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Recent development of the radiopurity.org materials database

September 2nd, 2021

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Outline

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

radiopurity.org

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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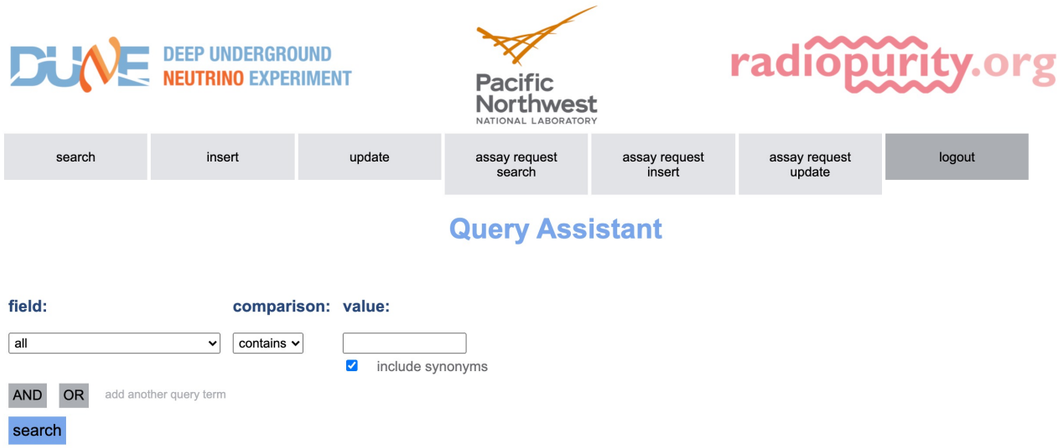
Introduction

- 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



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

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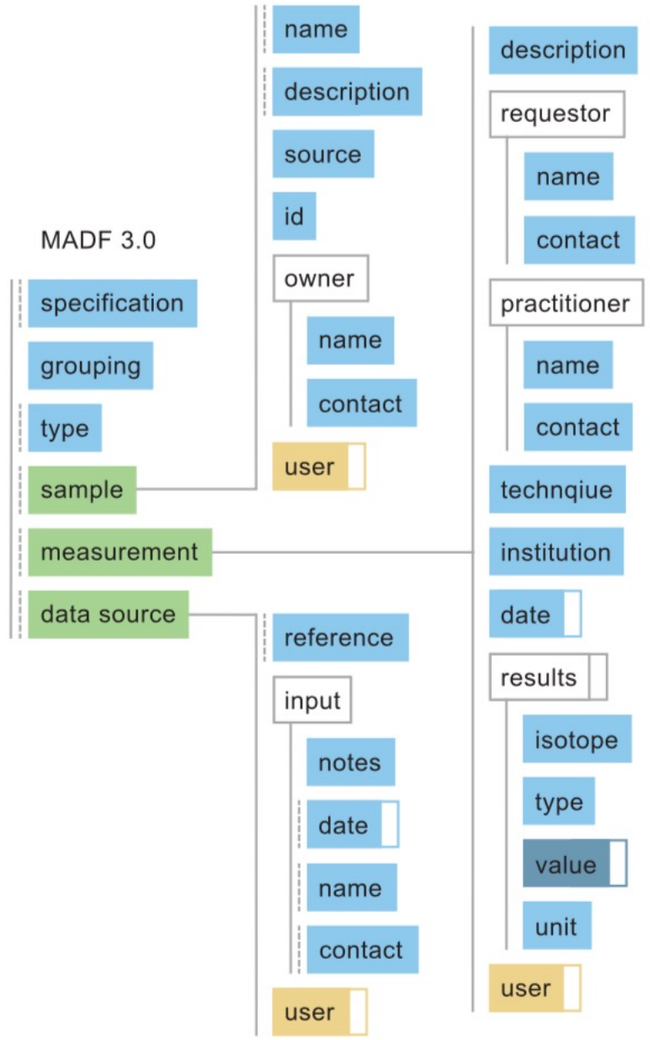
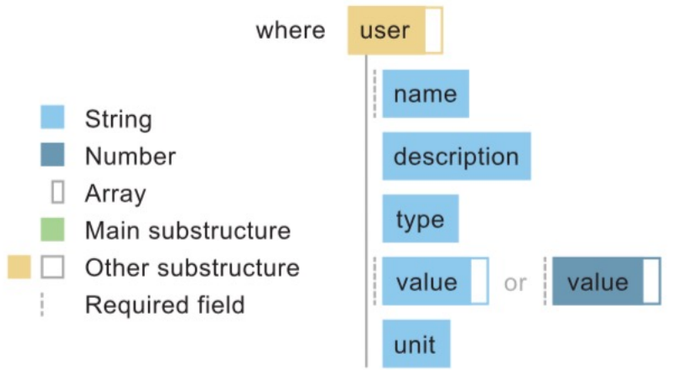
New!

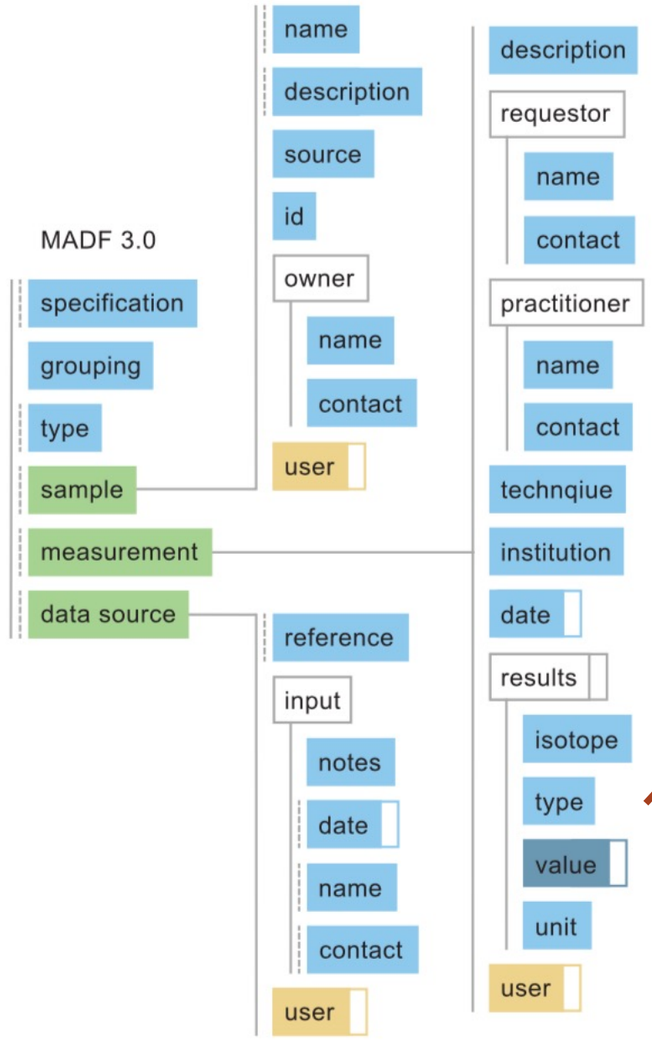
Upgraded!

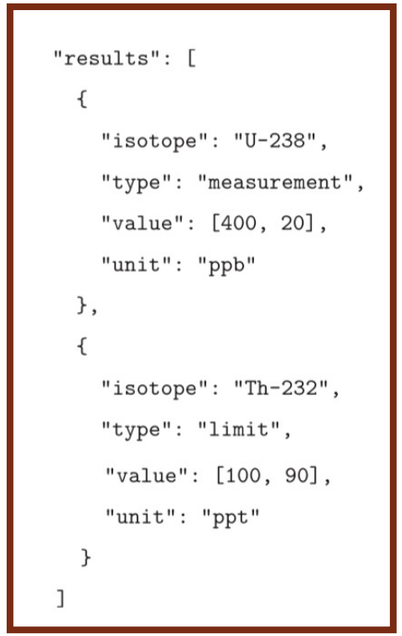
Material Assay Data Format



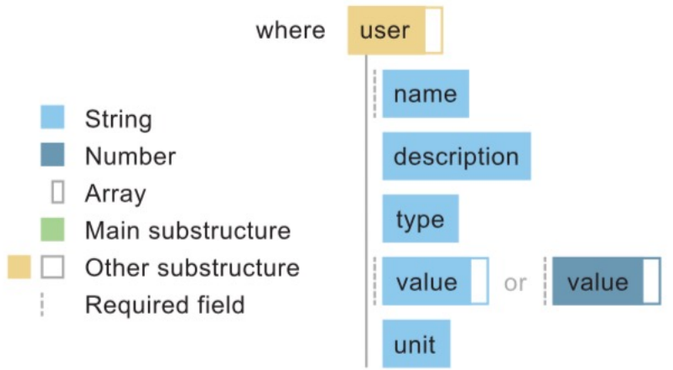


Material Assay Data Format





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



Backend structure

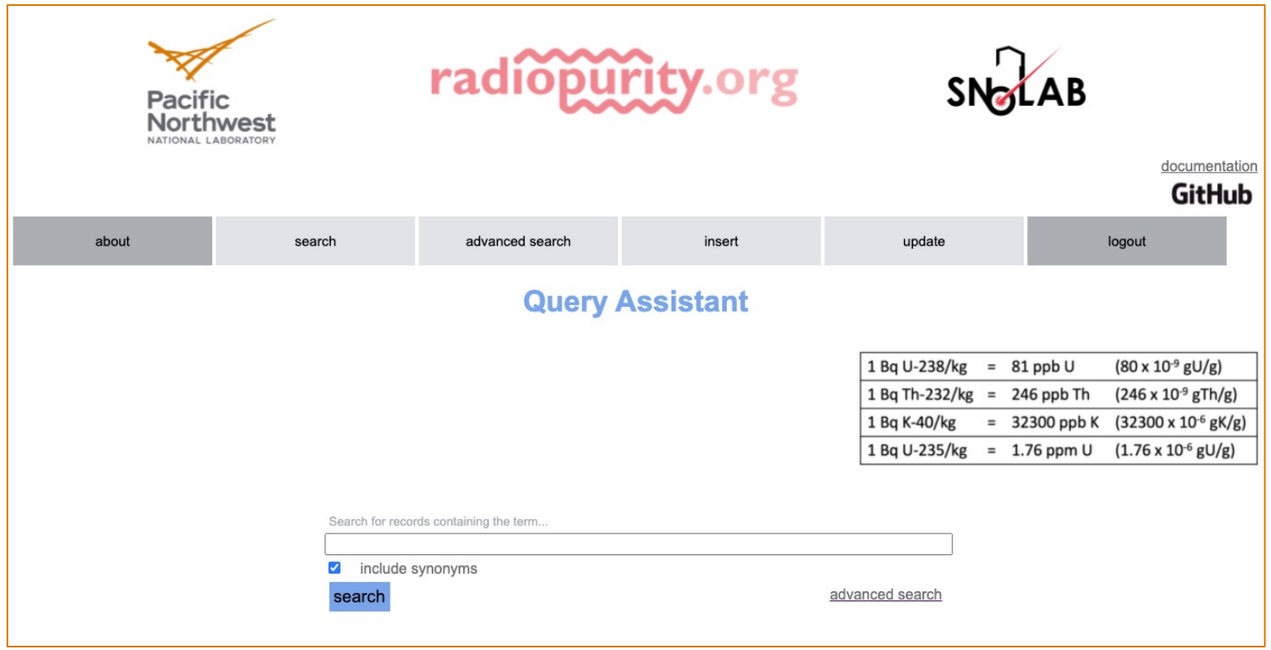
- MongoDB Database and python-based toolkit
  - Up-to-date standardized codebase
- Improved structure, ability to modify
  - 'old versions' collection in database to track changes to entries (linked by document ID
- This replaces a deprecated CouchDB database (Persephone)

- Open source code and available now:
  - https://github.com/pnnl/Radiopurity-database-assistant

Demonstration

- www.radiopurity.org

- 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



Future Plans

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

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

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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

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

radiopurity@snolab.ca

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Thank you