

SONDERKOLLOQUIUM

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Does the Higgs boson wear a Mexican-hat?

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The discovery of the Higgs boson in 2012 was a triumph for our understanding of how nature works at the smallest scales. In the past decade, many properties of this unique particle have been measured. But despite this remarkable progress, our global picture of the Higgs boson is still blurry. One of the most important properties has so far eluded precise experimental testing: the Higgs potential.

Theory predicts that the Higgs boson's underlying quantum field has a Mexican-hat shaped potential with a minimum at non-zero field values. The exact shape of this potential has far-reaching implications for our understanding of the electroweak vacuum and can be linked to baryogenesis in the early universe. But how can we check it?

In my seminar, I will show how searches for Higgs boson pair production with the ATLAS detector at the LHC enable us to directly probe the shape of the Higgs potential through its self-interaction. Starting from a recent snapshot of the Higgs boson, I will discuss the experimental challenges that searches for Higgs boson pair production face. I will elaborate on how ongoing efforts on the detector upgrade and the development of new analysis techniques will bring us closer to the once-thought-impossible observation of this rare process at the LHC, narrowing in on the shape of the Higgs potential.