Update on the Muons in the EU-SINE2020 project

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STFC - ISIS

What is SINE2020?

- Part of H2020, 12 countries, 18 partner institutes
- Latest in a series of EU funded projects developing neutron and muon techniques, (JRAs in FP6, FP7 - NMI3 and NMI3-II)
- 2015 - 2019
- *Prepare for ESS* and *Develop the innovation potential of neutron (& muon) LSFs*

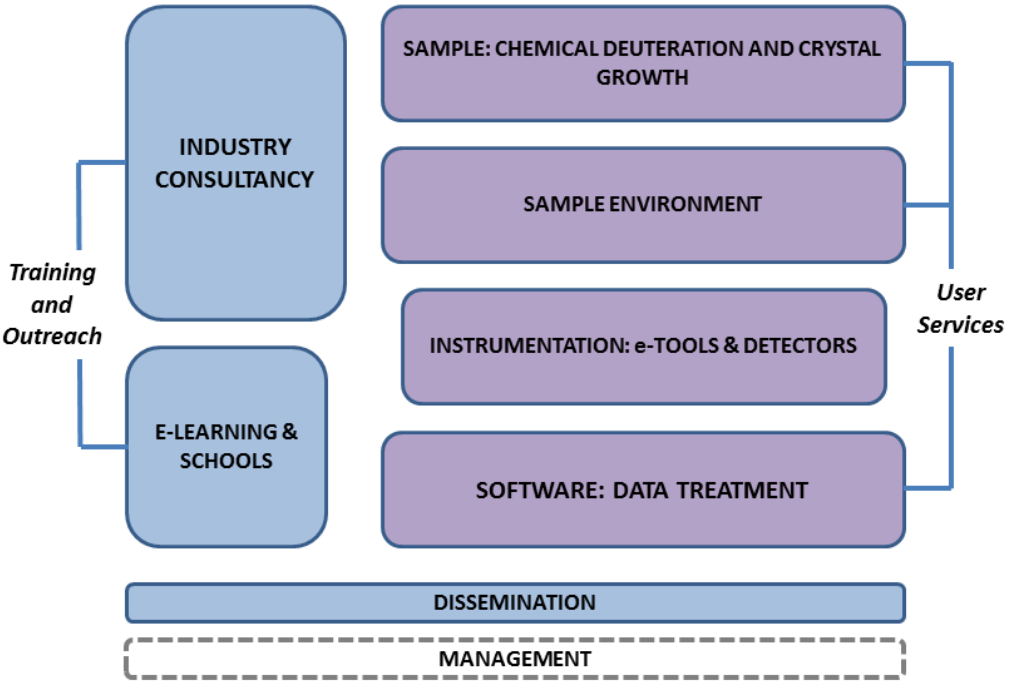
Why Muons?

- A closely related complementary technique
- Available at two national neutron sources

- Muon spectroscopy was a good ‘fit’ because:
  - The activities will benefit both neutron and muon techniques
  - Opportunity to enhance complementarity

What is SINE2020 doing?

Project Structure



Project Work packages

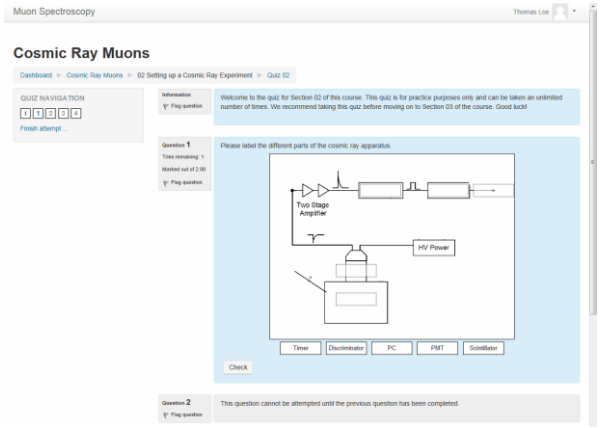
1. Management
2. Dissemination
3. e-learning & schools
4. Industry consultancy
5. Sample – chemical deuteration
6. Sample – crystallogenesis
7. Sample environment
8. Instrumentation – e-tools
9. Instrumentation - detectors
10. Data treatment software

Where do Muons fit in?

- Muons are involved in:
  - e-Learning and Schools (WP3)
    - » STFC and PSI
  - Sample Environment (WP7)
    - » STFC and PSI
  - Instrumentation and Detectors (WP9)
    - » STFC
  - Data treatment software (WP10)
    - » University of Parma and STFC

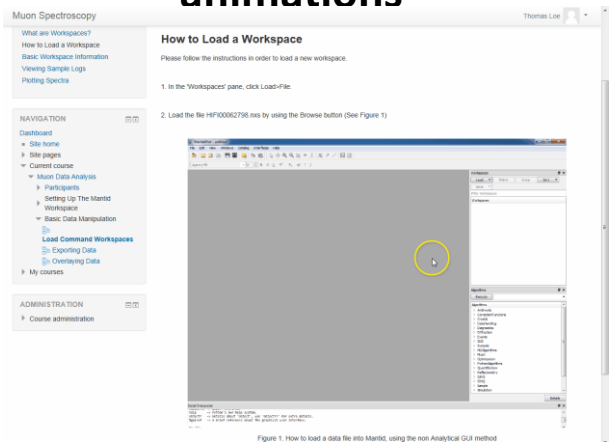
e-Learning (WP3)

Cosmic Ray Practical from Diamond-ISIS CDT Training School



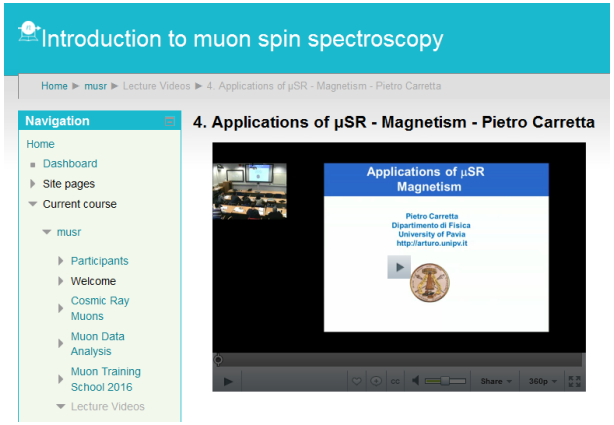
Introduces muon basics to people completely unfamiliar with the technique

Mantid workbook exercises with walk-through animations



Pre-course materials for training schools; three-hour head start on data analysis

Talk videos online from 2016-2018 Muon Training Schools



Speakers recorded and final talks are awaiting upload after editing

- Also have an introduction to different types of µSR
- Excellent feedback from students
- Development continuing

Sample Environment (WP7)

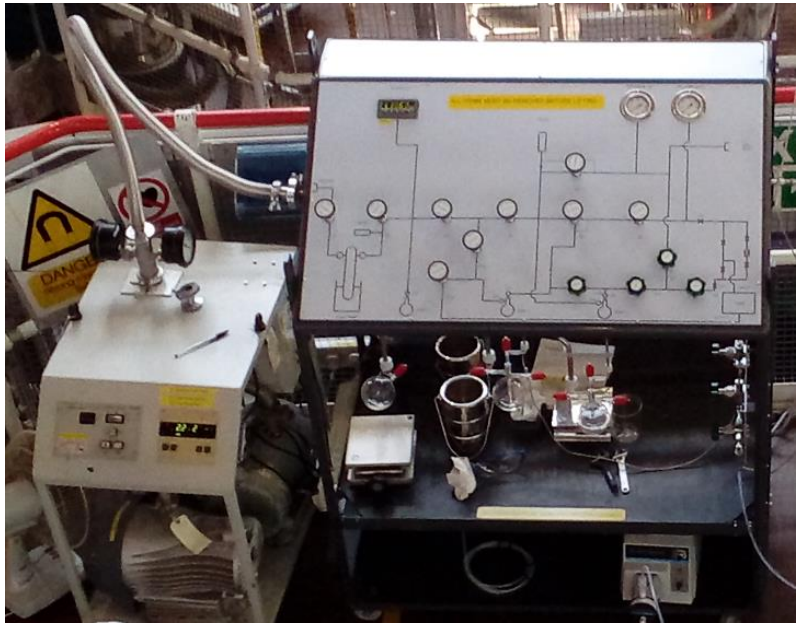
Task 3 – Next generation pressure cells for neutron and muon research

- Improved piston cell, evaluating PE geometries for RIKEN beamlines, and considering the problems of developing anvil pressure cells for MuSR

Task 4 – Complementary in-situ measurements for neutron and muon experiments

- Muons developing sample handling systems, RF setup for the study of muoniated radicals

SE for RF-MuSR

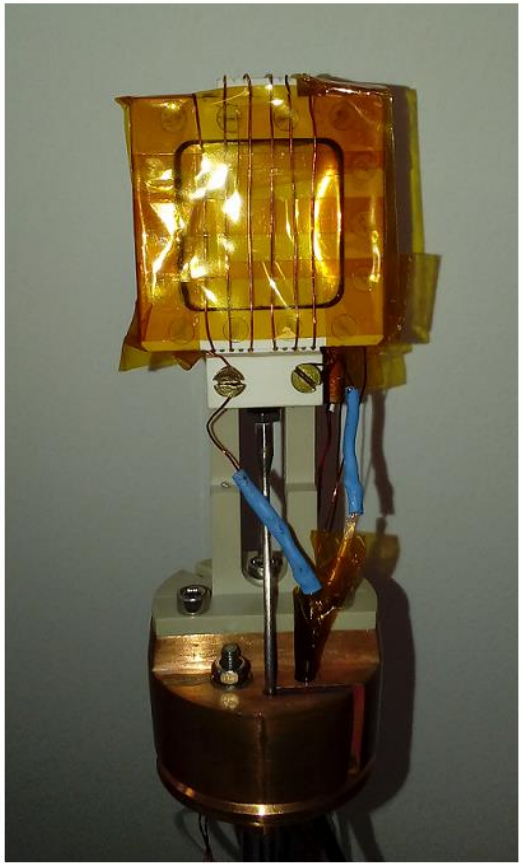


Stainless-steel rig for sample-preparation and handling

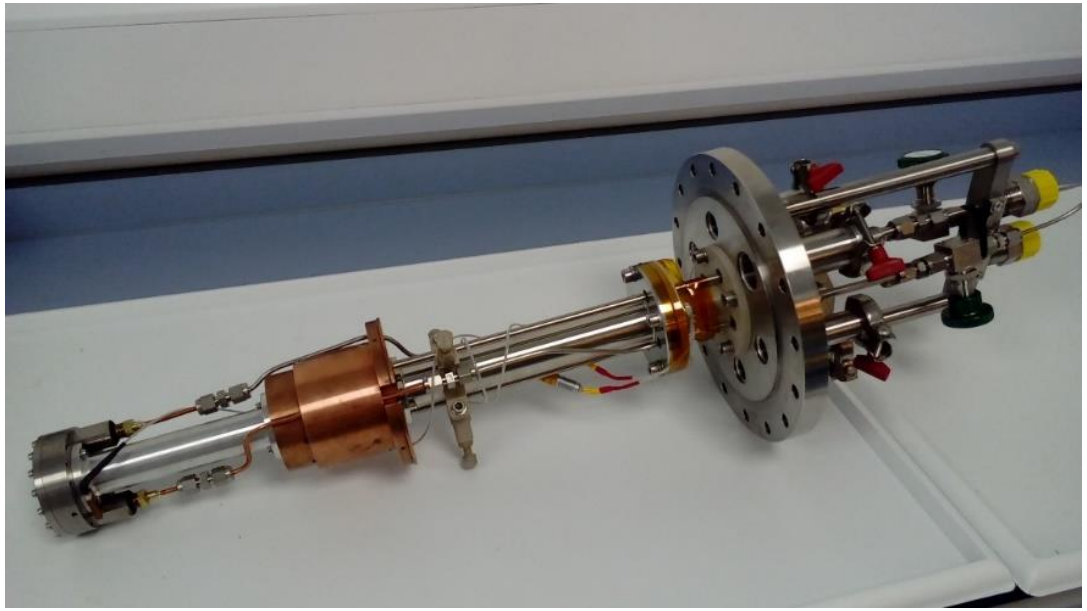
Cold trap
3 Degas ports
Inert gas
Release valve
In-situ

Ceramic cells for in-situ RF-µSR measurements

Leak-tight
In-situ loading
Compatibility with He flow cryostats
RF flattened solenoid



SE for RF-MuSR



- Oil-bath Temperature control (-50/+100C)
- Sample circulation
- In-situ capability
- Leak-tight & O_2-proof
- Large sample volume

Dedicated RF-compatible insert
+ advanced RF coils

>> ω
RF field strength
Field homogeneity

Instrumentation - Detectors (WP9)

Task 4.3 – Silicon Photomultipliers for Muon Spectroscopy

- Application of SiPMs of interest to neutrons and muons
- Evaluating emerging commercial SiPMs, considering their suitability for µSR detector arrays
- Investigating alternative technologies for µSR detectors and suitability of technologies for pulsed and continuous muon sources

D. Pooley, "future detector technologies for µSR"

Data treatment software (WP10)

Task 2 – Guidelines and Standards

- Muons already making use of Mantid / NeXus data format ⇒ Scope for adopting new standards and refining functionality to help users' moving between techniques

Task 4 – Atomistic Modelling, DFT calculations

- Developing new methods & case studies. Mantid as a platform for hosting site refinement and beyond. Work likely of interest beyond the muon community … complementarity with neutrons.

R. De Renzi, "TBD"

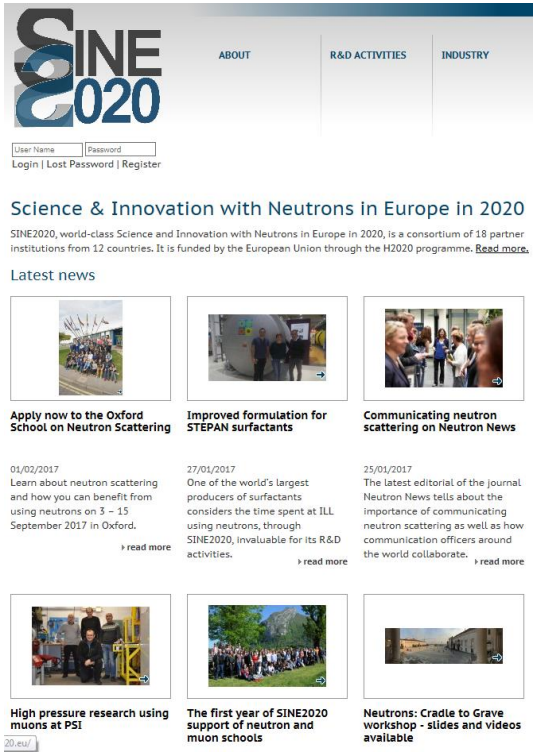
More Information?

- The SINE2020 website at:

  http://www.sine2020.eu/

- For more about muon facilities and muon research worldwide:

  http://muonsources.org/



(feedback is always highly appreciated)