



SULF

Sample and User Laboratory Facilities

Monika Hartl, Katrin Michel, Melissa Sharp, Ghazaleh Roostaei, Damian Martin Rodriguez

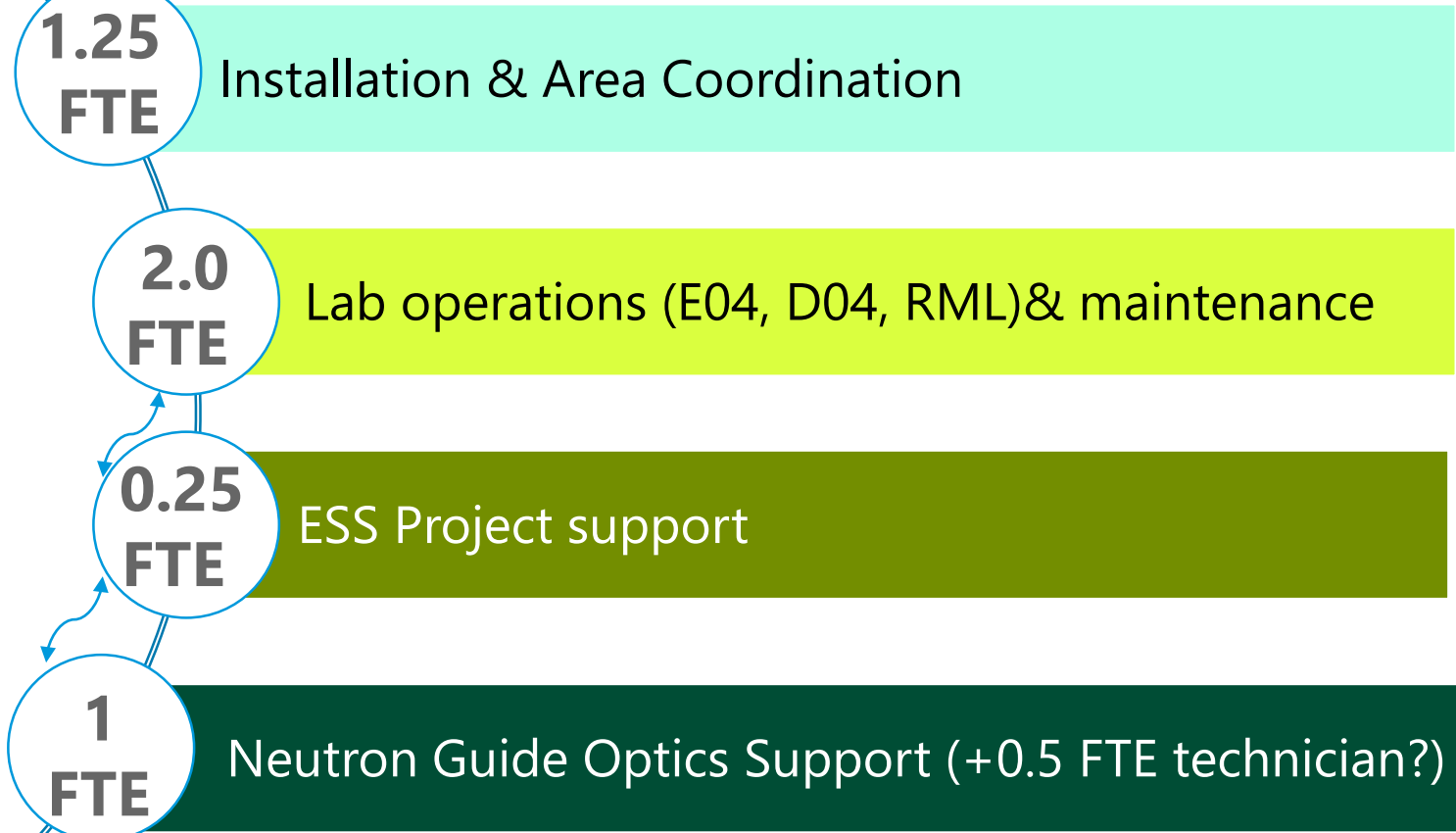
PRESENTED BY MONIKA HARTL

2023-04-24



SULF Team (increased scope/FTE)

Distribution of Full-Time-Employee (FTE) on areas of work



CORE TEAM (4 FTE+2):

Monika Hartl	Katrin Michel	Damian Martin Rodriguez	Melissa Sharp
		<u>internship</u>	
Ghazaleh Roostaei	CTA (hiring process)	(PhysTA Q3/23; CTA intern???)	

- Ghazaleh joined the team in Oct. '22 as support for installation (2 years)
- 1FTE on long-term sick leave, MH ~50% on other tasks
- Hiring of CTA ongoing (planned for '26, hired now due to DEMAX move)
- 2028: 6 FTE (2 more FTE to be hired)

SULF Budget

Distribution of Budget on areas of work



**692
k€**

Installation cost D04/D08 & D08 furniture (incl. MPS)

**180
k€/yr**

Lab consumables (120 k€) & equipment renewal (60 k€)

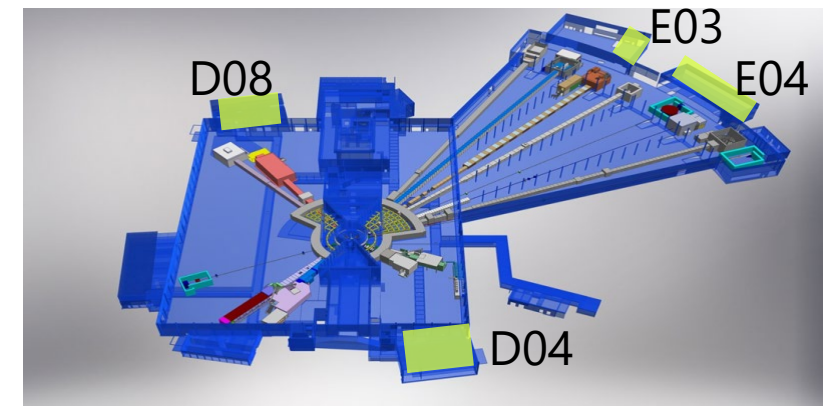
**41
k€/yr**

ESS Project Support: consumables

**~30
k€/yr**

Neutron Guide Optics Support + γ -spectrometer

Lab AREAs (4 buildings):



E04: SULF offices, current user labs (6 rooms)

E03: optics lab (1 room)

D04: future user labs (4 rooms) + workshop

D08: SULF offices, Radioact. Mat. Lab (RML), future user labs (4 rooms)

1 Installation & Area Coordination

Lab operations & maintenance

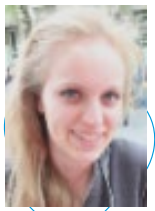
ESS Project Support

Neutron Guide Optics support

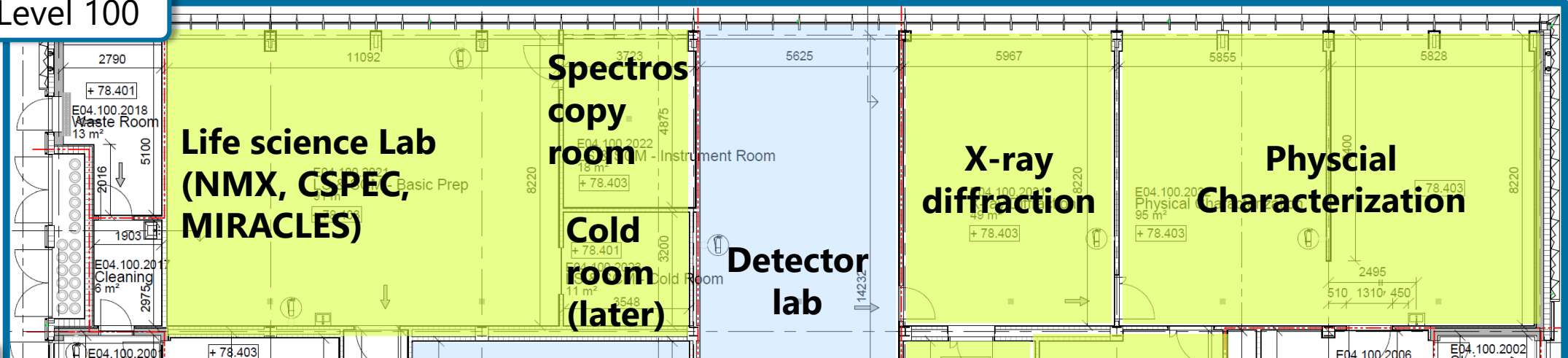


Operating Labs: E04 Level 100/110

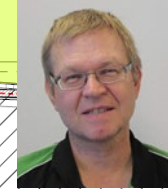
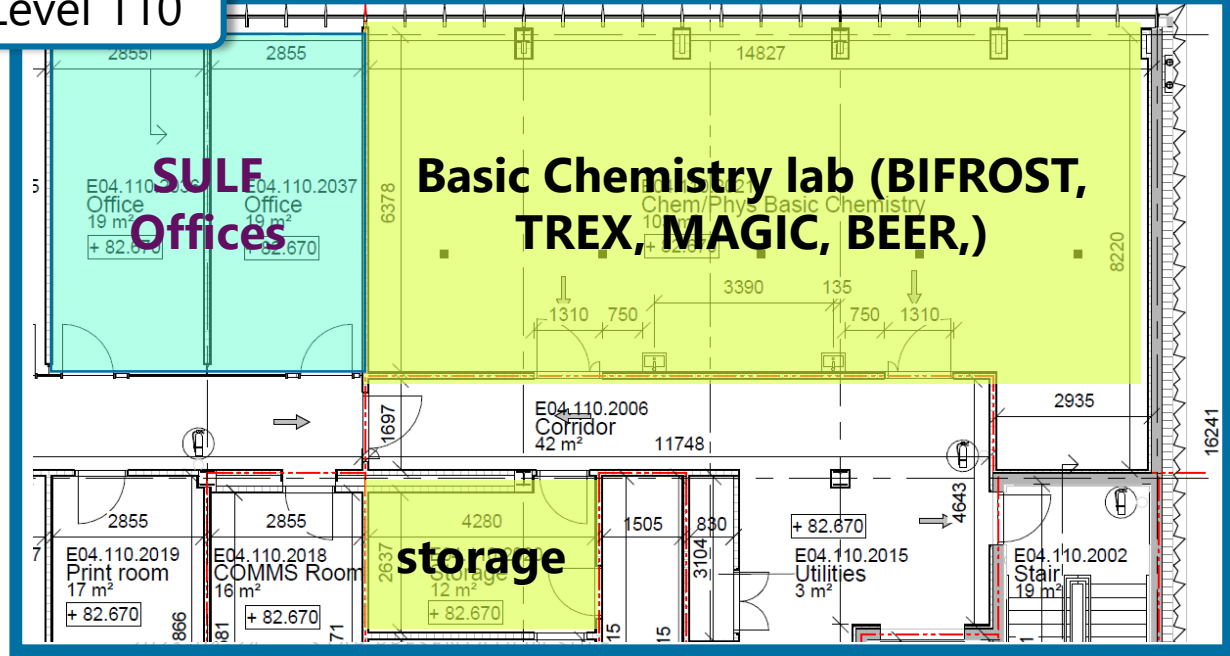
Area coordinator: Katrin



Level 100



Level 110



Commissioning ongoing: E03 – Optics Lab

Area coordinator: Damian



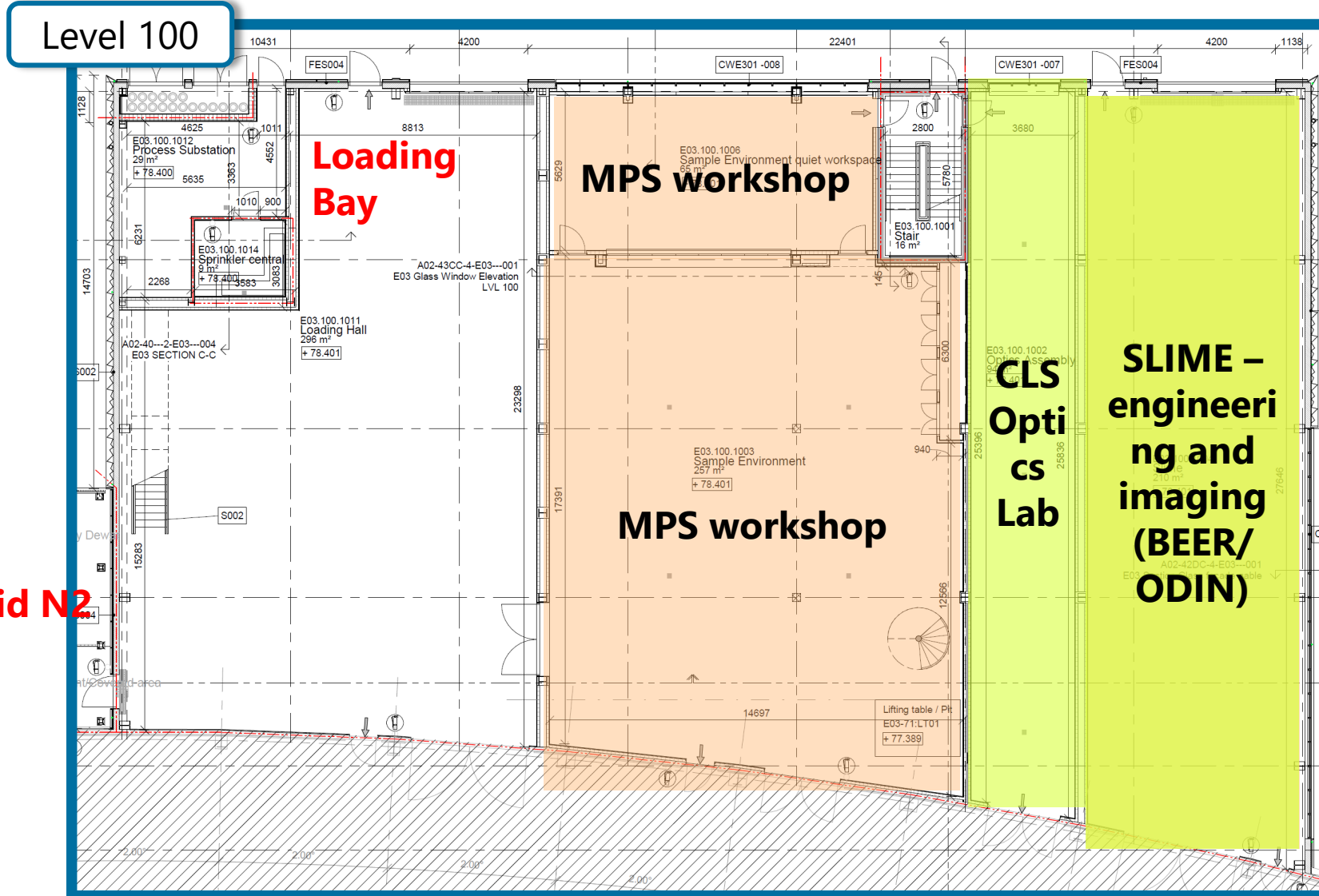
SLIME (Scientific Laboratory for Imaging and Engineering): Moved to MPS.

Damian is area coordinator for E03 Optics lab

Commissioning:

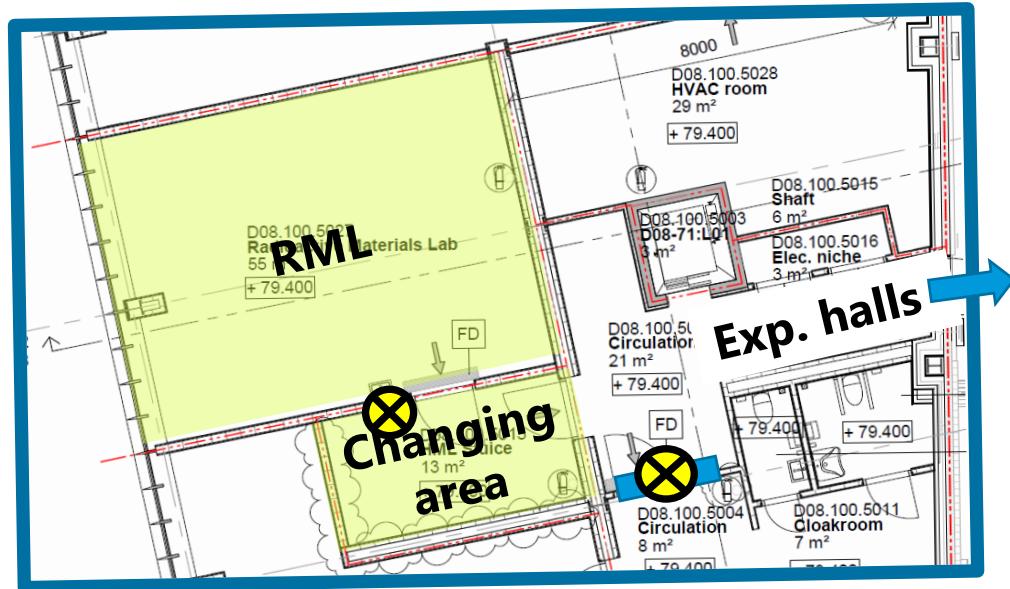
- XRF/LIBS station
- Neutron Optics Test Bench
- Soon: Gamma Spectrometer (coll. With Spall. Phys. & Test Beamline) – foil activation measurements

Liquid N₂



Commissioning finished: RML in D08

“Hot” commissioning of radioactive materials lab in fall 23?



⊗ Radiation monitor

Test cases:

- H&F Monitor need (already at ESS)
- soon “hot” commissioning
- tensile testing of proton beam window



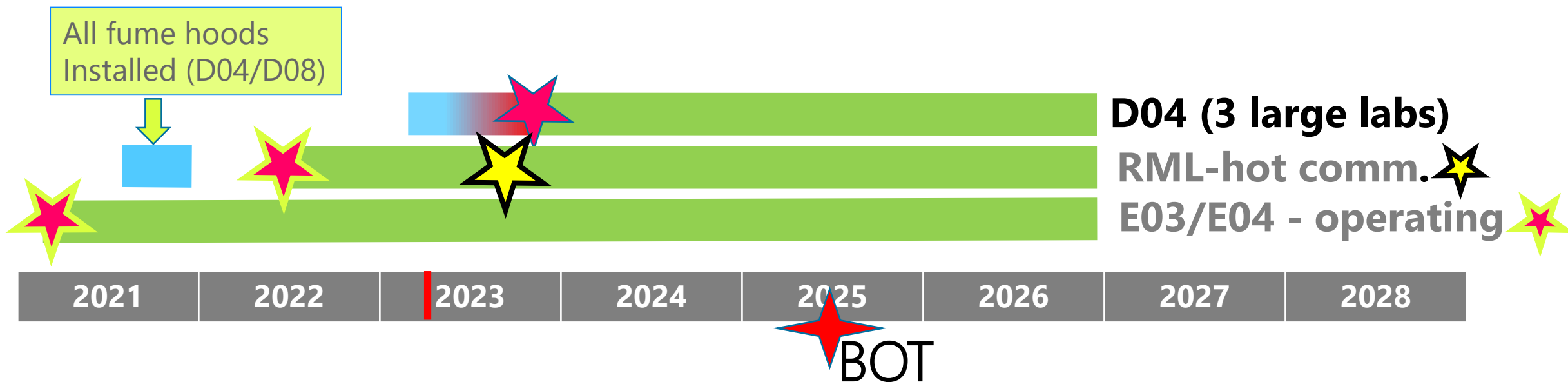
SULF Timeline –installation (status 2023)



Upcoming: installation of chemistry and sample environment labs in D04 and D08

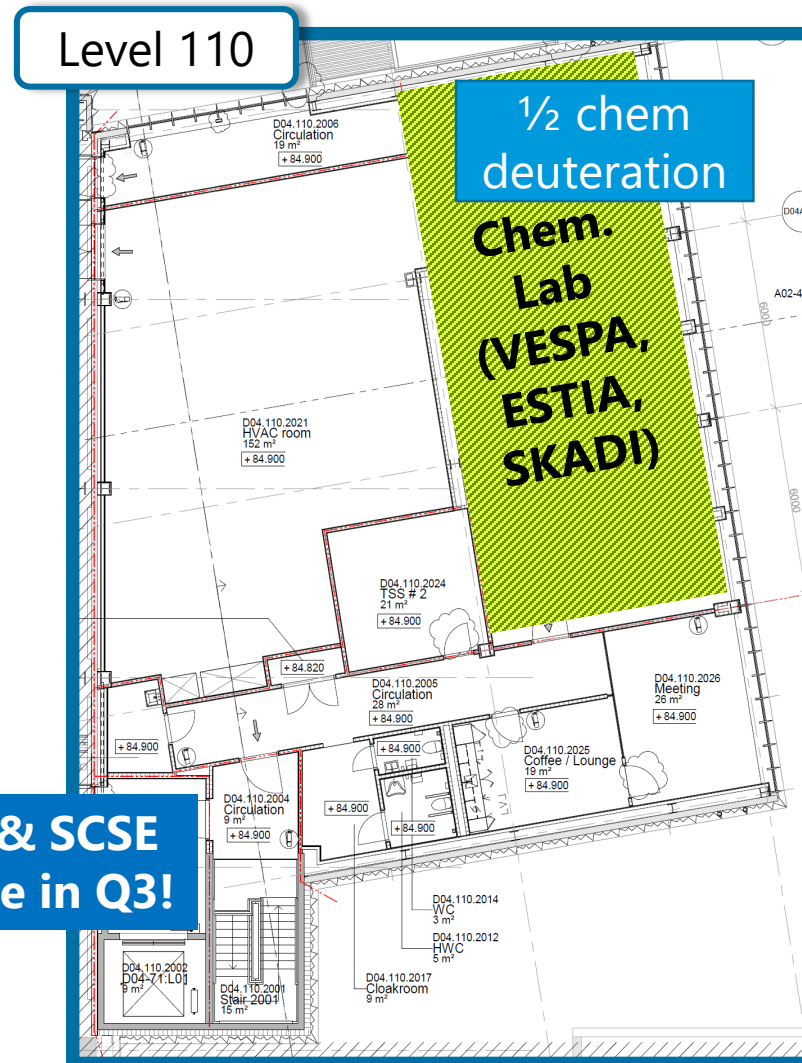
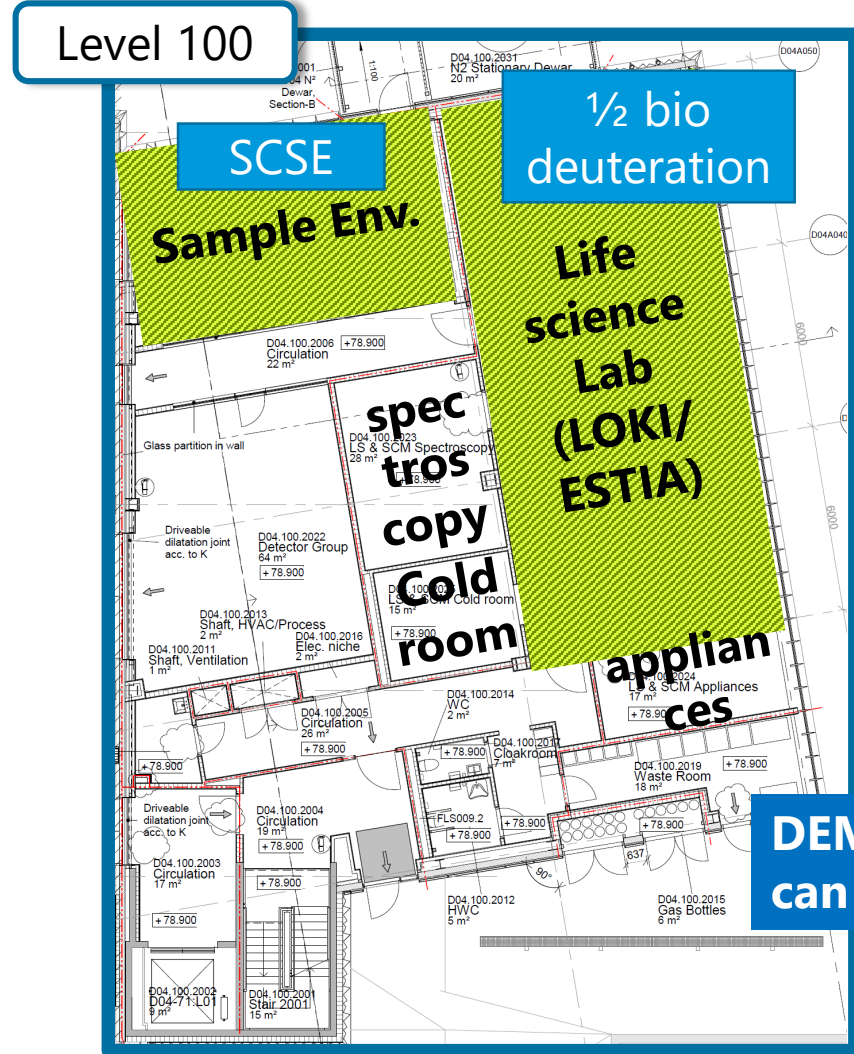
- installation
- commissioning
- in operation

★ Lab ready for operations



D04 Installations ongoing

Furniture procured Dec. 2021, contract finished March '23, Installations started



Installation support:

- risk assessments
- training records
- hot works support

... whatever it takes to move the installation forward

D04 installations – first lab ready May !?

Ongoing – 2 large laboratories and CLS Sample Environment Workshop



SULF Timeline –installation (status 2023)



Upcoming: installation of chemistry and sample environment labs in D04 and D08

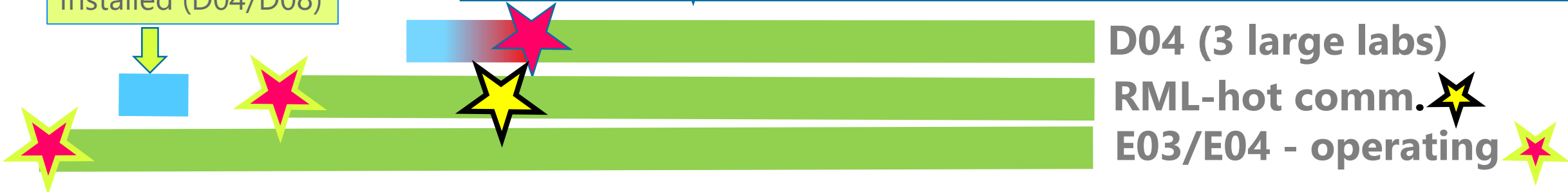
- installation
- commissioning
- in operation

★ Lab ready for operations

All fume hoods
Installed (D04/D08)

Price increase (3-4x) for rest of D04/D08 now ~2 M€ (incl. MPS)

- D04(rest), D08(chemlab)**
- D08 (MPS)**
- D08 (3 specialized labs)**



2021	2022	2023	2024	2025	2026	2027	2028
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↑ Framework agreement lab installation

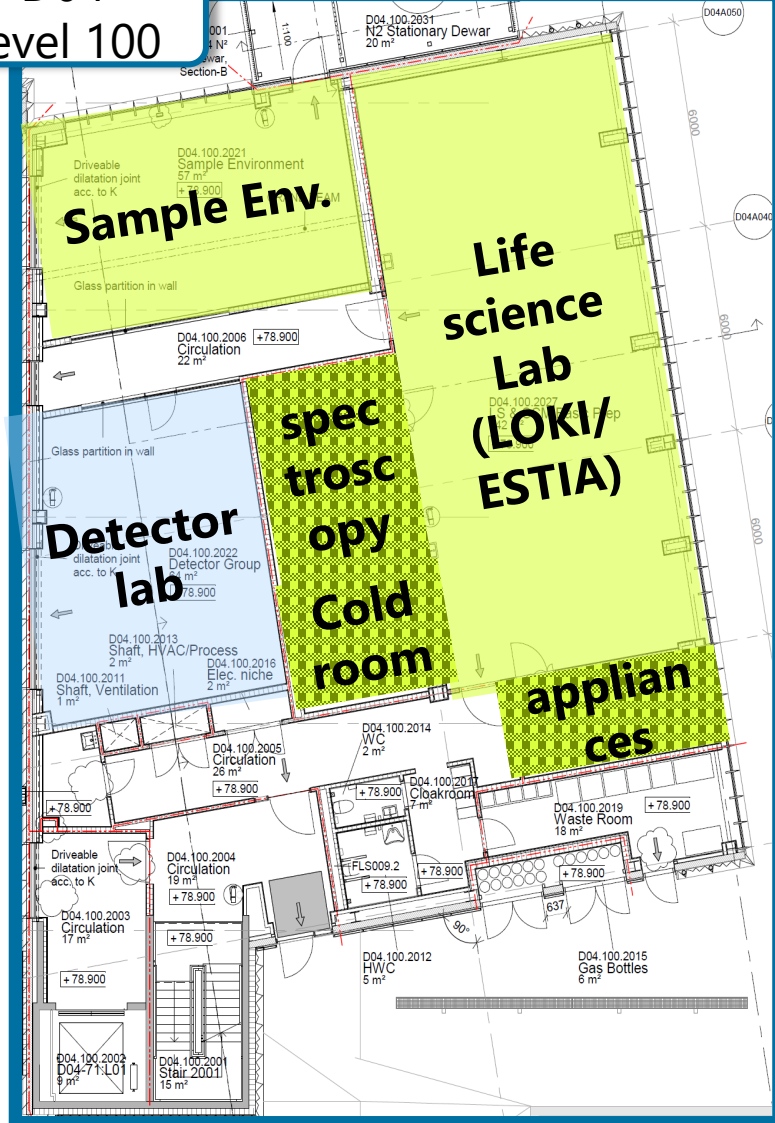
↑ ★ BOT

D08/D04 Installations planned for 2024

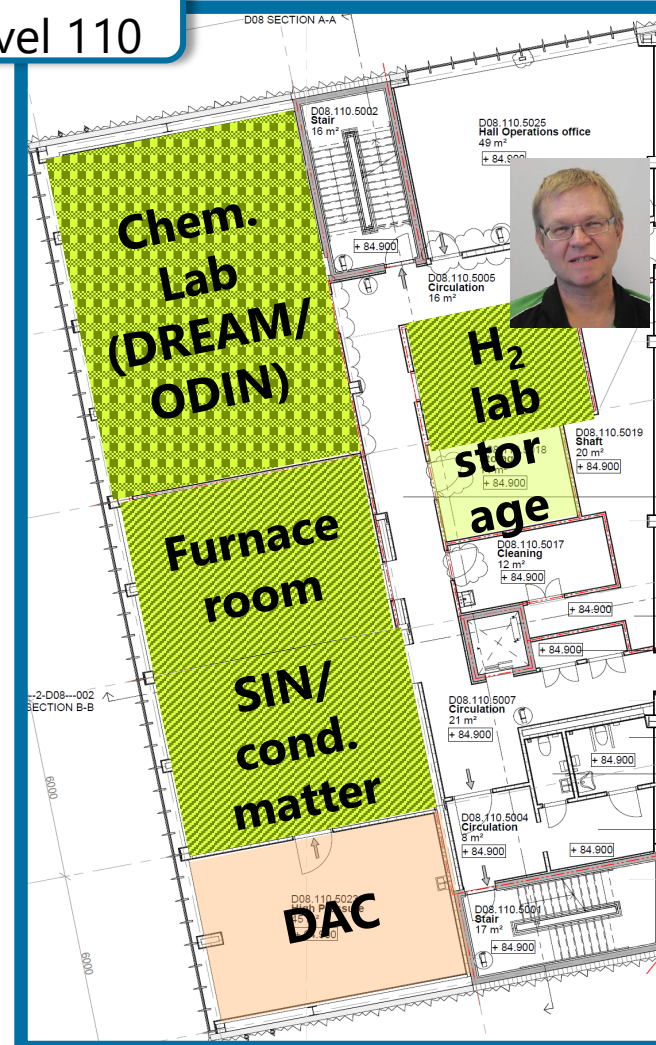
Furniture procurement (Q4/23), installations 2024



D04
Level 100



D08
Level 110






Change request to increase budget to be able to install labs in D08 and finish D04

Framework agreement valid until March 2025 -- need to be done with basic fit out in all rooms.

Procure furniture for D08 after summer.

Continue in 3 phases

-  1. install specialized labs (CLS)
-  2. install DAC lab, SE lab and Optics (polarization) lab (MPS)
-  3. finish remaining 3 rooms in D04 (CLS) and large chemlab in D08

Installation & Area Coordination

2 Lab operations & maintenance

ESS Project Support

Neutron Guide Optics support

There is no time left in the SULF team to go out and participate in funding calls nor in joint research proposals. How can we still stay on top of ongoing science?

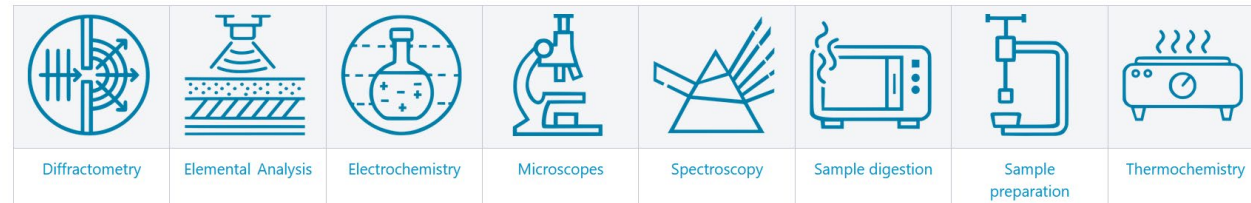
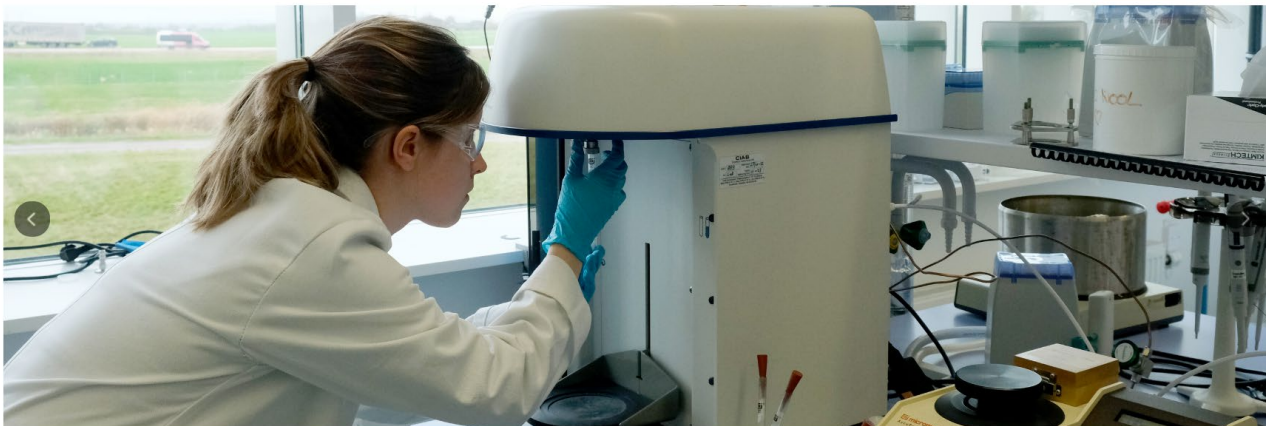


Internal webpages

Instrumentation description, user guides, manuals

Sample Handling and User Labs (SULF) Equipments

Created by Ghazaleh Roostaei, last modified on Dec 13, 2022



Specifications		
Engineering:	Wavelength Range:	190nm - 2.5µm
	Source:	Deep-UV Deuterium & Tungsten Halogen
	Nominal Bulb Power:	20 W (tungsten halogen) 26 W (deuterium)
	Typical Output Power:	585 µW (deuterium) 990 µW (tungsten halogen)
Environmental:	Safety & Regulatory:	CE

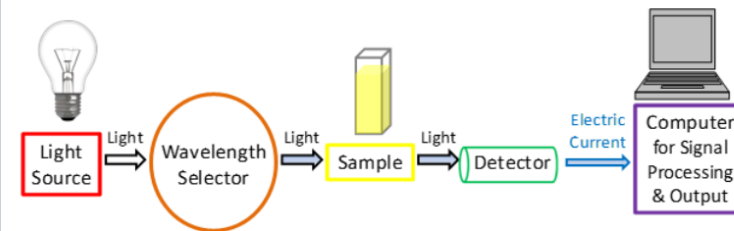


Figure 1: A simplified schematic of the main components in a UV-Vis spectrophotometer. Credit: Dr. Justin Tom.

Ref: <https://www.technologynetworks.com/analysis/articles/uv-vis-spectroscopy-principle-strengths-and-limitations-and-applications-349865>

UV/VIS

DLS

FT-IR

Raman

How does a UV-Vis spectrophotometer work?

Whilst there are many variations on the UV-Vis spectrophotometer, the basic understanding of how an UV-Vis spectrophotometer works is depicted in Figure 1.

UV-VIS Library

DH2000.pdf

DH-2000-Operating-Instructions.pdf

Fiber & Tools.pdf

flame.pdf

Ocean_Optics_Catalog_2012.pdf

OceanView_iO_SoftwareManual.pdf

technique, a steady source able to provide a wide range of wavelengths in the UV and visible ranges. Xenon lamps are commonly used for both the UV and visible ranges. Xenon lamps are more stable in comparison to tungsten and deuterium lamps. When employing two lamps, a tungsten or halogen lamp and a deuterium lamp is the common setup. The tungsten lamp is needed to scan both the UV and visible ranges, while the deuterium lamp is used to scan between 300 and 350 nm where

SULF – lab operations / core business

Main issue right now – lack of time/staff

Daily tasks (core business):

- keep instruments calibrated and maintained, train colleagues
- update lab safety guidelines, perform safety walk-throughs
- chemical inventory, order chemicals, I-N₂ & gas cylinders, chemical waste removal

DEMAX move seems to be on-track:

- lots of task related to get services started (chemical waste, utility, access)
- hope that CTA will be hired soon to help with D04 (“learning by doing” with the DEMAX team)

Unavoidable issues:

- single-point failure: will hopefully be less of an issue when DEMAX is on site
- need more time/staff (installation, restructuring have been a huge time drain)



- CTA intern through ERASMUS program was a great success.
- AS OF LAST WEEK, we have lab coat wash service!

Equipment renewal and extension

What has been done to the list from 2022



Larger equipment wish list (2022):

- ~~CHN+S elemental analysis (approx. 80 k€)~~ **on the way** ✓
- ~~database (ICDD) for XRD (10 k€ for 5 years)~~ **in use** ✓
- ~~polishing setup (15 k€)~~ **in use** ✓
- benchtop NMR (approx. 70 k€) need extra funding**
- reflectometry setup for XRD (approx. 100 k€, 2x 50k€)
Or new machine (150 k€) need extra funding**
- camera for microscope & software (15 k€) **Q3/23**
- cutting** -(30 k€)
- spin coater (20 k€??) **Q3/23** (NGO budget?)
- electrochemistry module for corrosion potentiostat
need extra funding (operations in-kind?)**

Procured by collaborators:

- ~~Turbidimeter (procured by OHS)~~ ✓
- ~~Dissolved oxygen (procured by machine directorate?)~~ ✓
- ~~universal tensile machine (with Beam diagnostics/engineering)~~ – **on the way** ✓

New on list

- **Gamma spectrometer (Neutron Guide Optics budget) – procurement started**

Budget per year 220 kEUR (flat):

- € 41k ESS project support
- € 120k consumables
- € 60k equipment (renewal, small)

Installation & Area Coordination

Lab operations & maintenance

3

ESS Project Support

Neutron Guide Optics support

Supporting the ESS project is both beneficial to ESS and to SULF. How do we cope with the increasing demand and the necessity to supply written reports?

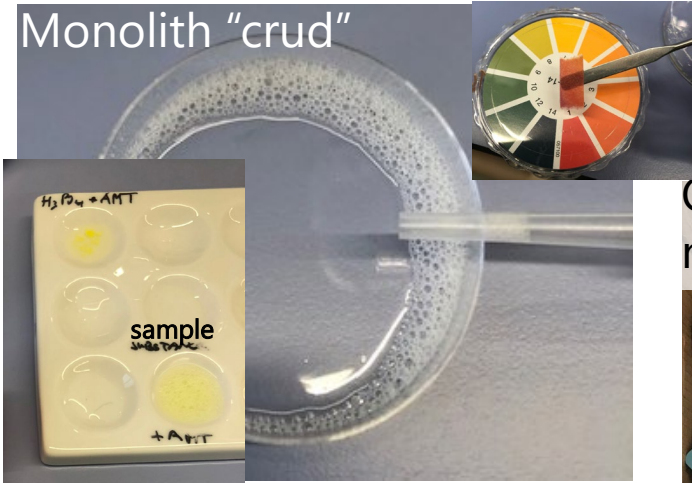


ESS Project Support

SULF is part of the "Spallation Chemistry Team"



Monolith "crud"



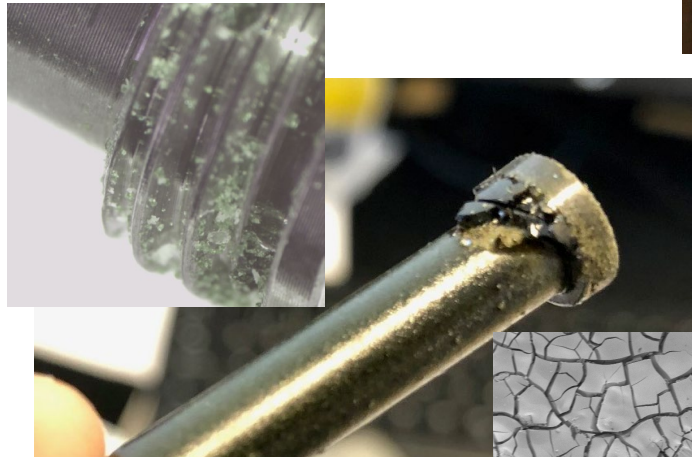
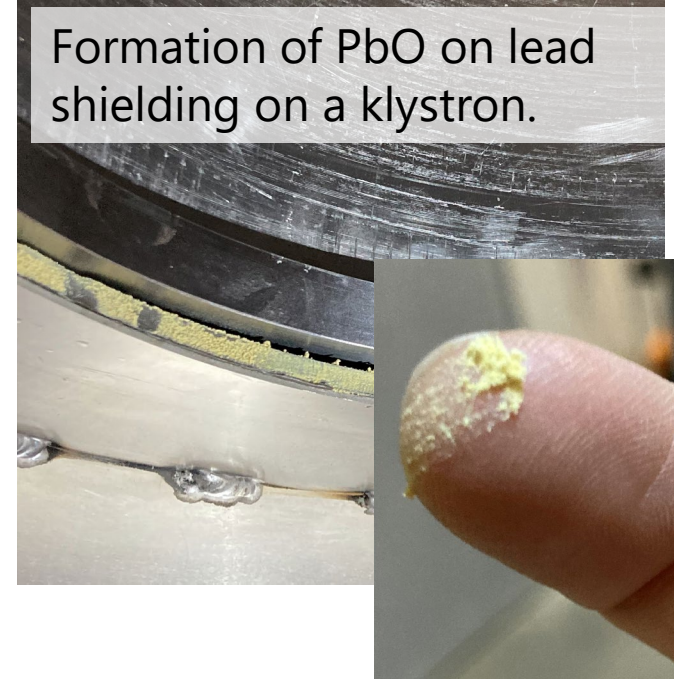
Grain size for Al neutron beam window



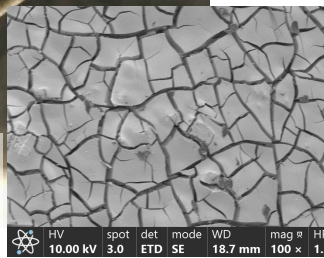
Carbonformation on tetrodes



Formation of PbO on lead shielding on a klystron.

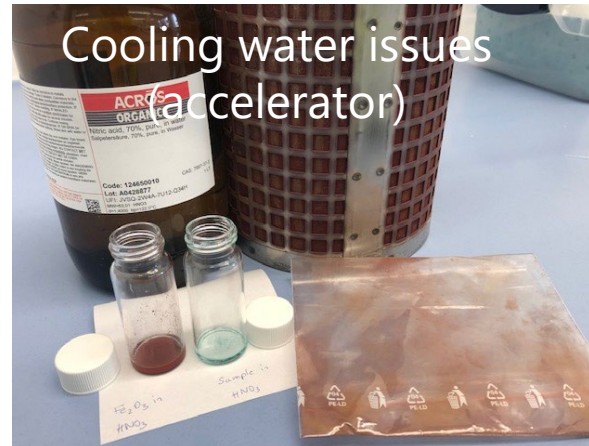


Pin of flowmeter (oxidation -> H_2WO_4)



HV 10.00 kV spot 3.0 det ETD mode SE WD 18.7 mm mag 100x 1.0

Cooling water issues (accelerator)



Date	Cu in CWM [ppb]	Cu in CWH [ppb]
Jun 22	BDL	38
Nov 22	BDL	BDL
Jan 23	90	33
Feb 23	620	BDL

Cutting of monolith in active cell

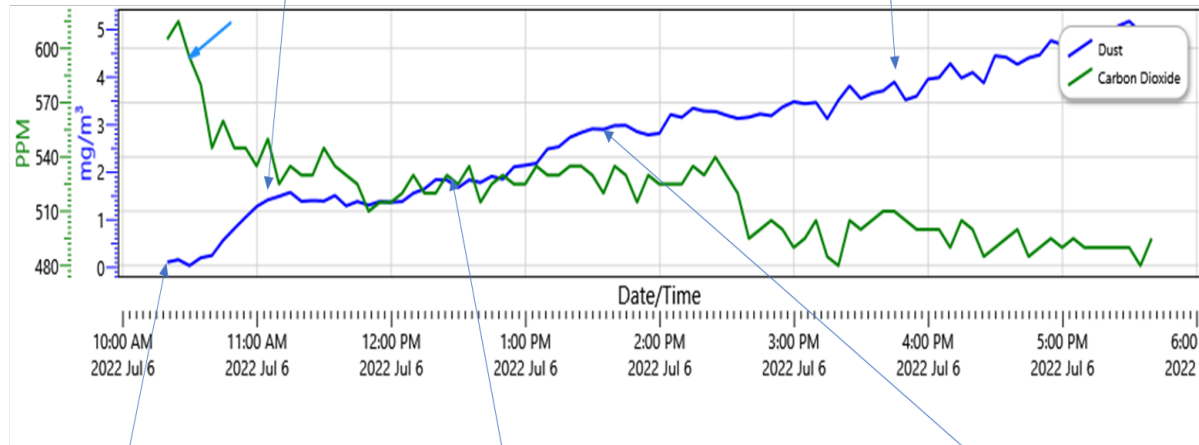


Testing dust/swarf distribution before active materials are present (C. Jones, J. Dahl, H. Sina)

Day 1 – Airborne Dust Levels

1201 Swedish Time - Cut stopped for lunch

1650 Swedish Time – Dust Monitor moved directly next to saw.



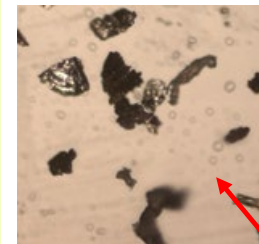
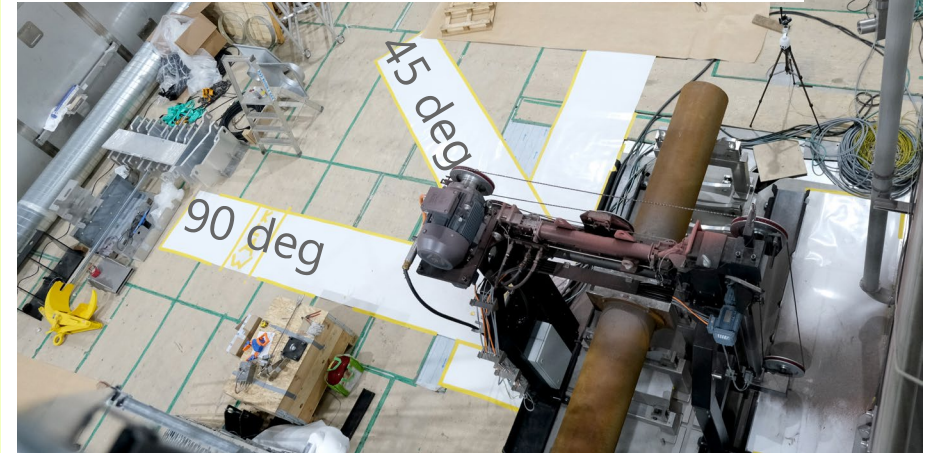
1125 Swedish Time – Cutting begins. Dust Monitor 1m from saw.

1323 Swedish Time – Cut restarts. Dust monitor 2m from saw.

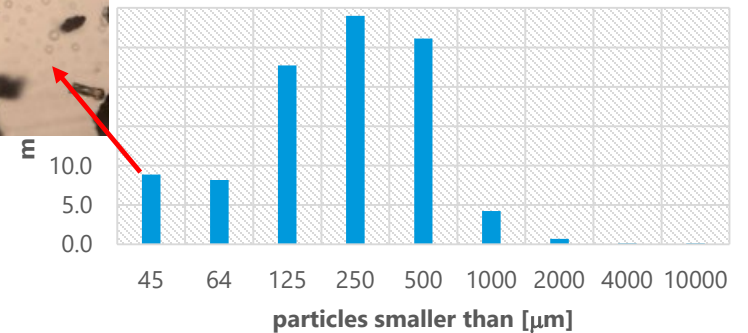
1430 Swedish Time – unexpected raised dust levels noted, masks required for cell entry before it settles.

Total Cutting Time: 4:49

Cutting of monolith components in the active cell



Active Cell Dust



Installation & Area Coordination

Lab operations & maintenance

ESS Project support

4

Neutron Guide Optics Support



Neutron Guide Optics Scope/Aim

XRF-Collaboration with Patric Linqvist-Reis



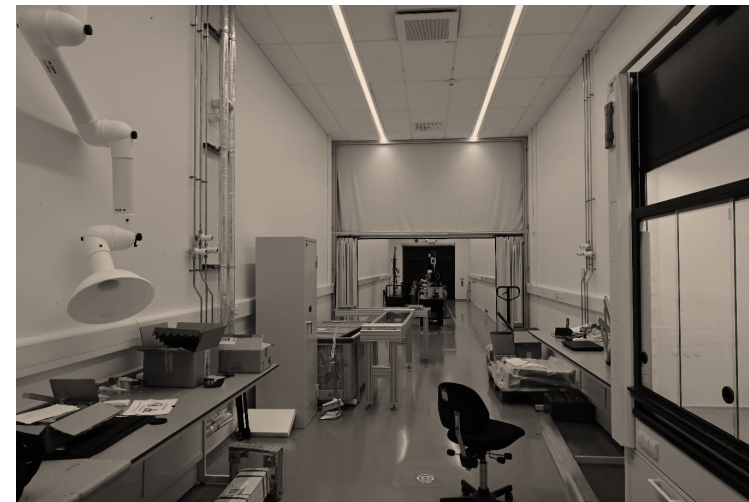
- Material assessments (XRF, LIBS additional possibly ICP-OES),
 - Neutron guide substrate: check for highly activating components (bunker needs to stay accessible), e.g. Co/SS, Ag/Cu
 - next project: heavy shutter materials.
- Expert review on guide design, installation and commissioning
- Responding to Spallation Chemistry Team request with portable XRF/LIBS
- Operate/maintain gamma-spectrometer for (gold) foil activation measurements



Neutron Beam Optics Assembly

% Cu \pm error (3σ)	% Ag
100.00 \pm 0.01	< 0.01
100.00 \pm 0.09	< 0.01
99.991	0.0044

2023-



Neutron Guide Optics Future?

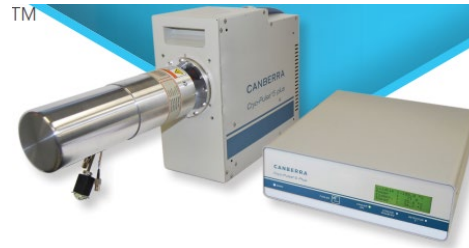
Neutron Optics Lab (collab. ESS Spall. Physics / Test Beamline)



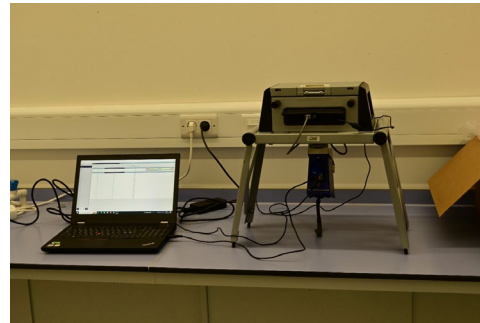
FUTURE:

- Use existing optical bench to test guide coatings? (200-300 k€ for deposition system)
- Start to develop guide coating using spin coater?
- Idea of setting up a compact neutron source in optics lab
 - moderator material testing?
 - guide testing?
 - Fast neutron radiography
 - Neutron activation analysis of materials

Gamma Spectrometer (Q3/23)



X-ray Fluorescence (portable)



Laser Induced Breakdown Spectroscopy (portable)



Neutron Optics Bench



IDEAS? SUGGESTIONS?



Thank you for the attention.