Laboratory of Excellence Physic Radiobiology Medical Imaging and Simulation - PRIMES
Béatrice Rayet, Denis Dauvergne, Françoise Peyrin

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Béatrice RAYET1, Denis DAUVERGNE2 and Françoise PEYRIN3, on behalf of the LabEx PRIMES members

1 Chef de Projet LabEx PRIMES – *Contact: b.rayet@ipnl.in2p3.fr – + 33 (0)4 72 43 11 40 – http://primes.universite-lyon.fr
2 CAS-PHABIO – Institut de Physique Nucléaire de Lyon, CNRS IN2P3, Villeurbanne
3 CREATIS Inserm U1044, CNRS UMR 5220, Villeurbanne et ESRF, Grenoble

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BACKGROUND

At the National level, the questions of cancer and ageing are given highest priority in the domain of health research, providing strong societal impact for the quality of life and for the economy.

The fundamental questions that are addressed in this project are how to provide new imaging tools for exploring living tissues at different scales with new contrast and how to build optimized, controlled and safe strategies for irradiation-based cancer therapy.

This field of research is by nature interdisciplinary and the LabEx members have expertise in physics, radiobiology, acquisition, images reconstruction and treatment, simulation and modeling.

RESEARCH: RADIOTherAPY (WP1; 3; 5)

WP1: Development of innovative methods and instruments in radiotherapy: innovative radiotherapies, will include hadrontherapy and hard X-rays at ESRF. A key issue will be on-line dose monitoring.

WP2: Radiobiology: including development of instruments, methods, models and simulations for the acquisition, the analysis and prediction of radiobiological data, and the improvement of innovative radiotherapy treatments based on high energy carbon ions, PAT-Z and MRT.

WP5: Image-based models and simulations will develop tools for modeling of a virtual patient and treatment room environment.

RESEARCH: MEDICAL IMAGING AND SIMULATION (WP2; 4; 5)

WP2: Emerging Imaging Techniques will cover new instruments for improved diagnosis with new hybrid imaging techniques, with combinations of PET, MRI, US, Optical Imaging, as well as challenging techniques such as cardiac DTI, novel X-ray based methods (Spectral CT, Phase-Contrast Imaging), or Fluorescent Diffuse Optical tomography.

WP4: Multidimensional Image Processing spanning new developments in inverse problems for emerging imaging modalities and extraction of image biomarkers involving denoising, segmentation, motion estimation, image registration and quantification.

WP5: Image-based models and simulations will develop tools for virtual multimodality imaging and modeling of a virtual patient.

VALORIZATION AND SOCIO-ECONOMIC IMPACTS

Cancers represent a multitude of diseases and is one of the most important cause of death and morbidity in Europe. Age related diseases including cardiovascular diseases, stroke, brain degenerative diseases, osteoarticular diseases are the first cause of acquired disability.

At the National level, the questions of cancer and ageing are given highest priority in the domain of health research, providing strong societal impact for the quality of life and for the economy.

The new achievements anticipated from the LabEx are expected to improve the early diagnosis of targeted diseases, improve the treatment of cancers and thus participate to a better quality of life. Early screening and stratification of risk through imaging may improve our knowledge and may have a significant socioeconomic impact.

Our socio-economic partners are: Fondation Neurodis; Cancéropolre CLARA; Lyon-Biopôle (IRIT); AQUILAB, CIRMA, VOCAIL, BioClinika, Khirnow, Erkisolation, Digenis, Guerbet, Bruker, IBA, Dosisoft...

CONCLUSION

The expectations from this LabEx initiative are to strengthen the local and regional synergies also with medical actors; to create a pole in medical imaging and physic applied to health; to increase the visibility on these thematic publications, diffusion, animation; to strengthen international collaborations; to gain recognition in initial and continuous training, to develop valorization through industrial partnership...