**Review**

for the Joint Institute for Nuclear Research project

 **“Study of Deeply subcritical accelerator driven systems and features of their application for energy production and Transmutation of spent nuclear fuel”**

The project is devoted to the study of the physical possibility of creating a sub-critical accelerator driven systems for safe energy and radioactive waste transmutation.

Currently the world paid much attention to the design and creation of sub-critical accelerator driven systems, (Accelerating Driven System, ADS) setup controlled by an accelerator.

Here we can note projects such as EUROTRANS, in which the EU plans to create a demonstrator MYRRHA, and then two subcritical reactors for transmutation waste, CADS (PRC), OMEGA (Japan) and others.

The development of all these projects is constrained by the complexity of the technology of creating and operating an accelerator of a continuous proton or deuteron beam of megawatt power and insufficient funding, as well as the incompleteness of nuclear physical data and constants.

During the implementation of the project, a number of studies were carried out at JINR to determine the neutron yield in an extended target.

Especially it is necessary to allocate an original technique of search and determining of neutrons quantity emitted outside the active zone assembly.

In fact, the JINR Nuclotron is currently the only accelerator in Russia, where it is possible to conduct research on subcritical assemblies in a practically interesting range of proton energies 1-3 GeV.

The work on the physical substantiation of subcritical assemblies irradiated with a beam of deuterium ions in the world is conducted mainly at JINR, other centers have the opportunity to work only with a proton beam.

In connection with the above, this project being implemented at JINR is topical and it is necessary to continue it.

It should be noted that the proposal to create a deeply sub-critical systems is not justified from the standpoint of the possibility of obtaining a overall efficiency of the installation, since it requires the use of a 10 GeV proton accelerator.

The energy consumption of such an accelerator will exceed output in the subcritical target.

Nevertheless, the methods used are universal and conducted investigation produce results that can be widely used in ADS projects with multiplication factor of 0.95-0.97, the concept of which is common accepted in the world.

The obtained results are unique and, of course, useful for the future creation of subcritical nuclear power installation controlled by an accelerator in the world, and later, perhaps in Russia.

Also it should be noted the possibility of attracting foreign colleagues, since conducting research in Europe is constrained by the possibilities of obtaining proton and deuteron beams with energy 1-3 GeV on the existing accelerators.

The target assembly "BURAN" will expand the experimental possibilities.

I believe that the continuation of the project will be useful and has the prospect of moving further into the practical implementation of a subcritical nuclear facility controlled by an accelerator.

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