From the theoretical model to the experimental observation

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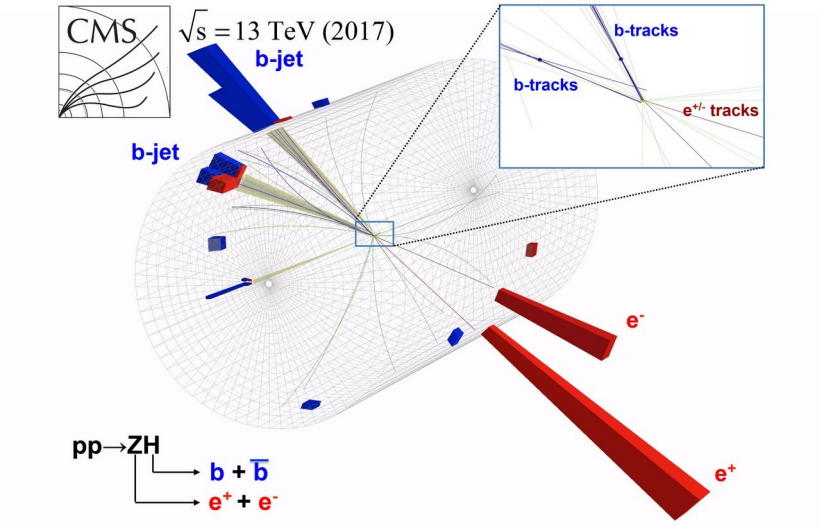
Most of the nature's behaviors are explained and predicted with relative precision through the The Standard Model (SM) of particle Physics. This theory is the most complete we have in our present times, being able to explain most of the Physics phenomena we are familiar with. Nevertheless, the question rises: Is there anything beyond the SM, or does the Physics end with it? Several discoveries, such as the Neutrino oscillation, possible dark matter and dark energy evidence, put into question the completeness of SM and rises the need for more complete theories. With more complete and complex theories, the need of new techniques rises in order to experimentally prove the theoretical conceptions and principles towards the nature of the Physics beyond. A working method is presented, where we start from theoretical Monte Carlo (MC) models to the possible experimental observations in particle colliders such as the LHC at CERN, thanks to complex particle detectors such as the CMS experiment.



Higgs boson, in association with a e^+e^- track (in red) coming from a Z boson (VH)[2].

References

[1] W. de Boer. Grand Unified Theories and Supersymmetry in Particle Physics and Cosmology. Prog.Part.Nucl.Phys.33:201-302, 1994.

[2] The-CMS-Collaboration. Observation of Higgs Boson Decay to Bottom Quarks. Phys. Rev. Lett. 121, 121801, 2018.