Estimation of the Dose Rate in the Preparation Phase of the Neutron Emission Rate Measurement

Štefan Čerba [1,a)], Branislav Vrban [1,b)], Jakub Lüley [1,c)], Filip Osuský [1,d)] and Vladimír Nečas [1,e)]

[1]*Slovak University of Technology in Bratislava, Faculty of Electrical Engineering and Information Technology, Institute of Nuclear and Physical Engineering, Ilkovičova 3, 812 19 Bratislava, Slovak Republic*

[a)]Corresponding author: stefan.cerba@stuba.sk
[b)]branislav.vrban@stuba.sk, [c)]jakub.luley@stuba.sk, [d)]filip.osusky@stuba.sk, [e)]vladimir.necas@stuba.sk

Abstract. The manganese bath activation technique has been developed and actively used for neutron emission rate measurements at the laboratory of the Institute of Nuclear and Physical Engineering FEI STU since 2015. For this technique a spherical Plexiglas vessel with manganese sulfate solution and Pu-Be isotope neutron source is used, which is before and after the emission rate measurement transported using a special source loading mechanism. Since all activities involved in the work with sources of radiation must be in line with the ALARA (As Low As Reasonably Achievable) principle, it is necessary to estimate the radiation situation during the source loading procedure and to optimize the measurement process. This paper focuses on the simulation of the radiation situation in case of these transportation process, based on Monte Carlo simulation using the detailed model of the experimental workspace developed in the SCALE6 system. The model consists of geometry configurations that can influence the attenuation of gamma and neutron radiation. To estimate the radiation situation 3D neutron and gamma mesh tallies and 5 point detectors, placed at specific positions, are used. The paper includes the achieved results of the dose rates as well as discussion on the optimization of the measurement process.