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Experimental particle physics priorities 2025: A String Phenomenology Perspective

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With the SNOWMASS 2021 process in the US and the on–going European Strategy Report 2025, the field of elementary particle physics is undergoing detailed community evaluation, and the experimental particle physics program, which requires substantial public investment, is under scrutiny. We offer an assessment of the current experimental particle physics priorities from a string phenomenology point of view. String theory provides a perturbatively consistent framework for quantum gravity. String phenomenology aims to connect between string theory and observational data. String theory is a consistent theory of quantum gravity that contains the other fundamental constituents of matter and interactions. As all forms of energy couple to gravity, string theory provides a framework that reproduces the structures of the Standard Model of particle physics and gives rise to detailed physics scenarios beyond the Standard Model, e.g. dark matter candidates, axions, additional gauge symmetries, etc. Given this breadth, we propose that from a string phenomenology perspective, the experimental particle physics priority is the nature of the Higgs boson and the electroweak symmetry breaking mechanism. An ideal facility in the near future to study this sector is a hadron collider at 50–60 TeV that utilises contemporary magnet technology and can be built in 10–15 years from decision.

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