

Determination of thermal neutron flux



BME Training Reactor, Exercise BME-01

Main topic: Reactor Physics / Spatial distribution and absolute value of thermal neutron flux in a reactor

Keywords: neutron activation, thermal neutron flux, neutron flux spatial distribution, gold activation

Purpose: In this experiment students activate samples in a reactor and investigate how the activation and subsequent measurement can be applied to determine relative and absolute neutron flux values. The influence of factors, such as the presence of reflector in a thermal reactor, on the thermal neutron flux distribution is analyzed. Characteristics, such as the thermal and epithermal (resonance) cross sections of the activated material and uncertainty factors of neutron flux determination by activation are also examined using the gold foil measurement.

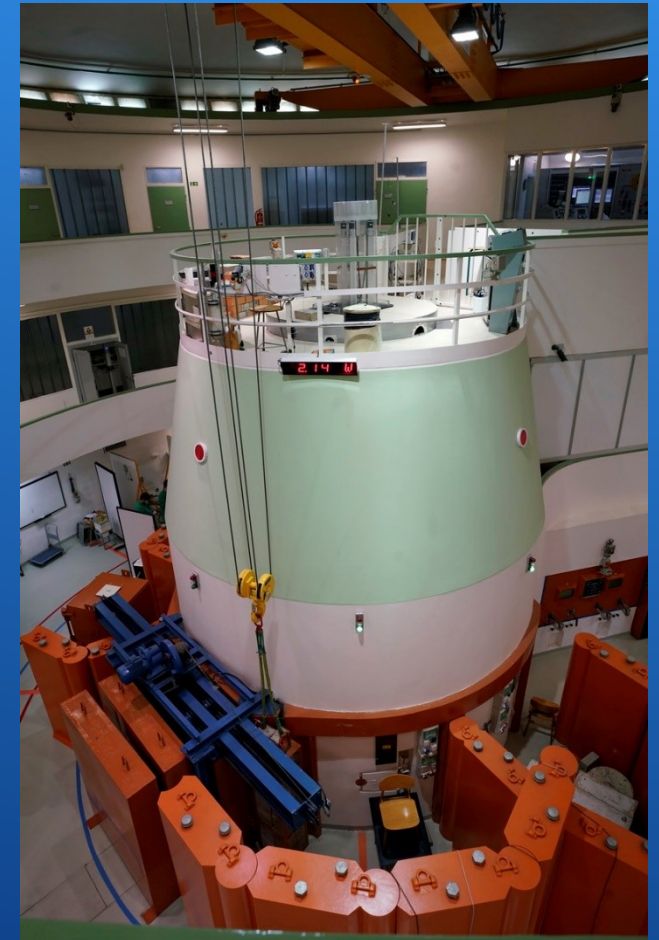
Level of exercise: Basic Advanced Complex
Level of education: BSc MSc PhD

What you will learn:

The students will learn how to determine the thermal neutron flux in the reactor core, using two methods

Important information:

- Minimal size of student group: 2
- Maximal size of student group: 6
- Overall duration of the experiment (in wall clock hours): 3-4



Determination of thermal neutron flux



BME Training Reactor, Exercise BME-01

Possibility to perform experiment on demand: Yes No

Frequency of occurrence: 10-12 times per year

Examination modalities: short test before measurement, experiment report after

Teaching languages: English, Hungarian

Pre-knowledge required: Basics on nuclear physics, reactor physics and nuclear measurement techniques

Instruments required for exercise:

- Reactor + pneumatic rabbit system for sample delivery
- Plexiglass rod to hold Dy wire
- Scintillation detector and pulse counter apparatus
- Wire activity measuring device

Execution:

- A wire of Dy-Al alloy is placed in a plexiglass rod, which is then placed into the reactor core
- The irradiation is performed.
- A dysprosium and a gold foil are simultaneously activated using the pneumatic rabbit system
- The wire is placed into the activity measuring apparatus, while the Dy foil is placed below the detector of the timer chain.
- The activity as a function of the position along the Dy-Al wire is determined
- The absolute value of thermal neutron flux is determined by the gold activation detector.

Limitations:

None.

