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# Higgs Precision at a 125 GeV Muon Collider

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The $s$-channel resonant production of the Higgs boson at a 125 GeV muon collider enables a unique way to determine the Higgs properties. However, a clear picture of the achievable Higgs precision has not yet been established. We perform a phenomenological study of the Higgs measurements at such resonant muon collider Higgs factory and present a systematic, detailed, and consistent extraction of Higgs precision measurements. Many new aspects about the lineshape scan, including the scaling with luminosity, optimal scan range, minimal scan steps, correlations with exclusive measurement, effective cross-section modeling, etc., are quantitatively studied in this work. All major exclusive Higgs channels are simulated and analyzed with Standard Model background, detection efficiencies, acceptance, angular distributions, and cross-channel correlations. Global analyses of the Higgs couplings are performed in the $\kappa$ framework and the effective-field-theory one. The results suggest that the 125 GeV muon-collider Higgs factory provides significant improvement to the Higgs coupling reach of the HL-LHC and provides independent and distinct Higgs precision information concerning future $e^+e^-$ colliders. We report results for both 5 fb$^{-1}$ and 20 fb$^{-1}$ integrated luminosity. These results provide comprehensive and quantitative physics understandings helpful in planning for the muon collider roadmap and global high-energy physics programs.

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