# Target activation and radiation safety for the HBS HiCANS

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## Abstract

Over the last years, rising research interest has been shown in the development of accelerator-based neutron sources. Reasonably high neutron yields are produced by using proton beams with energies in the MeV range and a high beam current of tens of milliamperes to bombard metal targets below the spallation threshold. Based on this concept for a High-Current Accelerator-based Neutron Source (HiCANS), the High Brilliance Neutron Source (HBS) project has been developed at Forschungszentrum Jülich for a high-flux neutron source for various scientific fields.

Using tantalum for the target material in the HBS project, in addition to neutron production, thermodynamic and structural mechanical analysis, the irradiation of the target was considered from the point of view of radiation protection. The induced radioactivity due to prompt and residual radiation of the target in different irradiation patterns was studied with FLUKA simulations.

The proton- and neutron-induced activity of the tantalum target (the main source of radioactivity in the HBS target station) was estimated for an incident proton beam of 70 MeV and a peak current of 100 mA and for irradiation times of 30, 90, 180, and 360 days. The decay of the total target activity was also considered. The major radionuclides, total activity, decay heat, and dose rate were calculated after 1, 3, 5, and 10 years of decay from the end of target irradiation. We will present the simulations for the target activation at the workshop. The build-up and decay of the radioactivity of the target will affect the decision on the target exchange system, the management of the spent target, e.g., the storage facility and the transport casks, the cooling of the targets due to the decay heat and so on.