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Hertha-Sponer-Prize 2025: Searching for the fingerprints of new phenomena with top quarks

Tuesday 1 April 2025 12:00 (30 minutes)

New phemonena may be more difficult to spot at the LHC than commonly assumed. Unlike the Higgs boson discovered in 2012, which was identified as a clear, localised peak on top of a smooth background distribution, additional heavier Higgs bosons or axion-like particles could manifest themselves as much more complicated interference patterns if they decayed primarily to a top-antitop quark pair. While much more challenging to identify and treat statistically, these interference patterns, like fingerprints, would carry valuable information about the properties of the new particles.

In this talk, I will present a comprehensive search for interference patterns on the ATLAS Run-2 dataset. For the first time, a consistent and proper statistical treatment of signal-background interference is presented. The search provides stringent constraints on previously unexplored parameter spaces of models with an extended Higgs sector or dark matter.

Presenter: BEHR, Katharina (ATLAS (Fingerprint of the Vacuum))

Session Classification: Plenary