PROPOSITIONS FOR STAGES IN TORINO, ITALY AT THE DEPARTMENT OF PHYSICS OF TORINO UNIVERSITY OR NATIONAL INSTITUTE OF ASTROPHYSICS (INAF-OATo)

All the possibilities can be interchanged between M1 and M2 and also the length of the work can be dimensioned on 3 or 5 months depending on the available time. In case of M1 the period will be from the beginning of April till the end of June. In case of M2 it will be from mid January till mid June.
Among the 4 propositions listed in the following only up to two will be supported through the ERASMUS program between the University of Nice and the University of Torino.

PROPOSITION 1:
Measurements using an experimental setup to reproduce the luminous signals expected by JEM-EUSO on the International Space Station.

Objective of the stage is to use a system based on standard electronics, photomultipliers, leds and a rotating water tank to reproduce experimentally the luminous background foreseen by JEM-EUSO on the International Space Station looking at the night atmosphere. The led lights will mimic the variable sky luminosity due to the moon phases; the presence of anthropogenic lights, such as city lights; very bright events such as Transient Luminous Events; meteors and cosmic rays. Each of these signals has different spatial extensions, time duration and intensity.
The work will include: utilization of electronics instrumentations, detectors, data analysis and experience in a laboratory.
The requirements are: basics of knowledge of C or Fortran language and of statistics and data analysis and processing.
The student will learn basics of the ROOT package developed at CERN for plots, and standard electronics used in nuclear experiments.
The work will be performed at the Department of Physics of the University of Torino under the supervision of Dr. Mario Edoardo BERTAINA (bertaina@to.infn.it, ph: +39-0116707492, for further information: http://personalpages.to.infn.it/~bertaina/index-e.html).

PROPOSITION 2:
Reconstruction of the main parameters of the extensive air showers produced by Ultra High Energy Cosmic Rays observed with JEM-EUSO on the International Space Station.

Objective of the stage is to develop algorithms to detect the light signal by JEM-EUSO on the International Space Station produced by an ultra high energy cosmic ray cascading in the atmosphere. These algorithms will be based on pattern recognition and imaging techniques to disentangle the luminous signal of the extensive air shower from the

fluctuations of the nightglow background. Estimation of the angular resolution and energy assignment will be performed.
The work will be based on simulations and analysis of simulated data.
The requirements are: basics of knowledge of C or Fortran language and of statistics and data analysis and processing.
The student will learn basics of the ROOT package developed at CERN for plots and the official analysis software of the JEM-EUSO collaboration called ESAF.
The work will be performed at the Department of Physics of the University of Torino under the supervision of Dr. Mario Edoardo BERTAINA (bertaina@to.infn.it, ph: +39-0116707492, for further information: http://personalpages.to.infn.it/~bertaina/index-e.html).

PROPOSITION 3:
Simulation and Reconstruction of meteor signals from space using the JEM-EUSO telescope on the International Space Station.

Objective of the stage is to use and refine a meteor simulator developed at INAF OATo to study the expected signal at JEM-EUSO level (400 km orbit) produced by meteorites developing in the atmosphere as a function of the magnitude of the meteor, its speed and the evolution of the luminous track in the atmosphere.
The work will be based on simulations and processing of simulated data and will require the use of algorithms of pattern recognition and imaging to disentangle the signal of the meteorites from the luminous background in case of high magnitude objects.
The requirements are: basics of knowledge of C or Fortran language and of statistics and data analysis and processing.
The student will learn the basics of the meteor physics and of the detection system of JEM-EUSO.
The work will be performed at the National Institute of Astrophysics: Astrophysical Observatory of Torino under the supervision of Dr. Alberto CELLINO (cellino@oato.inaf.it, ph:+39-0118101933, for further information: http://www.iau.org/administration/membership/individual/6690 ) and Mario Edoardo BERTAINA (bertaina@to.infn.it, ph:+39-0116707492,for further information: http://personalpages.to.infn.it/~bertaina/index-e.html).

PROPOSITION 4:
Study of the correlation between lightning occurrence and cloud-top altitude

Objective of this study is to perform an analysis on the correlation between the lightning occurrence and the type of clouds associated to the lightning phenomena, in order to estimate their cloud-top.
The work will include a research on the basic characteristics and formation of a lightning, the use of satellite and radar data to operate the classification and correlation between their occurrence and cloud-top altitude.

The requirements are: basics of knowledge of C or Fortran language and of statistics and data analysis and processing.
The student will learn the basics of the lightning phenomena and cloud formation and typology.
The work will be performed at the University of Torino under the supervision of Mario Edoardo BERTAINA (bertaina@to.infn.it, ph:+39-0116707492, for further information: http://personalpages.to.infn.it/~bertaina/index-e.html) and at the Regional Agency for Environmental Protection (http://www.arpa.piemonte.it) under the supervision of Dott. Roberto CREMONINI and Dr. Renzo BECHINI (roberto.cremonini@arpa.piemonte.it, renzo.bechini@arpa.piemonte.it, ph:+39-01119680265