POSSIBILITY OF THE USE OF FISSION REACTION AS AN INDICATOR OF NEUTRON CLUSTERS

Fomichev A.V.
Institute of Physics, Saint Petersburg State University, Russia
E-mail: fomichev_07@,bk.ru

The problem of the existence of neutron-only nuclei is closely connected with the cluster structure of nucleus. The typical approaches are to try to find these multineutrons in multinucleon transfer reactions in experiments with radioactive beams, in which charged products of reactions are registered [1,2], or in reactions of the direct capture of a free neutron cluster by a nucleus with the following activation analysis of exposed sample [3].

In the present report, another method for searching for multineutrons is discussed. This method was discovered in the course of the analysis of the technique which the author used for fission cross-sections measurements using a spallation neutron source.

In a spallation process, multineutrons can be born along with neutrons and these multineutrons will be contained in the neutron flux from such a source. You must identify the fission events (in sample placed in this flux) caused by neutrons, as opposed to those caused by multineutrons. This identification is ensured by using the method for selection of neutron by time-of-flight.

We should look for fission events in the region of low neutron energies located before the fission threshold for the nuclei placed in that neutron flux. In the region of low energies of incident neutrons, the fission events will be induced by multineutrons because they insert enough energy into fissionable nuclei. The method sensitivity depends on fission cross-section difference across the fission threshold. For Th-232, for instance, this difference is $\sim 10^5$. The above-presented reasoning is illustrated by Fig.1.

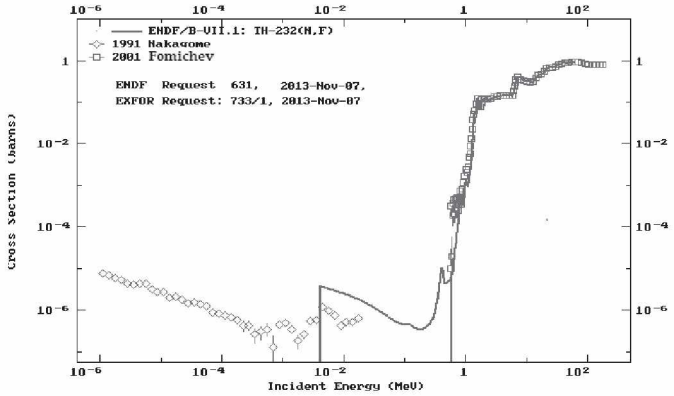

Fig. 1. Energy dependence of fission cross-section of threshold nucleus for Th-232.

1. D.V.Aleksandrov, E.Yu.Nikol'skii, B.G.Novatskii, *et al.* // JETP Letters. V.81(2). P.43.
2. Yu.Ts.Oganessian, V.I.Zagrebaev // Phys. Rev. Letters. 1999. V.82. N25. P.4996.
3. B.G.Novatsky, E.Yu.Nikolsky, S.B.Sakuta, *et al.* // JETP Letters. 2012. V.96(5). P. 280.