# Void coefficient of reactivity

## Jožef Stefan Institute, Exercise JSI-05

ENEEP

Jožef Stefan Institute
TRIGA REACTOR

**Main topic:** Reactor Physics

**Keywords:** Void formation, coolant boiling, void coefficient of reactivity

**Purpose:** The void coefficient of reactivity is one of the most important coefficients of reactivity for safe reactor operation. The JSI TRIGA reactor is equipped with an electro-pneumatic system with which air can be injected into the reactor core to simulate void formation through boiling. The purpose of the experiment is the measurement of the magnitude of the void coefficient as a function of the radial location in the reactor core.

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

**What you will learn:**
Students will observe the change in reactivity caused by the presence of air bubbles in the reactor core and understand the magnitude and sign of the reactivity coefficient, depending on the location in the reactor core where air bubbles are injected.

**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

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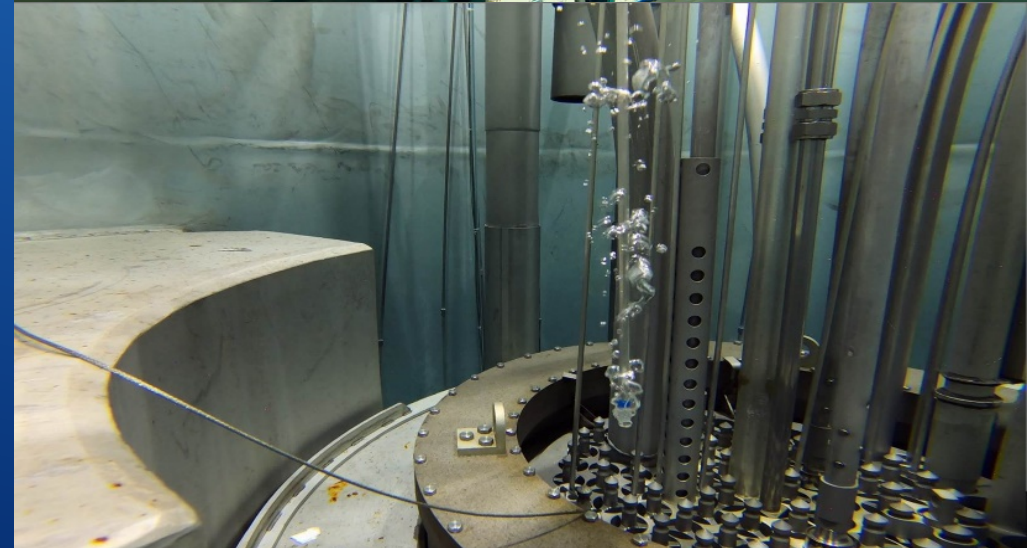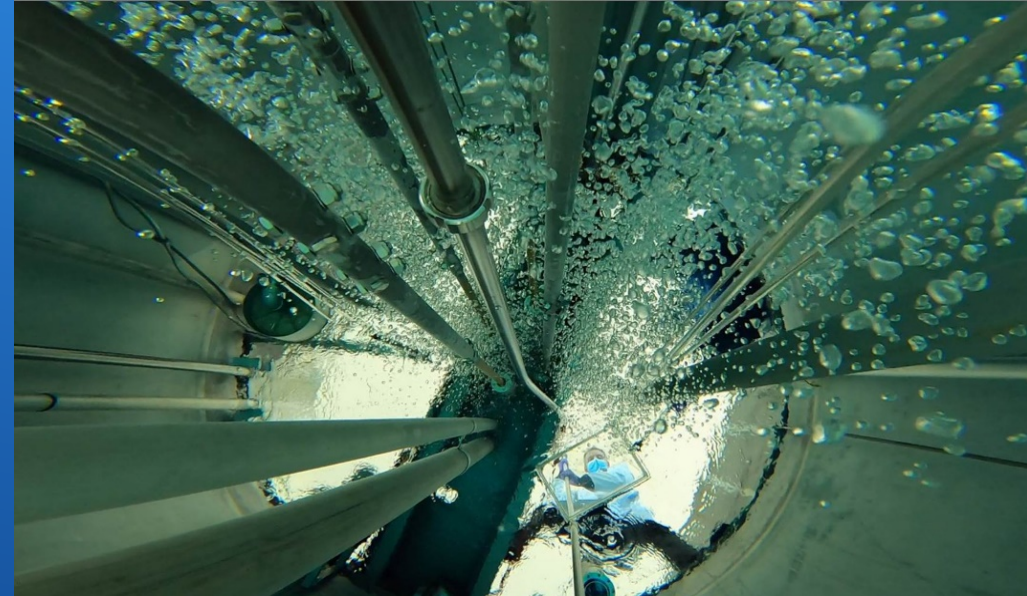
**Possibility to perform experiment on demand:** ☒ Yes ☐ No
**Frequency of occurrence:** on demand
**Examination modalities:** report
**Teaching languages:** English, Slovenian, Serbian/Croatian, Italian, French

**Pre-knowledge required:** Basics on reactor operation, basics on reactor behaviour and reactivity coefficients.

**Instruments required for exercise:**
- Reactor instrumentation;
- Digital meter of reactivity
- Electro-pneumatic system for injection of air into the reactor core
- Dedicated software developed by JSI

**Execution:**
- The task of the exercise is to measure the void coefficient of reactivity by introduction of void into several different positions in the core.
- The total volume of the voids is estimated on the basis of the flow rate, which is measured by the electro-pneumatic system.
- The magnitude and sign of the void coefficient of reactivity is determined and visualized on the spot, in dependence on the position on the reactor core.

**Limitations:**
None



Void coefficient of reactivity vs. radial position in the core for different control rod configurations

Measurement positions

Transient rod

Safety rod

Transient rod: 580, Safety rod: 200, Shim rod: OUT, Regulating rod: OUT, Pressure = 1000 mbar
Transient rod: 580, Safety rod: 200, Shim rod: OUT, Regulating rod: OUT, Pressure = 2000 mbar
Transient rod: OUT, Safety rod: 554, Shim rod: OUT, Regulating rod: OUT, Pressure = 2000 mbar