

Consortium for Advanced Simulation of Light Water Reactors

The VERA 2013 Test & Evaluation Release



About this Release

The Virtual Environment for Reactor Applications components included in this distribution include selected computational tools and supporting infrastructure that solve neutronics, thermal-hydraulics and coupled neutronics-thermal hydraulics problems. The infrastructure components provide a simplified user input capability and provide for the physics integration.

Neutronics analysis can be performed for 2D lattices, 2D core and 3D core problems for pressurized water reactor geometries that can be used to calculate criticality and fission rate distributions by pin for input fuel compositions. Two neutronics capabilities are provided in this distribution including MPACT (from the University of Michigan) that supports 2D lattices and Insilico (From Oak Ridge National Laboratory) that supports 2D lattices, 2D core planes, and 3D core geometries. Both codes include integrated cross section capabilities that provide problem-specific cross sections for the problems defined.

A thermal-hydraulics capability is provided with an updated version of the COBRA-TF code (from Pennsylvania State University) that allows thermal-hydraulics analyses for single and multiple assemblies and using the simplified VERA common input. This distribution also includes an initial coupled neutronics/thermal-hydraulics capability to allow calculations of single assemblies using Insilico coupled with COBRA-TF.

This distribution is intended to be used for *test and evaluation* purposes only. Testing within CASL has focused specifically on Westinghouse four-loop reactor geometries and conditions with example problems included in the distribution.

Physics components included in the VERA 2013 Test & Evaluation release are:

- COBRA-TF - Sub-channel resolved thermal-hydraulics coupled to fuel heat transfer.
- INSILICO – 2D and 3D parallel deterministic neutron transport. Both S_n and SP_n methods are supported.
- MPACT – 2D neutron transport and cross-section physics.

Infrastructure components included with the physics components are:

- DAKOTA Software library for Design Optimization, Parameter Estimation, Uncertainty Quantification and Sensitivity Analysis.
- DataTransferKit – Software library for parallel data transfer algorithms for physics code coupling.
- LIME – Lightweight Integrating Multiphysics Environment for coupling codes.
- TriBITS – Enhanced CMake based build system.
- TRILINOS – Software library for the solution of large scale complex multi physics engineering or scientific problems.
- VERAIn – VERA common input processor.

System Requirements

A Linux-based operating system with functioning gcc, g++ and gfortran compilers and X11 libraries is required. Hardware with 32 or more processor cores is recommended.

Detailed system software and third party library requirements are specified in the VERA Installation Guide.

Obtaining the Release

CASL will review and approve applications to obtain the software based upon the following criteria:

- Appropriate export control;
- Agreement to the Test & Evaluation license;
- Valid usage for VERA; and
- Feedback to inform future VERA development efforts.

You can initiate the request process by sending an email to info@casl.gov. Please include the following information in your request:

1. Name and citizenship of the requestor;
2. Company / institution;
3. The intended application of VERA;
4. Brief description of the intended tests and evaluations to be performed, with feedback that can be provided to CASL;
5. Point of contact information.

Once access is approved, the VERA 2013 Test & Evaluation Release software will be provided to the customer through the Radiation Safety Information Computational Center (RSICC). The package will be transmitted on a DVD, which includes zipped .tar files with source files, sample inputs, test problems, documentation and reference material. No executables are included in this distribution.

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