# Experimental confirmation of of cascade-type two-sectional blankets concept

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Of late years there has been arisen an interest to two-sectional blanket reactors with one-way neutron coupling of the sections (cascade type blankets). These facilities are designed to operate within accelerator-driven energetic and transmutational systems, and being applied, they provide essential reduction of the required capacity of the proton accelerator. There are some theoretical and design works pertinent to cascade type blankets, but no experimental investigations are so far available.

Deeply subcritical systems were under study $k_{eff} \cong 0.6$, which in diverse combinations contained a neptunium sphere of 8.17 cm diameter with the internal cavity of 3.4 cm diameter, layers of uranium-235 (90% concentration rate), layers of moderator, air gaps and cadmium filter. In the center of the neptunium sphere a primary neutron source $^{252}$Cf was placed.

To measure density distributions and total number of fissions of neptunium and uranium nuclei in the systems dielectric track detectors were employed. During the results processing the total number of fissions in each section of the multiplying system was normalized to one neutron emitted by the californium source.

Satisfactory agreement was obtained for the experimental and calculated values of the number of fissions in the assemblies and the factors of cascade multiplication. As the experiment results have indicated, the assemblies under study, in spite of the rather low $k_{eff}$ value, yield considerable cascade multiplication of the number of fissions. For one of the assemblies containing a neptunium sphere the cascade multiplication factor was 2.81.

The experiment results have afforded good corroboration for the theoretical estimates of cascade blanket properties, as well as for the efficiency of neptunium-237 use for providing the sections one-way coupling.

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