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#4-261 Characterization of the fast neutron source facility at STU

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This study presents a new facility developed at Slovak University of Technology in Bratislava. The laboratory aims to production of the fast neutrons for research and educational activities. The main component is the Deuterium- Deuterium neutron generator with the emission rate about $1E8$ neutron/sec. to 4π placed in the room with dimensions approximately $11\times 11\times 7.5$ m³. Internal construction of neutron generator employs titanium-coated copper target, which makes neutrons emission anisotropy unique for each new device and thus extensive measurement characterization of the source is required. Accelerated deuterium is trapped in the titanium lattice and when the saturated level is reached, the neutrons are emitted in the relevant amount. Intensive SCALE MONACO Monte Carlo simulations were carried out to evaluate primary characteristics and ambient dose rates within laboratory and adjacent area. Unfortunately, the real neutron source anisotropy was unknown and therefore theoretical anisotropy defined based on the point-source calculation was used. The paper characterizes the neutron source from the point of view of spatial and energy distribution of the neutrons around the generator head. However, the laboratory benefits from relatively large volume, the room effect can play a relevant role in the neutron spatial distribution and then must be properly characterized. The comprehensive characterizations is need not only for future experimental activities, but also for ambient dose rate evaluation and operation licensing issues. The facility aims to support precise fast neutron radiography of large industrial components deployed within Gen-IV reactor concepts. Neutron radiography presents a promising alternative for industrial applications especially where large penetrations are required and light nuclides are presented. The laboratory is also equipped by the X-ray lamp and flat panel to cover large area of non-destructive testing techniques and defects identification.

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