ODIN: Optical and **D**iffraction **I**maging with **N**eutrons at the ESS

Status and perspectives of the ODIN Project

PSI: M. Morgano, M. Strobl

TUM: E. Calzada, A. Tartaglione, M. Schulz

Outline

- ODIN overview
  - ODIN General overview
  - High level requirements
  - Instrument main layout
  - In Bunker – Ex Bunker components
  - Life cycle
- ODIN Project Update (since last STAP)
  - Update TUM
  - Next milestones and actions
  - Update PSI (by Manuel)
  - Technical and Design update (by Elbio later)

ODIN General Overview

- **O**ptical and **D**iffraction **I**maging with **N**eutrons: Neutron radiography and ToF imaging with variable wavelength resolution
- It will be a “first round” instrument.
- (Currently) one of the three “day-1” instruments (SOUP 31.12.2023)
- Joint project of PSI and TUM with TUM as lead institution
- Total Budget 11.6M€

ODIN General Overview

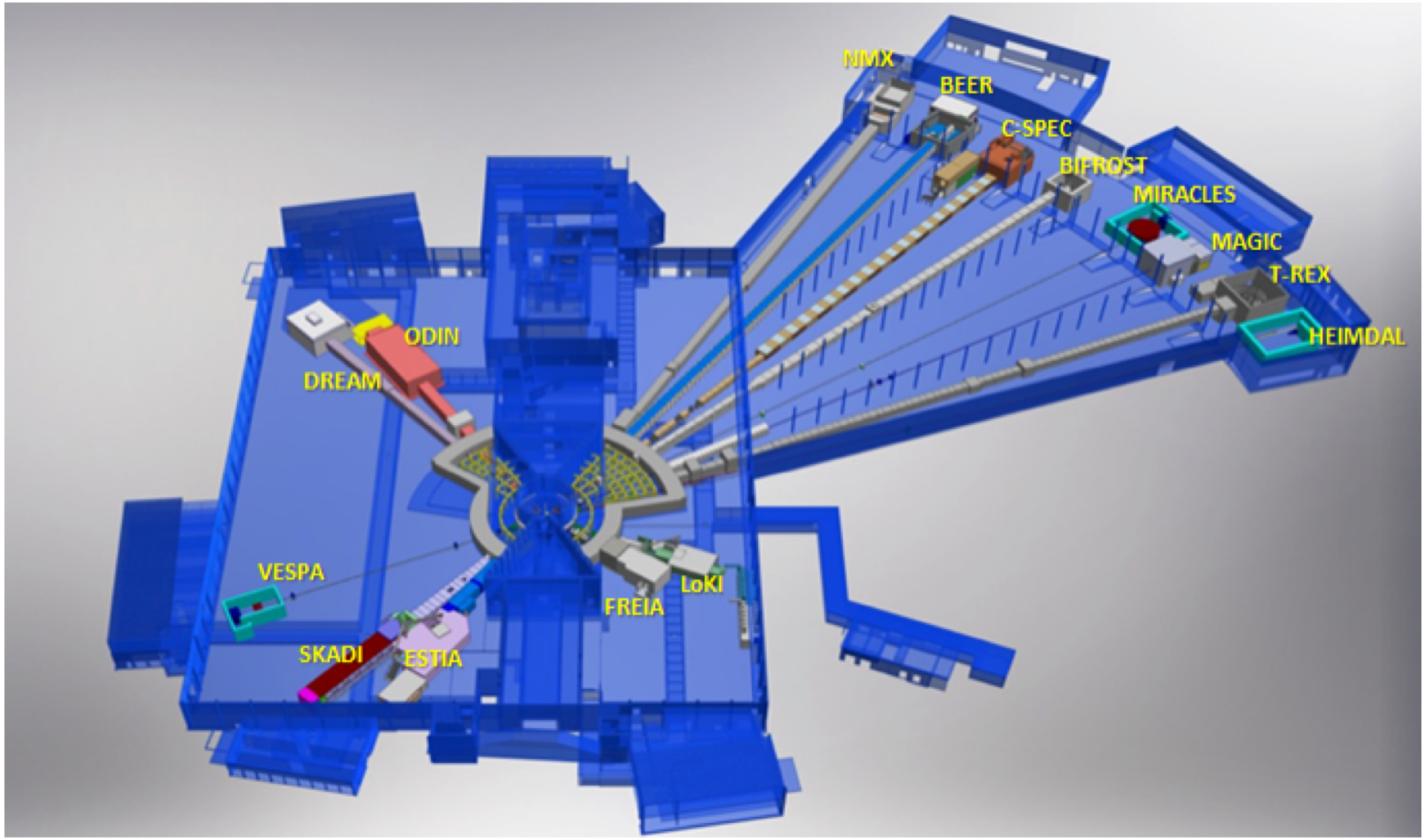
- Multi purpose imaging instrument
- 50m Source to pinhole
- Sample located up to 14m from the pinhole
- Straight beamline (direct view of the source)
- Chopper cascade consisting of 9 axis (plus 1 T_0)
- Range of operational modes:
  - “White beam” imaging with spectral choice
  - Low Time of Flight resolution
    - Grating interferometry
    - SEMSANS imaging
  - Medium Time of Flight Resolution
    - Polarized and polarimetric neutron imaging set-up, Bragg-edge and diffraction
  - High Time of Flight Resolution: Bragg-edge and diffraction geometry set-up
  - Perpendicular X-ray imaging set-up

High Level Requirements

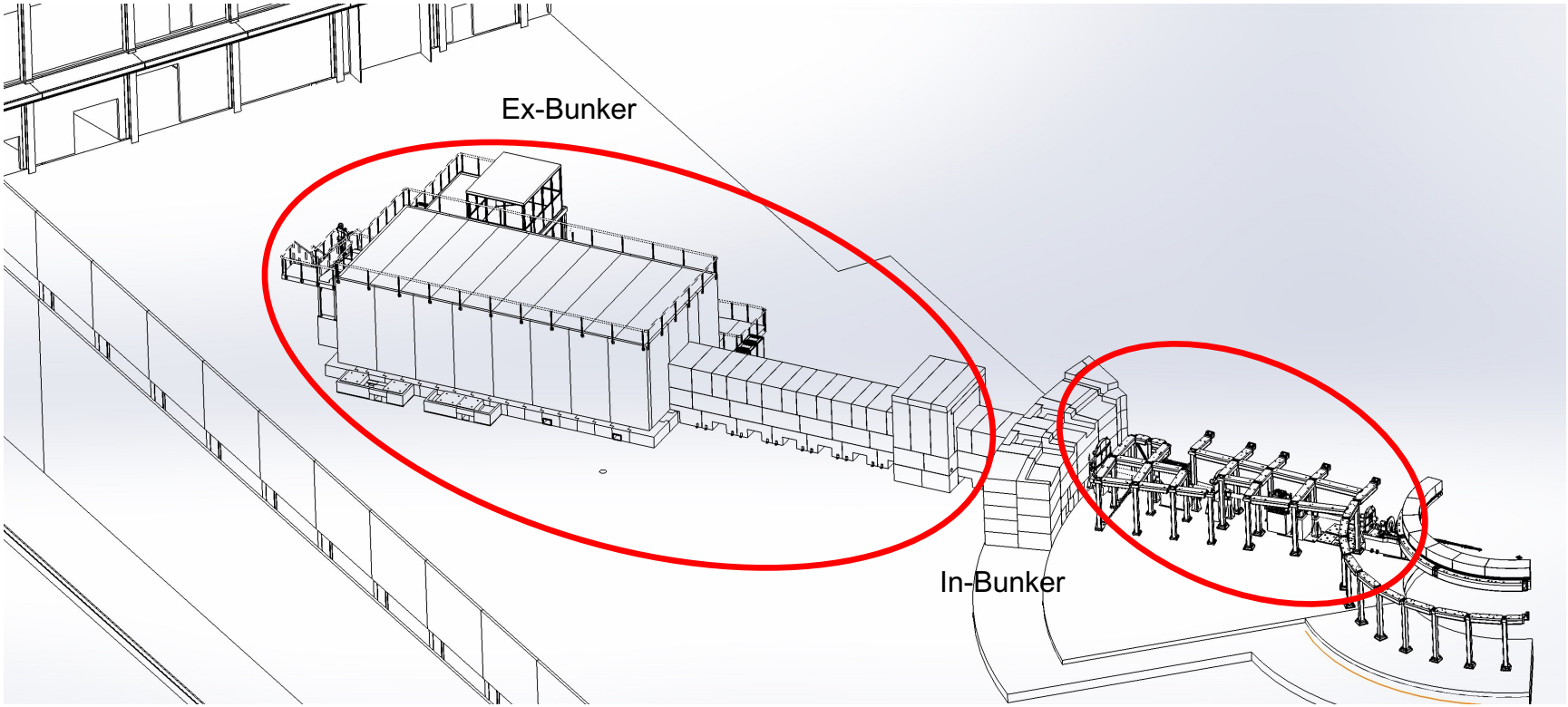
- Field of View up to $20 \times 20 cm^2$ with a homogeneity of more than 75%
- High resolution: Real space resolution of 10µm (smaller FOV)

- ODIN shall cover a wavelength range from 1 to 20 Å to make optimal use of ESS's spectrum.
- Wavelength resolutions of 10%, 1% and down to below 0.5% for spectra from 1 Å to 10 Å and 1 Å to 5.5 Å shall be available.
- Bandwidths of about 4.5 Å and 9 Å in every pulse and single pulse suppression modes shall be freely selectable between 1-20 Å.

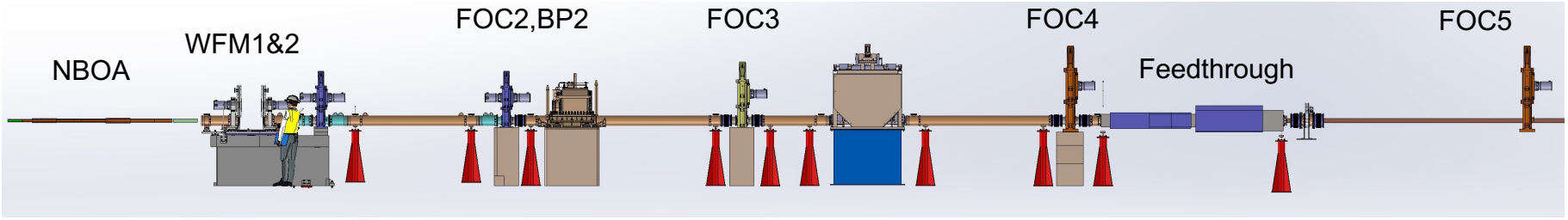
Instrument main layout



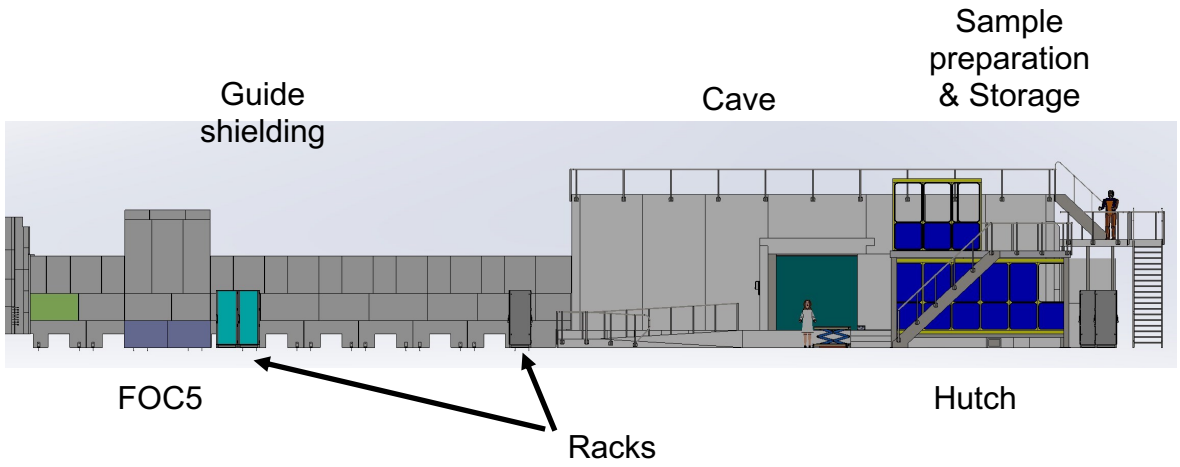
Instrument main layout



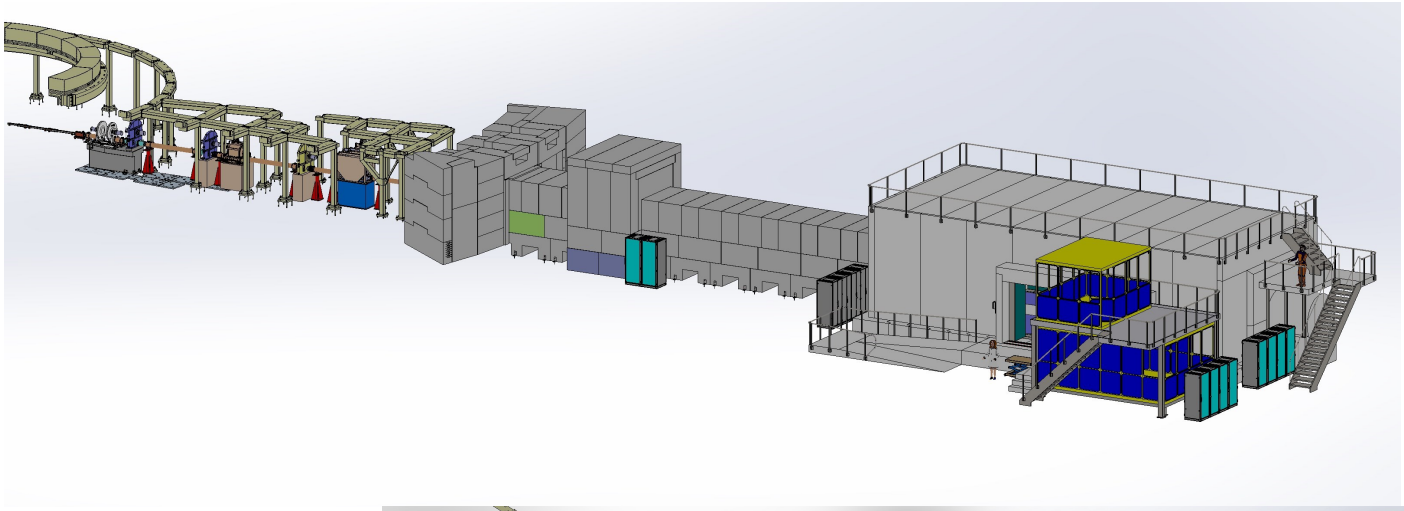
In-Bunker main components

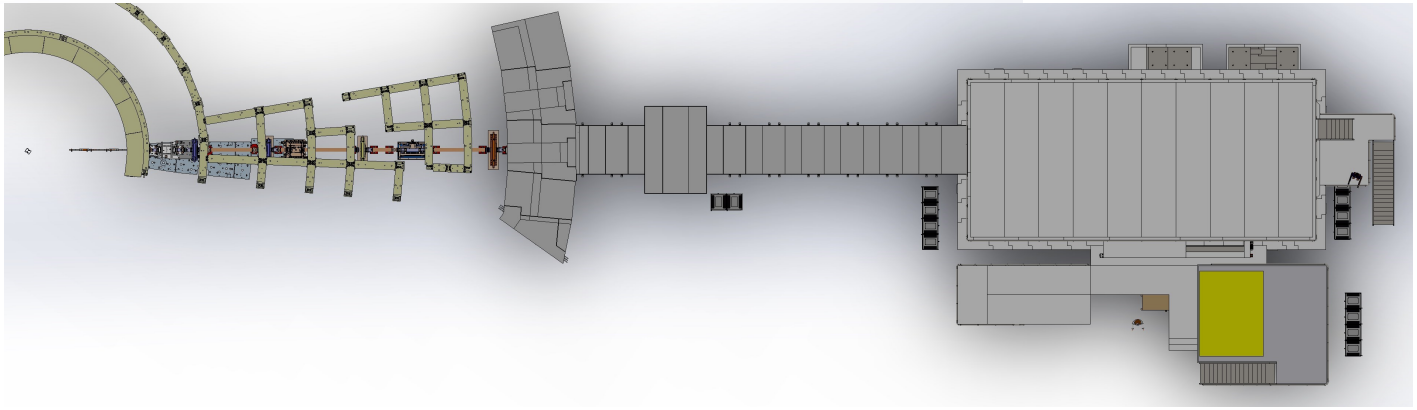


Ex-Bunker main components

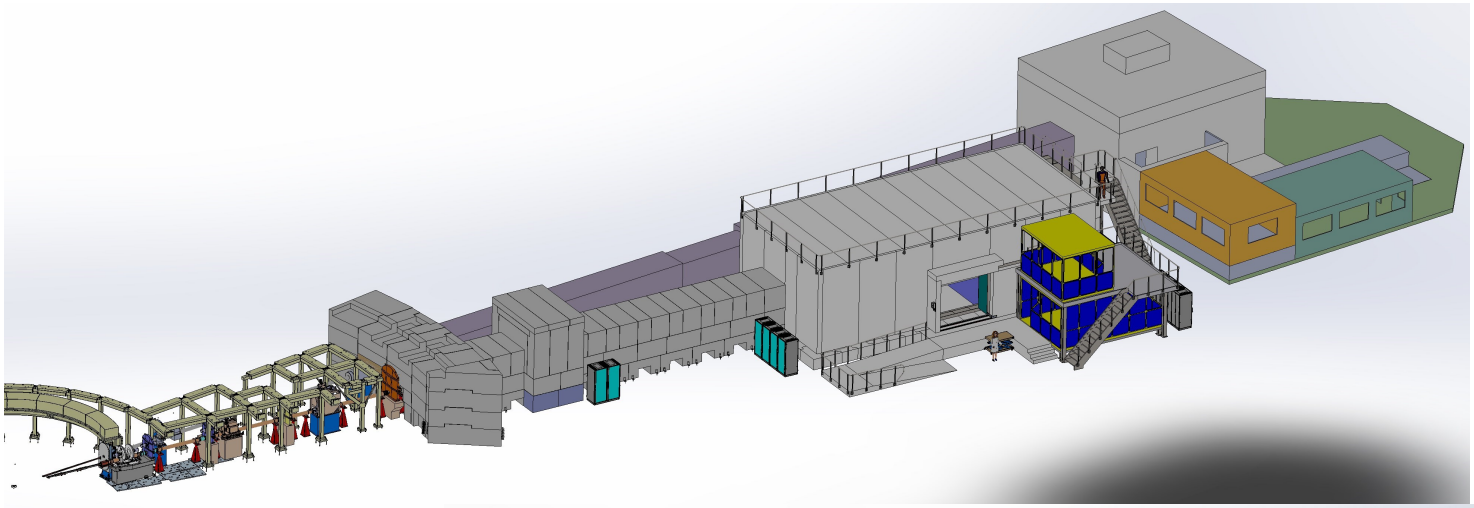


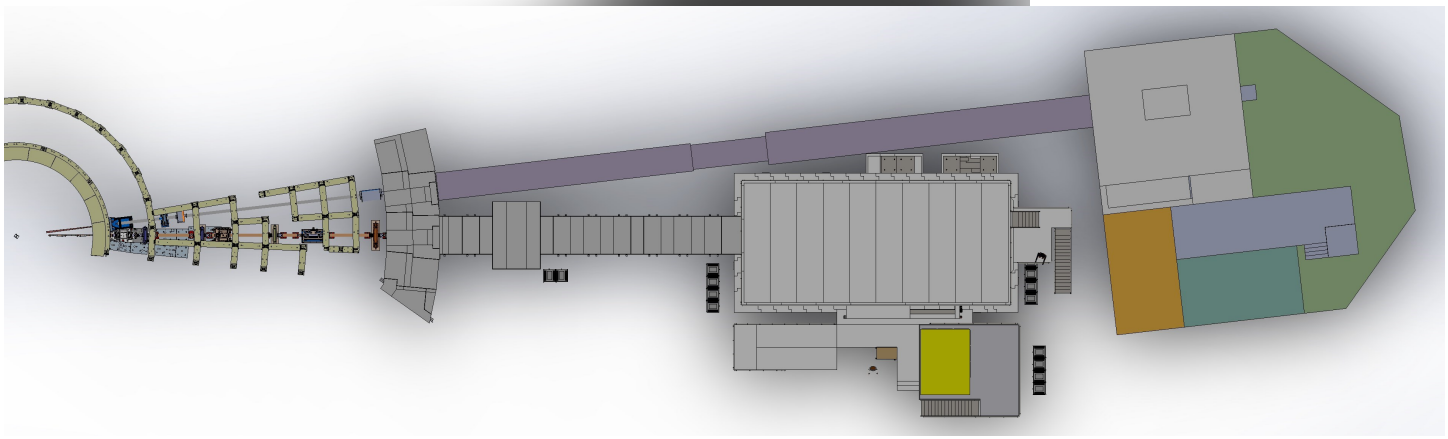
Main layout





Main layout: Dream





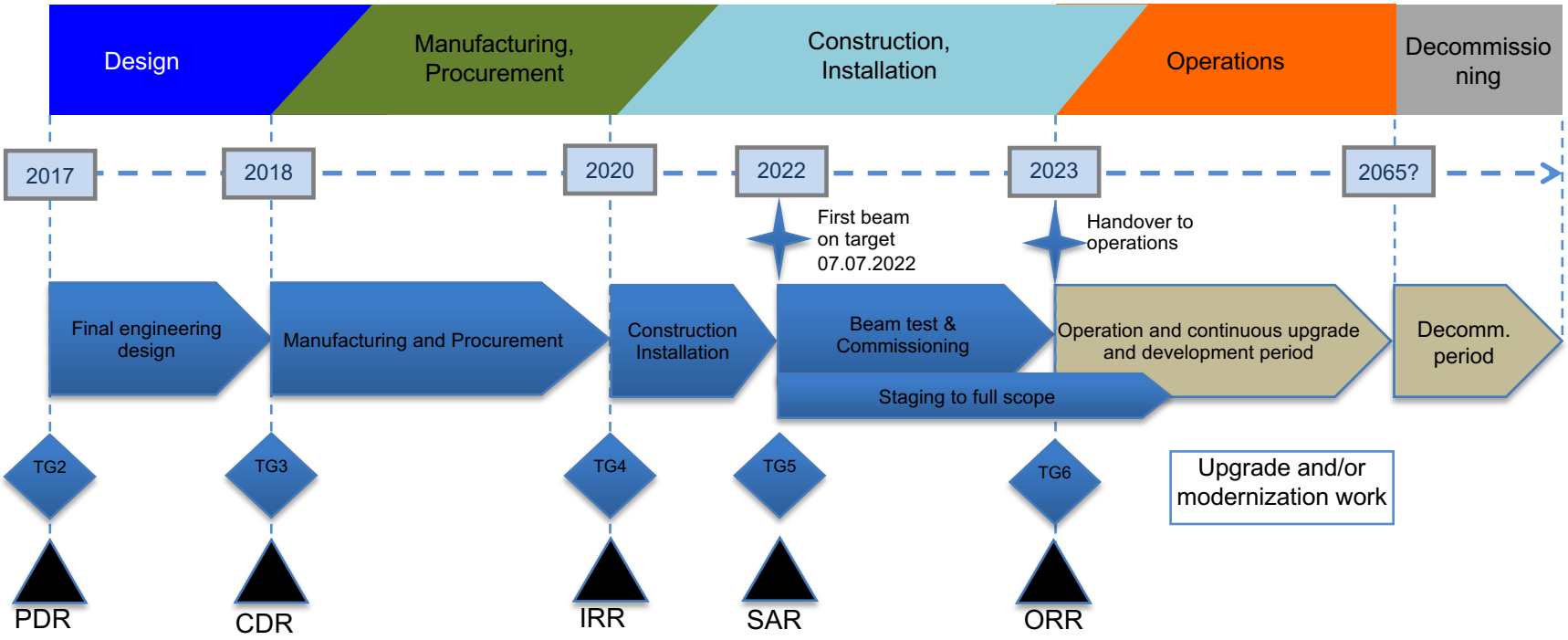
Work Units (TUM-PSI)

- Heavy shutter (TUM)
- T0 Chopper (TUM)
- Choppers (TUM)
- Guides + NBOA (PSI)
- Motion control and electric engineering (TUM)
- Shielding
  - Cave shielding (TUM)
  - Guide shielding (TUM)
- Cave interior (PSI)
- Instrument infrastructure (TUM)
  - Control Hutch (TUM)
  - Sample preparation area & storage (TUM)

PBS

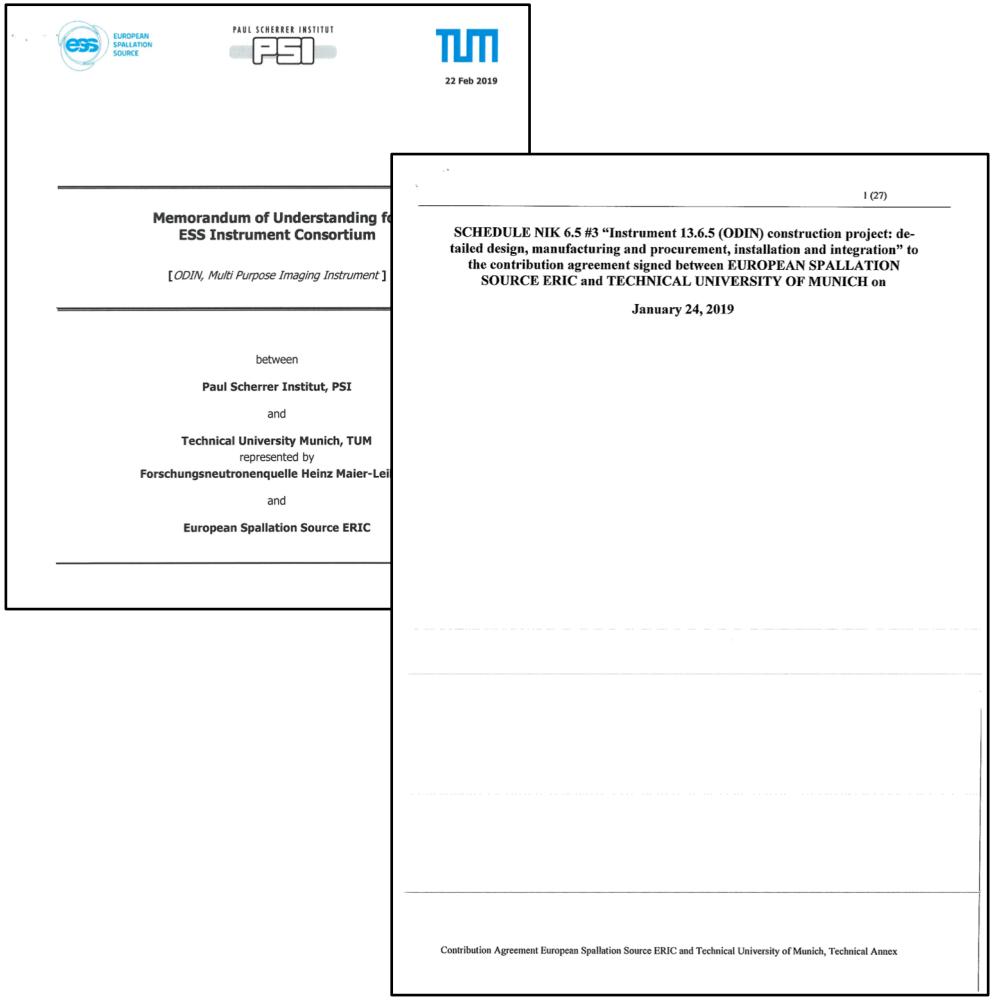

-.0 ODIN Instrument Integration
-.1 Beam Transport and Conditioning
-.2 Sample Exposure System
-.3 Scattering Characterization System
-.4 Optical Cave
-.5 Experimental Cave
-.6 Control Hutch
-.7 Sample Preparation Area
-.8 Utilities Distribution
-.9 Support Infrastructure
-.10 Control Racks
-.11 Integration Control and Monitoring
-.1.1 Beam Extraction System
-.1.2 Beam Delivery System
-.1.3 Chopper System
-.1.4 Beam Geometry Conditioning
-.1.5 Beam Filtering Systems
-.1.6 Beam Validation
-.1.7 Flight Tube
-.1.8 Beam Cut Off
-.1.9 Vacuum System
-.1.10 Shielding BTCS
-.1.1.1 NBEX
-.1.1.2 NBOA
-.1.2.1 Beam Bridge Guide
-.1.2.2 Guide G1
-.1.2.3 Guide G2
-.1.2.4 Guide G3
-.1.2.5 Guide G4
-.1.2.6 Guide G5
-.1.2.7 Guide G6
-.1.2.8 Guide G7
-.1.2.9 Guide G8
-.1.2.10 Guide G9
-.1.3.1 T0 Chopper
-.1.3.2 WFM Choppers
-.1.3.3 Bandpass Choppers
-.1.3.4 Frame Overlap
-.1.4.8 Beam Shaping Aperture System
-.1.5.8 Filter System @ Collimator
-.1.6.1 Beam Monitors
-.1.6.3 Cd Shutter (Filter)
-.1.7.1 Flight Tube Optical Cave
-.1.7.2 Flight Tube Separation Wall
-.1.7.3 Flight Tube Experimental Cave
-.1.8.1 PSS
-.1.8.2 Heavy Shutter
-.1.8.6 Beam Stop
-.1.10.1 In Bunker Shielding
-.1.10.2 Beamline Shielding
-.1.10.3 Guide Shielding (Collimators)
-.1.2.1.1 Copper Guide 1
-.1.2.2.2 Copper Guide 2
-.1.2.2.3 Copper Guide 3
-.1.3.2.1 WFM Chopper 1
-.1.3.2.2 WFM Chopper 2
-.1.3.2.3 WFMC-Motion Table
-.1.3.3.1 Bandpass Chopper 1
-.1.3.3.2 Bandpass Chopper 2
-.1.3.4.1 FOC 1
-.1.3.4.2 FOC 2
-.1.3.4.3 FOC 3
-.1.3.4.4 FOC 4
-.1.3.4.5 FOC 5
-.1.6.1.1 Beam Monitor 1
-.1.6.1.2 Beam Monitor 2
-.1.6.1.3 Beam Monitor 3
-.2.1 Sample Positioning
-.2.2 Ancillary Mounting
-.2.3 Sample Environment (ODIN)
-.2.4 Non SE Ancillary equipment
-.2.5 Fast Shutter
-.2.1.1 Sample Stage 1
-.2.1.2 Sample Stage 2
-.2.1.3 Sample Stage 3
-.2.2.1 Crane
-.3.1 Analyser Systems
-.3.2 Neutron Detector System
-.3.1.1 Polarisation Analyser system
-.3.1.2 Grating Interfometer Analyser
-.3.1.3 SEMSANS Analyser System
-.3.2.1 Neutron Detectors
-.3.2.2 Detector Positioning System
-.3.2.1.1 Scintillator / Camera System
-.3.2.1.2 Scattering Detector System
-.3.2.1.3 ToF Neutron Detector
-.3.2.1.4 ToF Detector Interface
-.4.1 PSS
-.4.2 Utilities Distribution
-.4.3 Support Infrastructure
-.4.4 Cave Shielding
-.4.5 Cave Building
-.4.2.1 Power Distribution
-.4.2.2 Compressed Air Distribution
-.4.3.1 Power
-.4.3.2 Network
-.4.3.3 Lighting
-.4.3.4 Video
-.4.3.5 Local Crane
-.4.3.6 Elevated Floor
-.5.1 PSS
-.5.2 Utilities Distribution
-.5.3 Support Infrastructure
-.5.4 Cave Shielding
-.5.5 Cave Building
-.5.6 Sample Environ. Utilities Supply
-.5.7 Sample Environ. Control Box
-.5.8 Optical Rail System
-.5.2.1 Power Distribution
-.5.2.2 Chilled Water Distribution
-.5.2.3 Compressed Air Distribution
-.5.2.4 Gas Distribution
-.5.2.4.1 He
-.5.2.4.2 N2
-.5.2.4.3 Artificial Air
-.5.3.1 Power
-.5.3.2 Network
-.5.3.3 Lighting
-.5.3.5 Fire Protection
-.5.3.6 Oxygen Monitor
-.5.3.7 Water Leak Detection
-.5.3.8 Hydrogen Detection
-.5.3.9 Video
-.5.3.10 Local Crane
-.5.3.11 Access Ramp
-.5.3.12 External Lift
-.5.3.13 Elevated Floor
-.5.6.1 Power Board
-.5.6.2 Gas Supply Board
-.5.6.3 Chilled Water Supply Board
-.5.6.2.1 He
-.5.6.2.2 N2
-.5.6.2.3 H2
-.6.1 Support Infrastructure
-.6.2 Hutch Building
-.6.3 Control Terminal
-.6.1.1 Power
-.6.1.2 Network
-.6.1.3 Lighting
-.7.1 Utilities Distribution
-.7.2 Support Infrastructure
-.7.3 Lab equipment storage
-.7.1.1 Power Distribution
-.7.1.3 Compressed Air Distribution
-.7.2.1 Power
-.7.2.3 Lighting
-.8.1 Hall 1
-.8.1.1 Power Distribution
-.8.1.2 Chilled Water Distribution
-.8.1.4 Gas Distribution
-.8.1.4.1 He
-.8.1.4.2 N2
-.9.1 Hall 1
-.10.1 Hall 1
-.10.1.1 Detector (DAQ)
-.10.1.2 DMSC
-.10.1.3 Motion Control
-.10.1.4 Chopper Control
-.10.1.5 Vacuum Control
-.10.1.6 PSS Control
-.11.1 Instr. Control and Automation
-.11.2 PSS
-.11.3 DMSC
-.11.1.1 Generic Motion Control
-.11.1.2 Special Purpose Motion Contr.
-.11.1.3 Vacuum Control
-.11.1.4 EPICS
-.11.3.1 Data Systems and Techno.
-.11.3.2 Data Management
-.11.3.3 Instrument Data
-.11.3.4 Data Analysis and Modelling

Instrument life cycle



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)	User Programme
03-Mar-17	31-Jun-18	24-Jan-19	15-Nov-20	03-Jun-21	11-Aug-21	25-Feb-22	06-Jul-22	31-Dec-23

ODIN Project Update: update TUM



EUROPEAN SPALLATION SOURCE

PAUL SCHERRER INSTITUT PSI

22 Feb 2019

Memorandum of Understanding f
ESS Instrument Consortium

[*ODIN, Multi Purpose Imaging Instrument*]

between

Paul Scherrer Institut, PSI

and

Technical University Munich, TUM
represented by
Forschungsneutronenquelle Heinz Maier-Lei

and

European Spallation Source ERIC

I (27)

SCHEDULE NIK 6.5 #3 "Instrument 13.6.5 (ODIN) construction project: detailed design, manufacturing and procurement, installation and integration" to the contribution agreement signed between EUROPEAN SPALLATION SOURCE ERIC and TECHNICAL UNIVERSITY OF MUNICH on

January 24, 2019

Contribution Agreement European Spallation Source ERIC and Technical University of Munich, Technical Annex

- MOU signed
- IKA TUM signed – TA Endorsed

ODIN Project Update: update TUM

- Technical Annex: Milestones TUM and progress reports

ID	Short description	Date	Location	Comment	EV [%]
0	Tollgate 2 meeting	24-Feb-2017	ESS		0
1	TG2 Review completed, Phase 2 starts	31-May-2017	TUM/ESS		0
2	Heavy Shutter IDR	19-Jun-2019	Online	Depends on ID33	0.5
3	Heavy Shutter design completed, TG3.03	3-Jan-2020	TUM/ESS		1.5
4	Heavy Shutter ready for shipment (FAT)	26-Jun-2020	Vendor		1
5	Heavy Shutter on site	17-Jul-2020	ESS		0.5
6	Heavy Shutter TG4.03	14-May-2021	ESS	together with ID 48	0.5
7	Heavy Shutter installation starts	15-Sep-2021	ESS		0
8	Heavy Shutter SAT	19-Oct-2021	ESS		1
9	T0 chopper IDR	22-Feb-2019	ESS		2
10	T0 chopper design completed, TG3.03	22-Nov-2019	ESS		1
11	T0 chopper build contract signed	7-Jan-2020	ESS		0
12	T0 chopper TG4.03	3-Sep-2021	ESS		0.5
13	T0 chopper on site	10-Oct-2021	ESS		0.5
14	T0 chopper installation starts	8-Nov-2021	ESS		0
15	T0 chopper SAT	2-Dec-2021	ESS		1
16	Tender for Chopper design-build contract ready	18-Jan-2019	TUM/ESS		0
17	Chopper Kickoff Meeting	31-May-2019	ESS		4.5
18	Chopper PDR	30-Sep-2019	Vendor	Design-built contract milestone for early procurement	0
19	Chopper CDR, TG3.04	31-Jan-2020	ESS	TG 3 procedure	11
20	Chopper FAT	31-Mar-2021	Vendor		7
21	Chopper on site	31-May-2021	ESS		3
22	Chopper Installation Start	3-Jun-2021	ESS		4
23	Chopper Installation End	6-Dec-2021	ESS		1
24	Chopper SAT	4-Feb-2022	ESS		0
25	Chopper contract end	4-Mar-2022	ESS		3
26	Motion Control CTV	14-Jun-2020	online	after Cave Interior contract (PSI)	0.5
27	Motion Control design build contract signed	18-Sep-2020	TUM		1
28	Motion Control Design completed, TG3.08	18-Dec-2020	Vendor		2
29	Motion Control manufacturing complete (FAT)	23-Apr-2021	Vendor		0.5
30	Motion Control on site	25-May-2021	ESS		0.5
31	Motion Control TG4.08	20-Aug-2021	ESS		0.5
32	Motion Control SAT	23-Sep-2021	ESS		0.5
33	MCNPx Shielding Simulations start	8-Jan-2018	Vendor	Simulations includes Heavy Shutter (WU 03)	0.5
34	Guide-Shielding preliminary calculations	10-Jan-2019	Vendor	TUM contribution to Common Guide-Shielding	0.5
35	Guide-Shielding design complete	1-Jun-2019	ESS	Common Guide-Shielding project	0.5
36	Guide-Shielding manufacturing complete (FAT)	1-Jun-2020	ESS	Common Guide-Shielding project	4
37	Guide-Shielding TG4.11.1	1-Jun-2021	ESS	Common Guide-Shielding project	0.5
38	Guide-Shielding installation start	6-Jun-2021	ESS	Common Guide-Shielding project	0
39	Cave and Heavy Shutter Shielding calculations docs ready	1-Jun-2019	Vendor	Shielding simulations ready for verification.	1
40	Cave-Shielding preliminary design ready	1-Aug-2019	TUM	Preliminary design based on ID 34	4
41	Tender for Cave shielding design contract	1-Sep-2019	TUM	Immediately after TG 3 (to avoid early procurement)	1
42	Cave-Shielding design build contract signed	1-Nov-2019	TUM		1
43	Cave-Shielding design complete (CDR)	2-Mar-2020	TUM		1
44	Tender for Cave shielding manufacturing	3-Mar-2020	TUM		1
45	Cave-Shielding manufacturing contract signed	4-May-2020	Vendor		9.5
46	Cave-Shielding manufacturing ends (FAT)	15-Apr-2021	TUM		5
47	Cave-Shielding on site delivery	5-May-2021	ESS		1
48	Cave-Shielding and Heavy Shutter TG4.11.2	14-May-2021	ESS	together with ID 6	8.5
49	Cave-Shielding installation start	3-Jun-2021	Vendor		1
50	Cave-Shielding SAT	6-Mar-2022	Vendor		1.5
51	Control Hutch CTV	19-Jun-2020			0
52	Control Hutch Procurement, manufacturing starts	7-Sep-2020	TUM		0.5
53	Control hutch manufacturing completed (FAT)	2-Apr-2021	TUM	Delivery adjustable for easier installation of Cave shielding	0.5
54	Control hutch ready to install	3-May-2021	ESS		0.5
55	Control hutch ready to accept components (SAT)	7-Jun-2021	ESS		0.5
56	All instrument infrastructure installed	21-Feb-2022	ESS		0.5
57	EPICS integration ready	3-Dec-2021	ESS	This also starts cold commissioning	0
58	TG3 Documents ready	25-Oct-2019	Online	Documents ready four weeks before TG3	0.5
59	Final Tollgate 3	22-Nov-2019	ESS		0.5
60	Final Tollgate 4	5-May-2021	ESS		0.5
61	Ready for cold commissioning	7-Mar-2022	ESS		0.5
62	Cold commissioning completed	5-Jul-2022	ESS		0
63	Final Tollgate 5	6-Jul-2022	ESS	Starts Hot Commissioning	5
TOTAL:					**100%**

ODIN Project Update: update TUM

- Technical Annex: Milestones TUM and progress reports
- Three progress reports delivered since TA signed: July, August, September
- Progress reports follows TA milestones achievement, date deviations, general activities updates and SPI = EV/PV

ODIN Project Update: update TUM

- Technical Annex: work packages TUM

Task no.	Deliverables – Project Results	Cost Book Value	Delivery Date
WU 01.0	Additional Management/Supervision for non-TUM WUs throughout the Project	108 000 €	N/A
WU 01.1	Travel	67 000 €	N/A
WU 03	Heavy Shutter	383 000 €	Oct 2021
WU 04	T0 Chopper	313 000 €	Dec 2021
WU 05	Choppers*	2 272 000 €	Mar 2022
WU 08	Motion Control and Electric Engineering	405 000 €	Sept 2021
WU 11	Shielding	2 887 000 €	N/A
WU 11.1	Guide Shielding (common shielding project)	.....500 000 €	Jul 2021
WU 11.2	Cave Shielding	....2 387 000 €	Aug 2021
WU 12	Instrument Infrastructure	306 000 €	Feb 2022
WU 14	PSS (mostly ESS responsibility)	164 000 €	Feb 2022
Task no.	**Document Deliverables**		**Delivery Date**
DP 3	Technical Data package Tollgate 3 (TG3/CDR)	N/A	Nov. 2019
DP 4	Technical Data package Tollgate 4 (TG4/IRR)	N/A	May 2021
DP 5	Technical Data package Tollgate 5 (TG5/SAR)	N/A	Jul 2022

ODIN Project Update: update TUM

- Shielding calculations

– TUM has a contract with Florian Grunauer for MCNP simulations
– Based on H1/H2 scenarios
– Preliminary results of “cave” were ready in May 2019
– Cave mechanical design revised → Impact on floor loading

– Solution for floor loading needed and complementary shielding simulations for cave (optimization) and heavy shutter as well

– New results & preliminary reports ready (two days ago!): CTV for shielding is in November 2019

ODIN Project Update: update TUM

- Shielding calculations

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– New results & preliminary reports ready (two days ago!): CTV for shielding is in November 2019

See later talk by Elbio for more tech. detail

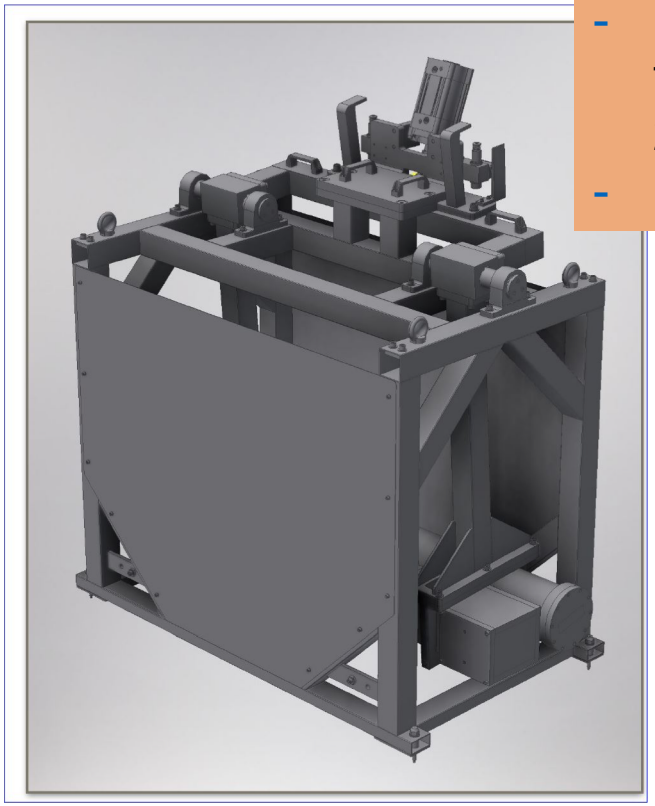
ODIN Project Update: update TUM

- WU 03: Heavy shutter

– Two conceptual designs proposed by ESS
– TUM had his own
– After internal evaluation in TUM and afterwards also agreed with PSI, one of the ESS concepts seems to be the best: Reliability and safety issues

ODIN Project Update: update TUM

- WU 03: Heavy shutter



- Now waiting for shielding calculations results to elaborate specifications (Goal: November 2019)
- Procurement in 2020 by ESS for TUM

Estimated cost by ESS: 40kEuro (only mechanics)
MCA, CE marking, Interlocks and optics not included
Delivery time est.: five months

Pro:

- Reliable: motors and pneumatics are far from beam
- Vacuum failure limited to its guide section
- More space for beam monitor

Con:

- Four extra window in the beam (but there are 25 windows in total)

ODIN Project Update: update TUM

- WU 04: T0 chopper

– CDR of prototype acomplished by ESS-Mirrotron
– Prototype (DREAM) expected finishing FAT in June 30th, 2020
– ODIN T0 chopper will be procured for TUM by ESS:
  – Specifications elaborated w/ ESS chopper (First draft submitted to chopper group last week)
  – Goal: CTV in December 2019, Call for tender in January 2020, Contract signed in March 2020 (the latest)
  – Estimated SAT between 15 and 18 months after contract signed
  – Estimated cost (ESS): 350kEuro
  – Cost might be an issue: Planned in TA 313kEuro

ODIN Project Update: update TUM

- WU 04: T0 chopper

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– Prototype (DREAM) expected finishing FA e 30th, 2020
– ODIN T0 chopper will be procured fo by ESS:
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ODIN Project Update: update TUM

- WU 05: Choppers

- Contract signed with AIRBUS in June 2019
- 9 chopper disks with ball bearings:1.887.528 Euro (excluding VAT)
- Kick-Off Meeting was in June 19th, 2019

- PDR scheduled in October 15th, 2019 (TG3)
- CDR scheduled in February 2nd, 2020 (TG3)

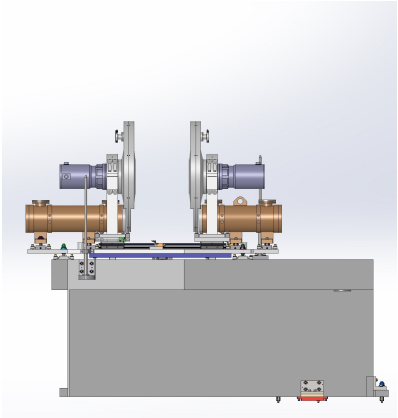
- McStas simulations for PDR (jitter requirement & boron content) finished and submitted to AIRBUS

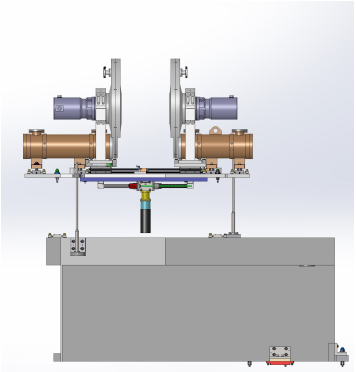
- Chopper windows final optimization (CDR) ongoing

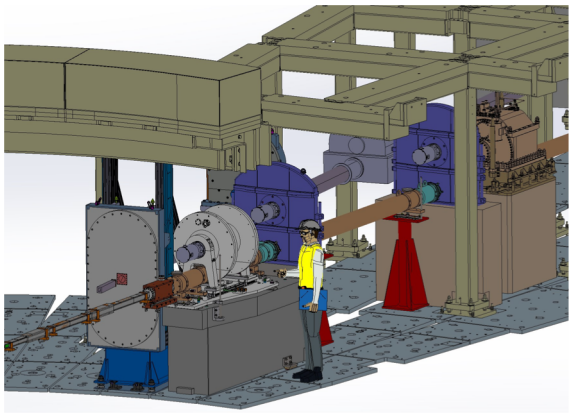
ODIN Project Update: update TUM

- WU 05: Choppers

- WFM chopper translation table:
  - Not included in the offer of AIRBUS
  - TUM has a revised preliminary design (conflict with DREAM solved). Now under evaluation by AIRBUS
  - Strategy: finishing an agreed design with AIRBUS by CDR. IDR at ESS and procure & fabricate at TUM in 2020
  - Shall be tested during FAT in AIRBUS







ODIN Project Update: update TUM

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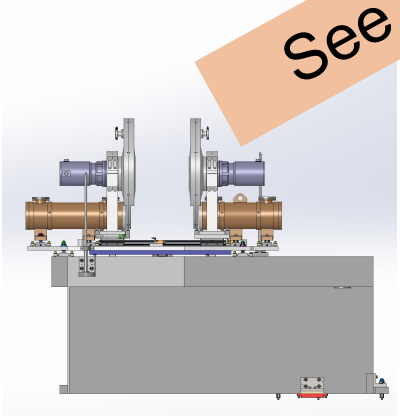
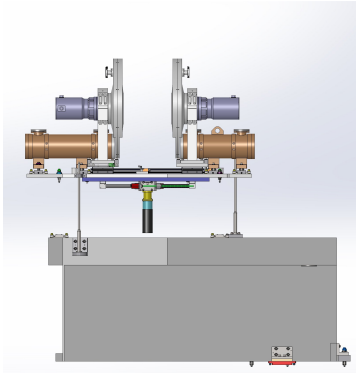
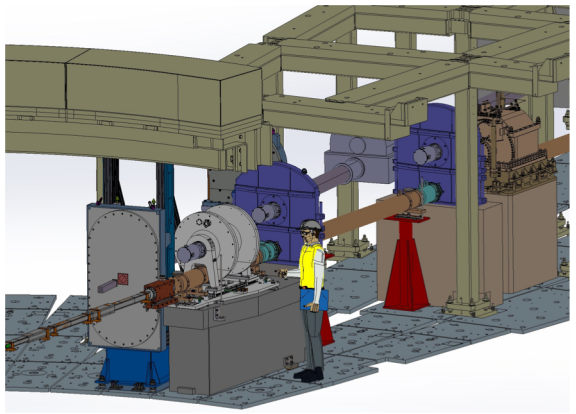
  - Strategy: finishing an agre… …gn with AIRBUS by CDR. IDR at ESS and procure & fabric… …M in 2020
  - Shall be tested … …AT in AIRBUS

See later talk by Elbio for more tech. detail







ODIN Project Update: update TUM

- WU 08: Motion control (MCA)

- Advanced conversations with ESS MCA Group Head, Thomas Gahl
- They can (and they want) work for ODIN´s MCAS
- Preliminary specifications („Motion table“) already exists
- ESS MCA Group Head will send us an offer in the next weeks

- Also agreed: One shared resource from ESS MCA Group for working in ODIN and CSPEC documentation for TG3

ODIN Project Update: update TUM

- WU 11: Shielding

1) Beam cut-off: Heavy shutter, Beam stop
2) Beamline shielding: Feedthrough, Guide shielding
3) Cave shielding: Optical cave and experimental cave

ODIN Project Update: update TUM

- WU 11: Shielding

1) Beam cut-off: Heavy shutter, Beam stop

- Heavy shutter: thickness and material selection waiting for ongoing shielding calculations. Results will be delivered in October to elaborate technical specifications

- Beam stop: Included in cave calculations. Present design satisfy requirements

ODIN Project Update: update TUM

- WU 11: Shielding

2) Beamline shielding: Feedthrough

- Bunker wall in south zone scheduled to be assembled in Dec 2020
- Optimal: delivering feedthrough including optics on time to assembly the whole system vertically in the bunker wall

- TUM has a preliminary design ready for elaborate specifications

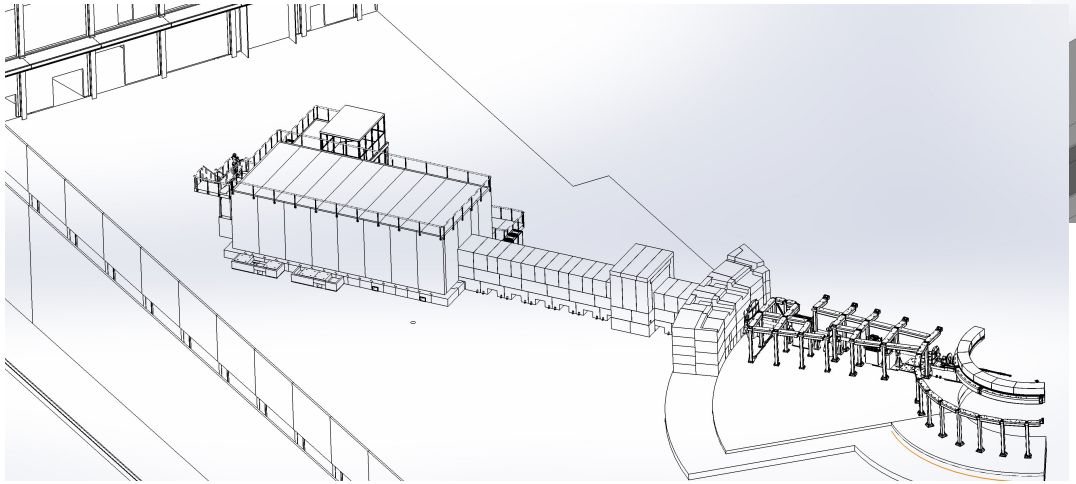
- A company is interested and technically could be able to manufacture it (informal contact at IKON 17)

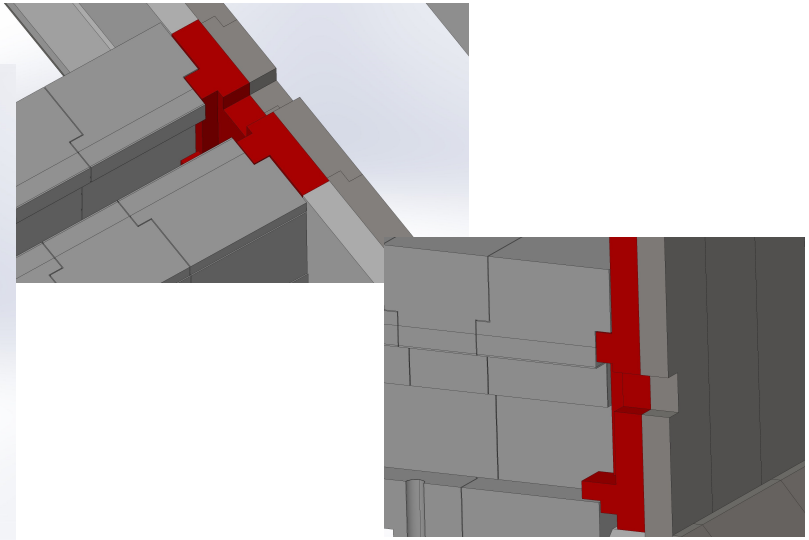
- If the optic has a delay, horizontal assembling might be possible. The detail design should then consider both assembling options. Feasible.

ODIN Project Update: update TUM

- WU 11: Shielding

2) Beamline shielding: Guide shielding
- Shielding between bunker and cave: guide shielding and FO5 chopper
- Also known as the Common Shielding Project at ESS
- On time: Detail design will be ready before end of this year (interface w/cave solved)



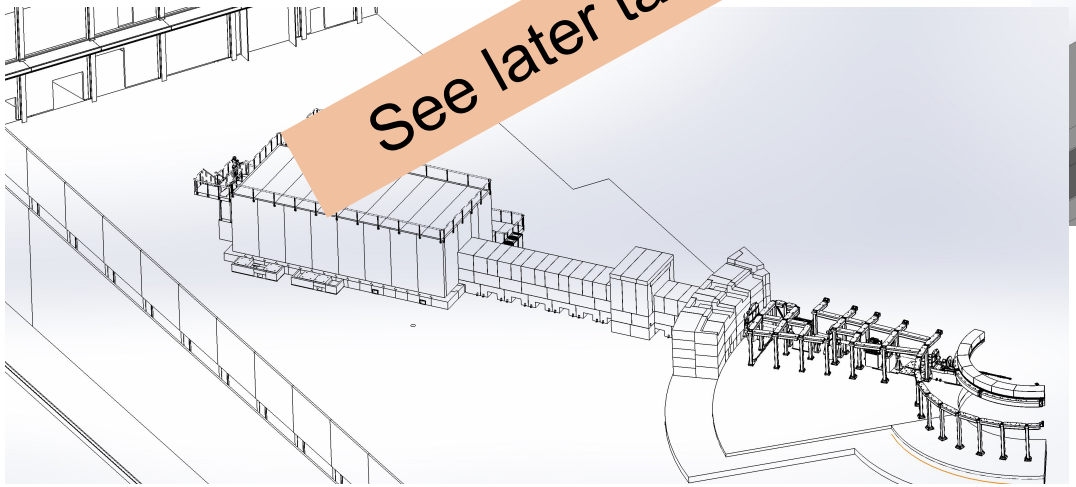


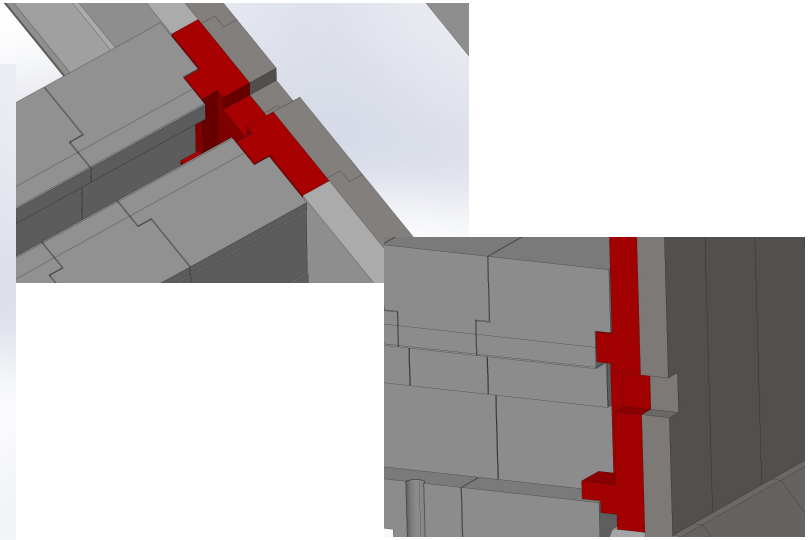
ODIN Project Update: update TUM

- WU 11: Shielding

2) Beamline shielding: Guide shielding
- Shielding between bunker and cave: guide [illegible] and FO5 chopper
- Also known as the Common Shielding [illegible] at ESS
- On time: Detail design will be read[illegible] end of this year (interface w/cave solved)

See later talk by Elbio for more tech. detail





ODIN Project Update: update TUM

- WU 11: Shielding

3) Cave shielding: Optical cave and experimental cave

- Radiologically the model works, according to proposed scenarios H1/H2

- Calculations almost finished. Delivery time: third week of September for internal revision. Sending to ESS in October as part of TG3

ODIN Project Update: update TUM

- WU 11: Shielding

3) Cave shielding: Optical cave and experimental cave

Floor loading:

- Floor loading requirement (14t/sqm) exceeded after implementing first shielding simulations recommendations
- Redesign of the cave was necessary (keeping the original height and width)

- A company from Sweden is doing the cave for another instrument (NMX) and might be a good option. Informal communications during IKON 17. Their timelines in principle are compatible with ODIN´s planification

- Goal: Cave shielding manufacturing contract signed before May 2020. Achievable.
- CTV scheduled for November 2019

ODIN Project Update: update TUM

- WU 11: Shielding

3) Cave shielding: Optical cave and experiment

Floor loading:

- Floor loading requirement (14t/s ter implementing first shielding simulations recommendati
- Redesign of the cave w (keeping the original height and width)

- A company f doing the cave for another instrument (NMX) and might be informal communications during IKON 17. Their timelines i le are compatible with ODIN´s planification

- Goal: Cave shielding manufacturing contract signed before May 2020. Achievable.
- CTV scheduled for November 2019

See later talk by Elbio for more tech. detail about shielding and simulations

ODIN Project Update: update TUM

- WU 12: Instrument infrastructure

Control hutch/Sample preparation area: Hutch building + Lab equipment storage

- Possible common project with ESS
- Pros: Swedish regulations might be an issue also in this case, and a common project might be advantageous

- Ongoing: Specifications for CTV, scheduled for November 2019

- We decided a two floor hutch and sample manipulation

ODIN Project Update: update TUM

- WU 12: Instrument infrastructure

Control hutch/Sample preparation area: Hutch buil[illegible]ab equipment storage

- Possible common project with ESS
- Pros: Swedish regulations might be a[illegible]also in this case, and a common project might be advantageous

- Ongoing: Specificatio[illegible]v, scheduled for November 2019

- We decided [illegible]or hutch and sample manipulation

See later talk by Elbio for more tech. detail

ODIN Project Update: update TUM

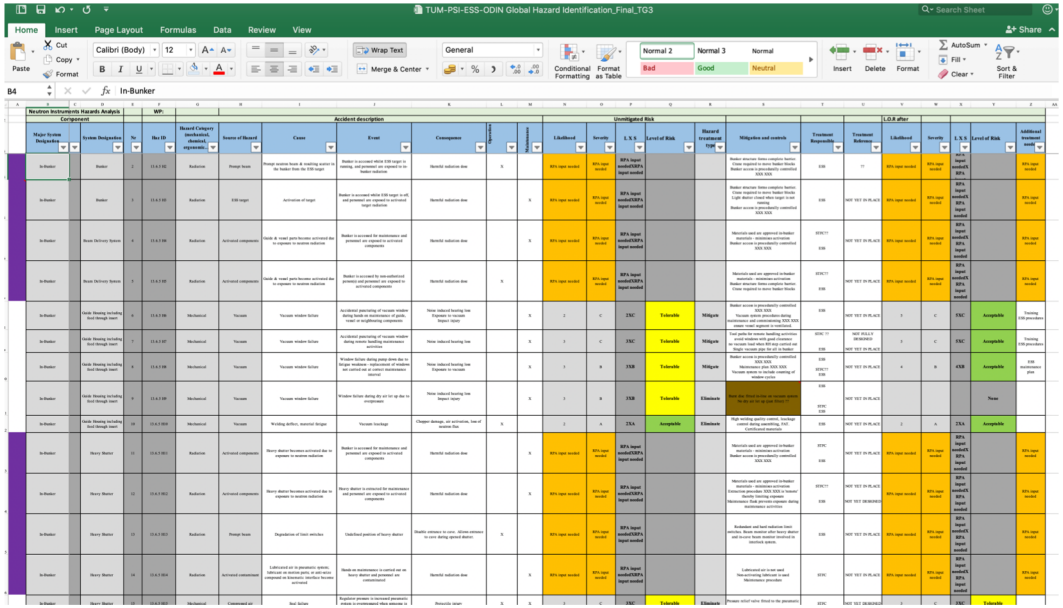
- WU 13: Vacuum

- For TG3 must elaborate the vacuum requirements and distribution. **Done**
- Good communication with Laurence Paige (ESS Vacuum Head)
- The main vacuum requirements and design are already agreed and ODIN has ready the vacuum layout for TG3.

ODIN Project Update: update TUM

- WU 14: PSS

- For TG3 we must complete PSS and CE marking worksheets: Instrument hazard analysis, Radiation safety analysis. Status: Ongoing
- During IKON we had a good feedback from ESS PSS responsible Stuart Birch



Next milestones and actions

Toll Gate 3 includes:

- Intermediate design review (IDR)
- Call for Tender Verification (CTVs)
- TG3.1
- TG3.2
- …

Next milestones and actions

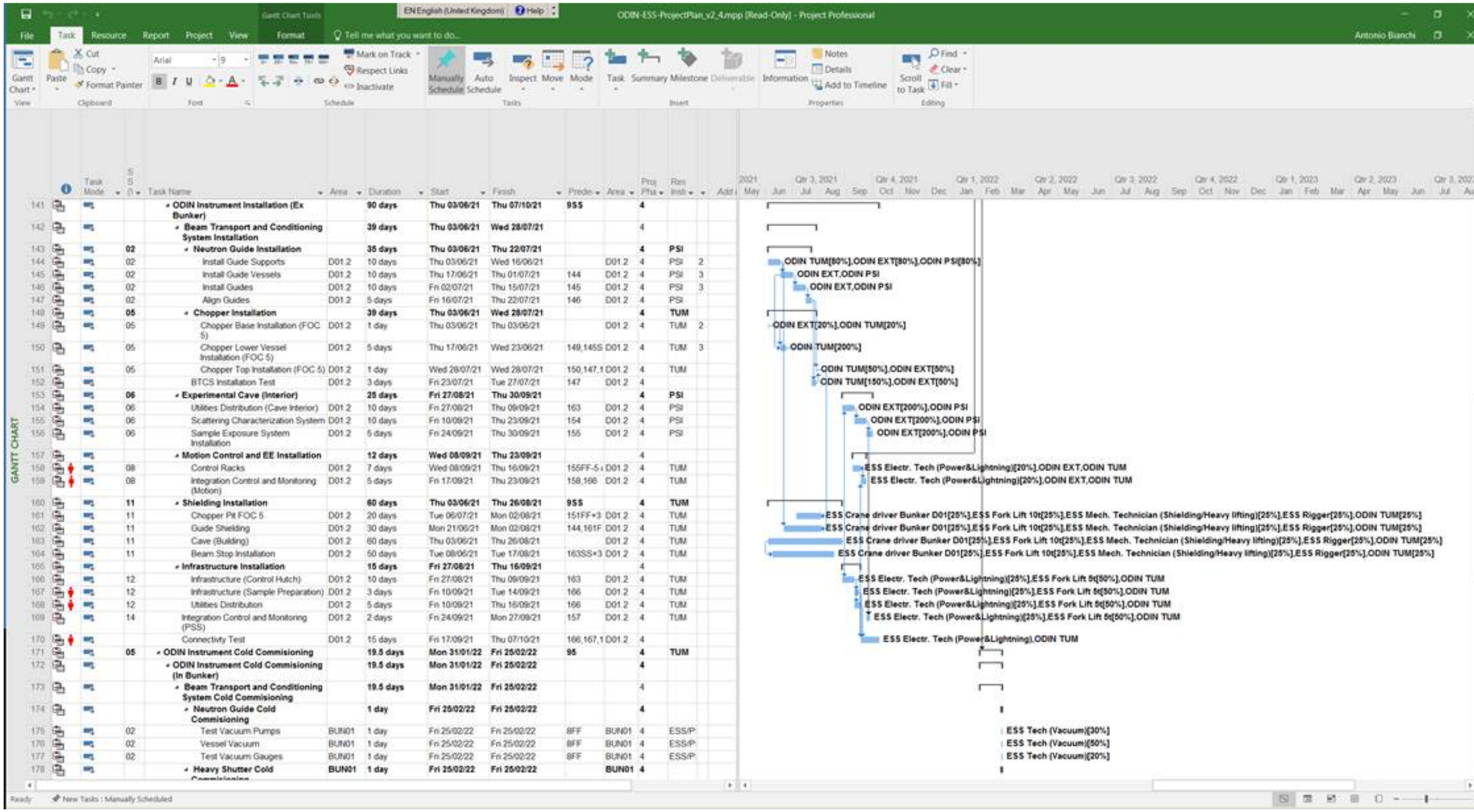
- For each stage it is necessary to prepare and update documentation

- Next for ODIN is CTV (Cave and hutch) & IDR (Choppers): Nov 15, 2019 (in person at Lund)
- Documents will be uploaded for revision Oct 25, 2019 the latest

  - Sub-System Design Description (SSDD) (draft) for Chopper system. AIRBUS is elaborating PDR documentation
  - Specifications for Cave and Hutch: ongoing
  - Updated TG2 documentation (ongoing): WP specification, PBS, WBS…
  - Plus: Vacuum diagram (Done), Material inventory (Activation analysis), Complete 3D model (almost done), Installation and verification plan (ongoing)

  - Updating MS Project ongoing: expanding with installation details of in-bunker components (choppers, guides, T0 chopper, heavy shutter, feed-through, monitors, vacuum, MCA, verifications and testings), and ex-bunker (guide shielding, FOC5, cave assembling, hutch, cave interior, racks, etc.)

Next milestones and actions



ID	Task Mode	S S (I	Task Name	Area	Duration	Start	Finish	Prede	Area	Proj Pha	Res Insti	
141			**ODIN Instrument Installation (Ex Bunker)**		**90 days**	**Thu 03/06/21**	**Thu 07/10/21**	**9SS**		**4**		
142			**Beam Transport and Conditioning System Installation**		**39 days**	**Thu 03/06/21**	**Wed 28/07/21**			4		
143		**02**	**Neutron Guide Installation**		**35 days**	**Thu 03/06/21**	**Thu 22/07/21**			**4**	**PSI**	
144		02	Install Guide Supports	D01.2	10 days	Thu 03/06/21	Wed 16/06/21		D01.2	4	PSI	2
145		02	Install Guide Vessels	D01.2	10 days	Thu 17/06/21	Thu 01/07/21	144	D01.2	4	PSI	3
146		02	Install Guides	D01.2	10 days	Fri 02/07/21	Thu 15/07/21	145	D01.2	4	PSI	3
147		02	Align Guides	D01.2	5 days	Fri 16/07/21	Thu 22/07/21	146	D01.2	4	PSI	
148		**05**	**Chopper Installation**		**39 days**	**Thu 03/06/21**	**Wed 28/07/21**			**4**	**TUM**	
149		05	Chopper Base Installation (FOC 5)	D01.2	1 day	Thu 03/06/21	Thu 03/06/21		D01.2	4	TUM	2
150		05	Chopper Lower Vessel Installation (FOC 5)	D01.2	5 days	Thu 17/06/21	Wed 23/06/21	149,145S	D01.2	4	TUM	3
151		05	Chopper Top Installation (FOC 5)	D01.2	1 day	Wed 28/07/21	Wed 28/07/21	150,147,1	D01.2	4	TUM	
152			BTCS Installation Test	D01.2	3 days	Fri 23/07/21	Tue 27/07/21	147	D01.2	4		
153		**06**	**Experimental Cave (Interior)**		**25 days**	**Fri 27/08/21**	**Thu 30/09/21**			**4**	**PSI**	
154		06	Utilities Distribution (Cave Interior)	D01.2	10 days	Fri 27/08/21	Thu 09/09/21	163	D01.2	4	PSI	
155		06	Scattering Characterization System	D01.2	10 days	Fri 10/09/21	Thu 23/09/21	154	D01.2	4	PSI	
156		06	Sample Exposure System Installation	D01.2	5 days	Fri 24/09/21	Thu 30/09/21	155	D01.2	4	PSI	
157			**Motion Control and EE Installation**		**12 days**	**Wed 08/09/21**	**Thu 23/09/21**			4		
158		08	Control Racks	D01.2	7 days	Wed 08/09/21	Thu 16/09/21	155FF-5	D01.2	4	TUM	
159		08	Integration Control and Monitoring (Motion)	D01.2	5 days	Fri 17/09/21	Thu 23/09/21	158,166	D01.2	4	TUM	
160		**11**	**Shielding Installation**		**60 days**	**Thu 03/06/21**	**Thu 26/08/21**	**9SS**		**4**	**TUM**	
161		11	Chopper Pit FOC 5	D01.2	20 days	Tue 06/07/21	Mon 02/08/21	151FF+3	D01.2	4	TUM	
162		11	Guide Shielding	D01.2	30 days	Mon 21/06/21	Mon 02/08/21	144,161F	D01.2	4	TUM	
163		11	Cave (Building)	D01.2	60 days	Thu 03/06/21	Thu 26/08/21		D01.2	4	TUM	
164		11	Beam Stop Installation	D01.2	50 days	Tue 08/06/21	Tue 17/08/21	163SS+3	D01.2	4	TUM	
165			**Infrastructure Installation**		**15 days**	**Fri 27/08/21**	**Thu 16/09/21**			4		
166		12	Infrastructure (Control Hutch)	D01.2	10 days	Fri 27/08/21	Thu 09/09/21	163	D01.2	4	TUM	
167		12	Infrastructure (Sample Preparation)	D01.2	3 days	Fri 10/09/21	Tue 14/09/21	166	D01.2	4	TUM	
168		12	Utilities Distribution	D01.2	5 days	Fri 10/09/21	Thu 16/09/21	166	D01.2	4	TUM	
169		14	Integration Control and Monitoring (PSS)	D01.2	2 days	Fri 24/09/21	Mon 27/09/21	157	D01.2	4	TUM	
170			Connectivity Test	D01.2	15 days	Fri 17/09/21	Thu 07/10/21	166,167,1	D01.2	4		
171		**05**	**ODIN Instrument Cold Commisioning**		**19.5 days**	**Mon 31/01/22**	**Fri 25/02/22**	**95**		**4**	**TUM**	
172			**ODIN Instrument Cold Commisioning (In Bunker)**		**19.5 days**	**Mon 31/01/22**	**Fri 25/02/22**			**4**		
173			**Beam Transport and Conditioning System Cold Commisioning**		**19.5 days**	**Mon 31/01/22**	**Fri 25/02/22**			4		
174			**Neutron Guide Cold Commisioning**		**1 day**	**Fri 25/02/22**	**Fri 25/02/22**			**4**		
175		02	Test Vacuum Pumps	BUN01	1 day	Fri 25/02/22	Fri 25/02/22	8FF	BUN01	4	ESS/P	
176		02	Vessel Vacuum	BUN01	1 day	Fri 25/02/22	Fri 25/02/22	8FF	BUN01	4	ESS/P	
177		02	Test Vacuum Gauges	BUN01	1 day	Fri 25/02/22	Fri 25/02/22	8FF	BUN01	4	ESS/P	
178			**Heavy Shutter Cold Commisioning**	**BUN01**	**1 day**	**Fri 25/02/22**	**Fri 25/02/22**		**BUN01**	**4**		

The core team

ODIN Team

- Elbio Calzada, Lead Engineer TUM
- Manuel Morgano, Instrument Scientist PSI
- Aureliano Tartaglione, Instrument Scientist TUM

- Robin Woracek, Coordination ESS

- TUM-PSI. Video call every two weeks for general update
- Frequent communication and very useful support of Robin and Clara Lopez from ESS



Thank You!

Outstanding issues

- VAT issue for guides
  - Potential risk for:
    - Chopper interfaces detail design (CDR) – Feb 2020
    - Chopper translation table detail design
    - Feedthrough final design. Installation scheduled date: Dec 2020
    - Heavy shutter detail design
    - T0 chopper detail design (interfaces)

- Floor loading
  - We have a feasible solution on the way, keeping cave dimensions and versatility. No interferences