



ENRICO FERMI INSTITUTE COLLOQUIUM

MEASURING THE HIGGS POTENTIAL AT THE LHC AND BEYOND

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The overabundance of matter over antimatter in the universe today is one of the major unanswered questions in modern physics. Several mechanisms for generating this asymmetry have been theorized but not all are testable at current particle physics facilities. If beyond the Standard Model (BSM) physics enters in the Higgs sector that modifies the electroweak phase transition and/or adds new sources of CP-violation in Higgs couplings, electroweak baryogenesis is a compelling explanation for the matter-antimatter asymmetry. Measurement of the Higgs self-coupling provides information on the local shape of the Higgs potential, which can reveal imprints of relevant BSM effects. The best probe of the Higgs self-coupling is through searches for double-Higgs production in the $bb\gamma\gamma$ final state. In this talk, I will present the ATLAS search for HH production in this channel using the full Run 2 dataset and interpretations in effective field theories. I will also discuss the ongoing effort to build the ATLAS inner pixel system at SLAC as part of the future tracker upgrade (ITk). The ITk upgrade is an essential part of the ATLAS Phase II upgrade program that is planned for the High-Luminosity LHC (HL-LHC) starting in 2029, during which data taking rates will increase by 4-5x, facilitating a 5σ observation of SM-like HH production. I will conclude by discussing future Higgs factory facilities under consideration and present the first comparative evaluation of their environmental sustainability.

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3:30 PM

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