

DELPHI

Subcritical Assembly

dr. ir. J.L. Kloosterman, ing. C.N.J. Kaaijk

For educational, training and research purposes the Department of Reactor Physics of IRI built a subcritical assembly called Delphi. This facility consists of an acrylic air-filled vessel to store the fuel and a stainless steel vessel which is filled with purified water before the start of an experiment. From bottom to top the height of the facility reaches about 250 cm, which makes it necessary to manipulate the fuel when standing on the loading platform. Attached to the top of each fuel pin, a special head makes it possible to load the fuel pins with a tailor-made handling tool. Delphi is equipped with two 10-bar ^3He proportional counter tubes with a diameter of 6 mm and an active length of 76 mm.

168 fuel pins made of 3.8% enriched UO_2 with a total length of 66.5 cm. The pins are positioned in a square lattice of 13×13 positions, with the central position being occupied by a water-filled tube. The pitch between the fuel pins is 23 mm, being the value at which k_{eff} is maximal 0.92.

The pulses from the detector are recorded in a PC, equipped with a pulse-counter card and LABVIEW software to control the measurements. This software also records each passage of the source synchronized with the neutron pulses.

Stainless steel vessel with an inner diameter of 100 cm.

The ^{252}Cf -neutron source placed in a plastic capsule is stored in a stainless steel box with paraffin and B_4C grains. This source has an initial strength of 18.5 MBq corresponding to a neutron emission rate of $2.4 \times 10^6 \text{ s}^{-1}$ and a gamma-ray emission rate of $1.3 \times 10^7 \text{ s}^{-1}$. Before the start of an experiment a shielding plug is removed and the source tube is lifted pneumatically. The source capsule can be shoot in and out with air pressure only if the vessel is filled with water.