

# Nuclear Physics, Radiochemistry and Radioisotope Production: an Interdisciplinary Endeavor for Imaging in Nuclear Medicine

**Bernd GRAMBOW**

Director, SUBATECH (IMT-Atlantique, Nantes University, CNRS/IN2P3), 4 rue Alfred Kastler, 44307 Nantes, France (grambow@subatech.in2p3.fr)

## **Abstract**

SUBATECH is a leading French research unit in nuclear physics and radiochemistry, studying the fundamental laws of matter and the Universe as well as societal relevant applications in the areas of environment, energy and health. Building on a strong fundament provided by the technical services (electronics, IT, mechanical, etc.), the various research groups in nuclear physics and radiochemistry work together on interdisciplinary projects. Within the regional cluster on "Nuclear Medicine and Ionizing Radiation" SUBATECH is associated with the nuclear medicines of CRCNA(INSERM), the high flux, high energy, dual beam Cyclotron ARRONAX, the Excellence cluster IRON (Innovative radiopharmaceuticals in Oncology and Neurology) and the Project ARRONAXPlus, allowing the French region "Pays de la Loire" to become a key player in the development of radiopharmaceuticals and medical imaging methods.

The nuclear physicists of SUBATECH contribute with the development of applications around the interaction of radiation and matter, notably in the production of new radionuclides for medical applications using the ARRONAX in view of higher production rates of, for example,  $^{82}\text{Sr}$ ,  $^{44}\text{Sc}$  or  $^{44\text{m}}\text{Sc}$ . The research in radio-isotope production has a large impact by making available innovative radioisotopes for very sensitive diagnostic procedures and for new targeted radionuclide therapies, thus improving healthcare.

Subatech targets a technological breakthrough in PET (Positron Emission Tomography) imaging using 3-photon Compton scattering imaging and liquid-Xenon detector technology. It has already demonstrated several key points of the technology, notably in the area of cryogenics and electronics in liquid xenon. It is expected that the technology can be further developed in order to compete with future Time of Flight PET imagers, optimized for full-body imaging.

In the area of radiochemistry SUBATECH focuses on the development of radionuclides for cancer therapy and diagnostics, in particular considering isotopes which can be used in the future PET camera. A startup company Ai4R for development of medical imaging has been formed as well.