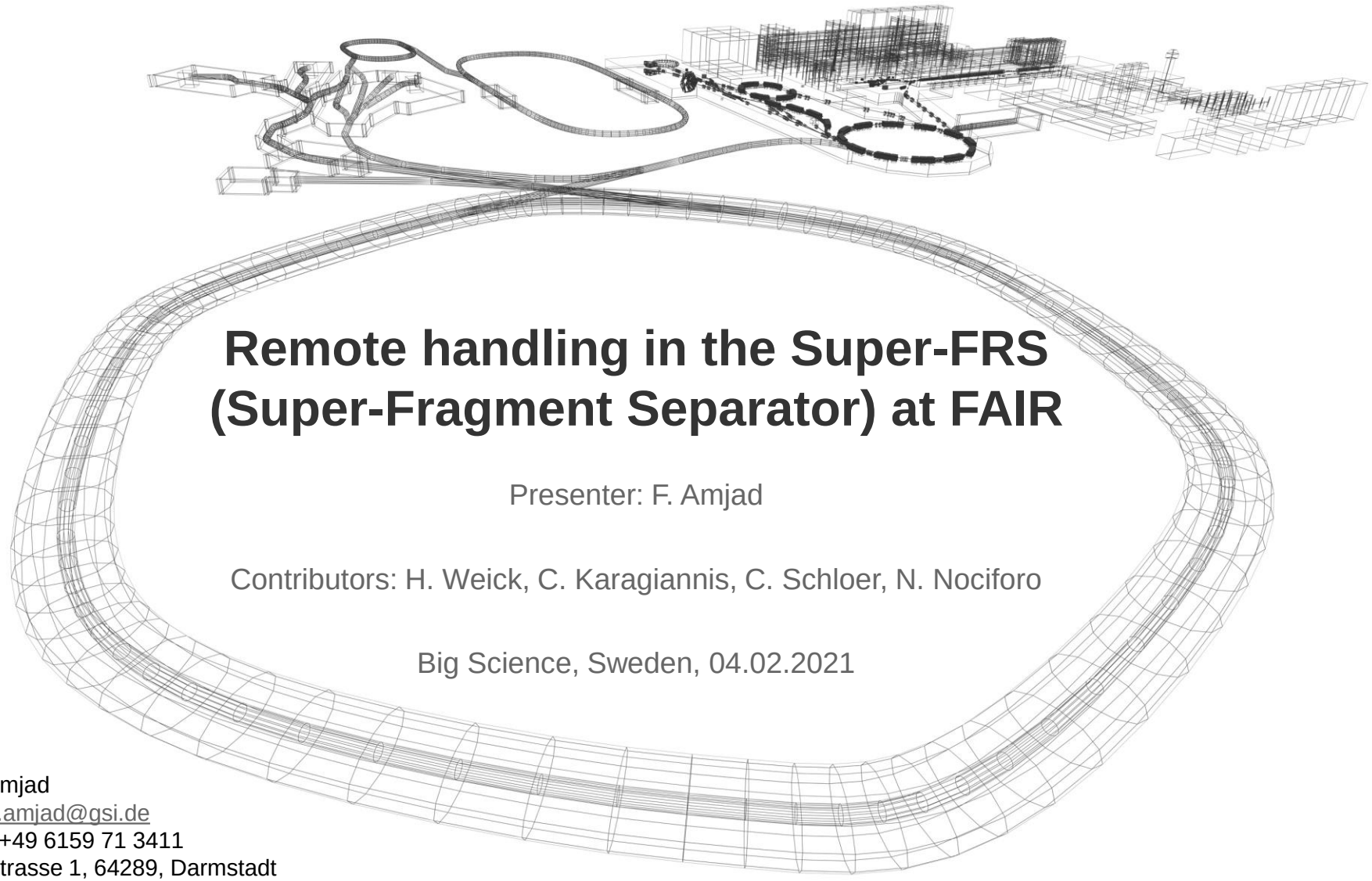

Remote handling in the Super-FRS (Super-Fragment Separator) at FAIR

Presenter: F. Amjad

Contributors: H. Weick, C. Karagiannis, C. Schloer, N. Nociforo

Big Science, Sweden, 04.02.2021

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Planckstrasse 1, 64289, Darmstadt

Agenda

- Introduction to GSI and FAIR
- Status of the construction site
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- Target area remote handling
- Hot-Cell facility at Super-FRS
- **Mobile robot system**
- FAIR RH projects status

GSI GmbH – Helmholtzzentrum für Schwerionenforschung
FAIR GmbH – Facility for Antiproton and Ion Research

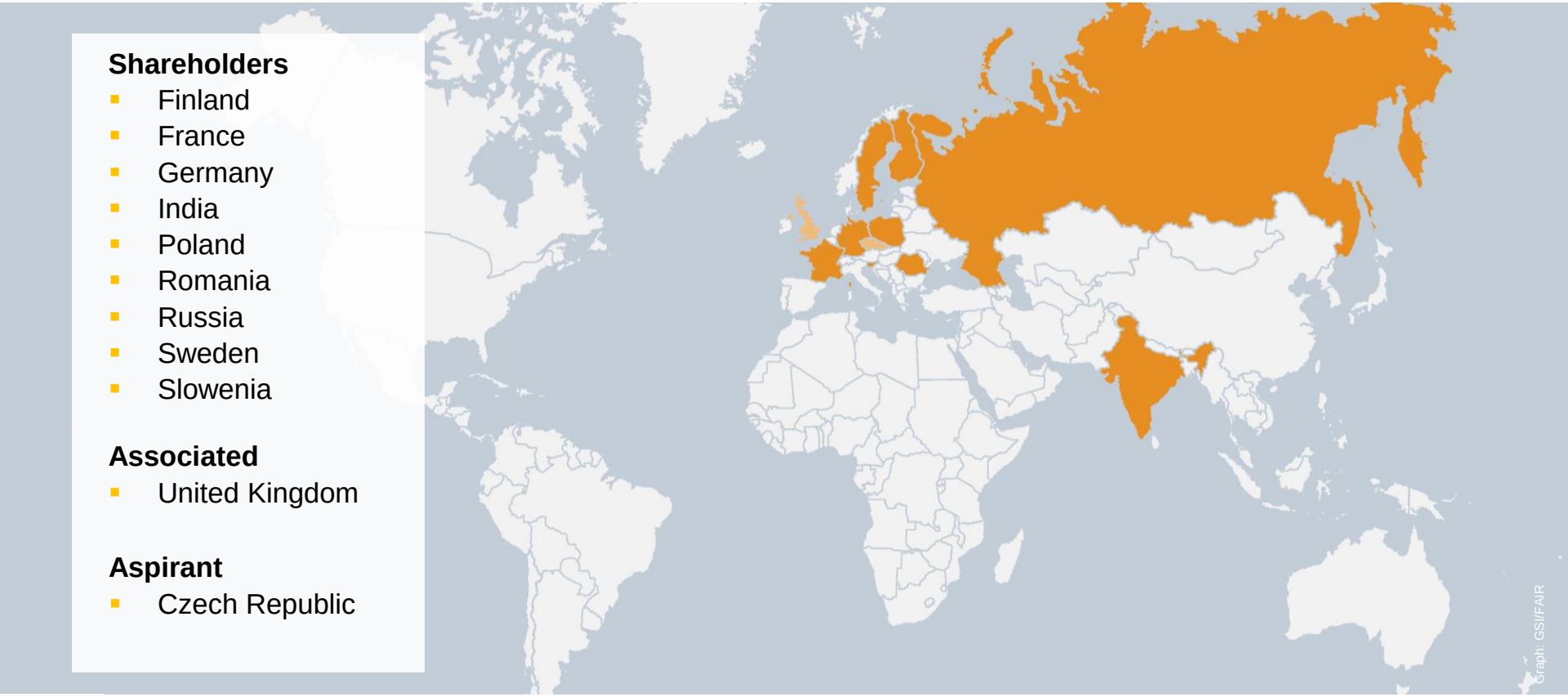
- Existing facility: GSI Darmstadt (Foundation: 1969)
- Shareholders: federal government (90%), Hesse (8%), Rhineland-Palatinate (1%), Thuringia (1%)
- Further locations in Mainz and Jena
- Future facility: FAIR (Foundation: 2010)
- Employees on campus: approx.1,450
- Ground breaking: July 2017

Shareholders worldwide

Shareholders
- Finland
- France
- Germany
- India
- Poland
- Romania
- Russia
- Sweden
- Slowenia

Associated
- United Kingdom

Aspirant
- Czech Republic



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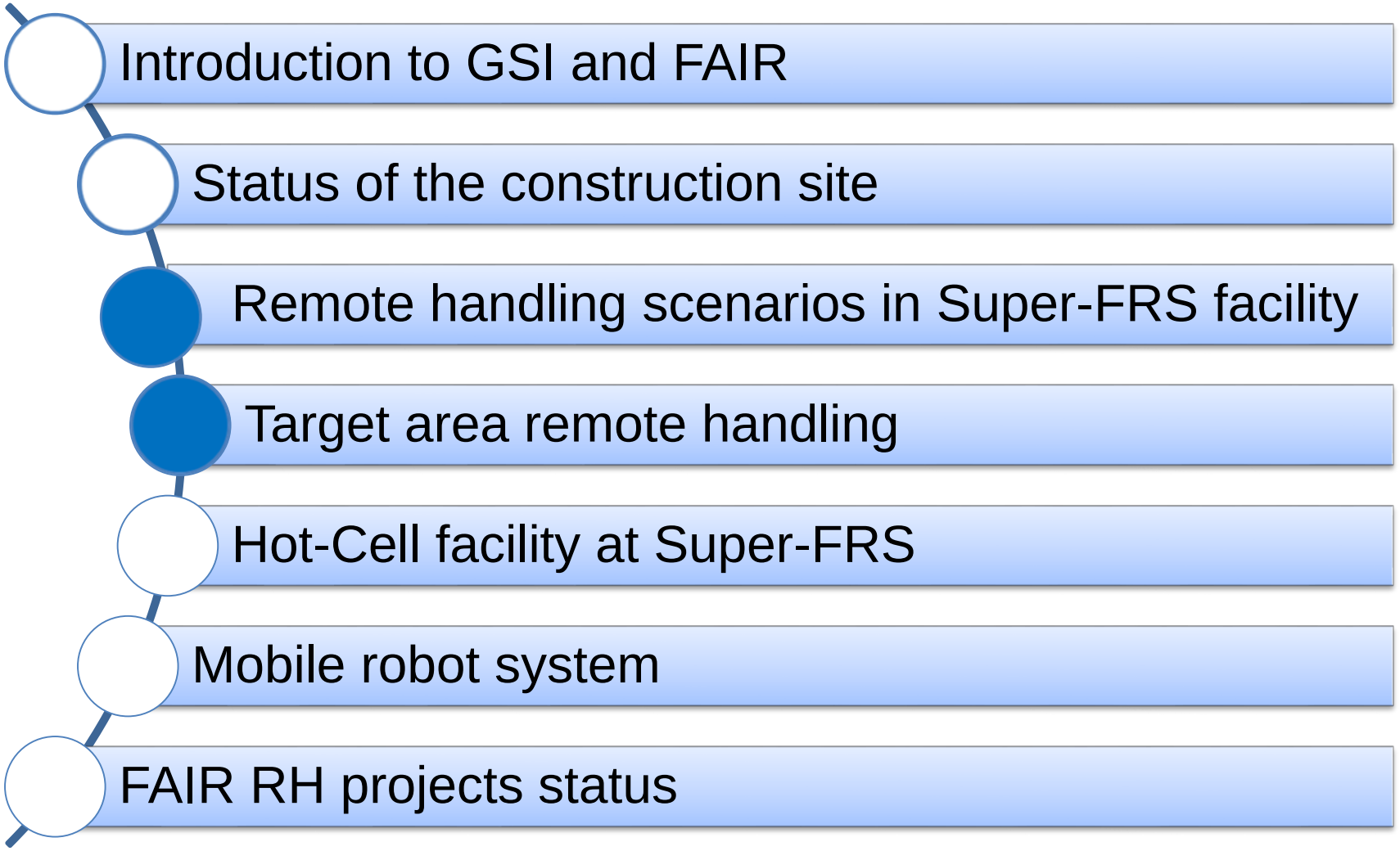
Status: Construction of the FAIR Southern Area (Started 2020)

SIS 100

pbar Target Building

Super-FRS Target Building

Agenda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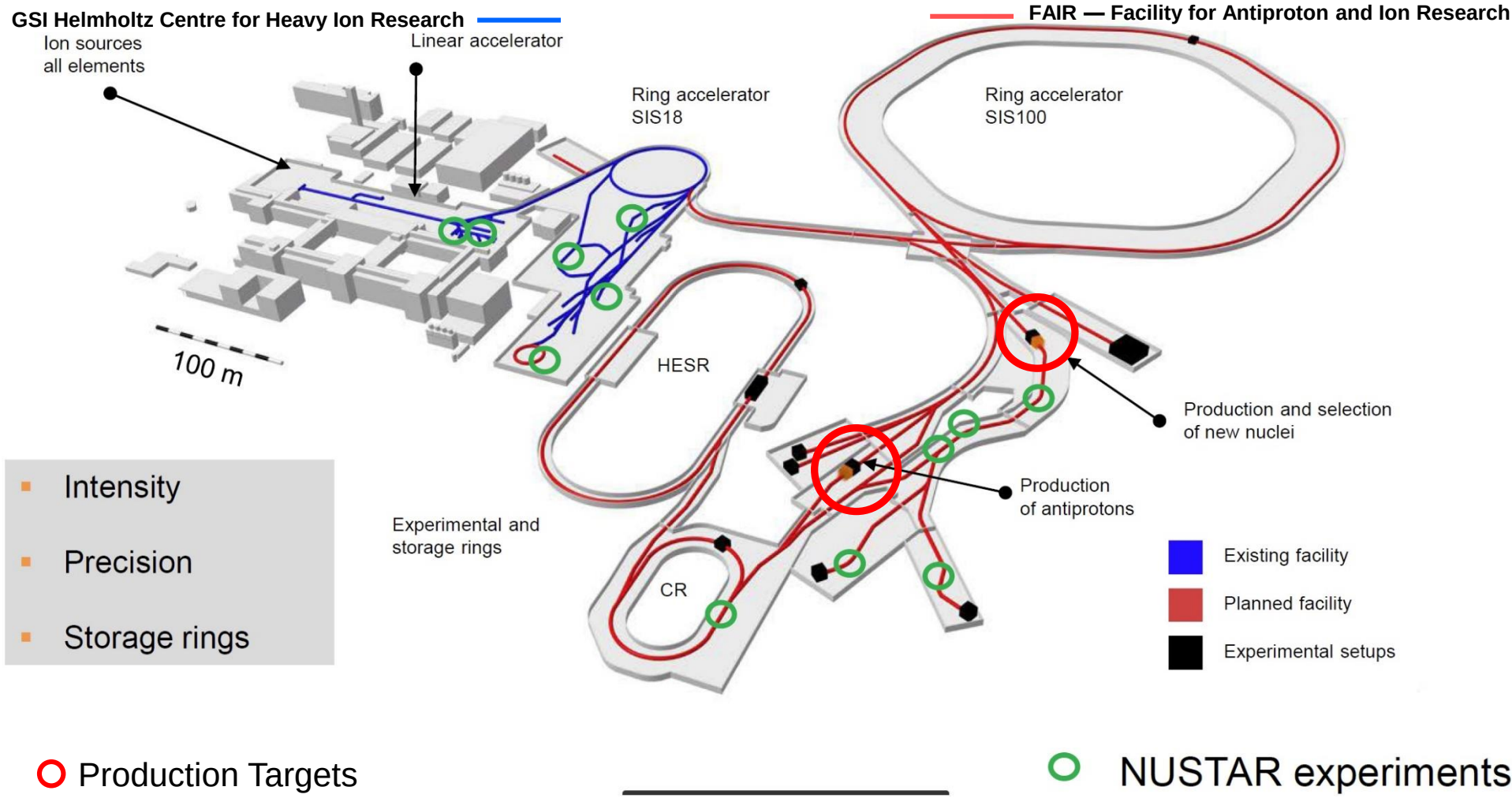
FAIR, Super-FRS and NUSTAR

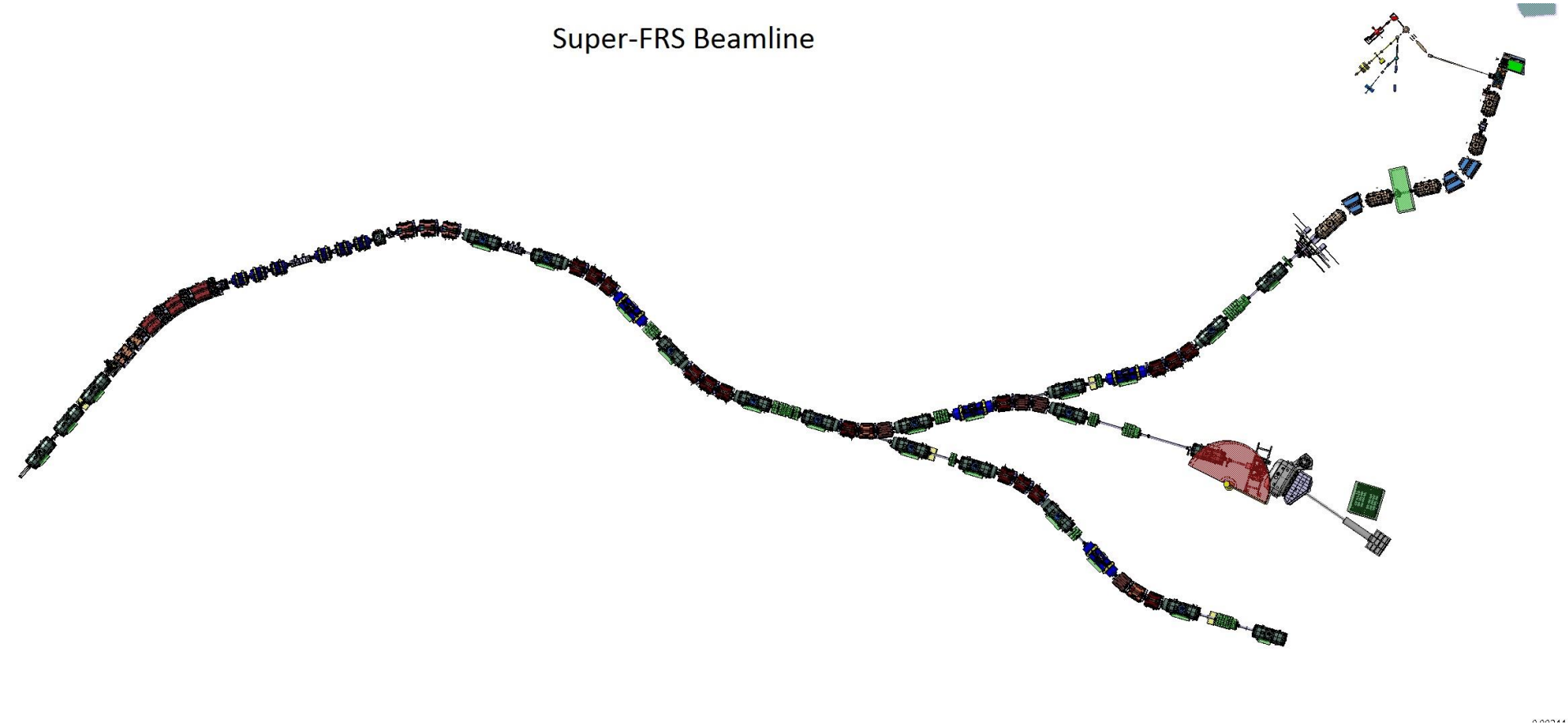


- Intensity
- Precision
- Storage rings

Production Targets

NUSTAR experiments

Super-FRS Beamline



Super Fragment Separator (Super-FRS) Facility

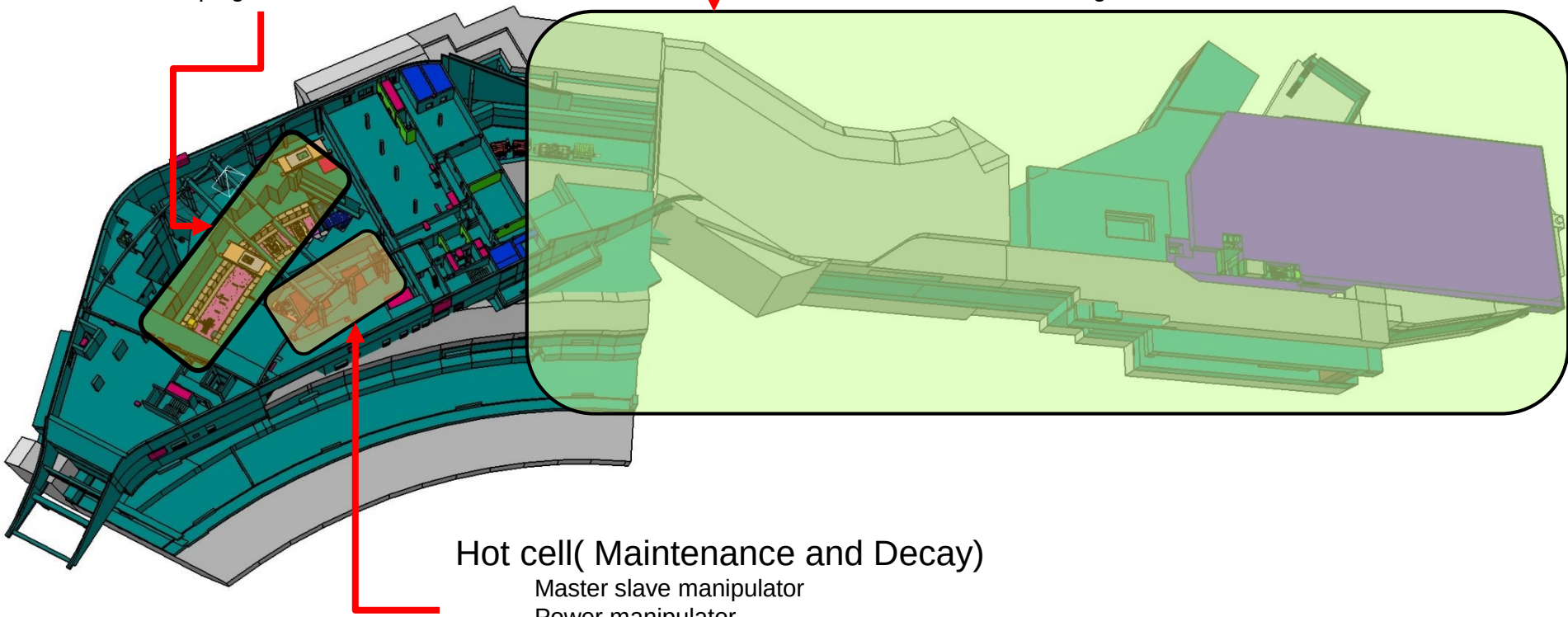
Super-FRS facility (320m long) Remote Handling (RH)

Target Area (40 m tunnel)

- Closed tunnel (Heavily shielded)
- Shielding flask to conduct RH
- Heaviest plug 8 tons

Main separator (130m tunnel)

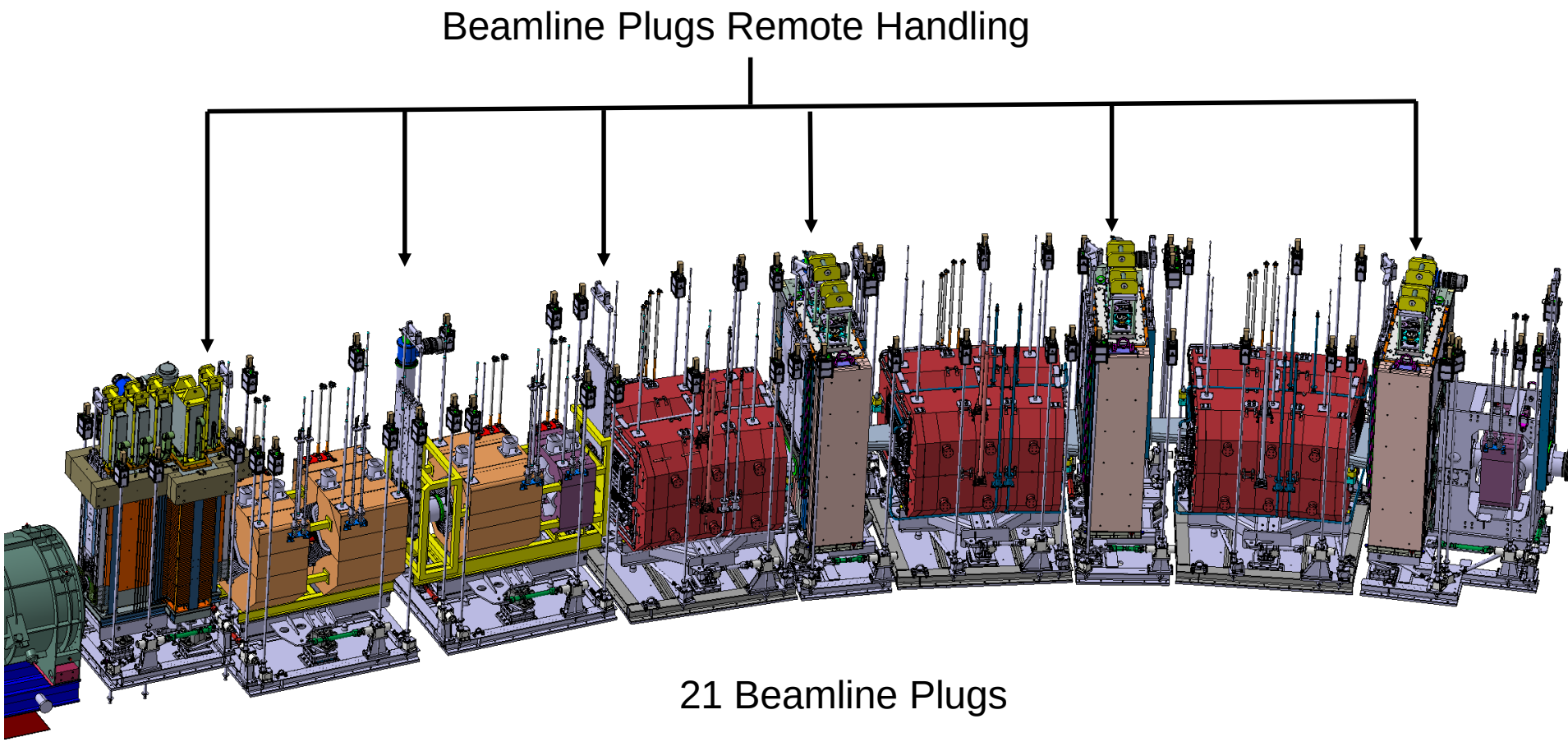
- Open tunnel
- Mobile robot to conduct RH
- Heaviest element 580 kgs



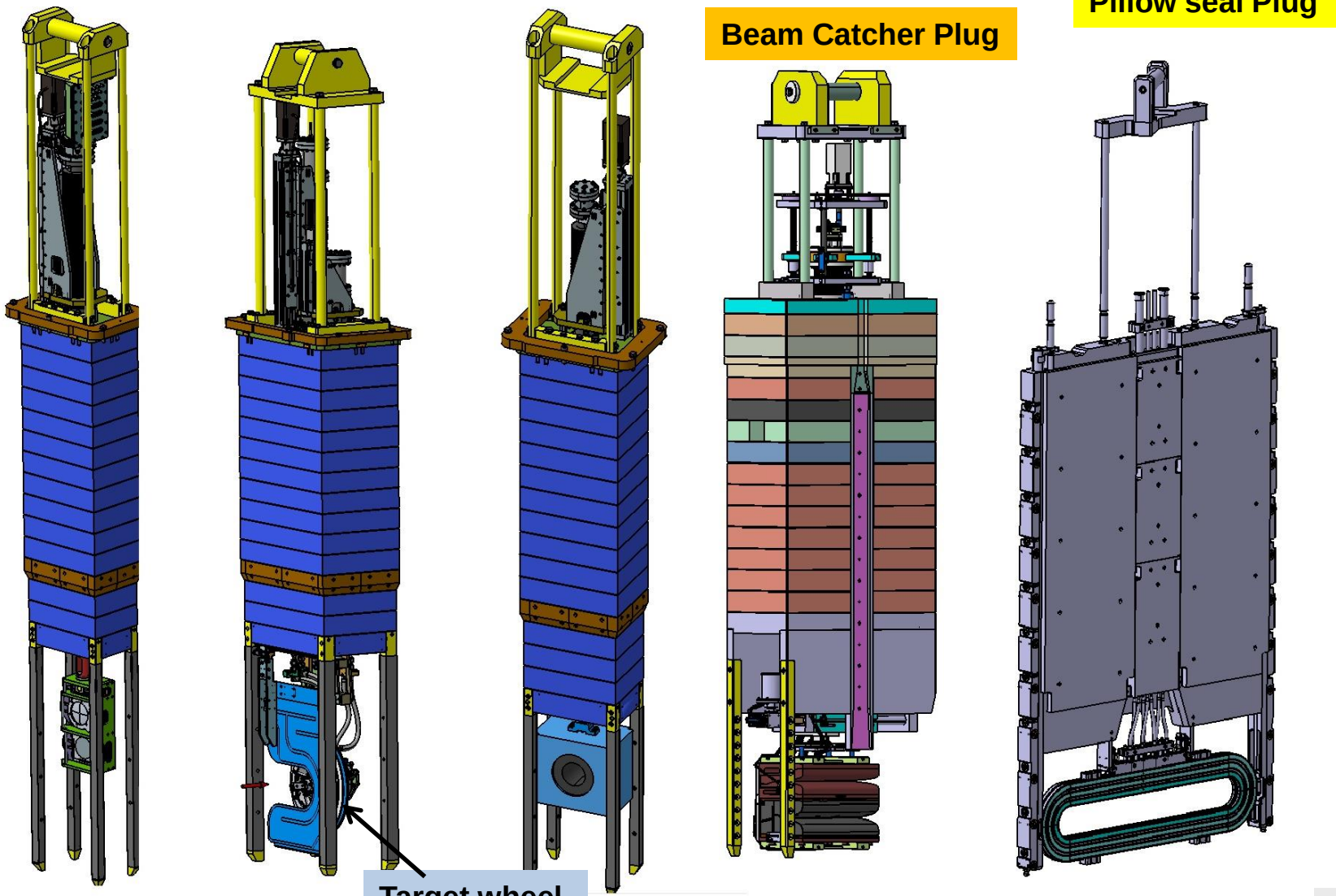
Hot cell(Maintenance and Decay)

- Master slave manipulator
- Power manipulator
- Rotating table
- Maintenance tooling

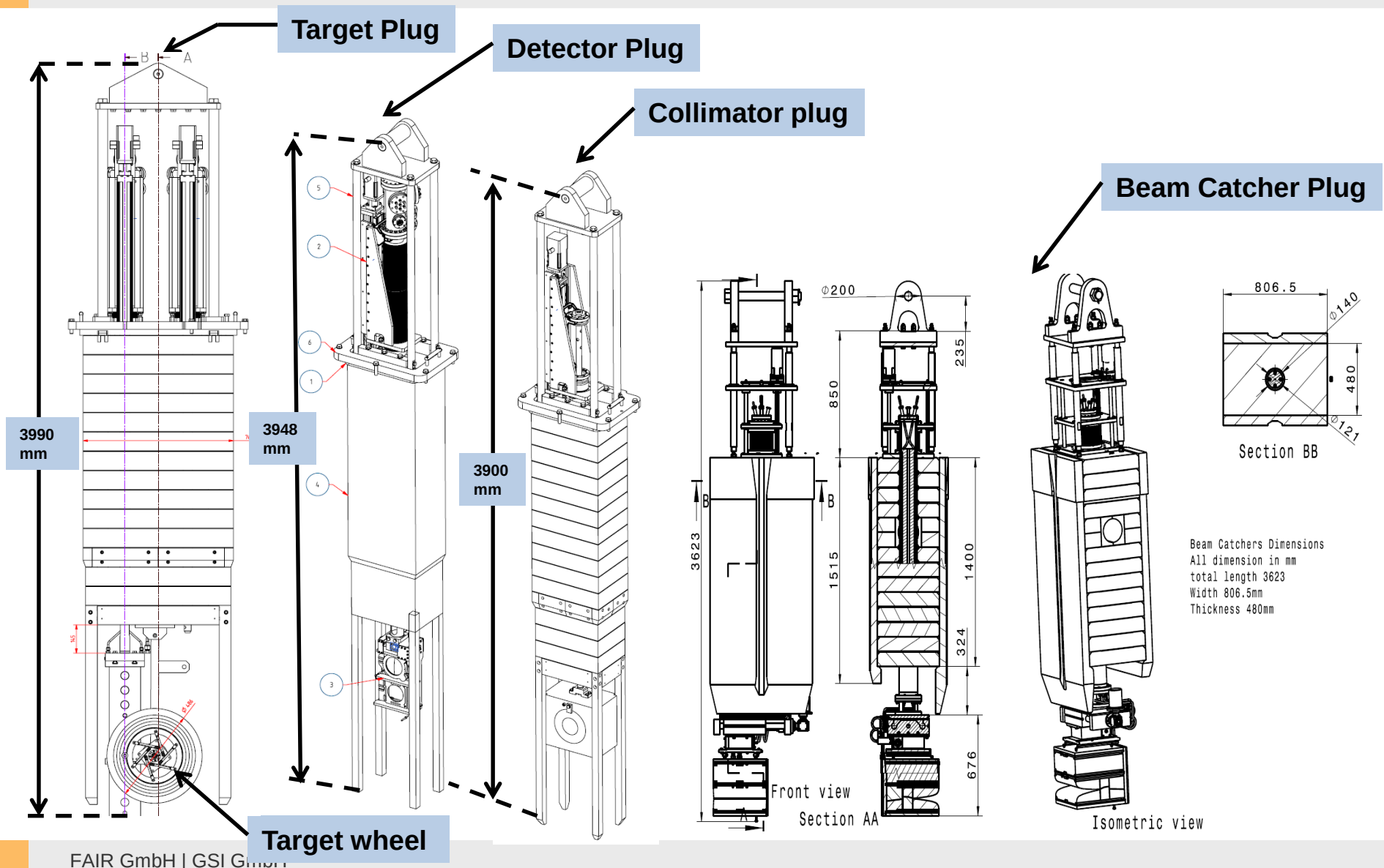
Target Area Beamline



Super-FRS Beamline plugs (21 plugs) Designed for Remote Handling



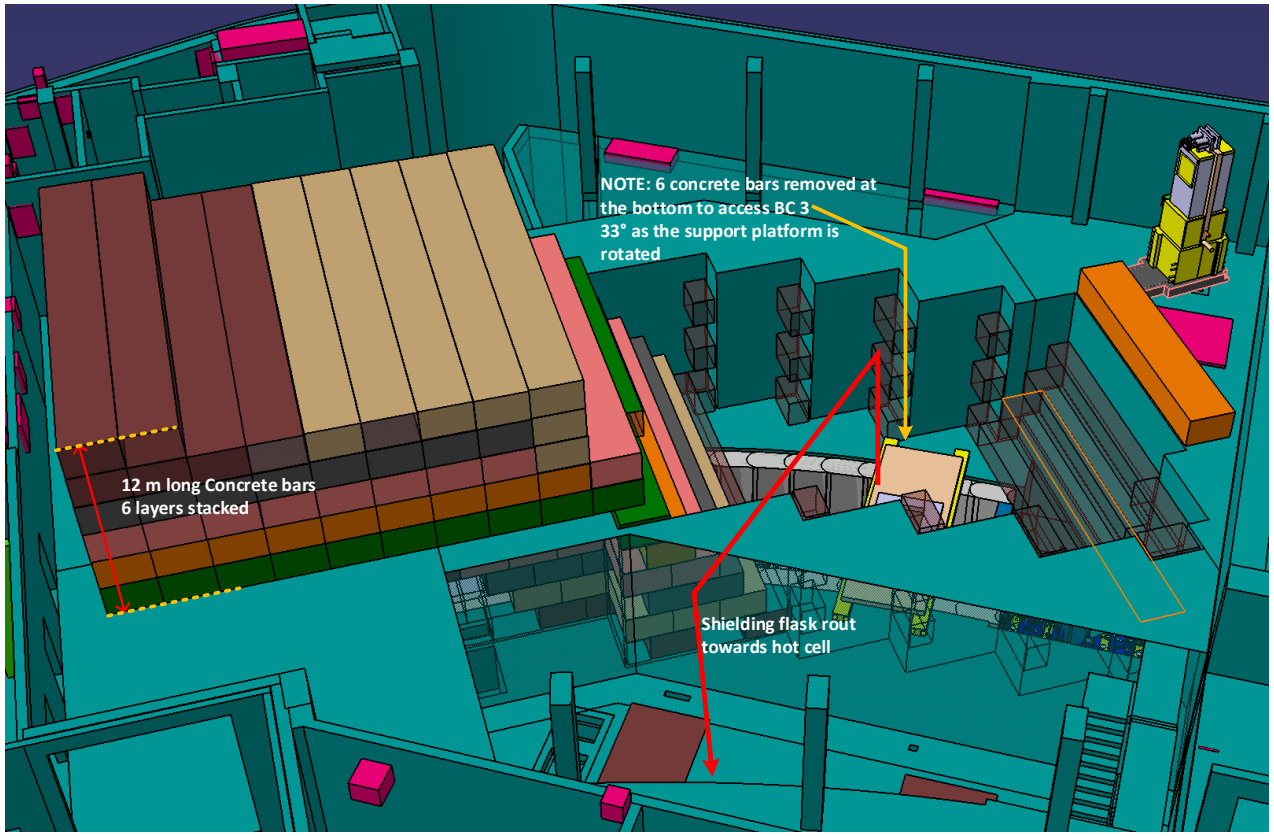
Super-FRS target area plug remote handling requirements

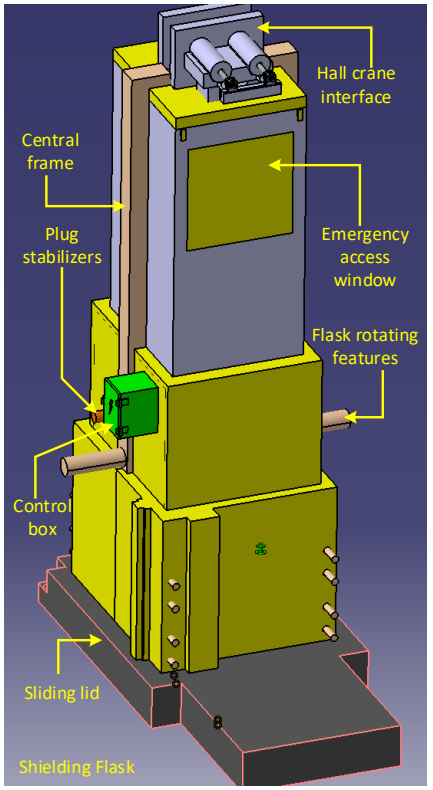


Target Area RH Setup

Target Area (40 m tunnel)

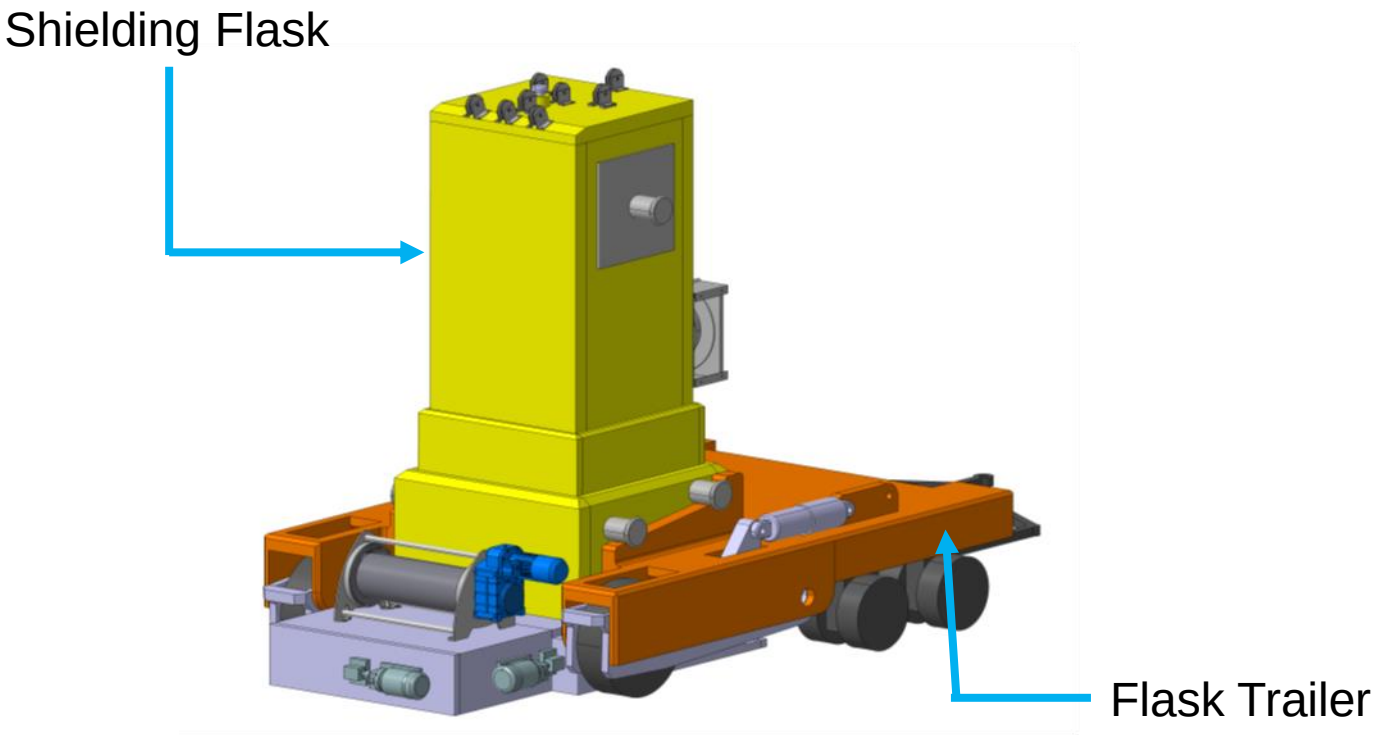
- 21 plugs positions that requires RH (8 tons heavy activated plugs)
- 60 Tons shielding flask
- 40 Tons of support platform for positioning (5 positioning configurations)



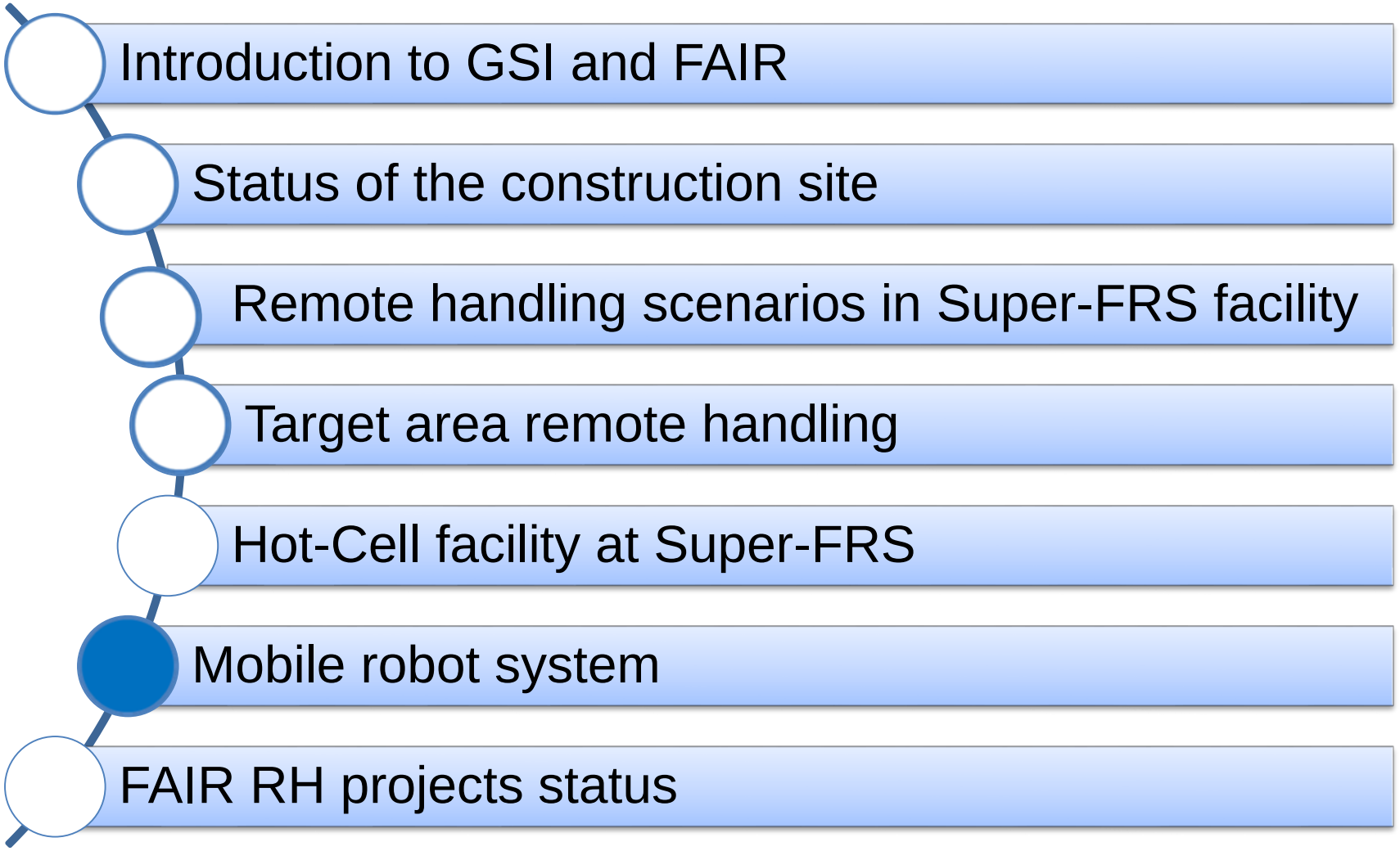


Shielding Flask

pbar Shielding Flask



Agenda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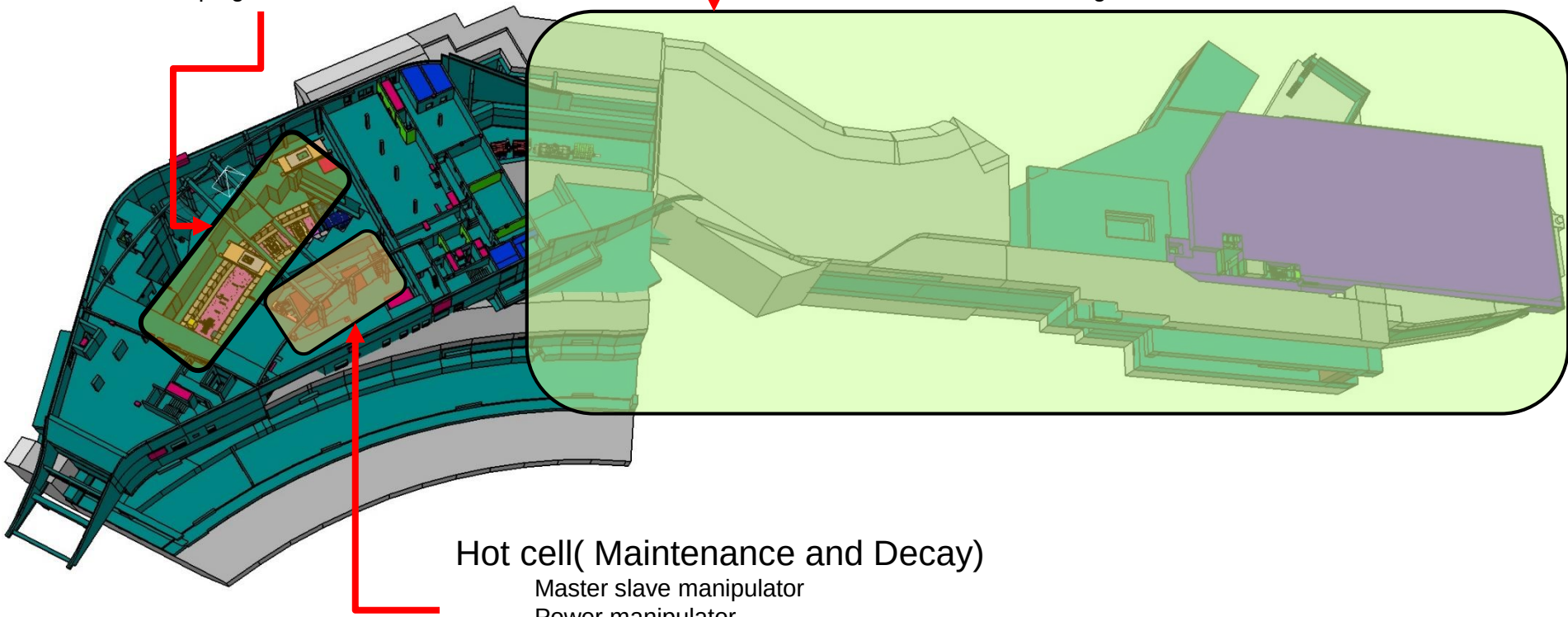

Hot cell(Maintenance and Decay)

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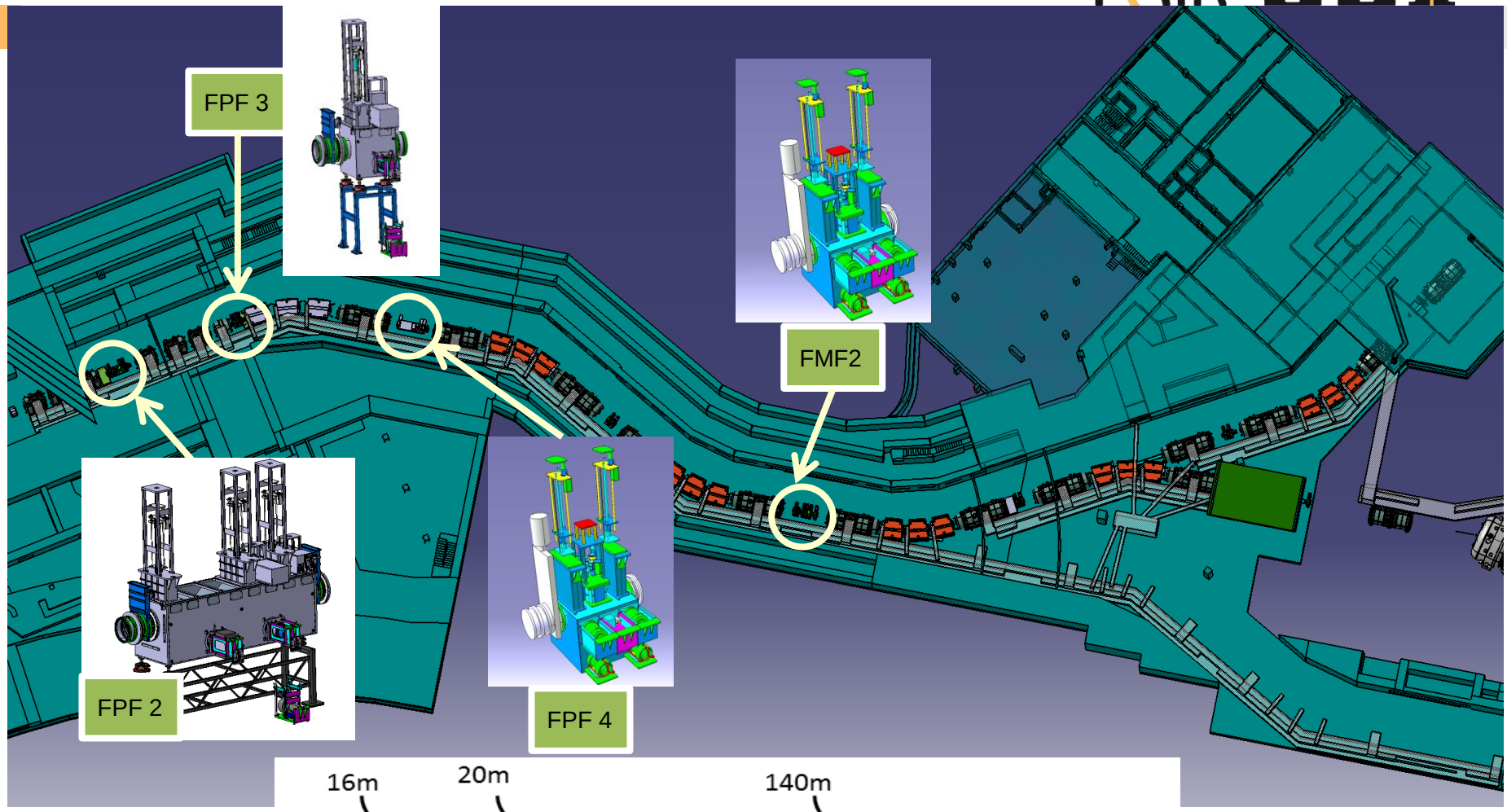
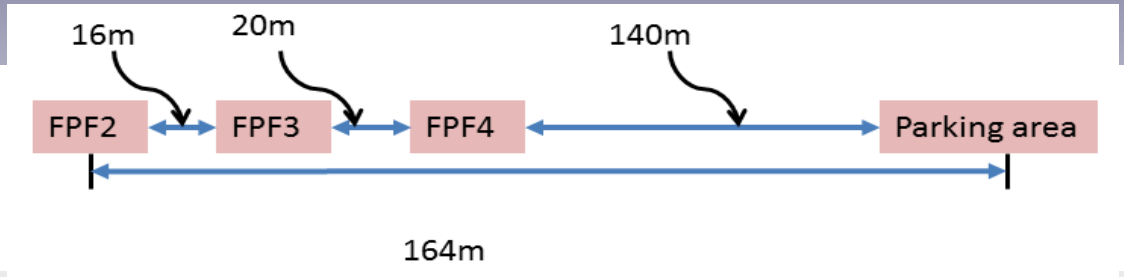
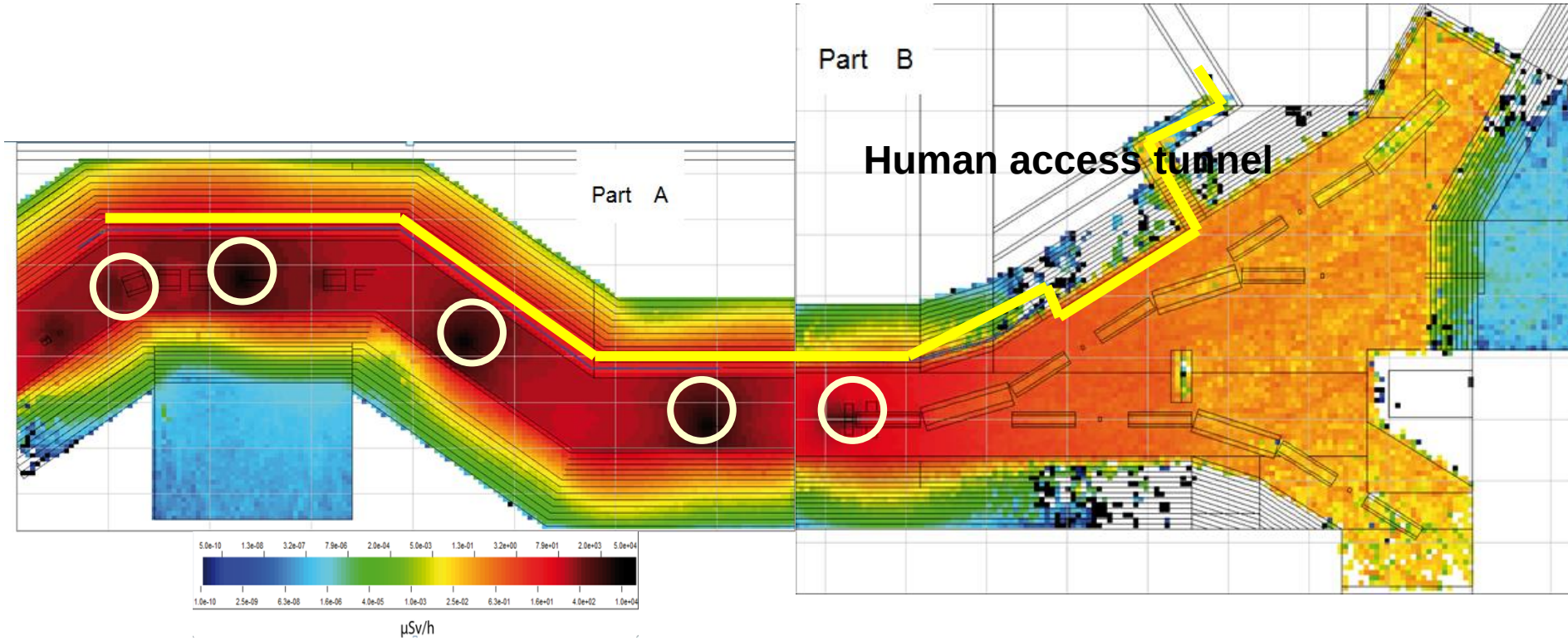
Super-FRS Remote handling scenario
Mobile Robot





Super-FRS Remote handling scenario (Radiation Environment)

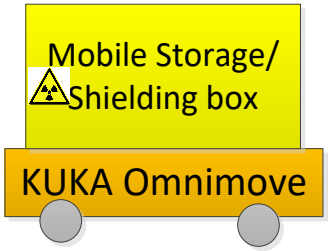


On average one person can get 1.5 mSv to 2.93 mSv dose per beamline insert replacement. Remote handling system is required here to replace, transport and store the beamline insert.

Super-FRS Remote handling scenario (open tunnel) Concept design

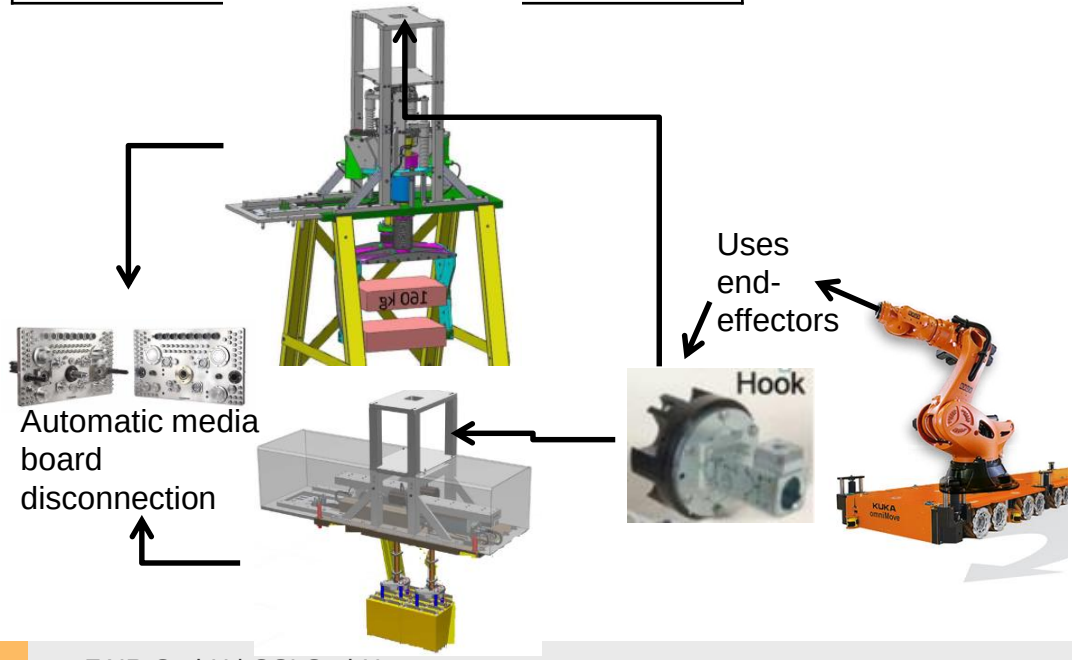
Mobile robot RH system

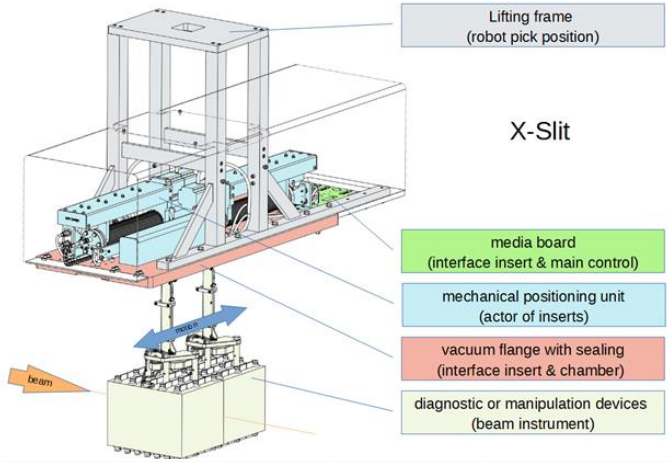
- Six axis (KUKA titan) robot to perform remote manipulation.
- Mobile platform (KUKA omnimove / AGV) that can transport robot in-between parking position to maintenance region.
- Mobile shielding container to transport activated beamline inserts.
- Power supply, navigation and parking system.
- Automatic media board connection



Local Storage (onsite)

Remote Handling of beamline inserts (X and Y slits) example

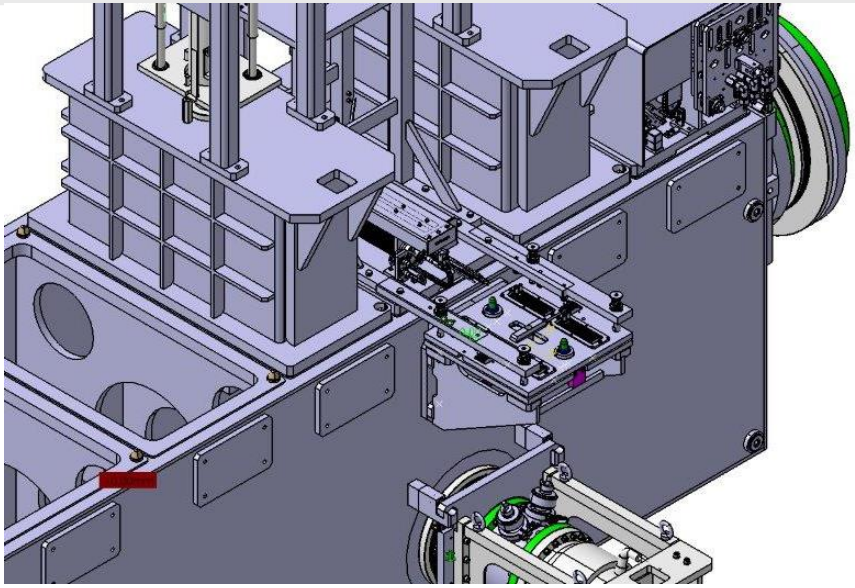


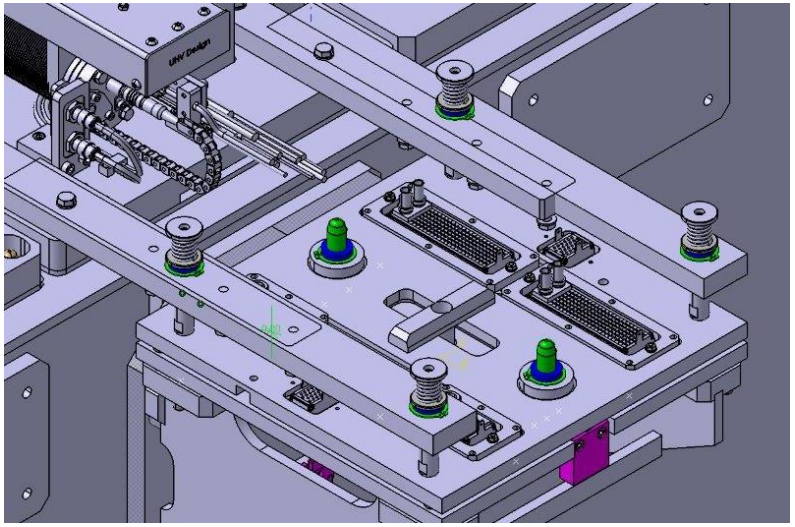


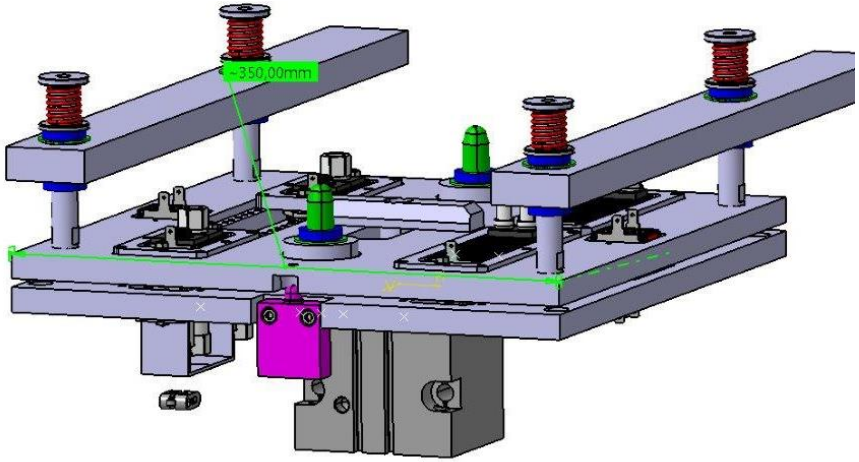
Slit X	495kg	390mm	1170mm

C. Schloer

Media board in house developed (Already being tested at GSI)







C. Schloer

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FAIR RH projects status and outlook

- Super-FRS shielding flask
  - Awarded in late 2020
  - BILFINGER NOELL GMBH
- Mobile robot system for remote nandling (Future)
  - Mobile robot systems (6 axis robot and AGV omnimove)
  - Remote operation of the system
  - Positioning across the tunnel
  - Storage and transportation of active plugs
- Hot cell in requirements (Chris presentation)
- Collaboration with GSI experts.
- Testing at GSI facilities.
- Link to GSI website
- https://www.gsi.de/en/work/administration/einkauf_und_materialwirtschaft/ausschreibungen.htm

Thank you for
your attention!
Graph: ion42/FAIR