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THE MYRRHA ADS PROGRAMME IN BELGIUM

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Since 1995, SCK•CEN has been studying the coupling of a proton accelerator, a windowless liquid Lead-Bismuth spallation target and a Lead-Bismuth cooled, sub-critical fast core. The study was first performed in collaboration with Ion Beam Applications (IBA, Louvain-la-Neuve) in the frame of the ADONIS project (1995-1997). ADONIS was a small irradiation facility, based on the ADS concept, having a dedicated objective to produce radioisotopes for medical purposes and more particularly 99Mo as a fission product from highly enriched 235U fissile targets. The ad-hoc scientific advisory committee recommended extending the purpose of the ADONIS machine to become a Material Testing Reactor (MTR) for material and fuel research, to study the feasibility of transmutation of the minor actinides and to demonstrate at a reasonable power scale the principle of the ADS. The project, since 1998 named MYRRHA, has then evolved to a larger installation.

MYRRHA today is conceived as a flexible fast spectrum irradiation facility, able to work as an Accelerator Driven System (subcritical mode) and in critical mode. In this way, MYRRHA will allow fuel developments for innovative reactor systems, material developments for GEN IV systems, material developments for fusion reactors, radioisotope production for medical and industrial applications and industrial applications, such as Si-doping. MYRRHA will also demonstrate the ADS full concept by coupling the three components (accelerator, spallation target and subcritical reactor) at a reasonable power level to allow operation feedback, scalable to an industrial demonstrator and allow the study of efficient transmutation of high-level nuclear waste.

MYRRHA consists of a proton accelerator with a proton energy of 600 MeV and a design intensity of 4 mA, coupled to a liquid Lead-Bismuth Eutectic spallation neutron source. Apart from the experimental and irradiation possibilities in the subcritical reactor, the MYRRHA proton accelerator on its own can be used as a supply of proton beams for a number of experiments. In order to explore new research opportunities offered by the accelerator, a pre-study was initiated within the framework of the "Belgian Research Initiative on eXotic nuclei"(BriX) network of the Interuniversity Attraction Poles Programme of the Belgian State. This study is investigating unique possibilities for fundamental research using high-intensity proton beams with a fraction of the full beam during ADS operation (up to 200 μA). An interesting approach for fundamental research using the 600-MeV proton accelerator is the installation of an Isotope Separator On-Line (ISOL@MYRRHA) facility with a ruggedized target-ion source system, which is able to provide intense low-energy Radioactive Ion Beams (RIB) for experiments requiring very long beam times (up to several months). This will open unique opportunities for RIB research in various scientific fields, which is complementary with the activities at other existing and future facilities. In a second phase, when the MYRRHA reactor will run as a stand-alone critical reactor, the full proton-beam intensity might be used for ISOL@MYRRHA or other applications.

MYRRHA is foreseen to be in full operation by 2024 and it will be operated in the first years as an ADS.

Is this an invited talk? (please answer yes or no)

no

Would you prefer your contribution to be a poster presentation? (please answer yes or no)

no

Would you prefer your contribution to be an oral presentation? (please answer yes or no)

yes

Are you a student, postdoc or an attendee from an “emerging”country and would like to apply for financial support?

no

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