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Monte-Carlo simulations of the new radiation shielding at the thermal beamport SR8 @ FRM II with SERPENT 2

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The thermal beamport SR8 at the research neutron source Heinz Maier-Leibnitz in Garching will be optimized to allow the simultaneous operation of three independent monochromatic powder diffractometers. SPODI will continue to be one of the world-leading high-resolution powder diffractometers. FIREPOD will be a dedicated high throughput instrument, well suited for a broad range of fast parametric studies. ERWIN will be a highly versatile multi purpose diffractometer for both powder as well as single crystals. Due to the unique characteristics of each instrument, the optimized beamport SR8 will be able to cater for a wide range of experimental demands and will substantially increase available beam time for neutron powder diffraction. To exploit the full capabilities of each instrument a complete rebuilt of the primary neutron optics at the beamport SR8 is necessary. This requires an entirely new radiation shielding around the neutron guides and monochromators.

In this contribution, the results from detailed Monte-Carlo simulations to optimize the biological SR8-shielding are presented. Employing the SERPENT2 code, the full radiation transport of neutrons, as well as gamma radiation through the different shielding materials is simulated. While taking boundary conditions such as available space, floor load and costs into consideration, the underlying detailed CAD-based model is iteratively optimized to achieve a total dose rate lower than the desired limit of 3µSv/h outside the shielding.

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