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## Precision laser spectroscopy of short-lived bismuth isotopes

*A Data Management Plan created using DMPonline.be*

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### Project abstract:

The nuclear electromagnetic moments (EM) and the mean-charge radius  $\langle r^2 \rangle$  are important properties useful to investigate the nuclear structure and to probe our understanding of the nucleon-nucleon interaction. While the former gives an indication of the charge and current distribution in the nucleus, the radius allows to evaluate its size. Measurements of the lowest order EM moments and of the radius can be obtained with laser spectroscopy, a widely used experimental method which probes the hyperfine structure of atoms.

In this PhD project I will perform laser resonance ionization spectroscopy on the multi-quasiparticles states in 204-208Bi, by using the RAPTOR beamline at the IGISOL facility. The goal is to study the correlation between the deformation of the nuclei and their radius by extracting the quadrupole moment and  $\langle r^2 \rangle$  of the isotopes. Because Bi isotopes have only one valence proton outside the double-closed shell of 208Pb, their configurations are rather pure. Thus, the single-particle and collective degrees of freedom in the radii and moments are under control. Bi is also an ideal case for high precision measurements: the high sensitivity of its atomic structure to the octupole moment  $\Omega$  makes it a prime candidate to study this largely unexplored nuclear property. To reach this goal I will perform laser-rf double resonance spectroscopy on 209Bi in the laboratory at KU Leuven and I will extract  $\Omega$  by combining the results with the most recent atomic calculations.

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FWO DMP (Flemish Standard DMP)

1. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.

				Only for digital data	Only for digital data	Only for digital data	Only for physical data
Dataset Name	Description	New or reused	Digital or Physical	Digital Data Type	Digital Data format	Digital data volume (MB/GB/TB)	Physical volume
	The results of the measurements will be mainly recorded as the output of a photon and particle detectors, and as values of some laser or radiofrequency scanning parameters	Generate new data	Digital	Observational Experimental Simulation data Software Numerical Images	.xml, .tab, .csv,.pdf, .txt, .png, .jpg	<100GB	No

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:

I will not use existing data

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? Describe these issues in the comment section. Please refer to specific datasets or data types when appropriate.

- No

Will you process personal data? If so, briefly describe the kind of personal data you will use in the comment section. Please refer to specific datasets or data types when appropriate.

- No

Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, ...)? If so, please comment per dataset or data type where appropriate.

- No

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements/ research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.

- No

Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.

- No

## 2. Documentation and Metadata

Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g., in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).

To keep the data understandable and usable, for myself and others, I will report comments, and if necessary brief discussions, about the data in the laboratory Logbook. If further explanation is needed, I will write a README.txt file.

The .xml data files contain metadata that explain all the columns of the tables.

Will a metadata standard be used to make it easier to find and reuse the data? If so, please specify (where appropriate per dataset or data type) which metadata standard will be used. If not, please specify (where appropriate per dataset or data type) which metadata will be created to make the data easier to find and reuse.

- No

.xml files containing metadata.

## 3. Data storage & back-up during the research project

**Where will the data be stored?**

Shared network drive (J-drive)

OneDrive(KU Leuven)

Sharepoint online

**How will the data be backed up?**

Standard back-up provided by KU Leuven ICTS for my storage solution

Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely.

If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.

- Yes

**How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?**

The IT support team take care of the cluster share folder and the data so unauthorized persons cannot access the data

**What are the expected costs for data storage and backup during the research project? How will these costs be covered?**

The cost will be covered by the grant of my supervisor

#### **4. Data preservation after the end of the research project**

**Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).**

All data will be preserved for 10 years according to KU Leuven RDM policy

**Where will these data be archived (stored and curated for the long-term)?**

KU Leuven RDR

**What are the expected costs for data preservation during the expected retention period? How will these costs be covered?**

The cost will be covered by the grant of my supervisor

#### **5. Data sharing and reuse**

**Will the data (or part of the data) be made available for reuse after/during the project? In the comment section please explain per dataset or data type which data will be made available.**

- Yes, in an Open Access repository

All data

**If access is restricted, please specify who will be able to access the data and under what conditions.**

Access is not restricted

**Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain in the comment section per dataset or data type where appropriate.**

- No

**Where will the data be made available? If already known, please provide a repository per dataset or data type.**

KU Leuven RDR

**When will the data be made available?**

Upon publication of research results

**Which data usage licenses are you going to provide? If none, please explain why.**

CC-BY 4.0 (data)

**Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, you have the option to provide it in the comment section.**

- Yes

**What are the expected costs for data sharing? How will these costs be covered?**

The cost will be covered by the grant of my supervisor

## 6. Responsibilities

**Who will manage data documentation and metadata during the research project?**

Anita Candiello (myself)

**Who will manage data storage and backup during the research project?**

Departmental IT team

**Who will manage data preservation and sharing?**

Departmental IT team

**Who will update and implement this DMP?**

Anita Candiello (myself)