Plan Overview

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Title: Nuclear Shapes of Heavy Atoms and Proton-Emitting nuclei

Creator: n.n. n.n.

Principal Investigator: n.n.

Affiliation: KU Leuven (KUL)

Funder: European Research Council (ERC)

Template: ERC DMP +

Principal Investigator: n.n. n.n.

Project abstract:

By combining atomic, nuclear and particle physics techniques, I shall perform the experimental study of the shape of key atomic nuclei, to challenge our understanding of the nucleus. This combined effort will reach unprecedented sensitivity, precision and accuracy to determine the shape observables (charge radii, electric quadrupole moments) and compare them to state-of-the-art nuclear models (spherical shell model, density functional theory, ab initio models based on chiral effective field theory). This programme will combine different techniques at various accelerator facilities where I employ and develop unique approaches and instrumentation: - At CERN ISOLDE (Geneva, CH), high-resolution laser resonance ionization spectroscopy will be performed with the Resonant Ionization Laser Ion Source (RILIS) combined with the Perpendicularly-Illuminated Laser Ion Source and Trap (PI-LIST) to study the onset of octupole deformation and proceed towards the proton drip line with selected nuclei. - At GANIL SPIRAL2 (Caen, FR), high-sensitivity laser resonance ionization spectroscopy will be performed in the supersonic gas jet of the gas cell at the focal plane of the Super Separator Spectrometer (S3) to study the most exotic isotopes not available at ISOLDE, reaching proton-unbound nuclei at the drip line. - At PSI (Villigen, CH), muonic x-ray spectroscopy will be performed on key isotopes to measure absolute charge radii that are crucial to complete the analysis of the NSHAPE isotopes. This work will combine a strong experimental development in target production for muX, in the detector array, and in the analysis tools. Combining the high-resolution laser spectroscopy and the high-accuracy from μx-ray spectroscopy is a unique programme that only NSHAPE can fully realise, providing radii and moments with unprecedented accuracy. From those results, I shall obtain a deeper understanding of the strong interaction at work in the nuclear medium.

ID: 209045

Start date: 01-04-2023

End date: 31-03-2028

Last modified: 15-01-2025

Grant number / URL: 101088504

Nuclear Shapes of Heavy Atoms and Proton-Emitting nuclei
GDPR Record

GDPR record

Have you registered personal data processing activities for this project?

- No

Nuclear Shapes of Heavy Atoms and Proton-Emitting nuclei
DPIA

DPIA

Have you performed a DPIA for the personal data processing activities for this project?

- Not applicable

Nuclear Shapes of Heavy Atoms and Proton-Emitting nuclei
ERC DMP +

Project information

Project Acronym

NSHAPE

Project Number

101088504

Data summary

Summary

The NSHAPE project will generate many different forms of data, listed below, including details of their curation and accessibility.

- Physical targets for muonic x-ray studies. Those targets will require either a level of enrichment not yet available without the developments within NSHAPE or to be processed to match the experiment's requirements. The metadata on those targets include the data sheet of the different components (substrate, ingredients) and the production protocol. The target themselves will be kept afterwards under protection at either KU Leuven or at PSI (experiment location). The location of each sample and its condition is kept in a log file on the KU Leuven server.
- Development data at KU Leuven. Laser spectroscopy data in the form of frequency scan. All data will be kept on the KU Leuven server and will be automatically backed up on a weekly basis (*For storage, we are managing the data centrally on KU Leuven server with an efficient backup process and clear access rights.). A digital logbook is maintained with the needed metadata. The total expected size is several GB and the KU Leuven server provides secure long-term storage solution for reproducibility and preservation.
- *For Security and access rights: To mitigate the risk of unauthorized access and data deletion, we set a proper infrcasturce Process For raw Project data: team members can access only the data they need to answer their research questions.*
- Laser spectroscopy data at CERN in the form of frequency scans coupled with decay data. All data are kept on CERN Box, a CERN-based data server, and copied to KU Leuven for analysis. The machine logs are kept on TIMBER, a CERN data server, and an experimental log is kept for metadata information. The experimental log will be copied over with the data files.
- Laser spectroscopy data at GANIL in the form of frequency scans coupled with decay data. All data will be transferred to KU Leuven. The machine logs are in the format of EPICS and maintained by GANIL. An experimental log is kept for metadata information. The experimental log will be copied over with the data files.
- Muonic x-ray spectroscopy data generated at PSI will kept on their home data server and copied to KU Leuven for analysis. The muX acquisition system embeds the machine data log within the data stream and writes the metadata in json format. Those will be copied over with the data to KU Leuven.

FAIR data

1. Making data findable

During the analysis, the data will be curated by the team at KU Leuven, in coordination with the international collaboration where they are generated.
During publication, the appropriate secondary data will be released via Zenodo and attributed a DOI in the process, including the relevant metadata.

2. Making data openly accessible

Given that all the data will be acquired on experiment-specific software and that there is no standard in this field of research, it is not possible to release the raw data in any useable way.
Secondary data containing pre-processed data, histograms, and coincidence matrices will be made available via Zenodo during the publication process, together with the necessary metadata to understand its content.
Raw data will be made available on reasonable demand, and will then include proper training of those requesting it to ensure appropriate use of the data.

3. Making data interoperable

There is no standard in the field of research.
The metadata will thus strive to inform potential users of the units of collection, calibration information, and structure of the data.

4. Increase data re-use

Secondary data will be published upon publication of the results.
Primary data will remain accessible via the principal investigator upon reasonable request.
Close interaction with the collaboration that generated the data will ensure the proper re-use of the data.

5. Allocation of resources and data security

The data volume generated is rather limited to a few TB in total. The specific cost of curating these data is thus limited and absorbed in the larger data management investment of my research unit. An order of magnitude estimate places the share of the costs for this project at EUR 5k.
All data are kept on the servers of the KU Leuven Department of Physics and Astronomy, which are double backed up on a weekly basis at multiple locations, and overseen by a local ICT team.