

Searching for New Physics at the Large Hadron Collider

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The Large Hadron Collider (LHC) at CERN is the most powerful particle collider ever built, and its construction and operation represent one of the most ambitious scientific undertakings in history. It was designed to test the standard model (SM) of particle physics by studying interactions of the smallest particles through collisions of protons. The discovery of the Higgs boson in 2012, the final unobserved particle predicted by the SM, was a major milestone in this work. I will introduce the Large Hadron Collider and the Compact Muon Solenoid (CMS) experiment and the role they play as tools for probing the structure of matter at the smallest scales. I will present a new search with the CMS detector for the production of W and Z bosons, associated with hadronic “jets,” a rare and unmeasured process predicted by the SM. I will also discuss the role of this process in testing extensions of the SM, including searches for theorized charged Higgs bosons and generalizations of new interactions between the Higgs boson and the vector bosons.