In the framework of the European Marie Curie training project: ENTERVISION (Research Training in 3D Digital Imaging for Cancer Radiation Therapy), the PH-CMX group at CERN will host one Early Stage Researcher (ESR) for a duration of 36months.

The main objective of the early stage researcher work is to improve spatial and time resolution of PET and TOF-PET detection modules. The time resolution of a scintillator-based detection system is determined by the rate of photoelectrons at the detection threshold, which depends on the time distribution of photons being converted in the photo-detector.

The work of the ESR will focus on the possibility to achieve a time resolution of about 200ps. This requires the optimization of the light production in the scintillator, the light transport and its transfer from the scintillator to the photodetector.

The work of the ESR will consists of:

- Studying the basics of light production mechanisms in scintillators.

- Studying the fundamentals of photostatistics and implementing a light production and light transport Monte Carlo program based on the light ray tracing programme LITRANI, already in use in our group.

- Developing an appropriate instrumentation for crystal characterisation

- For a number of scintillators materials, measuring their scintillation properties (light yield, decay time, rise time), the optical light collection and timing performance in view of achieving the best possible timing performance.

During the training period, the ESR will be given the opportunity to work in a pluridisciplinary environment with experts in many different fields such as inorganic scintillators, photo detectors and readout electronics. The CERN group that will supervise the student has a long expertise in the characterisation and use of inorganic scintillators and the integration of large detector systems for high energy physics and medical imaging.
He also will get training and experience in using a light ray tracing software (LITRANI) that is key to the understanding of optical phenomena in inorganic scintillators.
Over 36 months the ESR will have the opportunity to work in various laboratories of IN2P3 in France that are members of the ENTERVISION project. He will get training on development of data acquisition systems as well as on GATE (Geant4 application for emission tomography), a simulation platform for PET system.
Moreover he will work in close collaboration with other students working on different projects in high energy physics as well as in medical imaging providing him with the opportunity to broaden his experience in experimental physics. He also will be given appropriate networking opportunities through participating in collaboration meetings and international conferences.

Profile
- Graduated Physics, Engineering in instrumentation with good knowledge in Optics

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