

## Comparison of ease of use of software tools for use in dose rate calculations

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In order to carry out work in the nuclear sector in a cost effective way, while keeping risks ALARA, it is necessary to perform calculations of dose rates in areas where workers will be present, and it is important to choose the right tool for each job. The dependence of this choice upon the type of radiation, material, and geometry is obvious. Of at least equal importance, however, are practical considerations such as the level of accuracy required, the time available to prepare and run the models, the power of available computers, and the expertise level of the analyst.

Individual analysts and organisations are cognizant of these factors and typically make their choices according to their own experiences and working habits. While convenient, selecting methods in this way is susceptible to bias in favour of familiar methods and may result in a superior method being overlooked if it has never come to the attention of the analyst before.

There is a lack of research systematically evaluating available software tools from the point of view of ease of use –i.e. how much time and effort does it take to prepare models, how high are the demands placed on the analyst, and what features are available in different software to partially automate tasks?

Historically, user-friendliness has not been given a high priority in development of radiation transport codes. In the last five to ten years, more and more codes are becoming available with features to improve usability, such as the GUIs of SuperMC [1] and Attila [2], and the unstructured mesh/CAD import feature of MCNP [3]. In the present work, the author presents a survey and comparison of some of the most commonly used tools for dose rate calculation, with particular focus on how difficult it is for a new user to become acquainted with the software and how much skill is required to use it effectively. The methods treated include Monte Carlo codes (MCNP, SuperMC, MCBEND, GEANT4), point kernel codes (Microshield, RadPro, VRdose, RANKERN), discrete ordinates deterministic methods (Attila, ANISN). It is hoped that others who need to calculate dose rates will find this comparison useful and will also follow the example of taking a wide and objective view at available software rather than habitually using the same methods repeatedly.

### References:

1. Yican Wu et al., “CAD-based Monte Carlo program for integrated simulation of nuclear system SuperMC”, *Annals of Nuclear Energy* 82 (2015) 161-168. <https://www.sciencedirect.com/science/article/pii/S0306454914004587>
2. <https://www.vareximaging.com/products/attila-software>
3. J. B. Spencer, J. A. Kulesza, A. Sood, “3D Geometry Visualization Capability for MCNP”, June 2017. [http://sites.nationalacademies.org/cs/groups/dbasse/site/documents/webpage/dbasse\\_179890.pdf](http://sites.nationalacademies.org/cs/groups/dbasse/site/documents/webpage/dbasse_179890.pdf)

**Author:** MURPHY, Daniel (Institute for Energy Technology)

**Presenter:** MURPHY, Daniel (Institute for Energy Technology)

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