actors. Results of calculations performed on supercomputers are demonstrated.)

Hotel info

The following hotels in Karlsruhe are recommend:

- IBIS Hotel Karlsruhe City, Poststraße 1, 76137 Karlsruhe. Tel. +49 721 35 23 2, FAX: +49 721 35 23 24 00, EMAIL: h6965@accor.com;
  - single room incl. breakfast from 59 to 79 €
- Hotel Residenz, Bahnhofplatz 14-16, 76137 Karlsruhe. Tel. +49 721 3715 0, FAX: +49 721 3715 113, EMAIL: info@hotel-residenz-ka.de;
  - single room incl. breakfast at 92 €.

Please mention KIT when making the reservation so you can benefit from our discount.

Both hotels are conveniently located to the right and left of Hauptbahnhof Karlsruhe (the main train station).

Web page

Information about the HPMC project and this seminar can be obtained from the project web page
http://www.fp7-hpmc.eu/

Registration

Email the following information to Petra Klug <Petra.Klug@kit.edu> before March 15th, 2014:

- First Name
- Last Name
- Organisation/Affiliation
- Address
- Phone
- Fax
- Email

Organisers

Victor Hugo Sanchez-Espinoza
<victor.espinoza@kit.edu>

Jan Dufek
<jandufek@kth.se>

HPMC Training Seminar

Karlsruhe Institute of Technology

April 24 – April 25, 2014

Overview

The EU FP7 High Performance Monte Carlo reactor core analysis project (HPMC) has been set up to develop and promote advanced high-performance Monte Carlo simulations of nuclear reactors. The project covers development of new methods for:

- coupled Monte Carlo - thermal–hydraulic calculations,
- Monte Carlo burnup calculations,
- kinetic Monte Carlo calculations,
- parallel Monte Carlo calculations.

As the project is in its final year, the methods and codes developed within the project are ready to be presented to the industry and academia. This seminar is thus an integral part of the project.

Aim of the seminar

The problems that have been solved within HPMC are often not well known to users of Monte Carlo codes. The aim of this seminar is to explain and demonstrate the problems of the existing Monte Carlo burnup codes as well as the problems of the common schemes coupling Monte Carlo and thermal–hydraulic solvers.

The HPMC project gives solutions to the above problems; these solutions will be explained and demonstrated. As the new methods have been implemented in the MCNP and SERPENT codes, several sessions are set up for you to become familiar with the new code features.

Place

The seminar will be held at the Institute for Neutron Physics and Reactor Technology (INR) at KIT Campus North, building 521, Room #220

Address:
Hermann-vom-Helmholtz-Platz-1
76344 Eggenstein-Leopoldshafen, Germany

INR web page: http://www.inr.kit.edu/

Speakers

- **Victor Hugo Sanchez-Espinoza**, Head of the Reactor Physics and Dynamics group at the Institute for Neutron Physics and Reactor Technology (INR), Karlsruhe Institute of Technology (KIT), Germany;
- **J. Eduard Hoogenboom**, Director of the Delft Nuclear Consultancy (DNC), The Netherlands;
- **Jaakko Leppänen**, Senior scientist at the Nuclear Reactor Safety Analysis group, Technical Research Centre of Finland (VTT);
- **Jan Dufek**, Assistant professor at the Division of Nuclear Reactor Technology, Royal Institute of Technology (KTH), Sweden;
- **Aleksandar Ivanov**, PhD candidate at the Reactor Physics and Dynamics group at the Institute for Neutron Physics and Reactor Technology (INR), Karlsruhe Institute of Technology (KIT), Germany;
- **Anton Travleev**, Researcher at the Reactor Physics and Dynamics group at the Institute for Neutron Physics and Reactor Technology (INR), Karlsruhe Institute of Technology (KIT), Germany;

Schedule

Thursday, April 24

9:00 –9:30, **Victor Hugo Sanchez-Espinoza**, KIT
Welcome speech: "Deterministic vs. Monte Carlo simulations of nuclear reactors - a look into the future of core simulations" (30 min)
(A summary of advantages and disadvantages of deterministic and Monte Carlo solvers, and the future prospects.)

9:30 –10:00, **Jan Dufek**, KTH
Numerically stable and unstable MC-TH coupling schemes (30 min)
(The thermal-hydraulic feedback is becoming commonly integrated into Monte Carlo calculations today - here we show the consequences of an incorrect implementation, and describe a stable coupling scheme.)

10:00 –10:20, **J. Eduard Hoogenboom**, DNC
Interpolation of thermal scattering and other cross sections for a specific temperature (20 min)
(The cross section libraries are required at a great variety of temperatures during coupled MC-TH calculations; here, we explain a way to deal with this problem.)

10:20 - 10:40: Coffee break

10:40 –12:00, **Jan Dufek**, KTH

- ***Numerical stability of existing MC burnup codes***
- ***A new stable MC burnup coupling scheme***
- ***Stable MC burnup calculations with TH feedback***

(80 min)
(This presentation describes the common schemes for coupling the MC criticality and depletion solvers, and explains their numerical stability problems. A stable MC burnup coupling scheme that has been developed within the HPMC project is then presented together with its thermal-hydraulic feedback extension.)

12:00 - 13:30: Lunch

13:30 –15:00, **Jaakko Leppänen**, VTT
SERPENT multi-physics interface (90 min)
(A new multi-physics interface was implemented into SERPENT within the HPMC project. This interface offers the user a flexible way of coupling the SERPENT code to solvers modelling various phenomena.)

15:00 - 15:20: Coffee break

15:20 –15:50, **J. Eduard Hoogenboom**, DNC
Improving the efficiency of parallel MC criticality calculations (30 min)
(This presentation explains the principal difficulties in performing efficient parallel MC criticality calculations, and suggests a way of improving the efficiency with the existing MC codes.)

Friday, April 25

9:00 –10:30, **Anton Travleev**, KIT
External MC-TH coupling via Python scripting (90 min)
(Coupled calculations are commonly accomplished using scripts that repeatedly launch various solvers and process their input and output files. A powerful Python script was written for the purpose of coupled MC-TH calculations within the HPMC project. This presentation explains the usage of this script and gives practical examples.)

10:30 - 10:50: Coffee break

10:50 –12:20, **Aleksandar Ivanov**, KIT
Internal MC-TH coupling (90 min)
(An internal coupling implements the feedback directly into the source code of MC solvers. This presentation explains the advantages and disadvantages of external and internal coupling, and introduces a modified MCNP with a TH feedback implementation.)

12:20 - 14:00: Lunch

14:00 –15:00, **J. Eduard Hoogenboom**, DNC
Kinetic Monte Carlo solver (60 min)
(This presentation gives the theory and implementation details of converting MC criticality solvers into MC kinetic solvers. Promising results are demonstrated.)

15:00 - 15:20: Coffee break

15:20 –15:50, **Jaakko Leppänen**, VTT
Stochastic implicit Euler based MC burnup scheme in SERPENT (30 min)
(The SIE based scheme, developed within HPMC, was implemented into the SERPENT code. This presentation gives practical advises on how this scheme can be used in SERPENT, and compares results achieved with this and conventional scheme.)

15:50 –16:30, **J. Eduard Hoogenboom and Aleksandar Ivanov**, DNC, KIT
SERPENT and MCNP parallel calculations on supercomputers (40 min)
(This presentation explains the design of supercomputers, and delivers practical advises on setting up the supercomputers for MCNP and SERPENT calculations of nuclear re-