

## Czech Technical University in Prague, Experiment CTU02

**Main topic:** Experimental reactor physics

**Keywords:** VR-1 reactor, neutron detection

**Purpose:** Neutrons are key particles which cause fission chain reactions and allow operation of nuclear reactors. That is why their detection is crucial for any reactor. Neutron detectors, as devices which are able to detect neutrons, provide information about reactor power, power distribution in the reactor core, and rate of power changes. Various types of neutron detectors are used at a reactor. In general, they can be divided into two groups: passive detectors and active detectors.

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

### What you will learn:

Learning objective of the experiment is to understand the detection of neutrons in order to understand safe reactor operation. 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): 1.0-1.5



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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 student should be familiar with introduction to the theory of neutron detection.

### Instruments required for exercise:

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

### Execution:

At the Training reactor VR-1 this is the first real measurement which students are carried out at the reactor after the reactor visit. During this experiment, gas-filled neutron detectors are used to demonstrate basic principles of neutron detection. Students will learn how to determine the counting characteristics and differential characteristics of selected gas-filled neutron detectors, the correct input voltage based on the results of the counting characteristics, how to set-up the correct discrimination levels to eliminate the effect of noise and gamma radiation on the measured counting rate. Dead-time of a neutron detector is also investigated and demonstrated at various power levels of the VR-1 reactor.

### 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.

