CP-even or CP-odd EFT Interactions in the Top Quark Sector with ATLAS

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The success of the Standard Model (SM) of particle physics over the last few decades, continues with LHC experiments with in particular the Higgs boson discovery. This demonstrates the impressive robustness of this theory but also suggests that new phenomena, expected from the known SM incompleteness, seem to be out of LHC energy reach. In addition, hundreds of direct beyond the SM (BSM) searches keep pushing exclusion limits to higher energy scales. In this context, an almost agnostic parameterization of BSM physics, called Effective Field Theory (EFT) is one of the promising avenue to explore to better search for new phenomena within currently available experimental datasets.

This internship project focuses on top quarks physics in proton-proton collision, in the context of the EFT interpretation. Studying different EFT terms that would lead to either CP-odd or CP-even interaction, would be the first goal of the internship. In a second step, machine learning algorithms could be used to build observable directly sensitive the CP nature of the new interaction, in order to generically detect CP-odd or CP-even interactions, independently from the exact EFT term which is involved.

Basic knowledge in particle physics is required and an experience in experimental particle physics would be an asset. Some basics in C++ and/or python and machine learning the analysis software ROOT are welcome.