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## **Neutron transport calculations in support of the PSI-NEUTRA instrument upgrade**

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NEUTRA is the thermal neutron imaging instrument coupled to the Swiss Spallation source SINQ. Successfully completing 25 years of operation, the NEUTRA 2.0 upgrade project has been approved. The upgrade to NEUTRA 2.0 foresees a complete reconstruction of the instrument including a redesign of the shielding bunker. The inner space of the measurement bunker will be enlarged, enabling complex setups with bulky samples. Likewise, full access to an upstream measuring position, MP1, on the beamline will allow utilizing about half an order and one order of magnitude higher flux than at the currently accessible measurement positions MP2 and MP3, respectively. These measures will enable higher temporal resolution neutron imaging and the use of state-of-the-art detectors and measurement techniques at NEUTRA.

In this paper, the Monte Carlo MC / deterministic transport calculations performed for the verification of the safety of the shielding concept will be presented. In addition, we will give an overview of the calculation methodology and the variance reduction techniques applied for improving the simulation efficiency. With the help of the numerical analysis the shielding design has been optimised, its corresponding dose rate distribution maps are computed, and it is shown that the required radiation dose limits will be fulfilled.

**Scientific Topic 1**

**Scientific Topic 2**

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**Scientific Topic 4**

Shielding and dosimetry

**Scientific Topic 5**

**Scientific Topic 6**

## Scientific Topic 7

## Scientific Topic 8

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