Measurement of the production cross sections of a Z boson and one or more b jets at \(\sqrt{s}=7\) TeV

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**Abstract:** The \(Z(b\bar{b})\) b-jets cross-section with exactly one or at least 2 b-jets is measured at 7 TeV with the CMS detector at LHC. The production of a Z boson with at least one b jet is of interest for precision tests of perturbative QCD and as background for many searches. The results are compared to various theoretical predictions, especially including different generator schemes. Kinematic properties are also compared with the predictions from MADGRAPH event generator using the PYTHIA parton shower simulation.

**0. Motivations and Theory**

Z\(b\bar{b}\): perturbative QCD test

- Different simulation approaches for the production of b-quarks: 4F vs 5F, tree-level vs NLO.
- Four flavor scheme (4F)
- Five flavor scheme (5F)

**1. Selection**

- TTbar:
  - Estimated fit to SV mass of the 1 or 2 b-tagged jets
  - Normalized to data using CMS cross section measurement

- ZZ: from CMS measurement

- Template are taken from simulation for tt and from data for DY

**2. Background estimation**

- Background fractions

**3.a Unfolding**

- Unfold observed yields → Particle level yields
- If n-tagged jets → n reconstructed jets → generated b-jets

- Generated signal definition:
  - 1 Z candidate from opposite charged leptons in the detector acceptance
    - Use of dressed leptons: adding to the lepton all generator-level photons within a cone of \(\Delta R<0.1\)
    - Event purity

- ZZ: from CMS measurement
  - Normalized to data using CMS cross section measurement

**4. Measured Cross Section**

- Cross sections are compatible between both channels and combined in a single measurement

**5. Data / MC comparisons of kinematic variables**

**References**