

Search for supersymmetry and other new phenomena with the ATLAS and MoEDAL experiments at the LHC

Research Project / Research Group Description:

The IFIC ATLAS Silicon group participates in the operation and physics exploitation of the ATLAS and MoEDAL experiments at the Large Hadron Collider (LHC), being at the same time deeply involved in the R&D silicon detector developments towards the High Luminosity upgrade of the LHC.

The IFIC ATLAS Silicon group consists of 7 seniors, 3 postdocs, 6 PhD students with the support of several engineers/technicians, and has a close collaboration with the IFIC theory department for what concerns physics analysis and the MoEDAL experiment and with the Barcelona Institute of Microelectronics CNM for what concerns silicon R&D.

The group is fully engaged in data analyses, with a main interest in top quark physics and searches for new physics phenomena including supersymmetry and magnetic monopoles. It has also important responsibilities in the current ATLAS Semiconductor Tracker, the Inner Detector alignment and R&D for silicon tracking devices.

The project proposed here focuses on searches for supersymmetry and other phenomena using data from the ATLAS and MoEDAL detectors. Related to these topics, the group has undertaken important responsibilities in both ATLAS and MoEDAL, such as leading Prompt R-parity-violating supersymmetry in ATLAS and chairing the MoEDAL Collaboration Board.

Job position description:

Supersymmetry (SUSY) is a theoretical framework providing answers in an elegant manner to several open issues, such as the hierarchy problem, the nature of dark matter and the grand unification. It is in the forefront of the physics goals of the Large Hadron Collider (LHC) operating at CERN at the highest collision energy achieved so far. Both ATLAS and MoEDAL target these scenarios in a complementary manner: the former as a general-purpose experiment and the latter as a dedicated to highly-ionising particles detector.

The group has pioneered the searches for SUSY with violation of R-parity (RPV) in ATLAS. We introduced the study of a specific RPV scenario; through bilinear terms (bRPV), which also predicts massive neutrinos and implies long-lifetime particles and displaced vertices. The group has participated in several data analyses and interpretations in different SUSY models. The more recent work is the search of same-flavour opposite-sign dilepton pair, jets, and large missing transverse momentum. Currently there are two postdocs working on these topics in the group expected to assist with the PhD supervision.

The group and particular the MoEDAL team collaborates with several theoretical physics (IFIC, Wurzburg), proposing new signatures to LHC experiments and strengthening the interpretation of experimental results, in yet unconstrained theoretical scenarios.



The fellowship will focus on data from Run-2 period of the LHC at 13 TeV, which allows exploring a new energy territory. The successful candidate is expected to have a strong involvement in the following research topics:

- SUSY searches with ATLAS data with emphasis to R-parity violating scenarios with possibility to collaborate with theorists on related phenomenological studies.
- Contributions to the MoEDAL experiment at the LHC, including software development, physics simulation and data analysis.

Prior knowledge of C++/Python programming and HEP common software, such as ROOT, would be desirable.

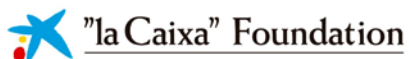
GROUP LEADER: Carmen García García

PhD Supervisor: Vasiliki Mitsou

vasiliki.mitsou@ific.uv.es

Research project/Research Group website

<http://webific.ific.uv.es/web/altasenergias>



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 713673.