

T 26: Invited Topical Talks 1

Time: Tuesday 14:00–15:30

Location: Geb. 30.21: Gerthsen-HS

Invited Topical Talk T 26.1 Tue 14:00 Geb. 30.21:
Gerthsen-HS

New physics searches through the Higgs and atomic windows — ●ELINA FUCHS — Leibniz University Hannover, Germany — Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

The observed matter-antimatter asymmetry of the Universe and the existence of Dark Matter are among the most compelling evidences for the necessity of physics beyond the Standard Model. As these puzzles do not predict at which energy scale to expect a discovery, a variety of observables at different energies is needed to explore viable scenarios. I will present two such avenues.

On the one hand, I will discuss how the precise measurements of the Higgs couplings allow one to determine to which extent CP violation in the interactions of the Higgs boson may contribute to the amount of CP violation needed to explain the observed baryon asymmetry. I will also show examples of Machine Learning approaches to improve the sensitivity to CP violation in Higgs couplings.

In a complementary way, I will present how high-precision frequency measurements in atoms and ions open up a quantum sensing window for searches for ultralight dark bosons.

Invited Topical Talk T 26.2 Tue 14:30 Geb. 30.21:
Gerthsen-HS

Study of electroweak interactions via vector boson scattering at the ATLAS detector — ●GIA KHORIAULI — Julius-Maximilians-Universität Würzburg

The LHC has opened the possibility of experimental studies of the self-interactions of the electroweak vector bosons in proton-proton collisions at the TeV energy scale. Electroweak vector boson scattering (VBS) processes imply the interactions between two vector bosons that

produce two final state vector bosons. The production is accompanied with two energetic back-to-back hadronic jets in the forward regions of the detector. These jets are initiated from the interacting quarks which radiated the scattering vector bosons. Leading order amplitudes of the electroweak VBS processes are sensitive to the triple and quartic gauge couplings between the vector bosons as well as to their couplings with the Higgs boson. Measurements of these processes are therefore important tests of the Standard Model and its symmetry breaking mechanism. The electroweak VBS final states have relatively low production cross sections at the LHC energies. This makes them sensitive to possible new physics effects that lead to anomalous quartic gauge couplings between the vector bosons and hence, to measurable deviations from the Standard Model predictions. Studies of various electroweak VBS final states at the ATLAS detector are presented. Experimental methods of the measurements and effective field theory interpretations of the results for model-independent searches for anomalous quartic gauge couplings are discussed.

Invited Topical Talk T 26.3 Tue 15:00 Geb. 30.21:
Gerthsen-HS

AI-aided searches for new physics — ●BENEDIKT MAIER — KIT, Karlsruhe, Germany

After the discovery of the Higgs boson, LHC experiments have not yet been able to find new, additional elementary particles that could explain the biggest open questions in particle physics and cosmology. To maximize the sensitivity of the searches, artificial intelligence solutions are permeating the analysis strategies, improving the results and sometimes enabling entirely new types of searches. I will present recent highlights of employing machine learning to find new physics at the LHC, and provide a perspective on what can be expected in the coming years leading up to the High Luminosity-LHC.