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Testing the Fundamental Laws of Nature at the Energy Frontier

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Abstract: Experiments performed at the Large Hadron Collider at CERN, the world's largest and most powerful particle accelerator, are testing the fundamental laws of physics at unprecedented high energies and small distances. One of the most profound open questions that is being addressed concerns the origin of the electroweak scale, at which the electroweak force is confined to short distances. Our current theory of the fundamental interactions gives an incredibly accurate description of all laboratory experiments performed so far, but does not explain the electroweak scale and predicts an incorrect cosmological evolution of our Universe. I will illustrate some of the fascinating theoretical ideas that have been proposed and discuss what the experimental data are suggesting so far, in particular on the role and nature of the Higgs boson.