Ecole Doctorale PHENIICS PhD proposal 2016

Laboratory/ research team : Laboratoire Leprince Ringuet / Astrophysics group

Title : Characterisation of blazars at gamma-ray energies and planning for CTA

Overview of the research :

The PhD described here is concerned with the investigation of the gamma-ray emission from blazars, a type of active galactic nucleus whose relativistic jets point in our direction. These extreme objects are prolific gamma-ray emitters and, by jointly analyzing the data from space- and ground-based gamma-ray telescopes, we will study their emission mechanisms. In addition to this scientific analysis, the successful candidate will help develop hardware for the next generation ground-based gamma-ray observatory, CTA (the Cherenkov Telescope Array) and will participate in the development of TeVCat, an online facility for TeV gamma-ray astronomy.

The astrophysics group at LLR participates in a number of gamma-ray experiments that are either currently in operation (the Fermi space telescope, H.E.S.S.) or that are in preparation (Cherenkov telescope array, HARPO), while also working closely with scientists who are members of the VERITAS Collaboration. With the data collected from these instruments we study many different classes of astrophysical objects including blazars, the scientific subject of this thesis. The PhD has three sub topics:

Firstly, it is concerned with the study of blazars in the gamma-ray energy regime. The PhD student will participate in the analysis of GeV data from the Fermi large area telescope (LAT) for a number of blazars known also to be emitters at TeV energies. These data will be combined with those at TeV energies so that we can characterise the GeV-TeV emission of a number of these extreme objects.

Secondly, this PhD offers the opportunity to participate in the validation of a 19-module demonstrator for the NectarCAM camera. This camera is being developed for deployment on the medium size telescopes of CTA. This major piece of hardware for CTA is currently being assembled and testing is expected to begin in 2016. LLR is heavily implicated in the calibration of NectarCAM so the student will participate in activities related to this endeavour.

Thirdly, a study will be undertaken using our current knowledge of the properties of AGN in the gamma-ray regime to help plan for blazar and more general AGN observations with CTA.

The successful candidate will also have the opportunity to help with the maintenance and development of TeVCat, an online catalogue for TeV gamma-ray astronomy.

Links:

Fermi LAT: http://fermi.gsfc.nasa.gov **TeVCat:** http://tevcat.in2p3.fr
NectarCAM: http://arxiv.org/abs/1508.06555 **CTA:** https://portal.cta-observatory.org

Contact :
Deirdre HORAN, 01 6933 5535, deirdre @ llr.in2p3.fr
Berrie GIEBELS, 01 6933 5553, berrie @ llr.in2p3.fr
Stephen FEGAN, 01 6933 5558, sfegan @ llr.in2p3.fr