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Dose rates and specific activities of LIEBE target at CERN after the irradiation with the high-power proton beam

The widespread approach to increasing the yield of radioactive isotopes in the accelerators is to increase the beam intensity. The creation of targets capable of accommodating these high-power beams is the main task in achieving higher radioactive isotope production. A prototype target named LIEBE (Liquid Eutectic lead Bismuth for Eurisol) was designed and assembled for that purpose at CERN. The proton transport simulations with the MCNP code were performed to generate neutron flux densities and spectra at the LIEBE target and its surroundings. The FISPACT code with the TENDL 2021 nuclear data library was used for the LIEBE irradiation simulations using the MCNP-produced data and considering the irradiation durations of 1 hour, 1 day and 1 week at full power. The neutron-induced activation, contact dose rates and dose rates at a 30 cm distance were determined at several time slices after the shutdown and the end of irradiation. This data can be used to evaluate required changes for the LIEBE target to produce a higher yield of radioactive isotope production.

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