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Cyrcé, a new cyclotron for medical research

Cyrcé (Cyclotron pour la Recherche et l'Enseignement—Cyclotron for Research and Teaching), the new particle accelerator completed a few months ago at the Institut Pluridisciplinaire Hubert Curien (IPHC, CNRS/Université de Strasbourg) on the Strasbourg-Cronenbourg campus, is now up and running. It has just performed its first production of fluorine-18, a radioisotope commonly used as a tracer in nuclear medicine. This marks the start of operations at the facility—the only one of its kind in Europe—made available for academic research. Cyrcé is part of a French initiative to determine novel radioelements that will facilitate progress in diagnosis, monitoring of medicines and the discovery of new therapeutic protocols, especially in oncology and neurology.

Most cyclotrons of that type are dedicated to the commercial production of pharmaceuticals for hospitals, especially fluorine-18, a radioactive element that is essential to the production of fluorodeoxyglucose (FDG), commonly used as a tracer for functional imaging in the treatment of cancer.

Run by the academic community, the Cyrcé project is not subject to commercial interests, and will develop pharmaceuticals regardless of market considerations. Its unique energy characteristics (which can be adjusted from 19 to 24 MeV) will help it to produce a wide variety of radioelements (with half-lives ranging from a few minutes to several days) for use by the regional, national and international scientific communities. Cyrcé will be dedicated to research into radiolabeled molecules for preclinical use (on small animals) and clinical use (on humans) in oncological and neurological diagnosis, as well as for the development of new therapeutic protocols. The cyclotron will also serve as an unparalleled teaching platform for radiochemistry and nuclear instrumentation.

It took two years to design and produce the cyclotron and its infrastructure. Since its completion in July 2012 at the Strasbourg-Cronenbourg campus, Cyrcé has successfully performed all the installation and commissioning stages. The final qualification stage, which followed the delivery of an operating permit by the French Nuclear Safety Authority (ASN), consisted in firing up the cyclotron to produce fluorine-18 for the first time. It validated the machine's control system (which continuously monitors around a thousand parameters) and confirmed the effectiveness of the confinement system, made up of about a thousand tons of concrete and a hundred tons of lead to provide shielding from the emitted radiation. In addition to being a highly flexible tool, the cyclotron produces no long-term radioactive waste.

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As part of France's Investments for the Future program launched in 2009, the Cyrcé cyclotron completes Strasbourg's small animal imaging facilities within the Transimagin[1] Equipex and strengthens French research in nuclear medicine within the IRON[2] Labex, one of whose main objectives is innovation in cancer treatment.

With a total cost of M€ 4.85, the facility was funded by the French Ministry of Higher Education and Research, CNRS, the Alsace region, the Bas-Rhin Departmental Council, the Strasbourg Urban Community, the European Regional Development Fund (FEDER) and the University of Strasbourg.

[1] Coordinated by Institut Clinique de la Souris, the Transimagin (Translational and integrated multimodal imaging) Equipex (Equipement d'Excellence) brings together teams from Institut Clinique de la Souris (ICS), Institut Pluridisciplinaire Hubert Curien (IPHC, CNRS/Université de Strasbourg), Laboratoire des Sciences de l'Ingénieur, de l'Informatique et de l'Imagerie (ICube, CNRS/Université de Strasbourg/Insa Strasbourg/École Nationale du Génie de l'Eau et de l'Environnement de Strasbourg - ENGEES), Institut de Génétique et de Biologie Moléculaire et Cellulaire (IGBMC, CNRS/Université de Strasbourg/Inserm), Unité Interaction Virus-hôte et Maladies Hépatiques (Inserm/Université de Strasbourg), and the Laboratoire Immunopathologie et Chimie Thérapeutique (ICT, CNRS). The scientific goal is to develop translational and integrated multimodal small animal imaging (with the aim of transferring findings from animals to humans).

[2] Coordinated in Nantes around the Arronax cyclotron, the IRON (Innovative radiopharmaceuticals in oncology and neurology) Labex (Laboratory of excellence) brings together eight University-Hospital sites: Angers, Caen, Nantes, Orléans, Rennes, Strasbourg, Toulouse and Tours. The scientific objective is the clinical transfer of innovative radiopharmaceuticals for positron emission tomography (PET) imaging, which are essential to the development of customized healthcare programs, an important public health issue in the fields of neurology and cancer treatment.

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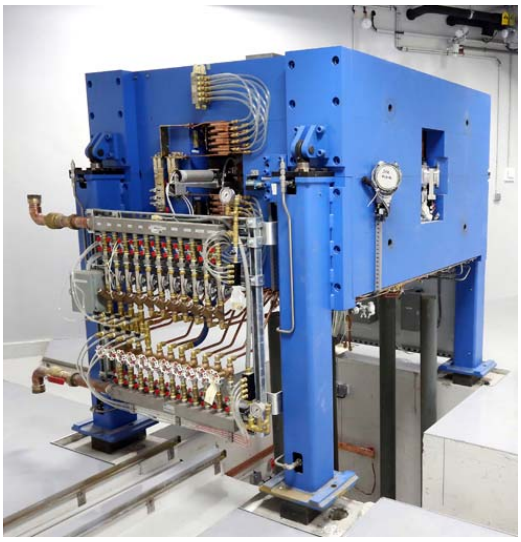

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The Cyrcé cyclotron ready for connection.

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David Brasse and Michel Pellicioli, respectively lead scientist and technical manager of the Cyrcé project, inspecting interior of the cyclotron after its initial conditioning phase.

To find out more about Cyrcé: http://www.iphc.cnrs.fr/Le-cyclotron-Cyrce.html

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