

Czech Technical University in Prague, Experiment CTU08

Main topic: Experimental reactor physics

Keywords: VR-1 reactor, multiplication factor, reactivity, rod drop, source jerk, positive period method

Purpose: Reactivity, prompt-neutron lifetime and the effective delayed neutron fraction are three most important reactor kinetics parameters at any reactor. Reactivity changes almost continuously when a reactor is in operation. Reactivity time variations have an immediate influence on the reactor operation and safety and therefore are strictly limited.

Level of exercise: Basic Advanced Complex
Level of education: BSc MSc PhD

What you will learn:

Learning objective of the experiment is to learn and to understand the concept of reactivity and its relation to the multiplication factor and to the reactor power. The experiment is highly suitable for students studying nuclear engineering as the major curriculum and it is suitable for students studying various major engineering curricula as such as power engineering, mechanical engineering, electrical engineering with future assignment in various nuclear curricula.

Important information:

- Minimal size of student group: 4
- Maximal size of student group: 10
- Overall duration of the experiment (in wall clock hours): 3



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Possibility to perform experiment on demand: Yes No
 Frequency of occurrence: On demand, ca 30 times/year
 Examination modalities: Protocol, evaluation, discussion
 Teaching languages: English, Czech

Pre-knowledge required: The students should be familiar with introduction to the reactor physics, particularly with concepts of multiplication factor and reactivity, and with neutron detection. Prior to this experiment, CTU02 - Neutron detection should be performed.

Instruments required for exercise:

- The VR-1 reactor
- The VR-1 neutron source
- Neutron detection system for education and training

Execution:

At the VR-1 reactor, the reactivity measurement is carried out by several methods: source jerk method, rod drop method, positive period method, neutron source multiplication (or Greenspan), the method or inverse kinetics, method implemented to digital reactivity meter. Lecturer chooses three or four methods during this experiment in order to demonstrate different approaches to the reactivity measurement in various reactor states.

Limitations:

No particular limitation for this experiment, only general requirements for entry to research nuclear installation according to the Czech nuclear legislation should be fulfilled.

