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 Abdus Salam International Centre for Theoretical Physics

Joint ICTP-IAEA Advanced Workshop on Model Codes for Spallation Reactions

4 - 8 February 2008

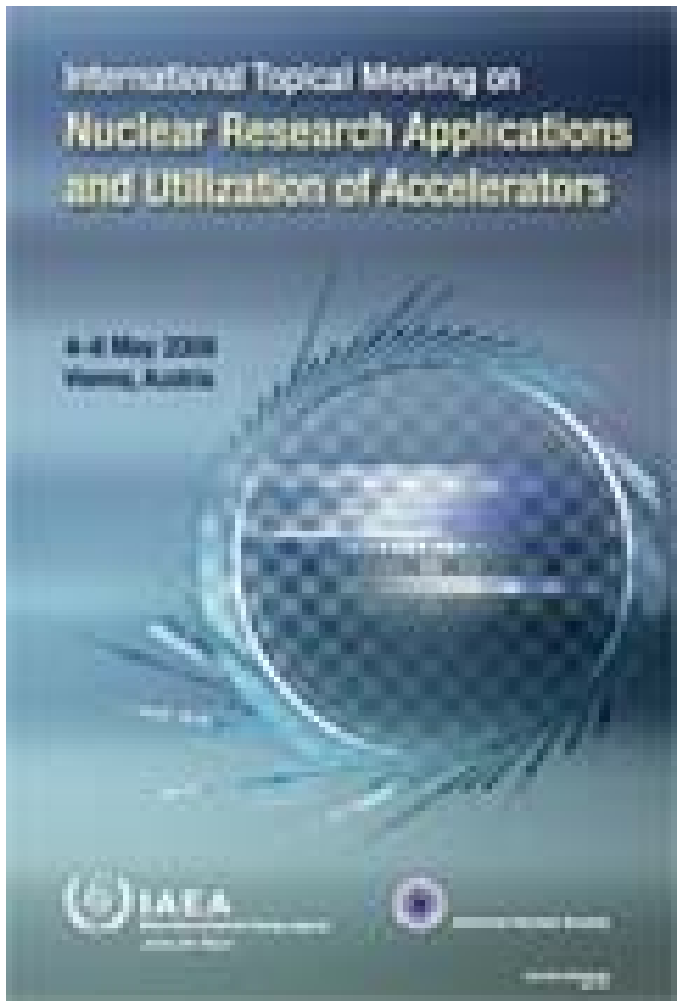
DEADLINE

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

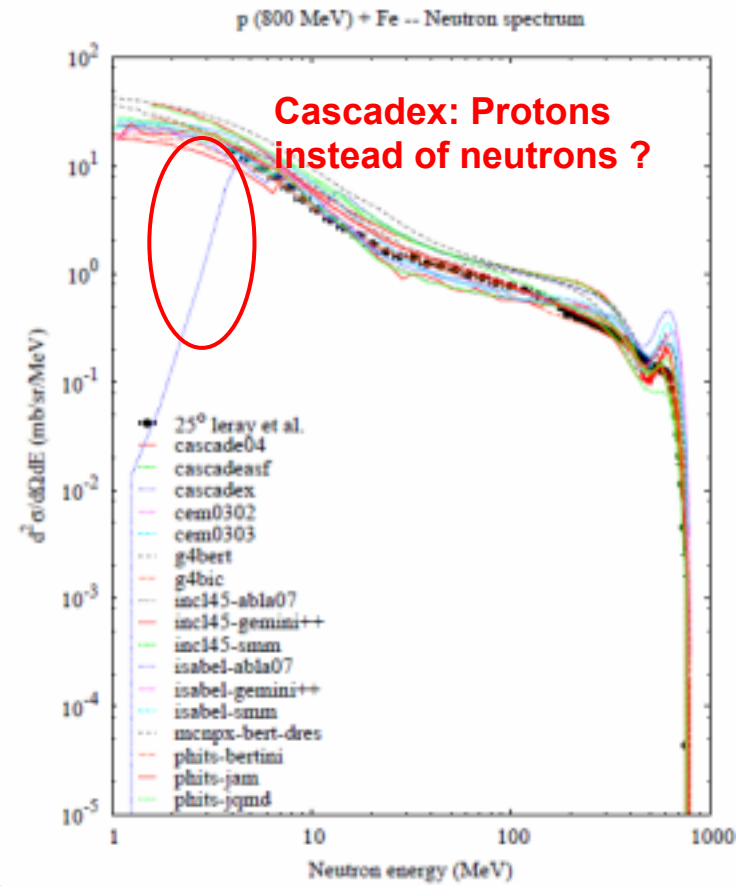
Provide the conclusions of the benchmark

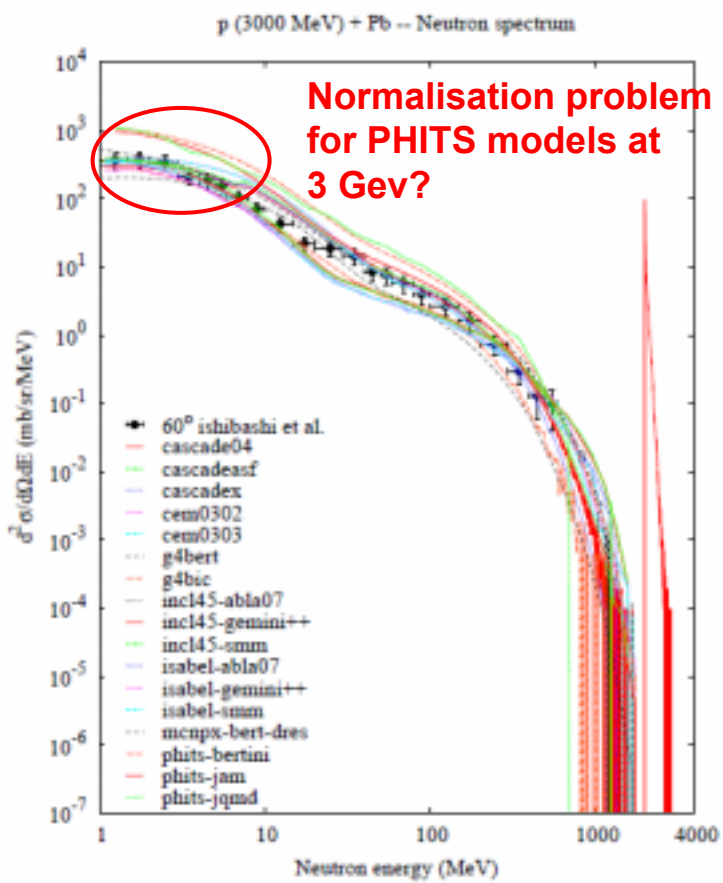
↪ final report

- **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



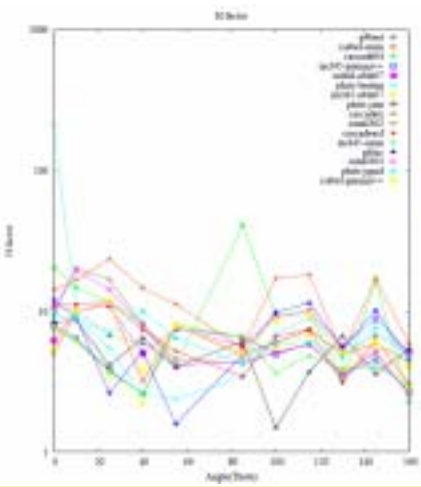


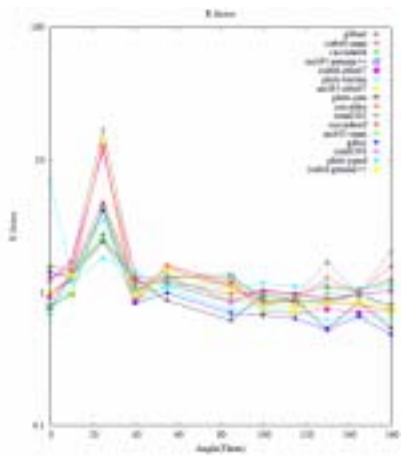
Objectives of the workshop

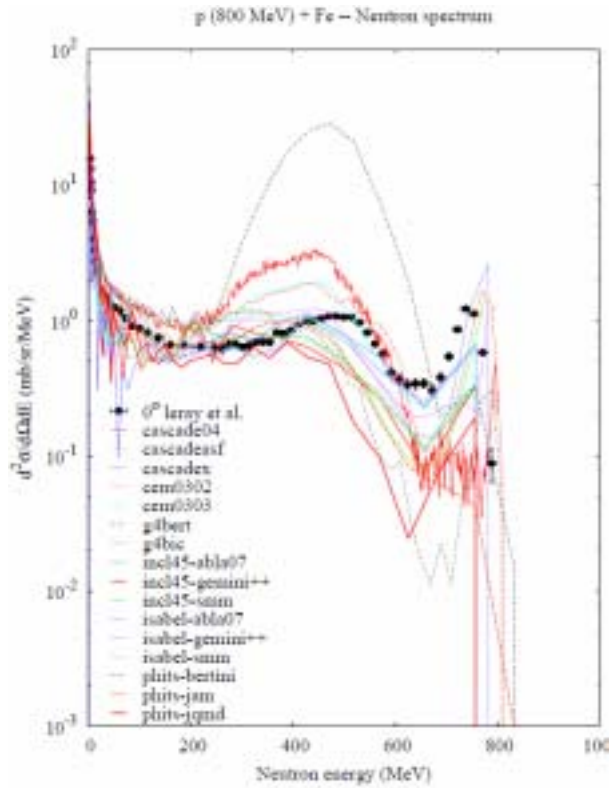
➢ **To assess the prediction capabilities of the spallation models used or that could be used in the future in high-energy transport codes**

➥ **Direct visual comparisons between data and calculation**

➥ **Figures-of-Merit / deviation factors**







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**