
Contribution ID: **459** Type: **POSTER**

# The method of calculating tritium content in various technological media of BN-type reactors

*Tuesday, June 27, 2017 5:30 PM (1h 30m)*

During the reactor operation a continuous generation of the radioactive isotope of hydrogen –tritium –takes place. Tritium is formed in nuclear reactions: fission of the fuel and interaction of neutrons with nuclei of some elements contained in the fuel, structural materials and coolant. Tritium has a great penetrating ability and migrates through the technological media. Thus it gets into the environment. Peculiarities of its transfer essentially depend on the reactor facility type.

Experience in operating domestic BN reactors as well as international experience suggests that only a small portion of tritium coming in the sodium coolant is released to the environment.

Data on the amount of tritium coming into the environment, along with the data on the content of tritium in technological environments, can be used in practical calculations of radiation exposure because of tritium for the population and the staff at NPPs with the BN reactor. This is required for the various operating modes of BN, including decommissioning.

As it has been shown in several studies, tritium transport and allocation in sodium circuits of BN reactors is directly connected with the content of protium (hereinafter referred to as hydrogen - H) in soduim. Therefore, there is a need for simultaneous determination of the mass transfer of hydrogen and tritium. Tritium mass transfer model in application to the three-loop reactor is based on a consideration of hydrogen and tritium balance in the first and second circuits, as well as in emergency heat removal system (EHRS).

In the present study it is noted that, in general, for plants with BN reactors isotopes of hydrogen (H and T) balanced equation must be written for sodium and for the gas phase in each circuit, and for the second circuit and EHRS equations must be written for each loop.

It is also noted that for the BN reactor these tasks are simplified due to the fact that with sufficient accuracy for practical purposes can be assumed that the gas phase has no affect on the mass transfer of hydrogen isotopes (H, T) in the sodium loops as their main mass is in the coolant.

These quantities of tritium content in different technological media of BN reactors provide the basis for determining the effects of tritium on the personnel and the environment.

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**Session Classification:** Poster Session 1

**Track Classification:** Track 3. Fast Reactor Safety