EUROPEAN
SPALLATION
SOURCE

Materials Science and Physics Support Group

Scientific Support Division

PRESENTED BY CAROLINE CURFS

Agenda

1 Scope and Team

2 Updates

3 Labs and Workshops

1

Scope and Team

Scope

- Provide and maintain **sample environment systems** in the fields of:
  - Low and ultra low temperatures
  - High temperature
  - Electrical and magnetic fields
  - High pressure
  - Mechanical processing
- Provide **mechanical integration** for all SES (including CLS projects)
- Provide **control integration** for complex SES (including CLS projects)
- Provide **services** for materials engineering, quantum materials and physics
- Coordinate the **He management**

Team

Current

- **2 technicians** : Lauritz and Richard
- **2 control engineers** : Niklas and Andreas
- **4 sample environment engineers**: Alex, Oleksiy, Damian and Caroline
- **0.5 mechanical design engineer**: Luca
- **1 technical writer** : Yulia

Planned recruitment:

- on going : Sample environment engineer for HT
- End of 2024: 2 technicians
- 2025: 1 technician
- 2027: 1 technician

3

Updates

MSPS Sample Environment Systems

Systems to be delivered before 12.2027

- 8 **magnets** from 2.5 T to 15 T
- **Low temperature** : 6 cryofurnaces and 10 cryostats including 1 for PE presses and 1 for electro-chemistry
- **Ultra low temperature**: 3 dilution fridges and 1 He3 insert
- **High temperature**: 3 ILL-type furnaces (2 Niobium, 1 Vanadium), 1 induction furnace, 1 lamp furnace and 1 hot air blower
- **High pressure**: 10 high pressure cells (5 gas, 4 liquid and 1 clamp), 5 compressors (4 automatic and 1 manual), 5 Paris Edinburgh presses with gas loader
- **Mechanical processing** : 2 stress rigs (uniaxial and torsion/rotation), 1 thermo-mechanical instrument (dilatometer)
- **Provided by instruments** : 1 He3 insert, 1 cryofurnace with sample changer and 4 cryostats

Status of SES by end of 2023

Magnets	2.5 T WBM	8 T magnet	15 T magnet	Spectro magnet	15T magnet	6.5T magnet
Cryo Instr. & IK	Flow cryostat ESTIA	**Wet cryostat BIFROST**	Cryofurnace CSPEC	Sample changer CSPEC	He3 insert CSPEC	HP cryostat
Cryo pool	Sample rot sticks	Dry Cryo DIFF EC	Cryofurnace DIFF 2nd hand	Dil. Fridge 2nd hand	Dil. Fridge	Dry cryo spectro
	Dry Cryo Heimdal					
High Pressure	Clamps	Gas cells	PE	Gas loading for PE		
Mechanical processing	Rig 60 kN	Tortion/rot. rig	Dilatometer			
High temperature	ILL-type furnace	Induction furnace	Cryostream/gas blower			

Specifications

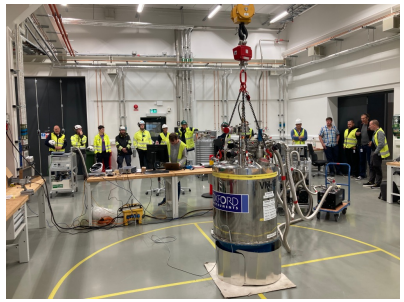
Preparation CFT
Design
CFT

Construction
Procurement

Tests
Control and mechanical integration

Update

Magnets



- **15T for BIFROST (VM1B)**
  - 2nd hand from HZB
  - Done: Tested up to 15T with new electronic rack
  - Next step: Control (via Octopy) and mechanical integration
- **6.5T for ESTIA (VM2)**
  - 2nd hand from HZB
  - Tested up to 6.5 T with new electronic racks
  - Next step: Control (via Octopy) and mechanical integration
- **15T for POOL (VM1)**
  - 2nd hand from HZB
  - Leak tested at room temperature
  - Next step: test at field and integration
- **2.1T WBM for ESTIA**
  - HTS 110 compatible with flow cryostat and polarisation
  - In production
  - Planned to arrive at ESS Q4/24
- **8T magnet for Diffraction**
  - Large aperture magnet
  - In production
  - Planned to arrive at ESS Q4/24-Q1/25
- **Magnet for Spectroscopy**
  - Design study on going for a 14T
  - Next step: Call for tender
- **Future magnets**
  - Meeting with instruments 01.24
  - List of priority set :
    1. > 10T horizontal split pair for SKADI
    2. 1-2 T electromagnet for LOKI, SKADI and ESTIA
    3. 10T wide opening for Diffraction
    4. 10T wide opening for Spectrometer
    5. 7T full polarisation for SKADI and ESTIA

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Update

LT and ULT

- **Pools cryostats and cryofurnaces**
  - 8 cryostats and 2 cryofurnaces
  - Specified for each tecgnique or/and instrument
  - Tender and purchase specifications sent to procurement

- **Cryostat for Electro-chemistry**
  - Dry cryostat dedicated to diffraction
  - In Production
  - Delivery planned Q4/24

- **Cryostat for High-Pressure (IK)**
  - Custom-made wet cryostat built by ILL
  - In construction
  - Planned to be ready in 25

- **Dilution fridges**
  - 2nd hand from HZB
    - Refurbished and successfully tested down to 27 mK
    - Next step : control integration

  - IK with LLB suitable with 8T magnet
    - Answers for CFT received – Decision on going

  - Pool
    - Tender and specifications in writing

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Update

High-Pressure

- **Gas. Liquid and clamp cells**
  - Received at ESS and some tested without beam
  - Training to manufacture more done
- **10kBar compressor for gas cells**
  - Received at ESS
  - Quality issues: modification and repairs on going
- **Other compressors**
  - Vinci pump and PACE 5000 control integrated
- **PE presses and gas loader**
  - 2 PE presses at ESS, tested
  - 1 PE press + gas loader to arrive at ESS April 24

- **DAC**
  - Project DAC for Lab Xray started
  - PRL ready
  - RAMAN system in specifications phase
- **Future HP**
  - SANS cells : discussion with scientists and other facilities on going

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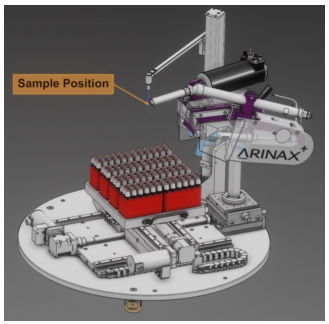
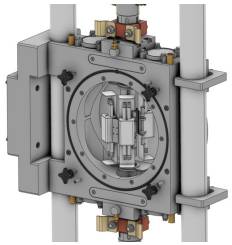
Update

High Temperature and Mechanical processing

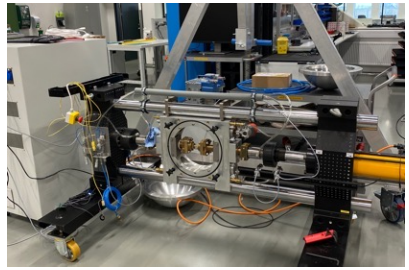
- **ILL-Type furnaces**
  - 2 Niobium 1650 C and 1800 C (2nd hand)
    - Transfer from LLB delayed
    - Refurbishement will be needed
  - 1 Vanadium 1100 C
    - Specifications on going



- **Hot Air Blower/Cryostream**
  - From 100 K to 800 C
  - Sample changer
  - Design nearly completed
  - Off-the-shelf parts ordered – some received
  - Planned to be available Q4/24-Q1/25

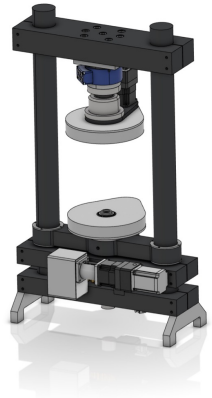


- **UHT furnace**
  - Lamp furnace up to 1800 C
  - Vacuum or inert atmosphere
  - Adapted to the NPI
  - Design on going with ISIS



- **NPI stress rig**
  - 60 kN unixial deformation rig
  - Conductive heating (800 A / 15 V)
  - At ESS
  - Software update on going
  - Collaboration with Alfa Laval for use case started

- **Tortion/rotation rig**
  - Design on going
  - Construction planned 25



- **Dilatometer**
  - Specifications on going

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Status of SES by end of 2024

Expected

Magnets	2.5 T WBM	8 T magnet	**15 T magnet**	Spectro magnet	**15T magnet**	**6.5T magnet**
	High Field SANS magnet					
Cryo Instr. & IK	Flow cryostat ESTIA	**Wet cryostat BIFROST**	Cryofurnace CSPEC	Sample changer CSPEC	He3 insert CSPEC	HP cryostat
	Dil. Fridge					
Cryo pool	Sample rot sticks	Dry Cryo DIFF EC	Cryofurnace DIFF 2nd hand	Dil. Fridge 2nd hand	Dil. Fridge	Dry cryo spectro
	Dry Cryo Heimdal	He3 insert	Wet cryo MIRACLES	Wet Cryo TREX	Dry Cryo SANS	Cryofurnace TREX
High Pressure	**Clamps**	**Gas cells**	**PE**	**Gas loading for PE**	DAC/RAMAN	
Mechanical processing	**Rig 60 kN**	Tortion/rot. rig	Dilatometer			
High temperature	ILL-type furnace	Induction furnace	Cryostream/gas blower	UHT furnace		

Specifications

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MSPS priorities for HC and CC

	Instrument	Cold Commissioning		Hot Commissioning	
		SES	Timeline	SES	Timeline
TRANCHE 1	**DREAM**	Hot Air Blower/Cryostream	10.24 – 03.25	ILL-Type furnace	07.25-03.26
	BIFROST	15T magnet / Wet cryostat	11.24-04.25		
	ODIN			Tortion/rotation rig	07.25-03.26
TRANCHE 2	**ESTIA**	2.5 T WBM/Flow cryostat	07.25-12.25		
	SKADI			Electromagnet	10.26-06.27
	BEER	60kN stress rig	07.26-12.26	Dilatometer	01.27-09.27
	MAGIC	8T magnet / Wet cryostat	04.26-09.26		
TRANCHE 3	**HEIMDAL**	ILL-Type furnace/Dry cryostat	10.26-03.27		
	T-REX	Wet cryostat	07.26-12.26	He3 insert	01.27-09.27
	MIRACLES	Dry cryofurnace	07.26-12.26	Wet cryostat	01.27-09.27
	CSPEC	Rotation stick	10.26-03.27	Spectro magnet	04.27-12.27
	VESPA	Dry cryostat	04.27-09.27		

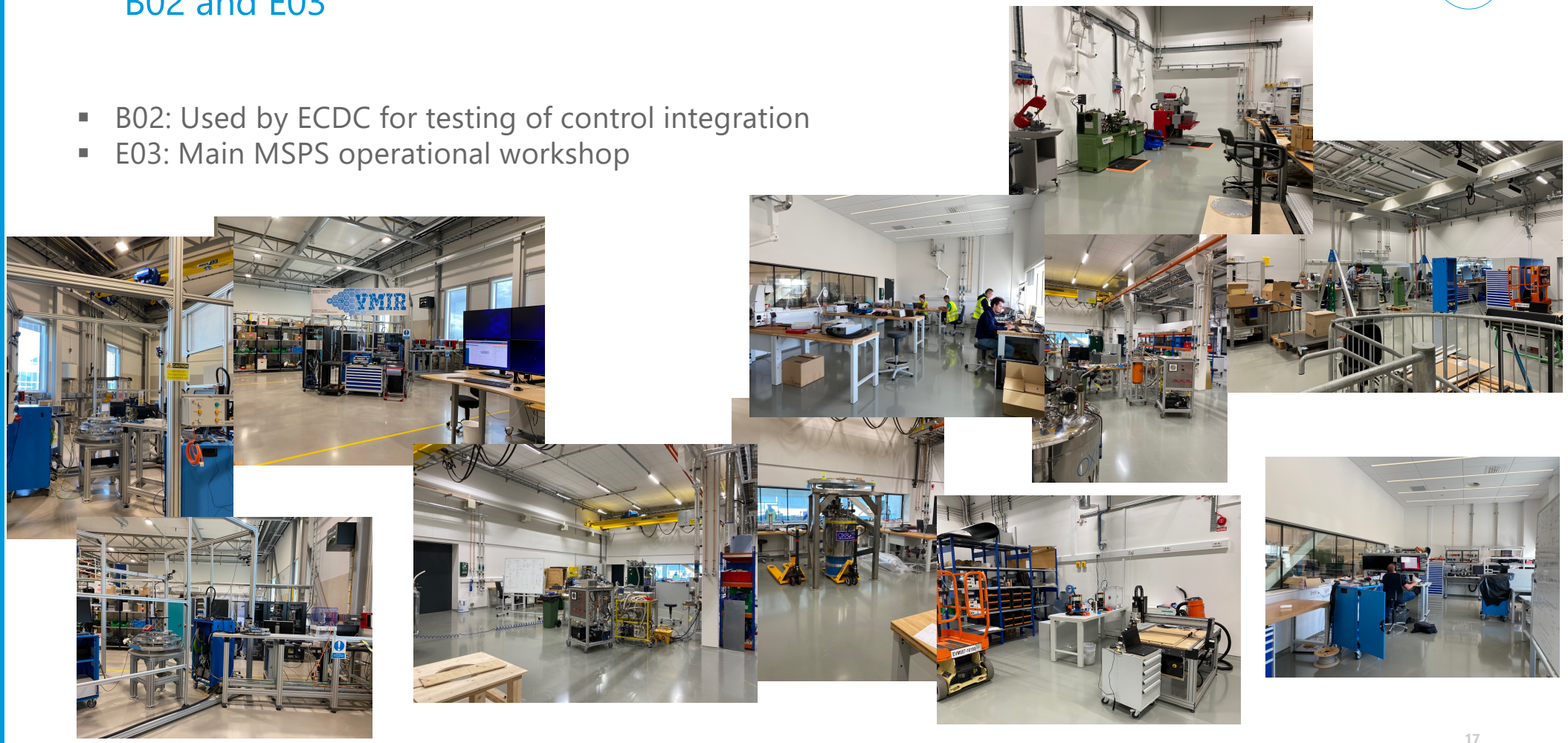
5

Labs and workshops

Main workshops used

B02 and E03

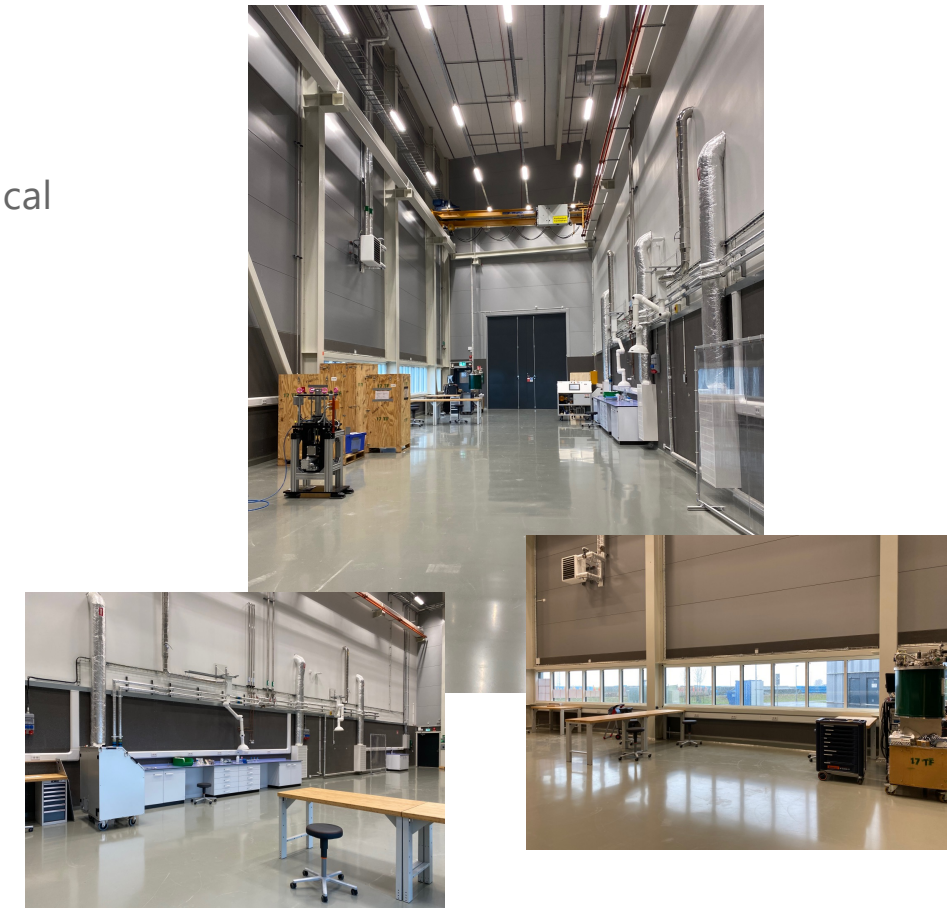
- B02: Used by ECDC for testing of control integration
- E03: Main MSPS operational workshop



Labs & workshops to install

E03 SLIME lab

- Installation started
- Planned to support **BEER and ODIN** users for mechanical engineering
  - Deformation rigs
  - Furnaces
  - Equipment for sample preparation



Labs & workshops to install

D08

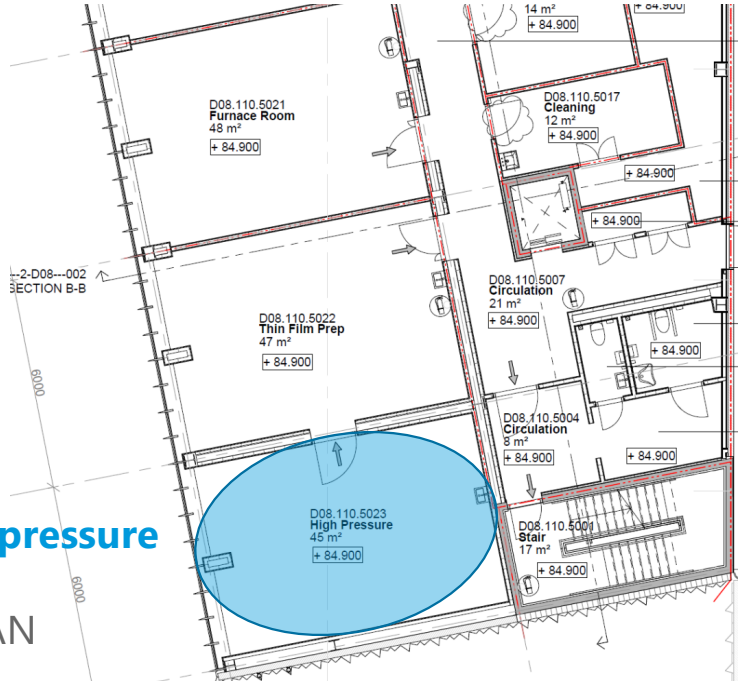
Ready to move in by end of 24

Sample environment
Maintenance and storage of cryos, magnets, furnaces for ODIN, DREAM, ESTIA,…

High Pressure
PE presses, Liquid, gas and clamp cells
Compressors

Ground floor

First floor



High pressure
DAC
RAMAN

Thanks to

Richard Ammer, Niklas Ekström, Andreas Hagelberg, Alexander Holmes, Damian Paliwoda, Yulia Pedersen, Luca Sagliano, Lauritz Saxtrup and Oleksiy Zadorozhko

and

you for your attention