NSS
Shielding and Safety systems
SAR

Operations & Maintenance

IAIN SUTTON

Relevant documentation

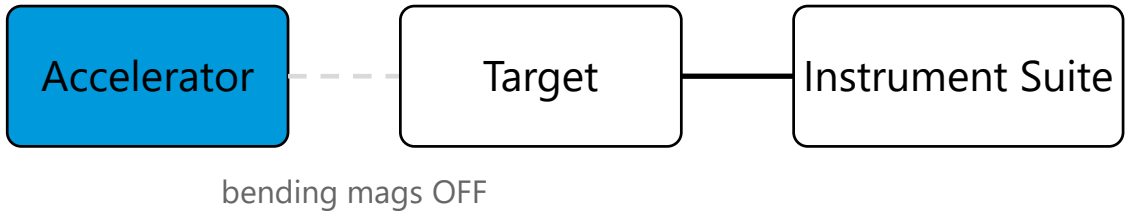
Consolidated Maintenance schedule	ESS-5855839
Bunker ConOps	ESS-0124440
Beamline shielding	ESS-5722240

Part of a bigger system

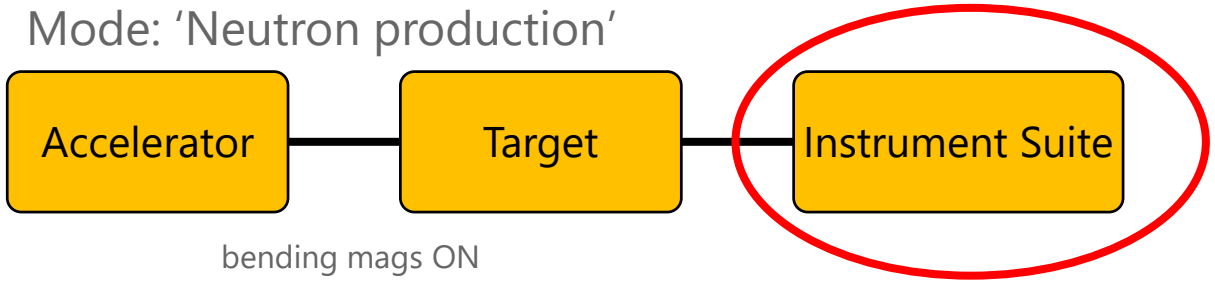
ESS-0038264 ESS beam operational modes

Simplified interaction model

Mode: Accelerator tests (beam to a dump)



Mode: 'Neutron production'



		Beam Operational Modes				
		Off-line	Accelerator Tests	Target Tests	Pre-production	Production
Accelerator Modes	Maintenance	INTENDED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
	Ion	INTENDED	ALLOWED	ALLOWED	NOT ALLOWED	NOT ALLOWED
	RF	NOT ALLOWED	INTENDED	ALLOWED	NOT ALLOWED	NOT ALLOWED
	Dump	NOT ALLOWED	INTENDED	ALLOWED	NOT ALLOWED	NOT ALLOWED
	Target	NOT ALLOWED	NOT ALLOWED	INTENDED	NOT ALLOWED	NOT ALLOWED
	Pre-production	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	INTENDED	NOT ALLOWED
	Production	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	INTENDED
Target Modes	Maintenance	INTENDED	ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
	Startup	ALLOWED	INTENDED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
	Cooling down	ALLOWED	ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
	Production	ALLOWED	ALLOWED	INTENDED	INTENDED	INTENDED
Instrument Suite Modes	Maintenance	INTENDED	ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
	Production	ALLOWED	ALLOWED	INTENDED	INTENDED	INTENDED

Operation

MODE
PRODUCTION

Bunker / Temp beamstops / Beamline shielding
NBOA / BWI

Beam ON = Bunker (+beamstops) CLOSED

Access ON or IN Not authorized

Activity ON or IN Not authorized

Activity in Instrument halls Authorized

<u>Activities in Production</u>

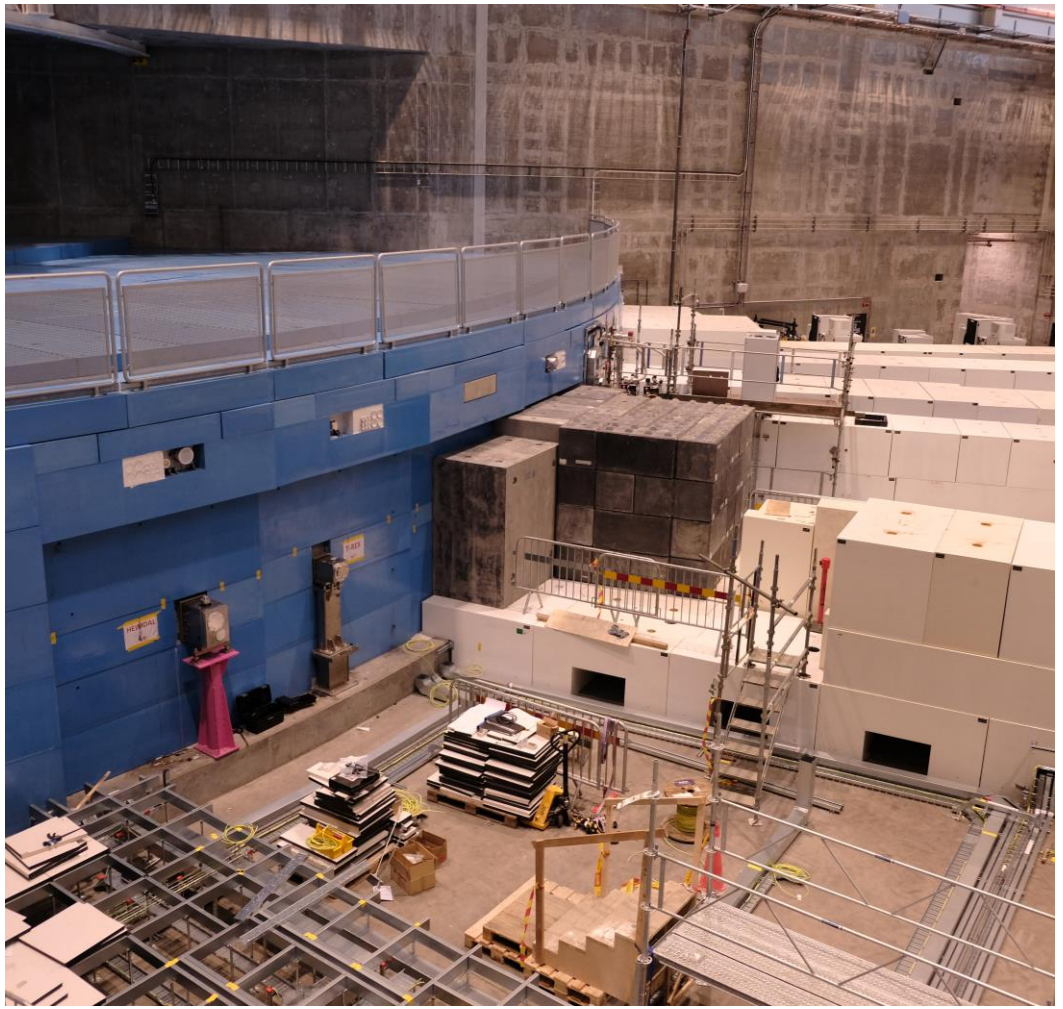
Shielding

- None

Fire system

NBOA (NBPI) None

- Gas atmosphere monitoring



Maintenance

Bunker / Temp beamstops / Beamline shielding

MODE
MAINTENANCE

Beam OFF = Bunker (+beamstops) OPEN

Access ON or IN Authorized

Activity ON or IN Authorized

<u>Activities in Maintenance</u>

Shielding

- Visual inspection for damage on removal

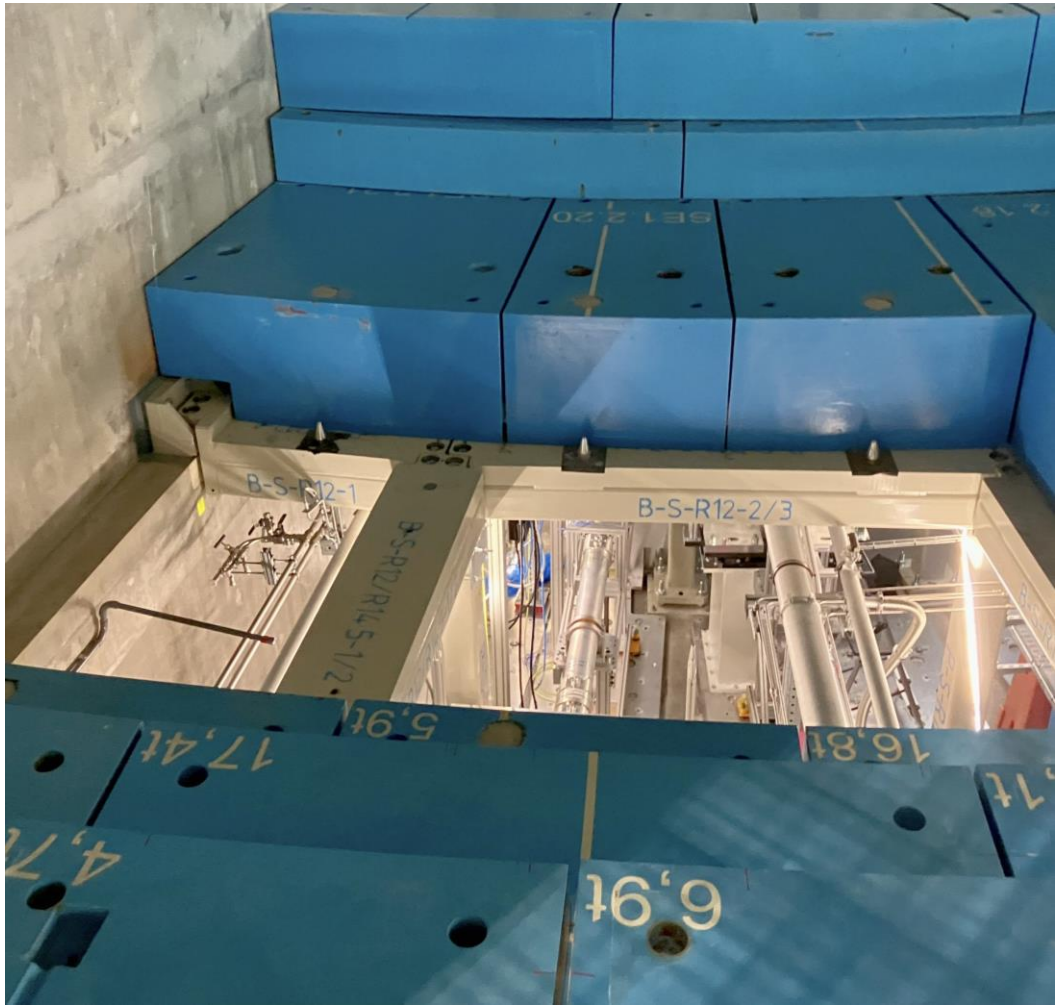
Structure

- Check bolt tightness if removed

Fire system

NBOA / BWI

- None



Shutter maintenance

overview

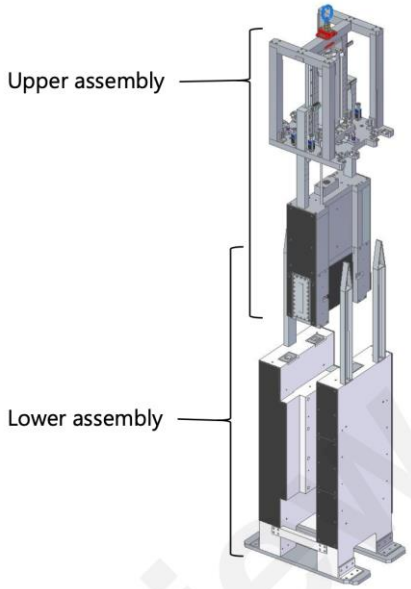
Disclaimer

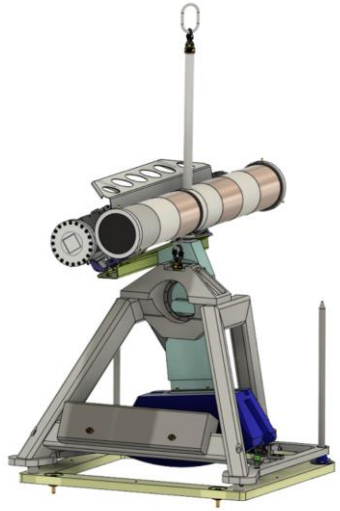
Shutter maintenance is part of instrument maintenance plan – thus out of scope.

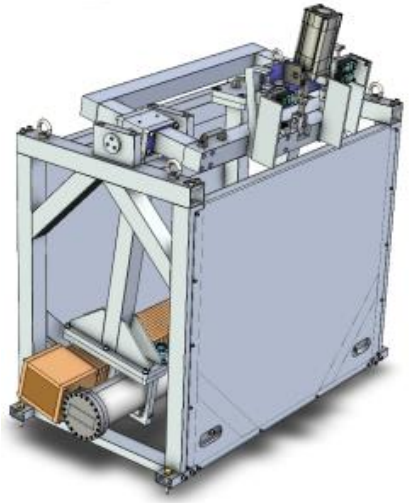
We have all documentation

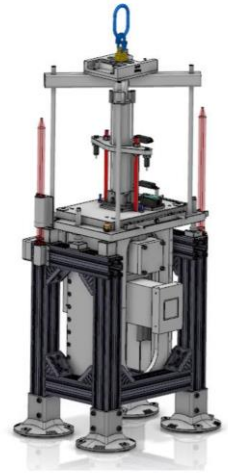
Design life 20 years with little or no maintenance scheduled

However, in the interest of ensuring facility operability requirements additional inspection requirements are being considered









access

The limit of current documentation

ESS-0377817 - Neutron Scattering Systems - System Design Description

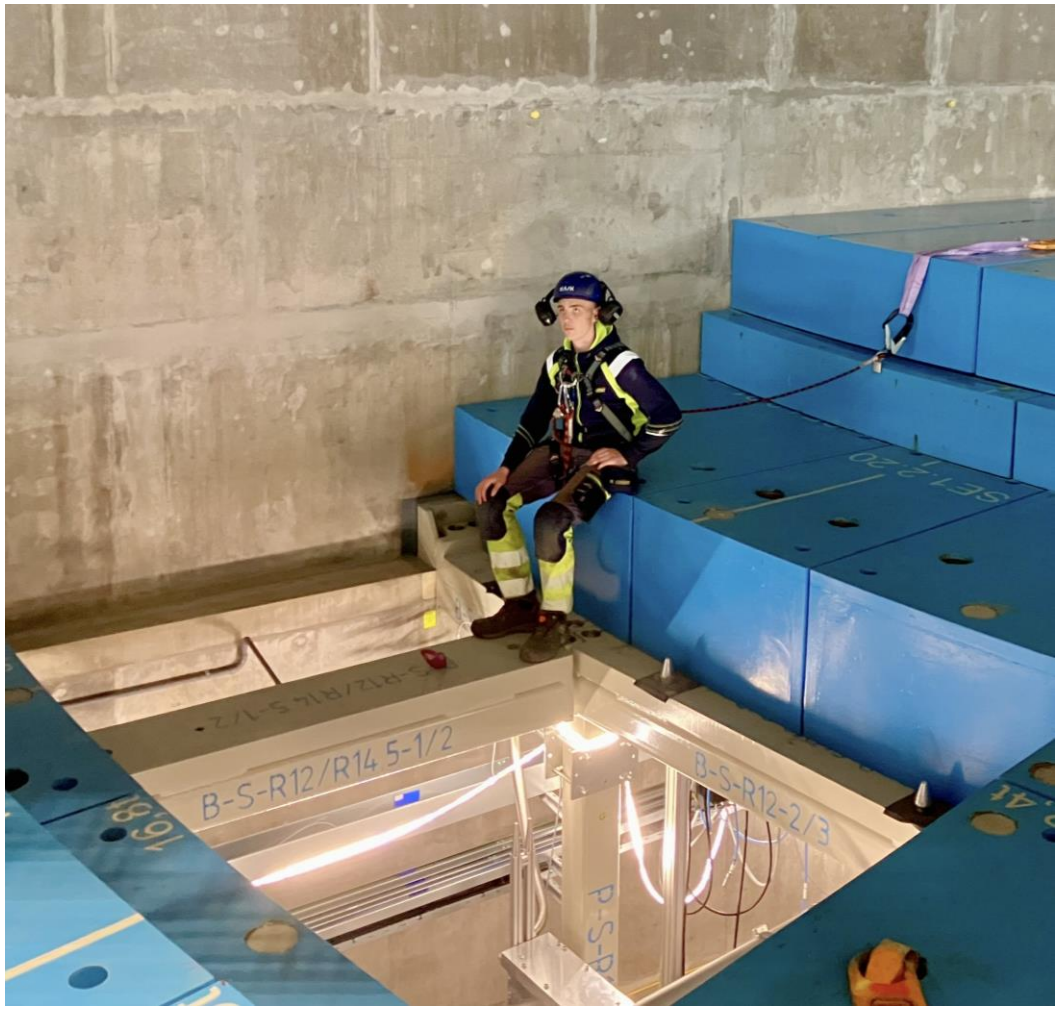
- Section 5.3.1, Section 6.1

ESS-4470664 – Concepts of Operations for Bunker Personnel Safety System:

- Sections 9.2.4 (Access procedure), Table 3 (Access procedure to the NWB), Table 4 (Entry), Table 5 (Exit), Table 6–7 (Restoring shielding and transition).

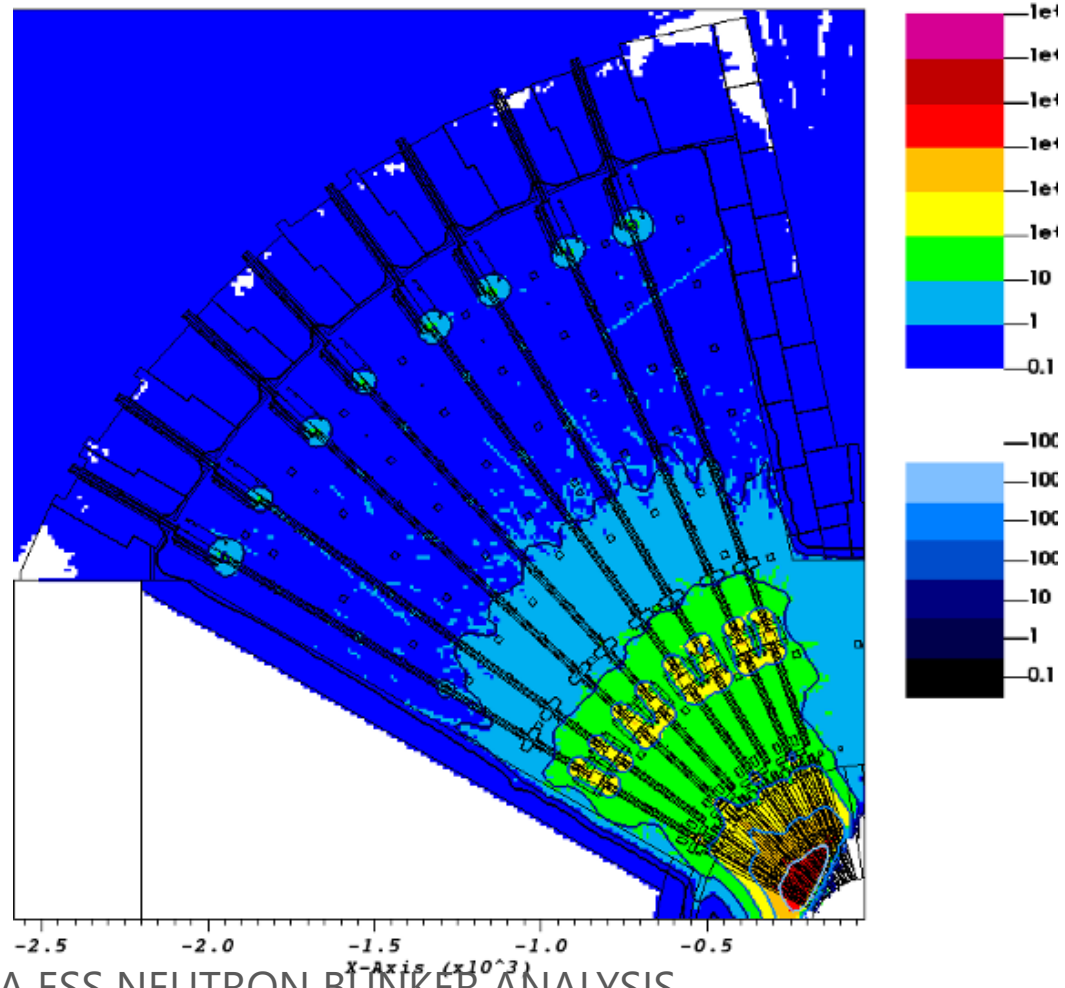
ESS-2972939 – Neutron Scattering Systems - Radiological Hazards and Radiation Safety Provisions for Operations and Maintenance:

- Section 2.2.1 (Access protocols), Section 2.3.1 (Access control), Section 4.2 (Cool-down periods and area classification). Tables 412–414



Hostile work environment

Conventional & Radiological Hazards



UKAEA ESS NEUTRON BUNKER ANALYSIS
TechD-20-092 / ESS-3143273

operations broader context

operating & maintaining the instrument suite

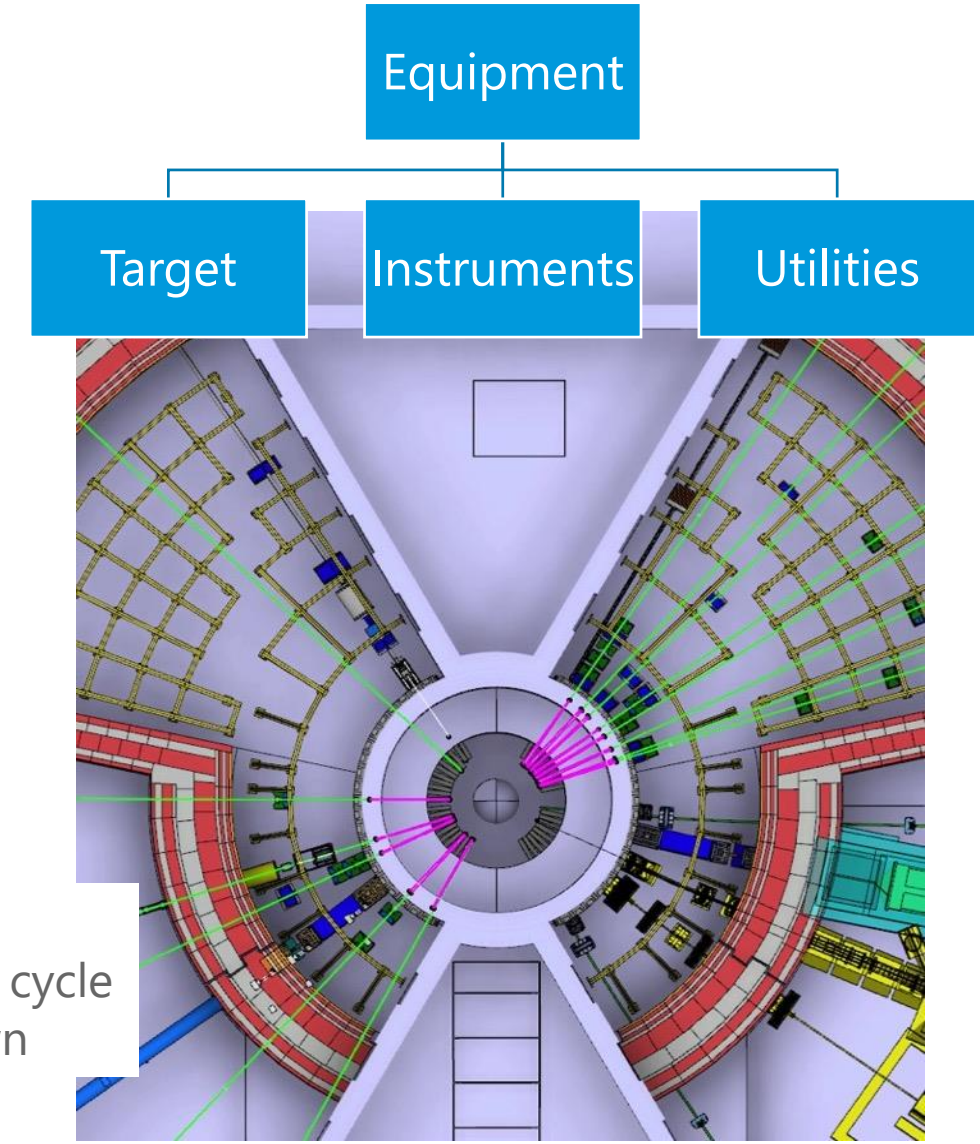
Target

- 16 Light shutter
- 42 Beam windows
- Helium & Water cooling

Instruments

- Choppers 98 axis
- Optics 300 m
- Shutters 30
- Monitors 30

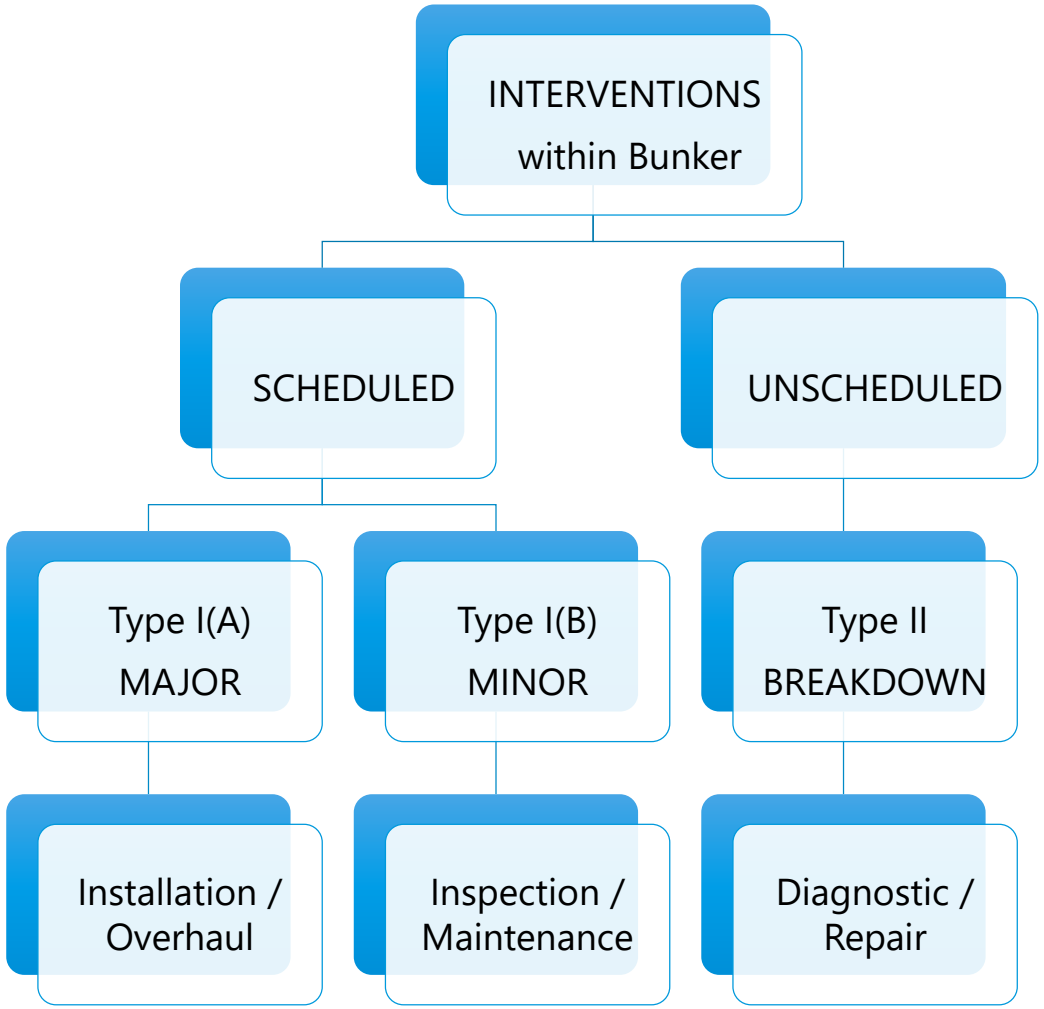
- Vacuum 350m
- Fluids 520m
- Cables 5-10 km

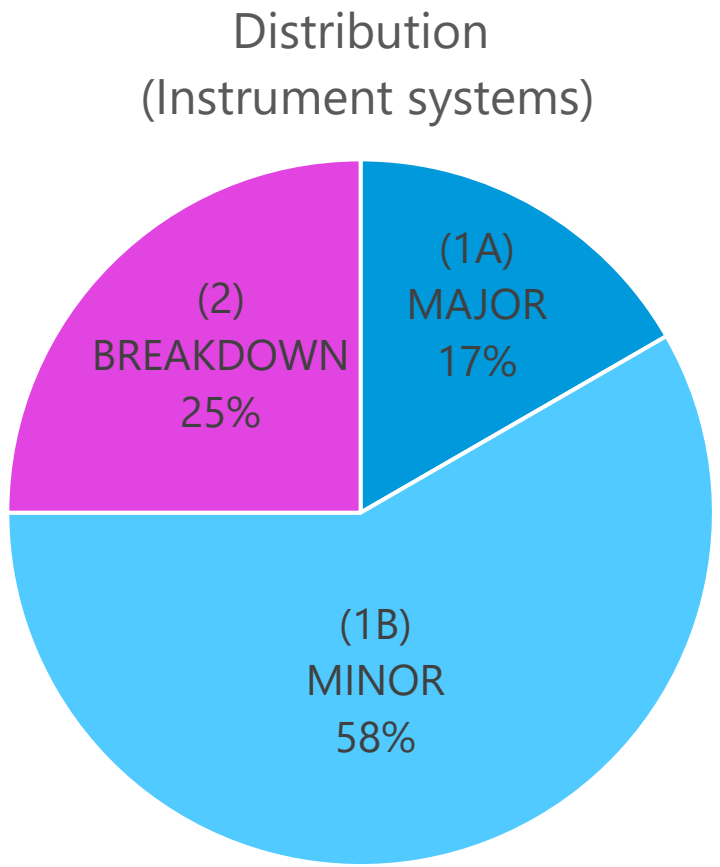


Assessment
Multiple failures pers cycle
Access each shutdown

Preparation for Operations

Intervention types





‘Quick’ access - Short shutdown

R6-R9 (Access ‘hole’)

Number of blocks/lifts	9/18
Shielding mass	72t
Handling time	4 – 6 hr

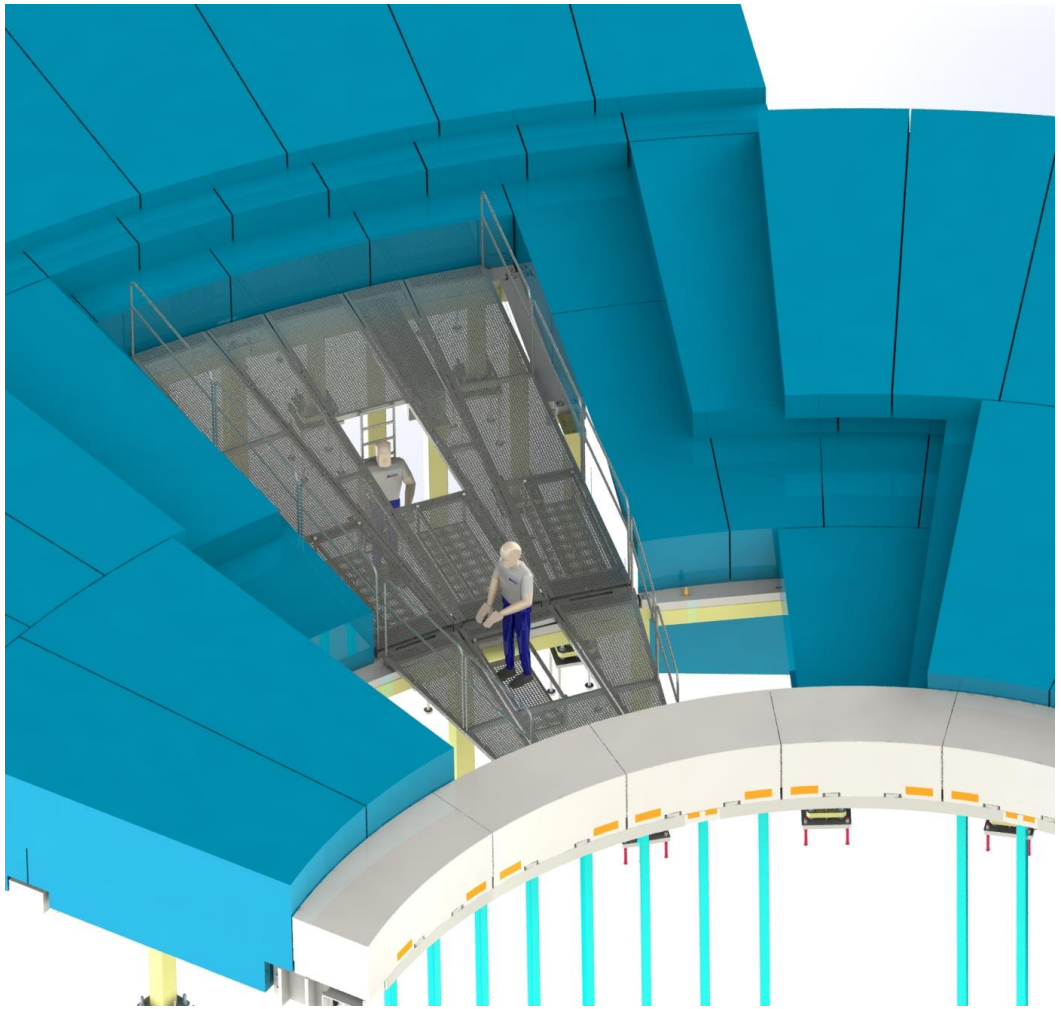
R6-R11.5

Number of blocks/lifts	23/46
Shielding mass	190t
Handling time	10-12hr

Bunker access configurations

Platform as working area – Wide open area ESS-0416084

- Predefined Bunker area is open
- Design of the platform is compatible with the block's width/length
- Removable fence – set only at perimeters of the working platform



RH Platform Deign

Platform features

- Several platform types/lengths
- Removable top plates
- “Drop-down” basket
- Add-on removable Ladders
- Lifting features/harness connections (fall restrain)
- Guide features for Bunker Frame pins
- Clamping connections between platform segments for wide working area assemblies.

training

Interim

Training solution

Platform constructed out of standard scaffolding components

Objective

- proof of concept for tooling solutions
- testbed for operational activities
- Development of
  - Local rules
  - Procedures
  - Rescue plans
- Personnel training
- training material

Operational training

Stakeholders

- NSS technical groups
- Operational RP
- OHS
- Riggers
- First responders
- Engineering group

- 2 workshops held
- Further planned

Finish presentation