

Profile of the Institute

The Institute for Neutron Physics and Reactor Technology provides experimental and theoretical contributions to the research field Energy of the Helmholtz community. This work is embedded in the research domains fusion technology, nuclear safety research, stationary energy storage devices and direct energy conversion. Key aspects concern:

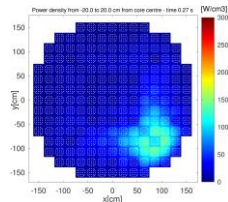
- Physical modeling of the heat and momentum transport in thermally highly loaded components,
- Computing methods, code development, and data for neutronics and reactor-physical applications,
- Multiphysics and multi-scale coupling methodologies to compute non-linear phenomena in the fields of neutron-physics, thermal-hydraulics, and fluid-structure interaction,
- Layout, design, fabrication, and analysis of nuclear components,
- Experiments and instrumentation for flows in gas and liquid metal cooled (helium, air, sodium) test modules to determine heat transfer and pressure drops and for direct energy conversion and high temperature heat storage for solar systems.

Besides the application oriented work in the frame of national and international co-operations, fundamental research is performed at the INR, where, in particular, students and Ph.D. candidates are integrated. They are supervised individually by dedicated in-house expert teams. Additionally, the INR is active in academic and vocational education. The INR also organizes and contributes to lectures at the university and international events like summer schools on reactor physics and fusion technologies.

Reactor Physics and Dynamics

Neutron physical calculation procedures and methods, including nuclear data processing; physics and dynamics of reactors and subcritical systems; development of methods to couple models for neutronics, thermal-hydraulics, and pin mechanics in safety analysis

codes; uncertainty and sensitivity analysis of the related simulation codes, including qualification with experimental data.



*PWR REA Analysis:
Serpent2/Subchanflow*

Contact: Dr. V. Sanchez-Espinoza, Dr. F. Gabrielli

Contact

Karlsruhe Institute of Technology (KIT)



Institute for Neutron Physics and Reactor Technology (INR)

Prof. Dr.-Ing. Robert Stieglitz
Head of Institute

Campus Nord
Hermann-von-Helmholtz-Platz 1
76344 Eggenstein-Leopoldshafen

Telefon: +49 721 608-22551
Fax: +49 721 608-22378

E-Mail: robert.stieglitz@kit.edu

www.inr.kit.edu

Karlsruhe Institute of Technology (KIT)
Kaiserstraße 12 | 76131 Karlsruhe
Germany

Status: May 2022

www.kit.edu

Institute for Neutron Physics and Reactor Technology

Research for
energy technology
of tomorrow

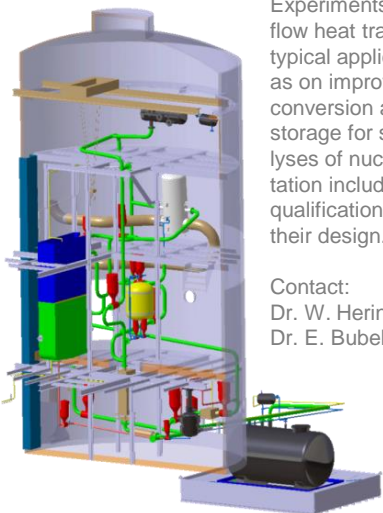
INSTITUTE FOR NEUTRON PHYSICS
AND REACTOR TECHNOLOGY



Facility Design, System Dynamics, and Safety

Experiments on single- and two-phase flow heat transport in sodium for prototypical applications (KASOLA), as well as on improvement of direct energy conversion and high temperature heat storage for solar systems; safety analyses of nuclear systems for transmutation including enhancement and qualification of computer codes for their design.

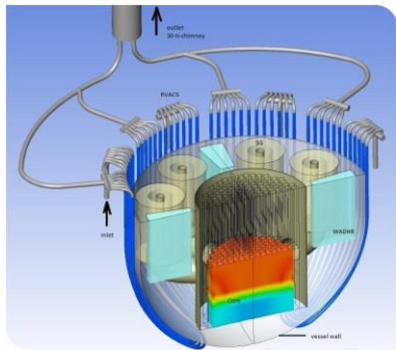
Contact:
Dr. W. Hering,
Dr. E. Bubelis



KASOLA

Thermal-Hydraulic Simulations and Optimization

Development of models and three-dimensional simulation of local thermal-hydraulic processes in nuclear systems; multi-scale methods for innovative nuclear systems; validation and qualification of numerical simulation programs, e.g. for two-phase flow; analyses of complex experiments in circuits with gas, water or liquid metal as a coolant.



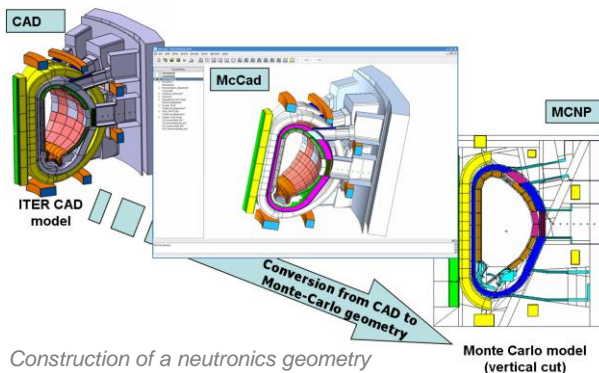
Flow simulation of a lead cooled fission reactor

Contact:
Prof. X. Cheng,
Dr. X. Jin

Neutronics and Nuclear Data

Development of methods and codes for nuclear physics and neutronics calculations; evaluation, processing and validation of nuclear data; design-oriented nuclear analyses of fusion facilities and accelerator driven systems; neutronics experiments and detector development.

Contact: Dr. D. Leichtle, Dr. P. Pereslavtsev

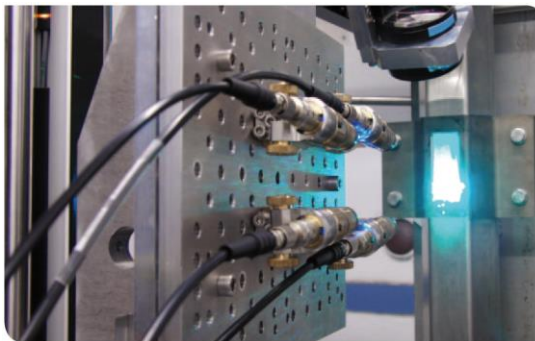


Construction of a neutronics geometry model of the ITER tokamak from CAD data

Measurement Technology and Experimental Methods

Development and application of innovative measurement techniques; realization of detailed single-effect experiments (focus on fluid dynamics with heat and mass transfer) for physical model validation, as well as support for facility and component design work by tests and experiments.

Contact: Dr. F. Arbeiter, Dr. D. Klimenko

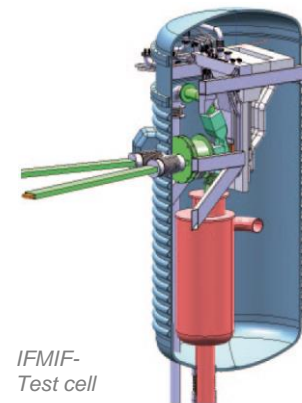


Laser-optical flow measurement technique

Complex Experiments, Experimental Design

Design, construction, and operation of a large scale Helium loop (HELOKA) for experiments for nuclear fusion; design of the test cell for the "International Fusion Materials Irradiation Facility (IFMIF)"; engineering design, fabrication monitoring as well as CAD administration and education.

Contact: Dr. B. Ghidersa,
Dipl.-Ing. (BA) M. Lux

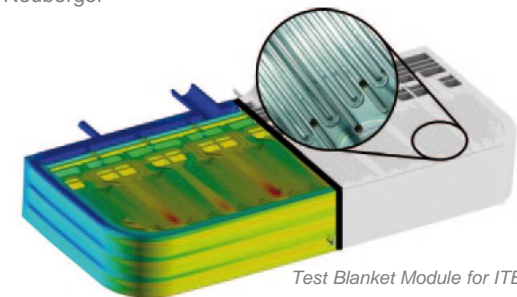


IFMIF-
Test cell

Design and Analyses of Nuclear Components, Manufacturing and Qualification

Design of thermally highly loaded components; thermal and structural analysis; qualification of fabrication processes for components for nuclear and fusion applications according to international design codes and standards.

Contact: Dr. F. A. Hernandez Gonzalez, Dipl.-Ing. (FH) H. Neuberger



Test Blanket Module for ITER

Finances, Personnel, and Cross-Section Tasks

Mechanical workshop; measurement and electronics; IT administration and IT security, documentation tasks and management of the institute database; financial planning and controlling; human resources planning; facility management.

Contact: Dr. R. Schwarz