**Health**

Among its scientific and technical missions, P2IO’s Labex puts forward an interdisciplinary research axis with Biology and Health stakes. For this, it gathers strong assets, combining a unique concentration of instrumentation know-how, structures familiar with medicine-physics interface (IMNC laboratory, IRFU teams, LAL, LLR, IPN) and a rich environment in biomedical platforms (Protontherapy center (Institut Curie, Orsay), Neurospin (a MRI neuroimaging platform), Service Hospitalier Frederic Joliot (a molecular imaging platform), …).

In order to meet this ambitious interdisciplinary challenge, P2IO’s Health pole is organized on the basis of a network associating skills in physics (detectors, accelerators, modeling and methodologies) and biomedical goals focused on cancer diagnosis and treatment and fundamental questions in neurosciences.

More specifically and within this biomedical framework, P2IO concentrates its activities on two areas:

**Multi-modalities clinical and preclinical imaging**: this theme includes first an upstream instrumental R&D, especially dedicated to photodetection, which irrigates development of innovative detectors for small animal in vivo imaging or clinical imaging (diagnosis, radio-guided surgical treatment of cancer, PET for neurology or therapeutic follow-up in cancer research). It also comprises the construction of very large and unique MRI solenoid dedicated to high field (up to 11,7 T) clinical imaging (Iseult project). The ThomX machine, one of P2IO flagship projects and a recent Equipex winner, will contribute to this axis. This project aims at developing a new compact source delivering a very intense and tunable X-ray flow with a potential use for therapy and imaging such as mammography. Finally, these researches are extended downstream by a methodological part (reconstruction, signal processing) based on modeling and simulation (GATE platform) that allows a quantitative interconnection between the nuclear image and expression of metabolic parameters. Part of this research is conducted within the national project “Infrastructures Nationales en Biologie et Santé” France Life Imaging.

 **Radiotherapy**: P2IO mobilizes its know-how to new radiotherapy methods for cancer treatment. This axis mainly includes research dedicated to hadrontherapy, both protontherapy in relation with the CPO and therapy with ion (carbon) beams that appears as a promising emerging technique. The expertise of P2IO specialists of particle-matter interaction will be used to optimize treatment planning through reliable tools enabling accurate assessment of dose delivery profile, precise tumor delineating and healthy tissues sparing. P2IO will also play a major role in developing innovative instrumentation for beam profile measurement, online dosimetry monitoring, including moving organ following, planimetry techniques improvement. As for the first theme, part of this research is conducted within the national project « Infrastructures Nationales en Biologie et Santé » France-Hadron.