UAM & IFT

IFT & IAA

The Instituto de Física Teórica in Madrid offers physics graduate students the opportunity to enjoy research in the field of Cosmology. The student will have the unique opportunity to participate and benefit from ongoing research projects that focus on cosmological N-body simulation. The main goal of the project is to improve the initial condition for running cosmological simulations of the large-scale structure of the universe and then apply detail comparisons with the current methodologies. The student will also benefit from discussions with other students and scientists at the institute working in a wide range of topics in theoretical physics.

IFT & UCM-Th

Theoretical and observational consequences of the Higgs field in Cosmology The aim of this project is the study of certain aspects of the interactions of the Higgs field with the space-time metric and its possible cosmological and astrophysical consequences. The study covers a wide range of theoretical tools (quantum field theory in curved space-time, renormalization, General Relaitivity or large scale structure formation) and also important experimental techniques (CMB temperature power spectrum calculations, N-body simulations, correlation functions in SDSS-III/BOSS or SDSS-IV/eBOSS and future DESI or Euclid catalogues).

UAM & UHU & EPS

Within the context of the Dark Energy Spectroscopic Instrument Project, our group is involved in the development of a fiber positioning robot capable of a precision better than 5 microns. The student will have the opportunity to perform in the laboratory of the Polytechnic School at UAM a set of tests to characterize the different functions of this robot, in particular measures will be made to determine its absolute precision and repeatability, and develop algorithms that will improve the performance of the robot.

IFT

Astrophysical determination of Dark Matter density

One of the astrophysical evidences for the existence of a dark component of matter (Dark Matter) is obtained by the mismatch between the rotation curve of spiral galaxies, and the one expected on by the contribution of the sole luminous matter. This poses (together with other astrophysical probes of DM) remarkable hints of physics beyond the standard model of particles, based on only astrophysical evidence. The search for Dark Matter is not limited to astrophysics, and both direct production at LHC is attempted, as well as search for direct scatter of DM particles against target nuclei, in experiments usually called of "Direct Detection".

One important ingredient to determine the rate of expected collisions (this permitting to reconstruct relevant DM quantities -mass, cross section- once detection has taken place) is the DM density around the Earth and Sun.

In this project we will address this problem using observations of the rotation curve of the Milky Way, in combination with microlensing observations of the Galactic Bulge, in order to normalize the content of luminous matter; this technique has been proved to be competitive with existing ones in 2011.

Here, the aim will be to update the results of 2011 making use of updated data of velocity curve, as well as on updated models of distribution of stars in the Milky Way, using once again astrophysical observables for particle physics purposes.

USAL

The USAL group offers one vacancy to a graduate/master student to participate in a summer visit during the month of September to initiate a research work in the field of dark matter direct and indirect search, especially in the context of the astrophysical dense environments.

UHU & IFIC-AHEP

Particle Physics Phenomenology-SUSY-LHC.

Combine Particle Physics Phenomenology and Statistics to perform an analysis of Models for Physics beyond the Standard Model.
This study requires the implementation of the bounds on New Physiscs imposed by the LHC as well as the ones coming from the Dark Matter searches and the use of the software with the appropriate statistical tools.

UPV

The group of Universitat Politècnica de València offers to host a student in the "MultiDark" Summer Student Program. The student will be involved in activities related to direct detection dark matter experiments using superheated liquids, and particularly in the study of the generation, propagation and detection of acoustic signals in these chambers. He will work in the development, tests and analysis of the acoustic systems of the chambers. Students of physics or engineering degrees with capabilities in acoustics, instrumentation and/or signal processing and analysis techniques are candidates with good profile.

IFIC-AHEP

The IFIC-AHEP group at Valencia accepts summer students for training in the group's research activities. Such activities are focused on phenomenology of beyond the Standard Model, Dark Matter and Neutrino physics. The selected students would get experience on direct and indirect dark matter searches, characterization of well--motivated dark matter candidates and their connection with neutrino physics.

UCM-Th

UCM-Th group offers to incorporate one student. Research topics proposed:
1. - Alternative cosmological models
The project focuses in the so called modified gravity theories and their possible connection to the dark matter and dark energy problems. In particular, we consider the possibility of studying dark energy models responsible for the present phase of accelerated expansion of the universe

based on vector-tensor theories and other modifications of gravity such as f(R) gravity. Dark energy models which differ from the standard cosmological constant could have important implications in the determination of the cosmological parameters, and in particular in the present value of the dark matter abundance.
2. - Dark Matter Phenomenology
The identity of the nature of dark matter is a major question in both particle physics and astrophysics. The traditional particle candidates are cold and collisionless, and they predict missing energy and momentum signals at particle colliders. However, recent progress has expanded the list of well-motivated candidates and their possible signatures. In this project, we will study the basic properties of non-standard candidates, their motivation, their expected production mechanisms, and their implications for particle colliders, direct detection, indirect searches, and other astrophysical observations as possible modifications of the cosmic microwave background or primordial abundances.

UZ

In the frame of the Summer Students Program of the MULTIDARK project, the Zaragoza University group offers the incorporation of one student to the activities carried out at the LSC in the direct search of the galactic dark matter. ANAIS uses NaI(Tl) scintillators and searches for the annual modulation expected in the dark matter signal. Presently, two prototypes 12.5 kg each, are taking data at the Canfranc Underground Laboratory. The selected student will collaborate in the operation and maintenance of the detectors at the Canfranc Underground Laboratory. However, most of his work will be carried out at the Zaragoza University facilities, collaborating in the data analysis.

IFIC-Exp

IFIC's group offers the summer students to get acquainted with the ANTARES and KM3NeT neutrino telescopes. There will be a variety of activities. They will learn to use at a basic level the data analysis tools with simple, but pedagogical problems using the ROOT package. They will make small simulations on concrete aspects of some problems related to ANTARES. They will prepare, guided by the group members, presentations on topics linked to dark matter and they will be encouraged to understand the essentials of the analyses being performed by some of the members of the research group. Finally, they will attend to the remote control of the ANTARES detector from the dedicated room installed at IFIC.