

SINE2020 General Assembly

Parma, 6 June 2018

WP 7

Sample Environment

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— CSEC, ESS, HZB, LLB, ICMA, ILL, IMPMC, ISIS, MLZ, NPI, PSI —

Objectives

- Establish standards to reduce development costs, strengthen relations with industry (7.1)
- Increase efficiency by reducing beam time losses and improving equipment (7.2),
- Open new fields of science by developing new equipment or extending physical parameters ranges (7.3 & 7.4)

Work carried out — Task 7.1

- **Sample Env. Communication Protocol: SECoP**
 - 11 meetings, 2 more already scheduled
 - Version 1.0 β circulating and to be reviewed in Potsdam at the ISSE workshop (Sept. 2018)
 - Started discussions with industry (OINS, attocube)
 - Software engineer coding libraries at HZB to facilitate SECoP adoption (server completed)
 - MQTT implementation started at the ESS

SampleEnvironment / **SECoP**

Unwatch 1 Star 1 Fork 1

- Code
- Issues 0
- Pull requests 0
- Projects 0
- Wiki
- Insights
- Settings

Sample Environment Communication Protocol

Edit

Add topics

105 commits 1 branch 0 releases 3 contributors MIT

Branch: master New pull request Create new file Upload files Find file Clone or download

markus-zolliker	Update secop_v2018-02-13.rst	Latest commit 57ec122 on Mar 23
protocol	Update secop_v2018-02-13.rst	2 months ago
.gitignore	- created folders	4 months ago
LICENSE	Initial commit	11 months ago
README.rst	change link to new SECoP specification	4 months ago

README.rst

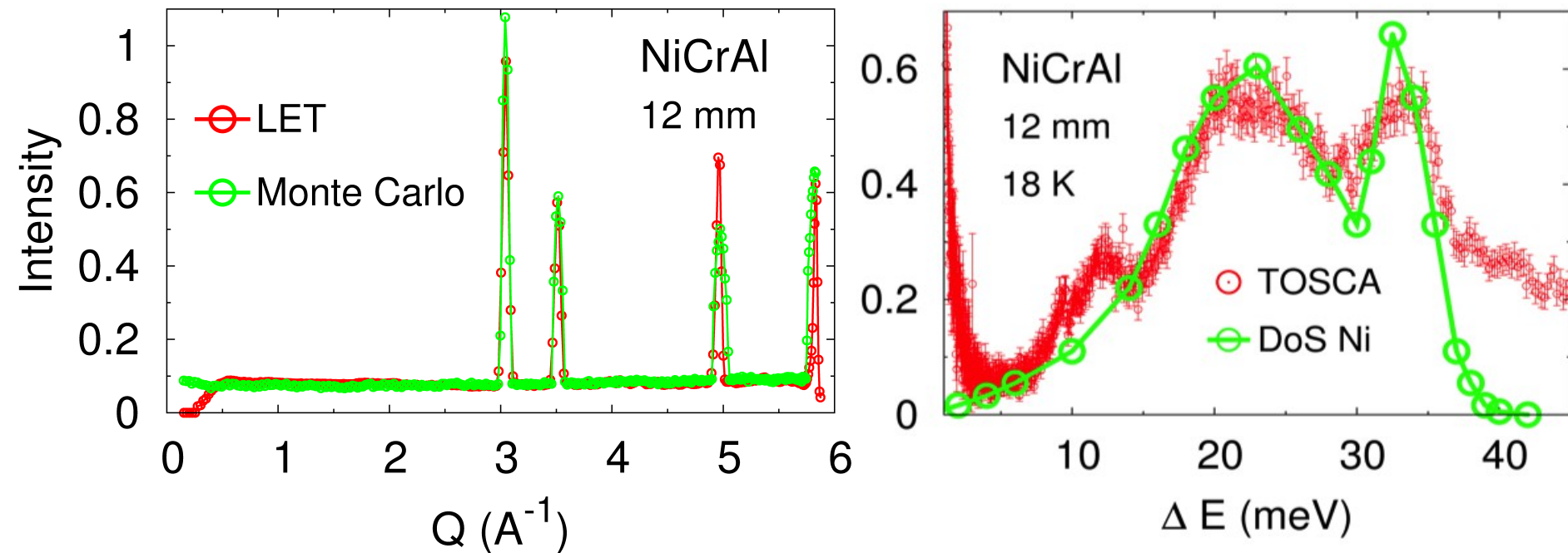
SECoP

Work carried out — Task 7.2

- Towards efficient Sample Env.: Simulations
 - ICMA is finalising a Union component of McStas taking into account diffuse, elastic/inelastic and coherent/incoh. scattering, microstructures, etc.
 - Input data being compiled from ISIS data for usual alloys: Al1050, Al7049A, CuBe2, NiCrAl, TiZr
 - Code benchmarked with ILL and ISIS data
 - Will soon allow the simulation of hybrid HP cells

Work carried out — Task 7.2

NiCrAl alloy data fitted with model developed by ICMA
for preparing simulations of double-layer high-pressure clamp cells

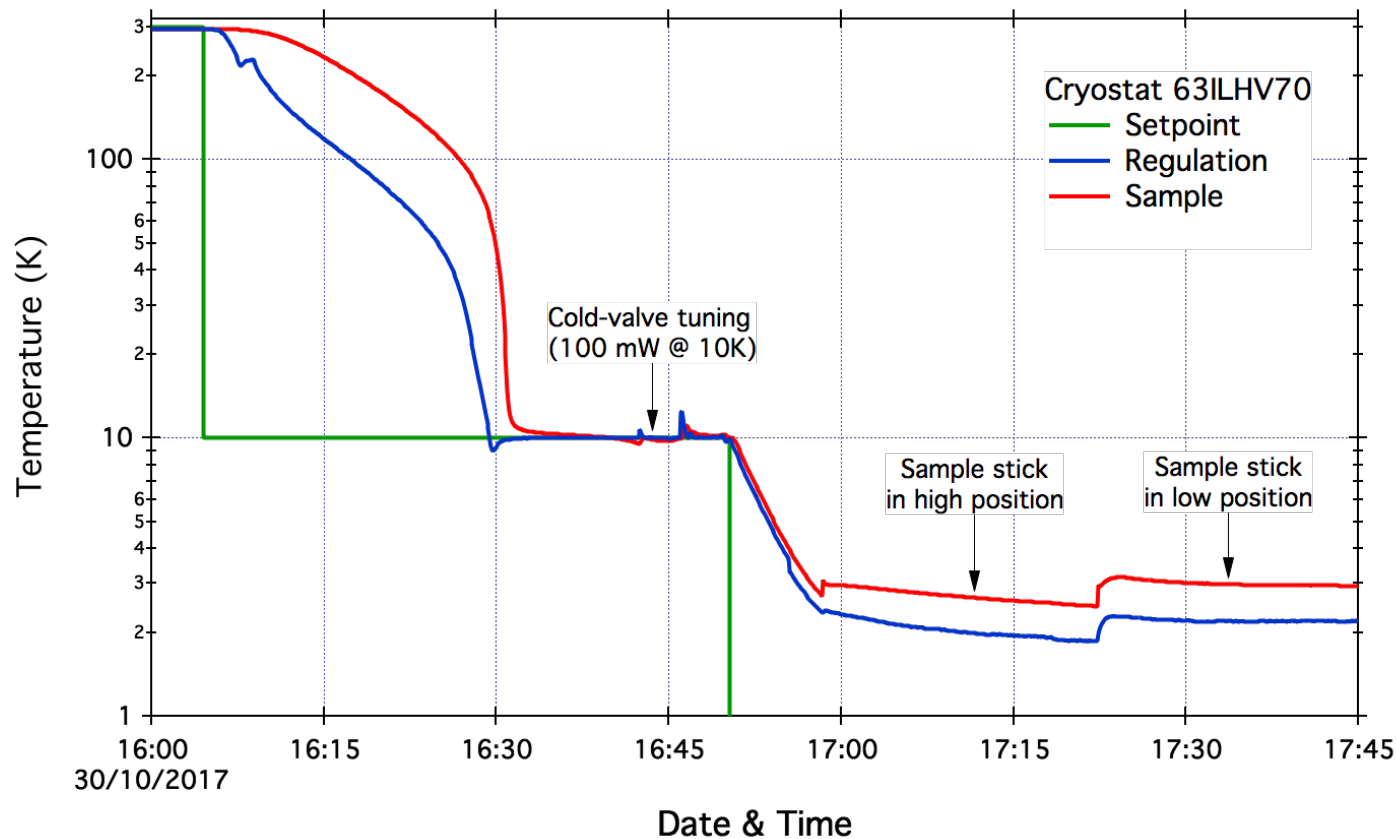


Work carried out — Task 7.2

- Towards efficient Sample Env.: Cryostats
 - 3x faster temperature changes (up and down) in wet cryostats at ILL
 - Technical transfer to **AS Scientific Ltd** done (UK)
 - 30% less background produced by vanadium cryofurnaces
 - 5x less background at low-Q in TOF cryostat

Work carried out — Task 7.2

Measurement of the cool-down time, the base temperature and the gradient of temperature in different/thinner calorimeters at ILL

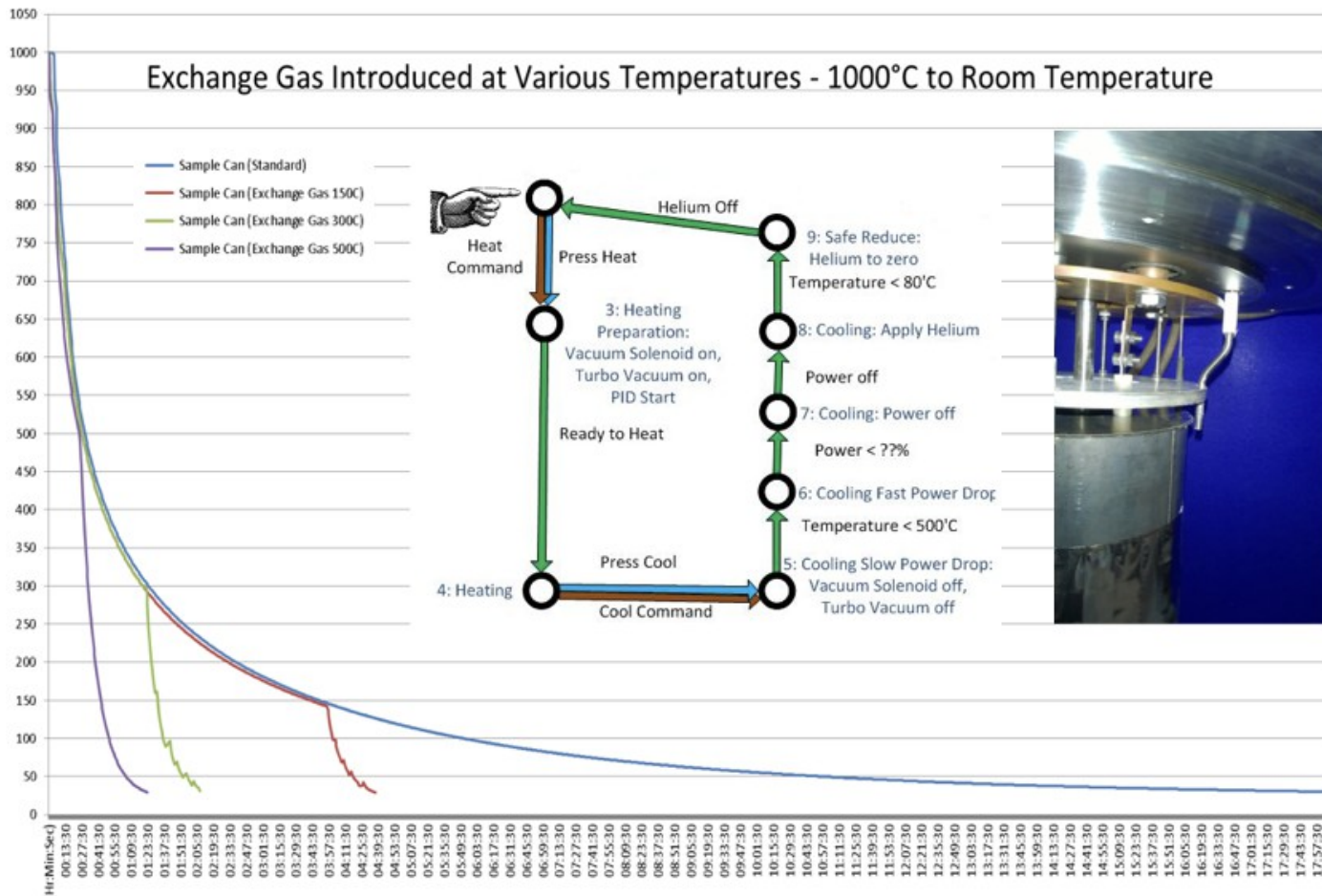


Work carried out — Task 7.2

- Towards efficient Sample Env.: Furnaces
 - +4x faster cool-downs in resistive furnaces achieved at ISIS with 2 L/min He flow (1000 to 150°C in less than 45')
 - +4x faster cool-down in resistive furnaces at ILL with 1 L/min He flow
 - Full automation being developed at ISIS & ILL
 - Technical transfer to **AS Scientific** envisaged (UK)

Work carried out — Task 7.2

Fast cooling tests in resistive furnaces at ISIS

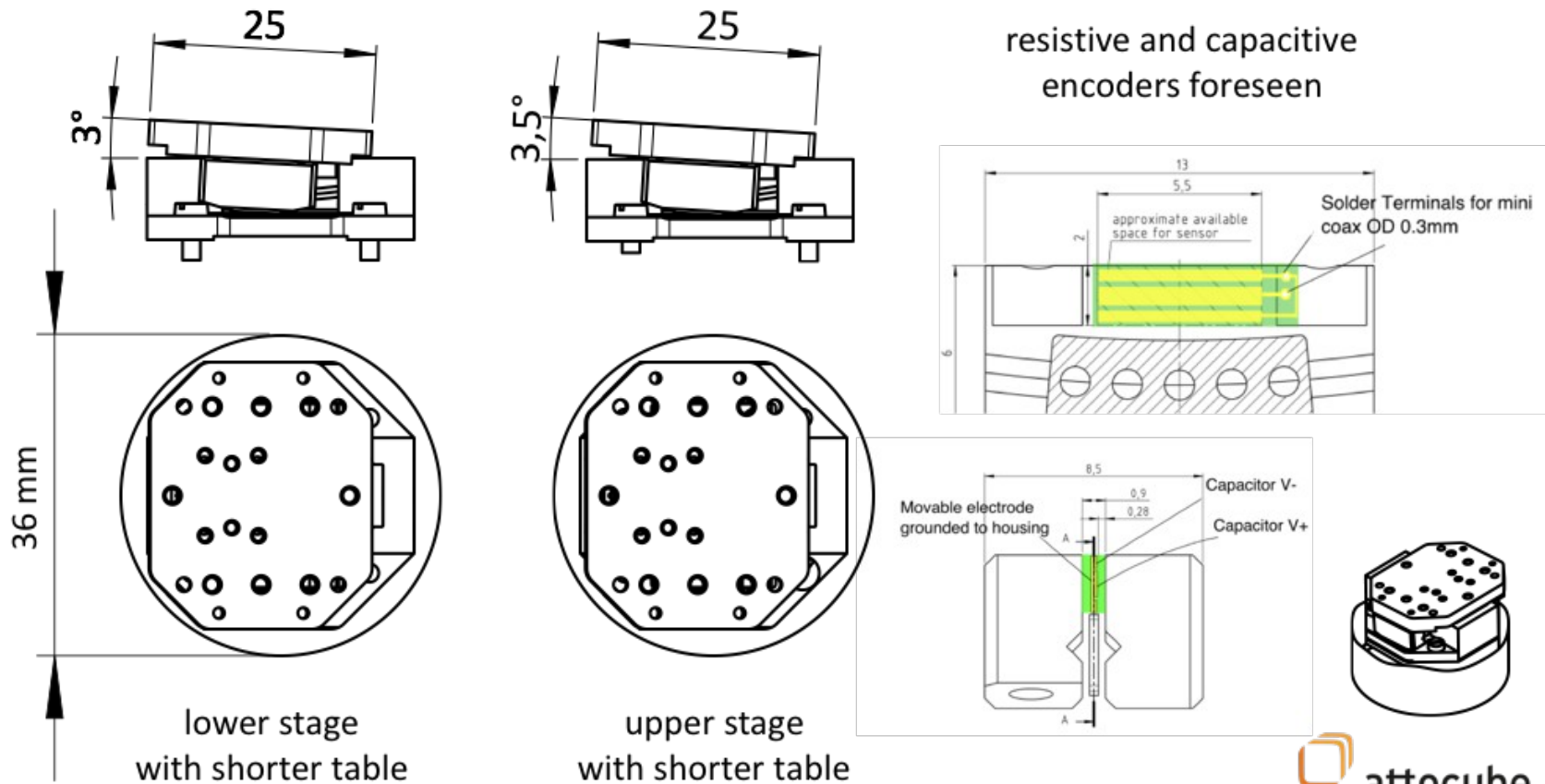


Work carried out — Task 7.2

- Towards efficient Sample Env.: Goniometers
 - Ultra-low temperature goniometer specifications defined from survey involving all partners (Ø36!)
 - Concept design agreed (amongst the 3 proposed)
 - Prototype in development phase at PSI
 - On-going discussions with **attocube** toward a potential industrialisation of the goniometer

Work carried out — Task 7.2

Ultra-low temperature goniometer designed by attocube, PSI & ILL



Work carried out — Task 7.3

- Next-generation HP cells for NS & μ SR
 - Kick-off meeting gathering μ SR, NS and HP experts at PSI in January 2016
 - CSEC high-pressure expertise transferred to PSI
 - Multi-layer concept design adopted for μ SR clamp
 - x1.5 gain factor established with 2.6 GPa μ SR cell
 - ANSYS FEA optimisation developed at PSI
 - Concept designed applied to neutron clamp cell

C: Static Structural

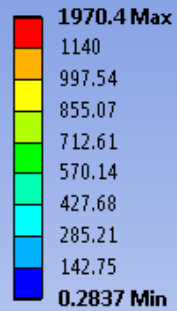
Equivalent Stress 2

Type: Equivalent (von-Mises) Stress

Unit: MPa

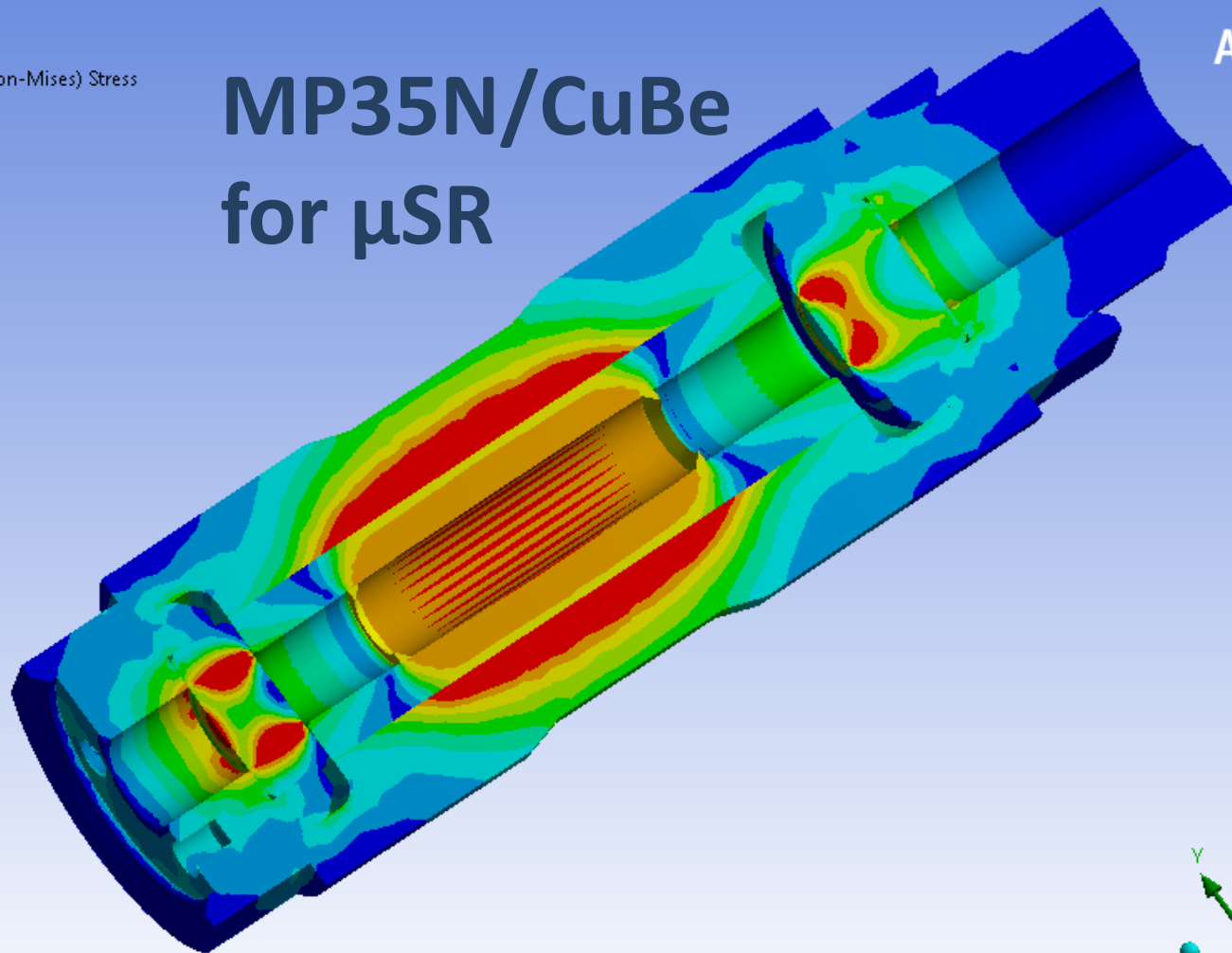
Time: 1

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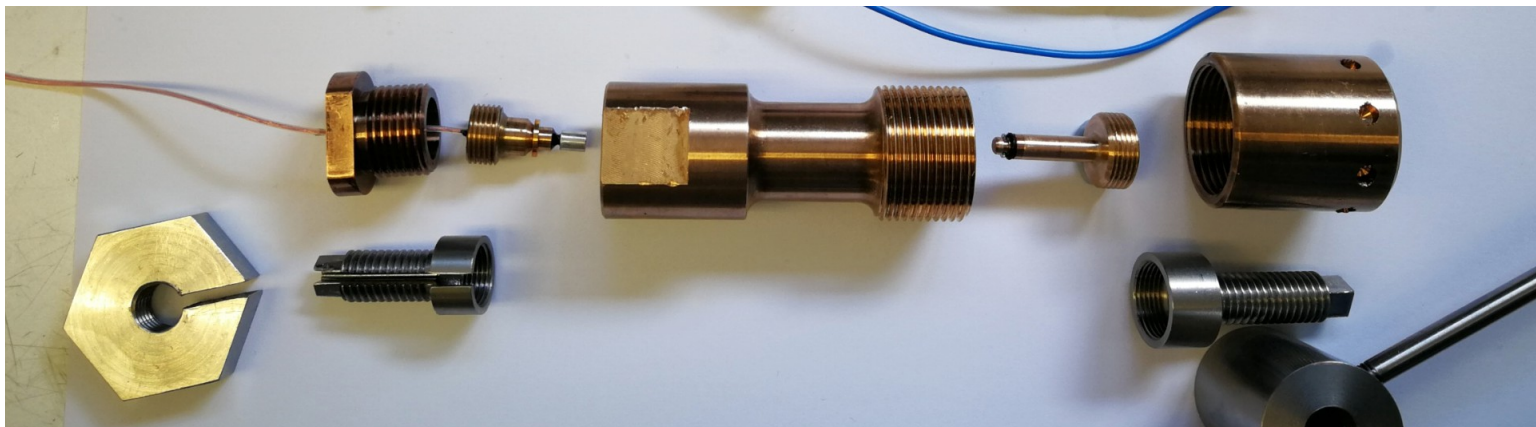
MP35N/CuBe for μ SR

ANSYS
R17.0



Work carried out — Task 7.3

- Next-generation HP cells for NS & μ SR
 - Measurements performed at ISIS on different instruments to identify best materials
 - ILL clamp cell modified to host new CSEC plug for in-situ pressure measurements



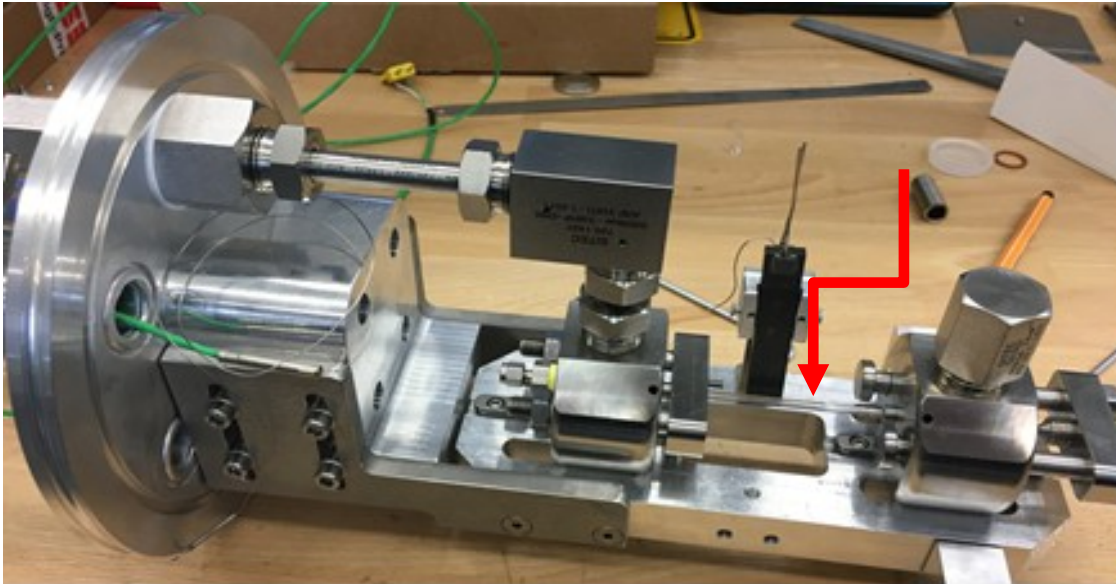
Work carried out — Task 7.3

- Next-generation HP cells for NS & μ SR
 - Tests experiments performed by IMPMC at ILL with Paris-Edinburgh cell have identified solutions for improving the signal to background ratio.
 - Meeting held at ISIS with PSI and HP experts concludes that it is not feasible to build an efficient anvil cell for existing μ SR instruments.
 - D7.16 is therefore not realistic but μ SR team has determined how to do HP experiments at ISIS.

Work carried out — Task 7.3

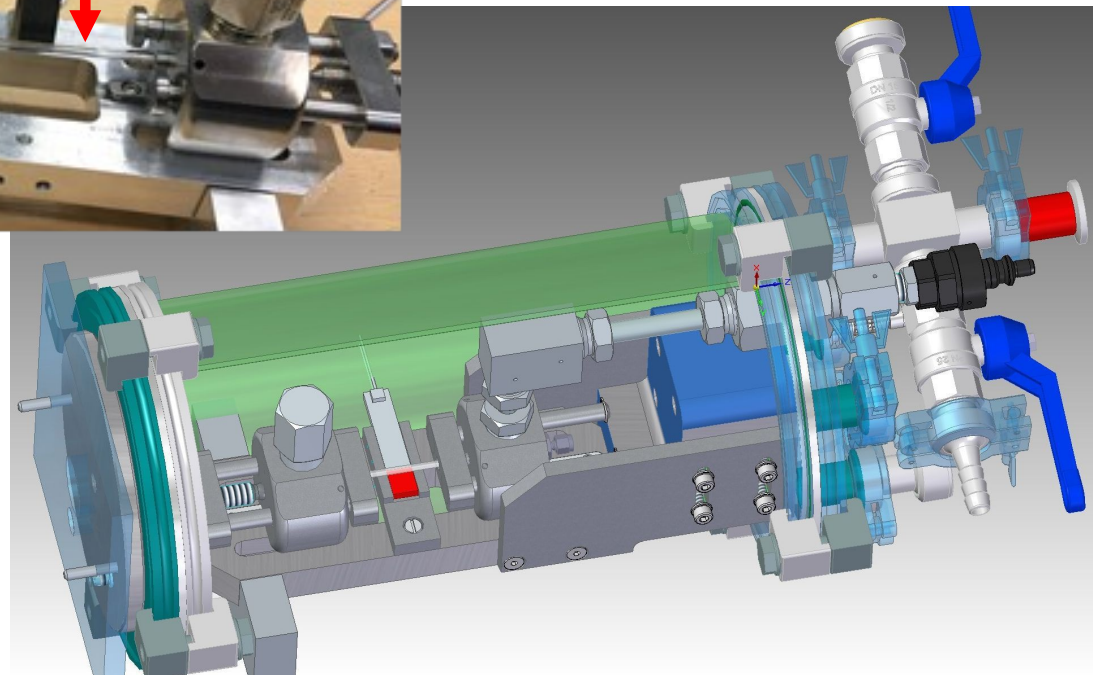
- Next-generation HP cells for NS & μ SR
 - Review of the 700 bar H₂ container used at X-ray facilities
 - Specifications refined with the help of high-pressure experts and SE teams of neutron facilities
 - Concept design and engineering drawings produced by HZG and reviewed with partners
 - 700 bar H₂ container built and tested at FRM II

Work carried out — Task 7.3



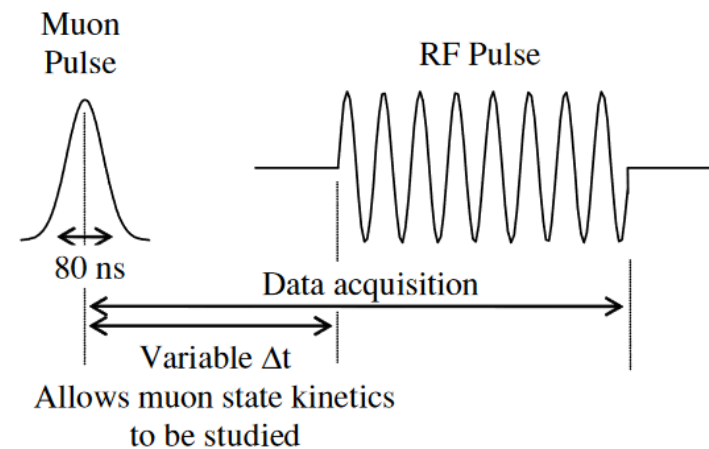
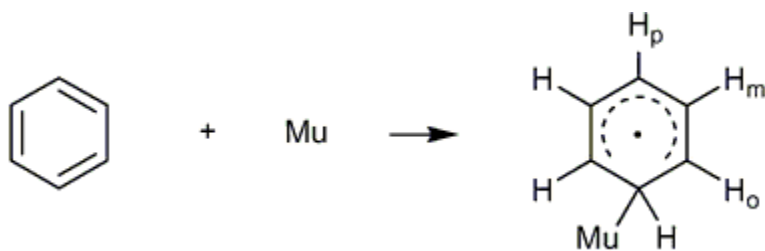
700 bar hydrogen
container for SANS
built at HZG

$\varnothing 1$ mm capillary for SANS
but much larger diameter
required for DIF and INS

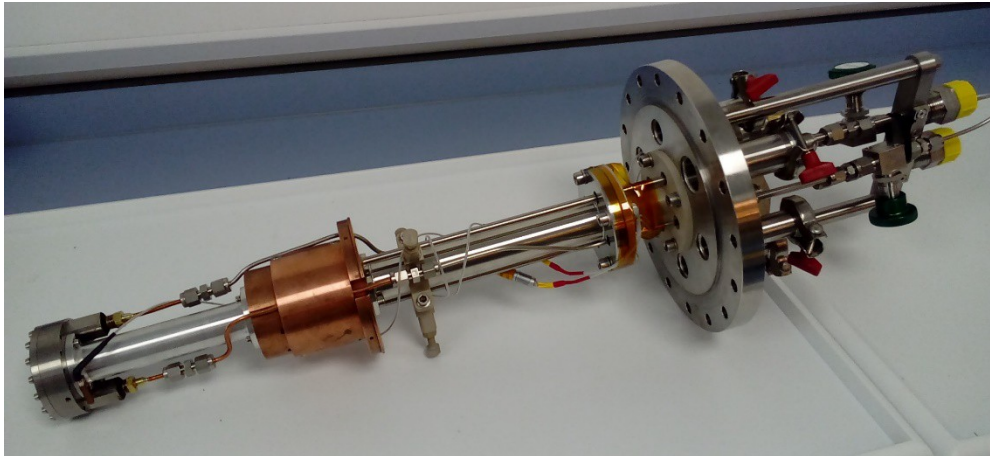


Work carried out — Task 7.4

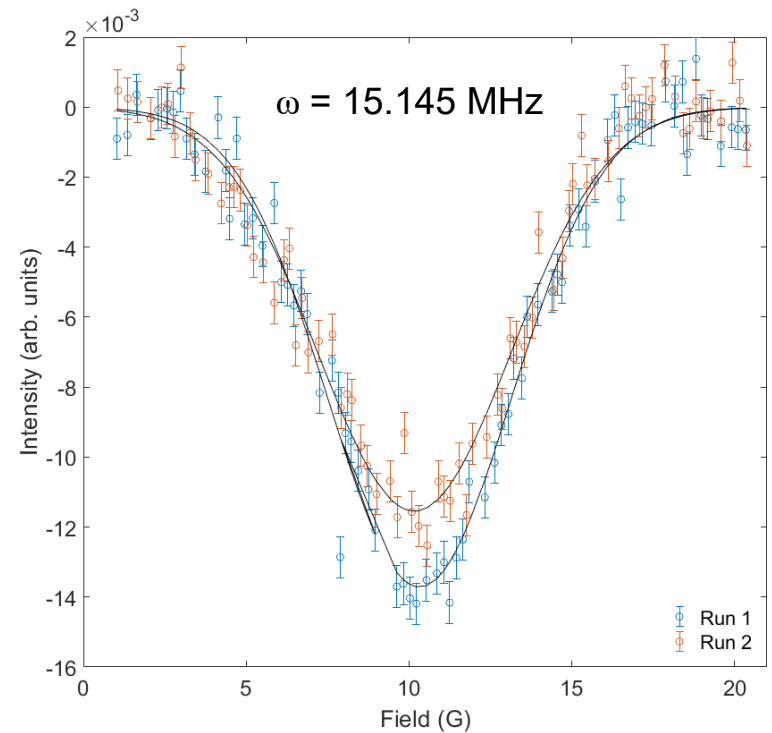
- In-situ muonium studies for μ SR
 - Cryostat, cell, rig for deoxygenating liquid samples commissioned, prototype birdcage RF coil tested
 - Remains to improve sample stability



Work carried out — Task 7.4



Successful test with water,
but in-situ degassing setup
needs improvement!

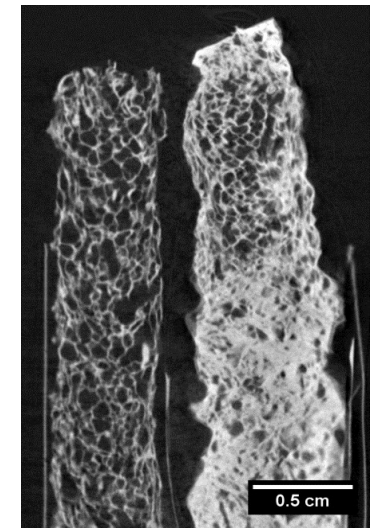
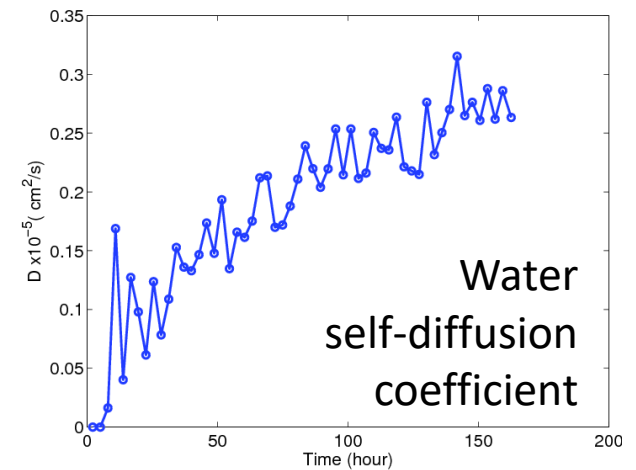
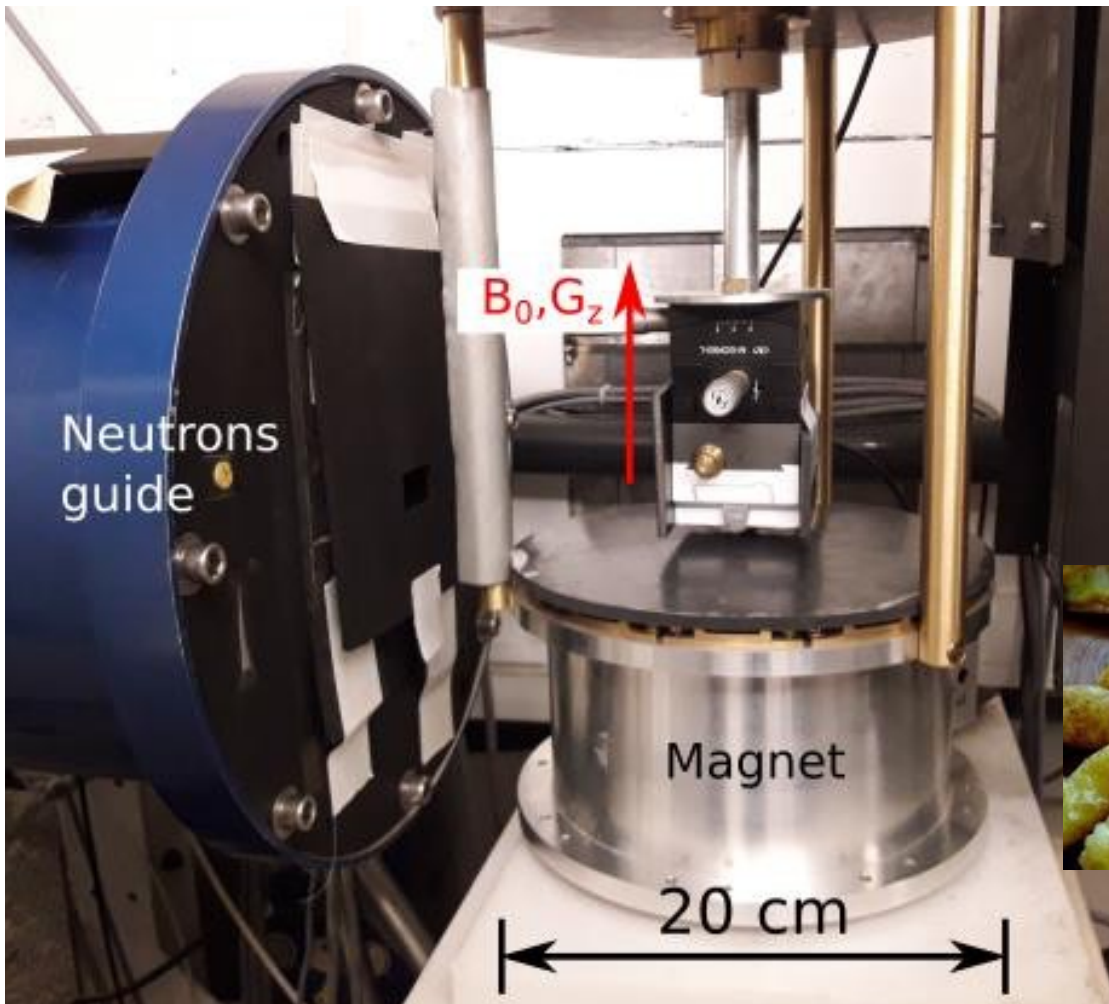


Work carried out — Task 7.4

- In-situ NMR for neutron scattering
 - NMR probe head designed and commissioned successfully on food science case
 - In-situ setup tested successfully at LLB on PRAXY (SANS) and IMAGINE (tomograph) instruments



Work carried out — Task 7.4



Impact / KPIs

- Contacted companies are keen to adopt SECoP international standard if APIs supplied
- 1.5x better HP cells, +4x faster furnaces, 3x faster cryostats, 1.5 to 5x lower background cryostats, new in-situ techniques for NS & μ SR
- AS Scientific Ltd has started upgrading cryostats of neutron facilities
- 5 peer-reviewed publications, more soon...

**Many thanks
to all WP7 participants
for their efforts**

**...and to you
for your attention**