



# General Area Dose Rate Maps to Support Advanced Reactor Experiments

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*Changing the World's Energy Future*

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## Overview

INL is collaborating with several demonstrators to perform experiments in support of advanced reactor technology. After completion of these experiments, the activated equipment will have to be removed and disposed. To aid in planning and executing the equipment removal activities, radiation dose rate maps must be developed and maintained to minimize the potential dose to workers per ALARA (As Low As Reasonably Achievable) principles.

## Methodology

Using the radiation transport code MCNP6.2, dose rates within the reactor facility were estimated. A reduced fidelity model was created and photon spectra developed for 41 separate sources folded into 18 systems. The photon fluxes were tallied using a 103 x 103 x 57 mesh of the geometry. Photon flux-to-dose conversion factors were applied (ANSI/ANS 1977) and results were normalized using a source strength multiplier. Results were visualized using MATLAB R2019b. Figure 1 shows an example dose rate map.

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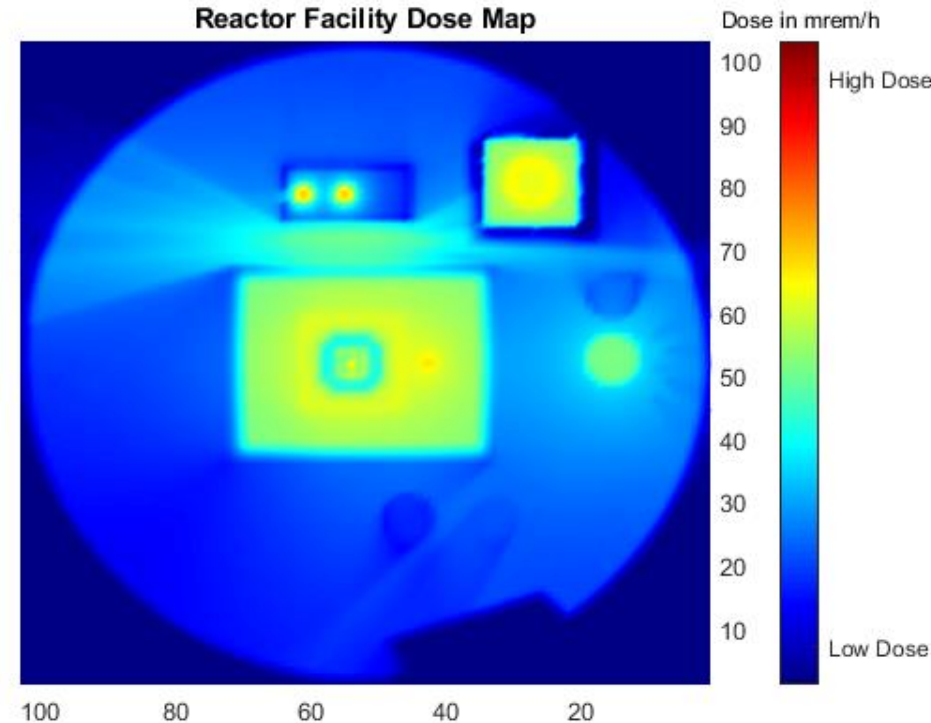


Figure 1. Two-Dimensional Resolution of Dosage Map at Chest Height

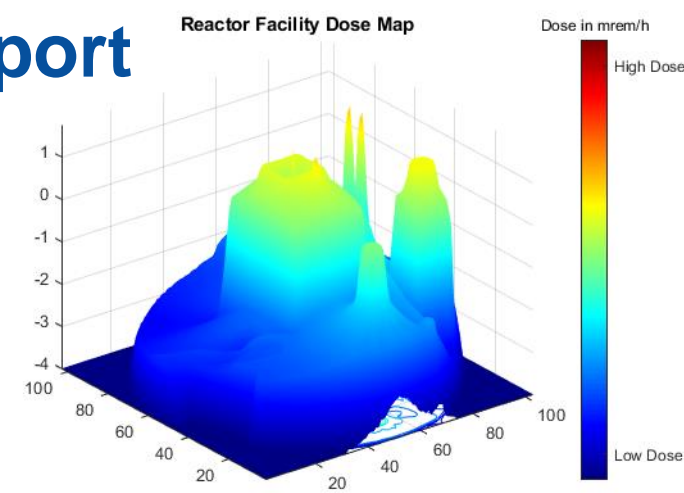


Figure 2. Three-Dimensional view of dose rate map

The areas of high and low radiation allow for evaluation of the preliminary shielding strategies employed. Radiation streaming can be seen, which indicates areas where additional engineering or programmatic control must be employed to protect workers.

## Conclusion

Dose maps are being developed to inform ongoing design and planning. This includes equipment layout and shielding to minimize worker dose per ALARA principles and planning of advanced reactor demonstrations.