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

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 □-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.

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.