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Mapping out the Higgs Boson: Highlights from the LHC Experiments

Wednesday 2 April 2025 11:30 (30 minutes)

The Higgs boson holds a unique position within the Standard Model of Particle Physics; it is the only known fundamental spin-0 particle and it has intrinsic links to the mass-generation mechanisms of fundamental particles and to the evolution of the Universe. It could hold a crucial key to unlocking access to yet unknown physics.

This talk will present the latest results of Higgs-boson research at the ATLAS and CMS experiments using proton-proton collision data from the Large Hadron Collider. The unprecedented precision reached in probes of Higgs boson couplings to fundamental fermions, leptons and quarks, hone in on the question if these couplings are proportional to the fermion masses as expected in the Standard Model or reveal the existence of additional unknown sources of mass generation. More extensive measurements of differential cross-sections probe for new physics affecting Higgs-boson production. Pushing the limits on studies of the Higgs-boson self-coupling further maps out the shape of the Higgs-field potential, which is connected to the long-term stability of the Universe. New and improved searches for other Higgs-boson-like particles and exotic Higgs-boson decays are cornering theories of additional phase transitions in the early universe and theories on the nature of dark matter. This presentation will also discuss the challenges of Higgs-boson research at the Large Hadron Collider and feature recent advancements in measurement techniques.

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Session Classification: Invited Overview Talks / Hauptvorträge