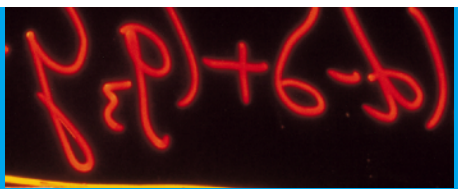
DESY
Particle and Astroparticle Physics Colloquium



Fingerprints of the vacuum:

Precision searches in di-top and di-Higgs final states in ATLAS.

Tuesday, 26 November, 2024
Auditorium & Webcast 16:00 h

ZOOM ID: 996 1652 8733
Meeting Password: 733220

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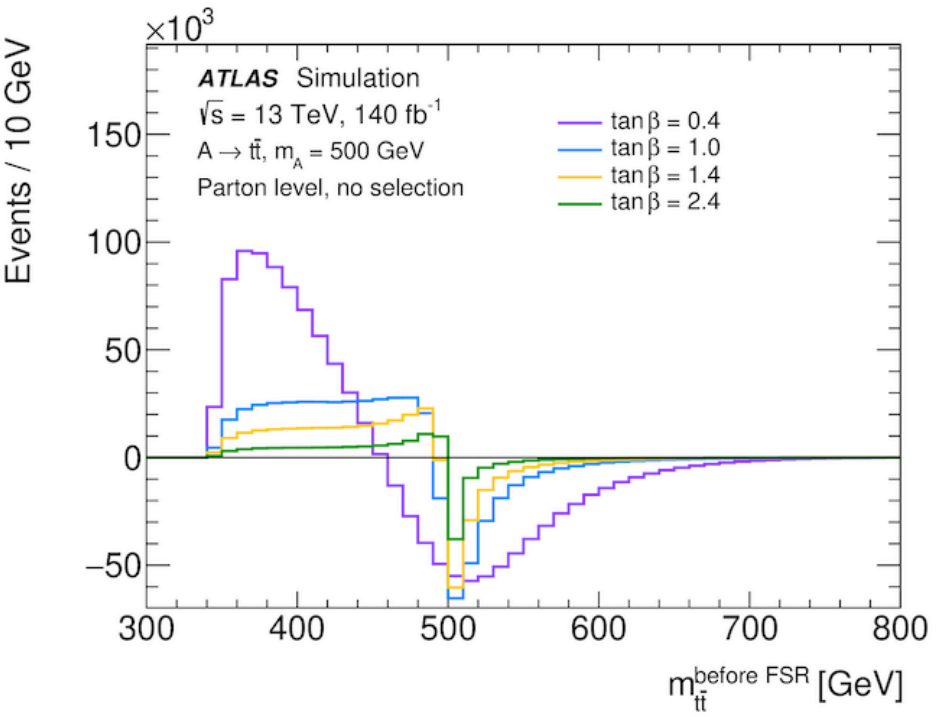
Tremendous progress has been made in measuring precisely key properties of the Higgs boson discovered in 2012 by the ATLAS and CMS Collaborations, such as its mass and couplings to the heavier particles of the Standard Model (SM). However, these measurements probe only a small region of the Higgs potential, close to the electroweak vacuum. Uncovering the full shape of the Higgs potential - the "fingerprint of the vacuum" - is of crucial importance for our understanding of the evolution of the early universe and could provide answers to further key questions of particle physics, such as the origin of the baryon asymmetry.



Searches for Higgs boson pair production provide the most direct access to the shape of the Higgs potential via the trilinear Higgs self-coupling. In parallel, direct searches for additional Higgs bosons could reveal a much more complex Higgs potential arising in the presence of additional Higgs fields. These additional Higgs bosons could have evaded traditional searches, which target local excesses in the data, if they decay primarily to a top-antitop quark pair. This signal process would interfere strongly with the main background from SM top-antitop production, leading to complex interference patterns, which, like a fingerprint, carry valuable information about the properties of the new state.

I will discuss the results of the latest searches for Higgs boson pair production from the ATLAS experiment as well as a recent interference search for heavy scalars and pseudoscalars decaying to a top-antitop quark pair.

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