COMPUTATIONAL DOSIMETRY FOR IMPROVED WORKER RADIATION MONITORING IN NEUTRON WORKPLACES: VALIDATION IN BUDAPEST RESEARCH REACTOR[#]

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Abstract

Radiation worker dose assessment by personal dosemeters is limited by the fact that the single-point measurements may not be representative for the whole body and by practical challenges, such as workers wearing incorrectly the dosemeters or occasionally even forgetting them. Furthermore, in neutron workplaces dosemeters can significantly over- or underestimate the dose. Computational neutron dosimetry presents an alternative monitoring method. This study aims to investigate the feasibility of using computational neutron dosimetry in a real neutron workplace, namely at the Budapest Research Reactor. The Raylab DIAMON neutron spectrometer and the Berthold LB6411 ambient neutron monitor were used for rapid neutron field characterisation. By combining the measured dose rate map with a camera-based motion tracking system, it was possible to calculate the neutron dose accumulated by a worker. This study demonstrated that worker movement can be accurately tracked, provided there are no obstacles between the camera and the worker. Additionally, the dose rate mapping can be easily done and the computational neutron dosimetry can effectively estimate worker dose in real neutron workplace fields, as long the radiation field remains stable or its intensity can be scaled using the reactor power or a reference ambient dosemeter as reference. This approach has the potential to complement or even to replace the physical dosemeters, providing improved accuracy in complex neutron fields. Combining directional and spectral data from the DIAMON could also enable calculations in terms of $H_p(10)$ or effective dose.

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