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# #04-102 Measurement of prompt gamma field above the VR-1 water level

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The good knowledge of gamma spectrum in vicinity of nuclear reactor core is essential in characterization of radiation field. It is important for ensuring of radiation safety, but well described gamma field can be used also for testing of radiation measuring devices. The field in vicinity of reactor core is interesting for testing because in contrary to commonly use gamma fields formed by common gamma sources, in the reactor fields there are high energy gammas formed by neutron interactions with reactor structural components. Due to this mechanism, the gammas in reactor field are mostly accompanied by presence of neutrons. An interesting situation may occur in deep penetration issues in water, because deep water slab is an excellent fission neutron absorber but week gamma absorber. Behind deep water slab one can expect high energy capture gamma field with negligible share of neutrons. This criterion is well filled above water surface of the VR-1 Czech Technical University research reactor. The water thickness above fuel is more than 300cm. The gamma fluxes were measured 88.6 cm above the water surface, and about 450cm from the center of the reactor core. The measurement was performed using NGA-01 spectrometric system and stilbene scintillation detector of 45 x 45 mm sensitive for both neutrons and gamma radiation. The NGA-01 spectrometric system was used for measurement and data evaluation. This system features two-parameter data processing from scintillation detectors in mixed fields of neutron and gamma radiation. The system works with high-speed ADC converters with 500 MS / s (alternatively 1 GS / s) and a resolution of 12 bits. FPGA (Field Programmable Gate Area) with advanced digital filters and PSD algorithms ensures lossless data processing. The measured gamma spectrum was compared with calculated one. The computational simulation of the prompt gamma field above the VR-1 water level was performed. This deep penetration problem was solved as fixed source gamma model, where the source gamma spectrum and gamma emission density was calculated in critical model. Generally, the calculated spectra are in satisfactory agreement with experiment.

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