



Neutron flux measurements using gamma-compensated boron-lined ionization chamber

Jožef Stefan Institute, Exercise JSI-08

Main topic: Reactor Physics

Keywords: Nuclear Instrumentation, compensated ionization chamber, neutron detection, B-10

Purpose: The purpose of the experiment is familiarization with the construction and operation of compensated boron-lined ionization chambers, which are frequently used as nuclear instrumentation detectors. Basic principle of chamber compensation are explained and demonstrated practically in a mixed neutron and gamma radiation field. Measurements of compensated ionization chamber response linearity are performed at different degrees of compensation.

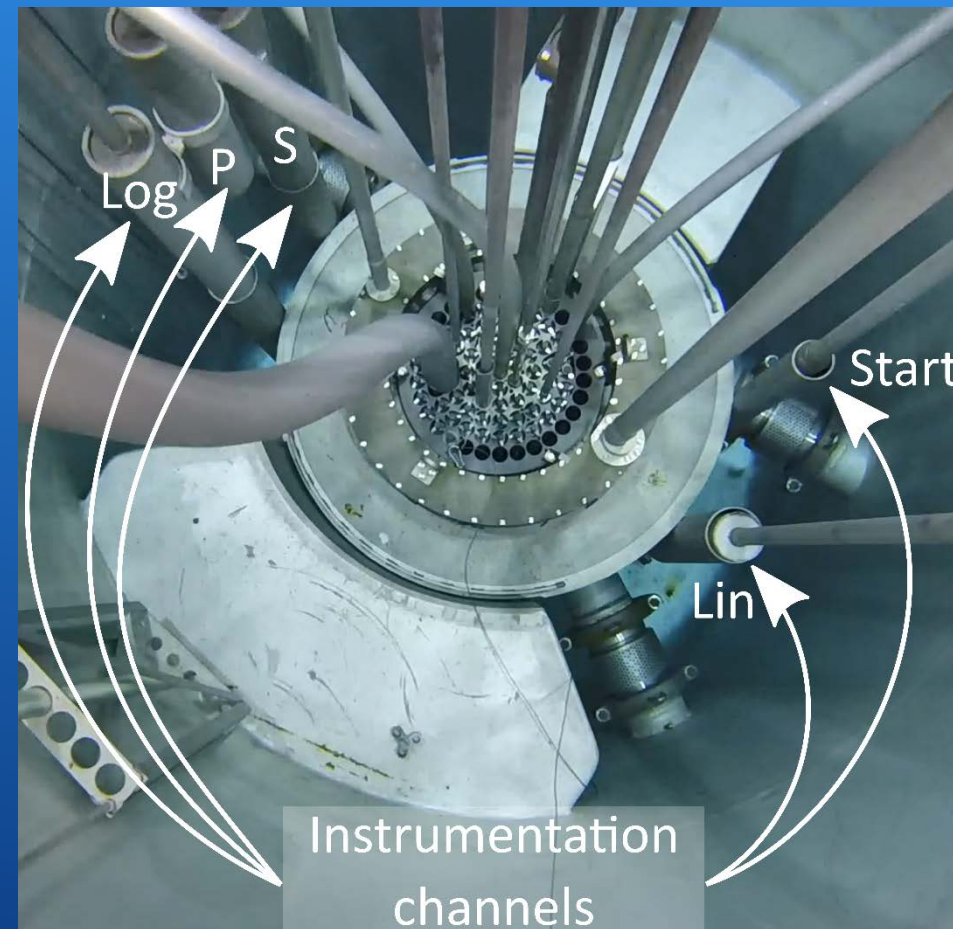
Level of exercise: Basic Advanced Complex
Level of education: BSc MSc PhD

What you will learn:

Students will learn about the construction and operation of a gamma-compensated ionization chamber, experimentally determine the compensation voltage and test the linearity of chamber response at different degrees of compensation.

Important information:

- Minimal size of student group: 4
- Maximal size of student group: 12
- Overall duration of the experiment (in wall clock hours): 3-4



Start = Starting channel (fission counter)
Lin = Linear channel (compensated ionization chamber)
Log = Logarithmic channel (compensated ionization chamber)
P = Pulse channel (uncompensated ionization chamber)
S = Safety channel (uncompensated ionization chamber)

Possibility to perform experiment on demand: Yes No

Frequency of occurrence: on demand

Examination modalities: report

Teaching languages: English, Slovenian, Serbian/Croatian, Italian, French

Pre-knowledge required: Basics on neutron detection, basics on reactor operation.

Instruments required for exercise:

- Reactor instrumentation
- Compensated ionization chamber
- Acquisition system

Execution:

- The construction and operation of a compensated ionization chamber is discussed.
- Chamber compensation is demonstrated in the gamma radiation field in the reactor core at zero power.
- The current vs. voltage characteristic is measured at different reactor power levels.
- The chamber response linearity vs. reactor power is tested at different degrees of chamber compensation.

Limitations:

None

