Contribution ID: **10** Type: **Oral presentation (preferred)**

Experience during Ring Injection Dump Parts Exchange at the Spallation Neutron Source

Thursday, 30 May 2024 09:00 (20 minutes)

According to the accelerator operation plan of the Oak Ridge National Laboratory Spallation Neutron Source (SNS), the beam-stop and the proton beam window (PBW) assemblies of the existing Ring Injection Dump (RID) are replaced with fresh assemblies, when they have reached their end-of-life. End-of-life is determined by the stainless-steel beam-stop window having accumulated 10 dpa radiation damage. The exchange process took place during facility maintenance period that started in March 2023. Each of the spent assembles were put into specially designed storage containers for intermediate on-site cooldown. The spent beam-stop was predicted to be the part of highest activation that has been taken out of service at SNS. The exchange processes require good work planning to minimize radiation exposure to personal.

The SNS accelerator employs an H- charge exchange process to obtain sum-microsecond proton pulses in its accumulator ring. The H- beam passes through a set of two foils to strip away the electrons and produce a proton beam. Non-stripped or partially stripped parts of the beam are called waste beam and are directed to the ring injection dump (RID). This dump was designed to accept 10% of the main 2-milliamp and 1-1.3 GeV proton beam deflected into this beam dump, depositing up to 200 kW of energy in the copper plate assembly of the beam dump. During the years, operational experience has shown that only about 5% of the main proton beam is going to the RID beam stop, however, this is still putting a large particle charge into the components during their lifetime and making them highly activated. The central part of the beam-dump, the beam stop, is heavily shielded by steel and concrete to keep radiation levels during accelerator operation under allowed limits.

The residual dose rate distribution is calculated using rigorous application of Monte Carlo code MCNPX together with Activation in Accelerator Radiation Environments script, which handles the transmutation analyses and prepares the sources for the residual dose rate calculations. Analyses are performed for each exchange step and the peak values of the dose rates are identified and were fed into the exchange work planning.

This paper gives an overview of the exchange process, describes methods for the neutronic analyses, some of encountered challenges, and gives the comparison of calculated vs measured dose rates during beam-stop assembly exchange.

Scientific Topic 1

Scientific Topic 2

Scientific Topic 3

Scientific Topic 4

Scientific Topic 5

Induced radioactivity and decommissioning

Scientific Topic 6

Scientific Topic 7

Scientific Topic 8

Primary author: POPOVA, Irina (Oak Ridge National Laboratory)

Co-authors: ELAM, Christi L. (ORNL); Dr GALLMEIER, Franz (ORNL); SCHULTZ, Ryan (ORNL)

Presenter: POPOVA, Irina (Oak Ridge National Laboratory)

Session Classification: Session 5 - Induced Radioactivity

Track Classification: Induced radioactivity and decommissioning