

Postdoctoral Fellowship under the Marie S. Curie Actions Cofund project “Opening Sphere UAB-CEI to Postdoctoral Fellows (P-Sphere)” Gran Agreement 665919.

Department or Institution involved



LHC-ATLAS

Topic Description

The project is part of a research line that started in 1992, when IFAE joined the ATLAS Collaboration at CERN's Large Hadron Collider (LHC). It involves two well-established IFAE groups with complementary expertise. Its overarching goals are to ensure the optimal participation of the IFAE group in the scientific exploitation of the ATLAS experiment during the LHC Run 2 (2015-2018), as well as to make a major technological contribution to the ATLAS Phase 1 upgrade (AFP) and consolidate IFAE in preparation for the high-luminosity detector upgrade (ITk).

The ATLAS detector was designed to probe a wide range of new phenomena in proton-proton (pp) collisions at the energy frontier. The IFAE group made critical contributions to the initial detector, in the Tile Calorimeter and related electronics and the Trigger system, and participated in all phases of R&D, construction, installation and commissioning of the detector. The first LHC run (Run 1, 2010-2012) was extremely successful: large samples of pp collisions at 7 and 8 TeV were collected by the ATLAS and CMS experiments and used to pursue an ambitious scientific program that culminated in 2012 with the discovery of the Standard Model (SM) Higgs boson. During Run 1 the IFAE group was strongly involved in detector operations, in particular of the TileCal detector and the Trigger, and deployed a very strong and rich physics program, leading many analyses published by ATLAS.

The expected increase of luminosity and higher energy in future LHC runs sets strong requirements on the detector in terms of performance and radiation hardness, in particular on the tracking system. State-of-the-art silicon sensors pixel technology is key to addressing some of these challenges. IFAE launched an R&D program five years ago that led to the development of new ultra-radiation-hard 3D-pixel devices and their qualification for usage in ATLAS. During the 2013-2015 shutdown 3D-pixel sensors were produced at Barcelona and qualified by IFAE. They have been installed as part of a fourth layer of the pixel detector (IBL) that is now taking data in the ATLAS detector. The same technology is now also adopted for the recently approved AFP ATLAS project.

The planned activities for the next three years (2016-2018) can be summarized as follows:

- Maintenance, operation and performance optimization of the ATLAS detector subsystems with IFAE responsibility (TileCal, Trigger, and IBL).
- Deployment of a competitive physics program exploiting Run 2 data, focused on searches for new phenomena and SM Higgs boson measurements.

- Upgrade of the Tier 3 computing facility to increase CPU and disk capacity to satisfy the needs of the physics analysis program.
- Construction, installation and commissioning of a 3D-pixel based tracking detector for the ATLAS Forward Proton detector, to be installed in 2016.
- Participation in upgrade activities of the ATLAS detector to be able to operate it at the high luminosities expected during Run 4 (2025-). It includes some upgrades to TileCal, but especially a strong effort towards qualifying the 3D sensor technology for ITk, as well as simulation studies of the ITk performance. It also aims at maintaining an active R&D program on very radiation-hard pixel detectors.

The successful candidate will work in close collaboration with PhD students and other postdoctoral members of our group. He/she would play an important role in one of the detector activities above. This would be combined with an immediate and energetic involvement in one of the main physics research lines, where he/she are expected to play a central role.

Project supervisor & Hosting Group

Prof. Dr. Mario Martínez Pérez, Group Leader of ATLAS Group at IFAE

The IFAE-ATLAS group is formed by about 30 persons, including faculty members, research scientists, postdoctoral fellows, and PhD students. The Fellow would be directly supervised by Prof. Martinez, with the support of other senior members of the team and in close collaboration with postdoctoral fellows and PhD students. The group took major responsibilities in the design and construction of the original ATLAS detector, including the construction of one third of the hadronic calorimeter (TileCal), the design and construction of its calibration electronics, the design and implementation of trigger algorithms and more recently the design and construction of pixel detectors now installed in the experiment.

The group in ATLAS is well recognized worldwide with leadership positions inside the experiment organization chart (contact persons of analyses, conveners of ATLAS working group, paper editors, run coordinators, etc.), and in each of the research lines considered which include: the study of the Higgs boson in different channels; the search for supersymmetry, extra-dimensions and dark matter candidates; precise top-quark measurements; and the search for vector-like quarks and new phenomena in top-quark related final states. The excellence of the group is easily shown by the numerous talks given at international conferences and the fact that several PhD students received awards for the excellence of their PhD research. The group has also recently organized high-level International conference in the field of particle physics like, for example, the 2011 Top Workshop or the 2013 LHCP conference. Upon arrival, the candidate would join one of the main detector-driven activities in the group and become one of the active members of one of the main physics research lines.

Planned Secondments

The successful candidate will have the opportunity to carry out a significant part of his/her research time based at CERN (Switzerland). In addition, the candidate is expected to participate actively and as needed in dedicated workshops and conferences.

Candidate's Profile

The successful candidate should have a Ph.D. in Experimental Particle Physics, good English communication skills, the ability to carry out an independent research and he/she will be expected to play a leading role in the physics analysis of the ATLAS data and detector-related activities in Run II.

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