

**MYRRHA,  
A Multi-purpose ADS for R&D - Pre-design Phase Completion**

H. Ait Abderrahim, P. Kupschus, Ph. Benoit, E. Malambu, K. Van Tichelen, B. Arien,  
F. Vermeersch, Th. Aoust, Ch. De Raedt, S. Bodart, P. D'hondt  
SCK-CEN, Boeretang 200, B-2400 Mol, Belgium  
Haitabde@sckcen.be or myrrha@sckcen.be

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**Abstract**

SCK-CEN, the Belgian Nuclear Research Centre in partnership with IBA s.a., Ion Beam Applications, is designing an ADS prototype, MYRRHA, and is conducting an associated R&D programme. The project focuses primarily on research on structural materials, nuclear fuel, liquid metals and associated aspects, on sub-critical reactor physics and subsequently on applications such as waste transmutation, radioisotope production and safety research on sub-critical systems. The MYRRHA system is intended to be a multipurpose R&D facility and is expected to become a new major research infrastructure for the European partners presently involved in the ADS Demo development.

The design of MYRRHA needs to satisfy a number of specifications such as:

- Achievement of the neutron flux levels required by the different applications considered in MYRRHA:
  - $\Phi_{>0.75 \text{ MeV}} = 1.0 \times 10^{15} \text{ n/cm}^2\cdot\text{s}$  at the locations for minor actinides (MA) transmutation
  - $\Phi_{>1 \text{ MeV}} = 1.0 \times 10^{13} \text{ to } 1.0 \times 10^{14} \text{ n/cm}^2\cdot\text{s}$  at the locations for structural material and fuel irradiation
  - $\Phi_{\text{th}} = 2.0 \text{ to } 3.0 \times 10^{15} \text{ n/cm}^2\cdot\text{s}$  at locations for long-lived fission products (LLFP) transmutation or radioisotope production
- Subcritical core total power: ranging between 20 and 30 MW
- Safety:  $k_{\text{eff}} \leq 0.95$  in all conditions, as in a fuel storage, to guarantee inherent safety;
- Operation of the fuel under safe conditions: average fuel pin linear power < 500 W/cm.

Ion Beam Applications is performing the accelerator development. Currently the preliminary conceptual design of the MYRRHA system is under way and intensive R&D programme is assessing the points of greatest risk in the present design. This work will define the final choice of characteristics of the facility. In this paper we will report on the completion of the pre-design study as of June 2001 as well as on the methods and results of the R&D programme.