The Higgs Legacy of the LHC Run I

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The run I of the LHC established the existence of the Higgs boson, a particle that seems to be directly related to the electroweak symmetry breaking. The study of the properties of the observed state may allow us then to start deciphering the details of the mechanism responsible for it. In this talk, we will first discuss the results of a global analysis of the Higgs interactions in the simplest of the frameworks:
SM operators with free couplings. This framework is well aligned with the LHC Higgs experimental measurements, and it allows us to compare the couplings of the observed state to the SM Higgs boson hypothesis given all the published experimental searches. In addition, it is useful to test several technical details of the global analysis of the Higgs interactions at the LHC. However, this simple framework needs to be further extended if we want to add the information from kinematic distributions into the global analysis. In this context, one of the most motivated frameworks that can be studied is the Effective Lagrangian approach to the Higgs interactions. In the talk we will review the main details of this approach; from the determination of the relevant set of higher dimensional operators needed to study the Higgs interactions at the LHC, to the details behind the optimal implementation of kinematic distributions in order to be sensitive to the new interactions generated by these operators. Finally, after performing the analysis, we will discuss what can be learned from the addition of these distributions, and how in the Effective Lagrangian approach the correlations between different interactions and data sets may help us to understand more on the nature of the observed Higgs boson.