FAIR Installation 2024/25 & Impact on ACC

Site Management

H. Hagelskamp - 11.07.2024

Topics

- Highlights of Start of Installation in 2024
- Installation Scope in 2024 / 25
- Impact on Resource Requirements 2024 / 25
- Some Early Lessons Learnt
- Feedback & Exchange with ESS & CERN
- Organisational Requirements for successful installation
  - PULL Team and Task Force Installation
  - QC Installation Team

ES Highlights on Site

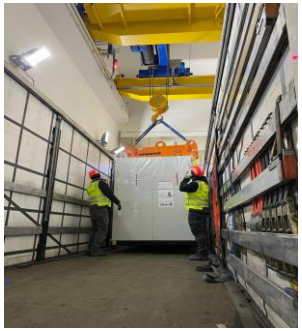
- Installation HEBT T1S2
  - 9 components in position
  - April 2024

- Installation Helium Tanks
  - six tanks installed
  - March 2024

- Installation SFRS Target Area
  - Shielding Blocks in position
  - June 2024

FS Highlights on Site

- Installation – SIS100 PSU
  - six units positioned
  - January 2024



- Installation SIS100 BPL & Cavities
  - three BPL spools in position
  - seven Cavities on Beam Line

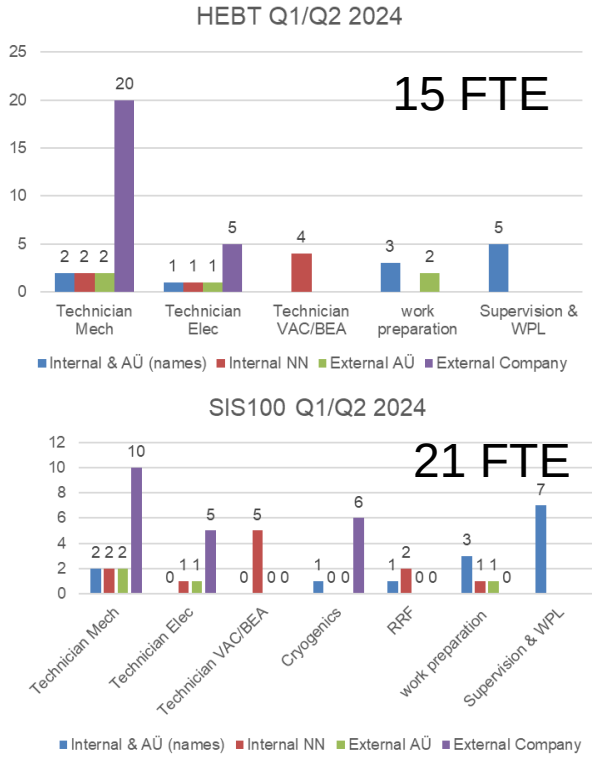
- Installation SIS100 Bend 3 Dipoles
  - 20 Dipoles on beam line
  - May 2024

ES & FS Highlights on Site

Resource Involvement and Scope achieved for FAIR machine installation

- **28 GSI** employees have contributed to the present status of installation in Q2 2024.
- 293 FTE days were recorded.
- equal to **7 FTE** for 100% for 40 days.
- **4 FTE** from IFJ PAN, Krakow.

- Mechanical installation only.
- No VAC installation, testing, completion.
- No electrical installation and cabling connection.
- No BEA installation and cabling.



Plan in 09-2023

Significant resource requirements for work scope is still to come.

Resource Efficiency in Q1&Q2 2024

09 / 2023

- Resources for **limited duration** engagement on FAIR site mainly from:
  - TRI ramping up in Q4-2023 for site establishment and for installation.
  - VAC, EPS, BEA, HF from Q2-2024.

Reasons for limited completion and resource under utilization:

- buildings not completed.
- cable pulling.
- settling behaviour of building.
- Shortage of availability of minor components – closing of VAC.
- Incomplete work preparation.
- Shortage & breakage of testing and installation equipment.
- Ad-hoc changes in work sequence.

First Lessons Learnt!

We are on a steep learning curve ! – not unusual !

ES & FS Highlights on Site

Outlook for next quarter

- Start of installation HEBT T1S1
  - close coordination with TBI installation
  - Removal of mobile shielding wall.

- Dipole Interconnections SIS 100 bend 3
  - completion of step 1 mechanical connections by IFJ PAN

- SIS100 - Assembly of straight 4
  - closing and testing of vacuum-connections
  - TRI and functional departments

Installation Scope Q3 – Q4 2024

2024

Q3

Q4

Early Science:

- HEBT T1S1
  - Structured **coordination** with TBI and cable pulling works (**FSB)**.
  - Mainly **quadrupoles**; Dipoles are in delivery process.
- SFRS Pre-target Area.
  - Cryo **T-Branch** from **WUST** (Nov 24).
  - Complex **interface coordination** with TBI and cable pulling (**FSB**).

First Science:

- SIS100 **completion** of mechanical installation in sector 4S.
- SIS100 **welding** of process lines of Dipole interconnections in sector 3B.
  - **FAIR-GSI internal** welding team.
- SIS100 mechanical installation of sector **3S** and sector **2B**.
- Start of **installation** of SIS100 **racks**.
- Start of **rack cabling** and connections in service areas (**machine scope**)

Installation Scope Q1 – Q2 2025

2025

Q1

Q2

Early Science

- HEBT mechanical installation of **T1S2** depending on further settling of building.
  - Start of cable installation and electrical connection (**machine scope**).
  - closing and testing of VAC systems.
- SFRS – mechanical installation of first **Multiplets** in Pre-Target Area.
  - Connecting first Multiplets to T-Branch Cryo lines (**WUST & Contractor**).
- Cryo Plant **Commissioning**

First Science:

- SIS100 - **completion** Dipole installations in all other sectors.
- SIS100 - **continued** installation of BPL and cavities in **straight sections**.
- **Coordination** and sequencing with cable pulling progress.
- Continuation of **rack installation** in SIS100 service tunnel.
- Start of **cable connections** to machine components (**machine scope**).

Installation Scope Q3 – Q4 2025

2025

Q3

Q4

Early Science

- **Expediting** of cable pulling in transfer building and tunnels towards SFRS.
- HEBT mechanical installation of **further beam lines** towards SFRS.
- HEBT complete installation of **T1S1** in next beam time break 2025.
- SFRS – mechanical installation of **Target Area** and Seperator beam line.
  - completion of cable pulling and start of cable connections to machine.

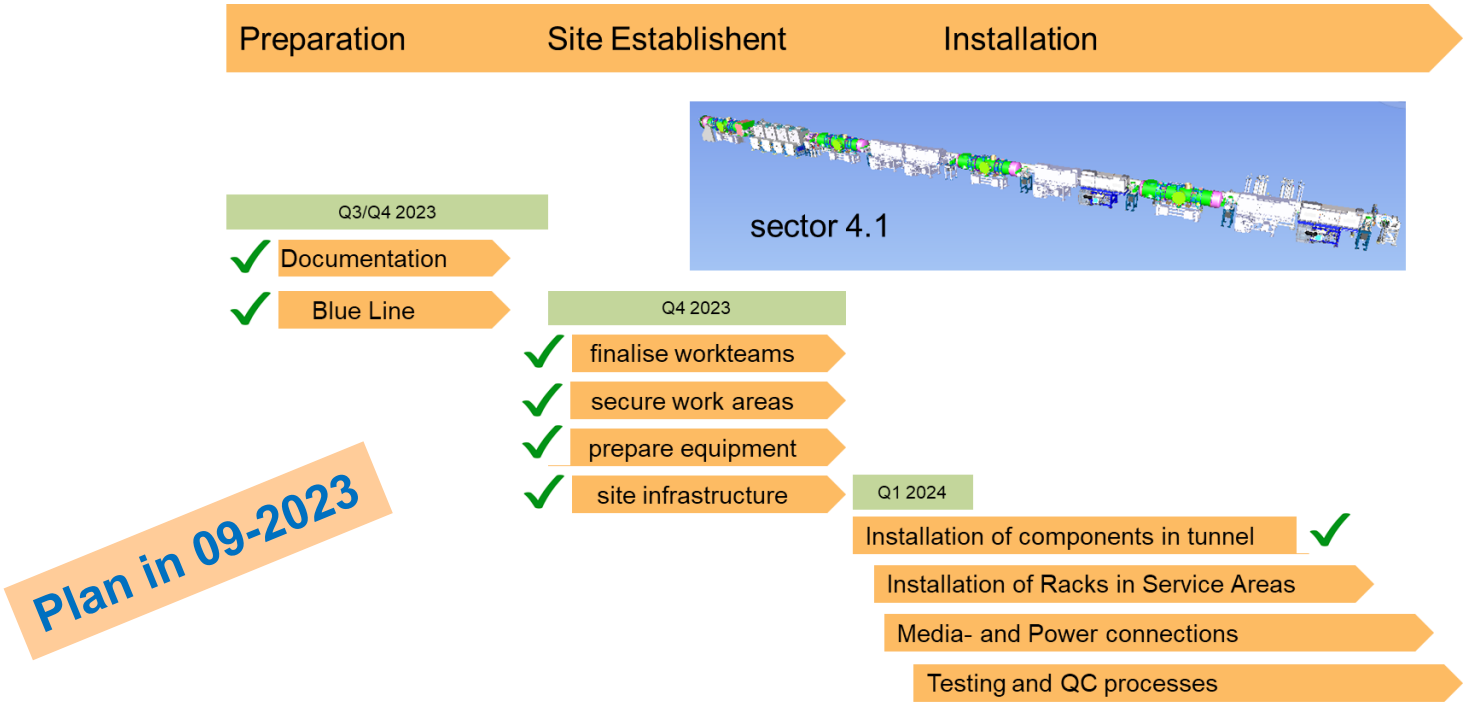
First Science:

- SIS100 – installation of Quadrupoles in all sectors according to delivery sequence.

Cabling work where ever possible.

- various cabling packages from HF, EPS, VAC, BEA, ACO etc have to be coordinated and sequenced

Installation preparation for 2023/2024

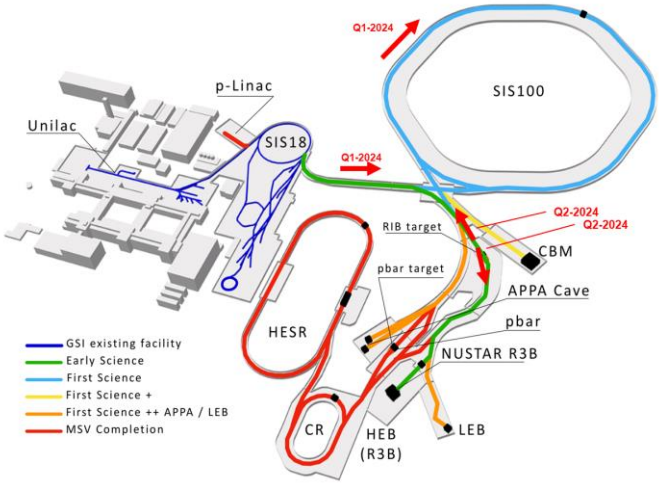


Site Preparation was performed to plan.
Is a critical milestone within the Installation Readiness Review.
Monitored and coordinated in PULL TEAM.

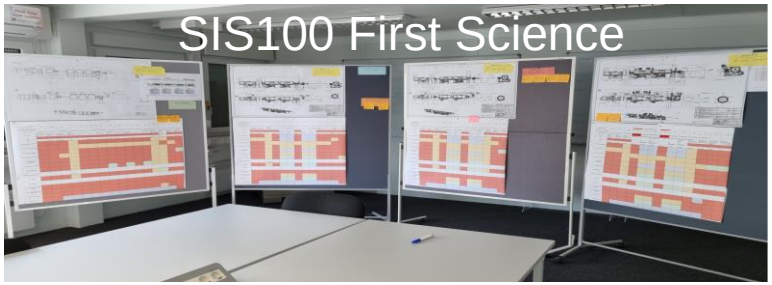
Installation Conditions and Maintenance

Prerequisites for installation start:

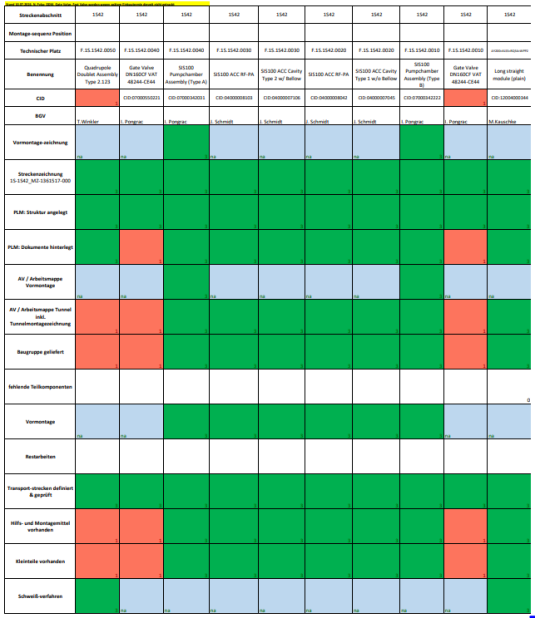
- *TBI is completed in all building sections and levels where installation is to commence.*
- **Exceptionally, start of installation before cable pulling was completed.**
- *Tunnels and service area are accessible, clean and can be secured against unauthorized access.*
- **Regular cleaning during and after installation is taking place.**
- *Components (assembly Groups) are deliverd, complete and ready for installation.*
- **Monitored in the PULL TEAM & LCM Sessions, weekly.**
- *All Work preparation is completed, documented and loaded in SAP-PLM in the correct structure.*
- **Monitored in PULL TEAM & LCM session, weekly.**
- *Blue-Lining survey will commence in November 2023.*
- **Has started and continues progressively as new tunnel section become available.**



Installation Coordination



Situation Room - PULL Team 1



Streckenabschnitt	1542	1542	1542	1542	1542	1542	1542	1542	1542	1542
Montage-sequenz Position										
Technischer Platz	F.15.1542.0050	F.15.1542.0040	F.15.1542.0040	F.15.1542.0030	F.15.1542.0030	F.15.1542.0020	F.15.1542.0020	F.15.1542.0010	F.15.1542.0010	
Benennung	Quadrupole Doublet Assembly Type 2.123	Gate Valve DN160CF VAT 48344-CE44	SIS100 Pumpchamber Assembly (Type A)	SIS100 ACC RF-FA	SIS100 ACC Cavity Type 2 w/ Bellow	SIS100 ACC RF-FA	SIS100 ACC Cavity Type 1 w/o Bellow	SIS100 Pumpchamber Assembly (Type B)	Gate Valve DN160CF VAT 48344-CE44	Long straight module (plain)
CID		CID-0700001031	CID-0700016031	CID-0400000105	CID-0400000106	CID-0400000042	CID-0400000565	CID-0700014233		CID: 12004000344
BGV	T. Winkler	L. Pongrac	L. Pongrac	L. Schmidt	L. Schmidt	L. Schmidt	L. Schmidt	L. Pongrac	L. Pongrac	M.Kaszchke
Vormontage-zeichnung										
Streckenzeichnung 15.1542_MD.156315-17-000										
PLM: Struktur angelegt										
PLM: Dokumente hinterlegt										
AV / Arbeitsmappe Vormontage										
AV / Arbeitsmappe Tunnel inkl. Tunnelmontagezeichnung										
Baugruppe geliefert										
fehlende Teilkomponenten										
Vormontage										
Restarbeiten										
Transport-strecken definiert & geprüft										
Hilfs- und Montagemittel vorhanden										
Kleinteile vorhanden										
Schweiß-verfahren										

Stand: 15.06.2024, N. Pyka; die QDM werden aktuell nicht getrackt, da der Einbau erst ab 2025 erfolgt.

Streckenabschnitt	153A	153A	153A	153B	153B	153B	153C	153C	153C	153D	153D	153D	153E	153E	153E
Montage-sequenz Position	Mike Drobisch-Info		Geplanter Einbau: 2025			Geplanter Einbau: 2025			Geplanter Einbau: 2025/26			Geplanter Einbau: 2026			Geplanter Einbau: 2026/27
Technischer Platz	F.15.153A.0010	F.15.153A.0020	F.15.153A.0030	F.15.153B.0010	F.15.153B.0020	F.15.153B.0030	F.15.153C.0010	F.15.153C.0020	F.15.153C.0030	F.15.153D.0020	F.15.153D.0030	F.15.153D.0040	F.15.153E.0010	F.15.153E.0020	F.15.153E.0030
Benennung	SIS100 Dipole Assembly Dip	SIS100 Dipole Assembly Dm	Quadrupole Doublet Assembly Type 1.54	SIS100 Dipole Assembly Dip	SIS100 Dipole Assembly Dm	Quadrupole Doublet Assembly Type 1.78	SIS100 Dipole Assembly Dip	SIS100 Dipole Assembly Dm	Quadrupole Doublet Assembly Type 2.8C	SIS100 Dipole Assembly Dip	SIS100 Dipole Assembly Dm	Quadrupole Doublet Assembly Type 2.0	SIS100 Missing Dipole Assembly	SIS100 Dipole Assembly Dm	Quadrupole Doublet Assembly Type 1.0
CID	CID-0200260484	CID-0200260026	CID-0200307549	CID-0200260309	CID-0200260040	CID-0200307462	CID-0200260234	CID-0200260357	CID-0200307585	CID-0200260330	CID-0200260095	CID-0200307677		CID-0200260187	CID-0200307790
BGV	Florian Kaether	Florian Kaether	Timo Winkler	Florian Kaether	Florian Kaether	Timo Winkler	Florian Kaether	Florian Kaether	Timo Winkler	Florian Kaether	Florian Kaether	Timo Winkler	Timo Winkler	Florian Kaether	Timo Winkler
Zeichnungsnummer Vormontage	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1
Vormontage-zeichnung	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1
Streckenzeichnung im PLM	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PLM: Struktur angelegt	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1
PLM: Dokumente hinterlegt	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1
AV / Arbeitsmappe Vormontage	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1
AV / Arbeitsmappe Tunnel inkl. Tunnelmontagezeichnung	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1
Baugruppe geliefert	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1
fehlende Teilkomponenten CID	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1
fehlende Teilkomponenten	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1
Vormontage	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1
Restarbeiten	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1
Transport-strecken definiert & geprüft	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1
Hilfs- und Montagemittel vorhanden	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1
Kleinteile vorhanden	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1
Schweiß-verfahren	3	3	1	3	3	1	3	3	1	3	3	1	3	3	1

Confirmed by experience of ESS and CERN

PULL TEAM - Installation Readiness Review
to ensure structured installation processes

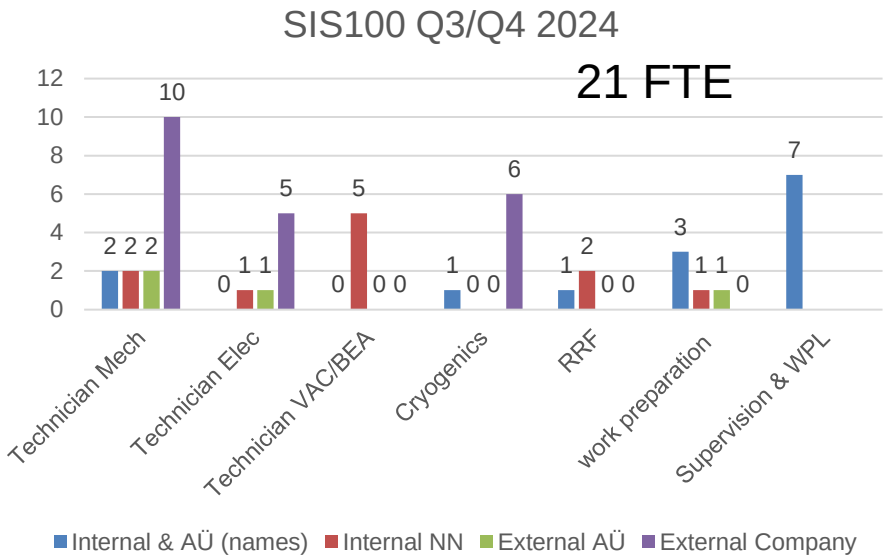
Resource Requirements 2024/25

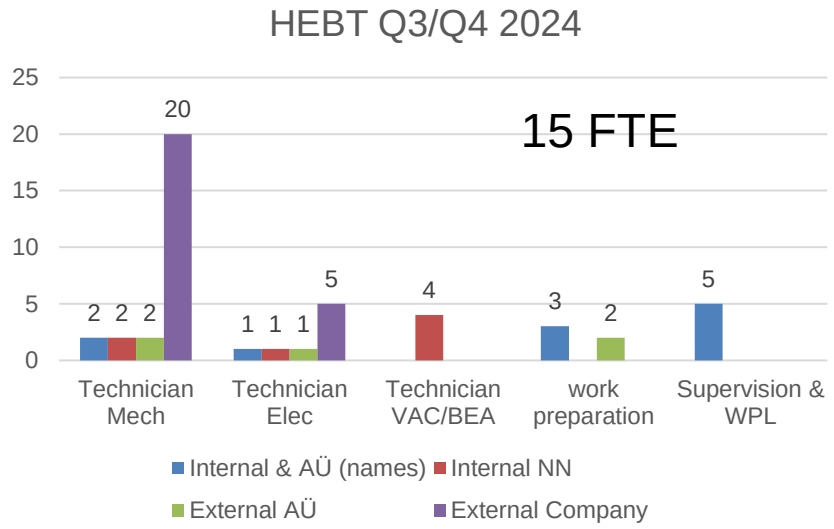
Work Scope Development in 2024 and 2025

- Density and **intensity of work scope** activities will increase significantly in 2024/25.
- A high **inter-dependency** of work activities – allowing little fluctuation and flexibility.
- A structured **sequencing and tacting** of activities from various disciplines will be important.
- Resources (people & equipment) have to be **available according to LCM** process planning.
- The role of the **Installation Representative** (MV) is becoming even more important to **coordinate resource requirements** from technical departments with sufficient lead time – based on LCM long-term process plan.

Resource Requirement 2024

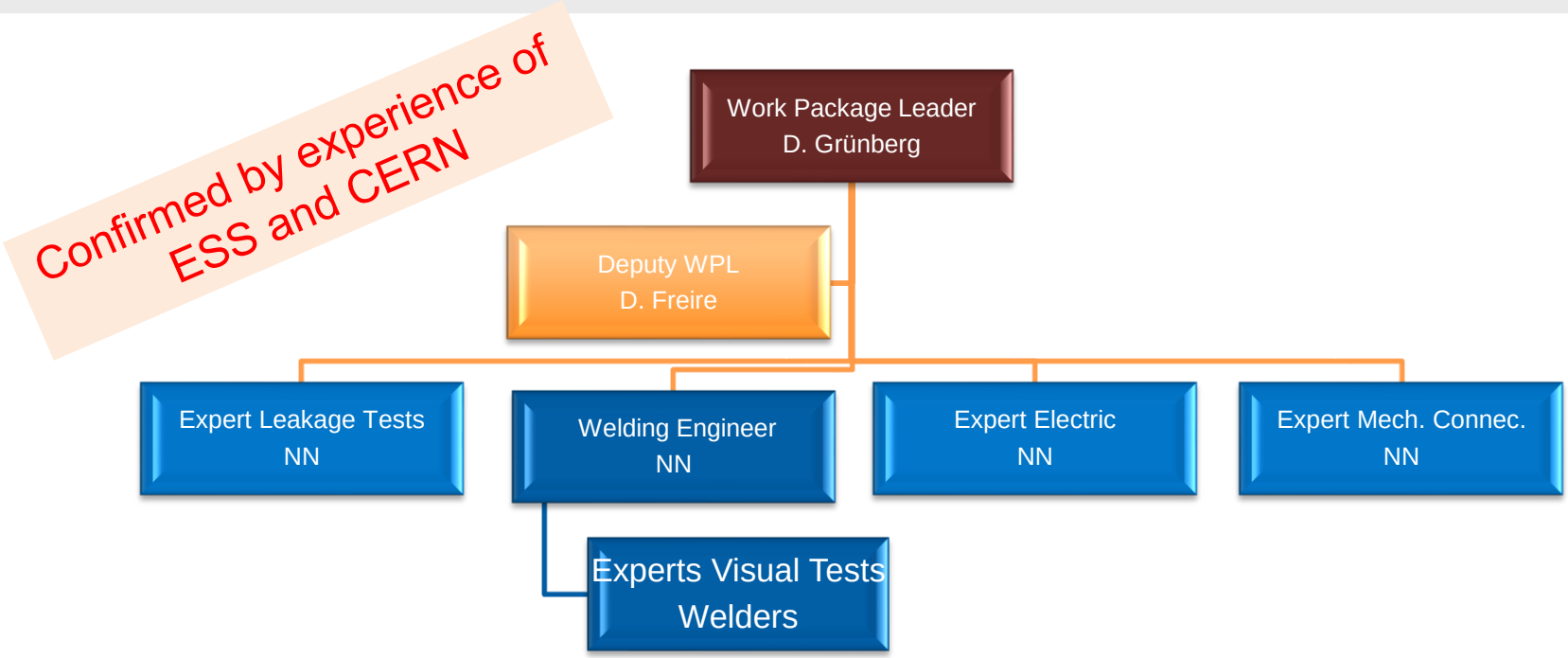
First Science





- Mechanical – sufficiently planned and available.
- Electrical – supervision only; work will be contracted to external company.
- COM-VAC/BEA – teams are to be established for Leakage test and local cable installations in sector 4 straight and further.
- Cryogenics – in 2026 after Quadrupole installation.
- RRF – cabling and testing – teams are to be established.
- External Resources from IFJ PAN will increase after contractual finalization.

QC Installation Team Organisation



- QC Experts coordinate all inspection activities in line with the installation plan and progress.
- ensure that the applied procedures are correct and released.
- ensure that test equipment and instrumentation is regularly maintained and calibrated.
- ensure that QC Protocols are kept up-to date and correctly archived.
- ensure that deviations from specification are communicated to and clarified with Installation representative and SPL/WPL.
- ensure that NCRs are dealt with and closed.

Summary

- **Successful start of installation** for Early Science and First science in Q1/Q2 2024.
- **PULL Team** and installation readiness review to coordinate overall processes - have become established processes.
- **LCM coordination** central tool for detail coordination and progress control – has become an established process.
- Resources demand on technical departments will increase in line with increased work density in the FAIR buildings.
- Ramping up to 55 by Q4 2024 (now Q1 -2025) for limited duration engagement.

Final Message

2024/25

Konzepts, Construktion, Procurement, Testing

Installation

Early Science

HEBT

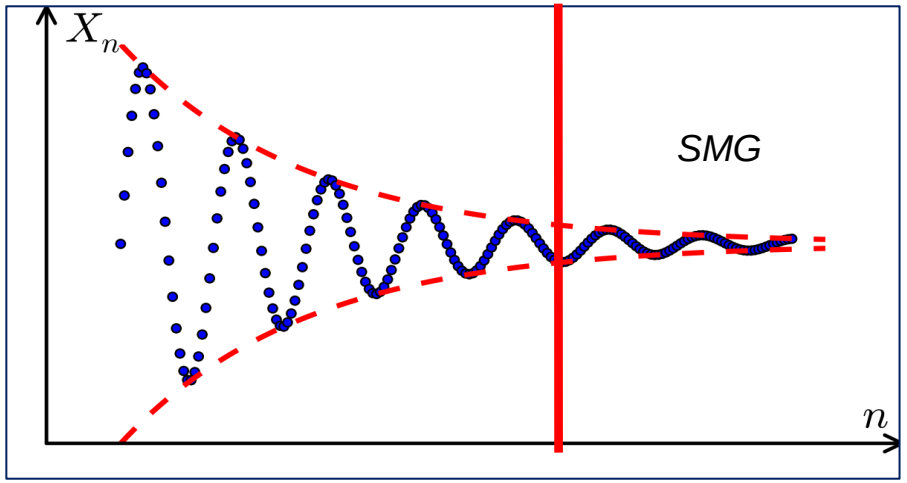
S-FRS

NUSTAR

First Science +

SIS100

CBM



Convergence from a construction phase to an installation phase of complex technologies.

A new focus is required.

Degrees of freedom are diminishing.

Process stability is becoming even more important.

Thank you for your attention