

# Measurement of the differential cross section of Z boson production in association with jets at CMS

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The measurement of the differential cross section of Z boson production in association with jets (Z+jets) in proton-proton collision at the center-of-mass energy of 13 TeV will be present. The data has been recorded with the CMS detector at the LHC during the year 2015, corresponding to an integrated luminosity of 2.19 fb<sup>-1</sup>. The goal of analysis is to perform a first measurement at 13 TeV of the cross sections of Z+jets as a function of the jet multiplicity, its dependence on the transverse momentum of the Z boson, the jet kinematic variables (transverse momentum and rapidity), the scalar sum of the jet momenta, and the balance in the transverse momentum between the reconstructed jet recoil and the Z boson. The results are obtained by correcting the detector effects, and are unfolded to particle level. The measurement are compared to four predictions using different approximations: at the leading-order (LO), next-to-leading-order (NLO) and next-to-next-to-leading order (NNLO) accuracy. The first two calculations used `{\sc MadGraph5_aMC@NLO}` interfaced with `{\sc pythia8}` for the parton showering and hadronisation, one of which includes matrix elements (MEs) at LO, another includes one-loop corrections (NLO). The third is a fixed-order calculation with NNLO accuracy for Z+1 jet using the N-jettiness subtraction scheme (Njetti). The fourth uses the `{\sc geneva}` program with an NNLO calculation combined with higher-order resummation.

Key words: physics, CMS, standard model, Quantum Chromodynamics, cross section, Z boson, jets, `{\sc MadGraph5_aMC@NLO}`, `{\sc geneva}`

## Summary

In summary, the predictions the NLO multiparton calculation by `{\sc MG5_aMC@NLO}` interfaced with `{\sc pythia8}` gives better descriptions. The prediction of `{\sc geneva}` shows good agreement with measurement with accuracy at NLO (Njets $\geq$ 1), while for LO accuracy it still needs to be improved. The measurement results suggest to use multiparton NLO predictions for the estimation of the Z + jets at CMS in the SM measurement and searches, along with its associated uncertainties.

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