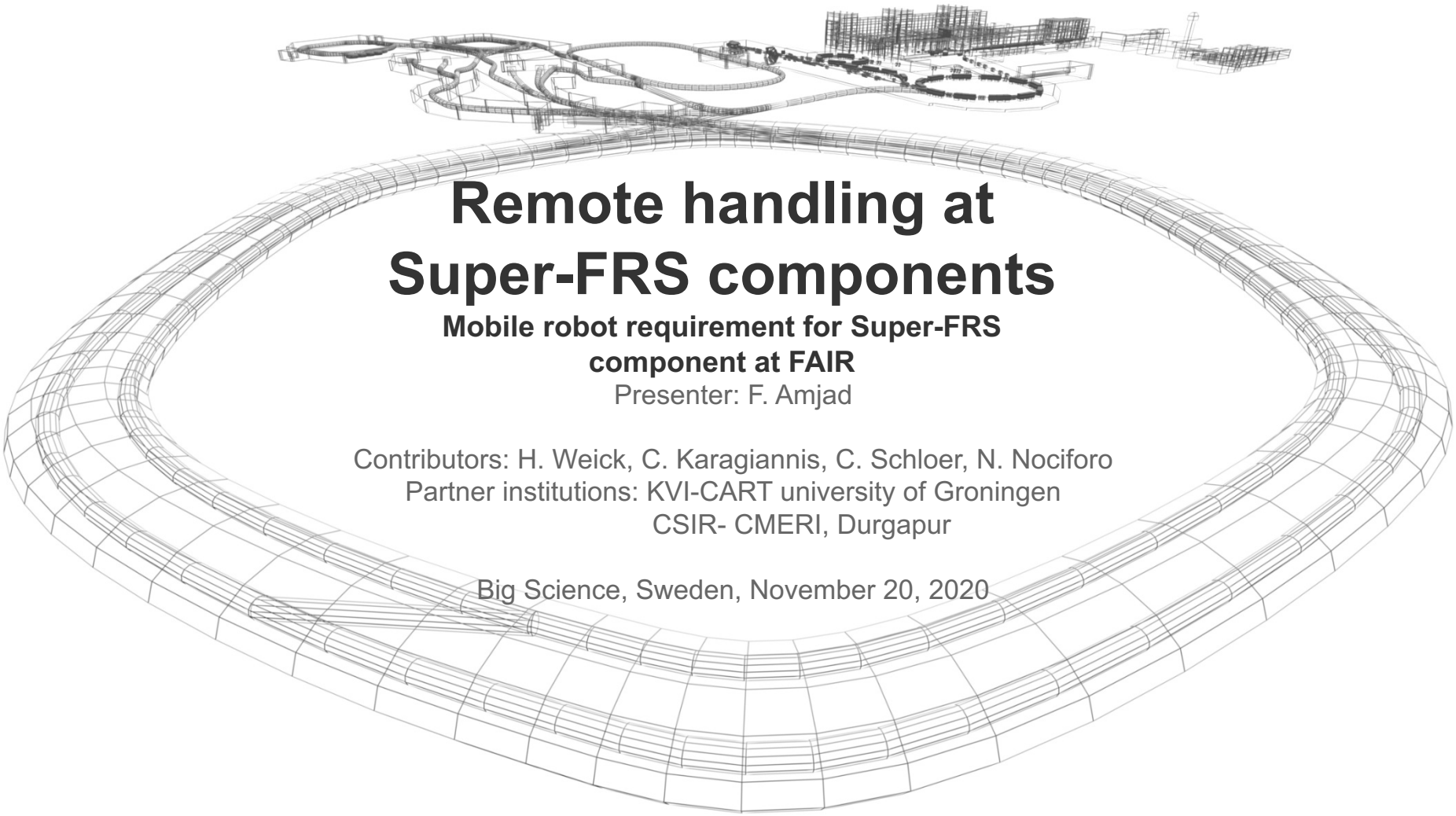


Remote handling at Super-FRS components

Mobile robot requirement for Super-FRS component at FAIR

Presenter: F. Amjad

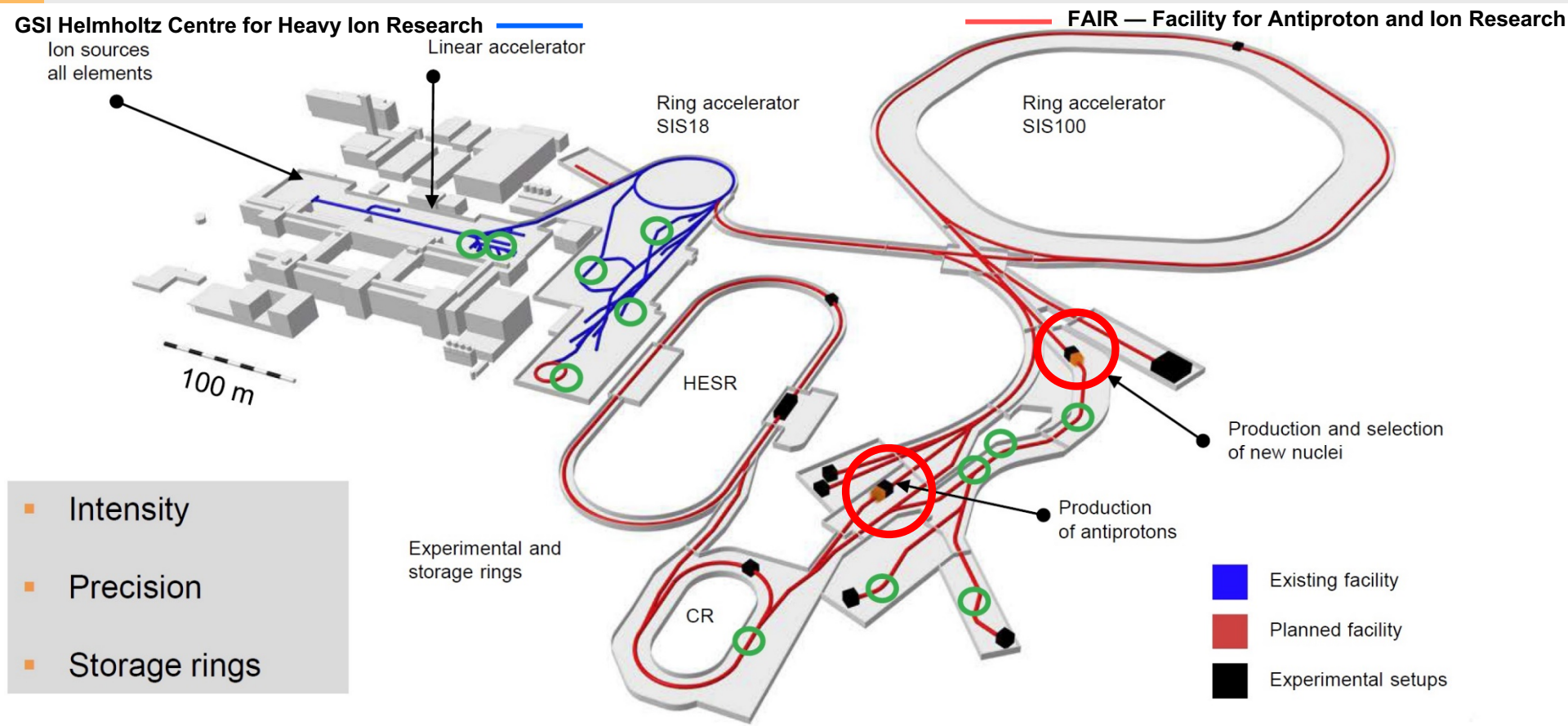
Contributors: H. Weick, C. Karagiannis, C. Schloer, N. Nociforo
Partner institutions: KVI-CART university of Groningen
CSIR- CMERI, Durgapur

Big Science, Sweden, November 20, 2020

Presentation Outline

- Introduction to FAIR
- Status of the construction site
- Remote handling scenarios in Super-FRS facility
  - Target area remote handling
  - Hot-Cell facility at Super-FRS
  - **Mobile robot system**
- FAIR future RH projects outlook

FAIR, Super-FRS and NUSTAR



- Intensity
- Precision
- Storage rings

Production Targets

NUSTAR experiments

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

Super Fragment Separator (Super-FRS) Facility

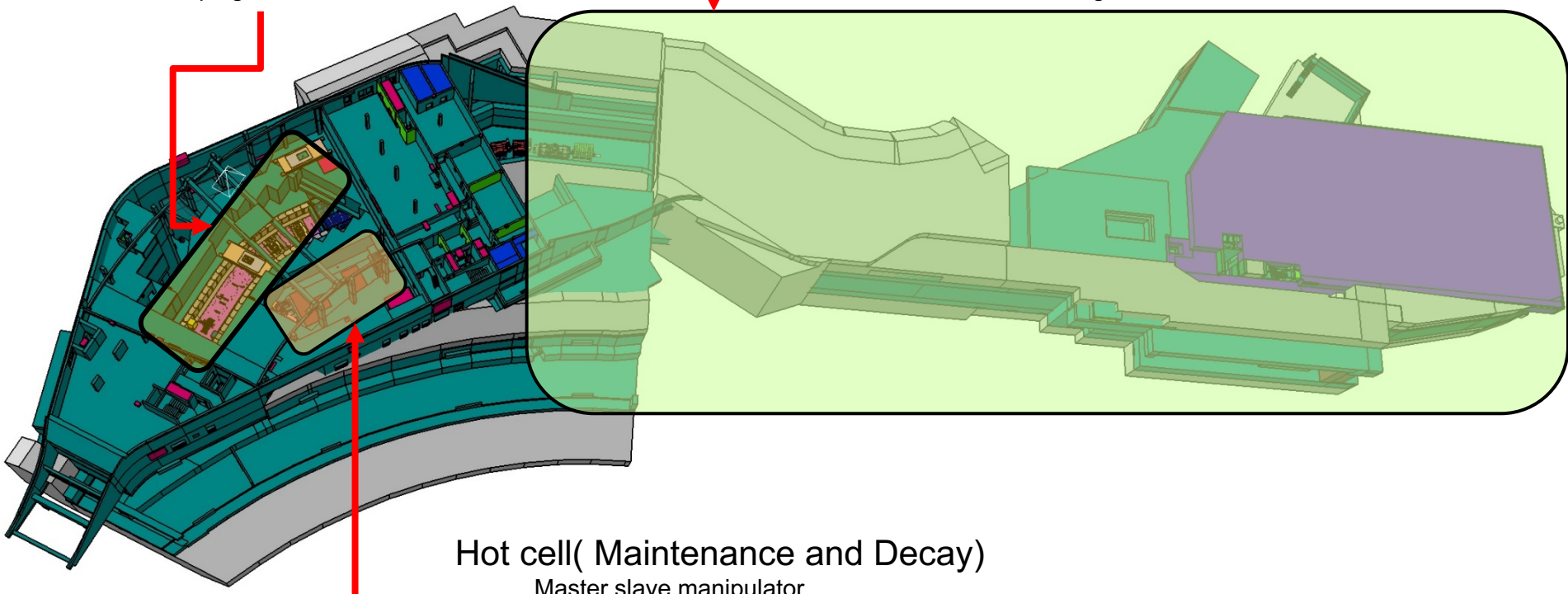
Super-FRS facility (320m long) Remote Handling (RH)

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



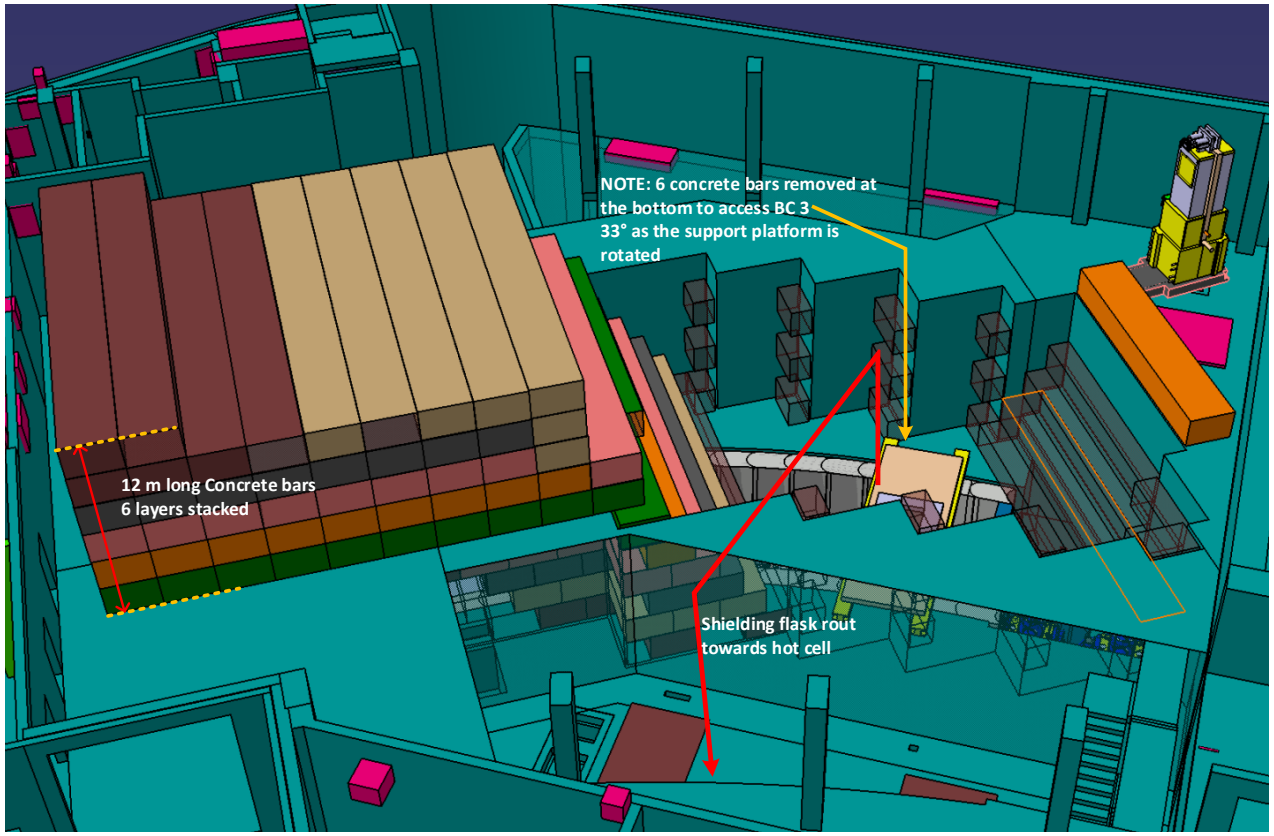
Hot cell(Maintenance and Decay)

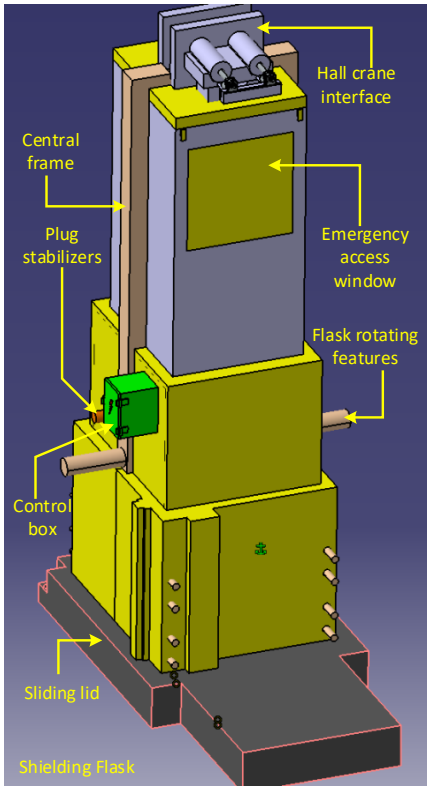
Master slave manipulator
Power manipulator
Rotating table
Maintenance tooling

Target Area RH Setup

Target Area (40 m tunnel)

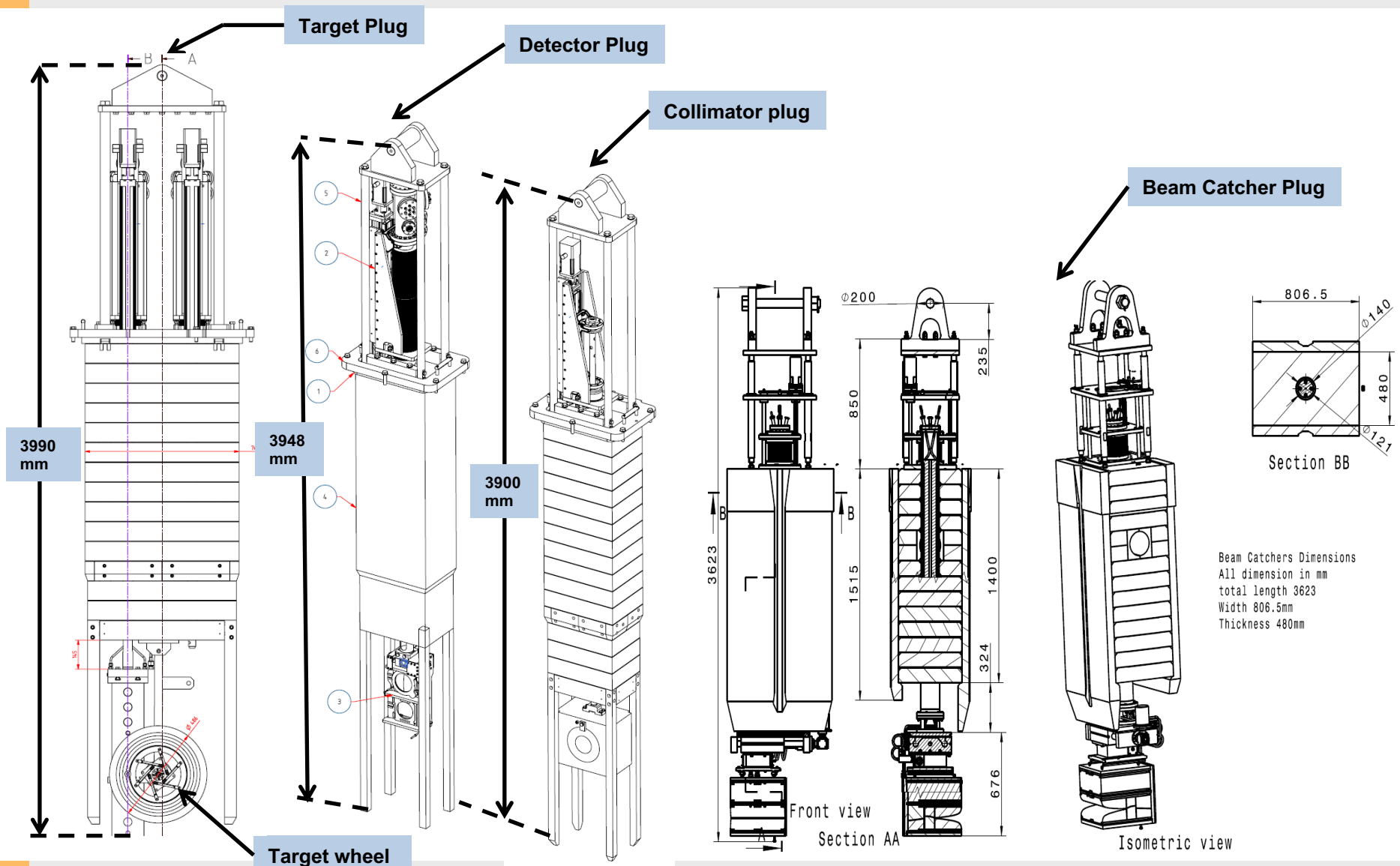
- 22 plugs positions that requires RH
- 60 Tons shielding flask
- 40 Tons of support platform for positioning (5 positioning configurations)



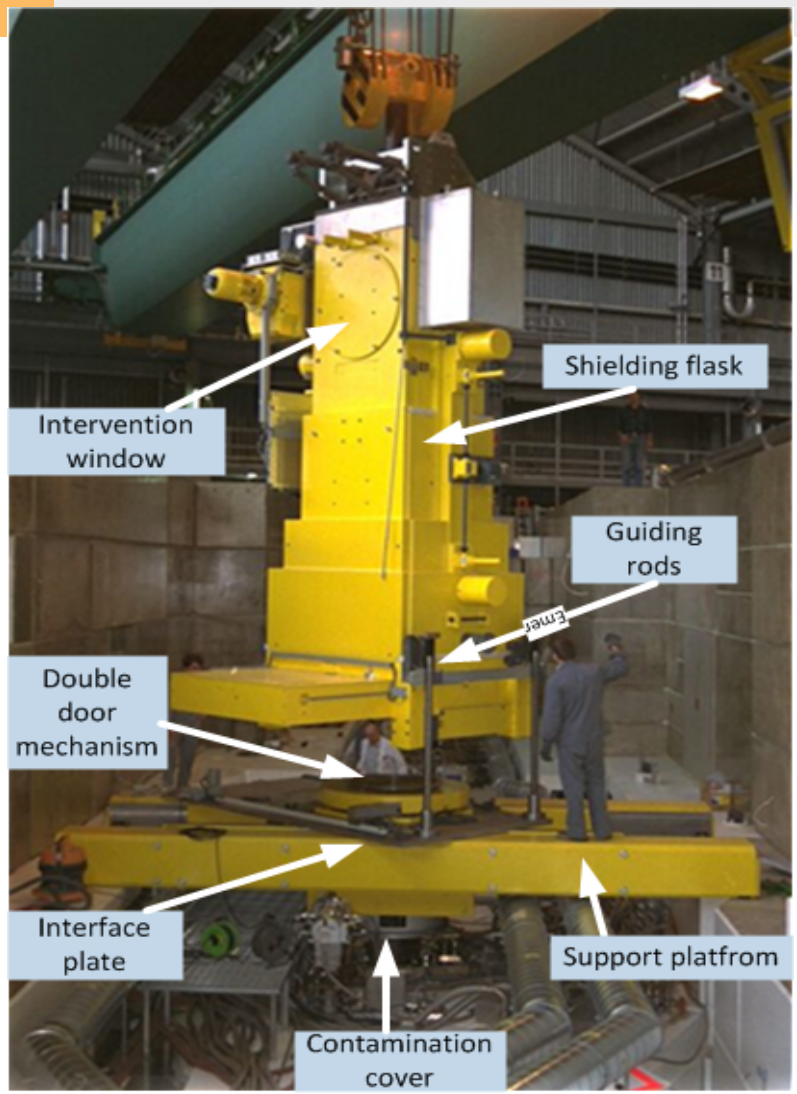


Shielding Flask

Super-FRS target area plug remote handling requirements

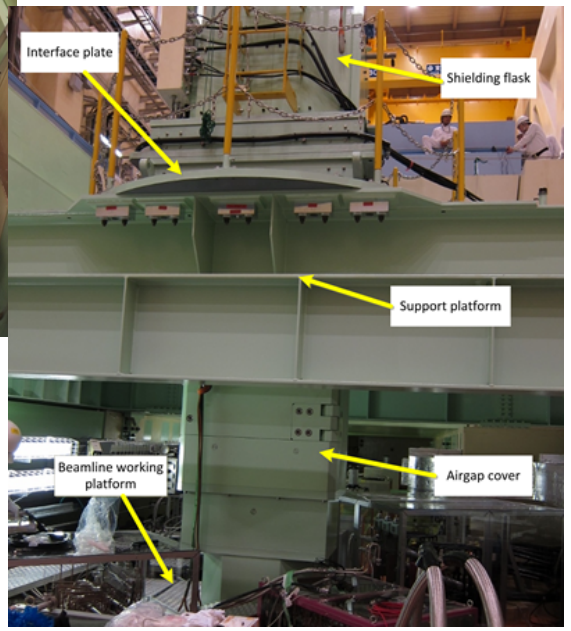


Super-FRS Shielding flask
Examples / Arrangement



PSI shielding Flask

J-PARC shielding Flask

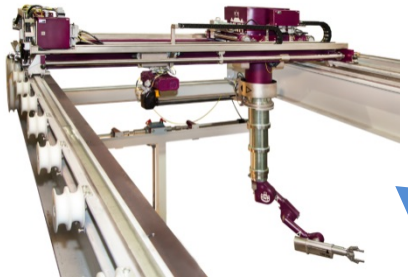


Super-FRS Hot cell

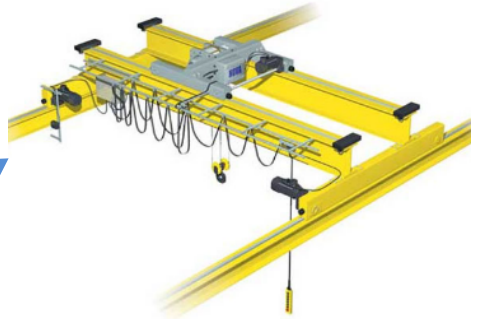
Plug Holder

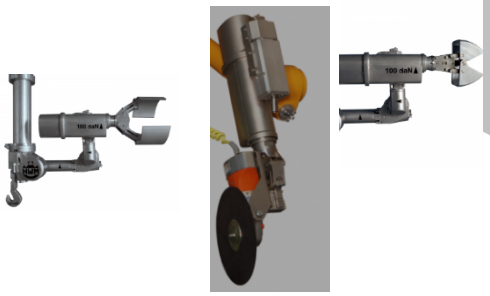
Shielding flask docking position

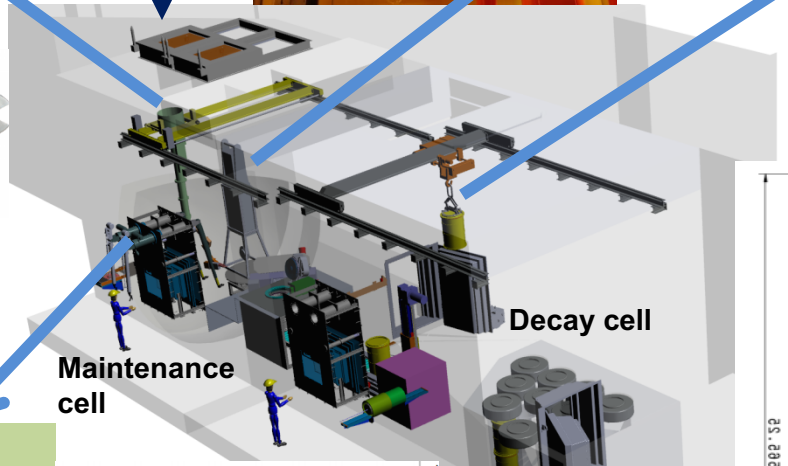
Power manipulator



Indoor overhead crane

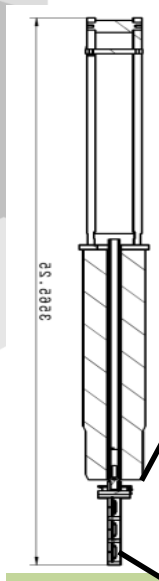




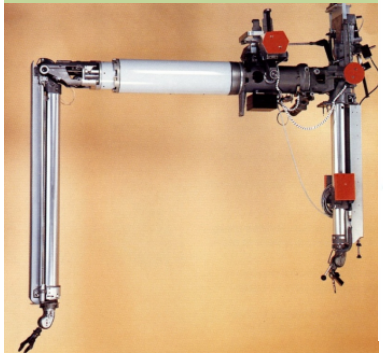


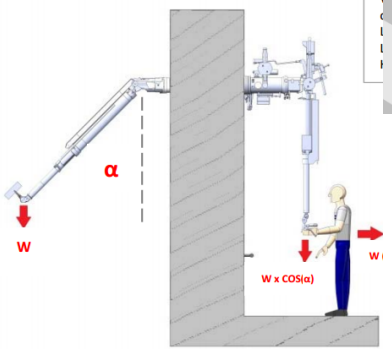
Decay cell

Maintenance cell

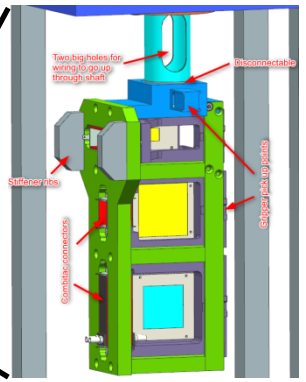


MT200 MSM



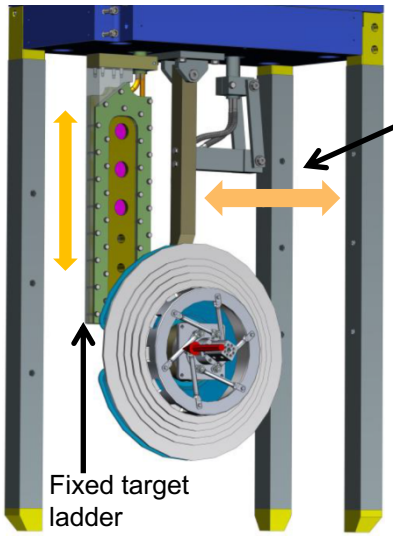


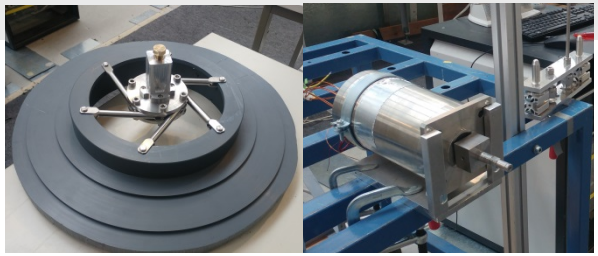
Detector plug



Modular Design

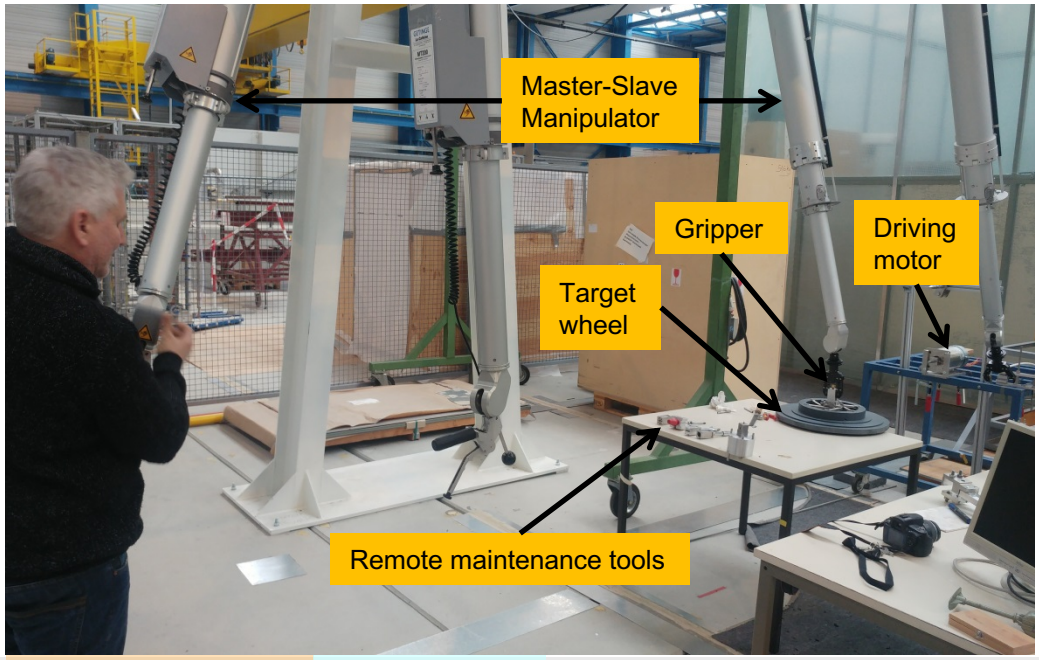
Target Wheel
remote maintenance





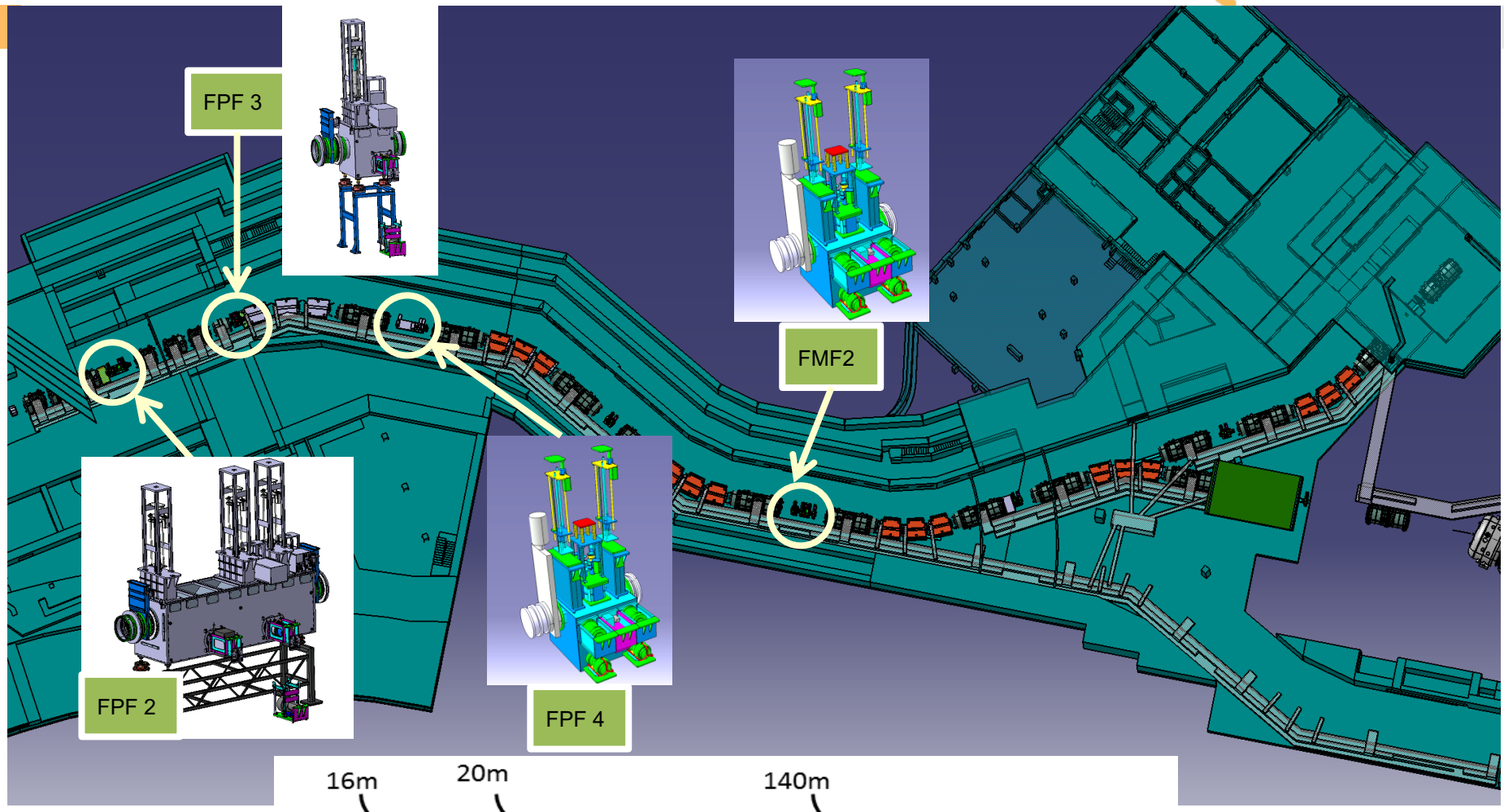
Target wheel and motor in vacuum
(regular replacement)

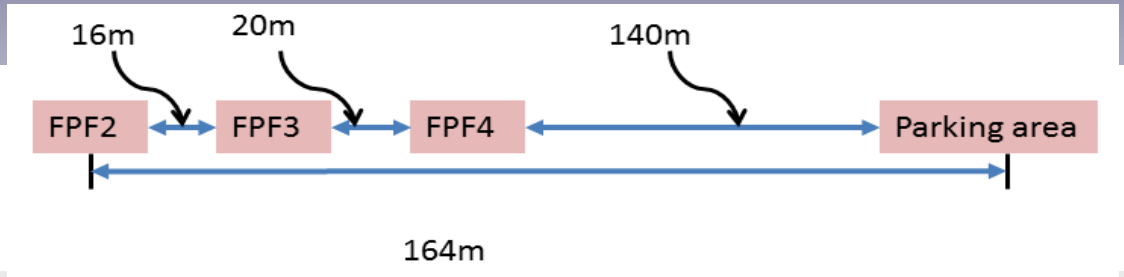
Tool adopted to fit MSM



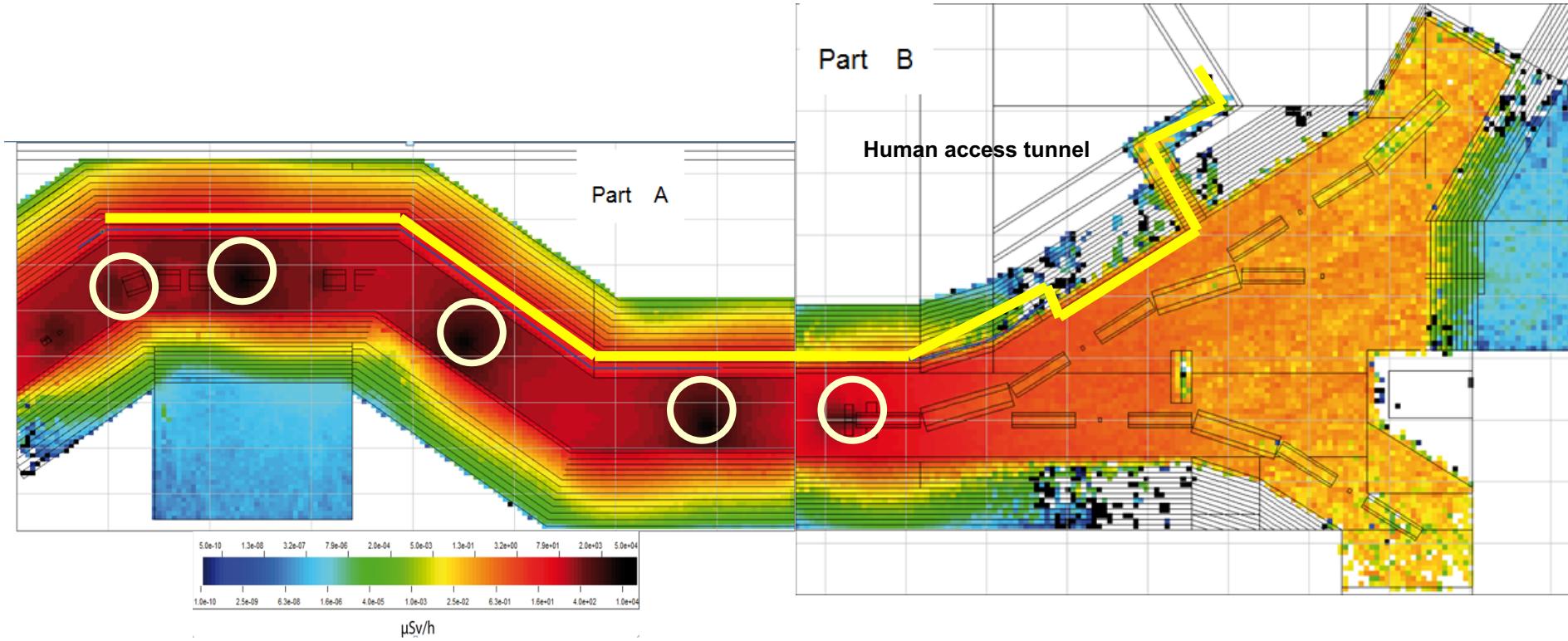
C.Karagiannis

Super-FRS Remote handling scenario
Mobile Robot





Super-FRS Remote handling scenario (Radiation Environment)

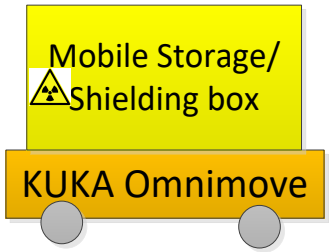


On average one person can get 1.5 mSv to 2.93 mSv dose per beamline insert replacement.
Remote handling system is required here to replace, transport and store the beamline insert.

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

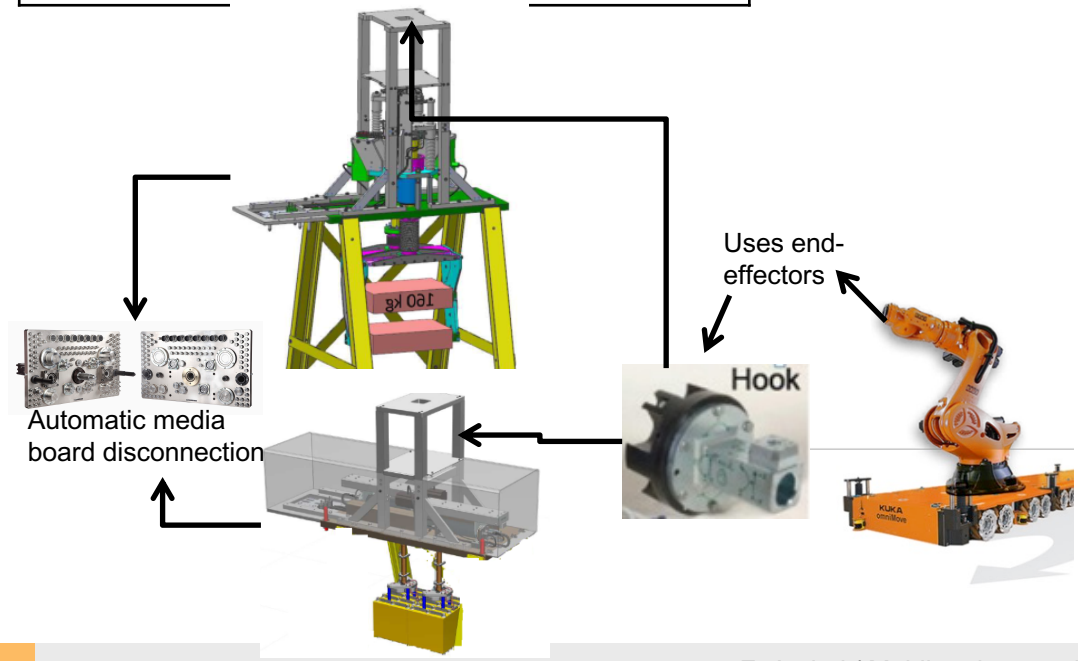
Mobile robot RH system

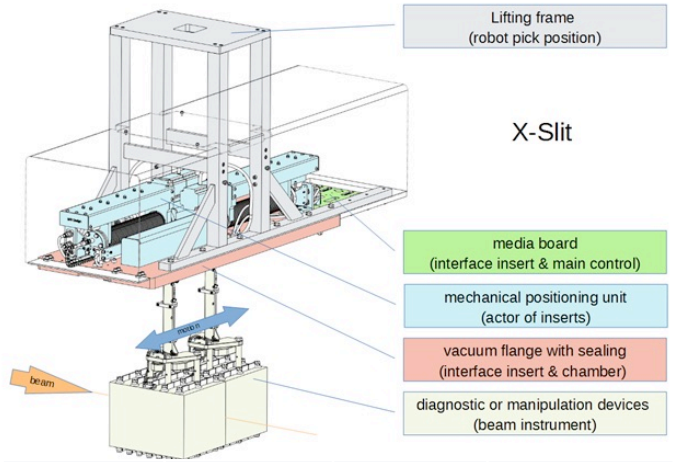
- Six axis (KUKA titan) robot to perform remote manipulation.
- Mobile platform (KUKA omnimove / AGV) that can transport robot in-between parking position to maintenance region.
- Mobile shielding container to transport activated beamline inserts.
- Power supply, navigation and parking system.
- Automatic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



Local Storage (onsite)

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

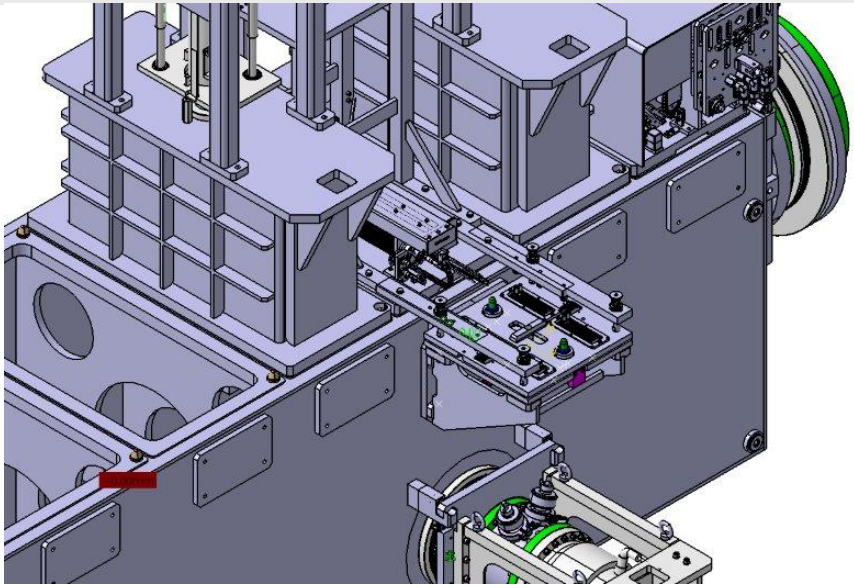


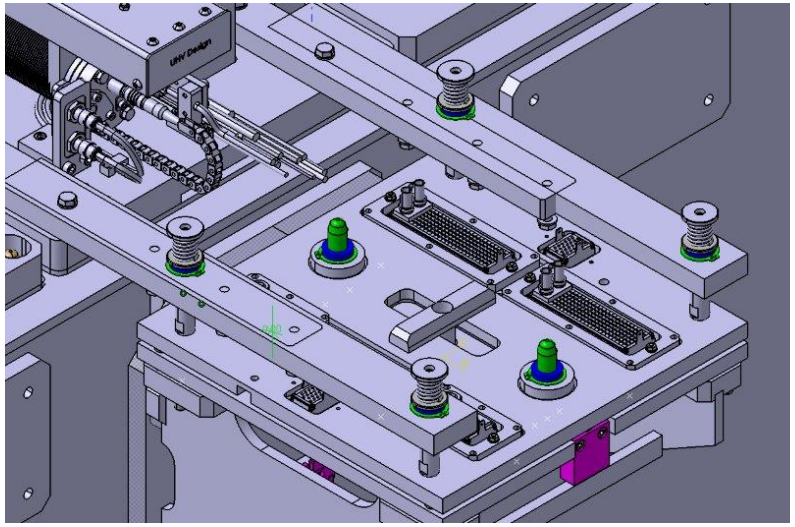


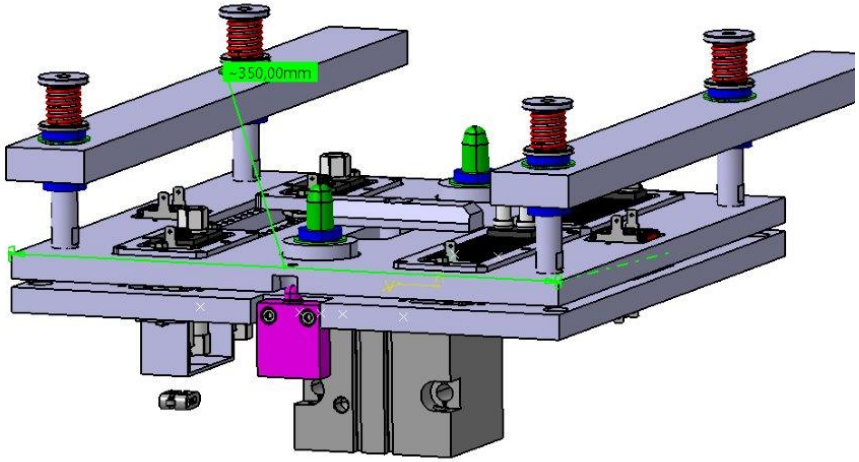
Slit X	495kg	390mm	1170mm

C. Schloer

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

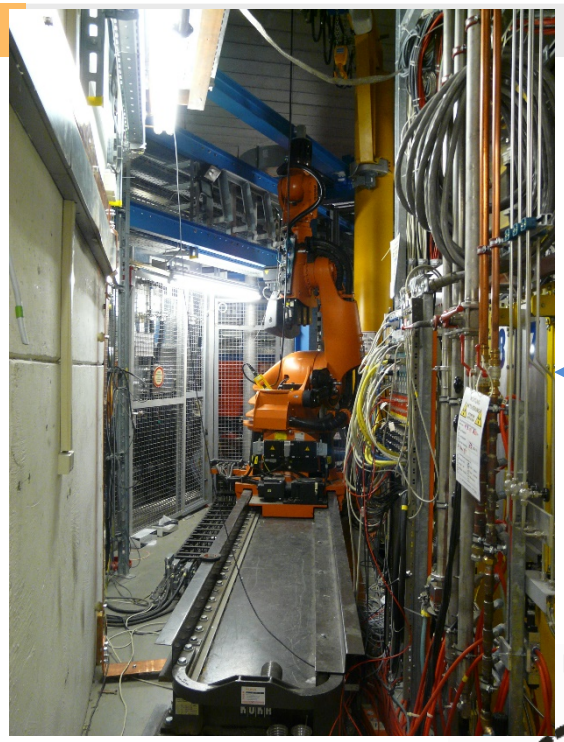




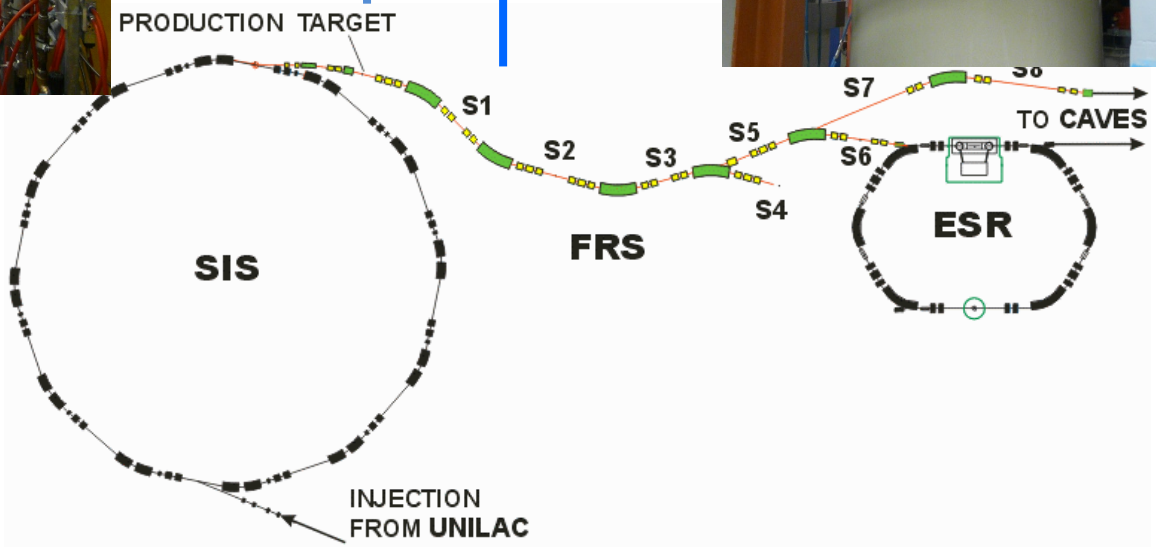


C. Schloer

Existing RH Setup at GSI for FRS

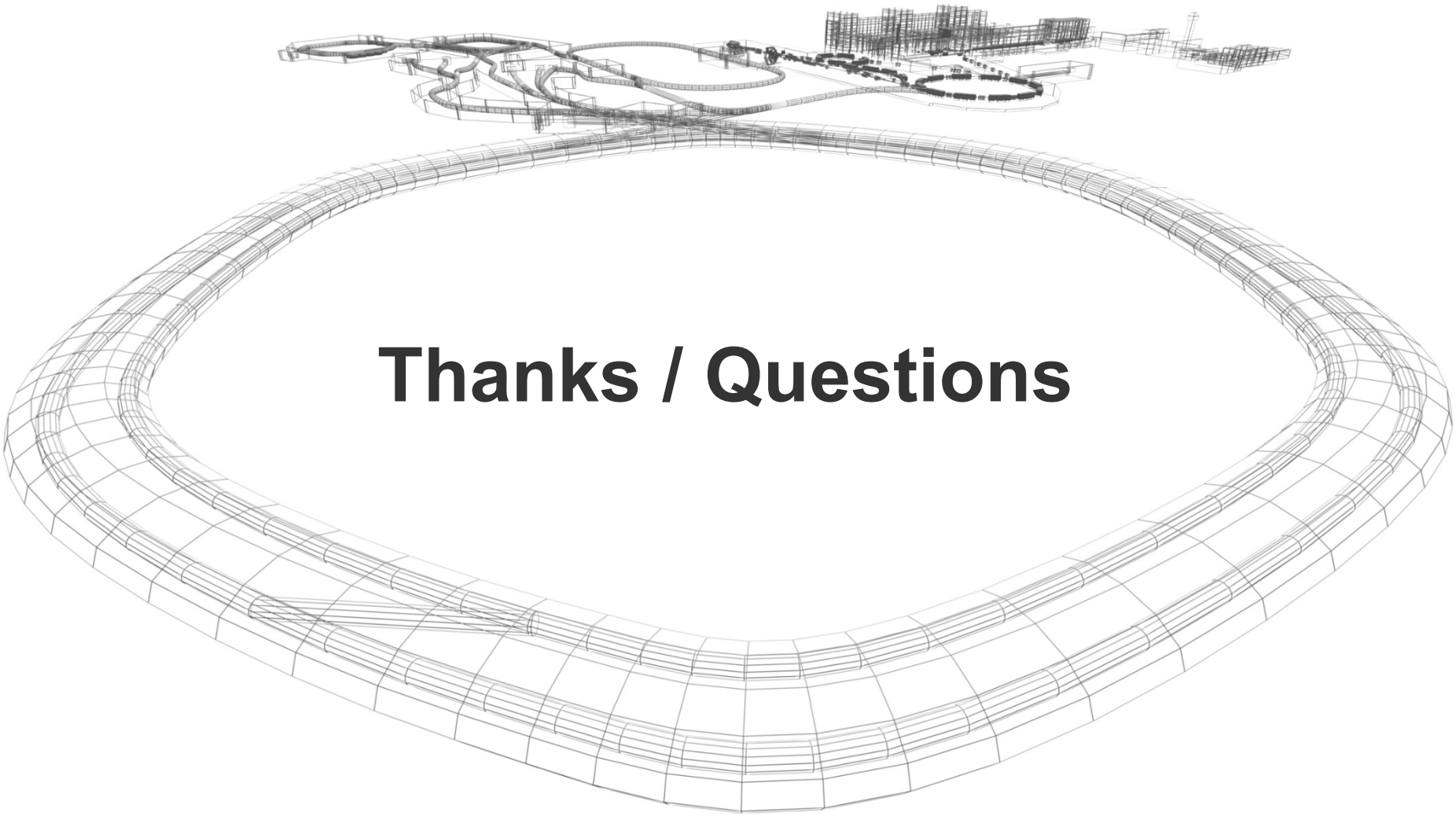


KUKA KR350
Payload 350 Kg
One mobile robot in Target Area
One fixed robot.



FAIR future RH tasks out look

- Mobile robot system for remote handling (Integration) 2021
  - Mobile robot systems (6 axis robot and AGV omnimove)
  - Remote operation of the system
  - Positioning across the tunnel
  - Storage and transportation of active plugs
- Mobile system lifecycle Support
- Hot cell equipment requirements
  - Shielding flask hot cell interface
  - rotating table system
  - visual and lighting system
  - barrel handling system
  - Tooling.



Thanks / Questions