Studsvik

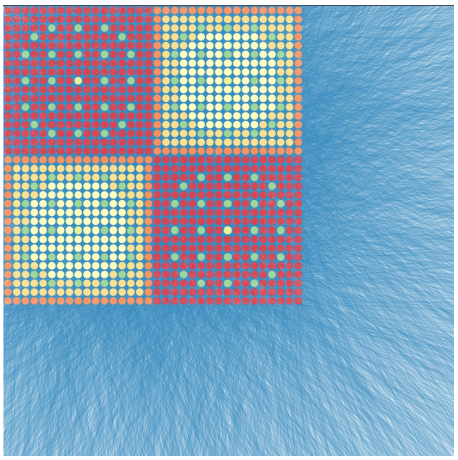
PEACOCK

Monte Carlo Analysis Tool

Peacock is Studsvik's new user-friendly, quality assured Monte Carlo tool for analyzing current and future reactors.

New Monte Carlo Code

Studsvik is developing a new generalized-geometry, continuous energy Monte Carlo code to support current and future reactor physics, shielding, and criticality analysis needs in industry. Written in C++ and using modern software development practices, Peacock is positioned to deliver state-of-the-art Monte Carlo analyses.



C5G7 MOX benchmark geometry generated by Peacock.

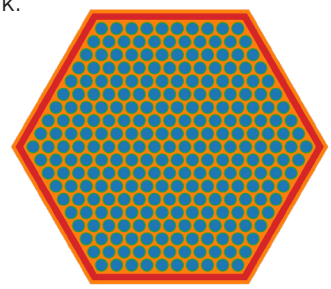
Built-in Depletion Capability

Fuel depletion and isotope transmutation are of primary importance in the analysis of nuclear systems. Changes in the nuclide composition due to burnup can easily be modeled with Peacock. Using the advanced methods developed for CASMO5 and HELIOS2, Peacock includes the capability for highly accurate depletion calculations.

Methodology

The Monte Carlo method is a powerful class of numerical techniques that rely on stochastic sampling of statistical distributions to simulate the behavior of physical systems. The Monte Carlo simulation of neutrons enables accurate predictions of criticality, the spatial fission rate distribution, generation of homogenized multi-group cross section data, and other tallied quantities for nuclear reactor applications.

Flexible three-dimensional generalized geometry, continuous energy representation of cross section data, built-in depletion capability, and ease of use position Peacock as the next production-level, state-of-the-art analysis tool being developed by Studsvik.



Modeling of Sodium-cooled Fast Reactors (SFR) assembly with Peacock.

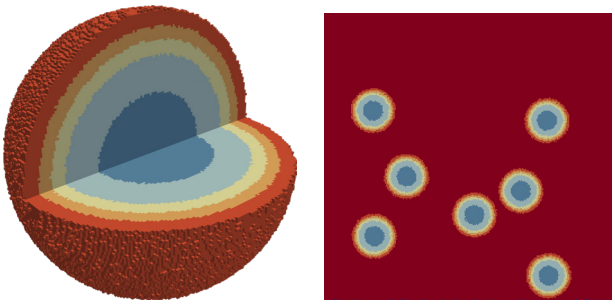
Peacock is the advanced Monte Carlo analysis code for the present and future nuclear reactor community.

Nuclear Data

By leveraging decades of Studsvik experience in processing evaluated nuclear data, pre-generated neutron data libraries are delivered which are ready to be used by the analyst. Peacock eliminates the data preparation requirements common to other Monte Carlo codes. Those users who have generated problem-specific temperature libraries for other MC codes will be happy to know that Peacock will support automatic temperature interpolation using the pre-built libraries. Industry-standard nuclear data evaluations such as ENDF/B-VII.1, as well as cutting-edge evaluations like ENDF/B-VIII.1, will be the foundation and starting point for the Peacock libraries.

Flexible Geometry

Flexible geometry modeling Constructive Solid Geometry (CSG) in Peacock allow the user to analyze fuel concepts beyond current designs. For instance, advanced concepts involving particles with encapsulated fuel, as shown in the figure, can be readily modeled using Peacock's flexible geometry description.



Advanced concept particles fuel modeled with Peacock.

Ease of Use

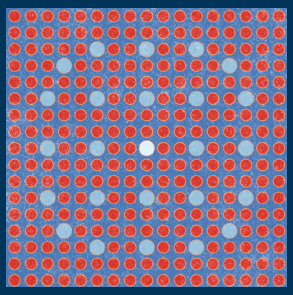
As expected from other Studsvik products, Peacock is being developed with the end-users in mind. An intuitive and simple YAML-based input file format has been developed which enables users to quickly set up regular fuel assembly lattices. Robust error checking and interfacing with other Studsvik codes allow engineers to spend their time in analysis, not troubleshooting software.

Applications

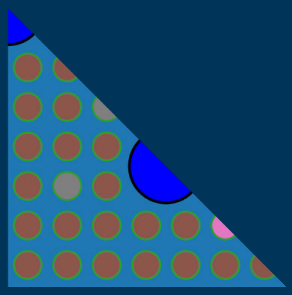
Peacock is being developed for reactor physics applications in advanced reactors and conventional Light Water Reactors (LWRs). As shown in the figure in the upper right, Peacock can be used as a lattice physics tool to model typical Pressurized Water Reactor (PWR) fuel assembly geometry and obtain homogenized data to support downstream full-core calculations.

Benchmarking

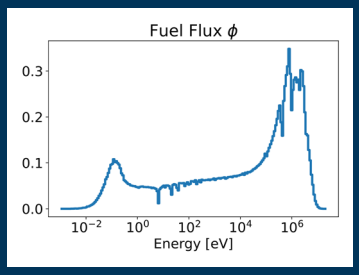
Continuous testing and benchmarking are integral parts of simulation software development.



Representative 17x17 PWR lattice geometry modeled with Peacock.



Automatic Generation of Peacock input from CASMO5 input.



Representative LWR neutron energy spectrum.

Spatial flux distribution in LWR pincell.

Peacock can also be used to investigate the continuous energy neutron flux spectrum for problems and regions of interest. For example, Peacock can be used to compare the flux spectra in different types of reactors. Peacock can also be used to compute neutron reaction rates and fluxes to generate multi-group cross sections for a downstream nodal method.

Nuclear Quality Assurance

Peacock will fully comply with the American Society of Mechanical Engineers (ASME) Nuclear Quality Assurance-1 (NQA-1) standard. Peacock stands apart from other Monte Carlo tools with respect to Quality Assurance (QA). Additionally, Peacock will be 10 CFR 50/Appendix B compliant with 10 CFR 21 reporting.

Unparalleled Customer Support

Studsvik's technical support is built on putting the needs of its customers first.

- 24-hour response time
- Easy ticketing system
- On-line support portals
- Access to technical documentation
- Active and growing user communities of practice

For further information please contact:
Your Studsvik representative or e-mail: **cms-info@studsvik.com**