ARIEL-H2020 International on-line school on nuclear data: the path from the detector to the reactor calculation -- NuDataPath - 2022



lunes, 21 de febrero de 2022 - viernes, 4 de marzo de 2022

Programa científico

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I. Nuclear data for nuclear technologies and applications Seminars on:

What are nuclear data? Nuclear data for nuclear technologies and applications The JEFF project

II. Identification of nuclear data priorities

Seminars on:

Nuclear data for reactor physics (thermal and fast systems) Nuclear data and sensitivity analyses Nuclear data and fuel cycle Nuclear data priorities for non-energy applications

Lectures with computer on:

Introduction to sensitivity analyses Methodologies used in sensitivity analyses Sensitivity analyses of thermal reactors Sensitivity analyses of fast reactors

III. Nuclear data measurements

Seminars on:

Facilities and experimental techniques: reactions (neutron beams, reactors)

Facilities and experimental techniques: decay data (accelerators)

Samples for nuclear data experiments
Detectors and experimental techniques
Identification and propagation of uncertainties
Dissemination of nuclear data

Lectures with computer on:

Capture experiments
Fission experiments
Transmission experiments
Data reduction
Data analysis

IV. Evaluation

Seminars on:

Nuclear data evaluation Automatic evaluation procedures

V. Verification and validation

Seminars on:

Data processing tools, simulation codes (Monte Carlo and deterministic) and reference databases of integral experiments

Validation of nuclear data libraries

Lectures with computer on:

Nuclear data visualisation tools Nuclear data processing tools Searching the databases Validation with integral experiments

Nuclear data for nuclear technologies

Applications/examples of calculations related to:

Nuclear safety
Reactor design
Nuclear fuel cycle
Non energy applications
Compilation of nuclear data in international databases for different applications.
International agencies.

Identification of nuclear data priorities

Prior knowledge in the actual nuclear data libraries. Physical quantities and uncertainties. New nuclear data needs and priorities. Sensitivity analysis.

Nuclear data measurements

1. Quantities to be measured

Nuclear reactions: cross sections, secondary product yields

Decay data

Possible sources of uncertainty: type I (statistical) and type II (systematic).

2. Experimental techniques and detectors

Particle induced reaction measurements: neutrons (total, fission, capture and inelastics), charged particles and \Box -rays.

Decay data. Measure the complete decay properties: T1/2, particle spectra and correlations.

3. Preparation of adequate samples

Raw material, sample preparation techniques.

4. Different facilities for nuclear data measurements:

-Neutron sources, (radioactive) ion beam facilities, metrology laboratories.

6. Data analysis and uncertainty assessment

Standard / custom analysis codes.

Identification and estimation of uncertainties.

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7. Dissemination

Data + uncertainties (covariance matrix). The EXFOR database.

Evaluation of nuclear data

Modelling of the disseminated data. Preparation of ENDF files (or new formats) and first validation. Compilation and release of the general/specific libraries.

Verification and validation

Integral experiments and reference databases: ICSBEP, SFCOMPO, IRPhE, ENSDF, SINBAD... Processing of the files for the different simulation codes: multigroup, pointwise, different temperatures...

Deterministic and Monte Carlo simulation codes: MCNP, ERANOS, TRIPOLI, SERPENT, SCALE, OPENMC, GEANT4...

Comparison of calculations with integral experiments.

International benchmarks.