



Horizon 2020



SUPPLYING ACCURATE NUCLEAR DATA FOR ENERGY AND NON-ENERGY APPLICATIONS

The **SANDA EURATOM** project

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on behalf of the SANDA Euratom project

H2020 Grant Agreement number: 847552

CIEMAT, Atomki, CEA, CERN, CNRS, CSIC, CVREZ, ENEA, HZDR, IFIN-HH, IRSN, IST-ID, JRC, JSI, JYU, KIT, NPI, NPL, NRG, NTUA, PSI, PTB, SCK-CEN, Sofia, TUW, UB, ULODZ, UMAINZ, UMANCH, UOI, UPC, UPM, USC, USE, UU.

SANDA Basic data

<http://www.sanda-nd.eu/>

H2020 Grant Agreement number: 847552 EURATOM WP2018 for NFRP-2018-4

Project Start date: 01/09/2019

Duration: 48 months (+12m extension proposed)

35 Partners: [CIEMAT](#), Atomki, CEA, CERN, CNRS, CSIC, CVREZ, ENEA, HZDR, IFIN-HH, IRSN, IST-ID, JRC, JSI, JYU, KIT, NPI, NPL, NRG, NTUA, PSI, PTB, SCK-CEN, Sofia, TUW, UB, ULODZ, UMAINZ, UMANCH, UOI, UPC, UPM, USC, USE, UU.

from 18 EU-countries (Au, Be, Bu, Cz, Fi, Fr, Ge, Gr, Hu, It, Ne, Pol, Por, Ro, Sln, Sp, Sw, UK) + Switzerland. A large fraction of the European Nuclear Data community

A holistic approach for topics, partners and schedules

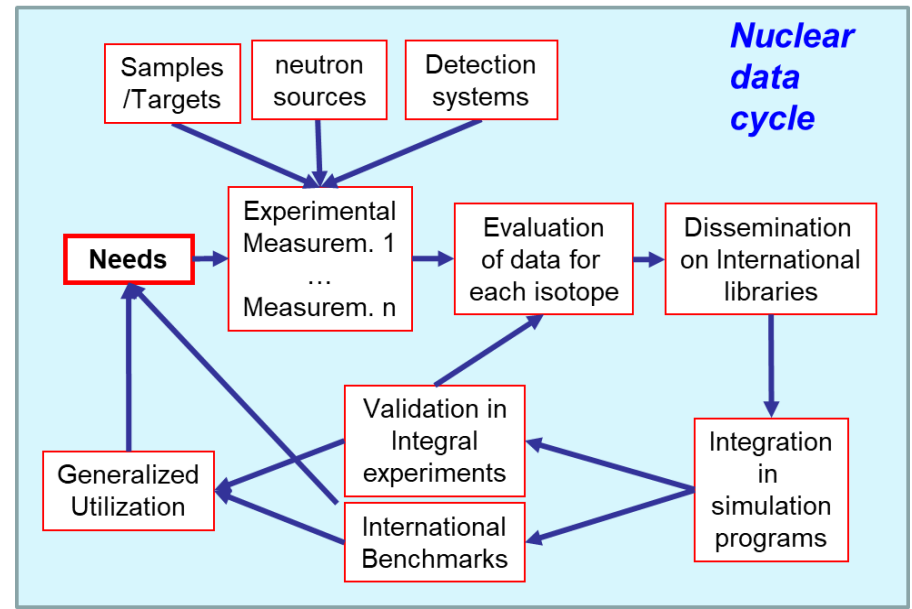
- Close collaboration with ARIEL and using other mobility tools
- Using results and tools from previous EURATOM projects: ANDES, CHANDA,...
- Well integrated with the International Agencies (IAEA, NEA/OECD, JEFF) and using their indication on priority for topics and isotopes

EU requested contribution voluntarily limited to 75% of eligible costs, to cover more activities and partners

SANDA objectives

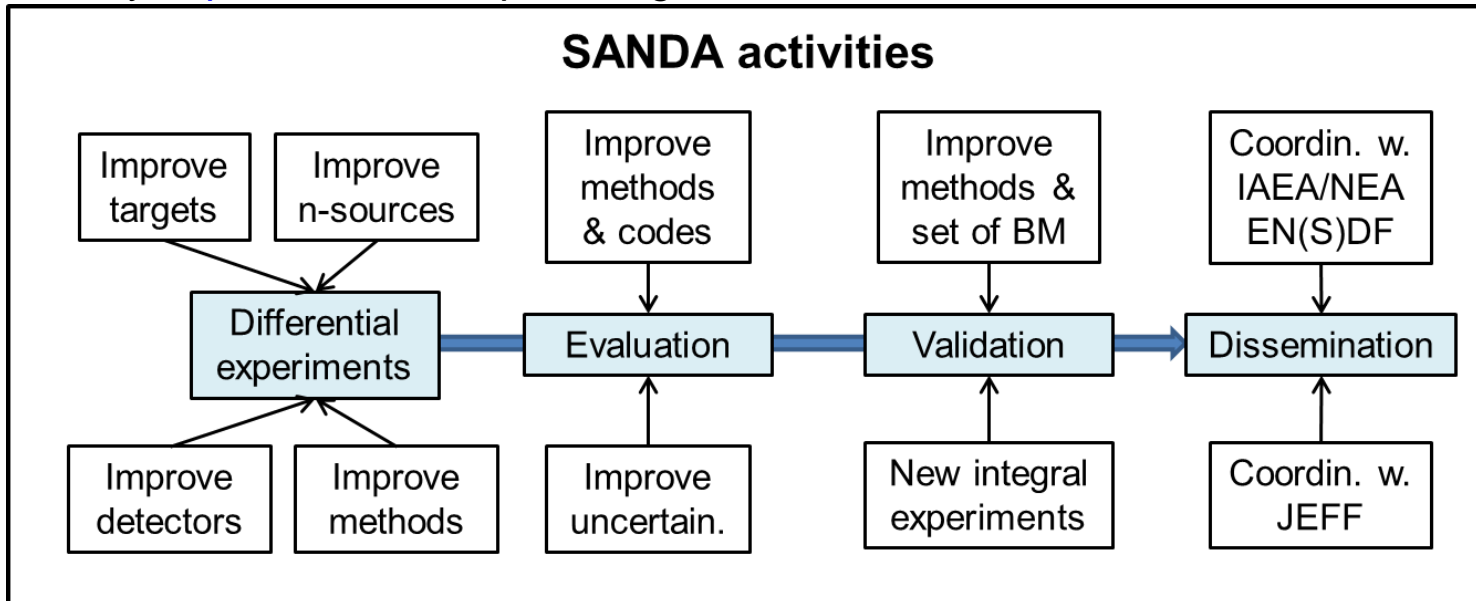
PRESENT: Improving important needs reachable with present tools (*Measurements, Samples, Evaluations, Validation*).

FUTURE: Improving the tools to be able to address important not reachable needs as soon and as efficient as possible (*Detectors, facilities, Samples Labs, Sensitivities, Evaluation tools, New benchmarks, Data needs*)

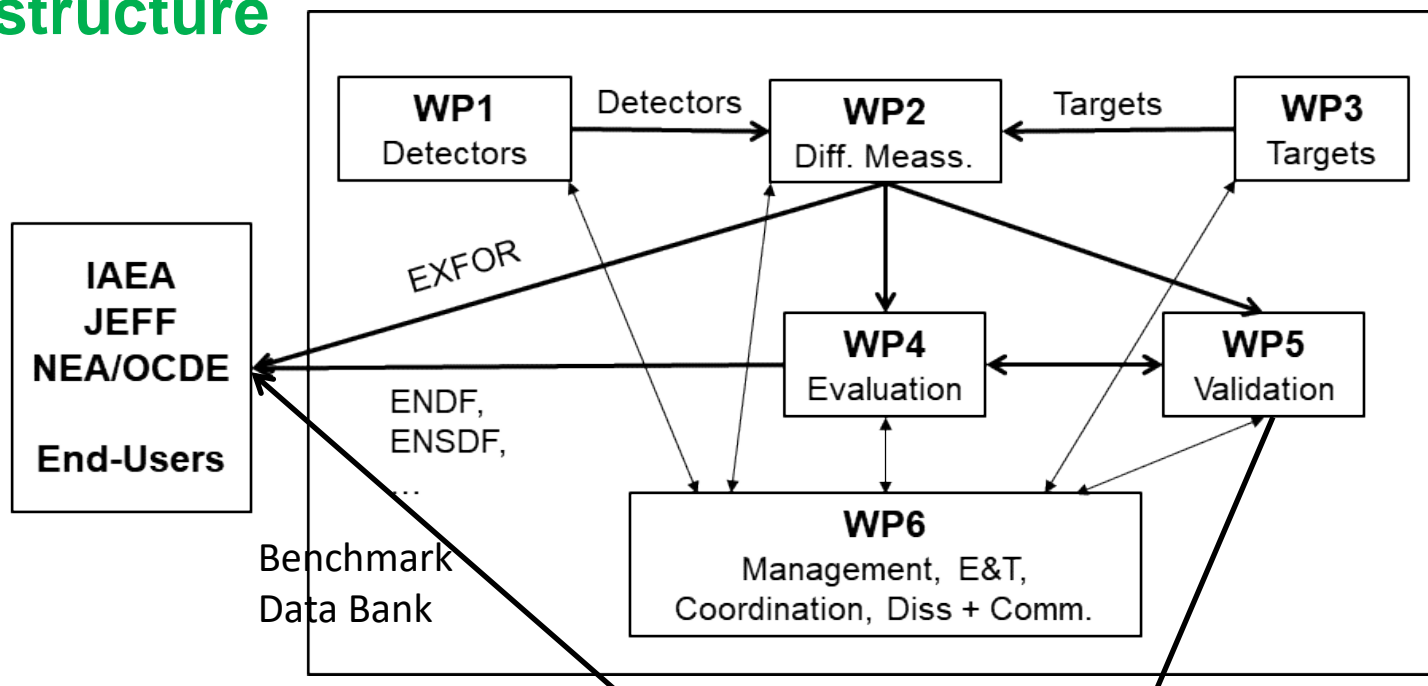


Covers all elements of the nuclear data cycle

Mostly *experimental* and providing *new results and new tools*



SANDA structure



WP #	Work Package Title	Lead P	PM
1	Developments of new innovative detector devices	CNRS	80.8
2	New nuclear data measurements for energy and non-energy applications	CIEMAT	213
3	Target Preparation for Improvement of Nuclear Data Measurements	PSI	66.2
4	Nuclear data evaluation and uncertainties	PSI	173.2
5	Nuclear data validation and integral experiments	CEA	69.2
6	Management, ND research coordination at EU level and Education and Training	CIEMAT	27.4

SANDA General Status

SANDA, despite the limitations from COVID, is progressing in all the activities proposed and providing many results including:

- Large achievements on new detectors for fission include
 - the production of a first prototype of the Micromegas XY-strip detector,
 - the experimental validation of a new Gaseous Proton Recoil Telescope,
 - that FALSTAFF has been improved and is ready for the experiment at NFS,
 - the design and test of the new n-detector BRIKEN,
 - the design and test of other neutron detectors (Stilbene, SCONE) and
 - the test of the new facility for measurements of half-lives at CEA/DRT/LNE-LNHB.
- Also, large progress has been made for gamma and lcp detectors including
 - new electronics and test for HPGe at n_TOF, and
 - the construction, tests and use in actual measurements of the sTED and i-TED detectors for n_TOF (EAR1 and EAR2).
 - Detectors for non-energy application (DDX data for the n-induced emission of lchp) are also being tested with beam at n_TOF.
- And for target preparation,
 - a first set of 12 samples has been produced and delivered to the SANDA experiments.
 - Additionally, the design and simulations for the development of an isotope separator (IS) has been completed and the preparation of the site for the IS at PSI are ongoing.
- Preparation and approval of beam requests at: n_TOF, GELINA, NFS, ILL, IGISOL, RIKEN, GSI/FAIR, WPE, HIT ...

SANDA General Status / 3

- Significant progress on evaluations and evaluation tools
 - New versions of TALYS and EMPIRE have been prepared, tested and distributed.
 - Progress on new evaluations of cross sections include the actinides like U235, U238 and Pu239, structural materials like Al27, Ti48, Ti50, Ni58, Ni60, Ni61, Ni64, Cr50, Cr52, Cr53 and Cr54 and fission fragments as Os 186, 187 and 188 , and La139.
 - Significant progress has also been made on the nuclear structure and decay evaluation of 131I and 140La, 117Sn, and the A=101, A=103 and A=107 mass chains.
- Large progress on sensitivity calculations, benchmarks and formatted libraries
 - improve processing and sensitivity calculations that have already helped to improve JEFF3-3
 - provided AMPX-formatted libraries of the most recent JEFF libraries.
 - ESRF, MYRRHA and ALFRED advanced reactor systems sensitivity/impact studies completed.
 - Identification of most relevant experimental benchmarks for validation with existing databases.
 - Large number of validations C/E with identification of trends had been performed comparing simulations with existing benchmarks specialized in different technologies / applications.
- Preparation of new integral experiments at GELINA/MINERVE, LR-0 & TAPIRO
 - First experiments at GELINA using MINERVE samples covers samples of 107Ag, 109Ag and 99Tc
 - GELINA ongoing program will provide data for samples of Sm, Nd, Cs, Mo, Ru, Eu, Gd, Rh.
 - The experiments at LR-0 has provided new benchmark for the delayed neutron fraction and prompt neutron lifetime.
 - First calibrations of reactor instrumentation at TAPIRO.

SANDA and future perspectives

- Despite the difficulties and delays of the COVID pandemic, significant progress and results had been achieved in all the types of activities and workpackages of SANDA.
- Significant number of publications (20) in peer review journals, communications to conferences and workshops and training of PhD (27) and Master (16) students
- Additional achievements will be developed in the remaining time of SANDA, mainly on differential and integral measurements, sensitivity studies and evaluations, and the corresponding publications and data for EXFOR, ENDF and ENSDF data libraries.
- In the new EURATOM program and call for proposals (open from April to November 2023) there is a point for nuclear data research that have a scope similar to the one for SANDA
 - HORIZON-EURATOM-2023-NRT-01-06: Improved nuclear data for the safety of energy and non-energy applications of ionising radiation. The SCOPE includes:
 - experimental measurements of the interactions of interest and estimation of their uncertainties and (cross-)correlations;
 - the evaluation of available experimental data and the creation of evaluated nuclear data libraries (including uncertainties and covariance matrices);
 - the validation of these (updated) evaluated nuclear data libraries by means of available differential and integral experimental data;
 - the dissemination of these (updated) evaluated nuclear data libraries according to the standards of 'reproducible science' – including all the information needed to reconstruct the evaluation process.