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Searches for Physics beyond the Standard Model at the LHC

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At the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN), protons and heavy ions are made to collide together near the speed of light to study particle interactions and give us an insight to the fundamental laws of nature. Three experiments that are located on the circular ring of the LHC specialize in proton-proton collisions, namely a toroidal LHC apparatus (ATLAS), a compact muon solenoid (CMS), and the large hadron collider beauty (LHCb). The energy and intensity of the particle beams at the LHC are unprecedented. The data recorded by the detectors that are located on the circular ring of the LHC already exceeded 200 petabytes in summer last year, and a petabyte a day is processed at the CERN data center alone. These data are used to study known particles of the well-established Standard Model of particle physics including the long expected and recently discovered Higgs boson.

With predictions such as the existence of the W and Z bosons, gluon, top and charm quarks, and Higgs boson, and experimental confirmations with good precision, the standard model is the most successful theory of particle physics to date describing the strong, weak and electromagnetic forces of nature. The standard model cannot, however, accommodate experimentally observed phenomena like gravity, neutrino masses, and dark matter. The theory can also be theoretically unsatisfying as a result of parameters that go unexplained, such as the value of the Higgs mass despite its large quantum corrections, implying a lack of understanding. For this reason, in addition to precision measurements of standard model observables, experiments search for new physics beyond the the standard model that could explain some of the shortcomings of the standard model. A selection of results for searches for new physics beyond the Standard Model using data recorded by ATLAS, CMS, and LHCb are presented in this talk.

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