

Second Advanced Workshop on Model Codes for Spallation Reactions



Saclay, February 8-11, 2010

Historical background

- **Joint ICTP-IAEA Advanced Workshop on Model Codes for Spallation Reactions (Trieste, February 2008)**
- **Satellite Meeting at AccApp09, Vienna, May**
- **Consultants meeting on “benchmark os spallation models”, Vienna, October 5-6, 2009**

Joint ICTP-IAEA Advanced Workshop on Model Codes for Spallation Reactions (Trieste, February 2008)

Goals

- To bring together experts on spallation models
 - To understand in depth, the physics of INC, QMD models and de-excitation models
 - To define an agreed set of experimental data to be used for the benchmarking of the models
 - To define the specifications of the benchmark
- ➔ <http://www-nds.iaea.org/reports-new/indc-reports/indc-nds/indc-nds-0530.pdf>

The poster is for the Joint ICTP-IAEA Advanced Workshop on Model Codes for Spallation Reactions, held from 4-8 February 2008 in Trieste, Italy. It features the logos of ICTP (The Abdus Salam International Centre for Theoretical Physics) and IAEA. The text describes the workshop's focus on spallation reactions, its purpose, and lists the organizers, local organizers, and a deadline for participation. The poster is designed with a blue and white color scheme and includes a photograph of a particle detector.

ICTP The Abdus Salam International Centre for Theoretical Physics

Joint ICTP-IAEA Advanced Workshop on Model Codes for Spallation Reactions
4 - 8 February 2008
Trieste, Italy

The International Atomic Energy Agency (IAEA) together with the Abdus Salam International Centre for Theoretical Physics (ICTP), will organize an Advanced Workshop on Model Codes for Spallation Reactions which will be held at the ICTP, Trieste, Italy, from 4 - 8 February 2008.

Spallation reactions play an important role in a wide variety of applications ranging from cosmic neutron sources for condensed matter and material studies, astrophysical and subatomic studies for the transmutation of nuclear waste and rare isotope production to astrophysics, simulation of detector response in nuclear and particle physics experiments, and satellite protection asset accelerators as in space. The workshop aims to discuss the state-of-the-art in high-energy transport codes in which stochastic cross-sections and characteristics of all the reaction products are taken from existing experimental library data or other experimental data or models, simulated using nuclear reaction codes or event generators. These are generally Monte-Carlo implementations of semi-nuclear cascade (INC) models or Quantum Molecular Dynamics (QMD) models followed by de-excitation (principally evaporative/fragmentation) models. It is of great importance to establish a common set of reaction codes to provide reliable, self-consistent, accurate, and efficient simulation for applications.

PURPOSE: The Workshop will facilitate experts and computer practitioners to better understand the physical basis, approximations, strengths and weaknesses of the currently used reaction codes. Presentation of relevant basic experimental data with emphasis on accuracies, detector efficiencies, rates and kinematics will provide basis for code validation and inter-comparison. Specifically the workshop will help:

- To understand in depth, the physics of INC, QMD models and de-excitation models
- To point out the reasons of their respective successes or difficulties
- To define an agreed set of experimental data to be used in validation and inter-comparison of the models
- To promote the exchange of information among researchers in the field
- To identify areas of international cooperation in the field

The agreed set of experimental data will be intended as an international benchmark and relevant by experts in a future activity.

PARTICIPATION: Experts, young scientists, and Ph.D. students from all countries which are members of the United Nations, UNDOQ or IAEA, may attend the advanced workshop. As it will be conducted in English, participants should have an adequate working knowledge of the language, although the main purpose of the workshop is to help research workers from developing countries through a programme of training activities within a framework of international cooperation, a limited number of young scientists, Ph.D. students, and post-doctoral scientists from developed countries are also welcome to attend the Workshop.

As a rule, travel and subsistence expenses of the participants should be borne by the hosts institution. Travel effort should be made by participants to ensure support for their time (or at least half-days). However, travel funds are available for some participants, who are nationals of, and working in, a developing country. Expenses will be given in equal proportions not more than 42 years old. Such support is available only for those who attend the entire activity. There is no registration fee.

Requests for Participation: The "Request for Participation" form is available via this server: <http://www-nds.iaea.org/indc-nds/indc-nds-0530.pdf>. It should be completed, signed and returned by using indc-nds@iaea.org or by fax to the following address:

If sending an application by e-mail to: indc-nds@iaea.org please use and send the attachments in either PDF (preferred) or RTF (second) or DOC format.

If sending an application form by regular mail or courier it should be posted to: Joint ICTP-IAEA Advanced Workshop on Model Codes for Spallation Reactions, c/o INFIS (3rd floor), Abdus Salam International Centre for Theoretical Physics, Strada 14/A, Trieste, Italy. (second photograph) if signature of the candidate is compulsory.

CONTACT INFORMATION: Telephone: +39-0432-310403 Fax: +39-0432-310404 E-mail: indc-nds@iaea.org ICFP Home Page: <http://www-nds.iaea.org>

Trieste, September 2007

CO-ORGANISERS:
ICTP (Abdus Salam International Centre for Theoretical Physics)

ORGANISERS:
S. MANN
IAEA, Vienna, Austria
S. FILGES
V.I.U. Trieste, Germany
S. LERAY
CEA, Saclay, France
Y. TAMURA
Tokyo Gakuin University, Japan

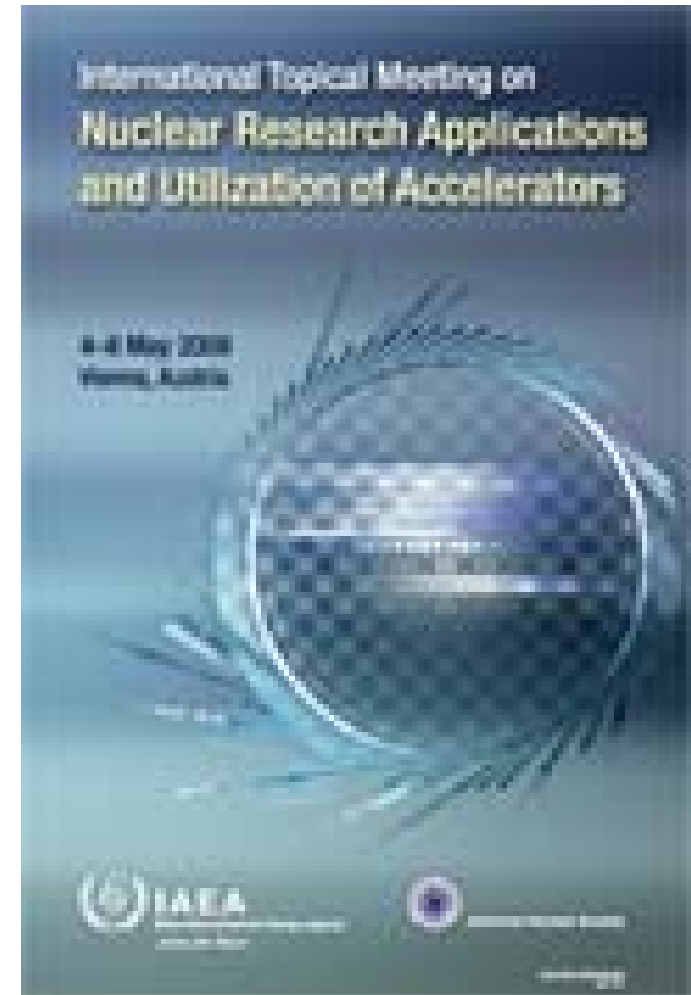
LOCAL ORGANISERS:
G. TAMBURINI
ICTP, Trieste, Italy

DEADLINE:
The registration participation
2 NOVEMBER 2007

Historical background

Satellite Meeting at AccApp09 Vienna, May 4-8, 2009

- **Presentations by the participants of their first results**
- **Some comparisons between models**
- **Discussions on the benchmark strategy, figures of merit**



Historical background

Consultants meeting on “benchmark of spallation models”, Vienna, October 5-6, 2009

J.C. David, D. Filges, M. Khandaker, A. Konobeyev, S. Leray, G. Mank, R. Michel, N. Otsuka, Y. Yariv, J. Yoo

- Choice of deviation factors : H, R, F, S, M, Ps
- Global analysis
 - Residues: R. Michel
 - Neutrons: D. Filges → J.C. David
 - Light charged particles: F. Gallmeier
- necessity of discussion with model authors
 - ↳ Second Meeting in February 2010
- Presentation of conclusions at ICANS, ND2010, SATIF
- Distribution of the codes by IAEA
- Possible continuation

Benchmark of Spallation Models

Objectives

- **To assess the prediction capabilities of the spallation models used or that could be used in the future in high-energy transport codes**
- **To understand the reason for the success or deficiency of the models in the different mass and energy regions or for the different exit channels**
- **To reach a consensus, if possible, on some of the physics ingredients that should be used in the models.**

Benchmark of Spallation Models

List of participating models

- CEM0303 (A. Gudima)
- CEM0302 (S. Mashnik)
- PHITS-jam (N. Matsuda)
- PHITS-Bertini (N. Matsuda)
- PHITS-JQMD (N. Matsuda)
- Cascade04 (H. Kumawat)
- Isabel-SMM (Y.Yariv / A. Botvina / D. Mancusi)
- Isabel-Gemini (Y.Yariv / R. Charity / D. Mancusi)
- Isabel-ABLA07 (Y.Yariv / A. Kelic / V. Ricciardi / D. Mancusi)
- Geant4-Bertini (D. Wright)
- Geant4-BIC (D. Wright)
- Cascade-ASF (A. Konobeyev)
- CASCADEX (Y. Korovin)
- INCL4.5-SMM (J. Cugnon / A. Boudard / A. Botvina / D. Mancusi)
- INCL4.5-Gemini (J. Cugnon / A. Boudard / R. Charity / D. Mancusi)
- INCL4.5-ABLA07 (J. Cugnon / A. Boudard / A. Kelic / V. Ricciardi / D. Mancusi)
- MCNPX Bertini-Dresner (F. Gallmeier)

Where the specifications followed ?

- Participants should treat the complete reaction : **OK**
- Participants should calculate the whole mandatory set of experimental data (+ eventually the additional set) : **OK except for CascadeX who gave only neutron DDXS, Cascade04 and MCNPX did not provide Multiplicities**
- Participants should give a comprehensive description of ingredients and parameters : **a lot are still missing**
- Participants should give additional information (E^* , A_R , Z_R , ...) : **a lot are still missing**
- Calculations should be done with the same set of parameters : **Seems ok**
- Participants should give the source code : **few have provided the code → distribution by IAEA**

Objectives of the workshop

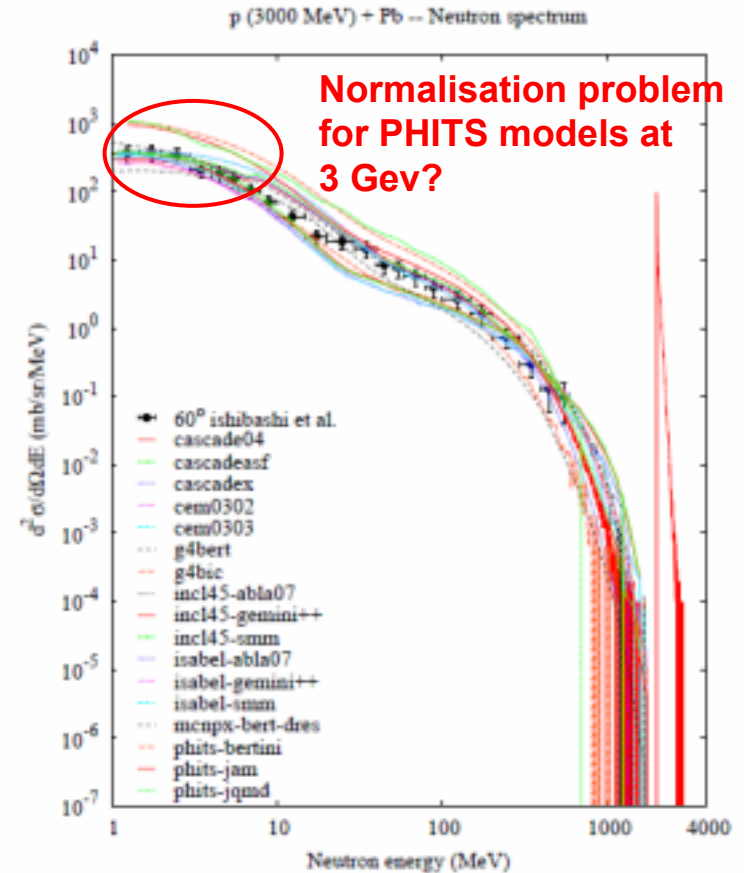
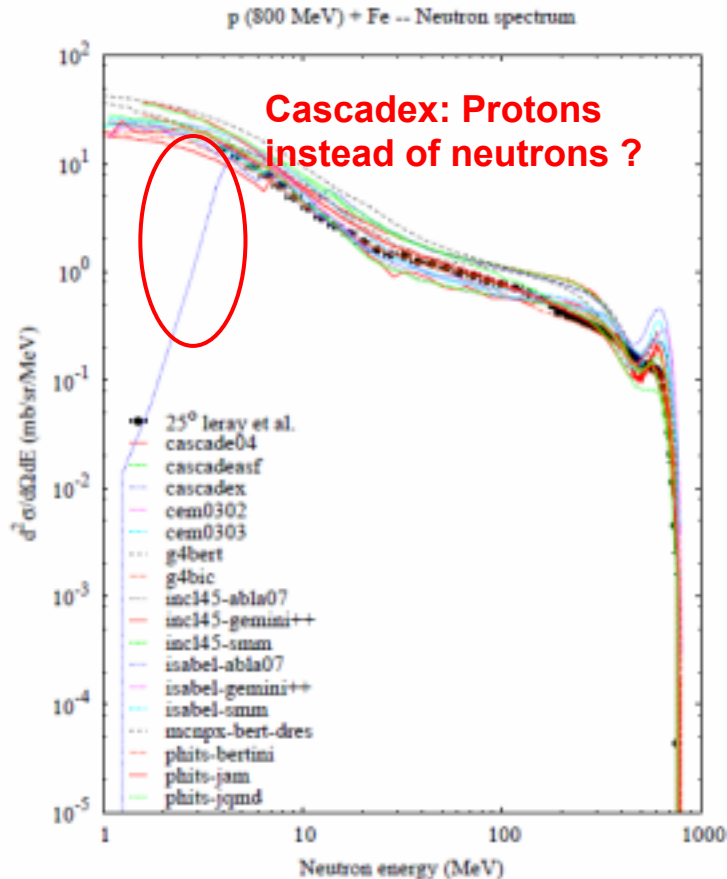
Provide the conclusions of the benchmark

↳ final report

- Discuss the global analyses of residues, neutrons, light charged particles
- Correct errors / provide missing information
- Provide conclusions on each calculation (strong / weak points) → **2 pages per calculations**
- Draw physics conclusions, consensus on some parameters / ingredients
- Identify still missing experimental data
- Impact for applications

Objectives of the workshop

Check / correct possible errors



Benchmark of Spallation Models

Possible continuation ?

➤ **A “dynamical” continuous benchmark so that end-users of spallation models in transport codes have up-to-date information**

↳ **new versions of the models / new models compared to the benchmark set of data added on the website**

↳ **new experimental data : ask authors to do additional calculations or do calculations with the version of the code given by the authors**