



ODIN: Optical and Diffraction Imaging with Neutrons at the ESS

IKON 19 – September 2020

Aureliano Tartaglione (TUM-Lead Instrument Scientist)

Manuel Morgano (PSI-Instrument Scientist)

Elbio Calzada (TUM-Lead Engineer)

Virginia Martinez Monge (TUM-Installation Engineer)

Robin Woracek (ESS-ICC)

Søren Schmidt (ESS-IDS)

- ODIN overview
 - Requirements & Applications
 - General overview
 - High level schedule
- How we work
- Project Status
 - ODIN Work Units Overview
 - Installation plan
- Summary

Field of View up to $20 \times 20 \text{cm}^2$ with a homogeneity of more than 75%

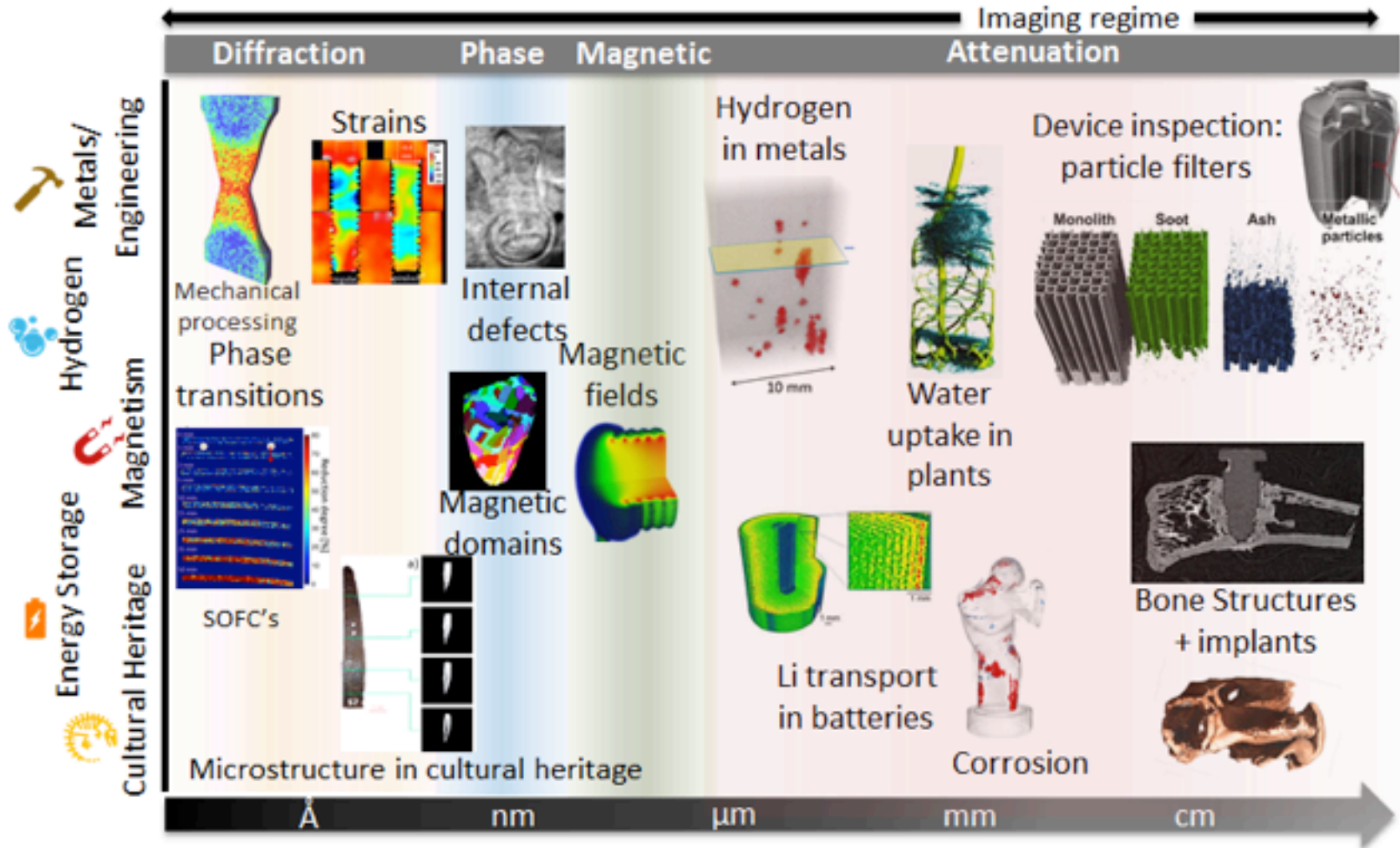
High resolution: Real space resolution of $10 \mu\text{m}$ (smaller FOV)

ODIN shall cover a wavelength range from 1 to 20Å to make optimal use of ESS's spectrum.

Wavelength resolutions of 10%, 1% and down to below 0.5% for spectra from 1Å to 10Å and 1Å to 5.5Å shall be available.

Bandwidths of about 4.5Å and 9Å in every pulse and single pulse suppression modes shall be freely selectable between 1- 20Å .

Applications



ODIN Overview

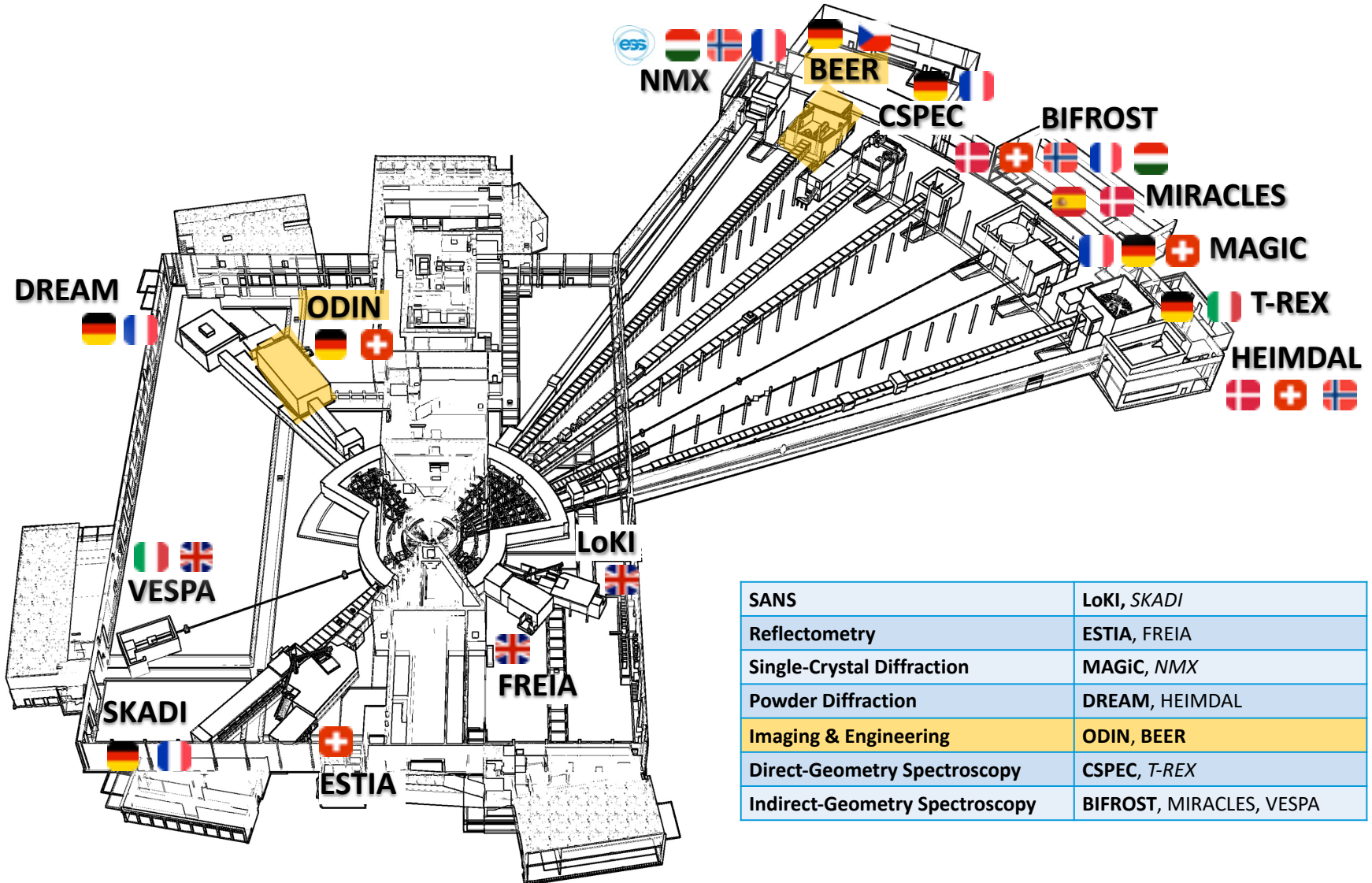
General Overview



EUROPEAN
SPALLATION
SOURCE

ODIN Overview

General Overview



SANS	LoKI, SKADI
Reflectometry	ESTIA, FREIA
Single-Crystal Diffraction	MAGiC, NMX
Powder Diffraction	DREAM, HEIMDAL
Imaging & Engineering	ODIN, BEER
Direct-Geometry Spectroscopy	CSPEC, T-REX
Indirect-Geometry Spectroscopy	BIFROST, MIRACLES, VESPA

K.H. Andersen, D.N. Argyriou, A.J. Jackson et al.

Nuclear Inst. and Methods in Physics Research, A 957 (2020) 163402

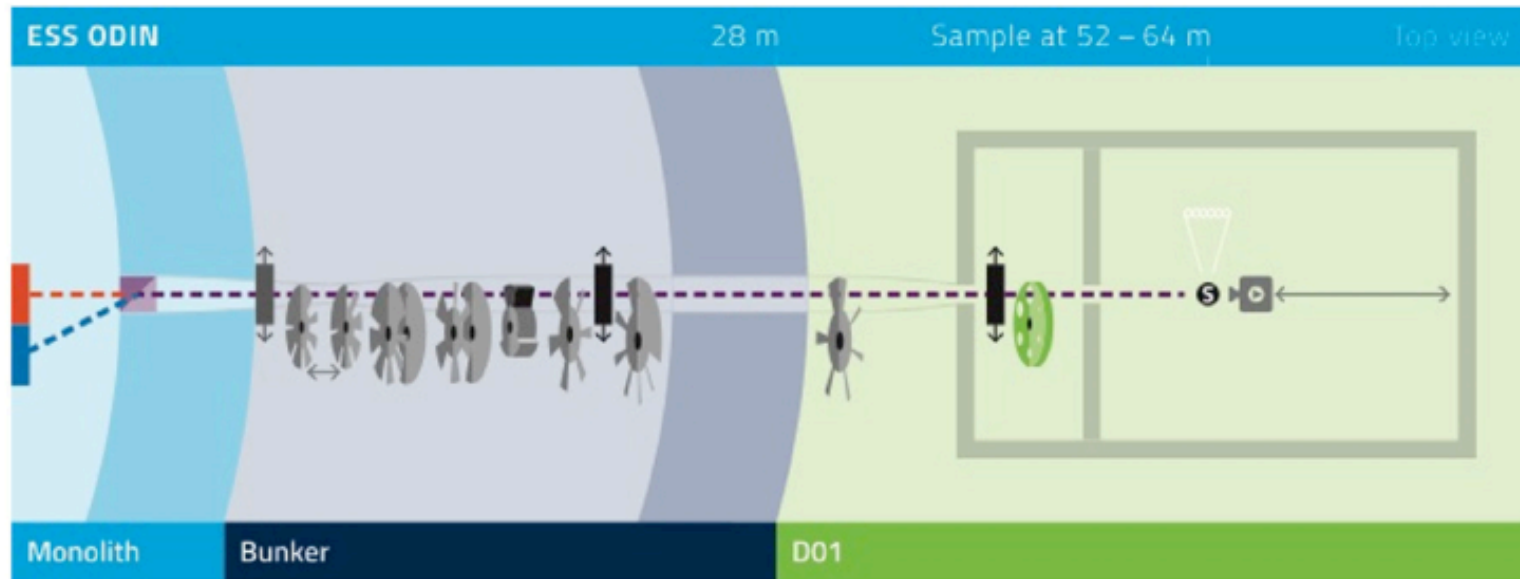
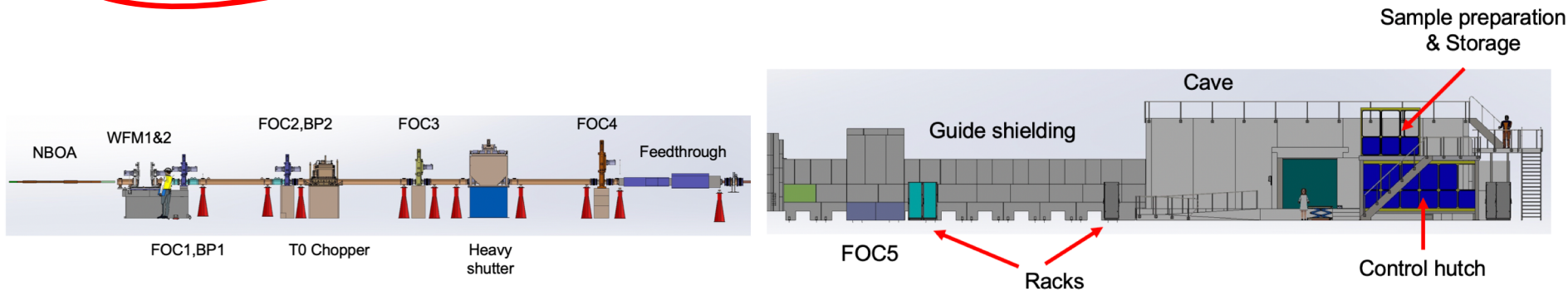
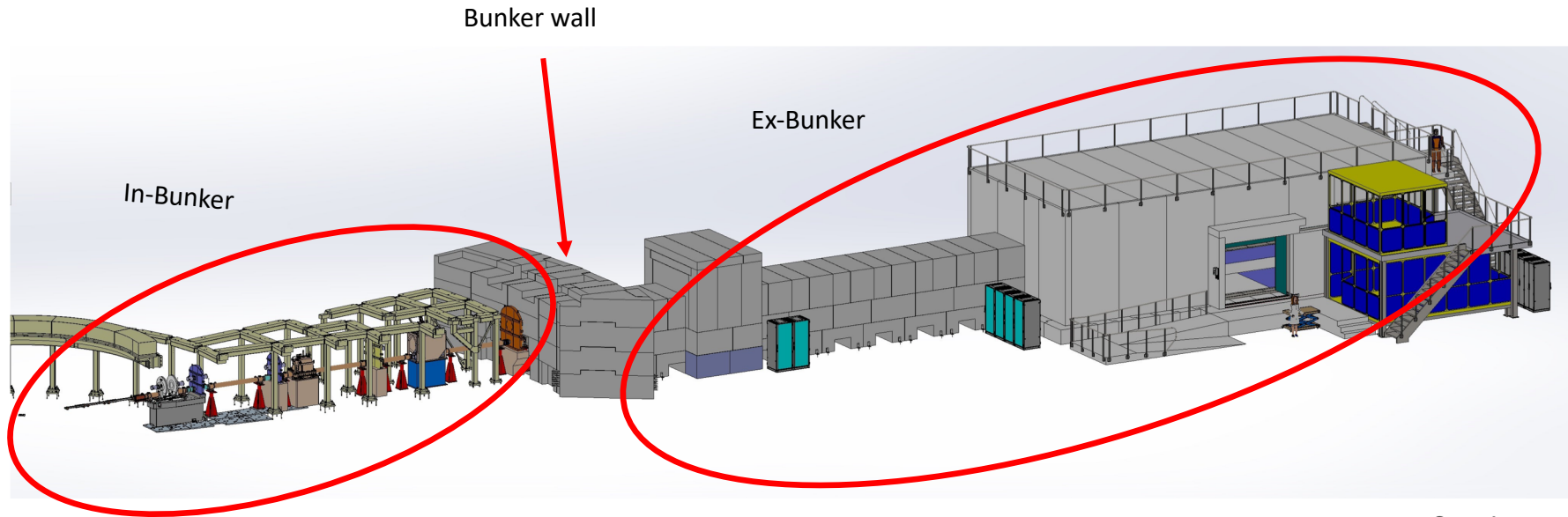


Fig. 19. ODIN instrument layout. Components shown in white are foreseen upgrades.

ODIN Overview

General Overview

- In-Kind partners TUM (lead institution) & PSI
- Multi purpose imaging instrument in D01 with flexible operation modes

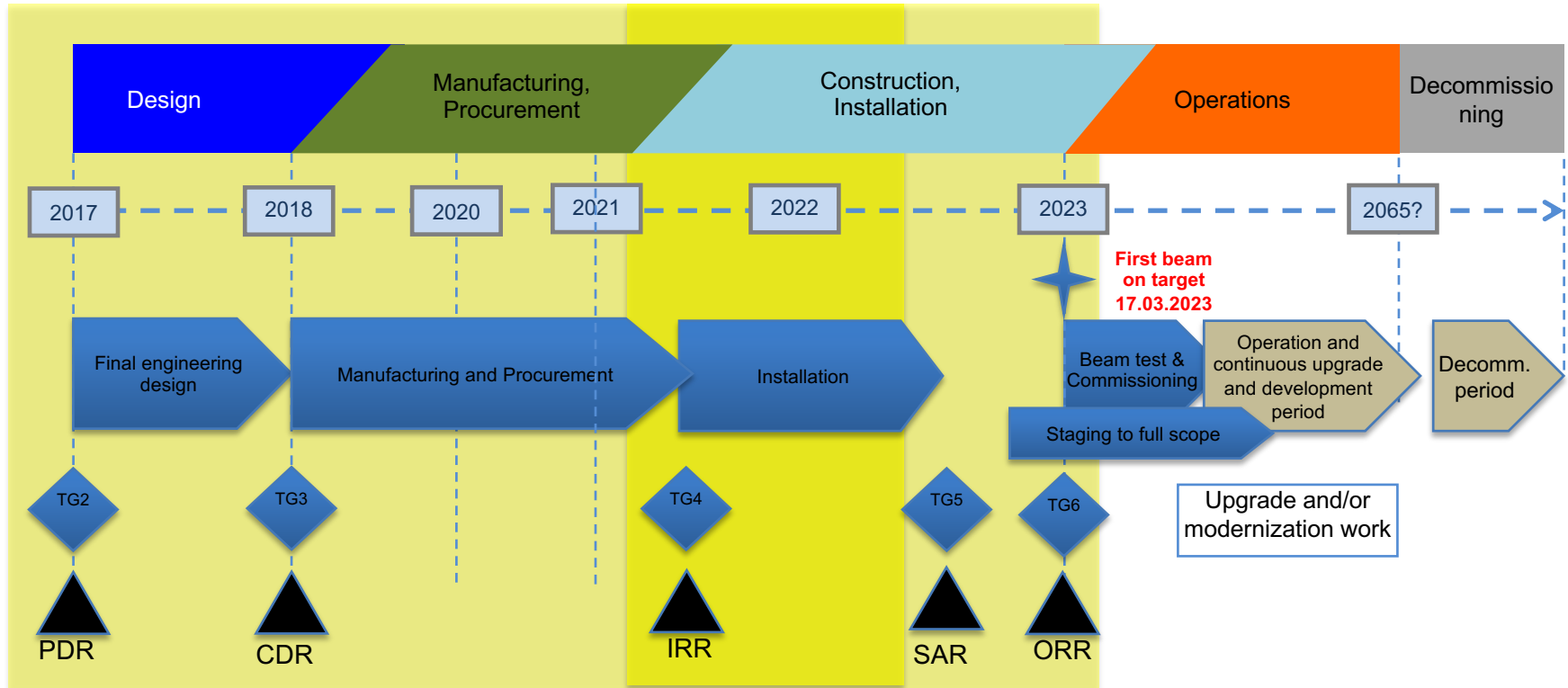


ODIN Overview

High level schedule



EUROPEAN
SPALLATION
SOURCE



Bunker wall penetration design	Design monolith insert envelop	Arrival in-monolith optics to ESS site	Bunker wall insert delivered to ESS	Partial Access D01	Start In-bunker installation	End In-bunker installation	Hot Commissioning (TG5)	BOT	User Programme
03-Mar-17	31-Jun-18	24-Jan-19	15-Nov-20	06-Jun-21	Oct-21	May-22	Oct-22	17-Mar-23	31-Dec-23

Project completion: 23/12/2022

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TUM:

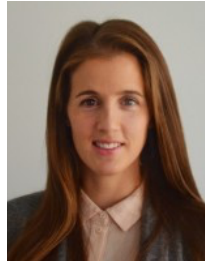
Aureliano Tartaglione
ODIN Lead Scientist



Elbio Calzada
ODIN Lead Engineer



Virginia Martinez Monge
*ODIN Installation Engineer
(since Nov 2020)*



Michael Schulz
Head of Imaging group



PSI:

Manuel Morgano
ODIN Scientist



Markus Strobl
*Head of Imaging
group*



Jan Hovind
*Technician of
Imaging Group*



ESS:



Robin Woracek
*Instrument Class
Coordinator*



Søren Schmidt
*Instrument Data
Scientist, Senior
Scientist
(ODIN&BEER)*

Day to day: PSI-TUM-ESS

- ❑ We always have phone, Vidyo, Zoom, WhatsApp, or Skype communications on demand
- ❑ TUM-PSI closely collaborates on documentation (e.g. mutually cross-review of documents required by ESS)
- ❑ On demand Skype or Vidyo meeting with ICC
- ❑ Positive: We usually reach agreement on working strategies and design criteria
- ❑ Regular participation on Instrument Scientist, and Engineering monthly meetings
- ❑ Very constructive collaboration and meetings on demand with ESS Chopper Group (Niko/Erik), ESS-NI Lead Engineer (Gabor), TG Coordination (Inga), Vacuum (Lawrence), Installation (Antonio), PSS (Morteza), Shielding (Valentina and Riccardo), Procurement (Mirko) and a lot of help from Zvonko.

Meetings with focus on scientific scope of the instrument

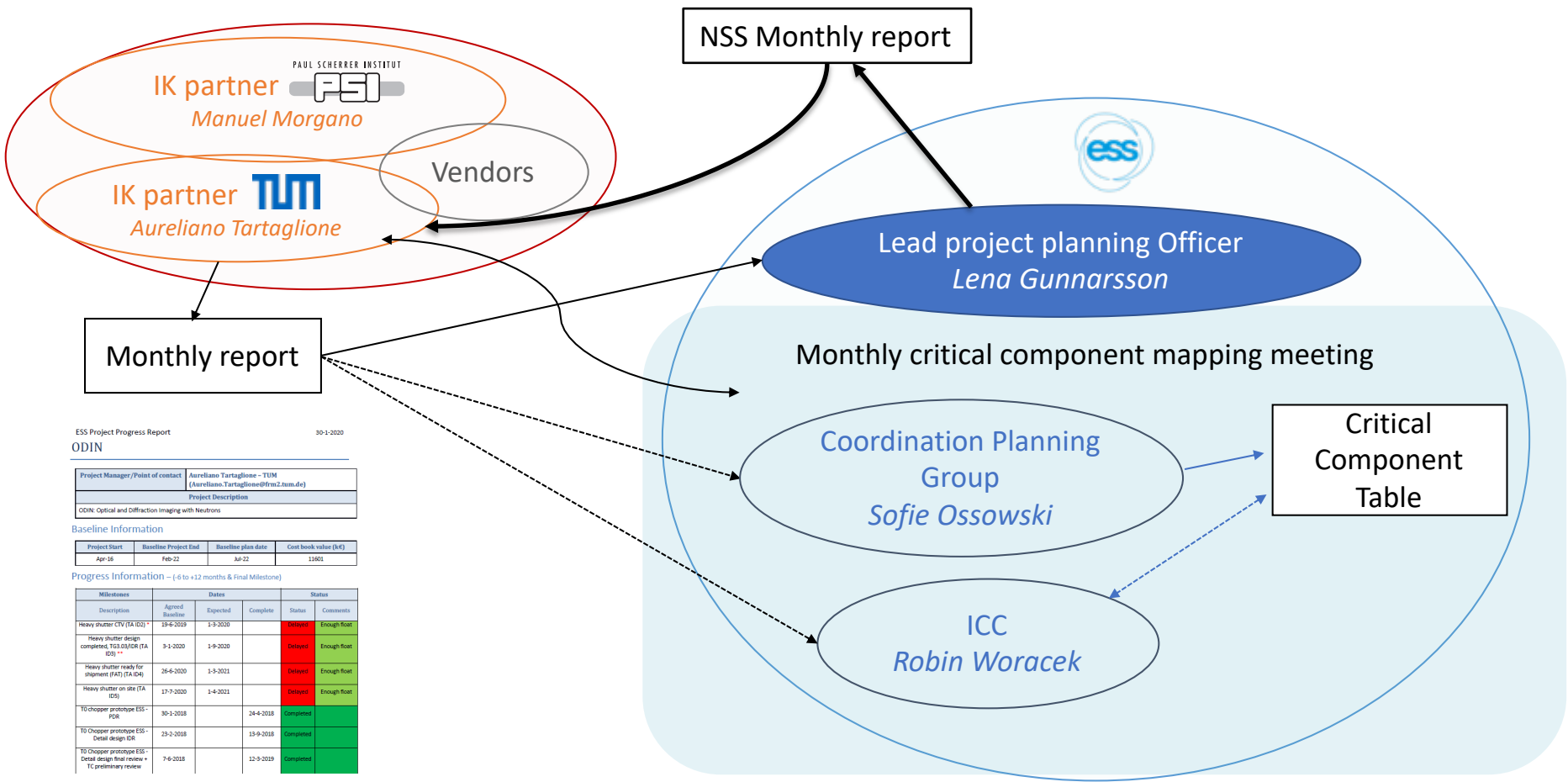
- STAP (1 video + 1 physical per year)
- ODIN team actively participates scientific workshops, conferences, proposal reviews for existing facilities, advisory panels for new beamlines (benchmarks known)

Project related meetings

- ICEB meeting (2 per year)

Monthly reports

- Always received on time. Checked and discussed at ESS.



ESS Project Progress Report 30-3-2020

ODIN

Project Manager/Point of contact	Aureliano Tartaglione - TUM (Aureliano.Tartaglione@frm2.tum.de)
Project Description	ODIN: Optical and Diffraction Imaging with Neutrons

Baseline Information

Project Start	Baseline Project End	Baseline plan date	Cost book value (k€)
Apr-16	Feb-22	Jul-22	11801

Progress Information - (-6 to +12 months & Final Milestone)

Milestone	Dates			Status	Comments
	Agreed Baseline	Expected	Complete		
Heavy shutter CTV (TA ID2) *	19-6-2019	1-9-2020		Delayed	Enough float
Heavy shutter design completed, top coil (TA ID2) **	3-1-2020	1-9-2020		Delayed	Enough float
Heavy shutter ready for shipment (TA ID2)	26-6-2020	1-9-2021		Delayed	Enough float
Heavy shutter on site (TA ID2)	17-7-2020	1-4-2021		Delayed	Enough float
TO Chopper prototype ESS - FOR	30-1-2018		24-4-2018	Completed	
TO Chopper prototype ESS - Detail design (DR)	29-3-2018		13-9-2018	Completed	
TO Chopper prototype ESS - Detail design final review + TC preliminary review	7-9-2018		12-9-2019	Completed	

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	Task no.	TA ID	Deliverables – Project Results	Delivery date	Status (milestones)
TUM	WU 03	2-8	Heavy Shutter*	Jun 2021	Tender done
TUM	WU 04	9-15	T0 Chopper*	May 2022	Tender
TUM	WU 05	16-25	Choppers*	Jun 2021	CDR closed. Sub-TG3 done. Now manufacturing.
TUM	WU 08	26-32	Motion Control and Electric Engineering	Mar 2021 (subTG3)	About to sign provision by MCAG (ESS): Design begins
TUM	WU 11		Shielding*	-	-
TUM	WU 11.1	33-38	Guide Shielding (common shielding project)	Jun 2021	Sub-TG3 Dec 2020
TUM	WU 11.2	39-50	Cave Shielding	Jun 2021	PDR done
TUM	WU 12		Instrument Infrastructure	-	-
TUM		51-56	Control Hutch (TUM) *	Oct 2021	SoC Dec2020
TUM			Sample preparation area & storage (TUM) *	Oct 2021	SoC Dec2020
TUM	AO01	-	Bunker Wall Feedthrough	Jun2021	KoM 1Q Oct 2020
TUM	AO02	-	Chopper supplements	Jun2021	IDR done
TUM		59	FINAL Tollgate 3	Re-Scheduled March 2021	Ongoing
PSI	02.1	1-4	NBOA	Q1 2021	Delivery ESS
PSI	02.2	5-16	Neutron transport system (Guides)	Mar 2022	IDR done
PSI	06	17-32	Cave interior #	Jun 2022	Tender done
PSI	09	33-43	White beam detectors	Dec 2021	Off-the-shelf
PSI	10	44-48	ToF detector	Dec 2021	Readout pending

* Item agreed to be procured by ESS for TUM

Parts of this item agreed to be delivered by ESS for PSI

Project Status

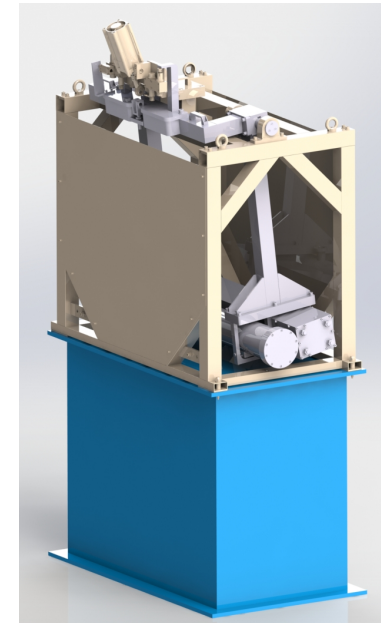
Work Units Overview



	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 03	2-8	Heavy Shutter*	Oct 2021	Tender Sep 2021	

In-Bunker main components:

- Installation window: 11.8.21 – 25.2.22
- Heavy shutter (TUM):
 - It is a concept proposed by ESS for TBL (G. Lászlo)
 - MC simulations completed July 2020
 - CTV completed July 2020
 - Delivery time: 6 months after contract signed
 - Tender done: Sept 2020
 - Status **OK**

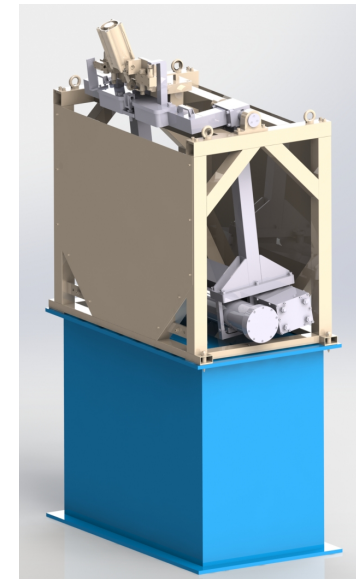
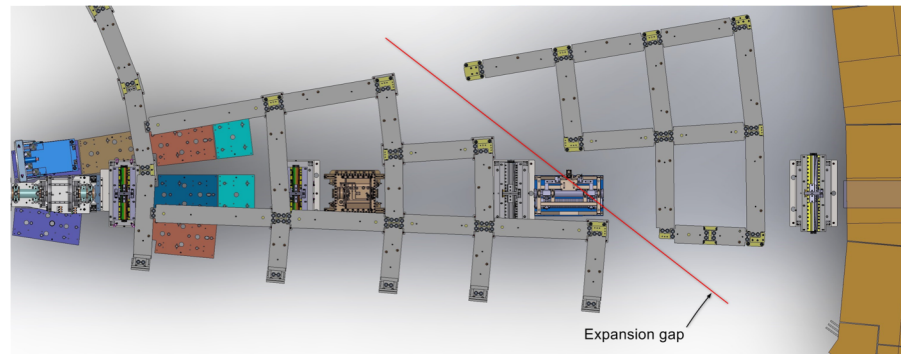


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	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 03	2-8	Heavy Shutter*	Oct 2021	Tender Sep 2021	

In-Bunker main components:

- Installation window: 11.8.21 – 25.2.22
- Heavy shutter (TUM):
- Design constraints
 - Pillars + Roof beams + Expansion gap (floor)
 - Max length required: 1.6m
 - Dose requirement: max 3 μ Sv/h in Cave, and 25 μ Sv/h in FOC5 pit
 - Safety factor: 2

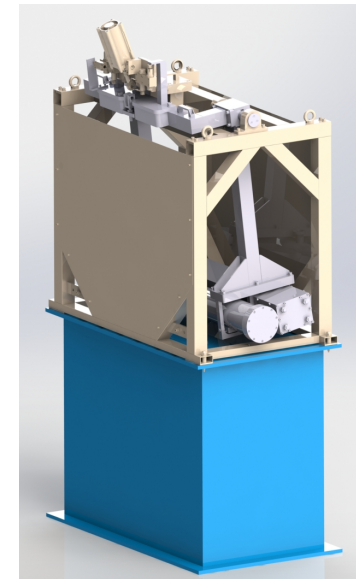


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	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 03	2-8	Heavy Shutter*	Oct 2021	Tender Sep 2021	

In-Bunker main components:

- Installation window: 11.8.21 – 25.2.22
- Heavy shutter (TUM):
- Design constraints
 - Pillars + Roof beams + Expansion gap (floor)
 - Max length required: 1.6m
 - Dose requirement: max $3\mu\text{Sv/h}$ in Cave, and $25\mu\text{Sv/h}$ in FOC5 pit
 - Safety factor: 2
- Stopper preliminary design ready:
 - Total thickness 1.2m ✓
 - Maximum attenuation: 1cm B4C + 24cm Steel + 96cm Copper
 - Total Dose: $0.5\mu\text{Sv/h}$ (Cave) and $1.4\mu\text{Sv/h}$ (FOC5 Pit) ✓
 - Guide vacuum vessel: scope of Axilon/SNAG ✓

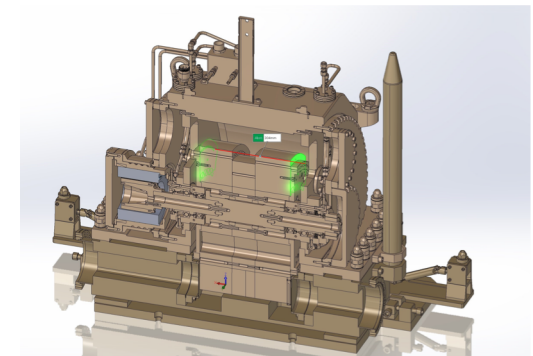
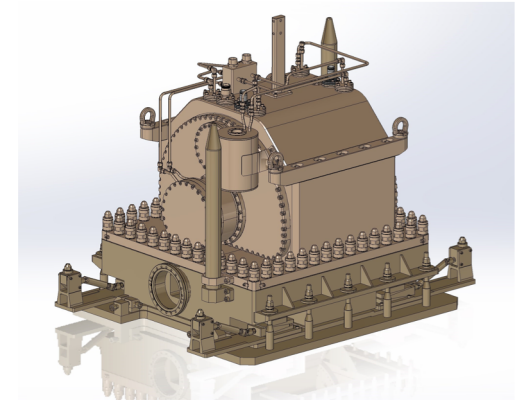


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	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 04	9-15	T0 Chopper*	May 2022	Tender	

In-Bunker main components:

- Installation window: Oct 2021 – May 2022
- T0 Chopper (TUM)
 - CTV ODIN T0 chopper approved Mar 2020
 - Design based on DREAM's T0 chopper but:
 - Larger diameter: 64cm
 - A redesign is needed
 - SoC expected Nov 2020
 - Delivery time: 18 months after SoC
 - Impacts In-bunker installation plan ❌
 - Status OK

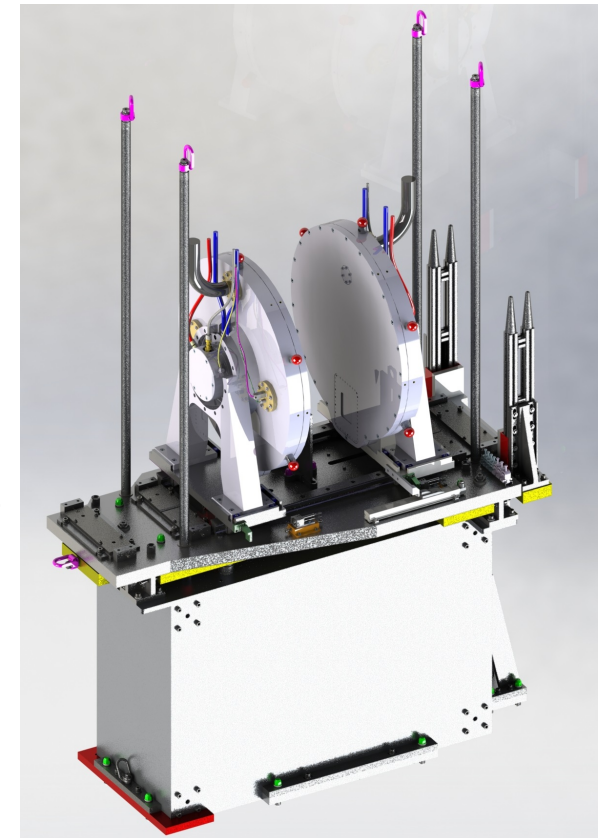


* Item agreed to be procured by ESS for TUM

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 05	16-25	Choppers*	Jun 2021	subTG3 accomplished	ok

In-Bunker main components:

- Installation window: Jun 21 – Feb 22
- Choppers (TUM)
 - Contract signed with AIRBUS in June 2019
 - subTG3 done Aug 2020 ✓
 - FAT scheduled in March 2021
 - SAT: July 2021
 - Pedestals, WFMC Motion Table and Alignment Interfaces designed and procured by TUM.
 - Choppers on schedule ✓
 - Status OK

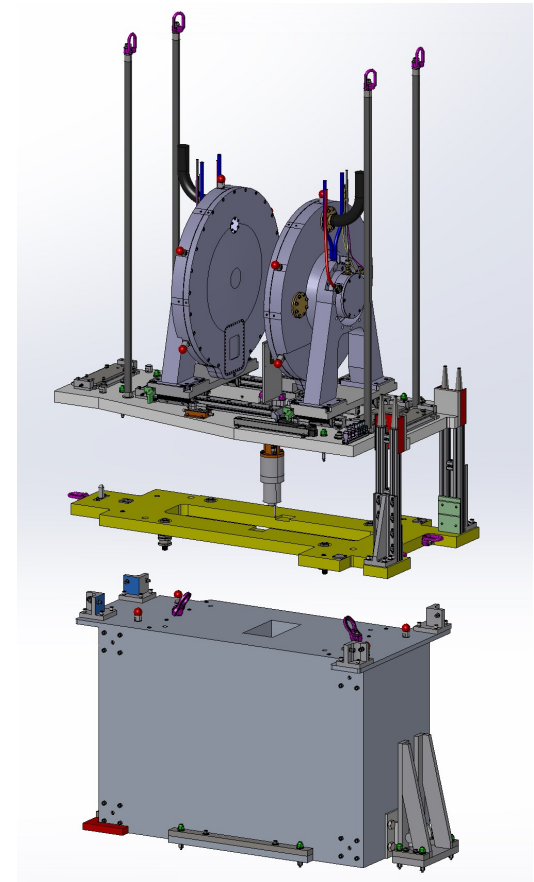
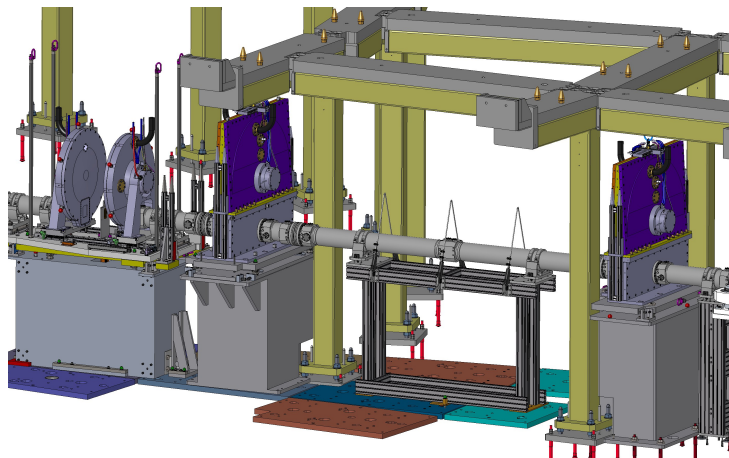


* Item agreed to be procured by ESS for TUM

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 05	16-25	Choppers*	Jun 2021	subTG3 accomplished	ok

In-Bunker main components:

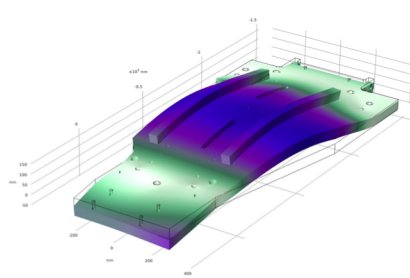
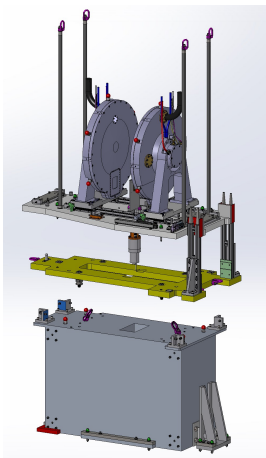
- Installation window: Jun 21 – Feb 22
- Choppers **Supplements** (TUM)
 - Pedestals, WFMC Motion Table and Alignment Interfaces designed and procured by TUM.
 - IDR done May 2020 ✓
 - Detail (& Manufacturing) design for subTG3 **ongoing**



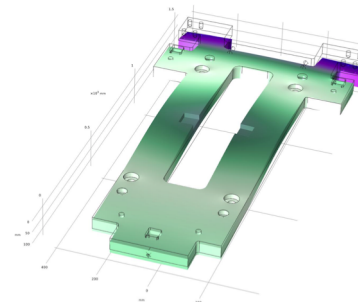
	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 05	16-25	Choppers*	Jun 2021	subTG3 accomplished	ok

In-Bunker main components:

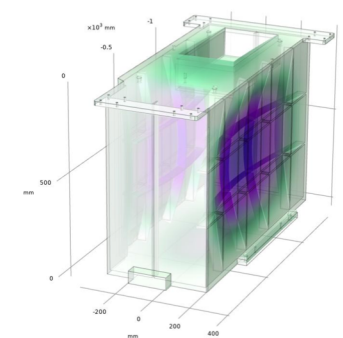
- Installation window: Jun 21 – Feb 22
- Choppers **Supplements** (TUM)
 - Pedestals, WFMC Motion Table and Alignment Interfaces designed and procured by TUM.
 - IDR done May 2020 ✓
 - Done for IDR by TUM: detail mechanical design of interfaces, WFMC motion table and pedestals
 - Use of COMSOL (Elbio) and ANSI (Kaltrina Shehu and Christian Reiter – FRM2 Hochdichte Kernbrennstoffe Gruppe) for resonance frequency verification. ✓



Lowest freq: 162.52Hz
Max deformation: 3µm



Lowest freq: 260.63Hz
Max deformation: 6µm



Lowest freq: 155.52Hz
Max deformation: 5µm

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 08	26-32	Motion Control and Electric Engineering	subTG3: Mar 2021	Design begin Oct 2020	On track

Ex-Bunker main components:

Installation window: 3.6.21 – 25.2.22

- Motion control and Electric Engineering
 - Agreed to be provided by ESS for TUM (TA)
 - Updated SoW and offer presented by ESS-MCA Sep 2020 ✓
 - SoC scheduled Oct 2020

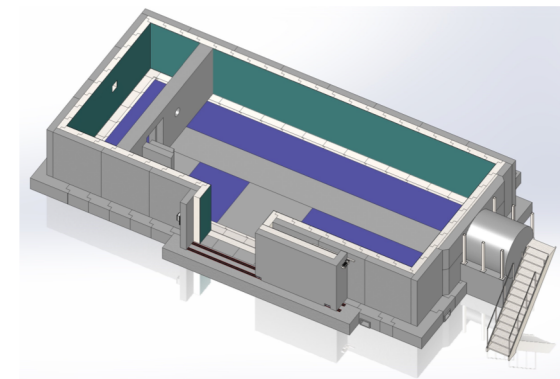
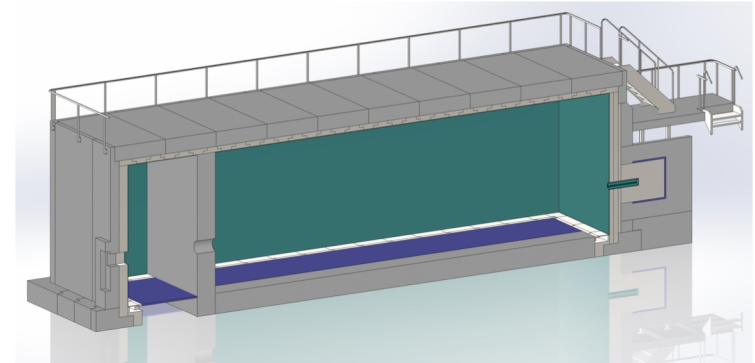
 - Status OK

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 11.2	39-50	Cave Shielding*	Jun 2021	PDR done	On track

Ex-Bunker main components:

Installation window: Jun 21 – Feb 22

- Shielding (TUM)
 - Cave shielding
 - SoC w/Mirrotron: Jul 2020 ✓
 - PDR meeting done: 18 Sep 2020 ✓
 - Goal: subTG3 in December 2020
 - Status OK



* Item agreed to be procured by ESS for TUM

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 11.2	39-50	Cave Shielding*	Jun 2021	PDR done	On track

Ex-Bunker main components:

Installation window: Jun 21 – Feb 22

Shielding (TUM)

- Cave shielding
 - H1/H2 Scenarios updated and preliminary Montecarlo (MC) calculation completed March 2020
 - Preliminary design (CTV) considered three layers: B4C, steel and normal concrete
 - Dose rate and floor loading requirements passed ✓
 - Mirrotron proposed same concept used for the bunker
 - Precasted heavy concrete (HC) stones
 - Includes 10cm borated HC layer
 - Preliminary MC using new material looking very good ✓
 - Detail design MC including chicanes ongoing. Preliminary results are promising ✓

- subTG3 scheduled Dec 2020

* Item agreed to be procured by ESS for TUM

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 11.2	39-50	Cave Shielding*	Jun 2021	PDR done	On track

Ex-Bunker main components:

Installation window: Jun 21 – Feb 22

Shielding (TUM)

- Cave shielding

fast and epithermal neutrons

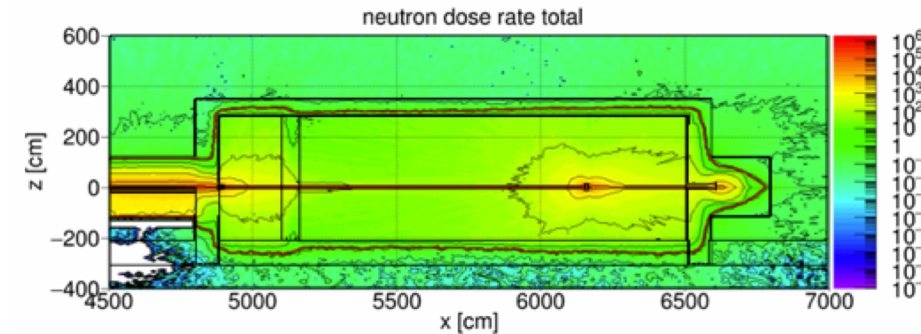
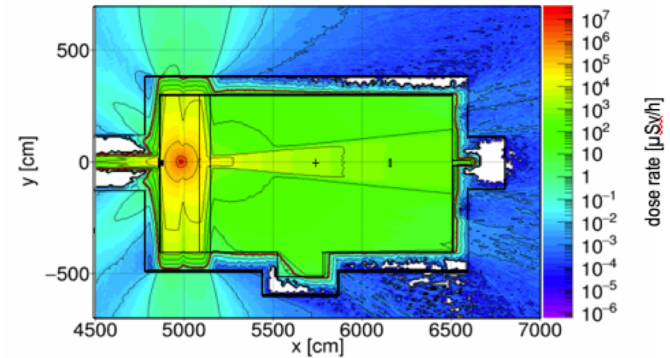


Figure 14: Neutron dose rate $E > 1\text{eV}$. The red line is the $1.5\mu\text{Sv/h}$ border. The maximum of the scale is the maximum that appears in the diagram.



re 61: Gamma dose rate produced by thermal neutrons ($E < 1\text{eV}$). The red line is the $1.5\mu\text{Sv/h}$ border. The maximum of the scale is the maximum that appears in the diagram.

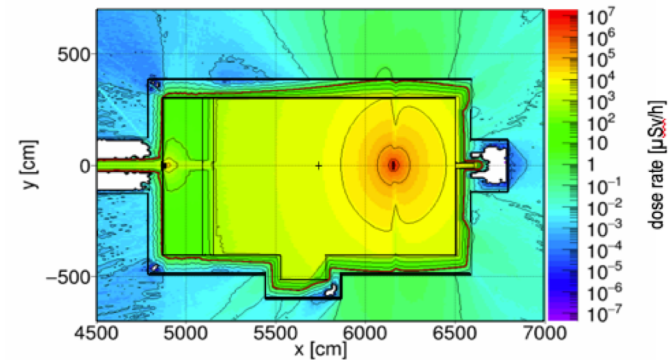


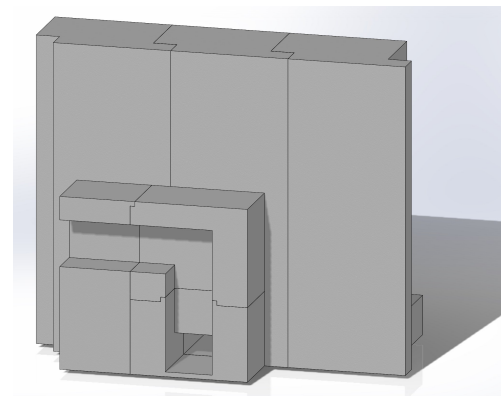
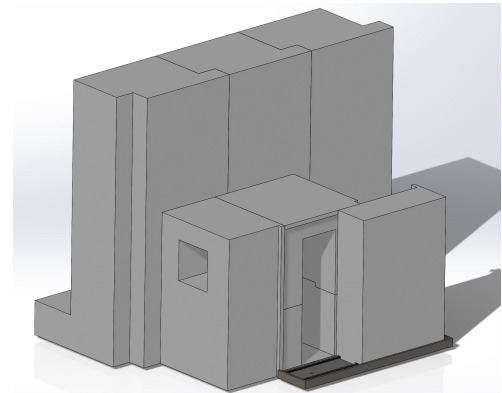
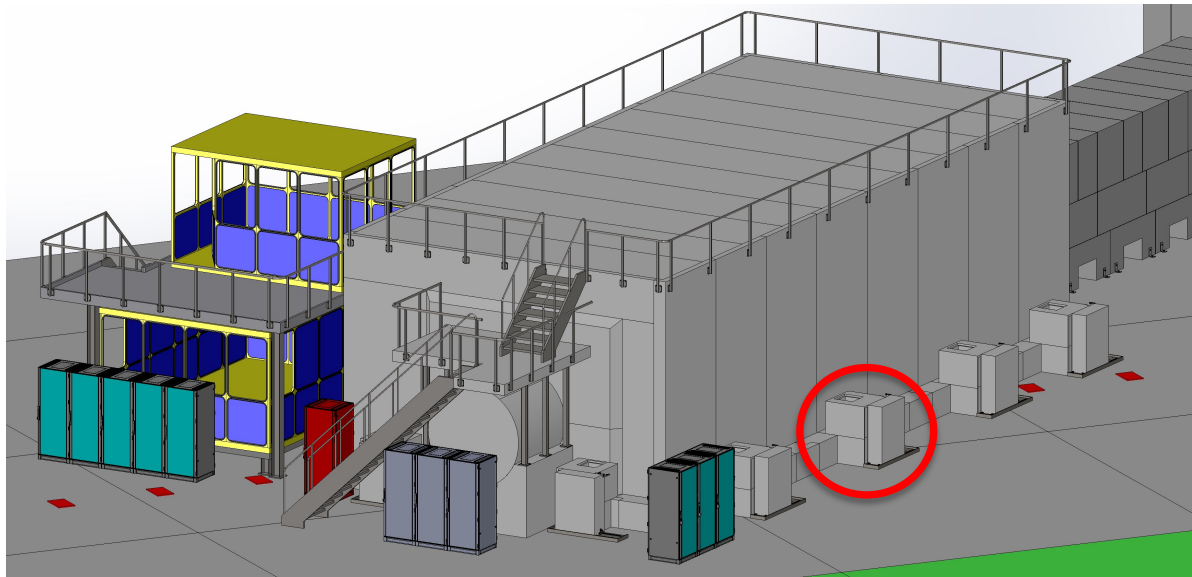
Figure 40: Gamma dose rate produced by thermal neutrons ($E < 1\text{eV}$). The red line is the $1.5\mu\text{Sv/h}$ border. The maximum of the scale is the maximum that appears in the diagram.

* Item agreed to be procured by ESS for TUM

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 11.2	39-50	Cave Shielding*	Jun 2021	PDR done	On track

Ex-Bunker main components:

Installation window: Jun 21 – Feb 22

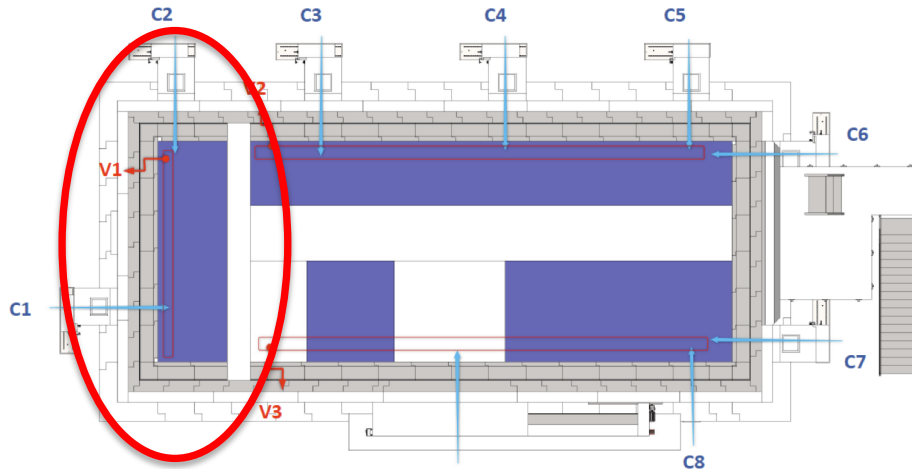


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	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 11.2	39-50	Cave Shielding*	Jun 2021	PDR done	On track

Ex-Bunker main components:

Installation window: Jun 21 – Feb 22



C1-C8: Chicanes for piping and cabling

V1-V3: Ventilation feedthrough

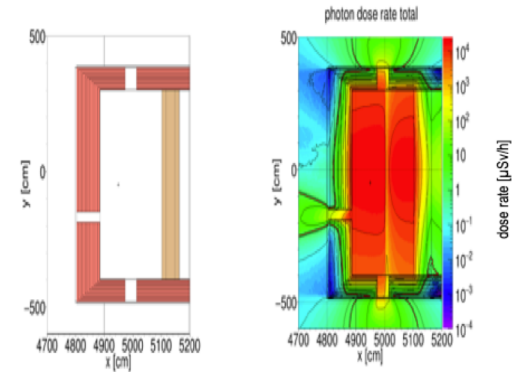


Fig. 4. Generated gamma dose rate due to thermal neutron capture (2mm Cd sheet in optical chamber). The red line is the 1.5μSv/h border.

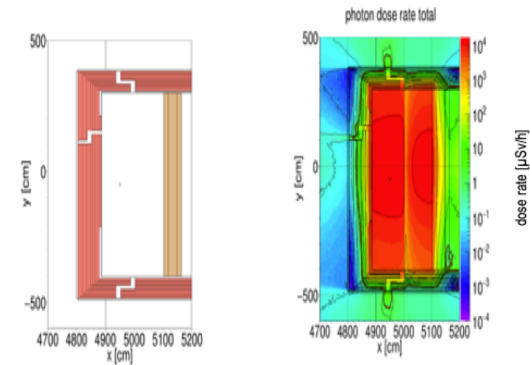


Fig. 6. Generated gamma dose rate due to thermal neutron capture (2mm Cd sheet in optical chamber). The red line is the 1.5μSv/h border.

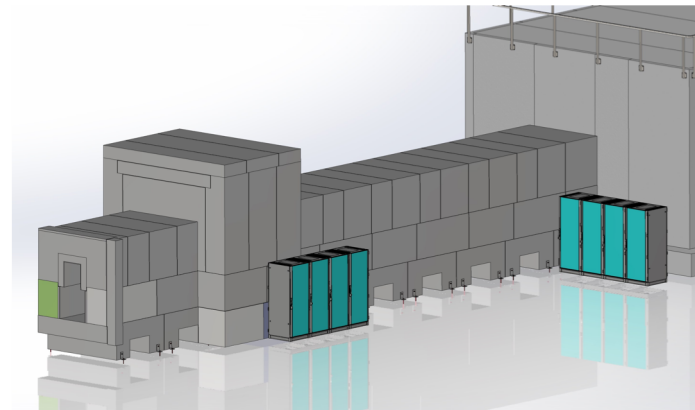
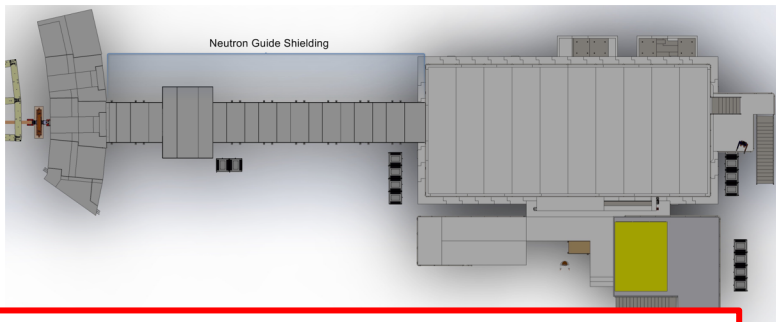
* Item agreed to be procured by ESS for TUM

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 11.1	33-38	Guide Shielding* (common shielding project)	Jun 2021	subTG3 Dec 2020	On track

Ex-Bunker main components:

Installation window: Jun 2021 – Mar 2022

- Guide shielding (TUM)
 - ODIN guide shielding belongs to Common shielding project ESS
 - Detail design: Last verification MC simulations ongoing
 - subTG3 re-scheduled Dec 2020
 - Status **OK**



* Item agreed to be procured by ESS for TUM

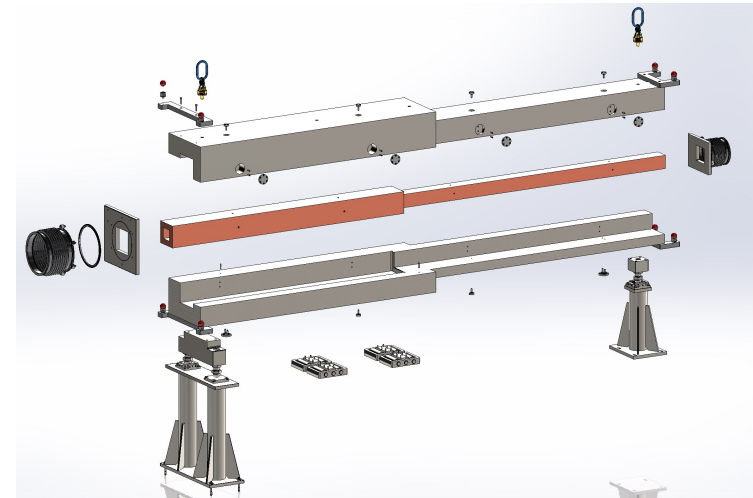
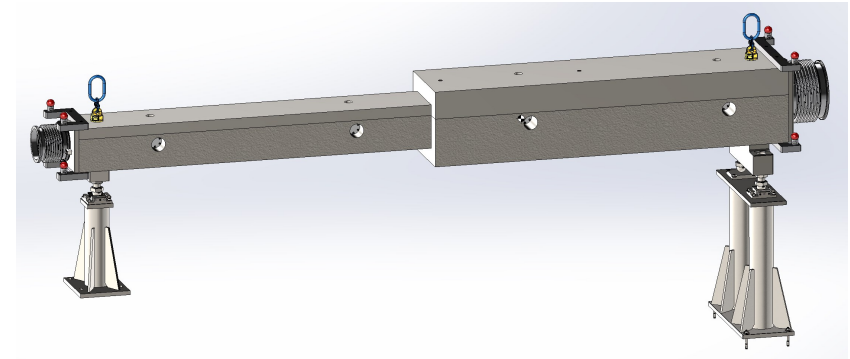
	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM			Bunker wall feedthrough	Jun 2021	KoM Oct 2020	On track

Ex-Bunker main components:

Installation window: Jun 2021 – Feb 2022

- Bunker wall Feedthrough
 - CTV Aproved Mar 2020
 - SoC Sep 2020 ✓
 - Manufactured by SNAG
 - KoM scheduled 1st week Oct 2020 ✓
 - subTG3 scheduled Dec 2020

 - Status OK



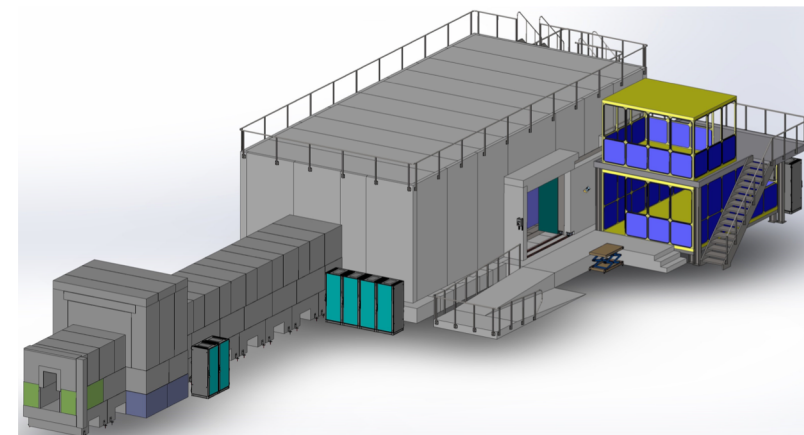
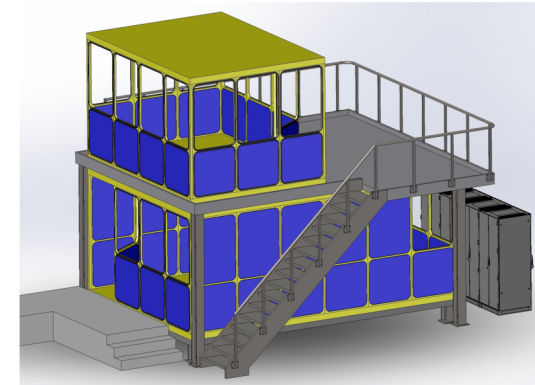
	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
TUM	WU 12		Instrument Infrastructure	Feb 2022	RfQ (Oct2020)	On track

Ex-Bunker main components:

Installation window: Jun 2021 – Oct 2021

- Instrument infrastructure (TUM)
 - Control Hutch (TUM)
 - Sample preparation Area & Storage (TUM)
 - CTV approved Mar 2020
 - RfQ scheduled October 2020 ✓
 - SoC Jan 2021 the latest

 - Status OK

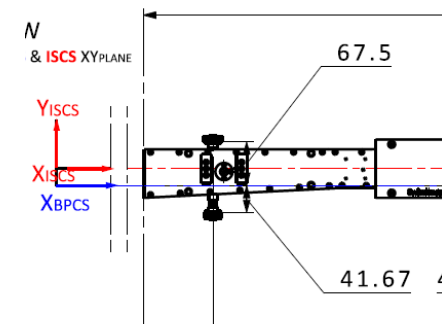
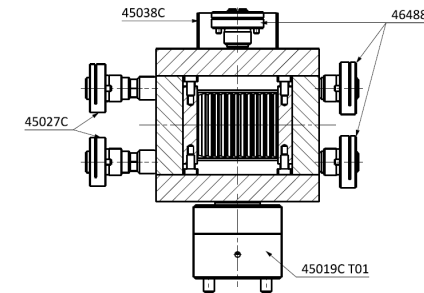


* Item agreed to be procured by ESS for TUM

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
PSI	02.1	1-4	NBOA	Q12021	Delivery ESS	On track

In-Bunker main components:

- Installation window: 11.8.21 – 25.2.22
- NBOA
 - NBOA manufacturing contract was signed in 2019
 - Simplification of the design was requested from SNAG
 - PDR was held in August 2019
 - Detailed design is now ready
 - Manufacturability check from FZJ done
 - TG3 passed in November 2019
 - Currently in manufacturing ✓
 - Status OK



	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
PSI	02.2	5-16	Neutron transport system	Mar 2022	IDR completed	Ok (using contingency)

In-Bunker main components:

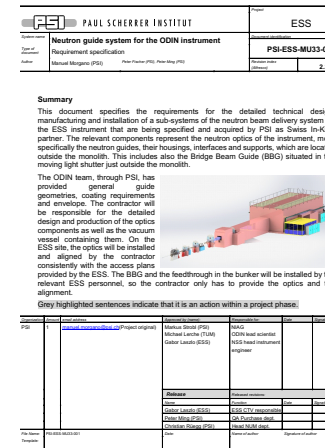
- Installation window: Nov 21 → to be rediscussed

Ex-Bunker main components:

- Installation window: Jan 22 → to be rediscussed

Guides

- Design-manufacture-shipment-installation tender published in May 2019
- Contract signed (Dec 20/2019) with Axilon+SNAG
- Budget: 1.76 MEUR (including NBOA and contingency, hardware only)
- Total price for the entire guide system: 1.768 MEUR
- KOM held on Feb 10th 2020
- IDR held on 21st September 2020 ✓
- Bi-weekly ODIN guide meeting with PSI - Axilon+SNAG – TUM (really helpful!)
- Installation issue due to the late delivery of the T0 chopper under discussion
- CDR by October and TG3 by December: timeline is feasible ✓
- Status **OK**



Summary

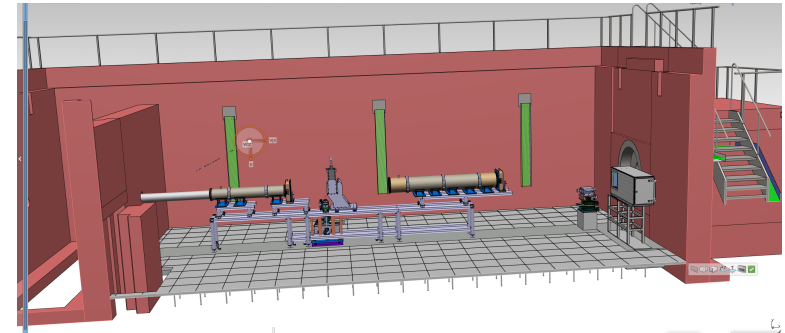
This document specifies the requirements for the detailed technical design, manufacturing and installation of a sub-systems of the neutron beam delivery system of the ESS instrument that are being specified and acquired by PSI as Swiss In-Kilopartner. The relevant components represent the neutron optics of the instrument, more specifically the neutron guides, their housings, interfaces and supports, which are located outside the monolith. This includes also the Bridge Beam Guide (BBG) situated in a moving light shutter just outside the monolith.

The ODIN team, through PSI, has provided general guide geometries, coating requirements and envelope. The contractor will be responsible for the detailed design and production of the optical components as well as the vacuum vessel containing them. On the ESS site, the optics will be installed and aligned by the contractor consistently with the access plans provided by the ESS. The BBG and the feedthrough in the bunker will be installed by it relevant ESS personnel, so the contractor only has to provide the optics and it alignment.

Grey highlighted sentences indicate that it is an action within a project phase:

PSI	Contractor	ESS
Neutron Guide (PSI)	SNAG	ESS
Bridge Beam Guide (PSI)	ESS	ESS
Supports (PSI)	ESS	ESS
Interfaces (PSI)	ESS	ESS
Coatings (PSI)	ESS	ESS
Installation (PSI)	ESS	ESS
Alignment (PSI)	ESS	ESS

	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
PSI	06	17-32	Cave interior	June 2022	In prep.	On track



Ex-Bunker main components:

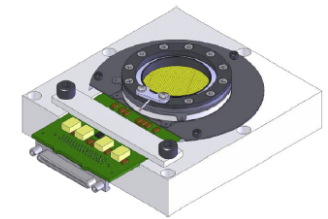
Installation window: 3.6.21 – 25.2.22

- Cave Interior (PSI)
 - Tender published (May 2020) and offers received (September 2020)
 - Received offers are significantly more expensive than the budget → discussion ongoing to de-scope and to save budget somewhere else
 - Some of the components will be designed internally by PSI (J. Hovind)
 - Current concept with a false floor to accommodate for the “elephant foot”
 - Advantages: cabling and piping hidden under the floor
 - ODIN wants to participate in the common power distribution project: waiting for an offer from ESS
 - Strong interest in the utilities distribution common project. First price estimate received ✓
 - Status OK

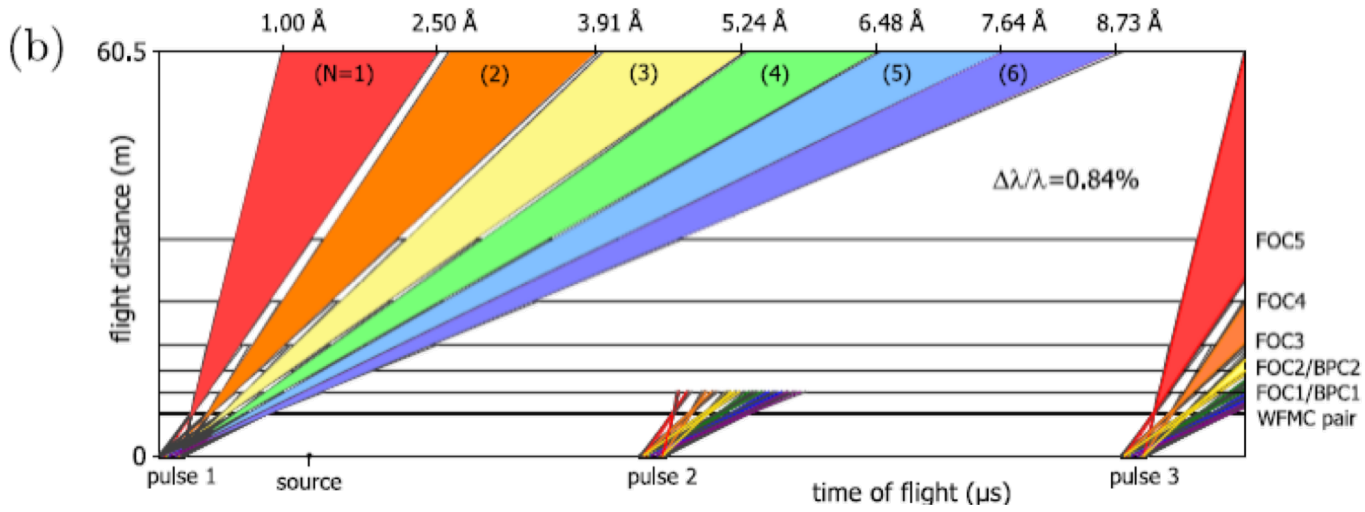
	Task no.	TA ID	Deliverables – Project Results	Delivery Date	Status	
PSI	09	33-43	White beam detectors (WB)	Dec. 2021	commercial	ok
PSI	10	44-48	ToF detector	Dec. 2021	Readout pending	ok

In-Bunker main components:

- Installation window: not critical
- WB+TOF detector
 - WB detectors: existing well probed technology, not critical ✓
 - TOF Detector from UC Berkeley acquired at PSI, GP2 (ISIS) and uNID (JPARC) detector tested ✓
 - New event-based detector technology tested in August 2020: definition of the best technology for ODIN will happen early next year ✓
 - Milestone definitions concerning readout, data reduction, instrument control and detector integration alignment projects crucial and needs to happen soon (DMSC/ICS deliverables)
 - ODIN participates in the ESS Beam Monitor Project ✓
 - Status OK

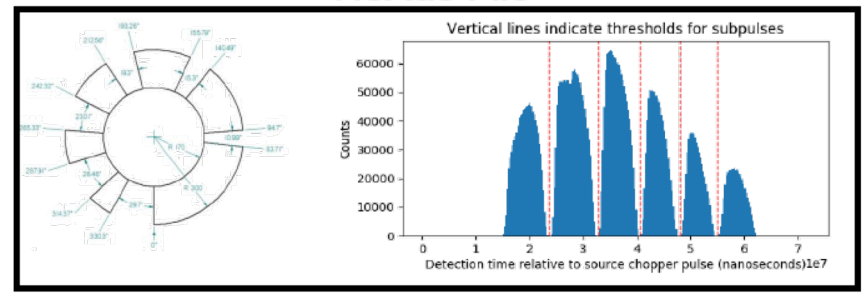


- ODIN employs Wavelength Frame Multiplication (WFM) to enable high wavelength resolutions
- Paper on ODIN chopper system published: Schmakat, P., et al. NIMA 979 (2020)



- WFM requires specialized data reduction and development work started based on data acquired on V20.
- Activities will now be focused with the start of the Instrument Data Scientist and regular meetings.

NeXus File



Project Status

Installation plan



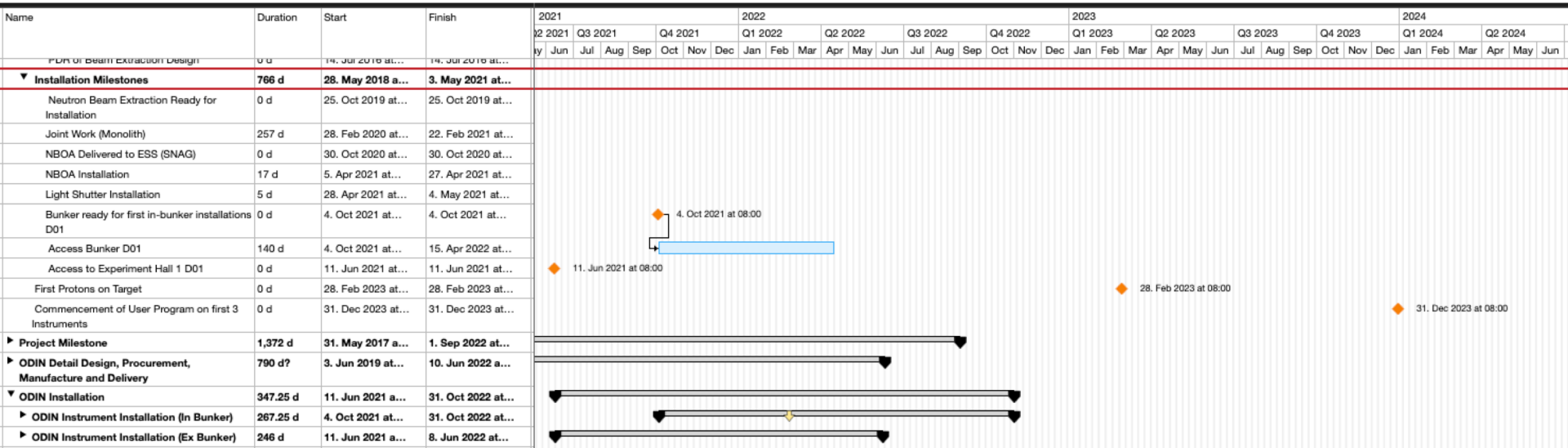
EUROPEAN
SPALLATION
SOURCE

- Installation plan evolving and shared with ESS (Antonio Bianchi)
 - Plan continuously updated with new installation information from contractors
- Starting soon with definition and preparation of binders (Virginia) ✓
- Installation in-bunker is a challenge
 - Timing: T0 Chopper, guides and bunker roof
 - Synchronization with DREAM (sharing resources for common tasks?)
 - Remote handling and other testing must be done (PSS? MCA?)
 - Power supply and utilities
 - Availability in-bunker?
 - Interfaces definition? Cable trays and connection panels?

- ODIN installation timeline is very tight
 - Bunker roof time window might be a major constraint

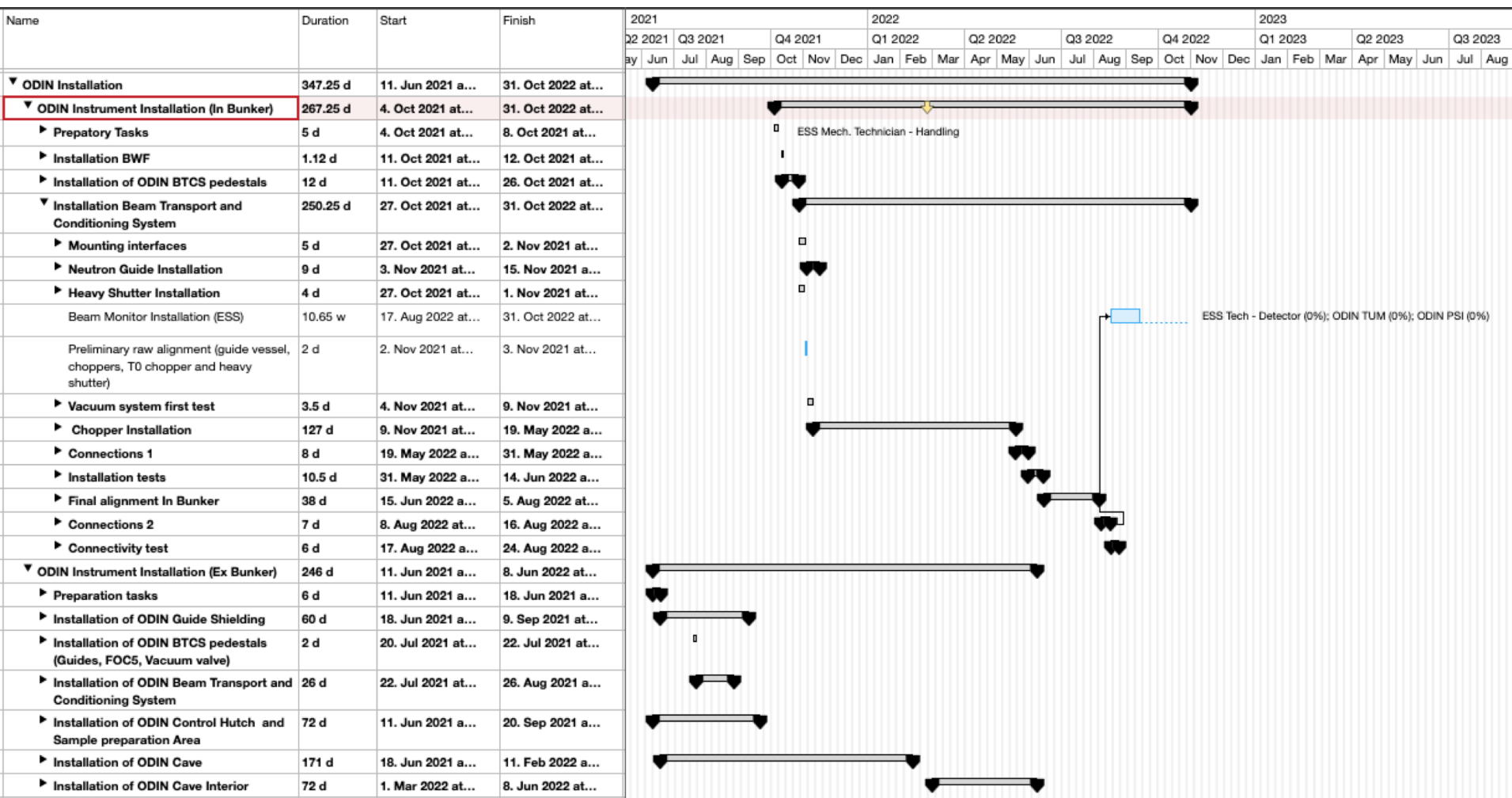
Project Status

Installation plan



Project Status

Installation plan



Open items (ongoing)

- PSS and IHA
 - Very productive collaboration with PSS (Morteza)
 - Working in PSS definitions and update of operational IHA, while the detail design of the cave occurs (CDR Dec 2020)

- Power distribution and utilities supply
 - Both are common projects where ODIN has joined
 - Still waiting an offer for Power distribution project
 - Many definitions of scope and interfaces still missing for Utilities supply project. Ongoing

- Major risks
 - COVID19 and installation
 - What if...
 - Travelling restrictions?
 - Major lockdown?
 - T0 chopper delivery and installation delays
 - New installation strategies ongoing

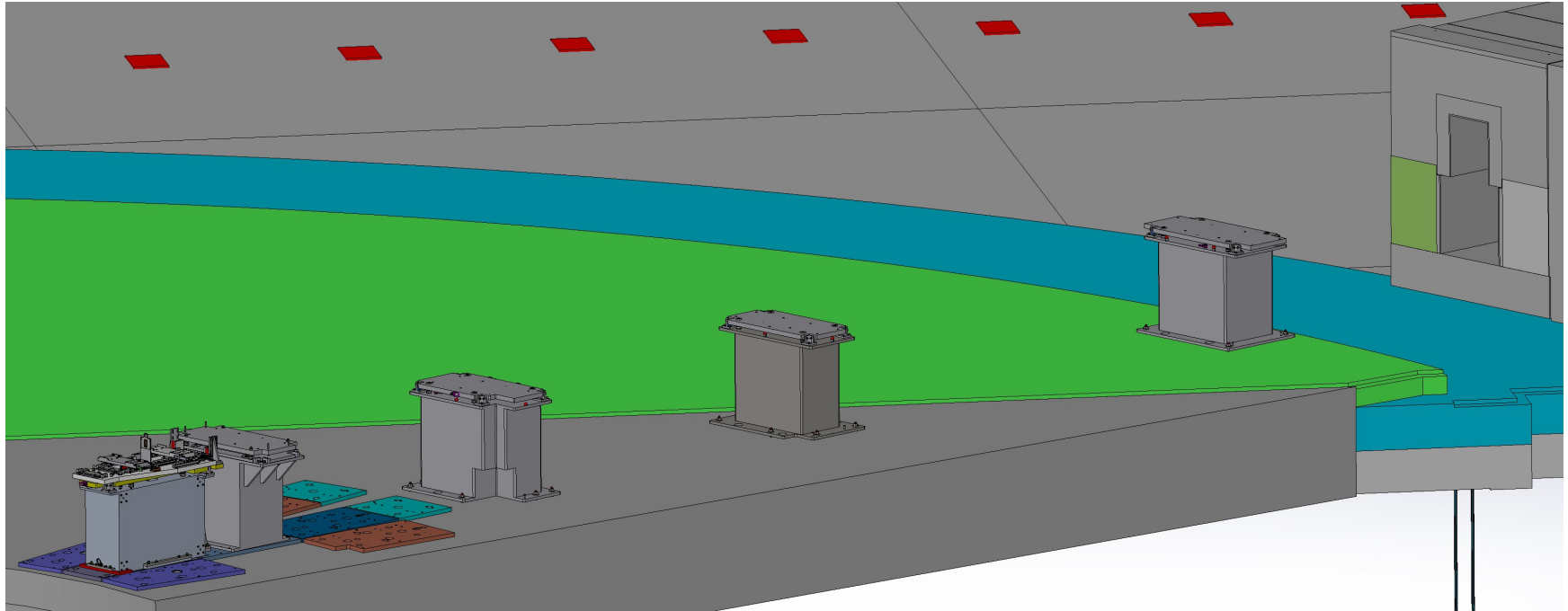
Project Status

ODIN design today... timelapse



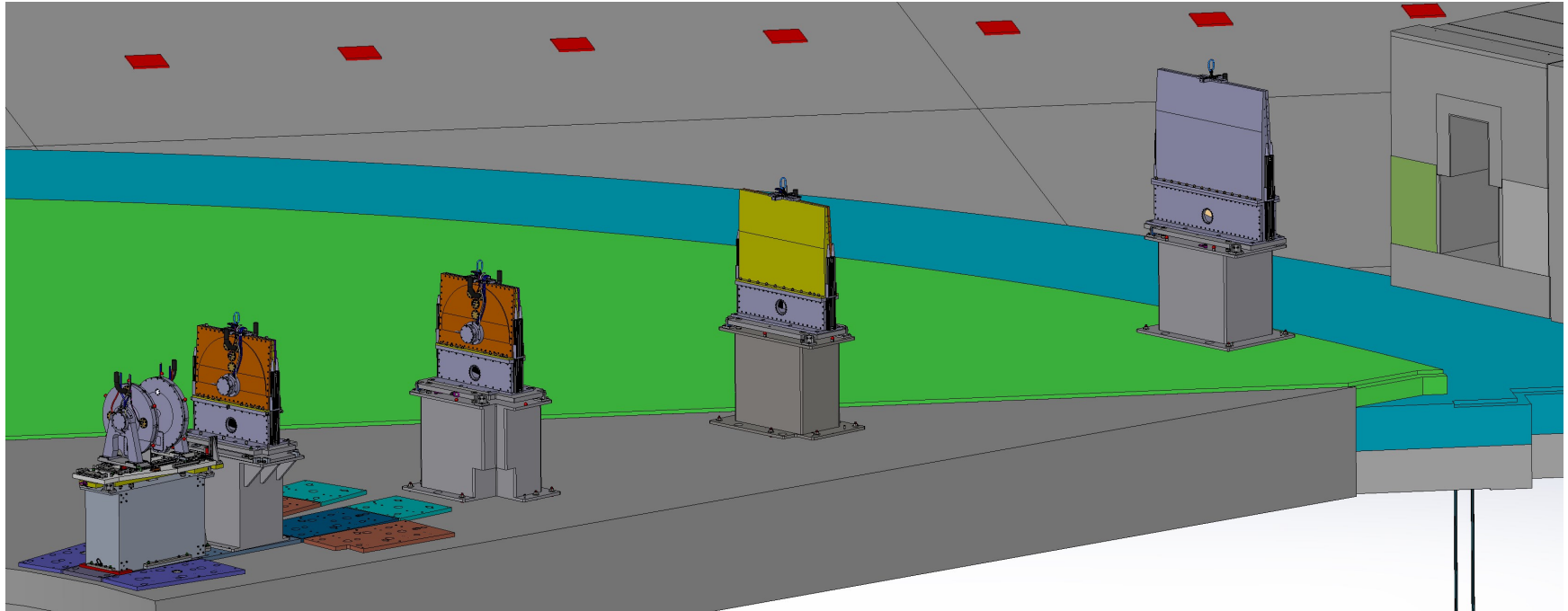
Project Status

ODIN design today... timelapse



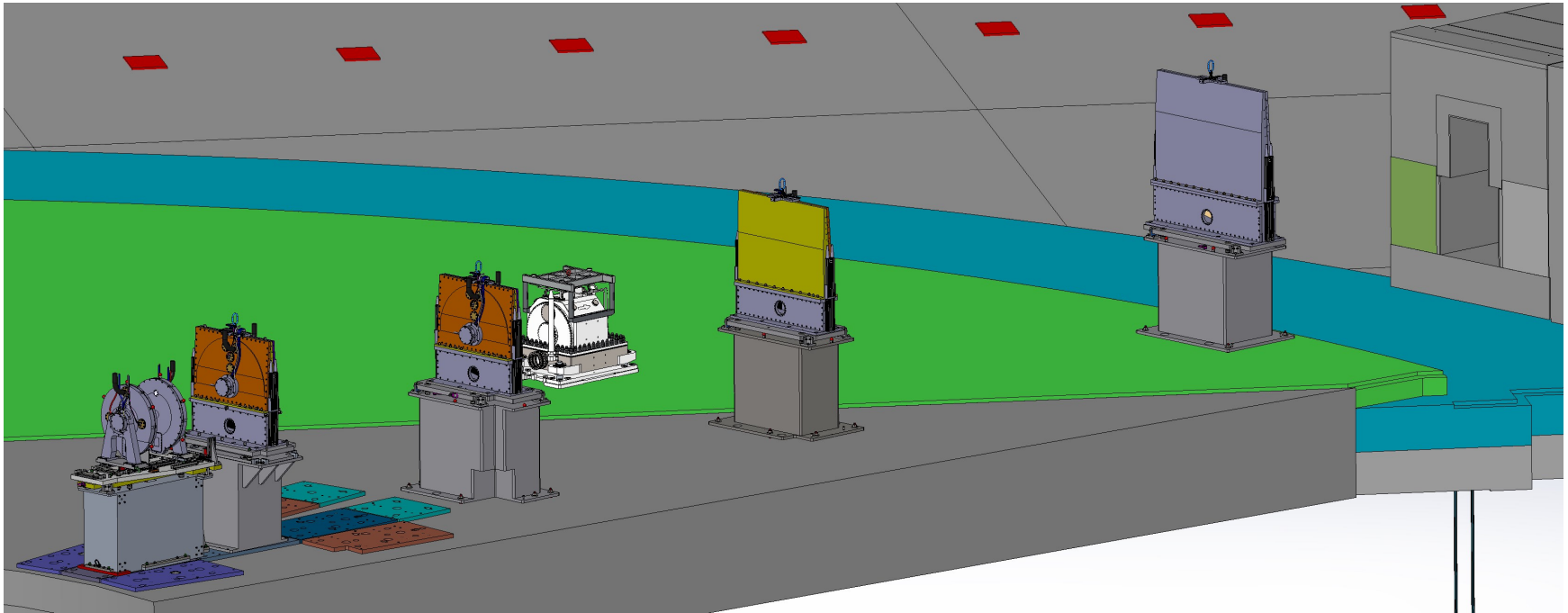
Project Status

ODIN design today... timelapse



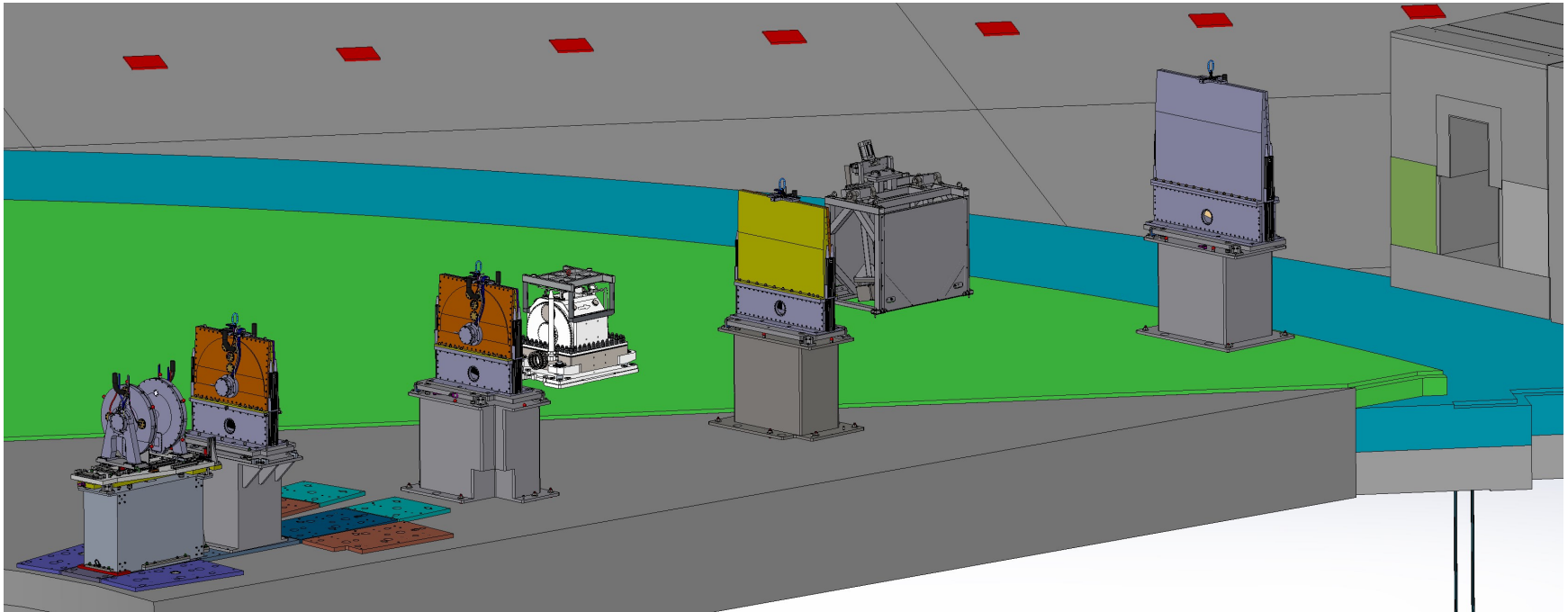
Project Status

ODIN design today... timelapse



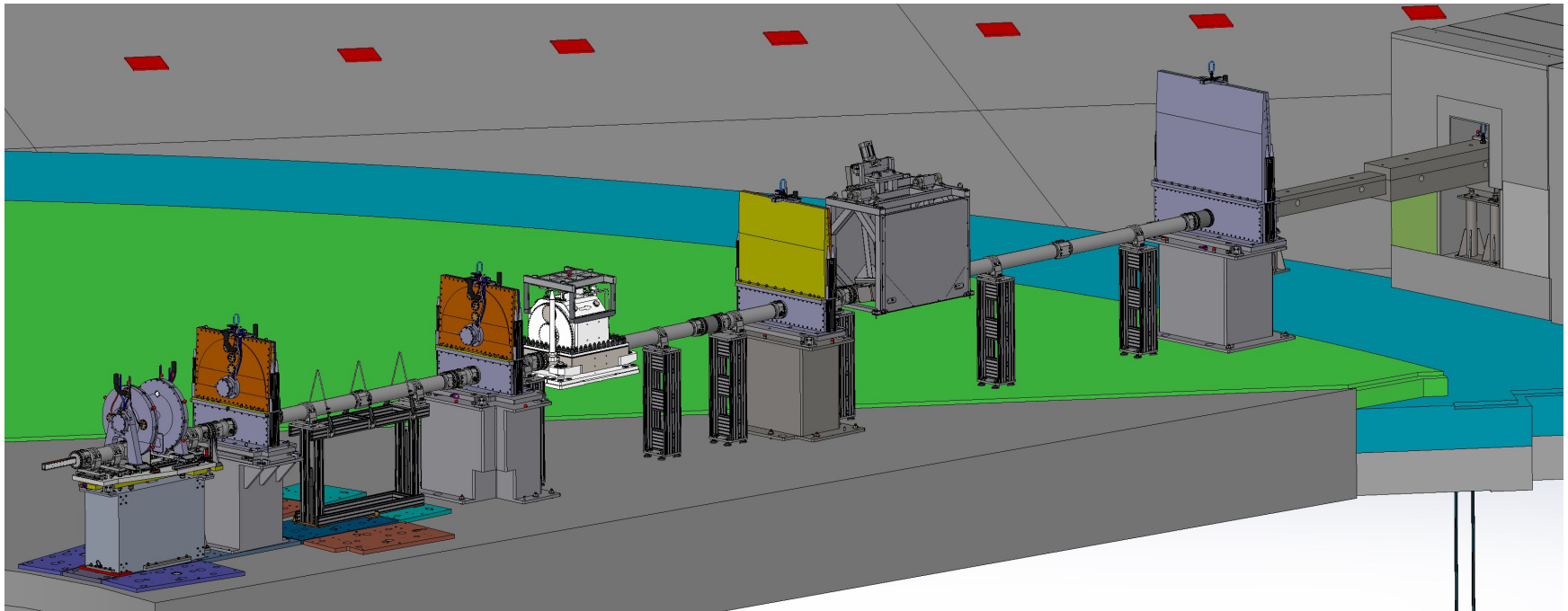
Project Status

ODIN design today... timelapse



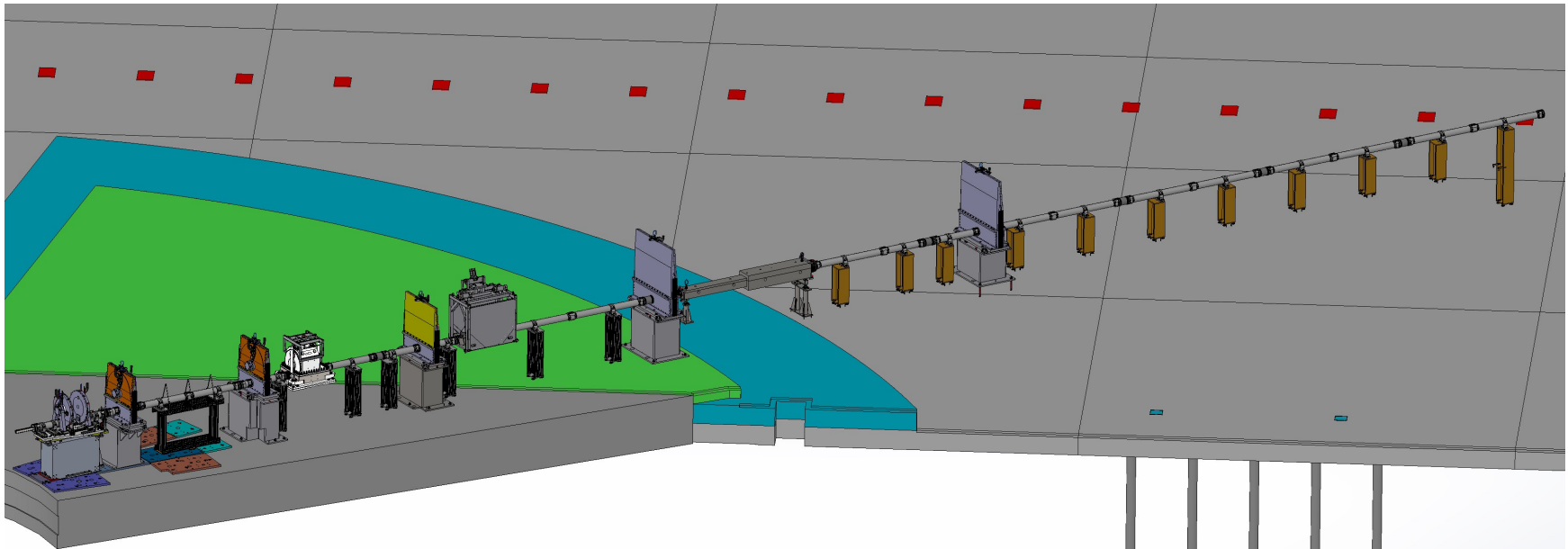
Project Status

ODIN design today... timelapse



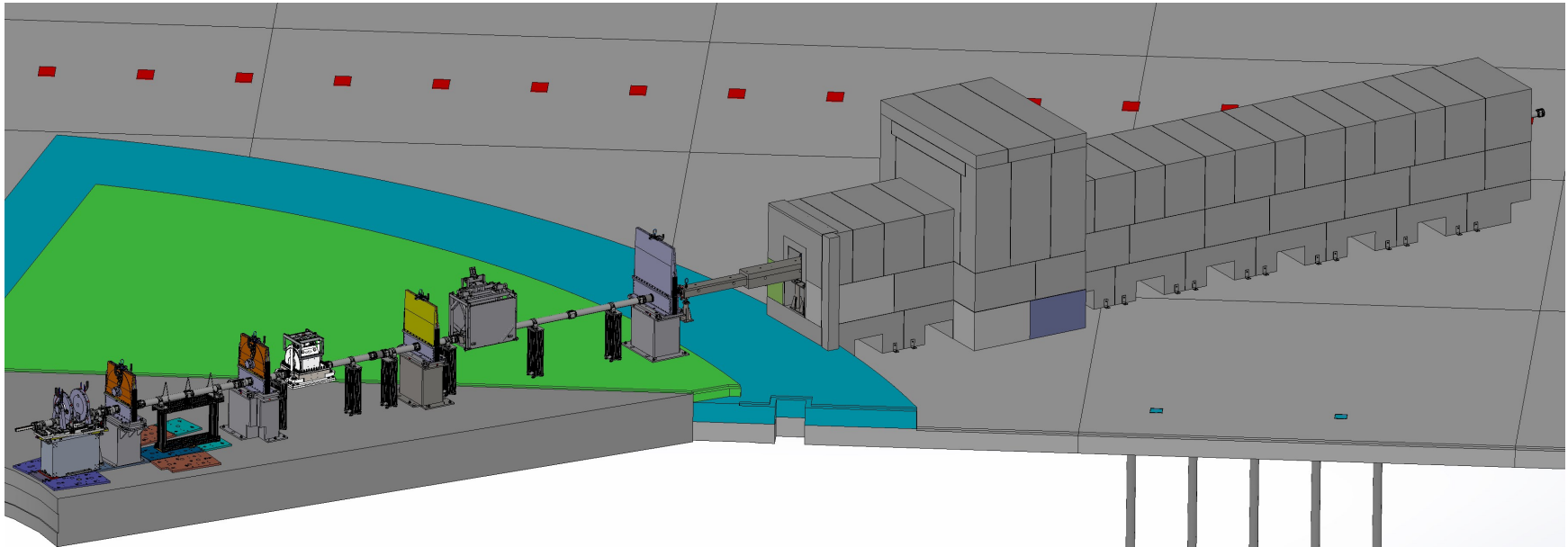
Project Status

ODIN design today... timelapse



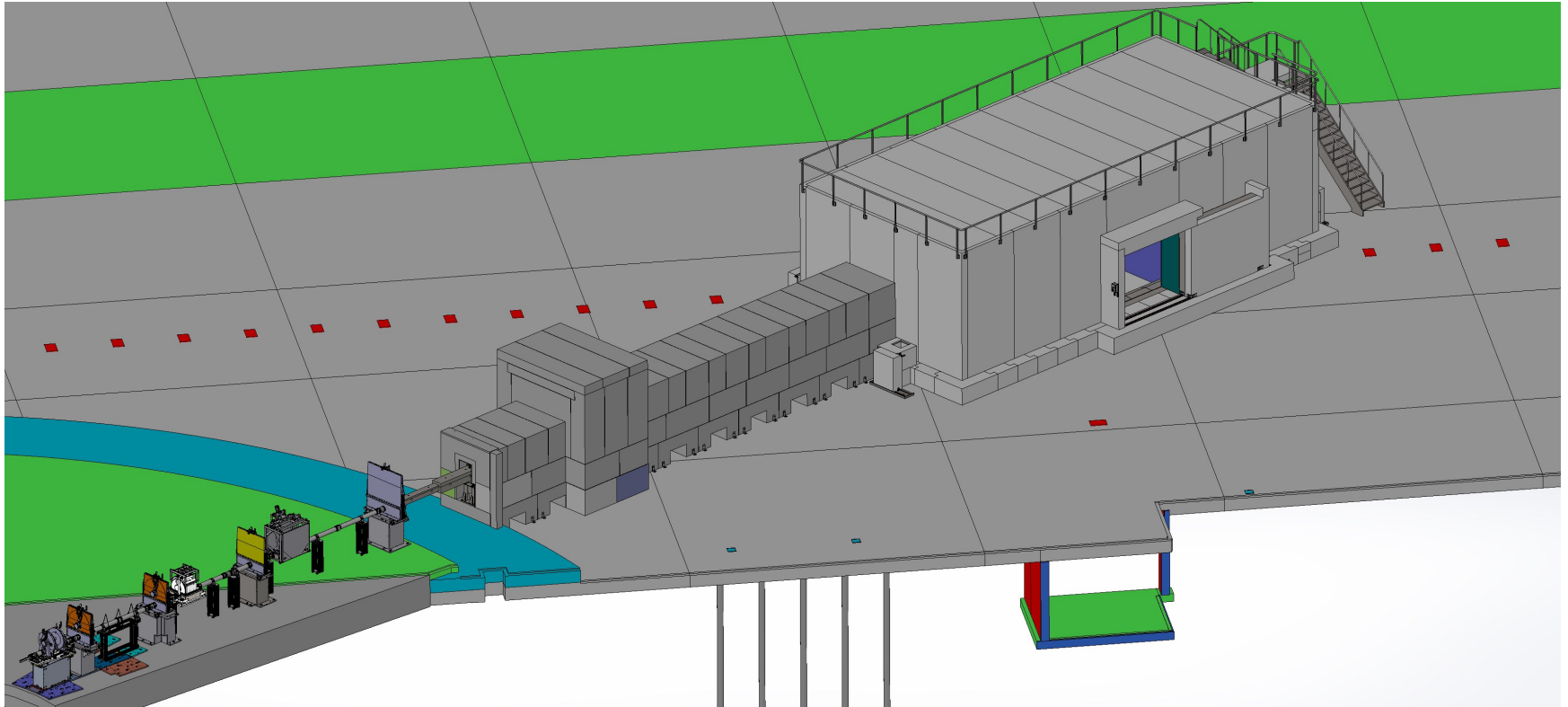
Project Status

ODIN design today... timelapse



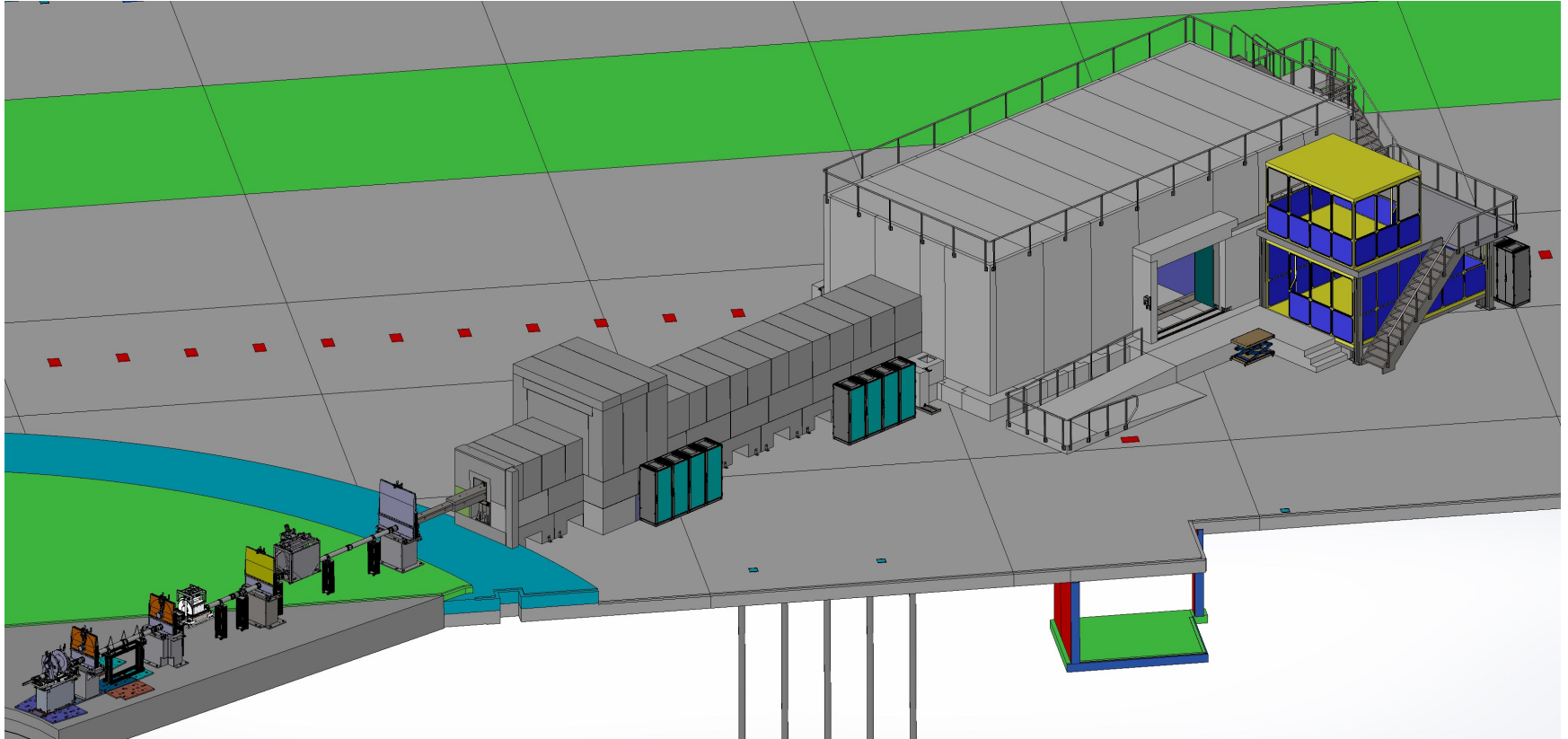
Project Status

ODIN design today... timelapse



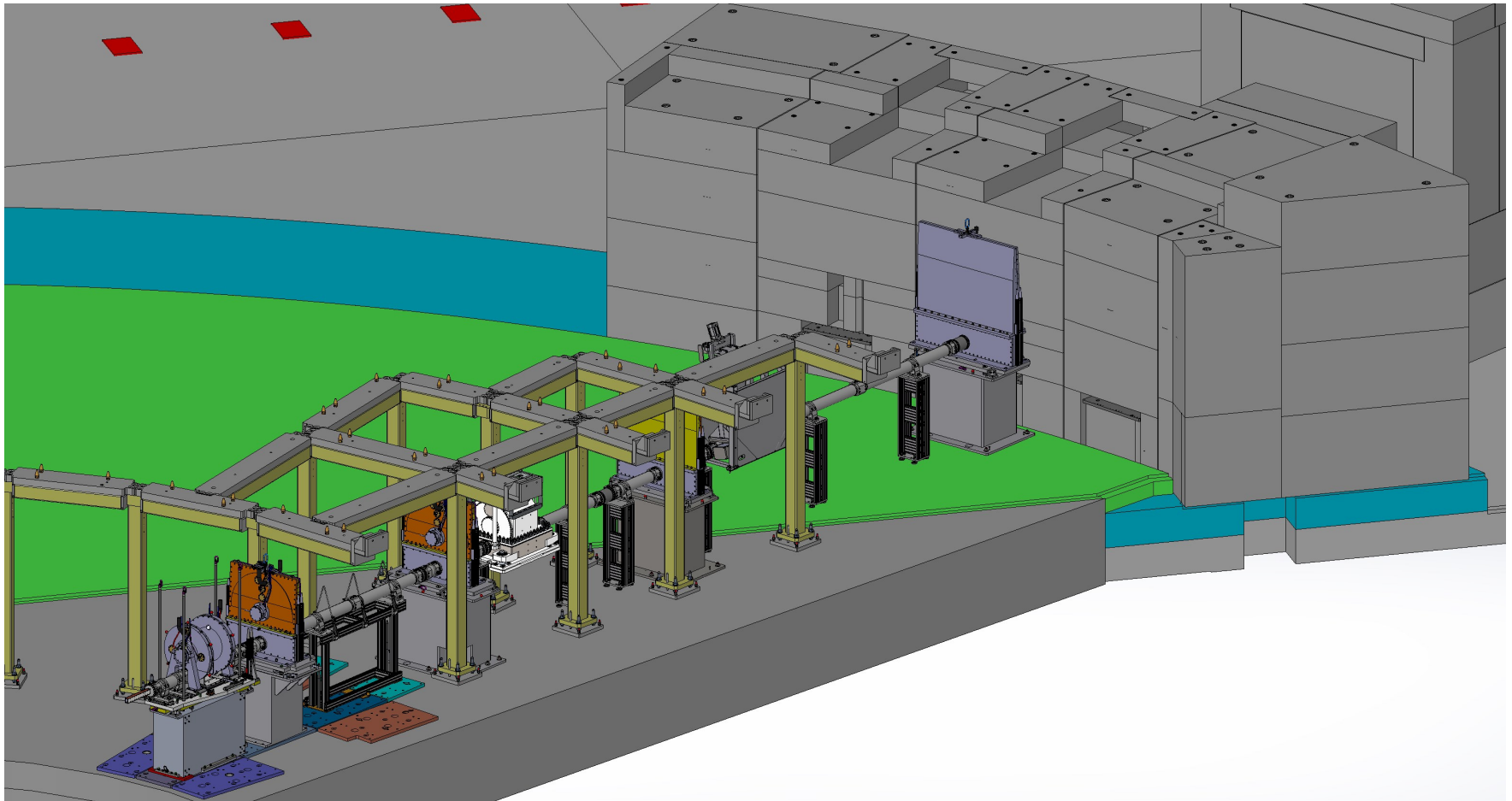
Project Status

ODIN design today... timelapse



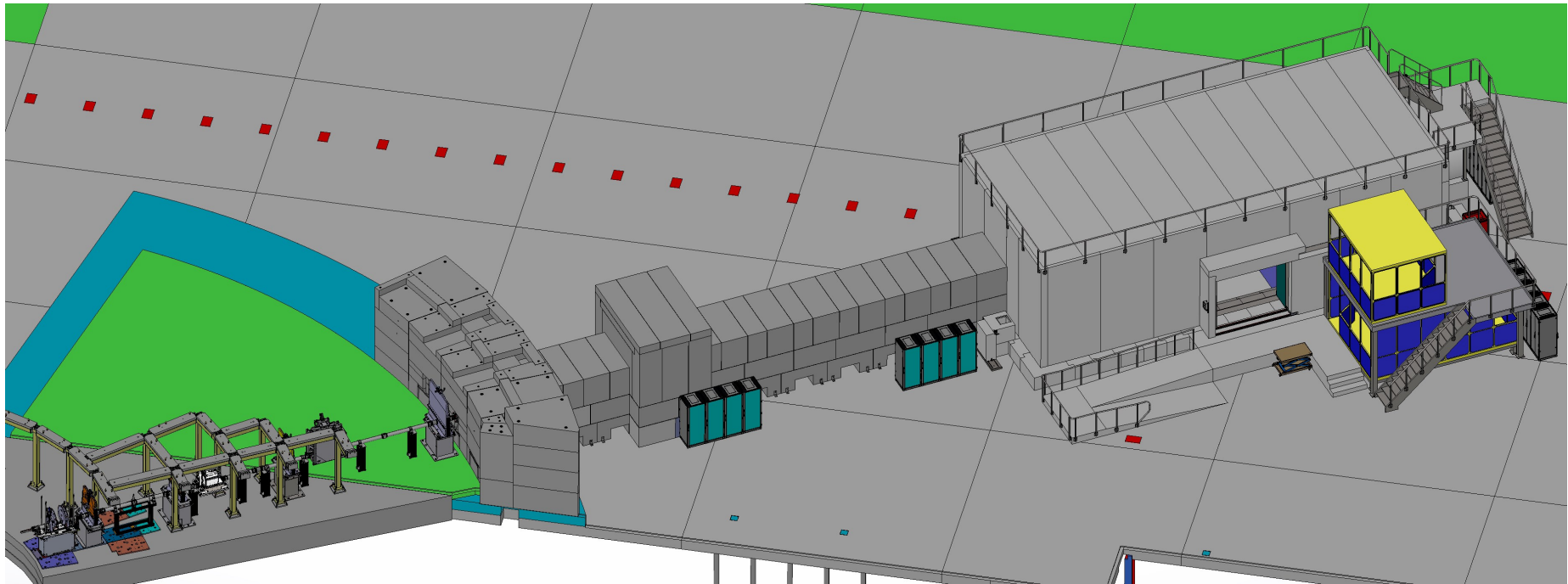
Project Status

ODIN design today... timelapse



Project Status

ODIN design today... timelapse



- ODIN overview
 - Requirements & Applications
 - General overview
 - High level schedule
- How we work
- Project Status
 - ODIN Work Units Overview
 - Installation plan
- Summary

Summary

- ODIN choppers system (Manufacturing), NBOA (Manufacturing) and Neutron guides (IDR Done). **On Track**
- Chopper supplements (IDR done). Preparing detail design for subTG3. **On Track**
- BW-Feedthrough (KoM Oct2020) and Heavy shutter (Tender done). **On track**
- Shielding
 - Cave shielding: PDR done. **On track**
 - Guide shielding (ESS Common Shielding Project): subTG3 scheduled in Dec2020. **The project status is OK**
- ODIN Cave interior: Tender done. **On track**
- T0 chopper: Tender ongoing. **Critical path.**
- MCA: Statement of Work and schedule ready. **Signature of agreement soon**
- PSS, Power distribution and Utilities supply: **Ongoing**
- ODIN Final TG3 scheduled in March2021. **Ongoing**

- Installation
 - Master plan and schedule exist. **New installation strategies (mitigations) ongoing**
 - ODIN has now a dedicated installation engineer. **✓**

- General ODIN status is: **On track ✓**



Thank you!

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