



THE HENRYK NIEWODNICZAŃSKI
INSTITUTE OF NUCLEAR PHYSICS
POLISH ACADEMY OF SCIENCES

Division of Scientific Equipment and Infrastructure Construction (DAI)

Division Head: **Jacek Świerblewski**

Presented by Deputy Division Head: **Jaromir Ludwin**



- Number of employees: 50
 - Applied Superconductivity Department: 5
- Soon to be increased to 66 to handle ongoing and upcoming collaborations requiring our presence on our partner's site



EUROPEAN
SPALLATION
SOURCE

Current team on site: 12



Preparation phase



Preparation phase
Numerous local projects

* I will not focus on details presented in the report provided to SAB

IFJ PAN in-kind contribution to ESS – Technical Annexes

SCHEDULE AIK 10.1-Cryomodule test

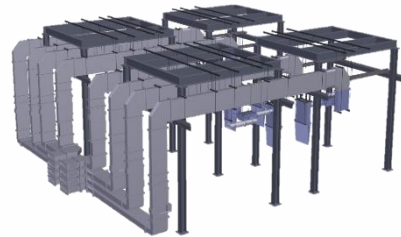
- Reception of Cryomodule units
- Preparation of Cryomodule units for the test bench
- Installation on the test bench
- Initial testing
- Cool down
- Heat load measurements
- Warm up
- Disconnection
- Preparation for the tunnel
- Participation in site activity coordination
- Final review



2017 - 2026

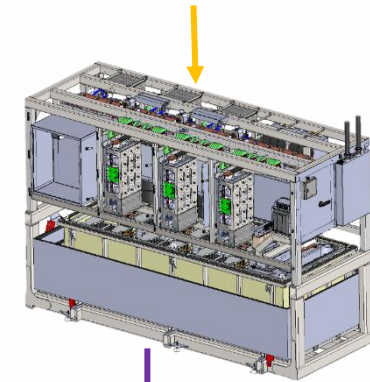
SCHEDULE AIK 8.6 - RF Installation

- Stub installation
- LLRF installation
- LPS installation
- Distribution system installation
- High Power Amplifier installation



SCHEDULE AIK 17.3 - PC Installation

- Klystrons Modulators for RFQ and DTL
- Klystron Modulators for Medium / High Beta
- Magnet Power Converters



SCHEDULE AIK 8.8

CONTRIBUTION TO THE LOW AND HIGH-POWER TESTS OF
RF EQUIPMENT AND TESTING AND INSTALLATION OF
RFPS'S IN TS3 AND IN G02.

2022 - 2023

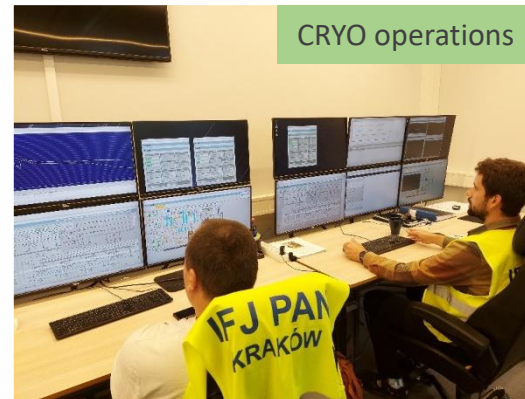
SCHEDULE AIK 17.12 -SRF and CRYOGENICS SUPPORT

2023 - 2024



- Cryogenic experts,
- Mechanical and electrical specialists,
- RF engineers,
- Vacuum specialists,
- Skilled technicians

permanently at ESS site 12 persons in total



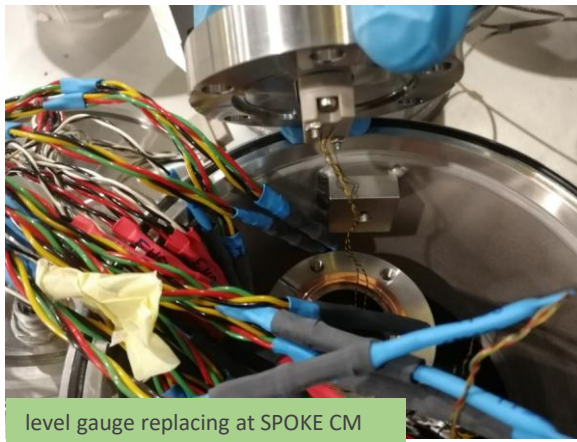


Supported activities at ESS side

- ▶ Support with installation trial of elliptical CM05 & spoke CM02 in the tunnel,
- ▶ Support with SPOKE CM10 CTS motor replacing,
- ▶ Replacing of the LG at all SPOKE CMs,
- ▶ Various leak tests for chosen SPOKE CMs,
- ▶ Support with MLI installation for ACCP-CTL interconnections,
- ▶ And many other...



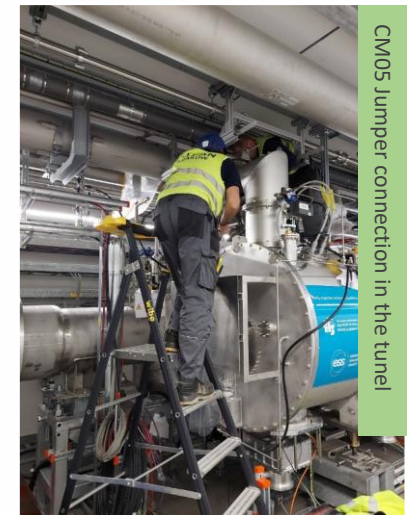
CM05 waveguides connection in the tunnel



level gauge replacing at SPOKE CM



CTS motor repairing at SPOKE CM



CM05 Jumper connection in the tunnel



Support for CERN's TE department during Long Shutdown 2 (LS2)



- Standard electrical tests on more than 1600 LHC superconducting circuits and their instrumentation before and after warm-up and cool-down of the LHC (four measurement campaigns)
- Diagnostics and solving of nonconformities revealed during tests (more than 240)
- Software development, design and fabrication of four dedicated diode lead measurement systems
- Electrical measurements of the main dipole bypass diode contact resistances during the diode insulation consolidation campaign
- Maintenance of equipment and software used by Electrical Quality Assurance Team

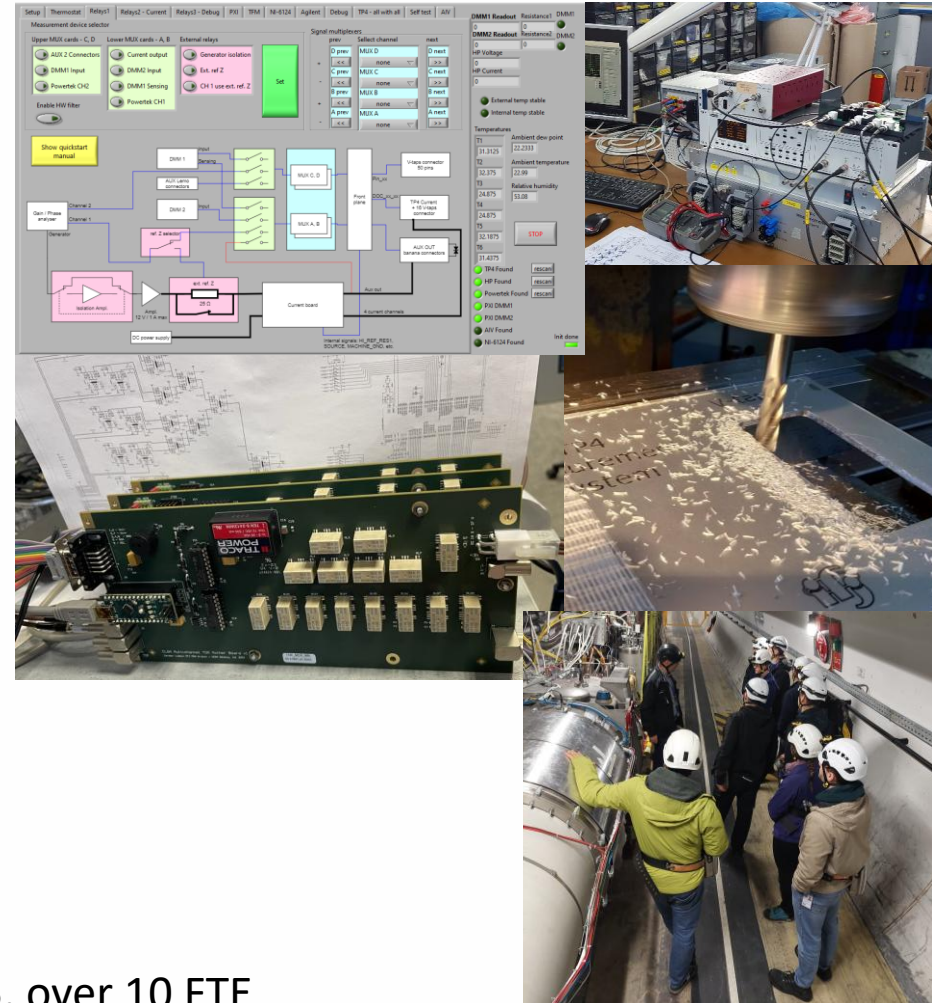
**Over 50 FTE during entire LS2
(~10 FTE in 2021)**



Preparation for Long Shutdown 3 (LS3)

- Modernisation and development of equipment and software used for Electrical Quality Assurance (ELQA) of LHC superconducting circuits
- Support during LHC technical stops
- Support for ELQA of inner triplet string
- Participation in preparation of ELQA related procedures for LS3

2021 – 2025, over 10 FTE

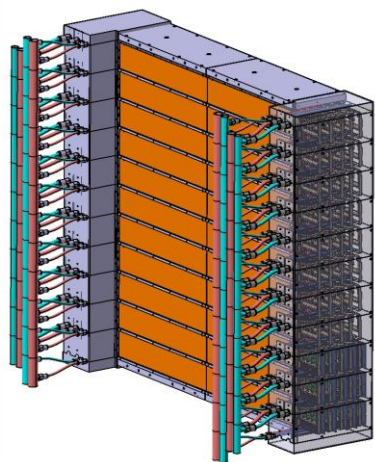




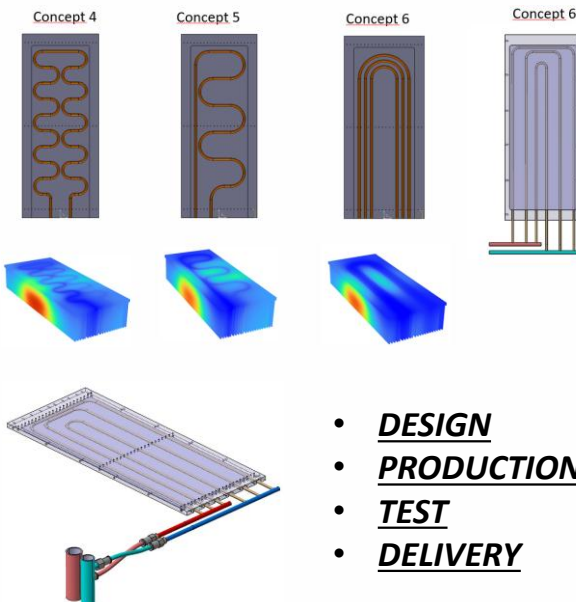
Contribution to (FoCal)



Custom FOCAL cooling system for the detector and local electronics



FOCAL-E heat exchanger

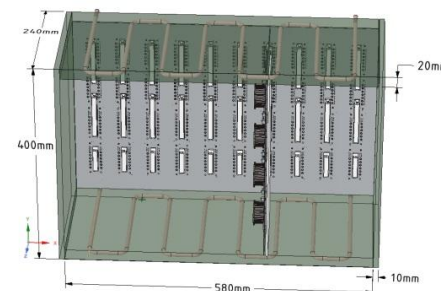


- DESIGN
- PRODUCTION
- TEST
- DELIVERY

Contribution to



Custom cooling system for electronics



- DESIGN
- PRODUCTION
- TEST
- DELIVERY

45 dedicated units.

Participation in the local organising comity of the 2024 ALICE Upgrade week
https://alice-collaboration.web.cern.ch/2024_ALICE_Upgrade_Week



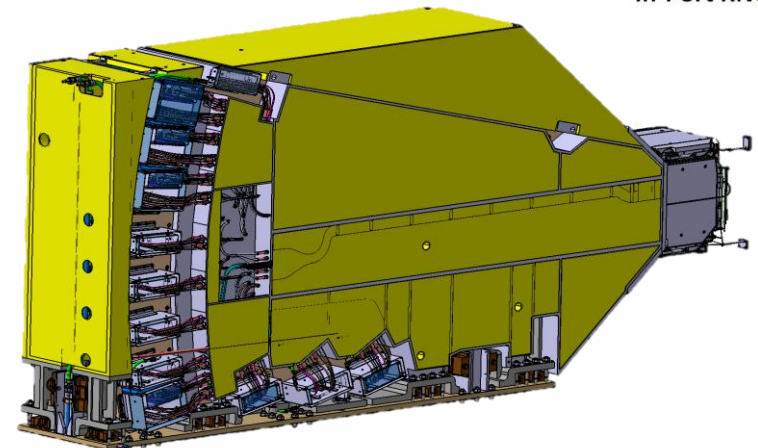
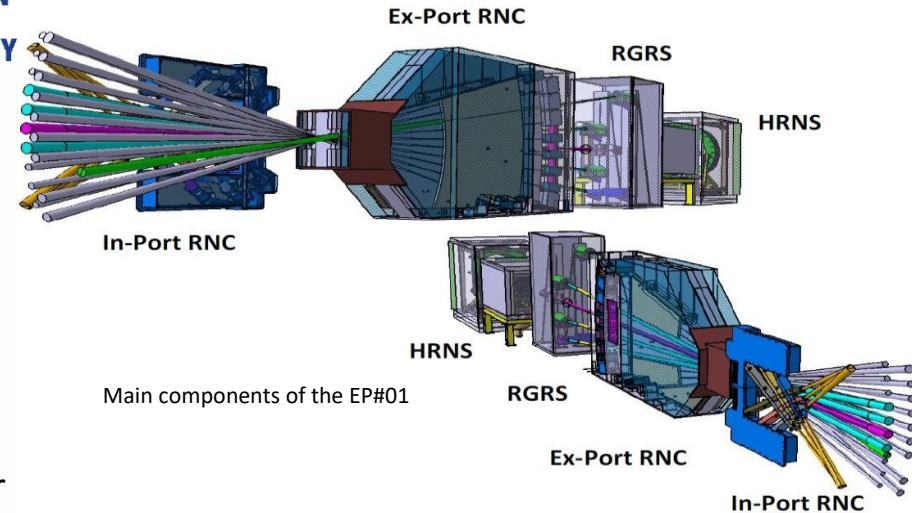
The ITER Radial Neutron Camera (RNC) is a multichannel detection system hosted in the Equatorial Port Plug 1 (EP#01). It is designed to measure the uncollided neutron flux from the plasma, providing information on the neutron emissivity profile, and the total neutron source strength, as well as spatial resolved measurements of several parameters needed for fusion power estimation, plasma control and plasma physics studies.

The main activity in the project was CAD support for promotion process of whole assembly in Ex-Port zone.

- Functional checks of the main components of the system (clash detection and quality improvements).
- CAD modification of parts and application of functional changes into the structure.
- Producing of the technical documentation.



FUSION
FOR
ENERGY



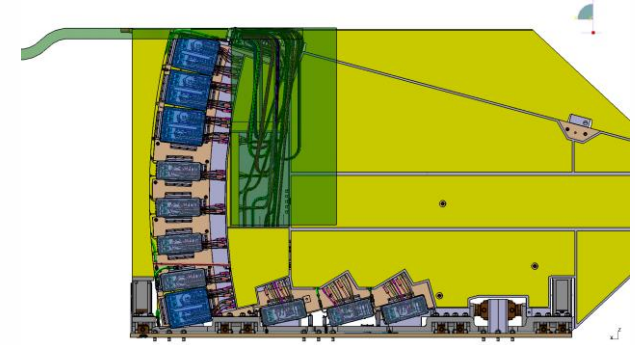
RNC system in EP#01 (Ex-Port zone)

~15 FTE

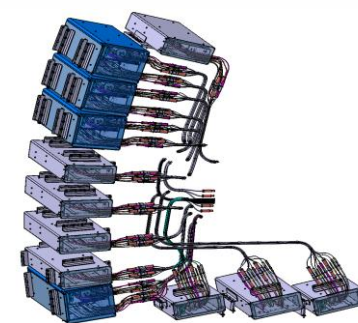


Main CAD modifications implemented in the Ex-Port:

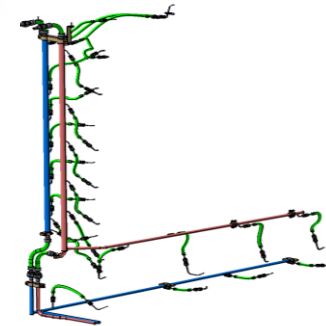
- Detector boxes: Changing of disconnection interface for detectors cables.
- Connectors and cable routing: cable management study inside the patch panel.
- Cooling system: application of functional changes e.g. new attachment components VCR.
- Modification of the external structure e.g. changes in the rear block.



Studies of cable routing inside patch panel and them exit to the cable tray interface



Detector boxes subassembly with detector cables inside patch panel



Main components of cooling system and their supports



Dimond detector test campaign – 2021, 2023



Feedthrough test campaign – 2024



Dedicated test stand for feedthrough and diamond detectors thermal stress tests at IFJ PAN

Example activities from 2024

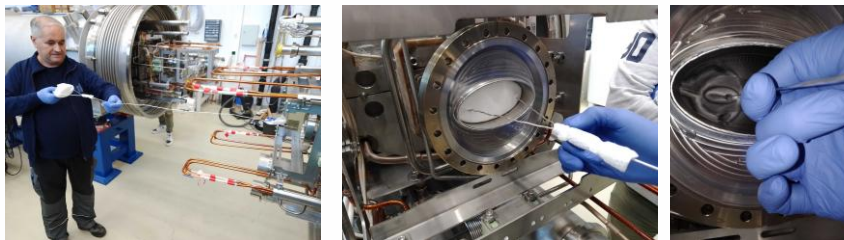
- MLI Wrapping of interconnection between quadrupole doublet module (QDM) and dipole module (DM) (22.09)



- Connection of the end cap to the by-pass line (06.10)



- Cleaning of 2 DMs beamline chambers (29.09)



- Transportation of the FoS QDM on the blue line and connection to the end cap (11.10)



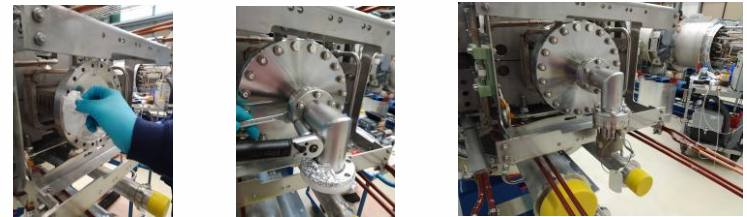


Example activities from 2024

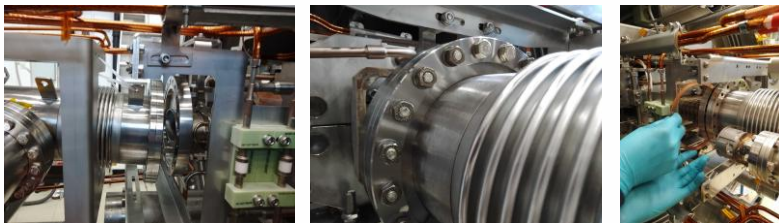
- Putting of 2 dipole modules (DM) on the position (13.10)



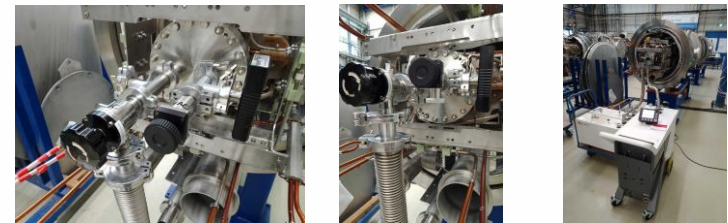
- Installation of vacuum equipment on the beamline in the end box (20.10)



- Beamline interconnection between dipole modules (14.10)



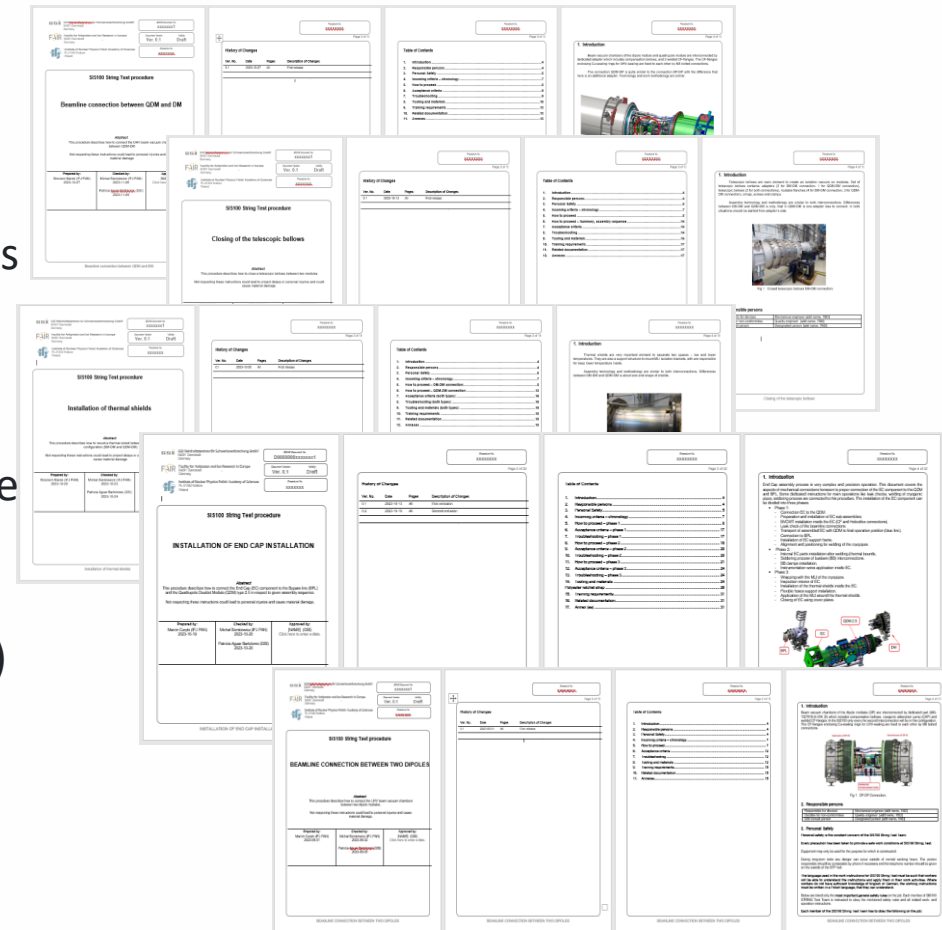
- Connection of the vacuum eq. to the beamline at the downstream side of the DM-DM string (21.10)





Examples of FAIR procedures prepared by DAI

- Beamline connection between two dipoles
- Installation of the end cap
- Installation of thermal shields
- Closing of the telescopic bellows
- Beamline connection between quadrupole doublet modules and dipole modules,
- Installation of multilayer insulation (beamline, process pipes, thermal shields)
- Assembly and installation of the pumping chamber



FAIR In-Kind Contract

the in-kind contribution PSP 2.15.1.1.1.7 and PSP 2.15.1.1.1.8 – Special Installation of accelerator components for the Construction of the FAIR facility – **was recently signed**

Upcoming contribution of 75,5 FTE



Development of Innovation and Cooperation of European Technological Infrastructures for Accelerators



Innovation Fostering in Accelerator Science and Technology (2021-2025)

WP13 activities are carried out by the Henryk Niewodniczański Institute of Nuclear Physics of the Polish Academy of Sciences



FuSuMaTech - Future Superconducting Magnet Technology (2017-2019, 2021-2025)

In Poland, the project is was carried out by the Henryk Niewodniczański Institute of Nuclear Physics of the Polish Academy of Sciences



Superconductivity & Particle Accelerators (since 2012, last conference in 2024)

DAI is organising a bi-yearly conference devoted to the research in the field of superconductivity and its applications in science, with a specific focus on particle accelerators, nuclear fusion and large scientific infrastructures

Lectures on electrical integrity tests and electrical failure diagnostics in superconducting circuits in 2023 and 2025

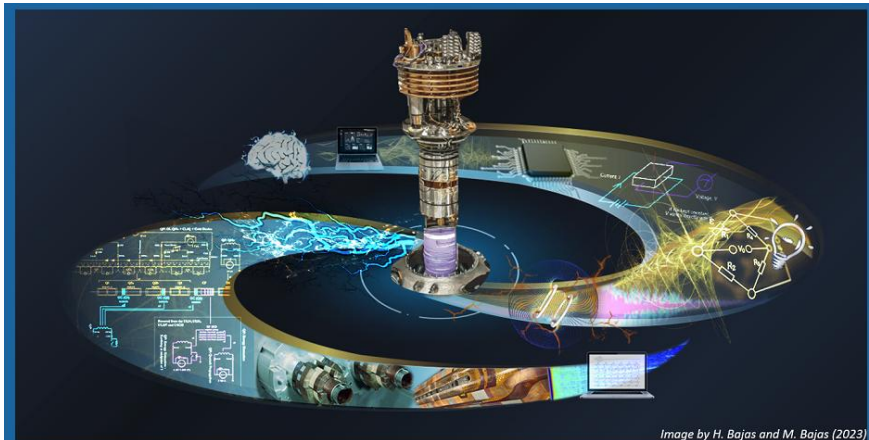


Image by H. Bajas and M. Bajas (2023)

Lectures on Superconducting Magnet Test Stands, Magnet Protections and Diagnostics (as integral part of SMTF & IDSM Workshops)

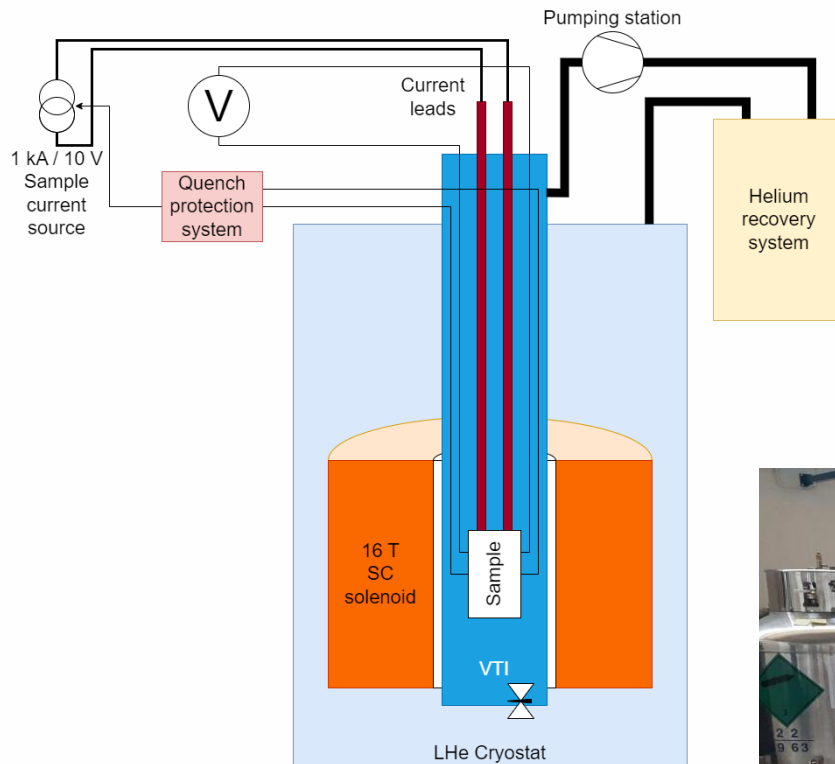
<https://indico.cern.ch/event/1281454/>



TIDM² x SC Magnets Lecture Series 2025

<https://indico.cern.ch/event/1540071/>

Superconducting strand test stand at IFJ PAN



- 16 T Magnet with Variable Temperature Insert (VTI)
- Liquid helium refilling installation
- 1 kA Sample Current Source
- Helium recovery system
- Data acquisition system based on 7 ½ digit digital multimeters and nano voltmeter
- Helium vapour heat exchanger equipped with heaters and air flow speed control system
- Helium vapour pumping station



Cryo infrastructure used to support the test stand



70 m³/h and 200 m³/h recovery compressors



30 mbar helium vapour pumping stations



Helium balloons, 2 x 15 m³ and 1x 80 m³

DAI is supplying entire IFJ PAN with the cryogenic liquids

- Liquid helium

Turbine helium liquefier system:

- Able to liquefy up to 35l/h
- Able to operate with helium contaminated by atmospheric air up to 1%.
- 1000 dm³ storage Dewar

Recovery system:

- Helium balloons, 2 x 15 m³ and 1x 80 m³
- 70 m³/h and 200 m³/h recovery compressors
- 3 helium high pressure storage groups, containing 108 90l bottles operating at 200 bar

- Liquid nitrogen

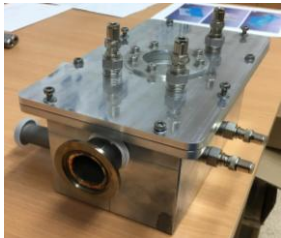
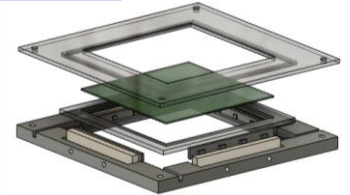
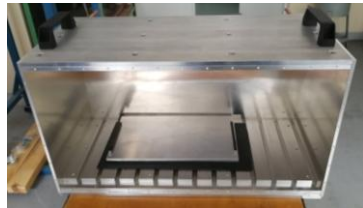
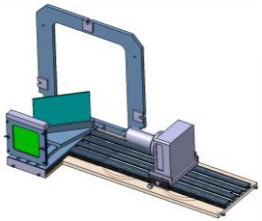
Daily distribution





DAI support to other IFJ PAN divisions

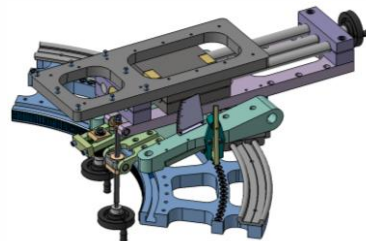
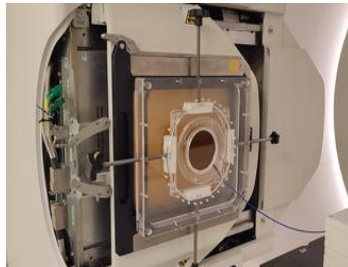
Year	Number of jobs	Number of supported IFJ PAN divisions
2022	66	20
2023	39	15
2024	37	14



Continuous support for CCB



Centrum Cyklotronowe
Bronowice





Thank you for your attention

Division of Scientific Equipment and Infrastructure Construction (DAI)

“So that customers come back to you, not products! Quality is something that satisfies and even delights customers.”

William Edwards Deming