**URANOS**

Markus Kohli1,2, Martin Schröer, Klaus Desch3, Ulrich Schmidt4

1 Physikalisches Institut, Heidelberg University
2 Physikalisches Institut, University of Bonn
3 Helmholtz Centre for Environmental Research GmbH – UFZ

**a voxel engine Neutron Transport Monte Carlo Simulation**

- simple user interface
- computationally efficient
- New geometry concept of layers and voxels

**The User Interface**

The geometry is generated in layers. This allows to easily build up a scenario of homogeneous materials with the inner parameter being content and target of each layer. Each layer thickness can be set for study the thickness distributions for the voxels.

**Layer and voxel geometry**

The URANOS GUI has been developed in collaboration with the UFZ Leipzig targeting especially the use of neutron ray surveys. For control over the settings of the input file, a simple user interface, which allows to define layers is required.

**Neat Examples**

URANOS modeling process, exemplarily for a neutron density in an urban environment:

- Choice of a simulation context
- Transfer to a selected simulation, e.g., calculation of a voxel model for the geometry unit and export of the neutron density

**Cross Sections**

Only few nuclides with significant contributions are taken into account. The user can select these nuclides with control less than 0.1% of the total cross section.

**Conversion treatment**

A reaction can change the energy of a neutron or an epithermal neutron. An inelastic neutron energy loss is converted to a delta energy. Inelastic neutron energy loss is calculated with the following expression:

\[ E_{\text{loss}} = E_{\text{neutron}} - E_{\text{target}} \]

where \( E_{\text{neutron}} \) is the initial neutron energy and \( E_{\text{target}} \) is the target energy. In the case of an inelastic collision, the resulting energy is assigned to the target nuclide with the lowest priority in the target list.

**Sources**

Available source definitions:
- spot source
- point-source
- cylindrical source
- planar source
- rectangular source
- Sedov source
- American-Diploma
- Paulson
- Littke
- Monte Carlo Source
- Coherent Neutron Source

**Footprint characteristics of the URANOS voxel engine Neutron Transport Monte Carlo Simulation**

- Neutron transport simulation for the voxel engine
- Efficiency of neutron source
- Neutron source modeling

**Publication Showcase**

Markus Kohli, Martin Schröer, Klaus Desch, Ulrich Schmidt

Physikalisches Institut, University of Bonn
Nussallee 12, 53115 Bonn, Germany

Ulrich Schmidt
Helmholtz Centre for Environmental Research GmbH – UFZ
Feldweg 50, 04318 Leipzig, Germany

**URANOS is freely available from the websites of the Physikalisches Institut Heidelberg and the UFZ Leipzig.**