



# Recent development of the radiopurity.org materials database

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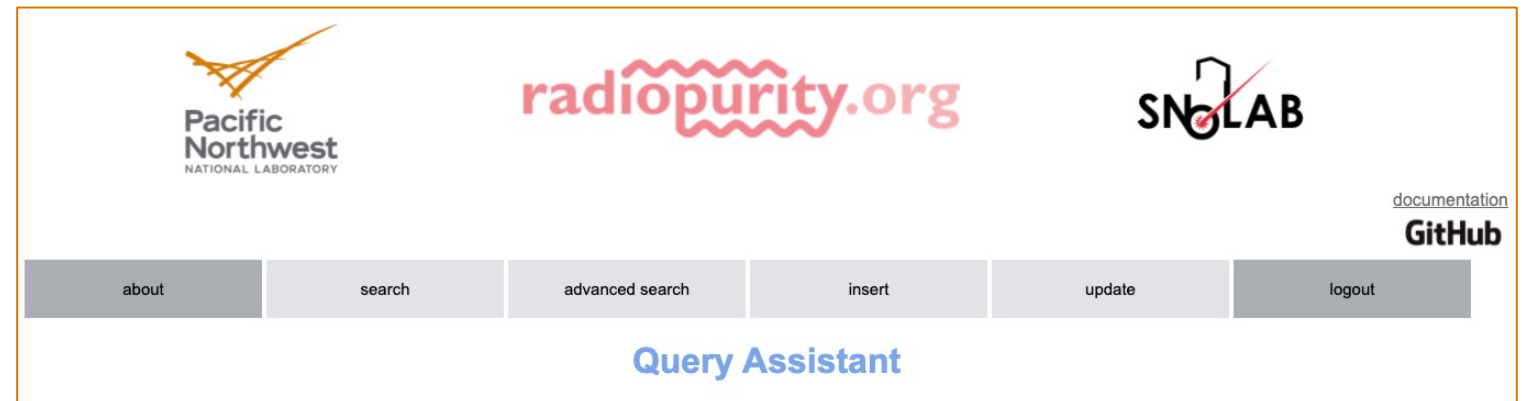


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# Outline

- Introduction
- Data format
- Code structure
- Demonstration
  - New features
- Future Plans
- Conclusions

# radiopurity.org



The screenshot shows the top navigation bar of the radiopurity.org website. It features the Pacific Northwest National Laboratory logo on the left, the radiopurity.org logo in the center, and the SNO LAB logo on the right. Below the logos is a horizontal menu with buttons for 'about', 'search', 'advanced search', 'insert', 'update', and 'logout'. To the right of the menu is a link for 'documentation' and a 'GitHub' logo. Below the menu is a 'Query Assistant' link.



# Introduction

- Designing and building a detector radioactively ‘clean’ requires considerable effort, must carefully control everything
- Good record keeping is essential
- Sharing results is invaluable

radiopurity.org

- Community tool used by several experiments
  - Originally from the AARM collaboration
  - Nuclear Instruments and Methods in Physics Research A 839 (2016) 6–11

A database for storing the results of material radiopurity measurements

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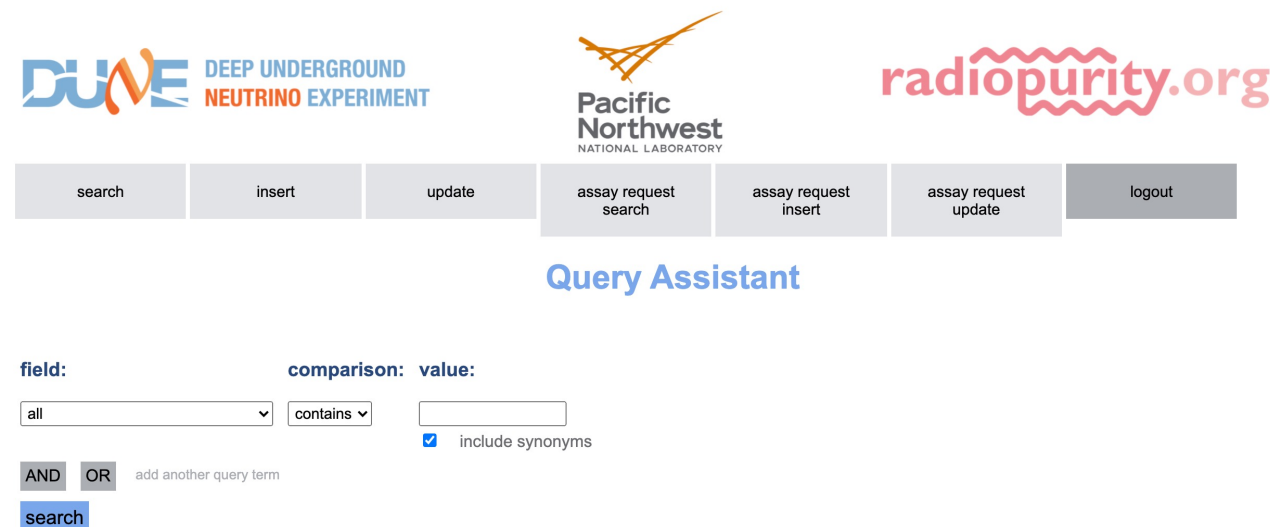
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<sup>c</sup> Department of Physics, Southern Methodist University, Dallas, TX75275, USA

<sup>d</sup> Institute for Nuclear Physics, Karlsruhe Institute of Technology, Karlsruhe 76131, Germany

# Introduction

- Origins of this work:
  - Wanted to use a database tool for DUNE radiopurity measurements
  - Went to radiopurity.org as community standard
- Discovered no active support of radiopurity.org – problems with python versions and deprecated backend code.
- PNNL software engineer Elise Saxon developed new modern implementation of database in MongoDB
- DUNE radiopurity.org live for > 1year



The screenshot shows the DUNE radiopurity.org Query Assistant interface. At the top, there are logos for DUNE (DEEP UNDERGROUND NEUTRINO EXPERIMENT), Pacific Northwest NATIONAL LABORATORY, and radiopurity.org. Below the logos is a navigation bar with buttons for search, insert, update, assay request search, assay request insert, assay request update, and logout. The main content area is titled "Query Assistant" and contains a search form with the following fields and options:

field:  comparison:  value:

include synonyms

AND OR add another query term

# Radiopurity.org Framework

- Material Assay Data Format (MADF)
  - Standardized, but flexible, json format
- Database Assistant
  - Open source format for storing, displaying and manipulating MADFs
- Public instance maintained by SNOLAB
  - <https://www.radiopurity.org/>
  - Can share results easily with community when ready

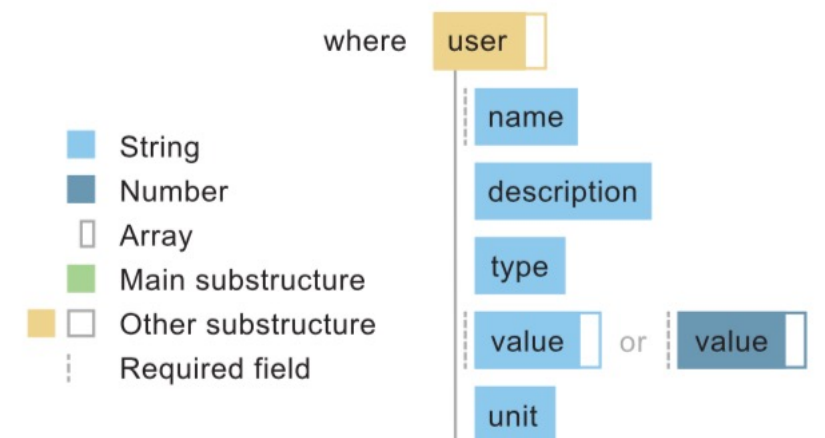
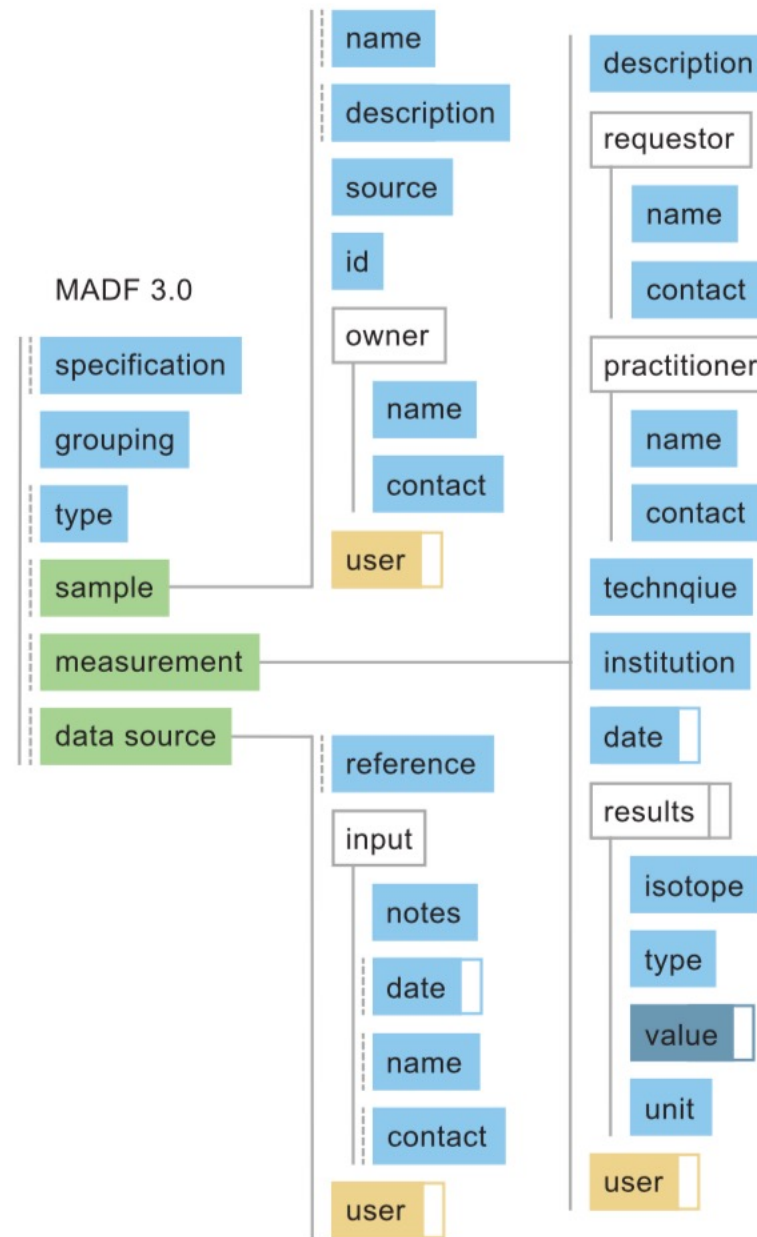
# Radiopurity.org Framework

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  - Standardized, but flexible, json format
- Database Assistant
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New!

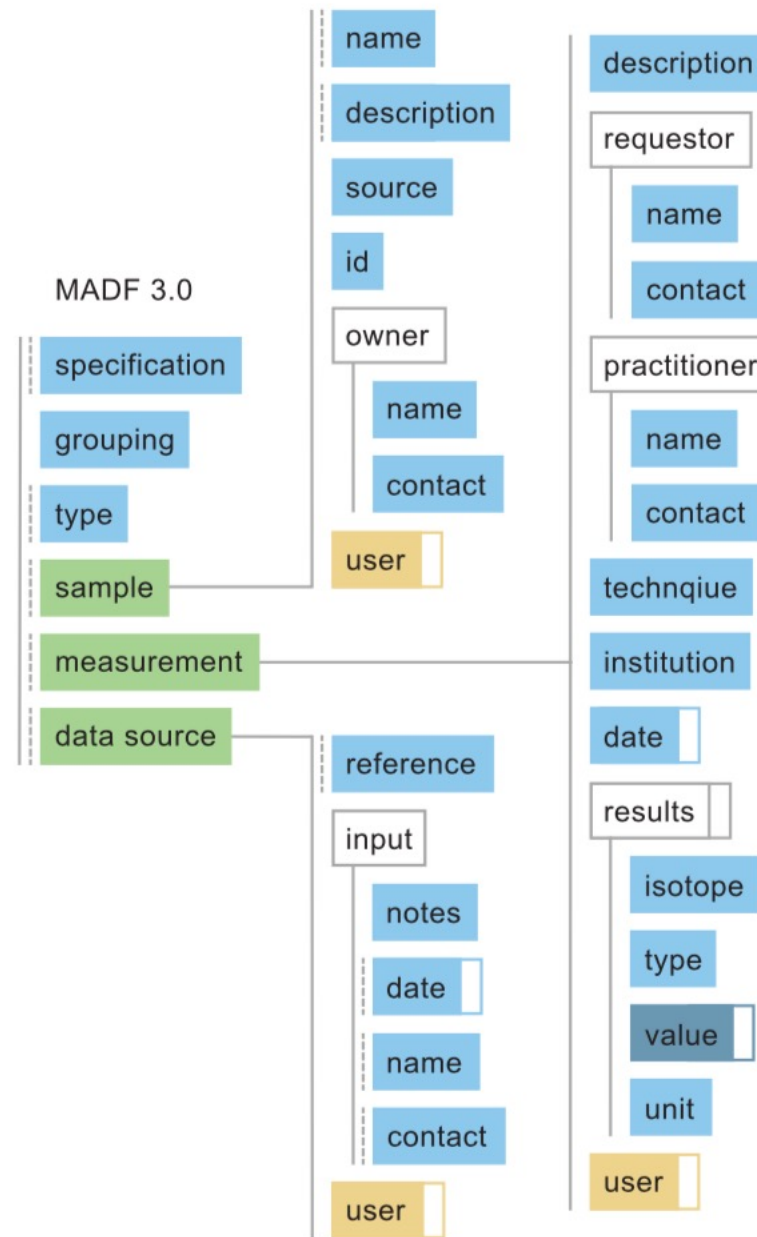
Upgraded!

# Material Assay Data Format



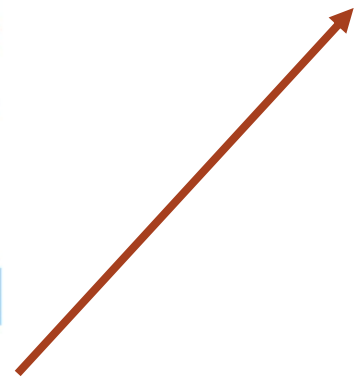


# Material Assay Data Format



```

"results": [
  {
    "isotope": "U-238",
    "type": "measurement",
    "value": [400, 20],
    "unit": "ppb"
  },
  {
    "isotope": "Th-232",
    "type": "limit",
    "value": [100, 90],
    "unit": "ppt"
  }
]
  
```



where **user** [ ]

- [ ] String
- [ ] Number
- [ ] Array
- [ ] Main substructure
- [ ] Other substructure
- [ ] Required field

```

name
description
type
value [ ] or [ ]
unit
  
```



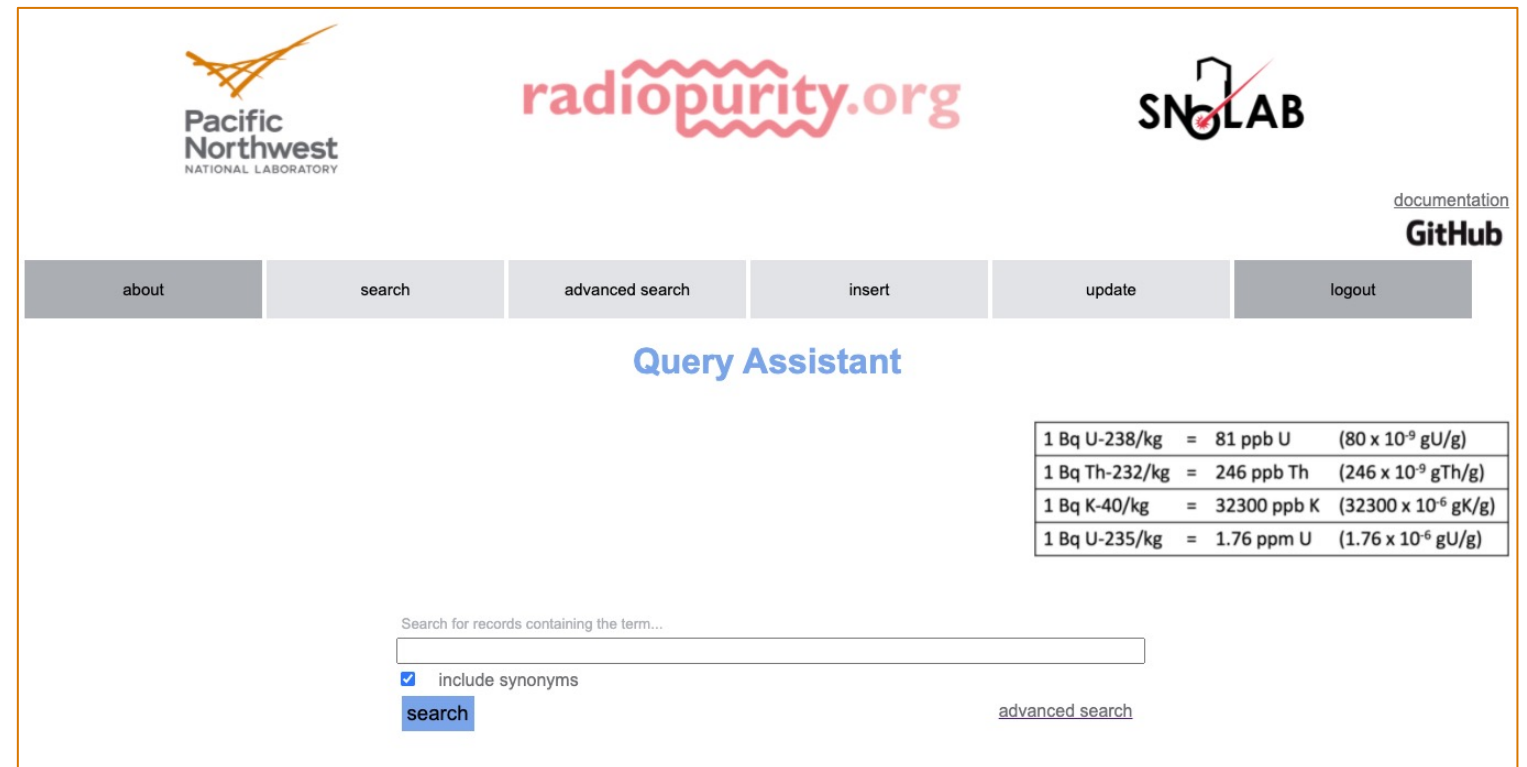
# Backend structure

- MongoDB Database and python-based toolkit
  - Up-to-date standardized codebase
- Improved structure, ability to modify
  - 'old versions' collection in database to track changes to entries (linked by document ID)
- This replaces a deprecated CouchDB database (Persephone)
  
- Open source code and available now:
  - <https://github.com/pnnl/Radiopurity-database-assistant>

# Demonstration

- [www.radiopurity.org](http://www.radiopurity.org)

- Search
  - Search all
  - Summary information changes
  - Synonyms - **New**
  - Published flag - **New**
- Advanced Search
  - Unit conversion - **New**
  - New data added (Xenon1T, LRT 2010)
- Data Entry
- Data Update - **New**



The screenshot shows the radiopurity.org website interface. At the top, there are logos for Pacific Northwest National Laboratory, radiopurity.org, and SNO LAB. A navigation bar contains links for about, search, advanced search, insert, update, and logout. Below the navigation bar is the "Query Assistant" section, which includes a search input field, a checkbox for "include synonyms", and a "search" button. To the right of the search area is a table of unit conversions.

1 Bq U-238/kg	=	81 ppb U	(80 x 10 <sup>-9</sup> gU/g)
1 Bq Th-232/kg	=	246 ppb Th	(246 x 10 <sup>-9</sup> gTh/g)
1 Bq K-40/kg	=	32300 ppb K	(32300 x 10 <sup>-6</sup> gK/g)
1 Bq U-235/kg	=	1.76 ppm U	(1.76 x 10 <sup>-6</sup> gU/g)

# Future Plans

- New radiopurity.org going live now!
- Missing data, comments, feedback:

[radiopurity@snolab.ca](mailto:radiopurity@snolab.ca)

- Ongoing support:
  - SNOLAB hosting and maintaining
  - PNNL providing software expertise
- Ongoing development plans underway:
  - DUNE radiopurity developing radiopurity database framework to manage a largescale assay program



# Conclusions

- Radiopurity.org is a proven tool of value to the low background physics community
- Backend has been completely rewritten to support modern MongoDB and is publicly available for any collaboration/institution to use for low background assay
- Public version hosted at SNOLAB has been updated and is now live

[www.radiopurity.org](http://www.radiopurity.org)

- Let us know if you are interested to use in your experiment
- Contact us with data to share or feedback

[radiopurity@snolab.ca](mailto:radiopurity@snolab.ca)



Thank you

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2]A Eu!c9  
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