

TECHNICAL SESSION V – SUMMARY

Progress in Physics and Nuclear Data

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Papers presented:

Studies of basic physics processes on ADS	4
Reactor based integral experiments for cross-section and basic nuclear data validation and measurements	2
Differential accelerator based experiments for cross-section and basic nuclear data measurements	3
Development of specific measurement techniques	2
New simulation tools for ADS and transmutation systems	3
Studies of transmutation scenarios and devices	2
Total	16

Studies of Basic Physics Processes on ADS

First Measurements of the Kinetic Response of the MUSE-4 Fast ADS Mock-up to Fast Neutron Pulse
D. Villamarin (CIEMAT) et al.

Determination of Reactivity by a Revised ROD-DROP Technique in the MUSE-4 Programme – Comparison with Dynamic Measurements
G. Perret (CEA) et al.

Investigation of Local Spectral Differences between Critical and Driven Sub-critical Configurations in MUSE-4
M. Plaschy (PSI) et al.

MUSE-4 Benchmark Calculations using MCNP-4C and Different Nuclear Data Libraries
N. Messaoudi (SCK-CEN) et al.

- Wide spectrum of ADS physics tests performed on MUSE.
 - New experimental results both on Spectral index and on Kinetic response will improve our understanding of ADS.
 - Development of reactivity monitoring and measuring techniques.
 - Experimental base for advanced computer simulation benchmarks in the ADS research.
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Reactor Based Integral Experiments for Cross-section and Basic Nuclear Data Validation and Measurements

Calculation and Experimental Studies on Minor Actinides Samples Irradiations in Fast Reactors
A. Kotchetkov (SSC IPPE) et al.

Experimental Studies of MA Nuclear Data Correction on Critical Assemblies
V. Doulin (SSC IPPE) et al.

- Large programme of integral test and validations on BN-350, BOR-60 and BFS.
- Combination of fission chambers, radiochemical analysis and other special methodologies.
- Covering many very relevant Np, Pu, Am and Cm isotopes.
- Already existing data base of experiments to be used for cross-section benchmarking and updating.
- New measurements in preparation to complete the studies for transmutation purposes including attention to Pb-cooled cores.

Differential Accelerator Based Experiments for Cross-section and Basic Nuclear Data Measurements

HINDAS, a European Nuclear Data Programme for Accelerator-driven Systems
Arjan Koning (NRG) et al.

Light Charged Particle Production Induced by Fast Neutrons ($E_n = 25 - 65$ MeV) on ^{59}Co and ^{nat}Fe
E. Raeymackers (UCL) et al.

Neutron Cross-section for P&T and ADS at the n_TOF Facility at CERN
E. Gonzalez (CIEMAT) on behalf of the n_TOF collaboration

- Measurements covering the full energy spectrum from thermal to 200 MeV.
 - Two large collaborations supported by the 5th FWP of EU.
 - New data specifically relevant for ADS design has been and being measured using a variety of European facilities.
 - The list of isotopes includes actinides, fission fragments, coolant and structural materials.
 - The projects combine experimental measurements and model development with cross-section evaluation.
 - Proposal to complete the work are in preparation for the 6th FWP of EU.
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Development of Specific Measurement Techniques

Feasibility Study of New Microscopic Fission Chambers dedicated for ADS

M. Fadil (CEA) et al.

The Use of Ge Detectors for (n,xn) Cross-section Measurements at Intense and Low Frequency Pulsed Neutron Beams

Strahinja Lukic (IN2P3/CNRS) et al.

- Specific needs of ongoing and planned integral and differential experiments and mock-ups require new detectors and measuring techniques.
- New μ FCs chambers developed for the particular MegaPie target conditions, will allow on-line experimental determination of both thermal and fast components of the neutron flux, including their time- and space-variations.
- Adapting Ge detectors, and its associated electronics, to work on-line in installations like n_TOF (CERN) will allow to perform precise measurements of (n, xn) reactions on future coolant and transmutation fuel isotopes.

New Simulation Tools for ADS and Transmutation Systems

The Physics Problem of the Spallation Neutron Production Source Related to Accelerator-driven System

S. Fan (CIAE) et al.

New Methods for the Monte Carlo Simulation of Neutron Noise Experiments in ADS

M. Szieberth (Budapest University) et al.

Nuclear Data for ADS: Code System and Theoretical Data Library (full paper not available)

S. Yavshits (KRI) et al.

- New version of SHIELD with improved capabilities for spallation source simulations.
- MC and deterministic codes are being adapted to handle in a more efficient and flexible way the kinetic aspects that have gain relevance in the ADS associated reactor physics.
- Two codes, MCFx and TALYS, are being developed to compute from basic physics (and some adjustments to data) the differential cross-sections for the most relevant reactions taking place on transmutation devices (ADS or critical reactors). They will be important tools for cross-section evaluation.

Studies of Transmutation Scenarios and Devices

Minor Actinides Transmutation Scenario Studies with PWRs, FRs and Moderated Targets

J.P. Grouiller (CEA/DEN) et al.

Reactor Physics Calculations on MOX Fuel in Boiling Water Reactors (BWRs)

C. Demazière (Chalmers University of Technology)

- Studies proposing transmutation based on the closest to existing technologies including thermal LWR.
- The proposals handle in specific ways the different component of the HLW from LWR and show the difficulties to handle some components of these wastes.

Concluding remarks

The contributions to this session show that if all the efforts worldwide on the R&D for transmutation and ADS are put together, it is possible to obtain a coherent and rather comprehensive development framework:

- A) The experiments on basic physics processes in mock-ups of Transmuter/ADS and the associated simulation benchmarks allow to develop the correct concepts to understand these systems and allow to identify the needs and deficiencies of the presently available nuclear data.
- B) A combination of reactor based integral experiments and differential accelerator-based experiments, using new specific measurement techniques, should provide the cross-section and basic nuclear data required as well as the models needed to predict non-measured data.
- C) These efforts are, and will continue, leading to new simulation tools for ADS and Transmutation systems (models, data and programs), that are then used to optimise the proposals for elements of transmutation scenarios and devices.

Lets keep exchanging experience and knowledge and developing even closer collaborations, using in particular experimental data driven benchmarks within the OECD/NEA and IAEA Agencies.
