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Measurement of the Z/γ^* \rightarrow $\tau\tau$ cross section in pp collisions at $\sqrt{s}=13$ TeV and validation of τ lepton analysis techniques

by: Sirunyan, AM (Sirunyan, A. M.)^[1]; Tumasyan, A (Tumasyan, A.)^[1]; Adam, W (Adam, W.)^[2]; Ambrogi, F (Ambrogi, F.)^[2]; Asilar, E (Asilar, E.)^[2]; Bergauer, T (Bergauer, T.)^[2]; Brandstetter, J (Brandstetter, J.)^[2]; Brondolin, E (Brondolin, E.)^[2]; Dragicevic, M (Dragicevic, M.)^[2]; Ero, J (Ero, J.)^[2] ...More

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Abstract

A measurement is presented of the $Z/\gamma^* \rightarrow \tau\tau$ cross section in pp collisions at $\sqrt{s} = 13$ TeV, using data recorded by the CMS experiment at the LHC, corresponding to an integrated luminosity of 2.3 fb⁻¹. The product of the inclusive cross section and branching fraction is measured to be $\sigma(\text{pp} \rightarrow Z/\gamma^* + X) \text{B}(Z/\gamma^* \rightarrow \tau\tau) = 1848 \pm 12 \text{ (stat)} \pm 67 \text{ (syst + lumi)}$ pb, in agreement with the standard model expectation, computed at next-to-next-to-leading order accuracy in perturbative quantum chromodynamics. The measurement is used to validate new analysis techniques relevant for future measurements of τ lepton production. The measurement also provides the reconstruction efficiency and energy scale for τ decays to hadrons + $\nu(\tau)$ final states, determined with respective relative uncertainties of 2.2 and 0.9%.

Keywords

KeyWords Plus: PROTON-PROTON COLLISIONS; MODEL HIGGS-BOSON; ATLAS DETECTOR; SEARCH; PAIR; MASS; LHC

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