

## Neutronics analysis for the Fusion Materials Irradiation Test Station (FMITS) at SNS

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### Abstract

The fusion material community has a growing interest in irradiating materials under a spallation spectrum, in which the range of helium/dpa ratios provides a unique opportunity for exploring the fundamental mechanisms of the radiation effects on structural fusion materials. One of such efforts is the recently proposed FMITS project to be carried out at SNS. In the conceptual design of FMITS, two sample rods are placed 3 cm and 5 cm off the centreline, respectively, in front of the mercury target, where the back scattering neutron flux spectrum was found to be fairly close to the ITER fusion spectrum. The PKA spectra at the FMITS samples were also compared to those at ITER. The results show a good agreement between the two types of PKA spectra. At a nominal power of 1.4 MW, the displacement production at samples of FMITS is 1.6-5.5 dpa/yr for steel, and 1.8-3.4 dpa/yr for SiC. The ratio of the gas production versus the displacement production is 13-75 appmHe/dpa and 76-311 appmH/dpa for steel, and 30-98 appmHe/dpa and 28-145 appmH/dpa for SiC. This study found no negative impact of FMITS on the SNS moderator performance based on the current conceptual design.