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PhD Thesis Proposal

Precision Higgs Physics and search for Physics Beyond the Standard Model with the Higgs Boson decaying into two photons with the ATLAS experiment at LHC

The ATLAS group of LAPP Annecy-le-Vieux (France) is seeking a candidate to start a PhD thesis in October 2018.

The PhD project will take place within the ATLAS Collaboration, and will be centered on the measurement of the Higgs boson couplings by exploiting its decay in photon pairs. The full dataset of proton-proton collisions collected by the ATLAS experiment at a center-of-mass of 13 TeV during the complete Run 2 in the 2015-2018 period will be used, amounting to about 100 fb^{-1} . The core of the thesis work will be the analysis of the Run 2 data in order to measure the Higgs couplings and Simplified Template Cross Sections (STXS).

Several aspects of the analysis will be covered, ranging from the background modeling, to the optimization of the production-mode-enriched categories using machine-learning techniques, to the statistical treatment and the theoretical interpretation.

The results will be interpreted using the Effective Field Theory (EFT) approach, that allows to identify or constrain the effects of BSM phenomena within a very general theoretical framework. The analysis will search for deviations from the SM predictions and may uncover evidence for new BSM physics, or will otherwise set experimental constraints on a large class of BSM theories.

An important part of the thesis work will be devoted to the study and optimization of the photon calibration performance, and in particular to the improvement systematic uncertainties associated with photon energy scale and resolution. A connection with the operation and calibration of the ATLAS Liquid Argon calorimeter is foreseen.

The ATLAS LAPP group is currently composed by 13 permanent physicists, 6 post-doctoral research associates, 6 PhD students and 20 engineers and technicians. The group physics interests range from Higgs physics to SM precision measurements to direct searches for New Physics at the LHC. We have a historical commitment to the ATLAS LAr calorimeter operations, maintenance and upgrades, and to other activities ranging from EGamma performances to trigger to the ATLAS ITK upgrade.

The geographical proximity of LAPP and CERN, about 50 km and 35' drive, will allow a strong involvement both with the data taking and detector operation, and with the participation in person to the working meetings of the ATLAS Higgs Group. A resident period of several months of continuous presence at CERN is in particular foreseen.

Enquiries on the PhD project and on the group activities can be made to Marco Delmastro (Marco.Delmastro@cern.ch) or to the ATLAS LAPP group leader Emmanuel Sauvan (sauvan@lapp.in2p3.fr).