar to the behavior seen in Pb+Pb collisions. Evidence for rapidity-even dipolar flow v_1 is also observed, further supporting a collective origin of the long-range two-particle correlations. The first measurement of the eta dependence of these correlations suggests that the v_2 values are smaller in the proton-going side than those in the Pb-going side. Finally v_n results are also extracted with four-particle cumulant method and compared with those obtained with two-particle correlation method. These results provide new important insights on the physics underlying the long-range pseudorapidity correlations.

On behalf of collaboration:

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