Beam interruption experiments in the GUINEVERE ADS from very sub-critical to nominal reactivity within the MYRACL program

J. L. Lecouey[a], A. Bailly[a], A. Billebaud[c], A. Kochetkov[b], A. Krása[b], S. Chabod[c], F. R. Lecolley[a], G. Lehaut[a], N. Marie[a], N. Messaoudi[b], G. Vittiglio[b] and J. Wagemans[b]

[a] Normandie Univ, ENSICAEN, UNICAEN, CNRS/IN2P3, LPC Caen, 14000 Caen, France
[b] SCK•CEN, Belgian Nuclear Research Centre, Boeretang 200, 2400 Mol, Belgium
[c] LPSC, Université Grenoble-Alpes, CNRS/IN2P3, 53 Avenue des Martyrs. 38026 Grenoble cedex, France

Abstract

The GUINEVERE (Generator of Uninterrupted Intense NEutrons at the lead VEnus REactor) project was launched in 2006, within the 6th Euratom Framework Program IP-EUROTRANS, in order to study the feasibility of transmutation in ADS. The eponymous facility hosted at the SCK·CEN site in Mol (Belgium) coupled the fast subcritical lead reactor VENUS-F with an external neutron source provided by the deuteron accelerator GENEPI-3C via T(d,n)4He fusion reactions occurring at the reactor core center. The GUINEVERE facility was then used in the follow-up FREYA project (7th European FP) which was dedicated to experiments in support of the design and licensing of critical and sub-critical configurations of MYRRHA (Multi-purpose hYbrid Research Reactor for High-tech Applications). In particular, techniques of on-line subcriticality monitoring were investigated by conducting various zero-power experiments with temporal variations of the external neutron source. Within the MYRTE H2020 European project (2016-2019), new experiments were carried out in a new VENUS-F configuration which was made more representative of the future MYRRHA subcritical reactor in operation, by introducing bismuth in the core. However, these experiments did not cover the particular features of an ADS at start-up. Indeed, when the ADS is being commissioned or restarted, the reactor will be largely subcritical and the linear accelerator duty cycle will be strongly reduced to limit the average power generated in the core. SCK•CEN and CNRS have collaborated within the new research program MYRACL (MYrrha ACceLerator) to perform new experiments gathering these two features at the GUINEVERE facility. This poster will present some preliminary results of MYRACL beam interruption experiments in largely subcritical configurations of VENUS-F with GENEPI-3C working in a very low duty cycle. Consequences for the reactivity monitoring of the MYRRHA ADS at commissioning are discussed.