Physikalisches Institut
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SONDERKOLLOQUIUM

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BIBLIOTHEK, WESTBAU PHYSIK

Transforming the investigation of the Higgs potential

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The discovery of the Higgs particle in 2012 at the Large Hadron Collider (LHC) by the ATLAS and CMS experiments opened the door to investigating the least understood part of the Standard Model of particle physics. Probing the structure of the Higgs potential is among the highest priority goals of the LHC physics programme. The inability of the Higgs potential, associated with just one Higgs boson, to explain the observed imbalance of matter and antimatter in the Universe provides strong motivation for an extended Higgs sector with new massive scalar or pseudo-scalar states. Likewise, additional particles are predicted by extensions of the Standard Model that provide a dynamical explanation for Higgs spontaneous symmetry breaking.

The LHC's resumed operation in 2022 provides a unique opportunity to search for these new particles and explore the Higgs field. The combined production of multiple top quarks and heavy bosons is among the most promising, yet also most challenging, signatures to study to this end. Recent advances in machine learning, resulting in novel algorithms for the identification of heavy-flavour jets, make these rare and complex signatures accessible.

My talk will discuss searches for heavy bosons in final states with multiple top quarks and the state-of-the-art flavour tagging algorithms which enable their study. It will conclude with an outlook on future collider experiments, motivating the required advances in instrumentation needed for exploiting the full potential of a "Higgs factory".