Contribution ID: 3

Asymmetries in invisible Dark Matter mediator production associated with $t\bar{t}$ final states

Wednesday 22 May 2024 16:00 (30 minutes)

In this paper, we propose two sets of different CP-sensitive observables inspired by the Higgs production in association with the top quark. We employ a Dark Matter simplified model that couples a scalar particle with three generation fermions with a mass equal to that of the top quark. The reconstruction of the kinematic variables is presented at NLO accuracy for events associated with this massive scalar particle, which is assumed to be vanishing to invisible decays in a detector such as ATLAS. We build these observables by taking advantage of the similarity between the scalar coupling with the top quark and the factorization theorem in the total scattering amplitude, in order to represent the basis in which the phase space is parameterized. A twofold approach employs the direct implementation of the four-momentum phase space measure in building CP sensitive observables such as b_2 for the Higgs, and the spin polarization of the top-quark decays in the narrow width approximation for the employed model. We studied the asymmetries of these distributions to test for any improvement in increasing the exclusion region for the $g_{u_{33}}^S - g_{u_{33}}^P$ parameters associated with this vanishing scalar particle. We have found no significant effect in the exclusion limits by using the forward-backward asymmetry distributions and the full shaped ones. The best limits obtained for $g_{u_{33}}^L$ at NLO accuracy were obtained: $b_2 : [-0.0425, 0.0475] n_4 : [-0.0450, 0.0450]$ for an invisible scalar with a mass of 10^{-2} GeV for a luminosity of 300 fb⁻¹ expected for the end of RUN 3 of the LHC.

Authors: CHALBAUD MOGOLLON, Esteban Ricardo (LIP - Laboratorio de Instrumentação e Física Experimental de Partículas (PT)); SILVA, Rui Miguel (Universidade do Minho/CFUMUP,LIP)

Co-authors: ONOFRE, Antonio (Universidade do Minho/CFUMUP,LIP); CASTRO NUNES FIOLHAIS, Miguel (LIP - Laboratorio de Instrumentação e Física Experimental de Partículas (PT)); MORAIS SILVA GONCALO, Ricardo Jose (LIP - Laboratorio de Instrumentação e Física Experimental de Partículas (PT))

Presenter: SILVA, Rui Miguel (Universidade do Minho/CFUMUP,LIP)

Session Classification: Contributed Talks