



Contribution ID: 67

Type: **not specified**

Higher-order corrections for $t\bar{t}Z$ production

We present calculations of higher-order QCD and electroweak (EW) corrections to the associated production of a top-antitop quark pair and a Z boson, i.e. $t\bar{t}Z$ production, in proton collisions. We find that the contributions from soft-gluon corrections are numerically dominant and large. We present approximate NNLO (aNNLO) and approximate $N^3\text{LO}$ (aN³LO) cross sections that include soft corrections on top of the exact NLO QCD result. We also add electroweak corrections through NLO. We compare our aN³LO QCD + NLO EW theoretical results to measurements of total cross sections from the LHC, and we also calculate top-quark differential distributions in transverse momentum and rapidity.

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Session Classification: WG4: QCD with Heavy Flavors and Hadronic Final States

Track Classification: QCD with Heavy Flavors and Hadronic Final States