Context & Job description

Project title: **Data-driven algorithms for serial µLaue diffraction and excited luminescence: application to nitrides optoelectronics**

Installed at the European synchrotron (ESRF) in Grenoble (BM32 beamline), the Laue microdiffraction instrument (µLaue) is unique in Europe and probes the matter by diffracting a polychromatic beam of a few hundred nanometers. The acquisition of the Laue diffraction diagram is very fast and allows scanning the samples with a high precision to get the structural parameters of mono or polycrystalline materials in terms of orientation, crystallographic lattice parameters and state of deformations. We added recently to this technique the possibility to record the emitted visible and near IR light excited from X-ray; the so-called XEOL technique (X-ray Excited Optical Luminescence). The acquisition of XEOL spectra (typically 1 s) can be easily synchronized to data collection of the Laue pattern so that to measure on the same specimen's location. The PhD subject consists in participating to the development of new ESRF experiments with our team (improvement of light collection and setup) and more specifically to the optimization of the data processing chain based on image analysis algorithms, intelligent Laue diagram recognition and micro and nanostructure reconstruction. This new data treatment will allow the systematic treatment of a large amount of data corresponding to objects that can be also randomly oriented. This "serial crystallography" (term used in biology) will be also correlated to the optical properties of important optoelectronic materials such as nitride materials. This work will benefit from the Extremely Brilliant Source (EBS) upgrade of the ESRF, recent fast pixel detector and continuous development of the LaueTools program for diffraction pattern analysis.

***Deadline for application** : April, 30, 2020. Further information may be obtained from*
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Expected profile

- A master in data analysis or a master of Science (physics or nanoscience disciplines with strong motivations in data analysis) is required. Skills in machine learning, image analysis and Python/Notebooks (programming language at ESRF) are important. Preliminary experience in software development for parallel computing architectures (either massively many-core or GPU-based) is welcome. Curiosity, enthusiasms for physics, experiments as well as materials science will be appreciated.

- Applicants must have not resided or carried out their main activity in France more than 12 months in the last three years (mobility condition). The PhD thesis is eligible for funding through the NUMERICS project (http://numerics.cea.fr/), an international Ph.D. program launched by CEA in the fields of numerical simulation and scientific computing. This project has received funding from the European Union's Horizon 2020 research and innovation programme within the Marie Sklodowska-Curie Actions (MSCA).

- He/She should demonstrate excellent oral and written communication skills in English.

Working conditions

The PhD candidate will join the Nanostructure Radiation Laboratory (NRS) of the CEA in Grenoble including research scientists in physics and instrumentation. NRS contributes to the scientific and technological objectives defined by CEA and by the French community within the framework of the French X-ray synchrotron large scale facilities. He will have a strong collaboration with the BM32 – IF (French-CRG beamline) beamline.