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Event selection and Z→μμ cross section as a function of charged-particle multiplicity in pp collisions at $\sqrt{s}$ = 5.36 TeV with CMS

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Abstract

Measurements of hard-process production as a function of charged-particle multiplicity in small systems require a careful control of pileup, since additional interactions modify the multiplicity observable and bias the event classes. We present a pileup-rejection filter ported to Run 3 MiniAOD and tuned for the 5.36 TeV pp reference data, together with its validation on zero-bias data and simulation, including a closure test on the vertex-associated multiplicity used in the analysis. Using the 2024 pp reference dataset, we measure the Z→μμ cross section differentially in Z transverse momentum and in classes of charged-particle multiplicity, with efficiency corrections and unfolding to the generator level. The results are compared with NNLO+NNLL predictions from DYTurbo for several PDF sets, with scale, PDF and resummation uncertainties. The calculation chain was first validated against the published CMS predictions at 5.02 TeV. This measurement provides a precise electroweak reference for the study of heavy-flavour production versus multiplicity.

Primary author(s) : Mr. NERI HUERTA, Fernando Enrique (FCFM-BUAP)

Presenter(s) : Mr. NERI HUERTA, Fernando Enrique (FCFM-BUAP)

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