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Multiplicity and transverse energy measurements from pp, pPb, PbPb and XeXe collisions with the CMS experiment

One of Richard Feynman's shortest and most cited papers concerns his prediction that for very high energy collisions, the analyticity condition for quantum fields should cause the fragmentation of a nuclear target to become independent of the collision energy. CMS has measured the pseudorapidity dependence of charged-hadron multiplicity and transverse energy for a wide range of energies and system sizes. These include pp (0.9 to 13 TeV), pPb (5.02 and 8.16 TeV), PbPb (2.76 and 5.02 TeV), and recently multiplicity measurements from XeXe at 5.44 TeV. In the midrapidity region, $|\eta| < 2.4$, the multiplicity measurements are based upon the CMS pixel detectors and the transverse energy measurements use information from both the calorimeters and tracking detectors via a particle flow algorithm. In the forward region, the TOTEM T2 tracker has been used to measure the charged-particle multiplicity in the region $5.5 < \eta < 6.3$ for 8 TeV pp collisions while the HF and CASTOR Cherenkov calorimeters have been used to measure transverse energy in the $3 < |\eta| < 6.5$ for a variety of systems. The results are compared across the different collision systems after normalising for the number of participating nucleons. The very large rapidity and energy range of the data allow detailed tests of state-of-the-art production models and event generators as well as tests of Feynman's early hypothesis.

Summary

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