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Probing CP couplings in $t\bar{t}X$ production at the Run 3 of the LHC

Wednesday, 6 July 2022 11:14 (8 minutes)

In this talk, we present simplified Dark Matter (DM) models for particle mediators between the Dark Sector and the Standard Model of particle physics. We focus on DM mediators produced in the s-channel together with a top quark pair, which are expected to be within experimental reach of the LHC.
We explore the experimental sensitivity obtained from CP-sensitive variables used in Higgs analyses (e.g. b2 and b4) in the context of DM mediator simplified models. We explore how these variables could be useful for constraining the parity of the mediators coupling with Dark Matter, in the context of a top quark event reconstruction at the parton level. Several mediator spin scenarios and mass scales are studied, compatible with a wide variety of astrophysical scenarios.
Finally, we briefly discuss future approaches to constraining such mediator couplings, using CP-sensitive variables and exploring new observable variables constructed from Parton-level kinematic distributions. We argue for the future employment of Machine Learning techniques and traditional maximum likelihood estimators that could allow probing the CP nature of these DM simplified mediators.

Primary author: CHALBAUD, Esteban (LIP-Coimbra)

Presenter: CHALBAUD, Esteban (LIP-Coimbra)

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