



Module MPERX 04 – EQF level8

Innovation – Advanced X-ray physics for imaging device and user protocol innovation in D&IR

Abstract:

Innovation in X-ray imaging for medical application relies on the use of physical properties of X-ray quanta: energy spectrum and phase characteristics. Presently, monochromatic X-ray sources of high intensity are available only in large accelerator facilities where cost and size prevent their use in the clinical setting. However, several studies have recently shown that, in the near future, compact sources could be installed in specialized centres so as to exploit the advantages of monochromatic radiation together with the possibility to investigate multi-energy imaging. Innovation shows great improvements also with the use of phase contrast, a novel technology that has the potential to improve image contrast beyond the one normally seen in present imaging systems.

A Medical Physics Expert (MPE) should be able to deal with such technology challenges. This Module MPE04 aims to help the future MPE in Diagnostic and Interventional Radiology (D&IR) to acquire the Knowledge, Skills and Competences (KSCs) necessary to take responsibility for statutory and institutional requirements with respect to Innovation. The major issues are the research and the critic assessment of innovative systems based on energy dependence of X-ray attenuation and on the use of phase-contrast. These KSCs will allow to define new metrics to assess image quality and to optimize the specific application once one of these new imaging modalities will be made available in the clinical environment.

Organization:

The module will achieve its learning objectives using a combination of online and face-to-face readings, presentations and discussions.

ONLINE PHASE: 8 July 2017 - 10 September 2017

The first online part would require approximately 48 hours of reading and effort by the participants. The online material will discuss the physical principles of spectral imaging and its dedicated detector technology, production of quasi-monochromatic X-ray with compact sources, particle accelerators involved in radiation production and the phase-contrast technique.

FACE-TO-FACE PHASE: 11-15 September 2017

Monday 11th of September, Ferrara: Spectral Imaging and monochromatic X-ray sources

Tuesday 12th of September, Ferrara: High-brilliance X-ray sources (background and application in D&IR) + Visit to X-ray facilities of the Department of Physics and Earth Sciences, University of Ferrara

Transfer to Trieste

Wednesday 13th of September, Trieste: Synchrotron radiation and Phase-Contrast Imaging + Visit at ELETTRA facility

Transfer to Ferrara

Thursday 14th of September, Ferrara: Exam preparation

Friday 15th of September, Ferrara: Participant assessment

Face-to-face lectures will be followed by a round-table discussion led by a panel of European leaders of the profession and candidates will have the opportunity to visit laboratories which host monochromatic X-rays sources and make their own experiment.

Lecturers:

Prof. Angelo Taibi, Department of Physics and Earth Sciences, University of Ferrara
Prof. Mauro Gambaccini, Department of Physics and Earth Sciences, University of Ferrara
Dr. Paolo Cardarelli, Department of Physics and Earth Sciences, University of Ferrara
Dr. Giuliana Tromba, Coordinator of the SYRMEP beamline at ELETTRA synchrotron source, Trieste
Dr. Luigi Rigon, Department of Physics, University of Trieste
Prof. Renata Longo, Department of Physics, University of Trieste

Assessment Mode:

The assessment mode will consist of a written closed-book examination regarding few cases scenarios of situations faced by MPE (D&IR) in which candidates are expected to demonstrate that they have a sufficient knowledge to assist radiologist and younger members of the profession and to explain to them the limits of clinical D&IR facilities in comparison with the new emerging X-ray imaging modalities. Participants are expected to back their arguments with the scientific rationale of such advanced X-ray imaging technologies. A public oral discussion will follow. In this part, examiners will evaluate the answer motivations and the input to the discussion of the other participants (opinions, corrections, different perspectives ...).

Module Homepage:

www.eutempe-rx.eu/index.php/ct-menu-item-3/14-sample-data-articles/85-course-4

Transfer and accommodation (Trieste):

Transfers for lectures in Trieste are organized by module leaders. Accommodation in a hotel close to the synchrotron facility will be also offered to the participants.

For any questions please write an email to: eutempe.ferrara@fe.infn.it

Useful links:

- www.unife.it/international
- www.unife.it/scienze/lm.physics
- www.unife.it/international/student-life
- www.elettra.trieste.eu
- www.elettra.eu/elettra-beamlines/syrmep.html