Control rods calibration
TU Wien, Exercise TUW-03

Main topic: Reactor Physics

Keywords: Control rods, reactivity worth, core excess reactivity

Purpose: This exercise examines the efficiency of control rods and measures the reactivity worth of the regulating rod. A visual representation of control rod worth may be obtained by plotting rod withdrawal against the excess reactivity. The resultant curve shows reactivity effect for different vertical positions of the calibrating rod. The participants will learn the meaning of calibration of the regulating rod, and become familiar with the effect of control rods on the reactivity of the core.

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

What you will learn:
During this experiment the participants will gain a profound understanding of calibrating and working with control rods in a nuclear reactor.

Important information:
- Minimal size of student group: 4
- Maximal size of student group: 8
- Overall duration of the experiment (in wall clock hours): 3

Control rods calibration
TU Wien, Exercise TUW-03

Possibility to perform experiment on demand: ☒Yes ☐ No
Frequency of occurrence: Once a year
Examination modalities: Participation in the experiment, protocol and final written test
Teaching languages: English/German

Pre-knowledge required: understanding in nuclear and reactor physics, radiation physics and protection.

Instruments required for exercise:
- Reactor I&C system;
- • Several stop watches.

Rod Position vs Integrated Reactivity Addition

Execution:
- After achieving a reactor power of 10 W, one control rod is withdrawn for a defined step. The reactivity addition caused by this movement causes the reactor to become supercritical.
- Stop watches are used to measure the time during which the reactor power increases by a factor of 1.5
- After obtaining the time periods, the reactor power is again stabilized at 10 W, and the experiment is repeated for several other heights of the regulating rod.
- The obtained reactivity values are applied to plot the integral and differential curve of the calibrated rod.
- Using the rod calibration curve, the rod reactivity value is determined.
- The total core excess reactivity is deducted.

Limitations:
This experiment will be conducted in a controlled radiation area. Hence. controlled radiation area limitations apply.