MEASUREMENT OF KINETIC PARAMETERS IN THE SOURCE-DRIVEN FAST SUBCRITICAL CORE MASURCA WITH NOISE METHODS *


1 SCK-CEN, Boeretang 200, B-2400 Mol, Belgium (pbaeten@sckcen.be)
2 ANL, P.O. Box 2528, Idaho Falls, ID 83403, USA
3 CEA, Centre de Cadarache, F-13108 Saint Paul lez Durance, France
4 CIEMAT, Avda. Complutense 22, Madrid, Spain
5 IRI, Delft University of Technology, Mekelweg 15, Delft, Netherlands

In the framework of the European 5FP MUSE measurements are performed to investigate the neutronic behaviour of the fast subcritical core MASURCA coupled with the pulsed GENEPI neutron generator. Noise techniques, such as the Rossi-alpha method, Feynman-alpha and spectral methods were applied in several measurement conditions. Different driving sources were used: the intrinsic plutonium source and a pulsed neutron source. This paper summarizes the main first results from the application of noise methods in the MUSE-4 configuration. Also the first conclusions are presented with respect to the applicability of individual noise techniques for ADS.

1. Introduction

The 5FP MUSE is aimed at studying the physics of subcritical systems in view of the development of future Accelerator Driven Systems (ADS). The choice for the most suited reactivity monitoring technique, an accurate determination of kinetic parameters and a thorough understanding of the specific kinetic behavior of deep subcritical systems (keff = 0.95-0.97) are indeed key points to guarantee a safe operation of an ADS. To give a satisfactory answer to these questions, the MUSE project makes use of the fast subcritical core MASURCA coupled to the GENEPI deuteron accelerator.

Reactivity and other kinetic parameters have been measured successfully in the past in (near) critical systems with well-known noise methods such as the Rossi-alpha method, Feynman-alpha technique or the analysis of auto- or cross power spectral densities [1]. The application of these techniques in subcritical systems driven by an external source is subject to several specific features. At

* This work is supported by the European Commission via the 5FP MUSE