Open Science and Open Data

presentation

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CATRIN Data Steward

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OUTLINE

OPEN SCIENCE

OPEN DATA

(META)DATA

LABORATORY LEVEL

PUBLICATION LEVEL

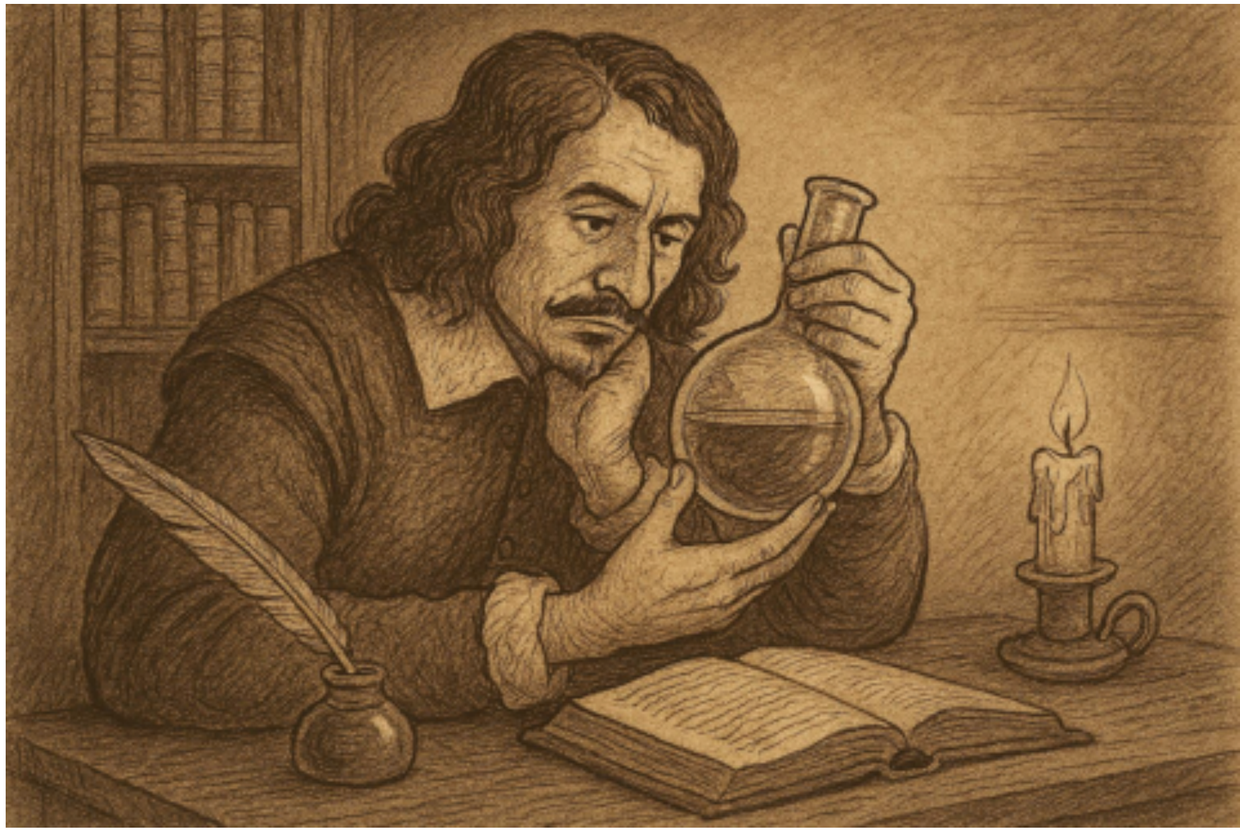
PUBLIC DATA REPOSITORY

QUESTIONS & ANSWERS

OPEN SCIENCE

History

1) Sharing of research results (17th century)
2) Paywall (19th – 20th century)
3) Secret research (cold war)
4) Digital revolution (end of 20th century)
5) Open Access (21st century)



OPEN SCIENCE

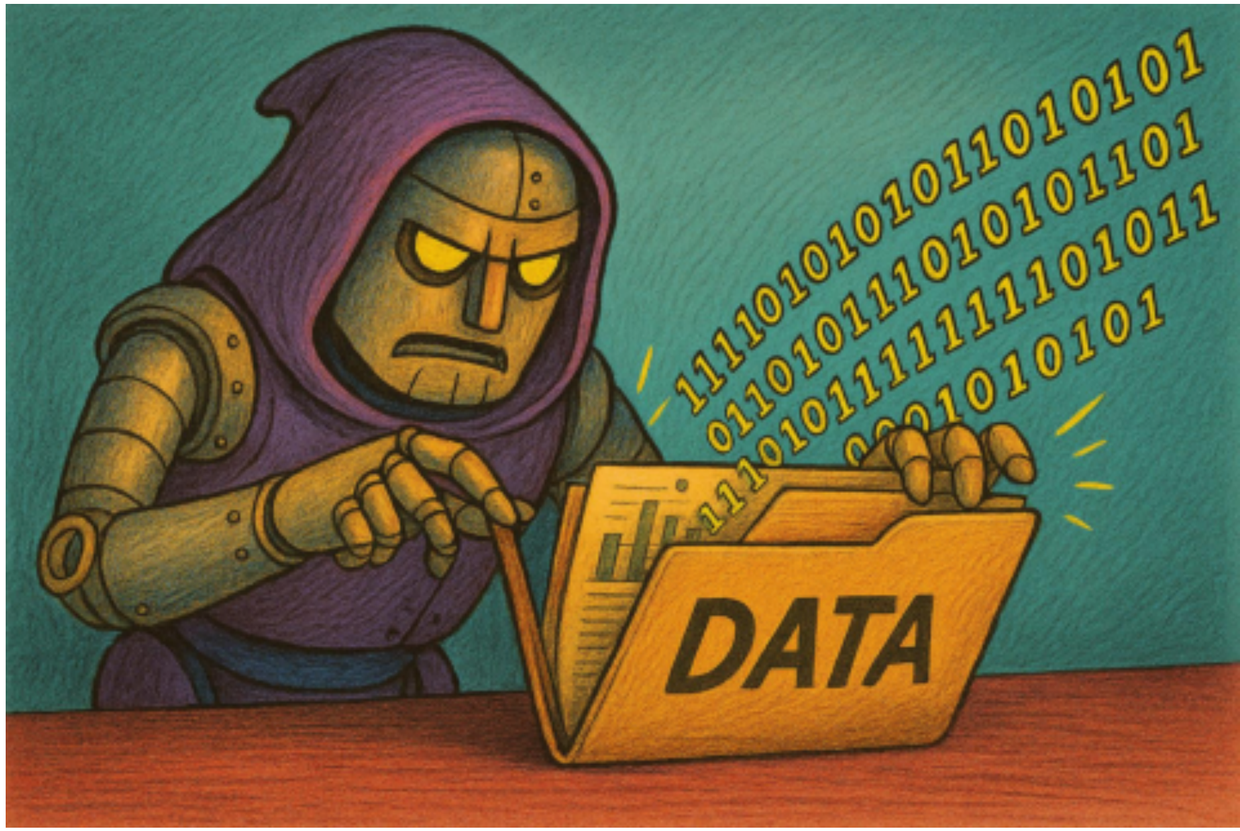
Motivation

1) Replication crisis
2) Fast sharing of data
3) Research output increase
4) Research quality increase

OPEN SCIENCE

RISKS

1) Data mining (open data)
2) High costs (open access)



OPEN DATA

F.A.I.R. Principles

Findable

Accessible

Interoperable

Reusable

OPEN DATA

Findable data

Laboratory level

- Proper sample identification (unique code, central laboratory evidence, …)
- All raw data must be accompanied with some king of metadata (assignability to the sample)
- All measurements must be registered in a laboratory book (hardcopy or electronic)
- A responsible person must be designated

Publication level

- All published data must be safely stored to ensure their full availability during the publication lifetime
- All data must be assignable to individual images, graphs, etc
- A responsible person must be designated (typically corresponding author)

OPEN DATA

Accessible data

Laboratory level

- Raw data and metadata are available for scientists who are working with them

Publication level

- All published data must be available for broad public
  - Previously on the request upon the containing author‘s team (typically corresponding author responsibility)
  - New trend is the unlimited public access through online repository

OPEN DATA

Interoperable data

Laboratory level

- Typically no interoperability request
- Raw data are often processed by specialized software

Publication level

- All published data should be usable with standard software tools and standard PC
  - Using of standard open formats, like: ***.TXT (ASCII)**, *.DOC, *.XLS, *.HTML, *.JPG, ...
  - Only exception is if there is no such possibility, then the data could be in method specific format

OPEN DATA

Reusable data

Laboratory level

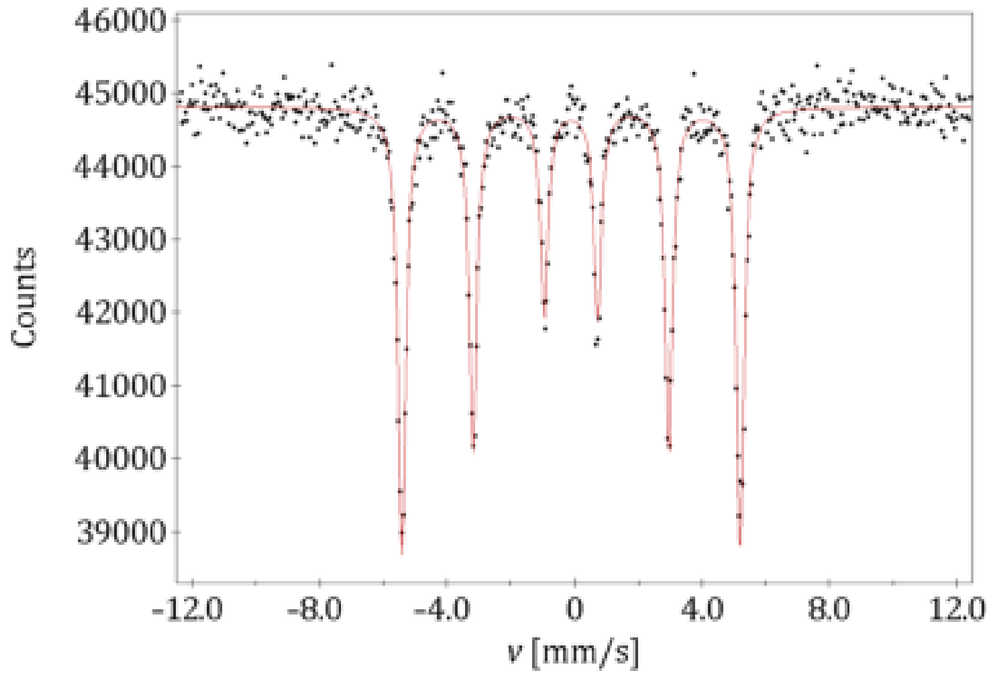
- Raw data are always reusable from their principle

Publication level

- All published data must be in a format and form which allows their reusage and evaluation by anyone

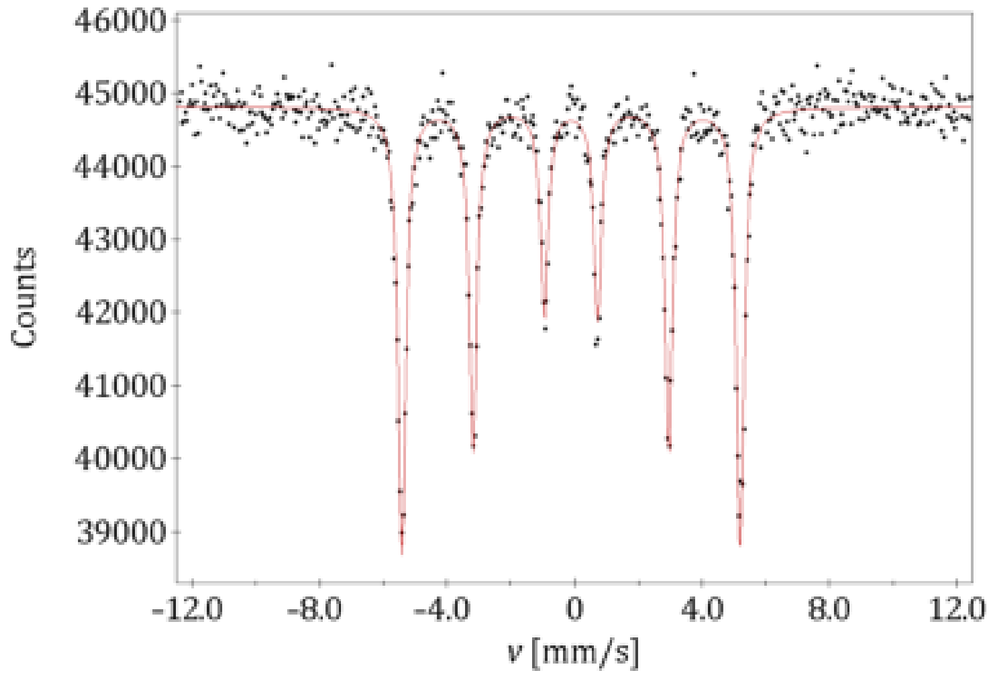
OPEN DATA

Reusable data example



OPEN DATA

Reusable data example



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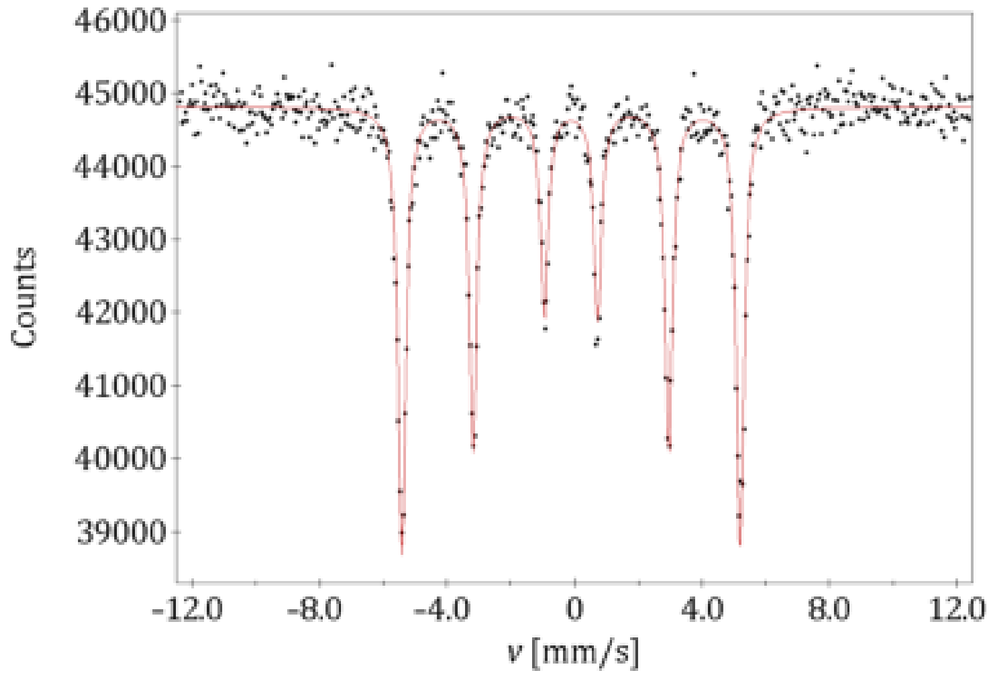

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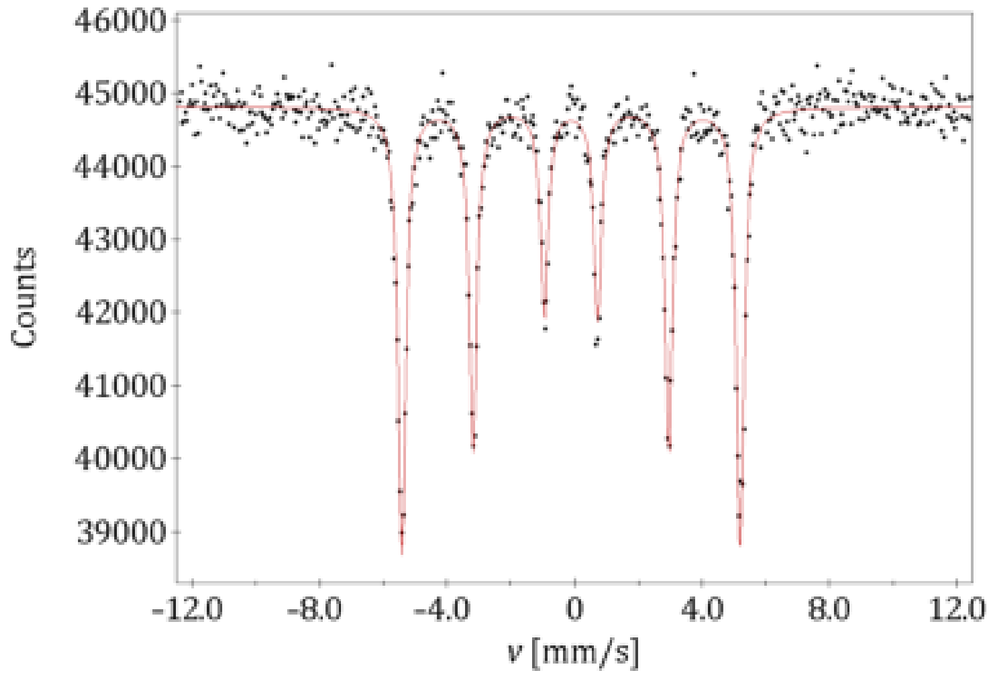
OPEN DATA

Reusable data example



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OPEN DATA

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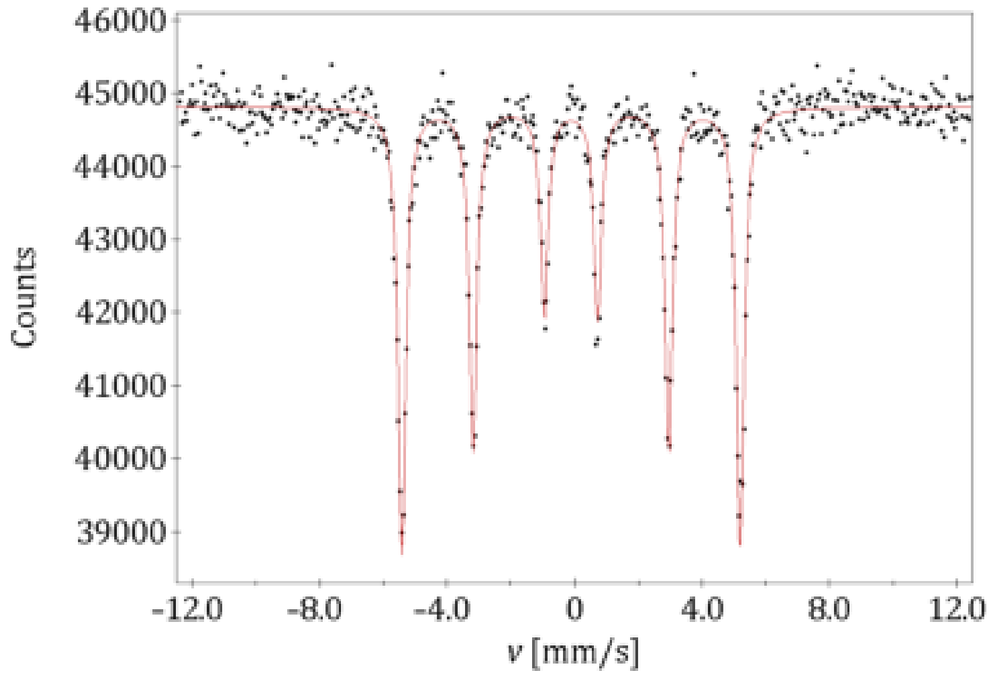

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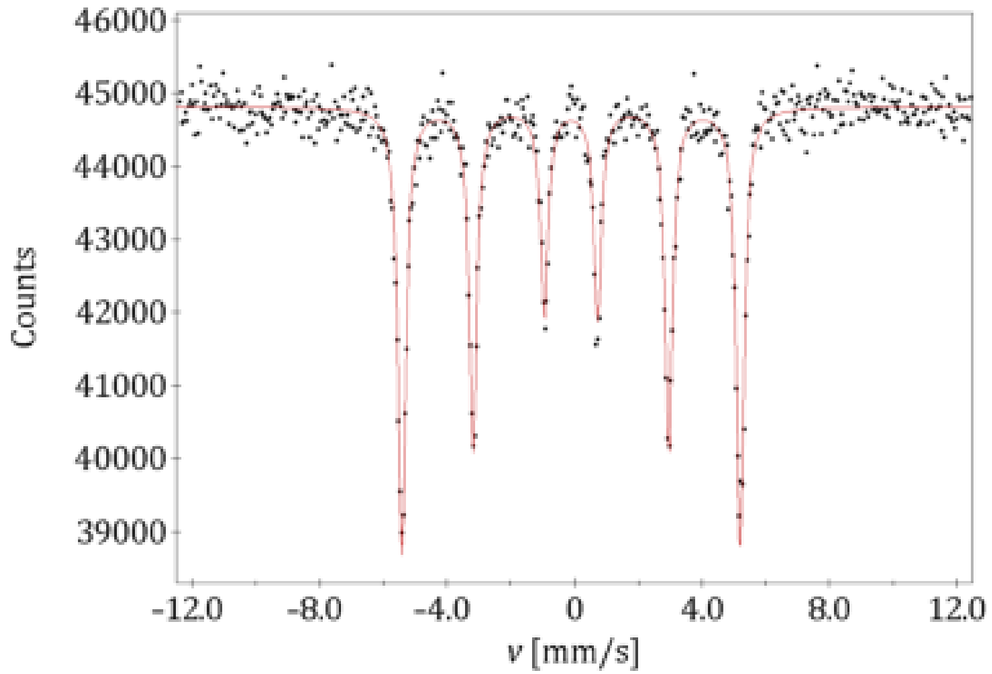

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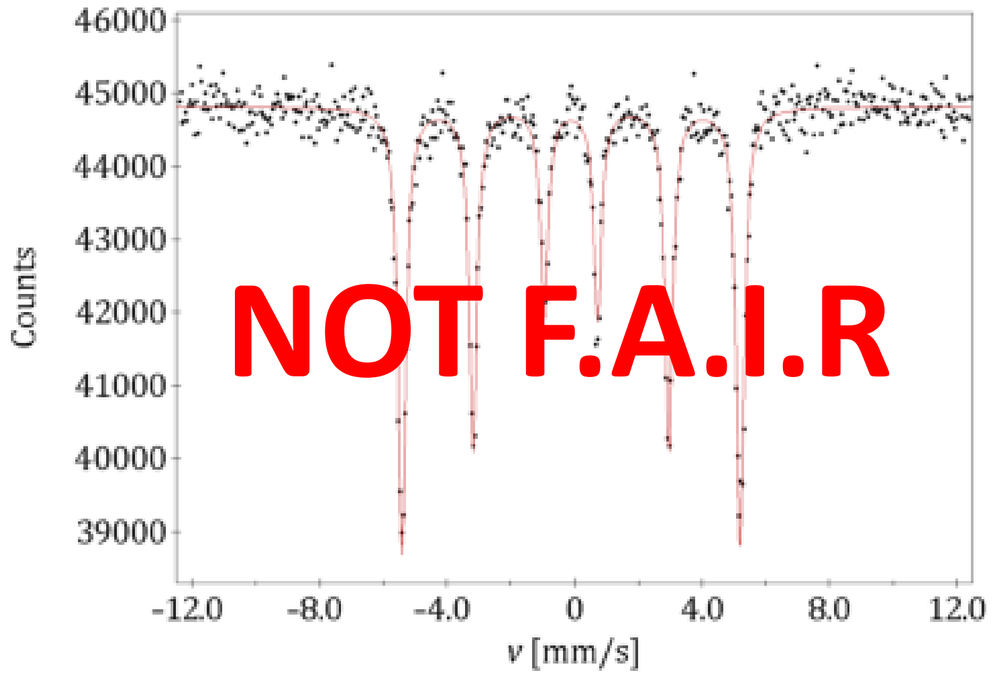

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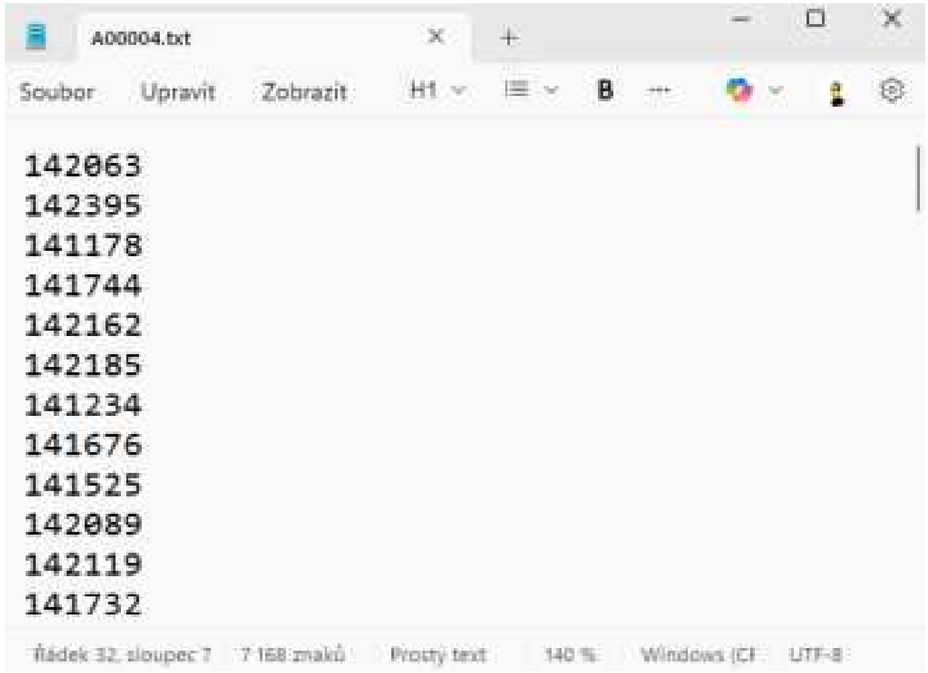

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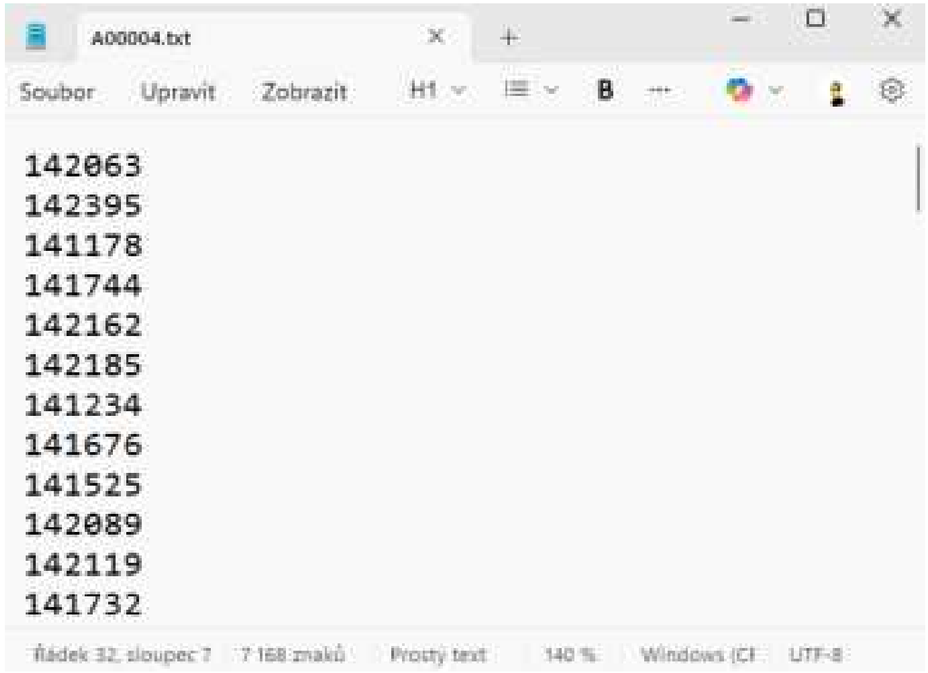

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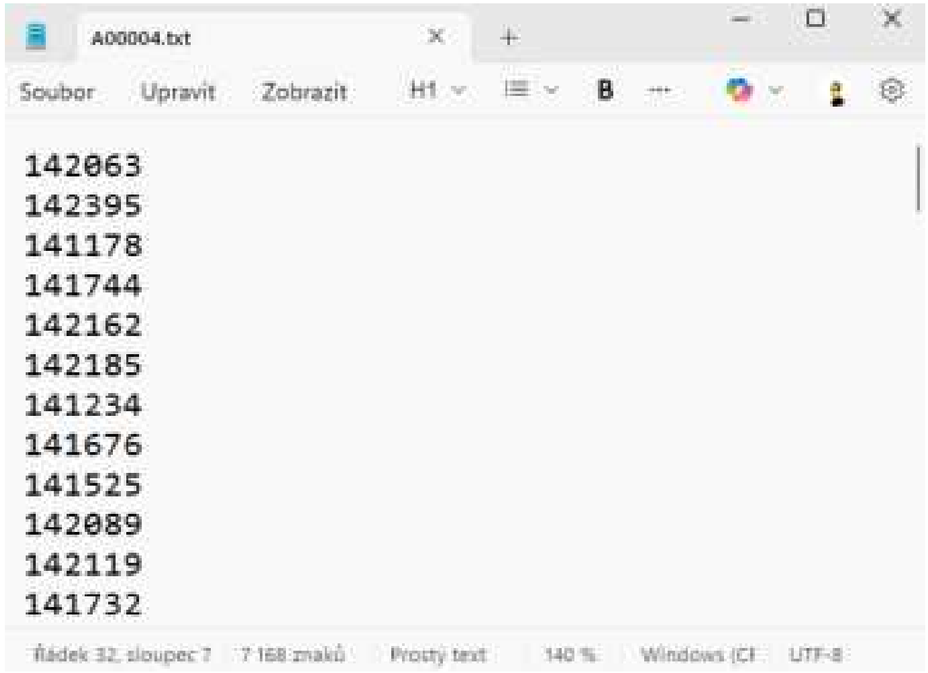

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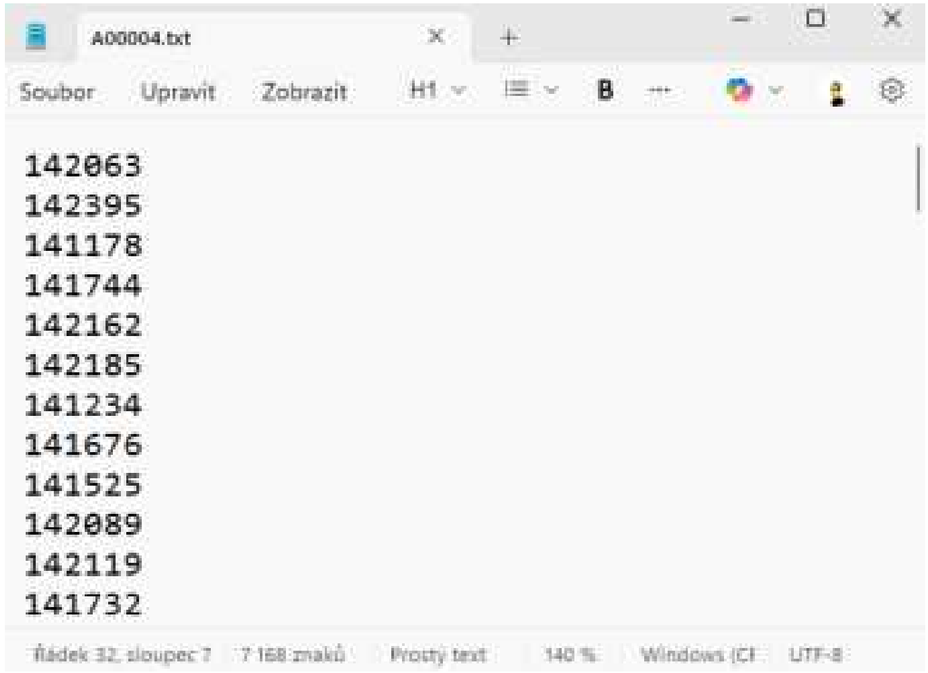

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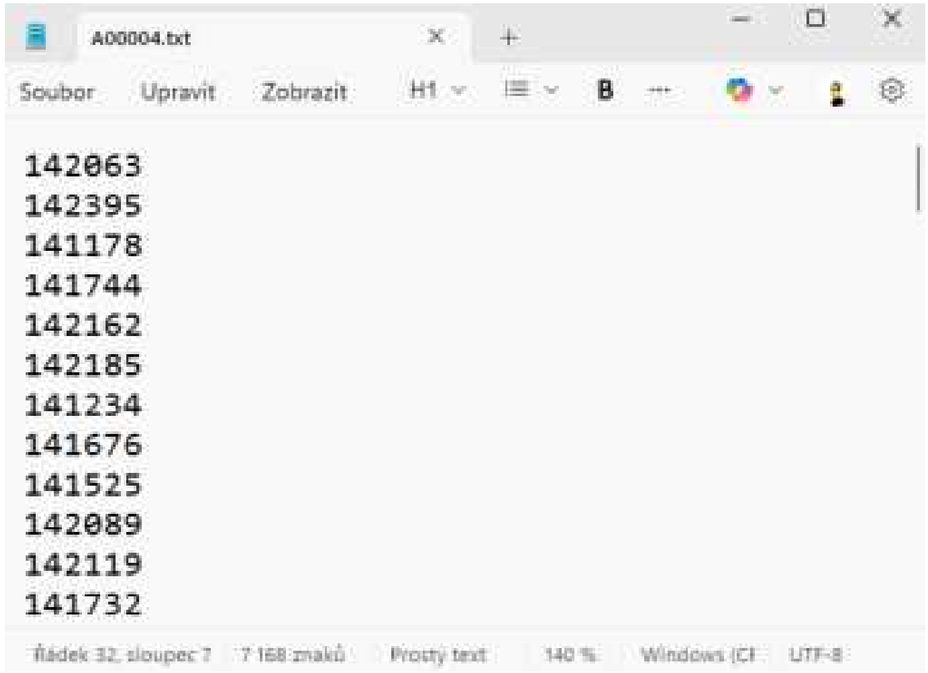

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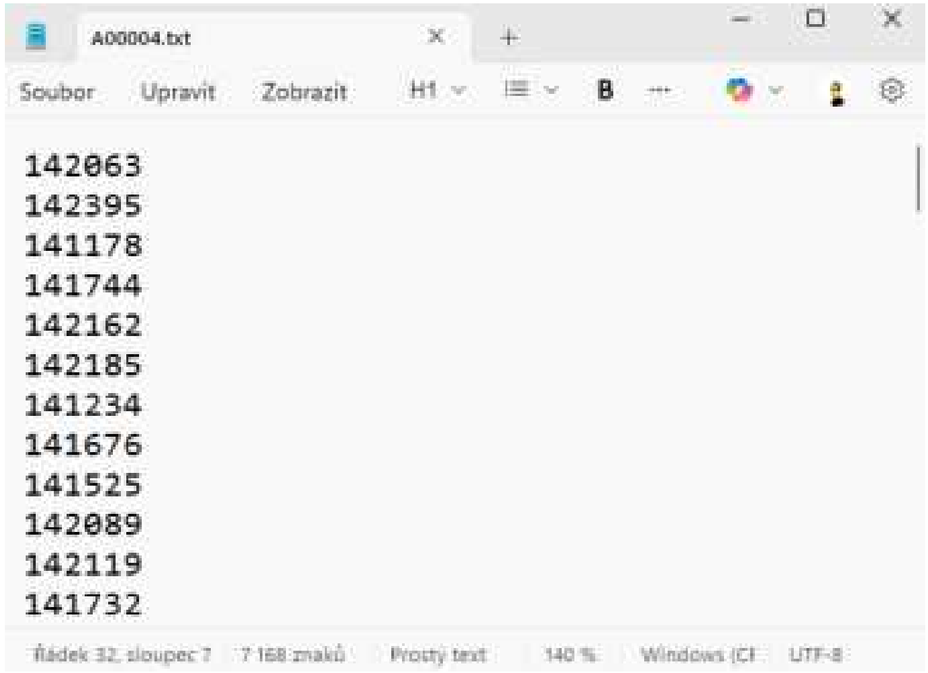

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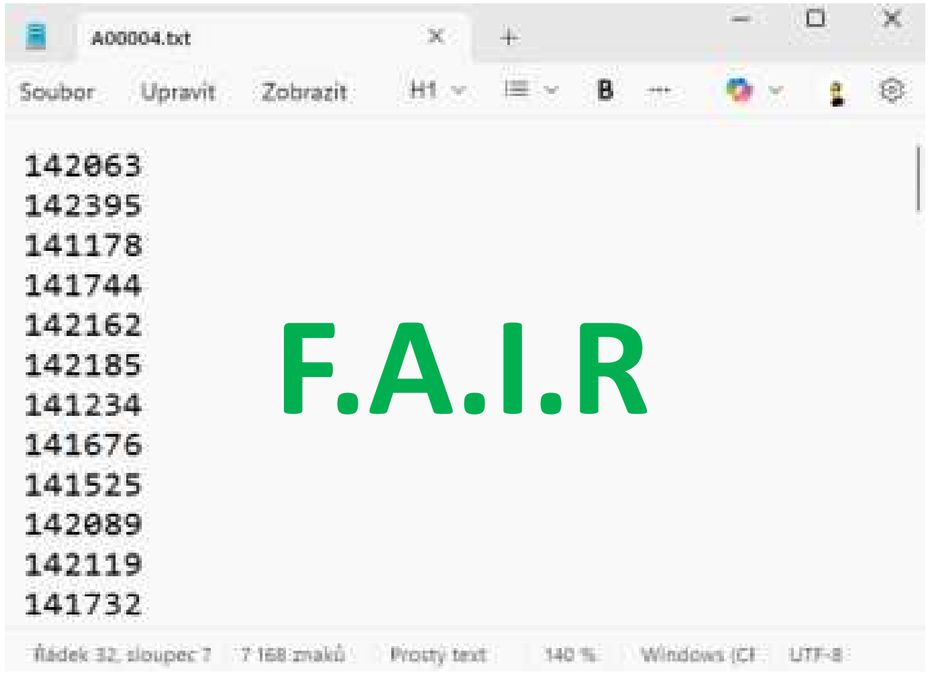


F.A.I.R

- ✔ Findable
- ✔ Accessible
- ✔ Interoperable
- ✔ Reusable

(META)DATA

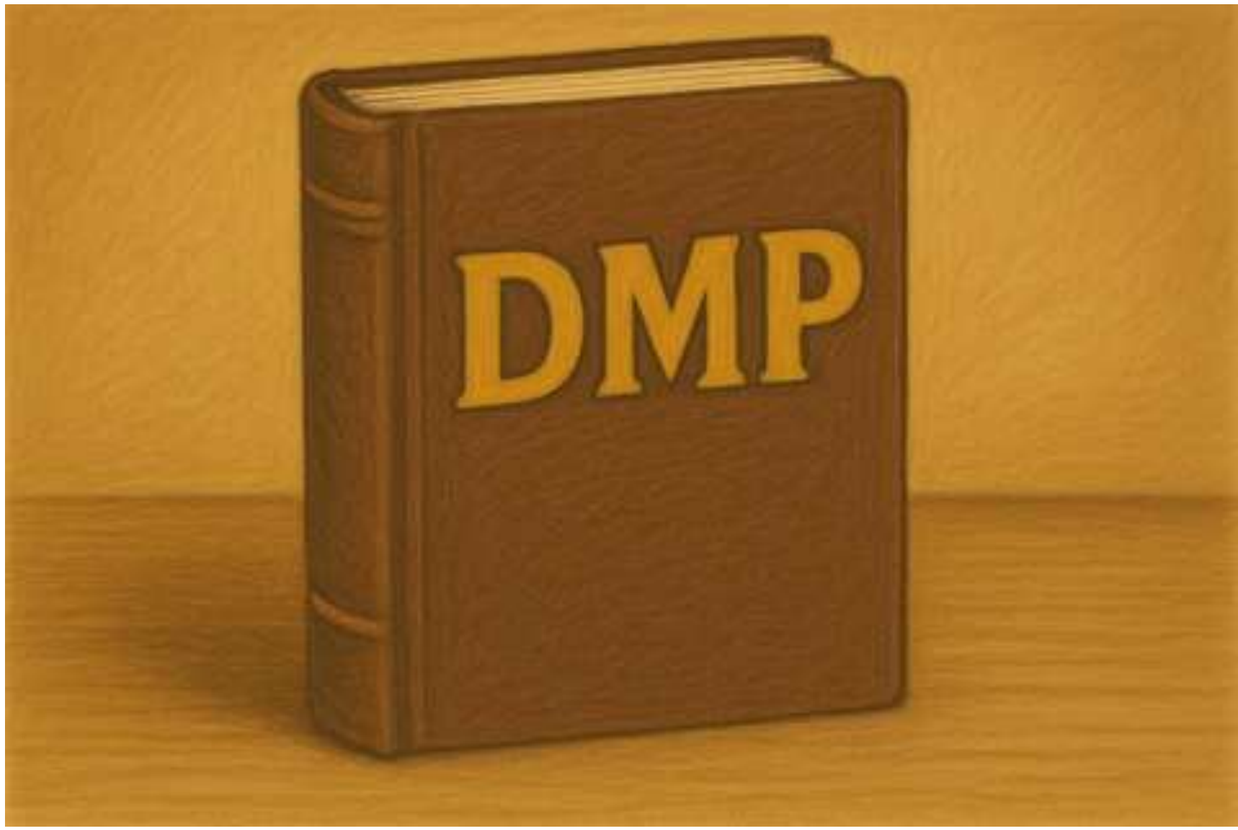
Data behind data

- Data contains experimental results
- Metadata contains information about data:
  - Sample name and description
  - Measurement conditions
  - Instrument information
  - Operator information
  - Other information
- Included in data file or separated
- **Important for reproducibility!**

LABORATORY LEVEL

Data Management Plan

- Written set of rules and principles
- Determines how data is handled
  - Data formats
  - Data storage, sharing and backup rules
  - Metadata contents and formats
  - Responsible person
- Data loss prevention
- Easy onboarding of new employees
- Everyone knows exactly their duties



PUBLICATION LEVEL

Funding and Good practice

- **Typically defined by project funder**
- Good practice – open access cloud
  - Data are publicly available
  - F.A.I.R. principles are fulfilled
  - Free of charge service
- Requires to set rules on a team level
  - Project/Team Data management plan
  - Responsible person
- **Unacceptable to restrict access to data**

  (data upon request, data upon REASONABLE request)

PUBLIC DATA REPOSITORY

Simple and effective

YOUR F.A.I.R Responsibility

- Interoperability
- Reusability

REPOSITORY F.A.I.R Responsibility

- Findability
- Accessibility

PUBLIC DATA REPOSITORY

How to do it?

- **Register on Zenodo.org or similar**
  - Zenodo is reliable public-accessible scientific data repository running under the CERN facility
  - Registration can be done on http://zenodo.org (simple email registration & verification)
  - Any standard online repository which can fulfill FAIR requirements is suitable, not just Zenodo

- **Prepare all the published data**
  - The data must meet the requirements on **interoperability and reusability**!
  - Use open formats usable with any computer!

    (if your instrument is using closed format, export data to open format and then upload both)
  - If you are uploading graph, do not forget to add the datasets for it, etc.!

PUBLIC DATA REPOSITORY

Practical example

Q&A

Thank you

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