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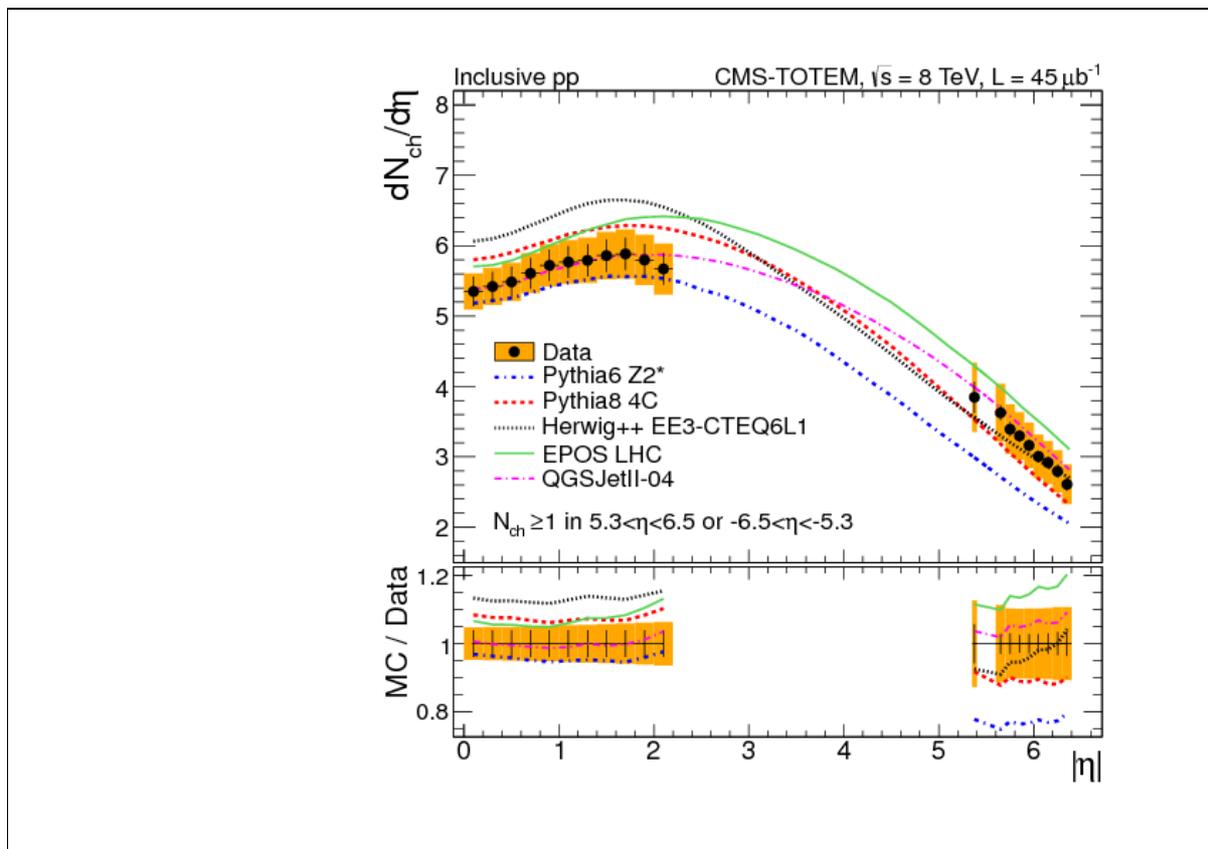
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# Measurement of pseudorapidity distributions of charged particles in proton-proton collisions at $\sqrt{s} = 8$ by the CMS and TOTEM experiments

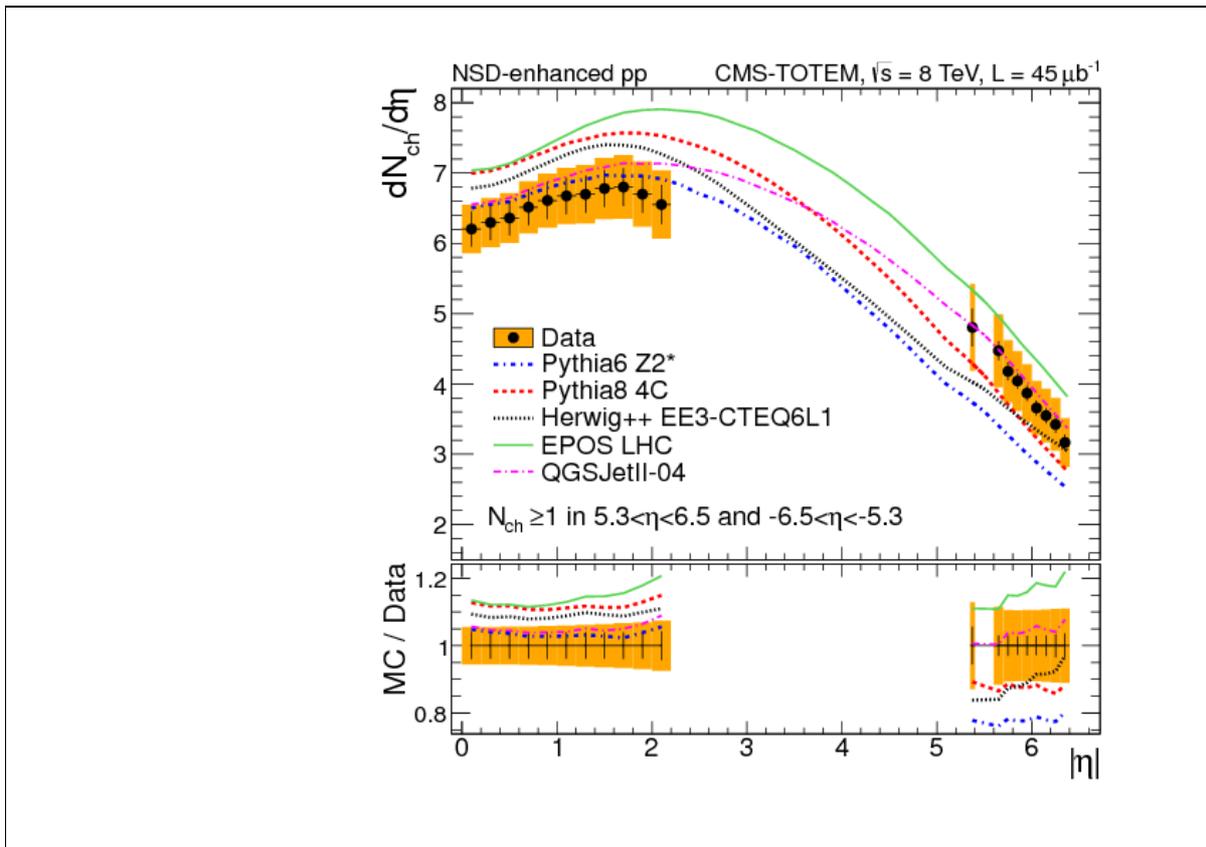
## Abstract

Pseudorapidity ( $\eta$ ) distributions of charged particles produced in proton-proton collisions at a centre-of-mass energy of 8 TeV are measured in the ranges  $|\eta| < 2.2$  and  $5.3 < |\eta| < 6.4$  covered by the CMS and TOTEM detectors, respectively. The data correspond to an integrated luminosity of 45 inverse microbarns. Measurements are presented for three event categories. The most inclusive category is sensitive to 91-96% of the total inelastic proton-proton cross section. The other two categories are disjoint subsets of the inclusive sample that are either enhanced or depleted in single diffractive dissociation events. The data are compared to models used to describe high-energy hadronic interactions. None of the models considered provide a consistent description of the measured distributions.

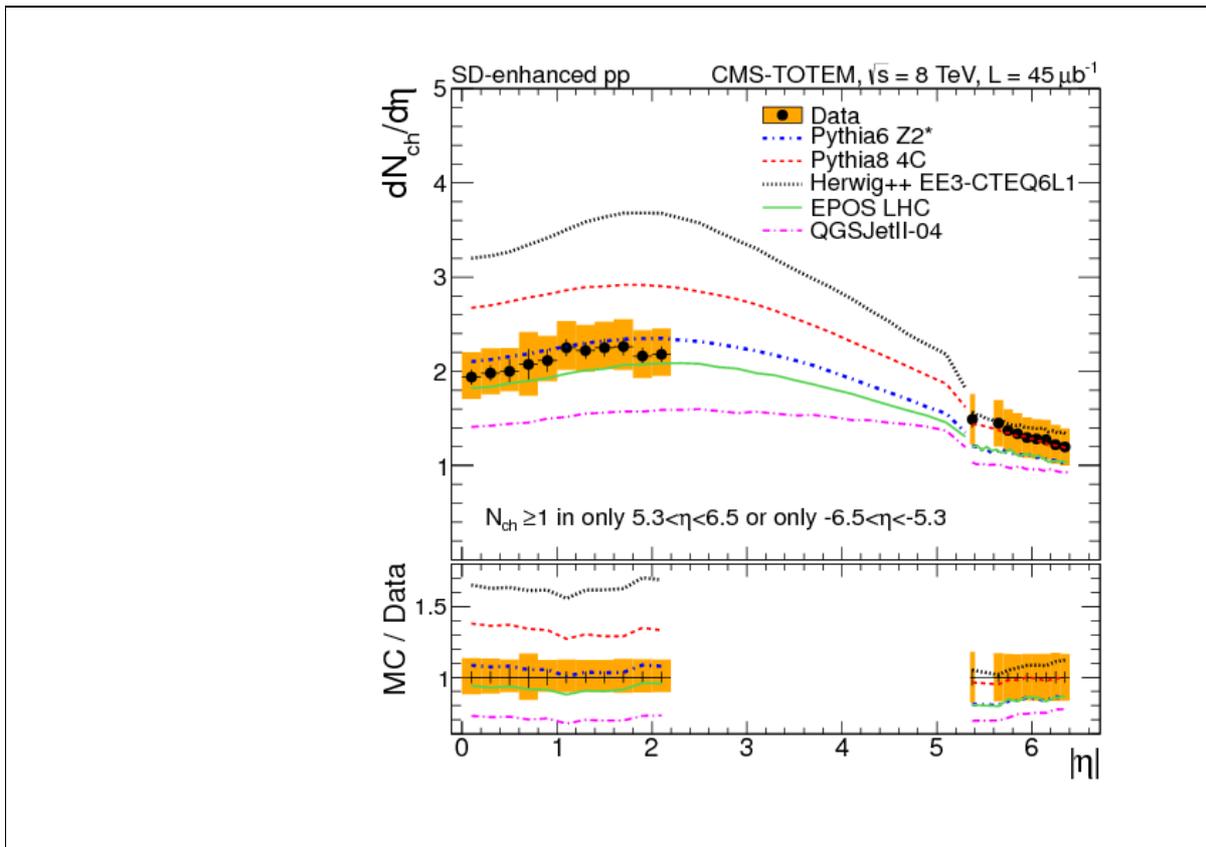
## Figures



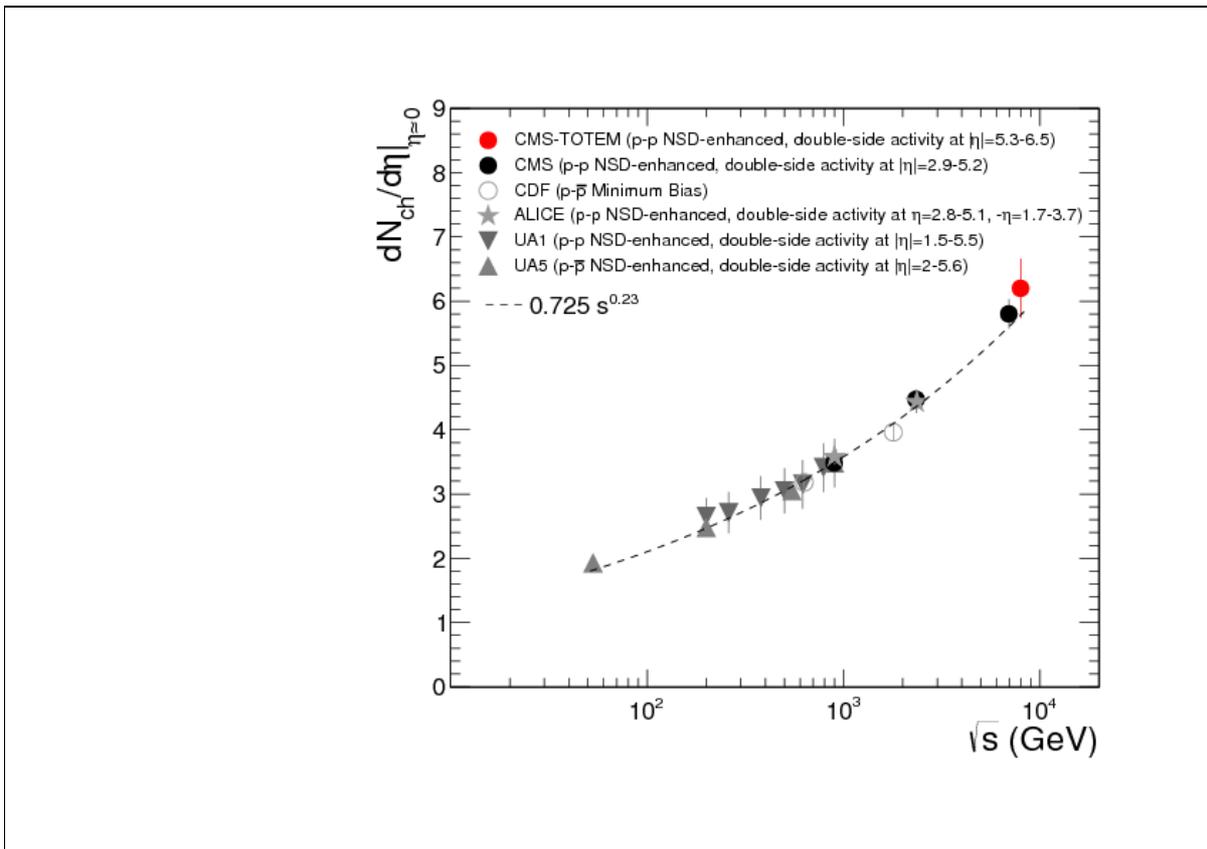
**Figure caption:** Charged-particle pseudorapidity distributions from an inclusive sample. The error bars represent the statistical + uncorrelated systematics between neighbouring bins and the bands show the combined systematic and statistical uncertainties. The measurements are compared to results from PYTHIA6, tune Z2\*, PYTHIA8, tune 4C, HERWIGpp, tune UE-EE-3 with CTEQ6L1 PDFs, EPOS, tune LHC, and QGS-04.



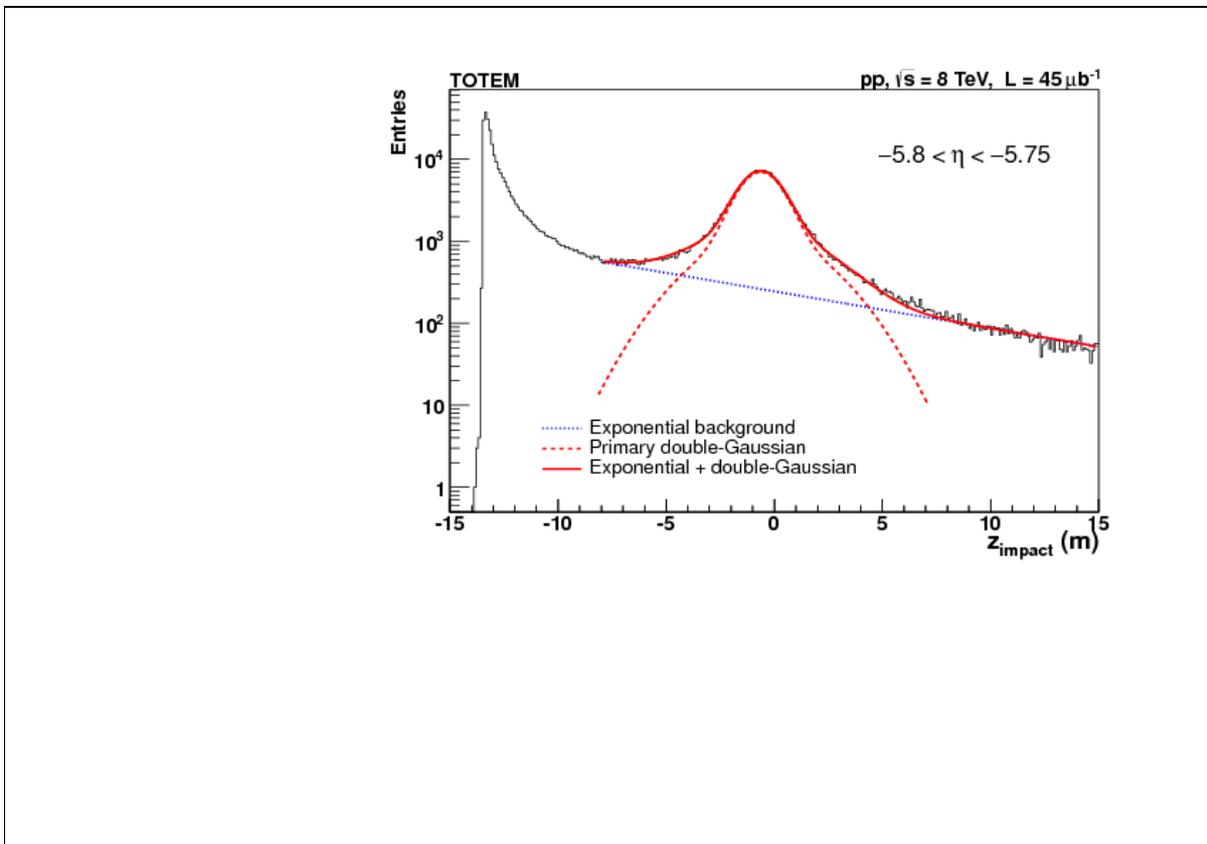
**Figure caption:** Charged-particle pseudorapidity distributions from a NSD-enhanced sample. The error bars represent the statistical + uncorrelated systematics between neighbouring bins and the bands show the combined systematic and statistical uncertainties. The measurements are compared to results from PYTHIA6, tune Z2\*, PYTHIA8, tune 4C, HERWIGpp, tune UE-EE-3 with CTEQ6L1 PDFs, EPOS, tune LHC, and QGS-04.



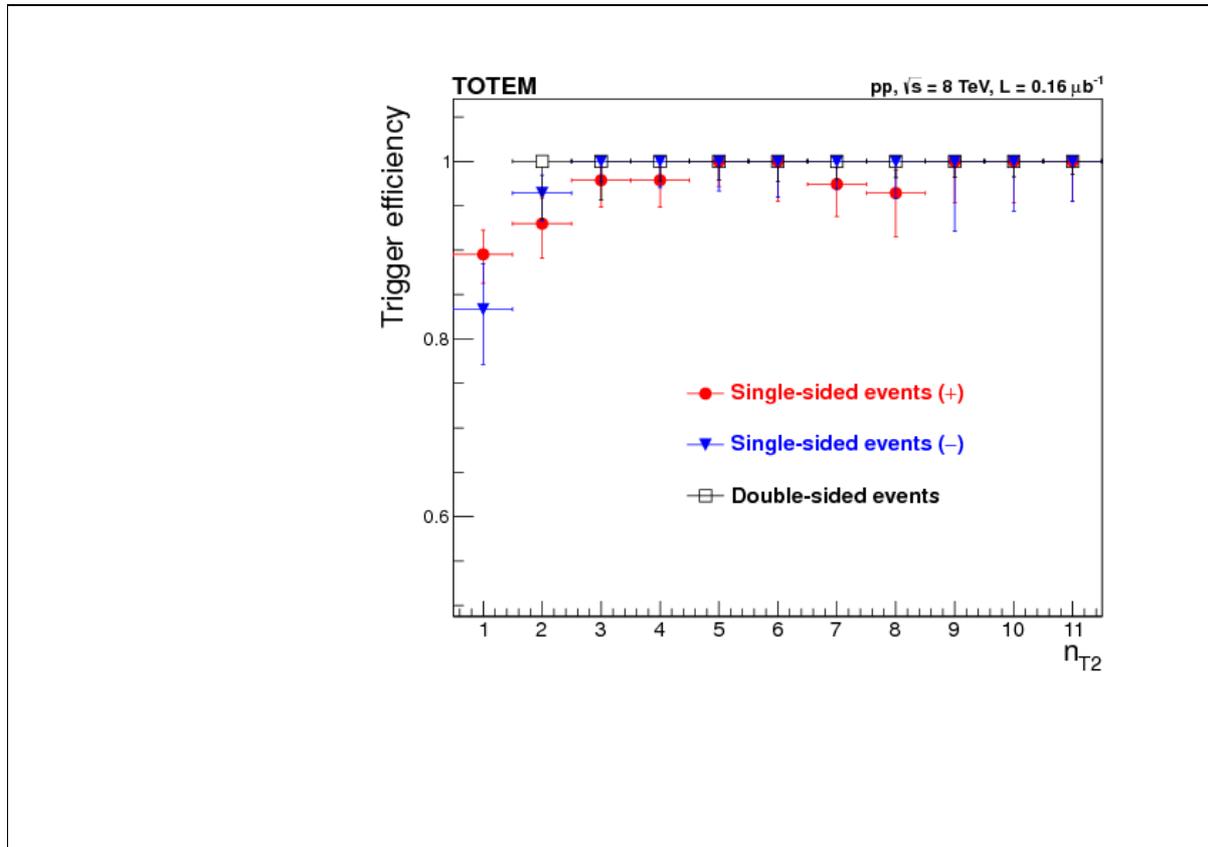
**Figure caption:** Charged-particle pseudorapidity distributions from a SD-enhanced sample (bottom). The error bars represent the statistical + uncorrelated systematics between neighbouring bins and the bands show the combined systematic and statistical uncertainties. The measurements are compared to results from PYTHIA6, tune Z2\*, PYTHIA8, tune 4C, HERWIGpp, tune UE-EE-3 with CTEQ6L1 PDFs, EPOS, tune LHC, and QGS-04.



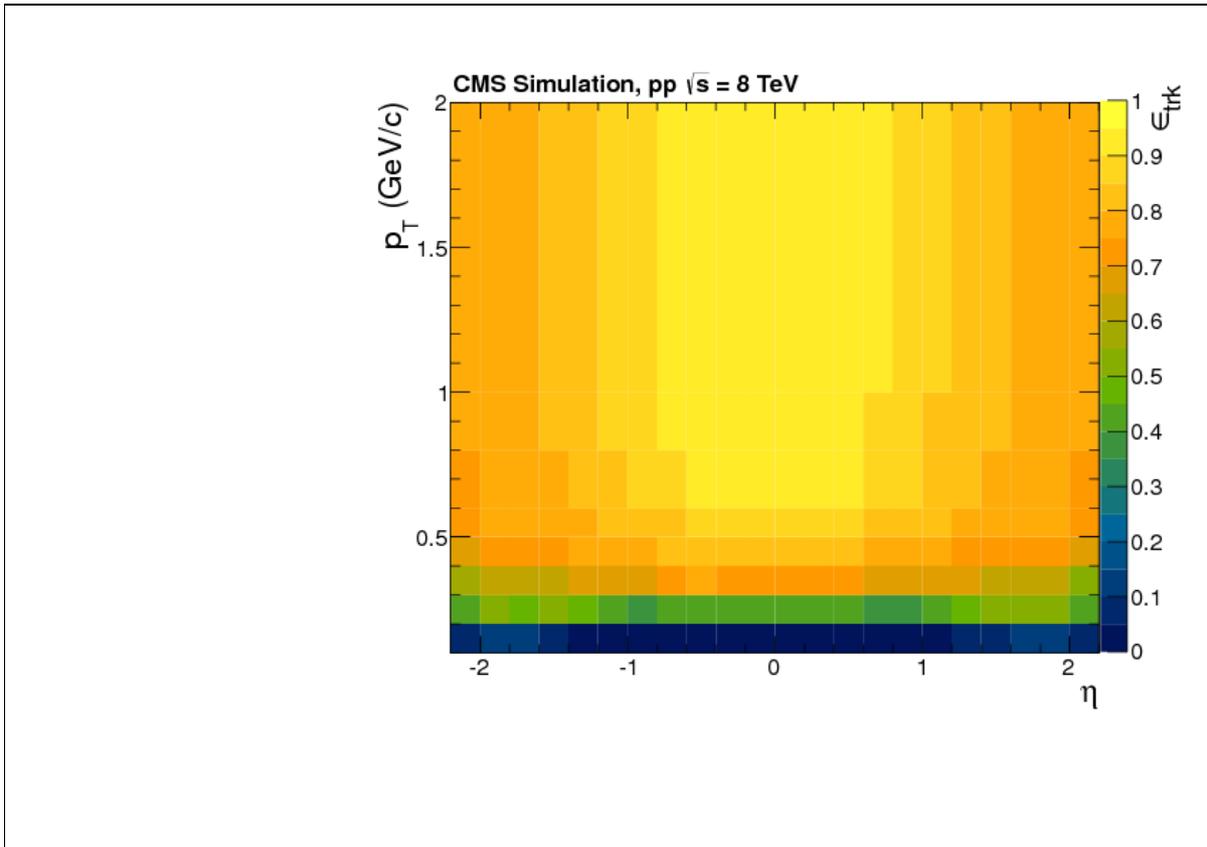
**Figure caption:** Value of  $dN_{ch}/d\eta$  at  $\eta = 0$  as a function of the centre-of-mass energy in p-p and p-pbar collisions. Shown are measurements performed with different NSD event selections from UA1, UA5, CDF, ALICE, and CMS. The dashed line is a power-law fit to the data.



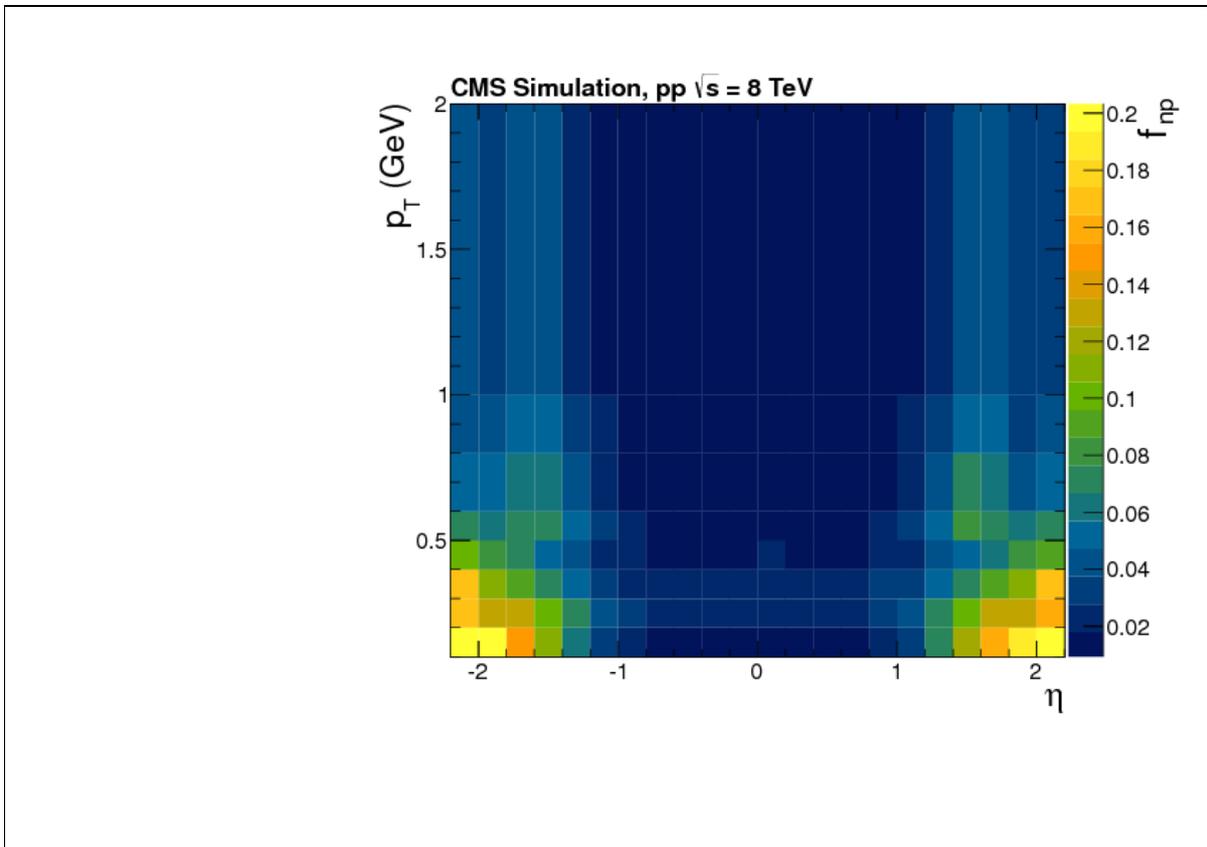
**Figure caption:** The zimpact parameter distribution for the data tracks reconstructed in one T2 half-arm in the range  $-5.8 < z < -5.75$ . A global (double-Gaussian + exponential function) fit, performed in the range from  $-8$  to  $15\text{m}$  is shown by the solid curve. The dotted curve represents the exponential component from secondary particles, while the dashed curve is the double-Gaussian component, mainly due to primary tracks.



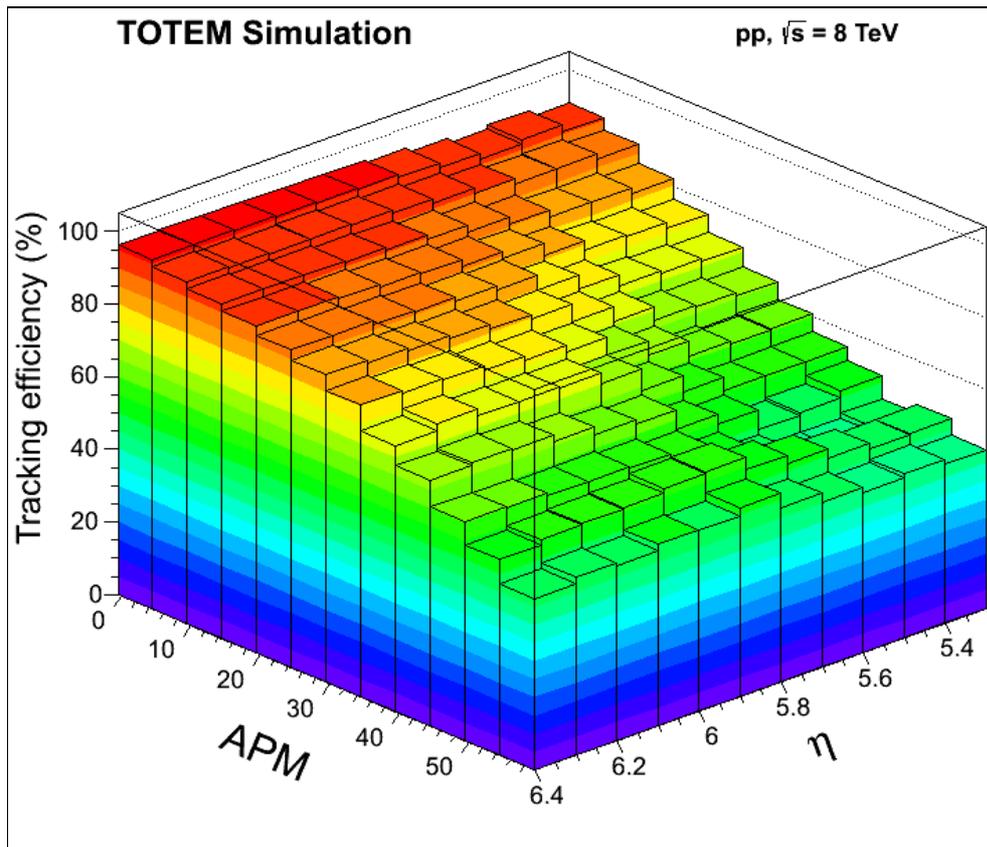
**Figure caption:** Trigger efficiency as a function of the total track multiplicity in the T2 telescopes for single-sided events with primary candidates in only the  $z > 0$  (+) or  $z < 0$  (-) telescope and double-sided events with primary candidates in both telescopes.



**Figure caption:** tracking efficiency,  $\epsilon_{\text{trk}}$ , as a function of  $p_T$  and  $\eta$  and averaged over all multiplicity bins (nCMS), for tracks with  $p_T > 0.1$  GeV/c and  $|\eta| < 2.2$ .



Correction factor,  $f_{np}$ , for non-primary tracks as a function of  $p_T$  and  $\eta$  and averaged over all multiplicity bins (nCMS), for tracks with  $p_T > 0.1$  GeVc and  $|\eta| < 2.2$



**Figure caption:** Primary track efficiency as a function of  $\eta$  and average pad cluster multiplicity (APM) in one T2 half-arm for the inclusive pp sample. The efficiency includes the track primary-candidate condition. Only particles with  $p_T > 40$  MeVc are considered.

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