Abstract Submitted
for the PSF21 Meeting of
The American Physical Society

Top-Higgs Interactive Simulations through MadGraph5_aMC@NLO and Future Investigations of Muon Colliders[1]

YANZHE ZHANG, MORGAN CASSIDY, IAN LEWIS, KYOUNGCHUL KONG, YAJUAN ZHENG, ZHONGTIAN DONG, University of Kansas — Particle colliders accelerate the discoveries and verification of the theoretical predictions of particles and the completeness of the Standard Model. Yet, the Standard Model still has its limitations including but not only the exclusion of gravity, the lack of solutions to the expanding universe in acceleration, and the problem of matter-antimatter asymmetry. Among all the fundamental particles within the Standard Model, top-quark and Higgs boson, as the most and second heaviest fundamental particles, are of particular interest. Therefore, we especially concentrate our focus on the top-Higgs interactions in a new type of proposed leptonic collider: the muon collider. Simulations of $\mu^+\mu^-$ collisions are done in both the Standard Model and a CP-violating model through MadGraph5_aMC@NLO and with smearing effects applied on the analyses of the cross-section variations and kinematic distributions as well as multiple cutoffs to find an analogy of the muon collider. With the study being further pursued, we hope to find more efficient cuts in order to maximize the signal-to-background significance and investigate the ability of a muon collider to detect CP violation in the top-Higgs interactions.

[1]This study is supported in part by U.S. Department of Energy under grant No. de-sc0019474 and in part by the State of Kansas EPSCoR grant program.

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Date submitted: 25 Oct 2021 Electronic form version 1.4