MagLab_DC_field_experiment Sample Template

Contributors: Nathaniel Fortune
Data created: 2021-10-10 02:07 PM | Last updated: 2021-10-12 04:00 PM
Category: Project
Description: example of OSF.IO template for NHMFL DC field condensed matter experiment
License: CC 1.0 Universal

This is a sample OSF.IO template for condensed matter DC field experiments at the magnet lab designed to simplify FAIR data compliance. The primary goal of the template, however, is to enable more easily reproducible, reusable, and reusable data analysis in extended research projects with students and collaborators by breaking the data processing and analysis into smaller manageable and more easy...

Citation
APA

MLA

Chicago

Out more citations
Enter citation style (e.g., "APA")

Components

- DAQ Instrumentation files
  - Fortune
  - configuration files (e.g., YAML, JSON, INI) for instrumentation settings, if implemented

- sensors and calibrations
  - Fortune
  - record of sensors (temperature, magnetization, etc) and calibrations used in experiment, plus data and software used for initial sensor calibrations...

- raw data stream
  - Fortune
  - raw data stream directly uploaded from NHMFL DAQ systems. Should also include linked metadata files and wiki logbook.

- clean data
  - Fortune
  - raw data after editing for glitches and parsing into files. Some filtering of noise also permitted, if documented and reversible through modification...

- calibrated data
  - Fortune
  - data after signal calibration and conversion to measurement units (e.g., resistance in ohms and field in Tesla at temperature in K, or vols to heater p...)

- data analysis
  - Fortune
  - record of steps taken in data analysis plus any custom software code (e.g. Python files) used in the analysis (including data modeling and curve fitting...)

- data graphs
  - Fortune
This is a sample odf template for condensed matter DC field experiments at the magnet lab designed to simplify FAIR data compliance. The primary goal of the template is to enable more easily reproducible, reusable, and reusable data analysis in extended research projects with students and collaborators by breaking the data processing and analysis into smaller manageable and more easily documentable steps. This also requires traceability of samples and calibrations.

In my opinion, there are three main initial steps: 3 steps slightly larger follow-up steps, and one still later large step that could be taken to greatly simplify and (better automate) this process. If odf is to be adopted as the lab's standard data storage tool.

First, the data files generated by the lab and user-specified data acquisition programs could be modified to include identifying column names, instrument units (eg., V), gains (eg., 1 V/10 V or 1 mV/10 mV), and, optionally, measurement units (eg., V, 1 V/10 V or 1 mV/10 mV). There should be an easy way to enter this information at the time of data collection e.g., two additional text fields beneath the ones that ask for the user to supply a name for each column of collected data and the multiplicative gain to be applied to each column.

In a follow-up step, the lab could build automatic uploading of these data files to the experimenters designated odfio website, provided it followed some standard format for the data storage location.

Second, the general purpose plan text comment fields provided in these programs could be split off from the file headers and instead saved as Github-flavored markdown text file the format used by ODFIO for wiki pages. The data file and markdown could share the same file header.

In a follow-up step, this top could be automatically uploaded to the experimenters' odfio experiment file, allowing the user to add additional comments and informants, photos, and graphs without needing to modify the header of the data file accompanying the wiki.

Third, the lab could arrange for the automatic upload of the following experimental metadata (as a standalone wiki file for the entire experiment, such as the wiki you are reading now, once the experiment enters the sample specific information. There would of course need to be an option for multiple samples and sensors

1. experimenter ID (eg., ORCID ID, request as part of application for magnet time)
2. magnet system ID (with link to field calibration)
3. cryostat/Probe ID (with link to drawings)
4. probe temperature sensor ID (with link to database of calibrations and calibration history)

In a follow-up step, the lab could provide free sample, sensor, and instrument cataloging database so that critical sample information and user-supplied sensor calibrations could be automatically added to the experimental wiki.

Finally, in a step requiring the largest lift, the lab could ultimately establish and disseminate a lab-standard HDF5 data file format (and naming convention) in which the above metadata (as well as parts plus instrumentation settings) are included as file attributes. To make this useful, the lab should also create how-to guides on how to access data and metadata stored in these lab-standard HDF5 files using standard data analysis and acquisition apps such as Igor Pro, Python, and LabVIEW.

PS: The most common question mag lab user committee members have had besides how to generate sharable data is when to share data. Here is the guidance from the magnet lab, courtesy Lisa Anderson during the morning FAIR data workshop session:

MagLab and NSF policies regarding when data are expected to be made publicly available are outlined in our data management plan.

https://nationalmaglab.org/about/fair-data

In sum, the NSF expects that data be made publicly available within 3 years of publication of an associated manuscript. If an associated manuscript is not published, the MagLab plan states that data should be made publicly available within 3 years of the last time the project was assigned magnet time, but concessions are made for issues regarding IP or publication process. Please refer to the DMP in the link above.