A Search for New Physics in Events with Two Photons and Missing Energy in pp Collisions at \( \sqrt{s} = 8 \) TeV

Abstract

by

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This dissertation describes a search for new physics that has been performed at the Compact Muon Solenoid experiment. The search makes use of an integrated luminosity \( \int \mathcal{L} = 19.5 \, fb^{-1} \) of data taken during the 2012 proton-proton collisions at center of mass energy \( \sqrt{s} = 8 \) TeV produced by the Large Hadron Collider near Geneva, Switzerland. The search has been performed on events with two photons, jets, and missing transverse energy. The final state for this search is motivated by the theory of gauge-mediated supersymmetry breaking but is sensitive to any new physics producing massive particles decaying via this channel. The dominant standard model backgrounds to this final state include quantum chromodynamics processes and electroweak processes involving W bosons. No excess above standard model backgrounds is observed. The results have been interpreted in the context of gauge-mediated supersymmetry in multiple model scans, resulting in 95% confidence level limits on signal production cross sections between X and Y \( fb \). The upper limits are the most stringent to date for gauge-mediated supersymmetry models.