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From ISOLDE to MEDICIS and beyond – Valorizing fundamental radioactive ion beam research at CERN for nuclear medicine

Abstract

With over 50 years of operation, the Isotope Separator On-Line DEvice (ISOLDE) is the longest running experiment at CERN. It uses the ISOL technique to produce and purify short-lived radioactive isotopes to support research in nuclear structure, nuclear reactions and nuclear physics applications in solid state physics, biophysics, and more. Moreover, since 2017, a new facility has been commissioned besides ISOLDE: the MEDical Isotopes Collected from ISolde (MEDICIS) project. This new collaboration applies the same production and purification techniques as ISOLDE with a symbiotic use of the infrastructure but with the specific goal to supply radioactive isotopes for medical research in partner university hospitals.

The new MEDICIS facility operates with targets irradiated by the PS Booster (protons at 1.4 GeV, up to 2 microA), as well as with targets irradiated elsewhere (neutron capture at ILL in Grenoble (FR) or at BR2 in Mol (BE); 30-70 MeV protons at ARRONAX in Nantes (FR)). In the last 3 years, this has supported some 15 different medical research programs across Europe and has led to a new movement.

In Belgium, a specific consortium has been established to develop novel nuclear medicine products based on radioactive terbium isotopes: the Terbium Isol Radioisotope for Medical Applications in Flanders (Tb-IRMA-V) together between the KU Leuven Institute for Nuclear Physics, the Belgian Nuclear Research Center SCK CEN (including the BR2 reactor) and the university hospital UZ Leuven. This consortium and the CERN MEDICIS facility form two nodes of the new European program PRISMAP that aims at spreading those novel developments across the European Union, based on the model of the DOE Nuclear Isotope Development Center (NIDC).

In this colloquium, I shall introduce the ISOL technique and discuss how it can become a game changer in medical research, present some highlights from the CERN MEDICIS facility, both on its physical and technical achievements as on some recent breakthroughs it has led to in radiopharmaceuticals research, and finally present the prospects offered by the new PRISMAP program.