CREATIS | Medical Imaging Research Laboratory
www.creatis.insa-lyon.fr

UNIVERSITÉ DE LYON

CREATIS

Research center in acquisition and image processing for health

Director: Olivier Beuf
Deputy-Directors: Patrick Clarysse, Olivier Bernard

Research center affiliated to several institutes:

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Lyon 1

cnrs

Inserm

UNIVERSITÉ JEAN MONNET SAINT-ÉTIENNE

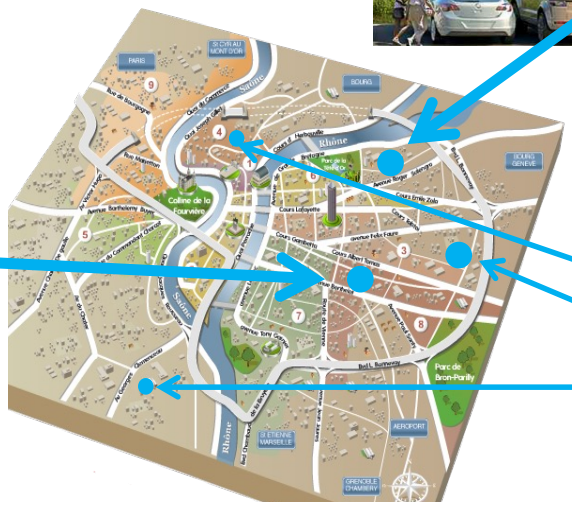
202 people / 89 people with permanent position
About 200 rank A published paper per year

https://www.creatis.insa-lyon.fr/site7/en

Located at 4 different places

CHU de Saint-Etienne
50 m²

Campus LyonTech La Doua
1800 m²
(Léonard de Vinci)



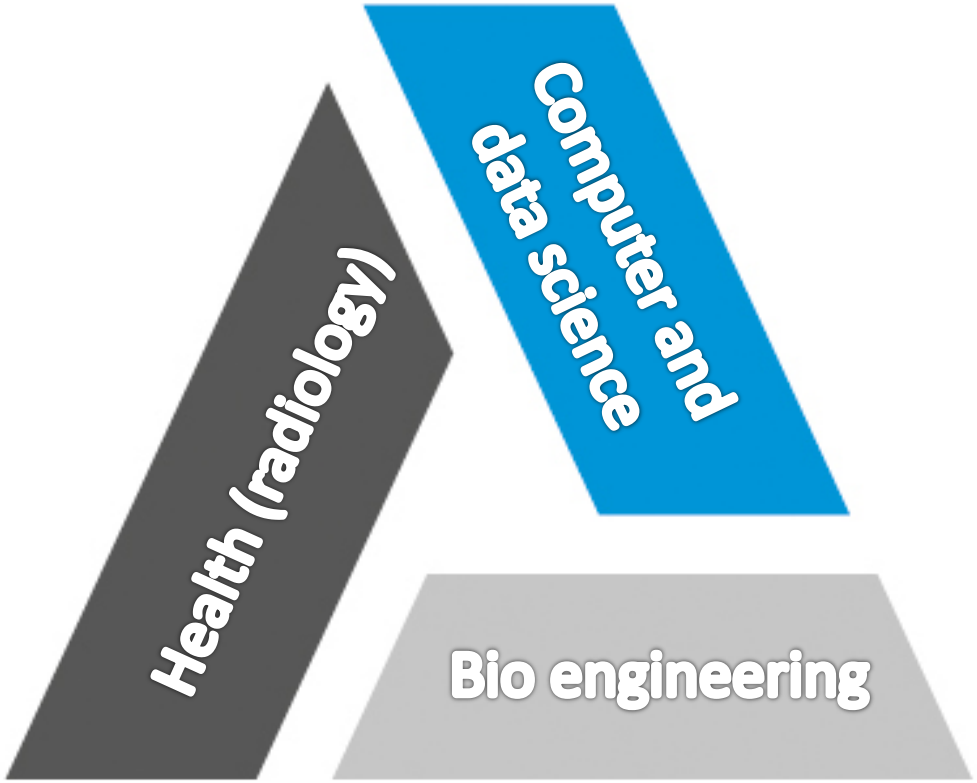
Centre Léon Bérard, Lyon
100 m²

And some people on HCL sites:

- *Hôpital de la Croix Rousse*
- *Hôpitaux Est (B13, CERMEP)*
- *Hôpital Lyon Sud*

Mission, skills and expertise

- To Contribute to **predictive** and **precision medicine** through imaging
- To bring knowledge and to contribute to training (through research)



Technologies for health

SKILLS

- Segmentation, registration
- Reconstruction, inverse problems
- Parametric fitting and quantification
- Data mining, big data, AI
- Distributed computing
- RF electronics
- MRI, CT, US, …

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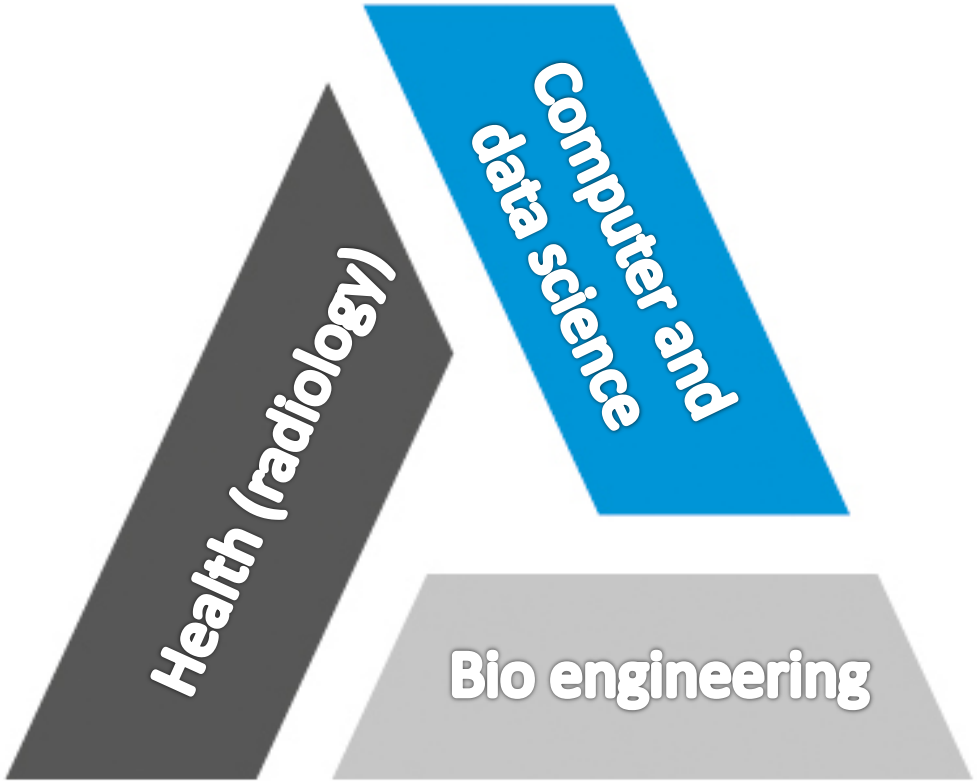
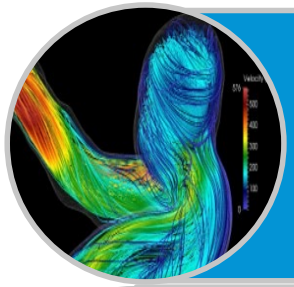


Technologies for health

SPECIFIC FIELDS OF INTEREST

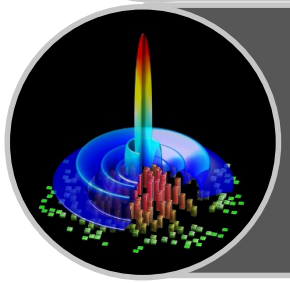
- Cancer (Breast, liver, prostate, ….)
- Cardiac ischemic diseases
- Diffuse liver diseases
- Brain diseases (Stroke, multiple sclerosis, epilepsy, …)
- Acute Respiratory Distress Syndrome
- Bone and cartilage ultrastructure
- Image-guided radiation therapy

Teams and scientific topics



MYRIAD : MODELING & ANALYSIS FOR MEDICAL IMAGING AND DIAGNOSIS (O. BERNARD)

- Machine learning for the processing of complex multi-parametric, -modals data (segmentation, detection, motion estimation, registration, inverse problems)
- Specific patient modeling (hemodynamics, mechanics)
- Application in cardiovascular, cerebral, lung imaging

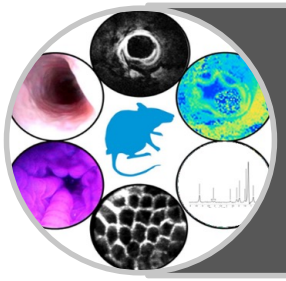


ULTIM : ULTRASOUND IMAGING (D. GARCIA)

- Rapid 3D imaging: Estimation of motion, flow, volumes for cardiovascular applications (image formation and reconstruction) and cancer diagnosis

TOMORADIO : TOMOGRAPHIC IMAGING AND RADIOTHERAPY (D. SARRUT)

- Image-guided radiotherapy (registration, dose simulation, imaging)
- Inverse problems, reconstruction and simulation in X-ray imaging (spectral CT)
- Translational research



MAGICS: NMR AND OPTICS: FROM MEASURE TO BIOMARKER (H. RATINEY)

- Identification of biomarkers based on multiparametric quantitative imaging
- New acquisition strategies based on optimization methods: optimal control
- Design of experimental devices for the measurement of new biomarkers

Transversal projects

MUltiple Sclerosis and neuroInflammatory project: from preclinical to Clinical investigations (MUSIC)

Radiomic for tumor characterization and treatment response (TUMOR ID)

Tissue Optical Imaging (TipTop)

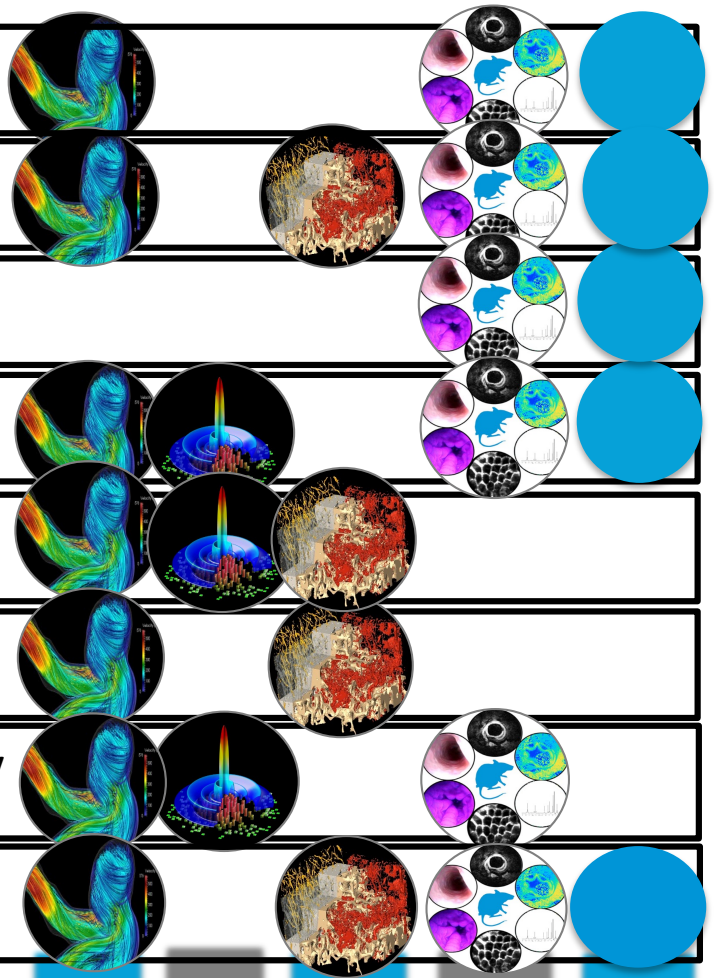
Multiparametric Multimodality Imaging of Musculo-skeletal & Myocardial muscles Damage (IDM4)

Imaging vascular pathologies and their consequences (IVPC)

Spectral photon counting (SPCCT)

Metislab - Medical Engineering and Theory in Image and Signal Laboratory IRP France-Chine

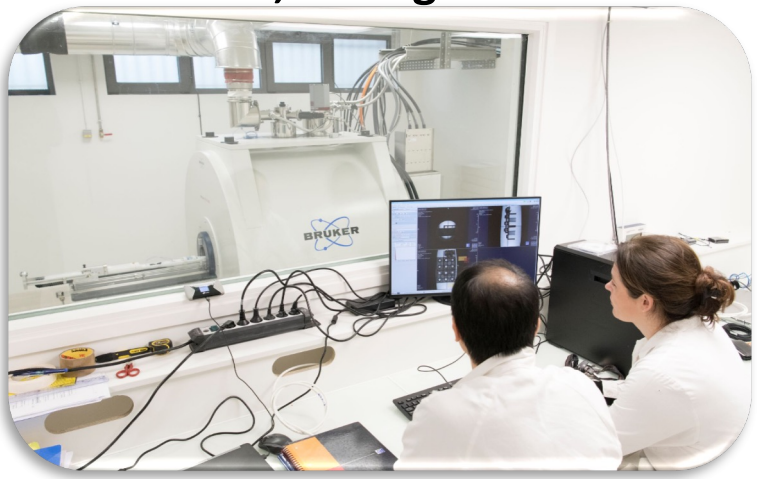
COVID-19



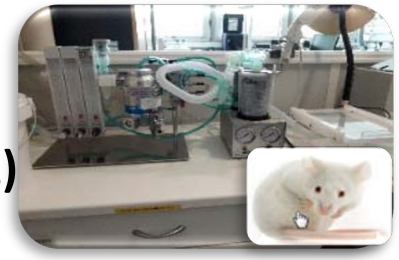
MYRIAD | ULTIM | TOMORADIO | MAGICS | PILoT, VIP, Info-dev

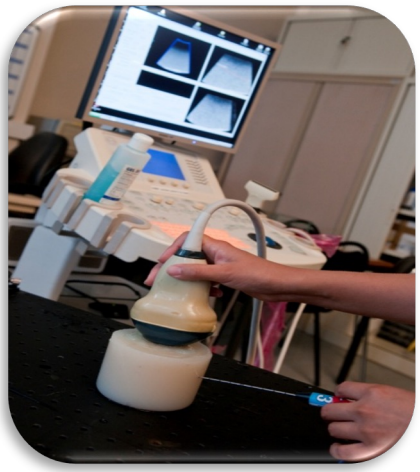
Experimental imaging platform LyonTech - PILoT

MR imaging and spectroscopy
7T and 11,7T magnets



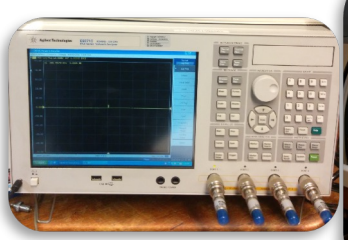
3 trained people for animal handling (level 1)
Rat & mouse housing (C 69 266 1401)

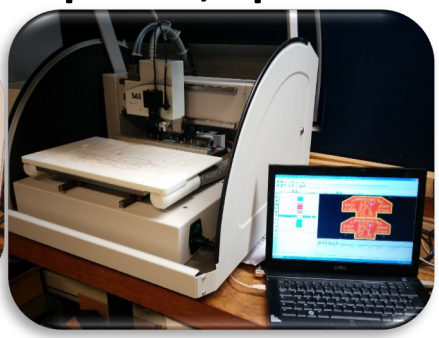


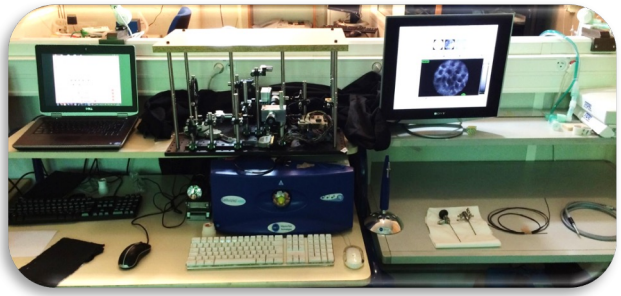


Ultrasound imaging
7 research echographs (-> 4 x 256 chanels)

Electronic workshop
Etching device, VNA, 3D printer, optical scanner…





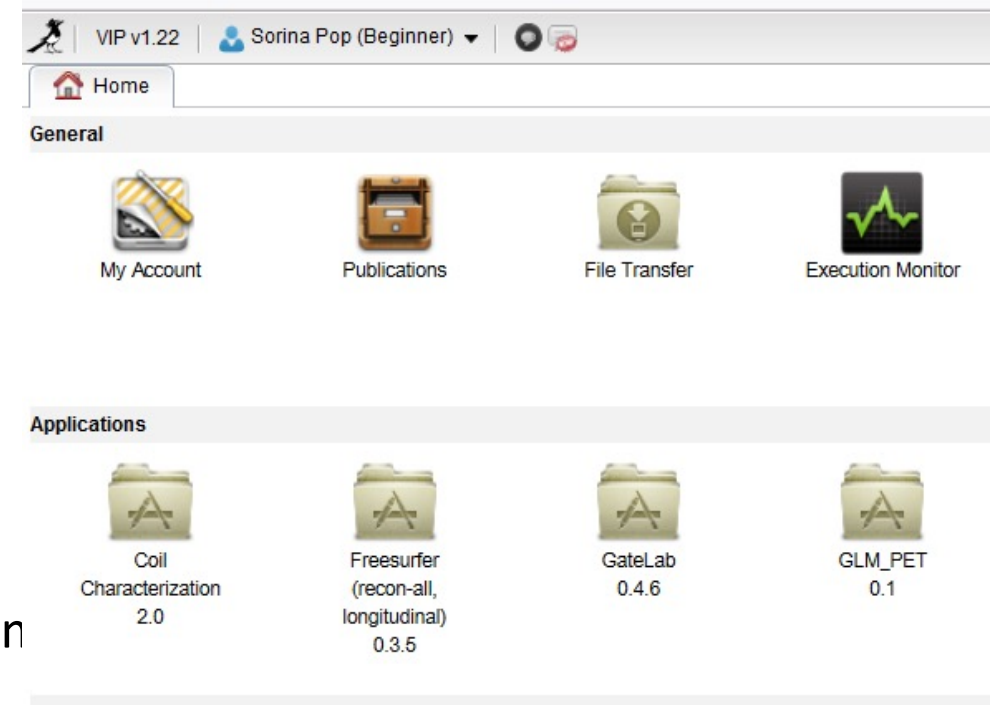


Optical imaging
Cameras and Laser sources

Virtual Imaging Platform

https://vip.creatis.insa-lyon.fr

VIRTUAL IMAGING PLATFORM



What VIP is offering?

- Easy access to distributed con Cloud, GPU)
- Applications as services (**Gate**, **Free surfer**, Coil Characterization, GLM, Tracto, ...)
- International sharing of applications and data (access management, organization of challenges, etc.)
- Features for open and reproducible research (use of DOIs, containers, etc.)

Scan me!

Resources for intensive computing (simulation & signal or image processing)

- 31 multiprocessor computer servers: 532 cores, 7.9TB RAM
- Some GPU resources (19 GPU boards with 4 Tesla V100-SXM2, 32 GB and 8 Quadro RTX 8000/A6000, 48 GB)
- 16 servers, 134 cores, 496 GB RAM housed for EGI

European Grid Infrastructure

Super-computer Jean Zay

IDRIS

1024 GPU boards with Tesla V100, 32 GB

- Access to computing centers (995 servers, 42 160 processors)

http://cctools.in2p3.fr/mrtguser/info_sge_parc.php

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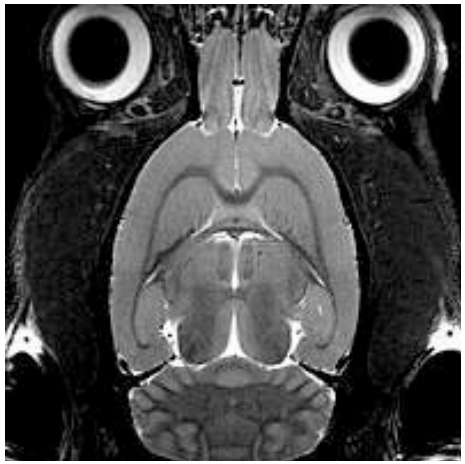
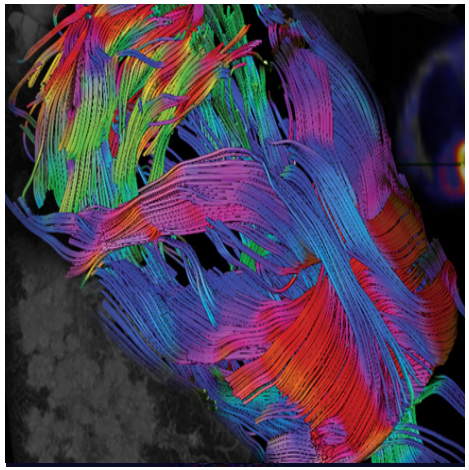
UNIVERSITÉ DE LYON

11,7T ultra high field MR imaging & spectroscopy

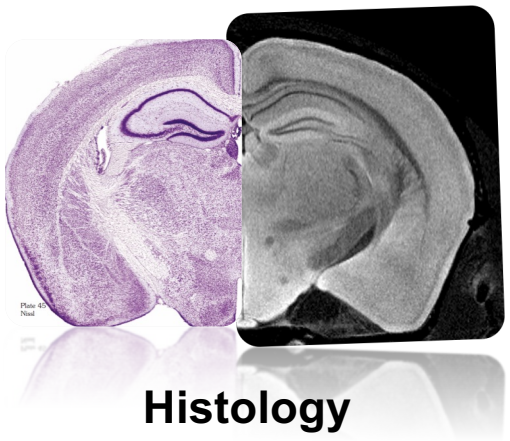


Brain **Anatomy**
(T2-weighted)

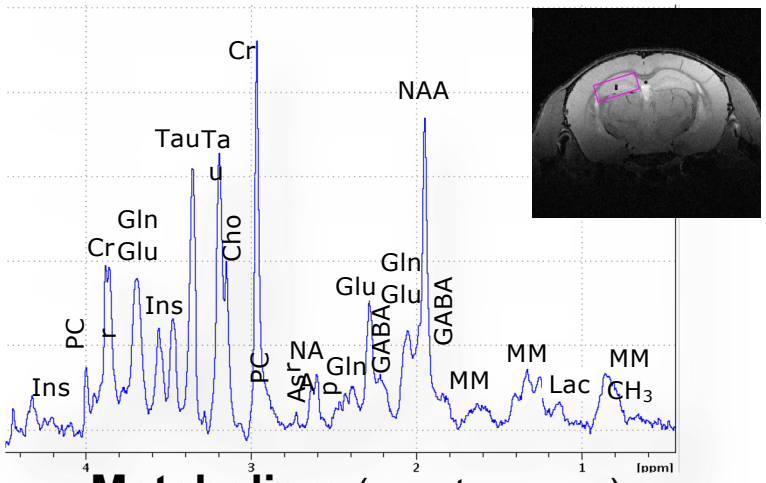


Brain **structure**
(diffusion tensor)

Cardiac **fonction**
(CINE)



Histology



Metabolism (spectroscopy)

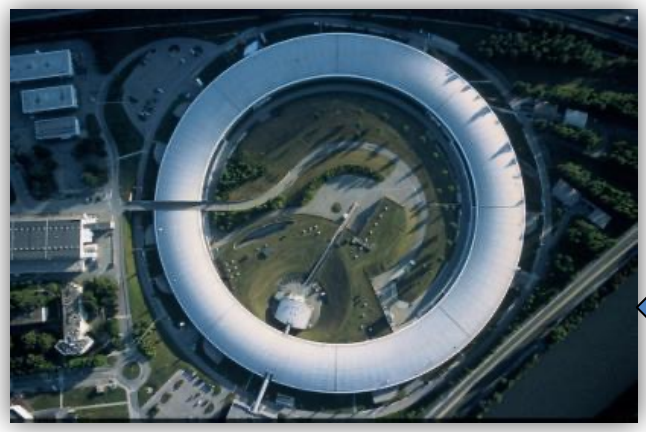
Privileged access to almost all imaging facilities

Radiotherapy, Elekta, CLB

- **Centre Léon Bérard (cancer center)**
- **Hospices Civils de Lyon**
- **University Hospital St-Etienne**
- **CERMEP, Imagerie du vivant**

Clinical imaging systems:
MRI, CT, PET, PET-CT, US, MR-PET

MR-PET, SIEMENS mMR



European Synchrotron Radiation Facility, Grenoble (Long Term Project)

International collaborations

26
partner countries

18
international PhD students each year

9
international projects