



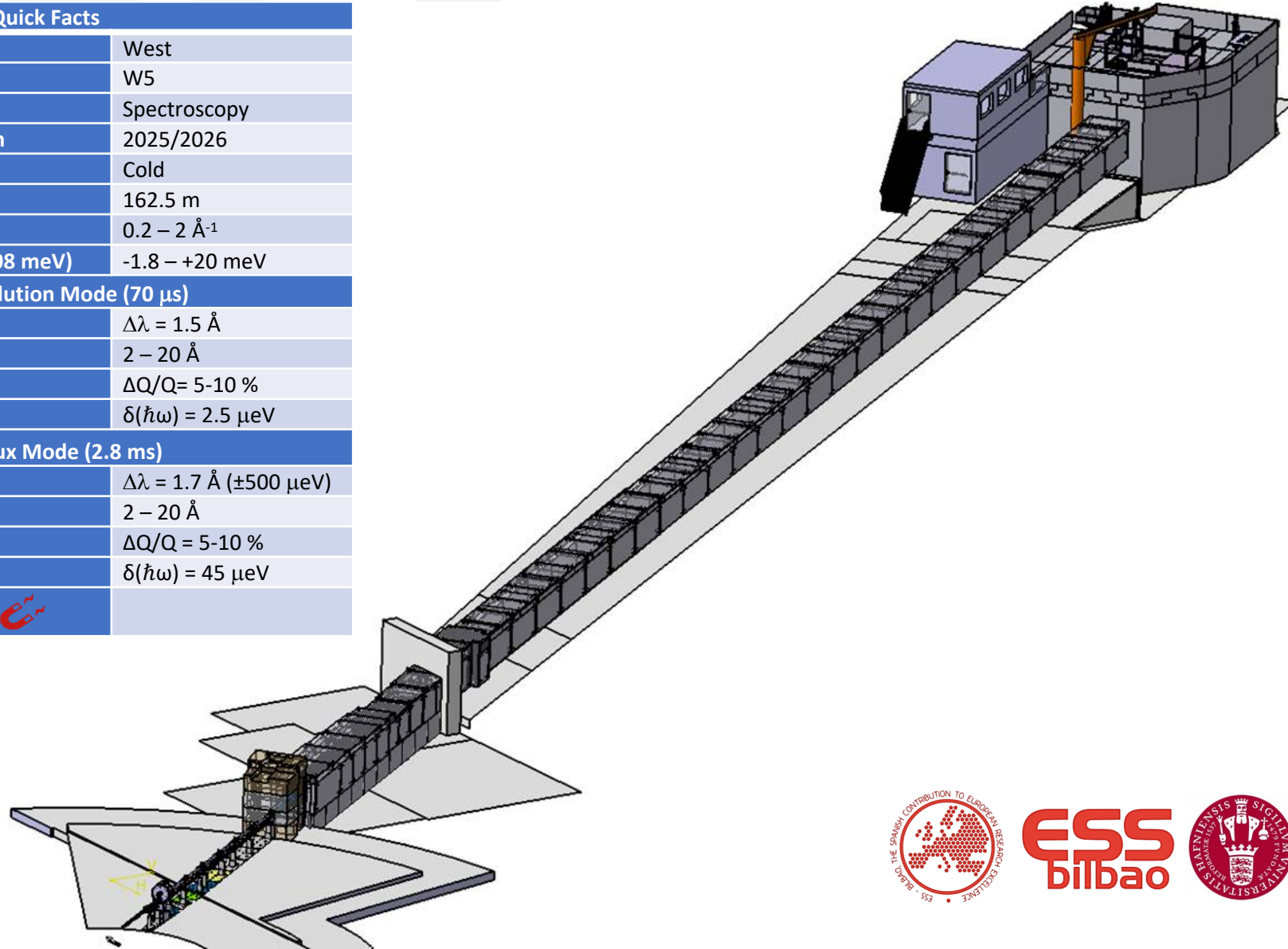
# MIRACLES update IKON 18

Octavio González del Moral,  
on behalf the MIRACLES team

25/02/2020

# MIRACLES project

Quick Facts	
Sector	West
Beam Port	W5
Class	Spectroscopy
Commissioning/Operation	2025/2026
Moderator	Cold
Length (source to sample)	162.5 m
Q-Range (at $\lambda=6.27 \text{ \AA}$ )	$0.2 - 2 \text{ \AA}^{-1}$
E-Transfer Range (at $E=2.08 \text{ meV}$ )	$-1.8 - +20 \text{ meV}$
High Resolution Mode (70 $\mu\text{s}$ )	
Wavelength Band	$\Delta\lambda = 1.5 \text{ \AA}$
Wavelength Range	$2 - 20 \text{ \AA}$
Momentum Resolution	$\Delta Q/Q = 5-10 \%$
Energy Resolution (QENS)	$\delta(\hbar\omega) = 2.5 \mu\text{eV}$
High Flux Mode (2.8 ms)	
Wavelength Band	$\Delta\lambda = 1.7 \text{ \AA} (\pm 500 \mu\text{eV})$
Wavelength Range	$2 - 20 \text{ \AA}$
Momentum Resolution	$\Delta Q/Q = 5-10 \%$
Energy Resolution (QENS)	$\delta(\hbar\omega) = 45 \mu\text{eV}$



EUROPEAN  
SPALLATION  
SOURCE

# MIRACLES project: schedule

- TA Phases 2-4, signed and approved
- Delivery 1<sup>st</sup> component (NBOA)
- CDRs/TG3s Phase 2
- IRRs/TG4s Phase 3
- SARs/TG5s Phase 4
- Hot commissioning

Q1 2020

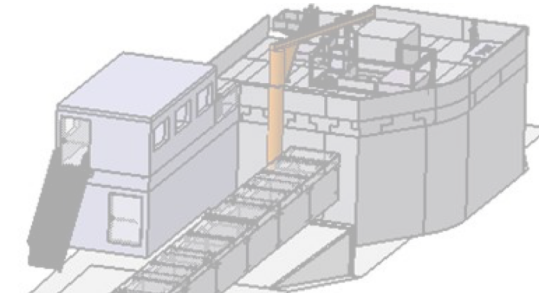
Q2 2020

Q2-Q3 2021

2023-2024

Q3-Q4 2025

Q1-Q2 2026



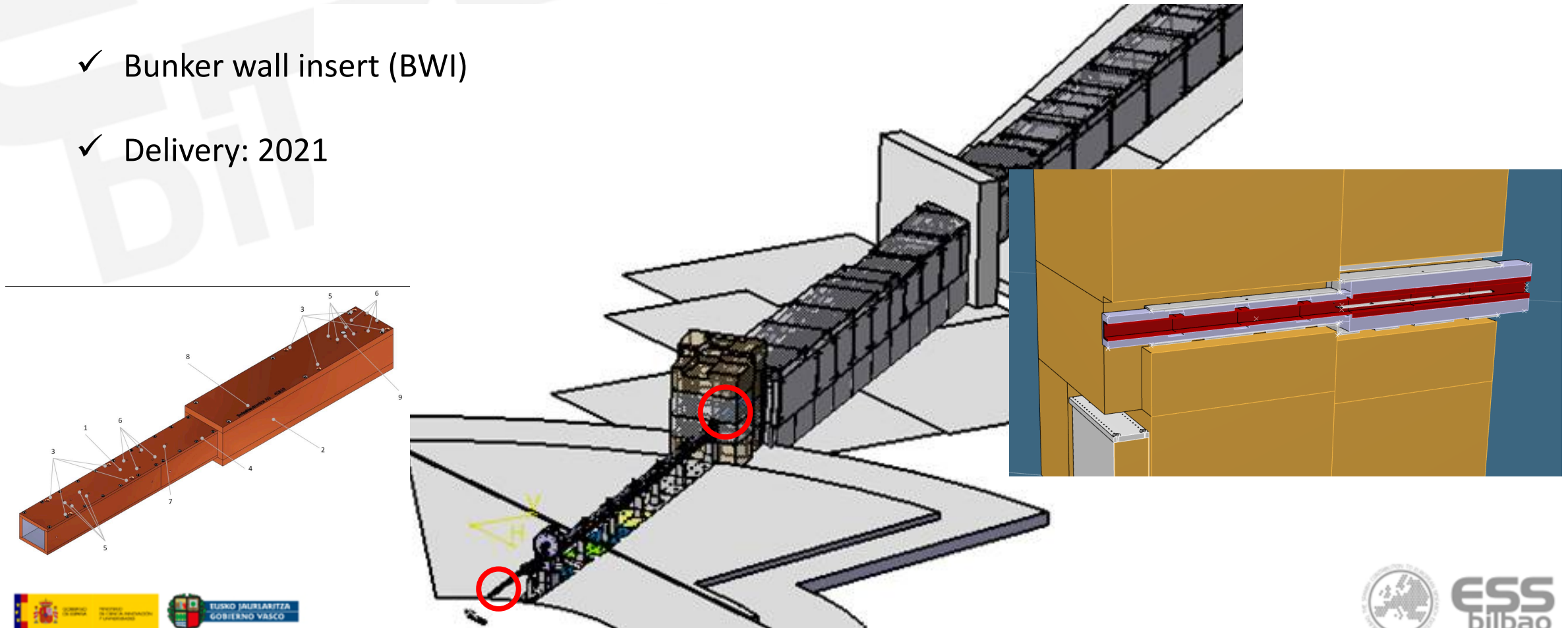
- Search for a new Lead Engineer
- Introduction of a PDR scattering vessel
- Shift optics procurement → to April → to July

*Shift of TG3.1-4 by 4 months*

→ (not project scope)

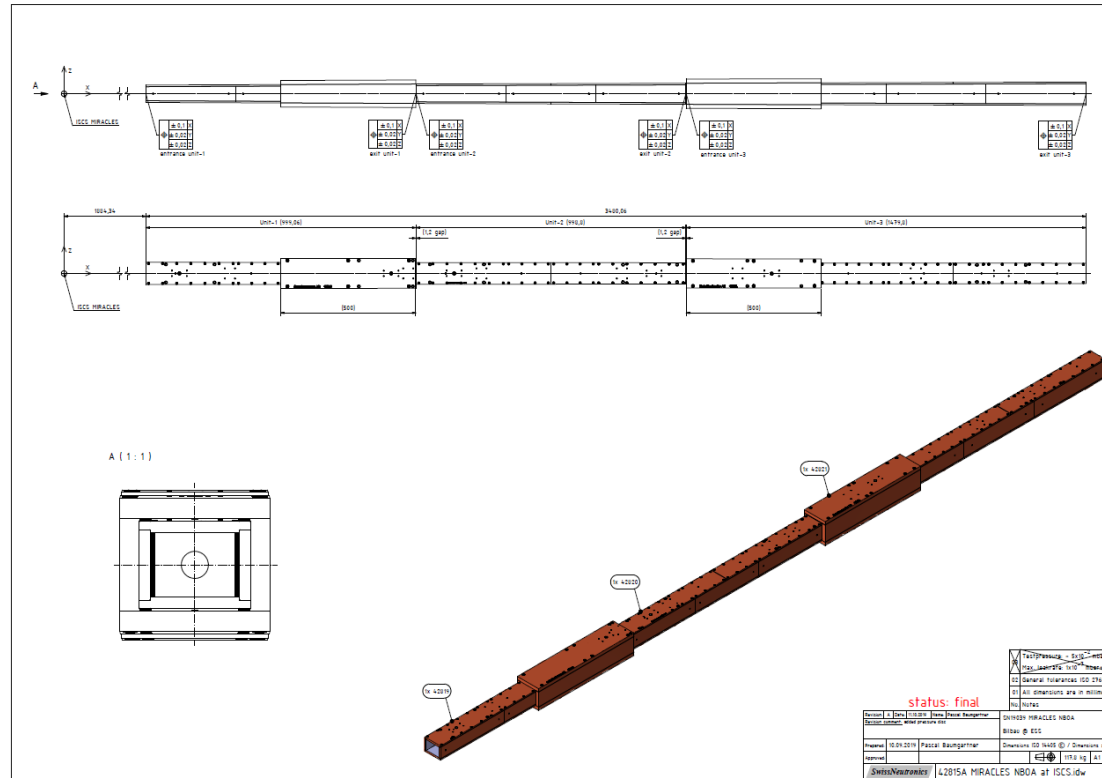
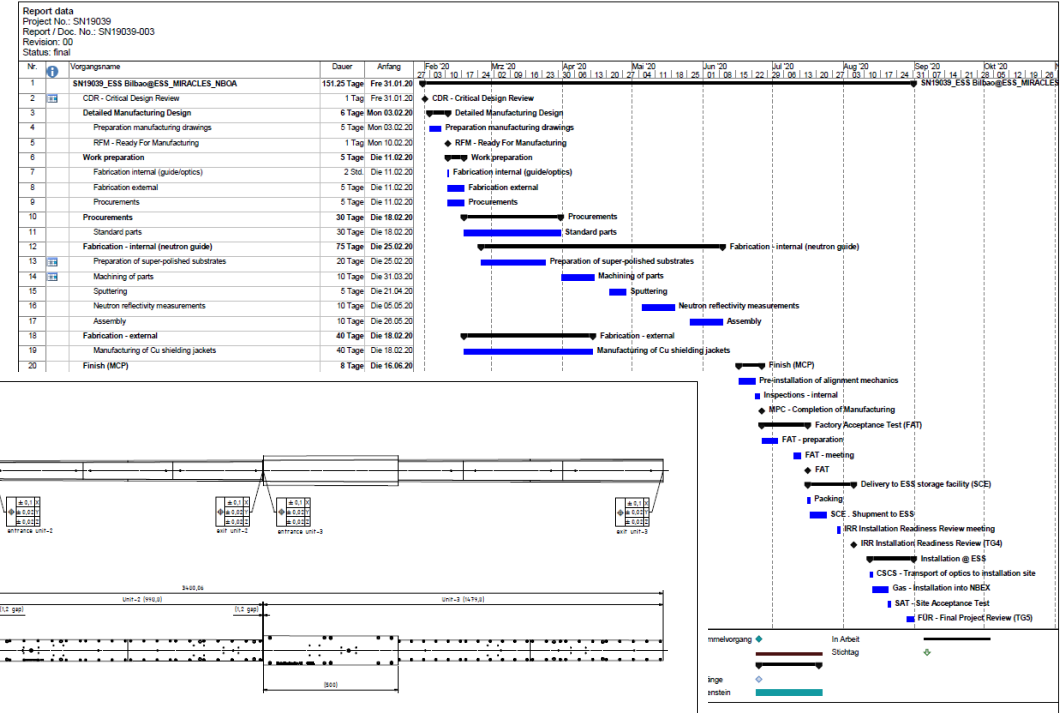
# 1<sup>st</sup> tenders: optics integrated to ESS construction

- ✓ Neutron Beam Optical Assembly (NBOA): In-monolith insert
- ✓ Bunker wall insert (BWI)
- ✓ Delivery: 2021



# NBOA milestones

- ✓ NBOA CDR: **Jan-2020**
- ✓ Materials purchased **Jan-2020**
- ✓ In fabrication **Feb/Jun-2020**
- ✓ Delivery (SAT/TG5): **Aug-2020**



**SwissNeutronics**  
 Neutron Optical Components  
 & Instruments

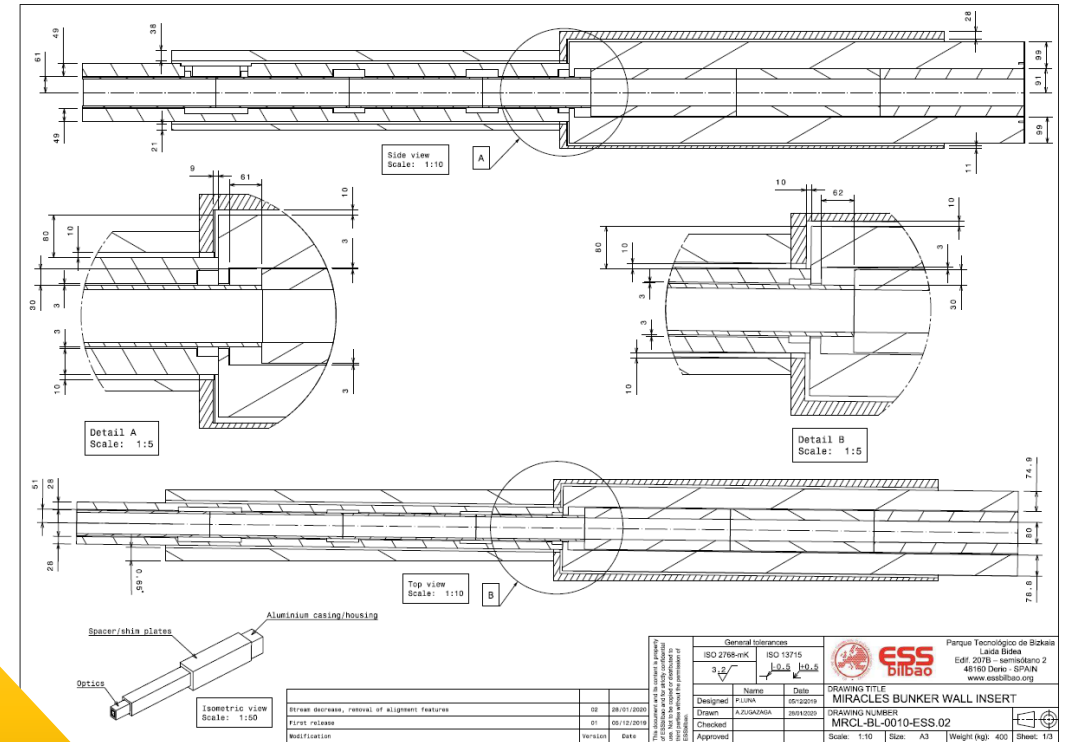
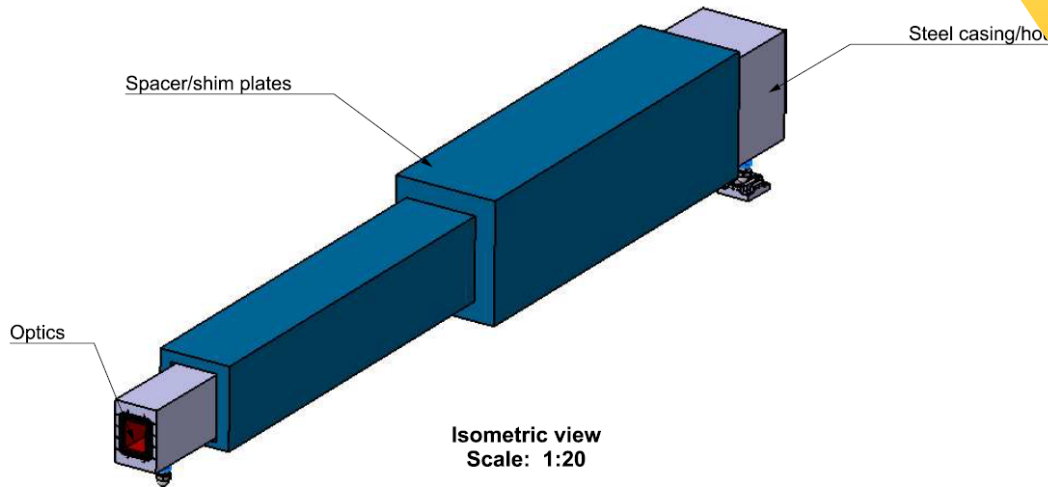


status: final	
Project / Doc. No.:	SN19039-003
Revision:	00
Author:	Pascal Baumgartner
Checked:	Dirk Hübner
Date:	10.09.2019
Project Name:	ESS-MIRACLES NBOA
Project Location:	Bilbao @ ESS
Project Manager:	Dirk Hübner
Project Sponsor:	ESS
Project Description:	ESS-MIRACLES NBOA
Project Status:	Final
Project Start:	31.01.2020
Project End:	18.06.2020
Project Duration:	151.25 Tage
Project Budget:	4.2015A MIRACLES NBOA @ ESS



# BWI milestones

- ✓ BWI CTV doc submitted: **Jan-2020**
- ✓ Procurement authorization delayed to: **Jul-2020**
- ✓ Still interested in installing ASAP: **Q3-2021**



What to do? Is there any formal/informal way of considering this option?

# Choppers

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- ✓ Join the Common Project (only for racks)
- ✓ CTV:
- ✓ No more clashes with MAGiC

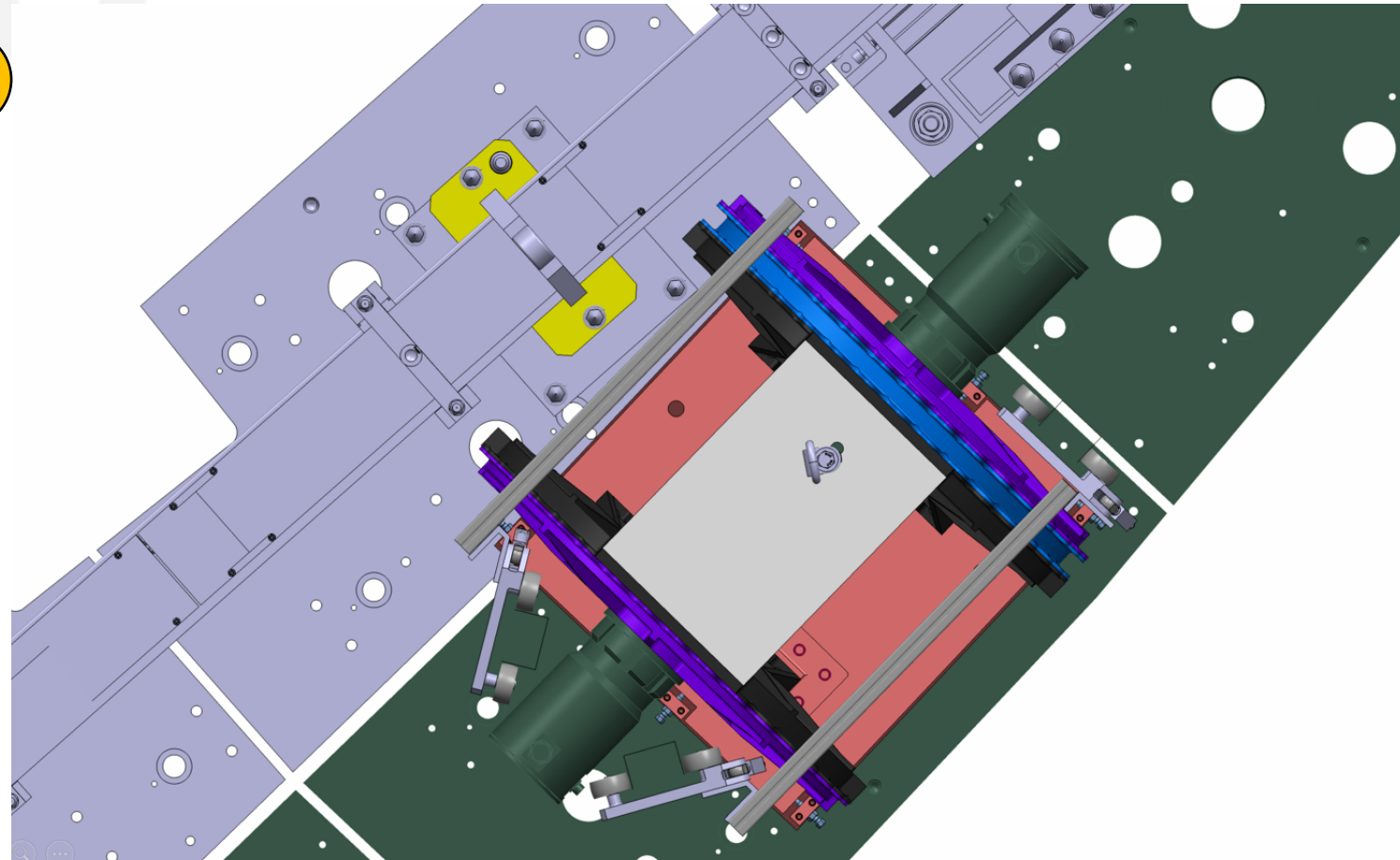


**Q3-2019**




*Any news?*

**Q2-2020**



# Beamline shielding

- ✓ Common shielding: MIRACLES finds agreement cost of the beamline shielding
- ✓ Gamma generation in supermirror coating implemented in MCNP6.2
- ✓ Dose map covering whole beamline length (except bunker: ~140 m)

 **EUROPEAN SPALLATION SOURCE**

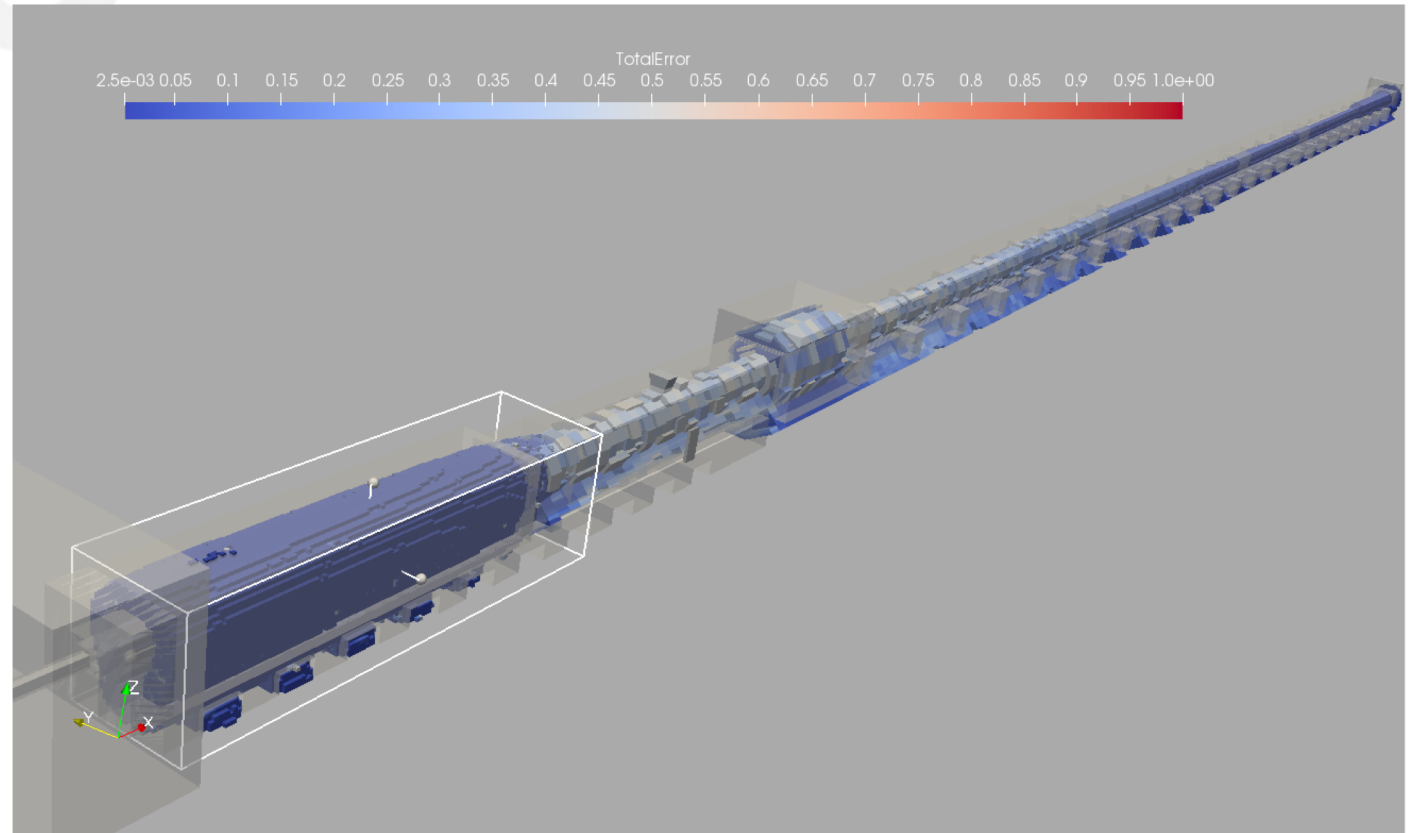
Document Type: Analysis Report  
Document Number: ESS-0114728  
Date: Sep 20, 2019  
Revision: 0  
State: Released  
Confidentiality Level: InternalInternalInternal  
Page: 1 (13)

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**Shielding report for the MIRACLES Beamline**

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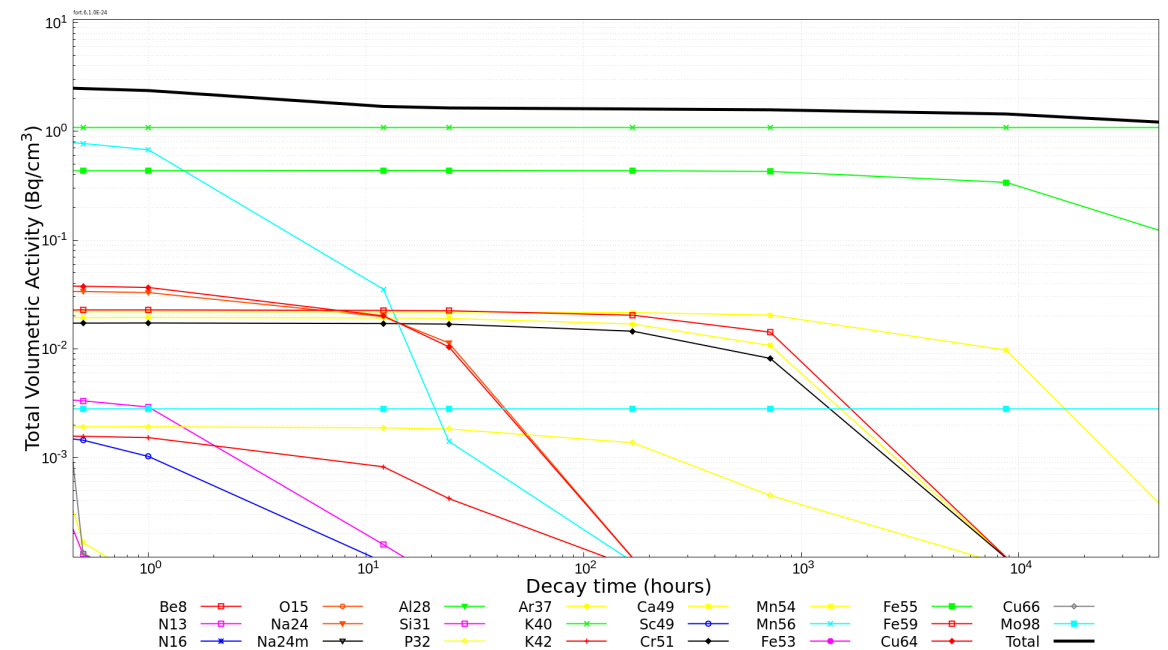
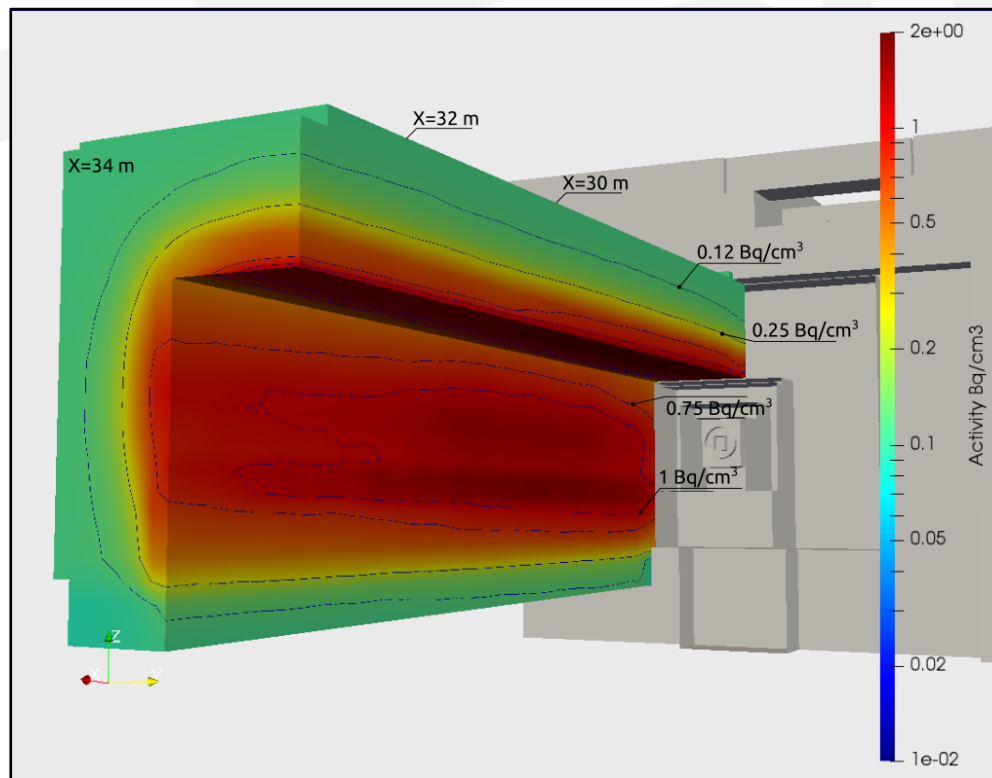
	Name	Role/Title
Owner	M. Magán	Project leader at ESS-Bilbao
Reviewer	V. Santoro	
Approver	Sigrid Kozieleski	Group leader Radiation Protection
	Günter Muhrer	ESS Shield Design Coordinator
	System owner/ Project manager	Role/Title of the system owner/Project manager
Distribution list	<<Name>>	<<Role/Title>>





# Beamline shielding

- ✓ Common shielding project
- ✓ Materials activation: the use of heavy concrete for the common shielding project
- ✓ Possible!

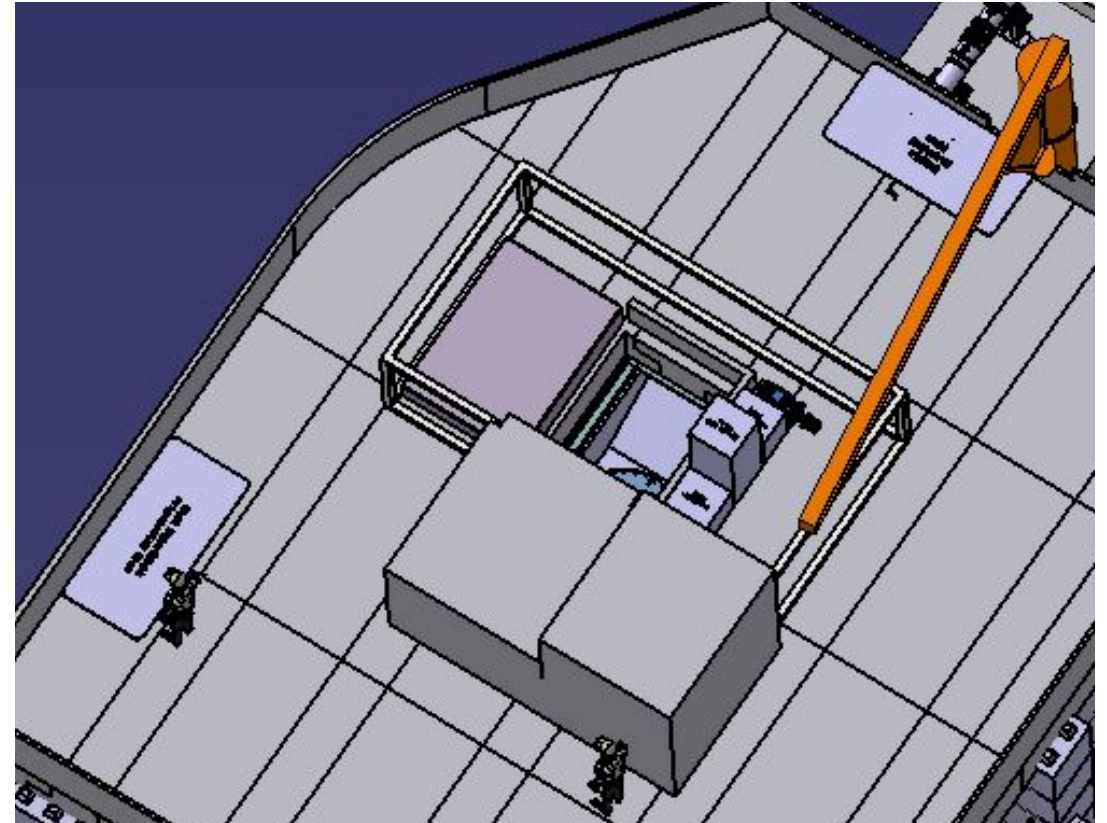
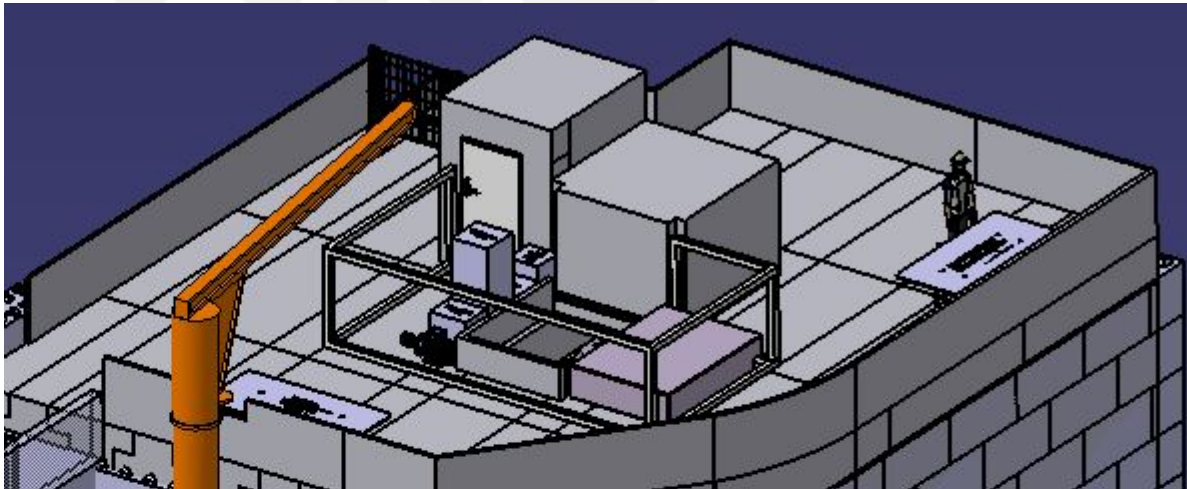




# Sample hatch

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- ✓ Hopefully, final design!
- ✓ Avoiding 2 moving slabs
- ✓ Just 1 slab



# Cave: H1 & H2 scenarios

Status now... (see below)

- ✓ Only Arno clicked “Approved” in the first and second version.
- 2 reviewers approved the 1st version, but need to approve the 2nd version with the minor comments incorporated
- Ken gave his OK by mail before leaving,... but did not click to approve the first version. What to do right now?

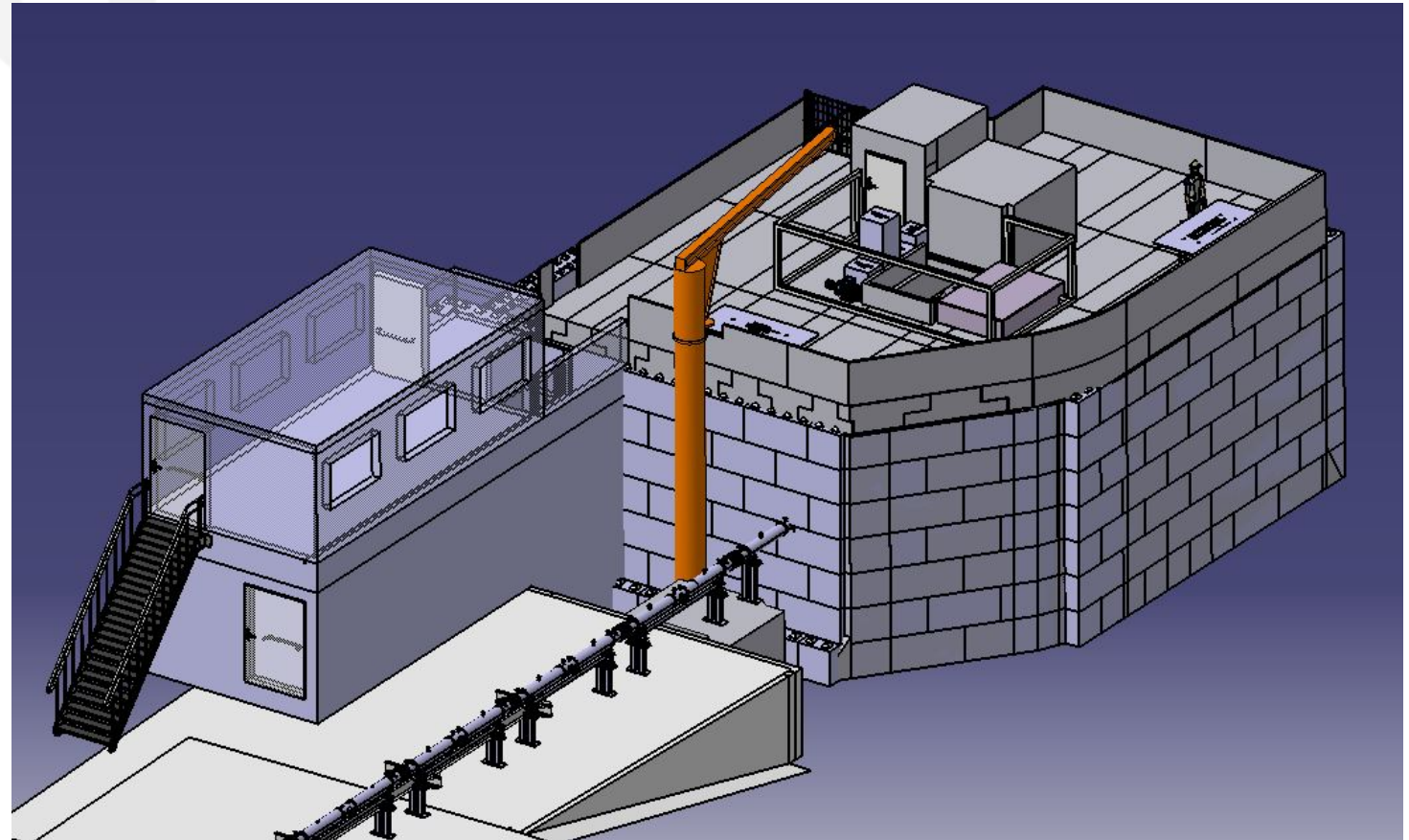


Document Type  
Document Number  
Date  
Revision  
State  
Confidentiality Level  
Page

Document Template  
ESS-0060987  
Apr 7, 2017  
3 (1)  
Preliminary  
Internal  
1 (11)

## MIRACLES: H1 and H2 scenarios

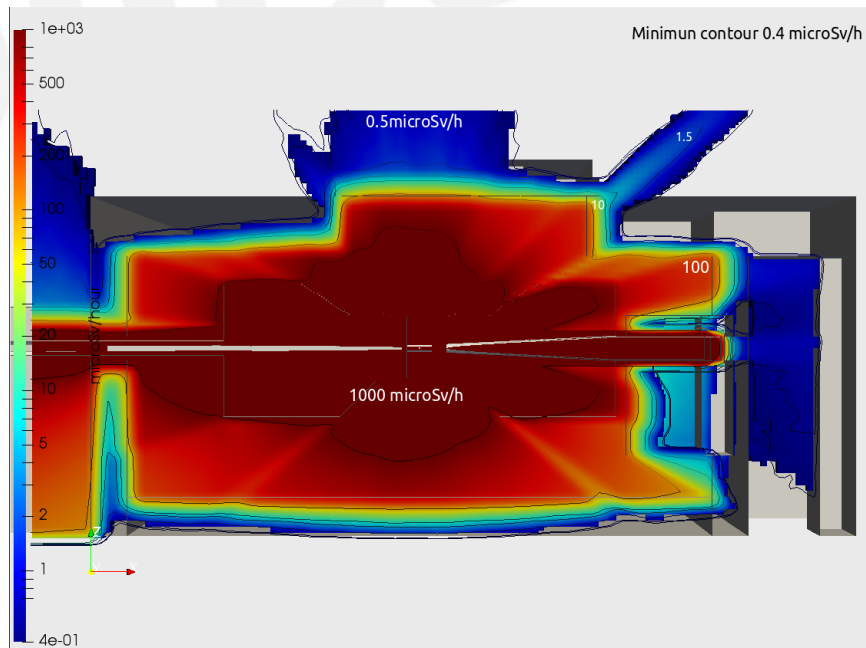
	Name	Role/Title
Owner	Felix J Villacorta	Lead Instrument Scientist
	Paula Luna	Lead Instrument Engineer
	Octavio G del Moral	Neutronics Engineer
	Miguel Magan	Neutronics Engineer
Reviewer	Ken Andersen	Head of the Neutron Instruments Division
	Arno Hies	Head of the Scientific Activities Division
	Valentina Santoro	Neutron Beam and Shielding Scientist
	Joffrey Germa	Radiation Physics Engineer – ES&H
Approver	Gunter Muhrer	ESS Target Physics Group Leader
	Sigrid Kozielski	ESS Radiation Protection Group Leader
	Shane Kennedy	NSS Project Leader
Distribution list	<<Name>>	<<Role/ Title>>



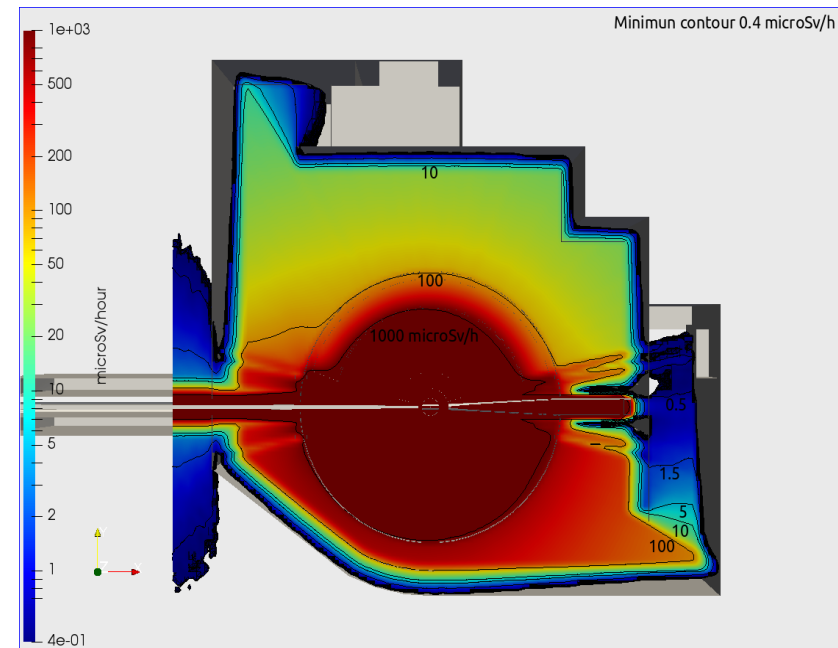
# Cave: H1 & H2 scenarios

H1: No sample, direct beam

Dose map



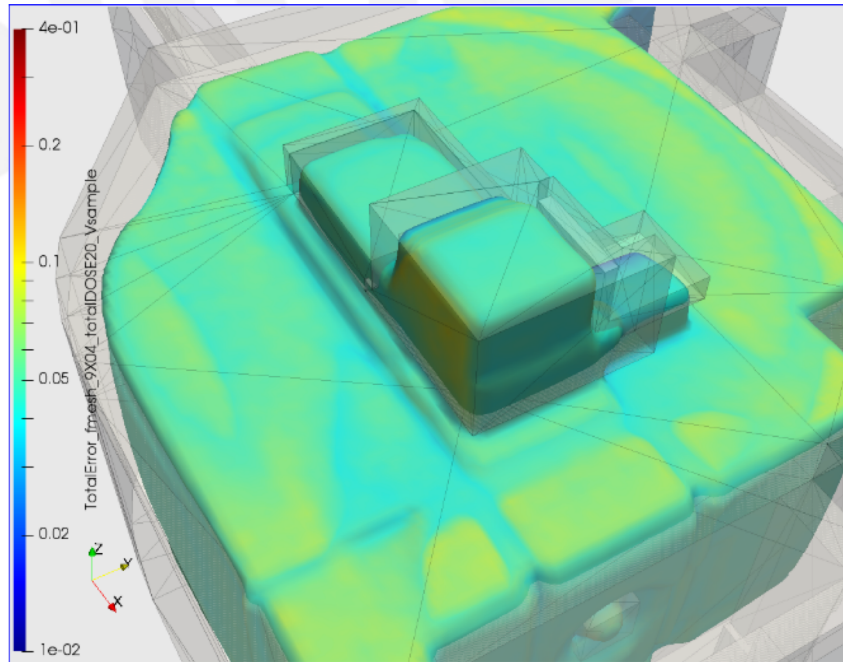
Dose map



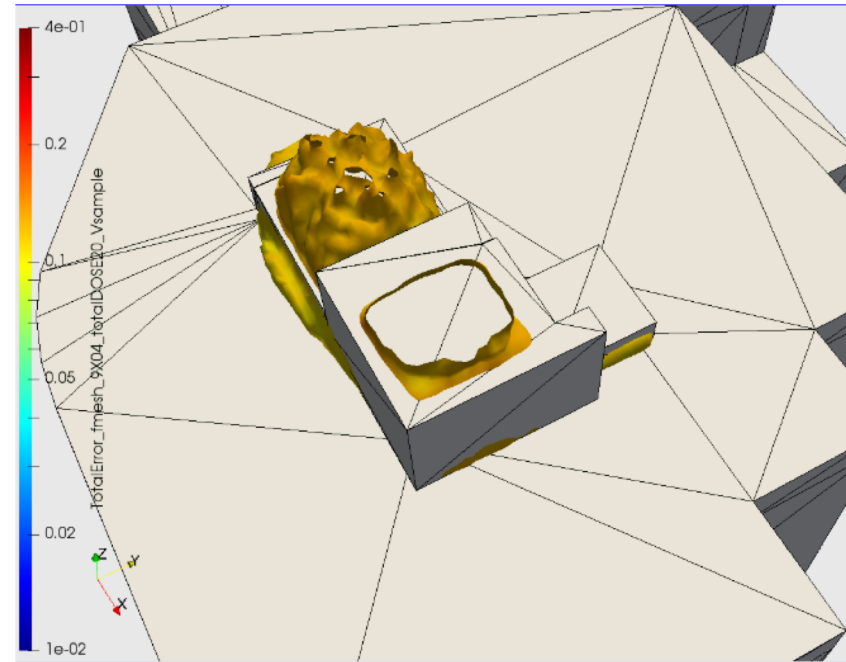
# Cave: H1 & H2 scenarios

H1: Vanadium sample

Isocontour 12.5  $\mu\text{Sv/h}$



Isocontour 1.5  $\mu\text{Sv/h}$

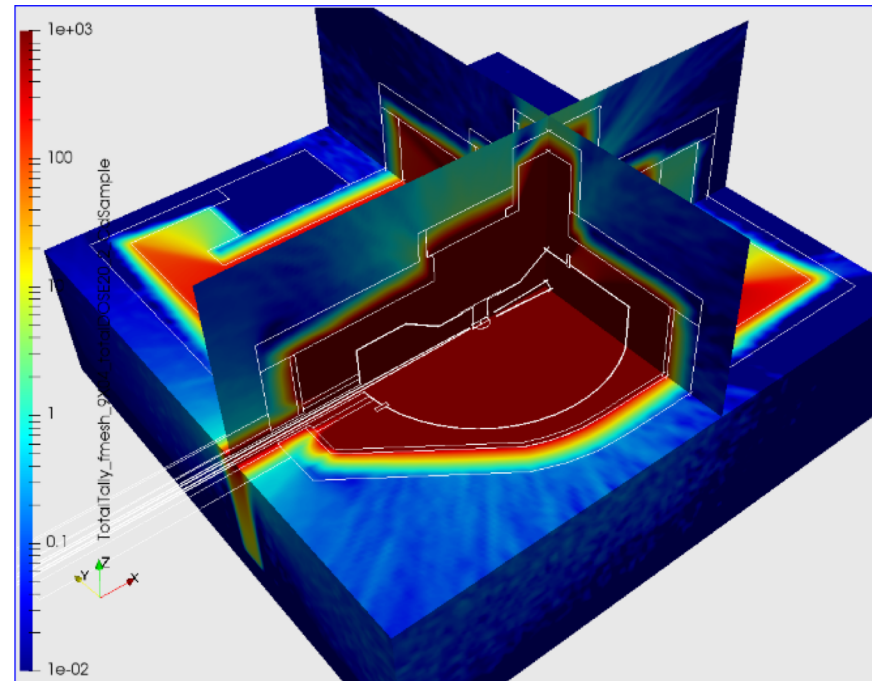
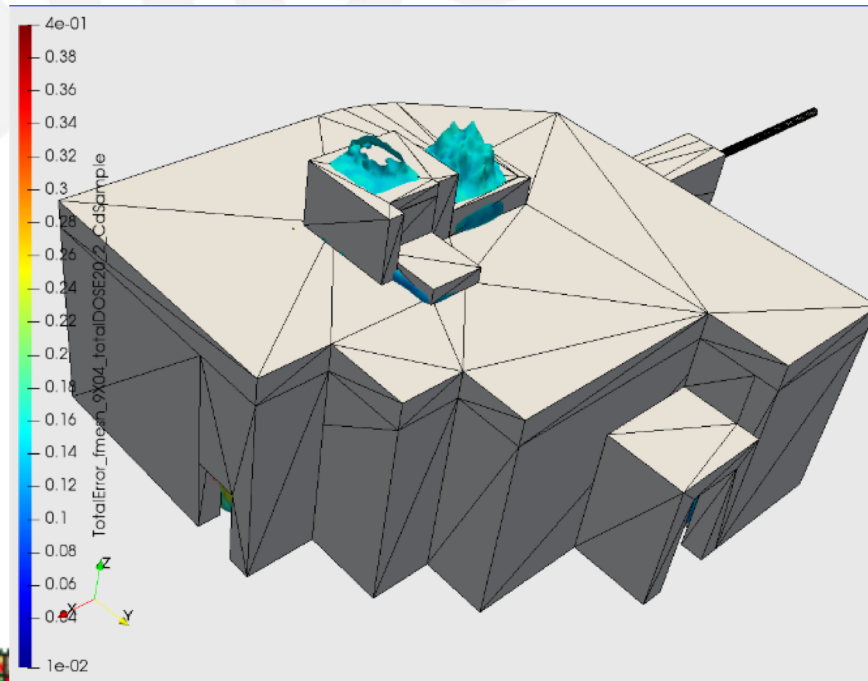


# Cave: H1 & H2 scenarios

H2: Cadmium

Isocontour 1.5  $\mu\text{Sv/h}$

Dose map

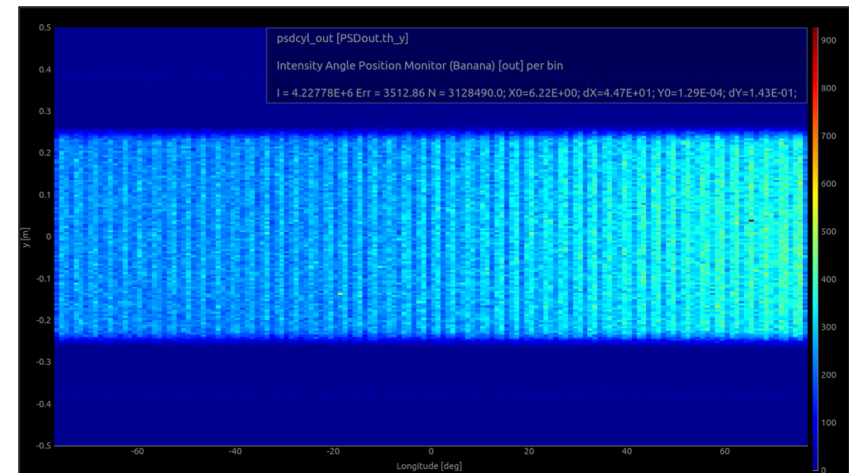
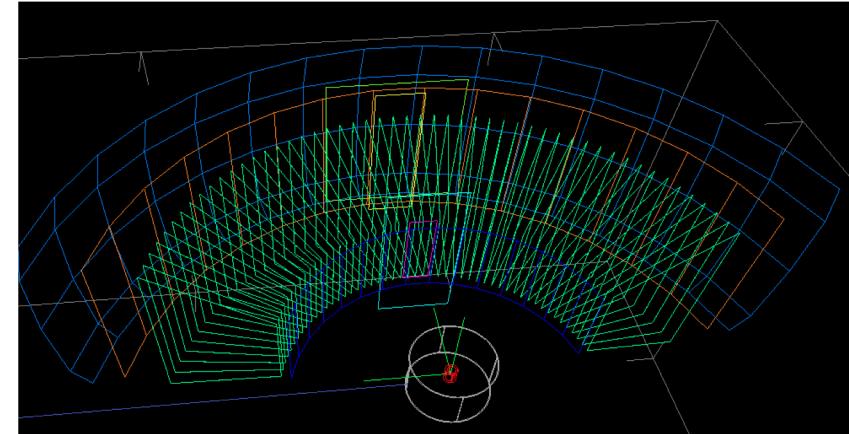
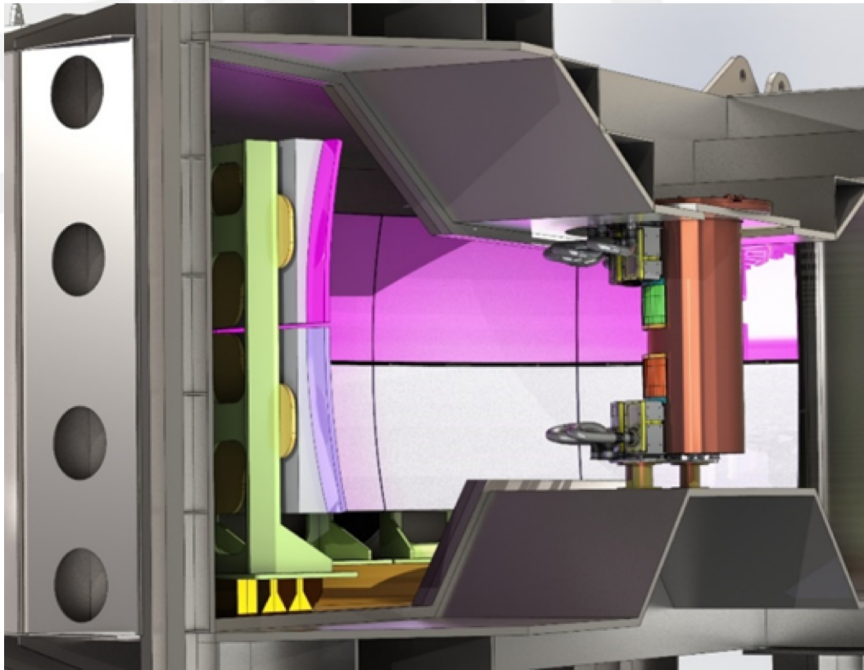


# Secondary spectrometer: PDR

Review in 2 stages:

- 26<sup>th</sup> February (tomorrow): ISIS reviewers
- 3<sup>rd</sup> March: rest of review panel

Aim: Validation of concept and readiness for tendering





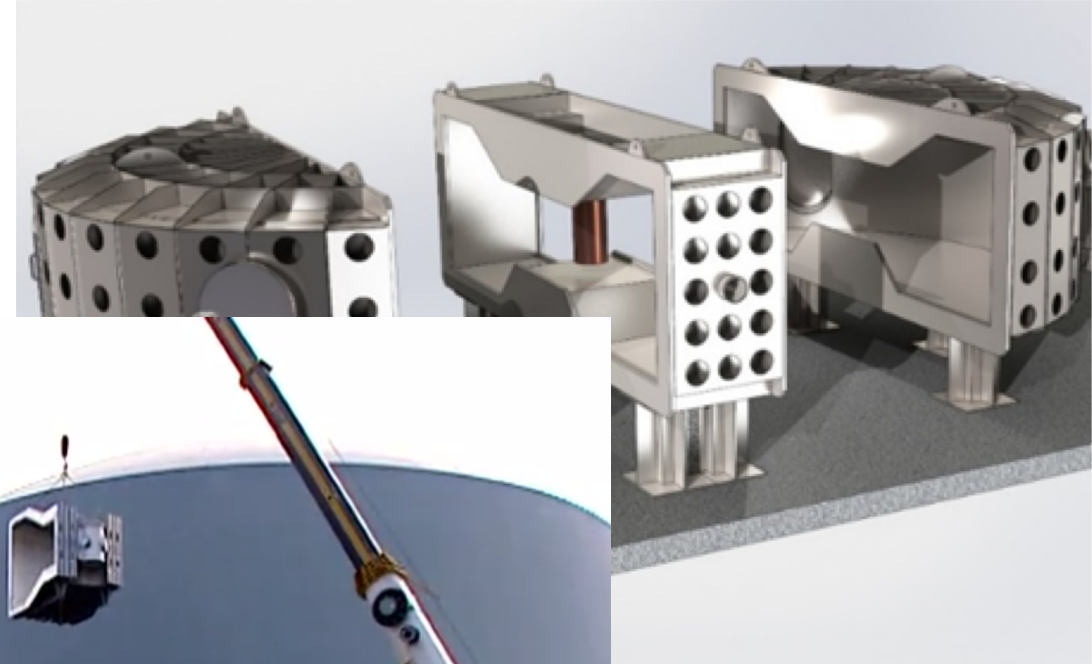
# Vessel: Installation

E01

- Small door
- No crane >10 T available
- Installation from the roof not possible?
- Mobile crane 25 T...



*Thanks,  
Clara!*



# Detectors

- ✓ 48 x 2  $^3\text{He}$  tubes
- ✓ This year: testing U-connection (similar to BaSIS)
- ✓ Issue: RF isolation (antenna), ground TBD
- ✓ Issue: thermal stability (resitivity?)
- ✓ Electronics: talking with CAEN

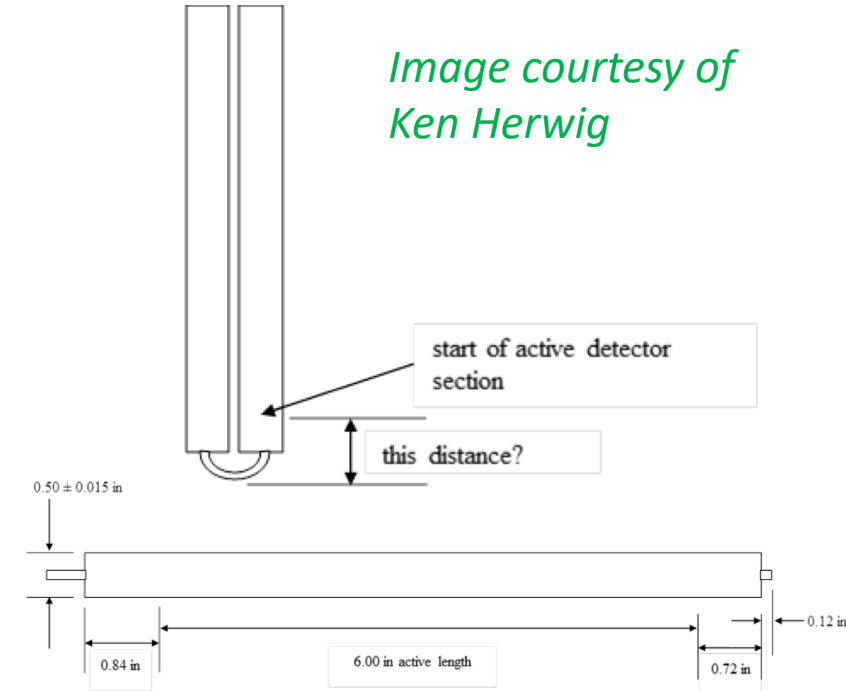
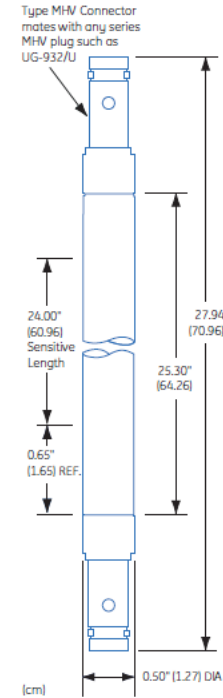
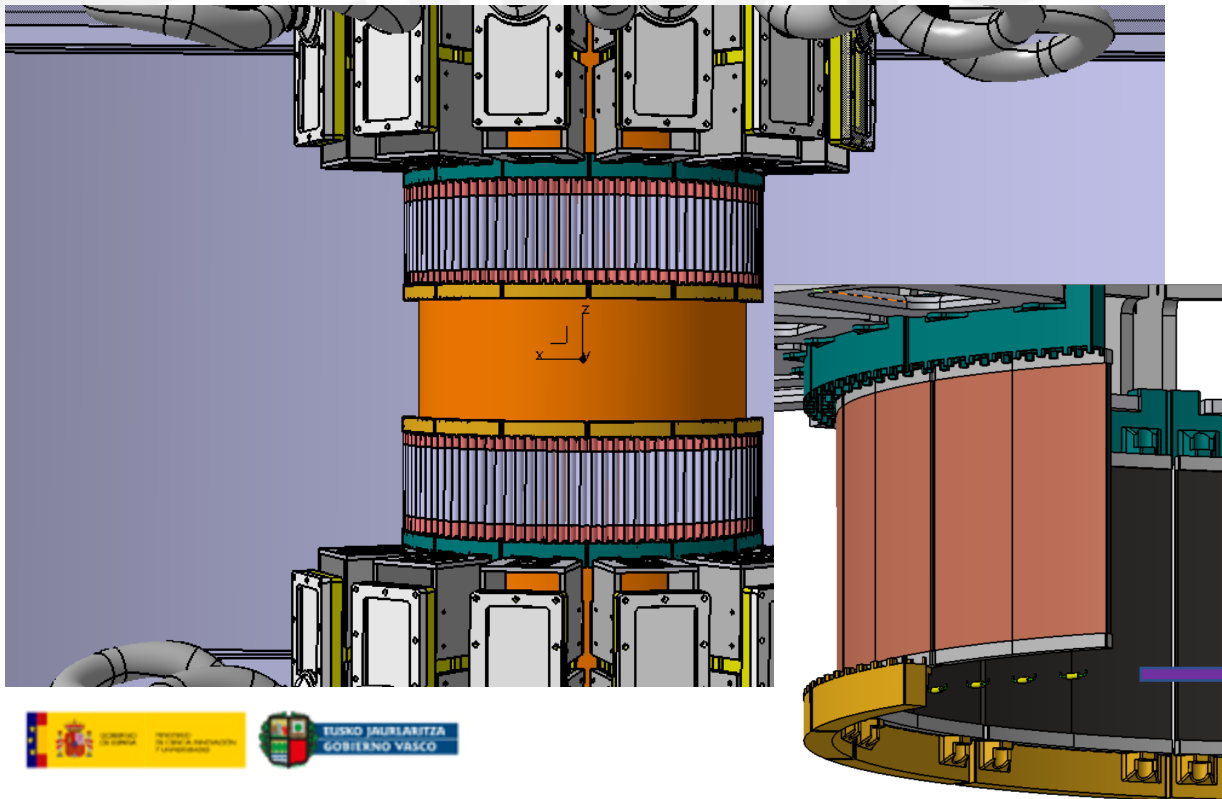


Image courtesy of Ken Herwig

# MIRACLES Phase 2: schedule

		2020					
		Jan-Apr '20	May '20	Jun '20	Oct '20	Nov '20	Dec '20
MIRACLES	<u>CTV</u>	<u>CTV</u>	<u>CTV</u>	<u>CTV</u>	<u>CTV</u>	<u>CTV</u>	<u>IDR</u>
	13.6.16.1.2.1.2 BWI	13.6.16.1.4 Slits	13.6.16.1.3 - Choppers and modules	13.6.16.1.2.7-10 Beam Delivery System (out-of-bunker guides)	13.6.16.5 - Cave	13.6.16.1.4 Slits	
		13.6.16.1.8.6 Beam Stop			13.6.16.6 - Control Hutch	13.6.16.1.8.6 Beam Stop	
		13.6.16.3 - Scattering Characterization System (except detectors): [Vessel, Secondary Spectrometer]			13.6.16.7 - Sample Preparation Area	13.6.16.3 - Scattering Characterization System (except detectors): [Vessel, Secondary Spectrometer]	
	<u>Sub-TG3</u>					<u>Sub-TG3</u>	
	13.6.16.1.1.1 NBOA					13.6.16.1.2.1.2 BWI	

1<sup>st</sup> April: new lead engineer!

		2021						
		Jan '21	Feb '21	Mar '21	Apr '21	Jun '21	Aug '21	Sep '21
	<u>CTV</u>	<u>IDR</u>	<u>IDR</u>	<u>SubTG3.1</u>	<u>SubTG3.2</u>	<u>SubTG3.3</u>	<u>SubTG3.4</u>	
	13.6.16.1.2.1&3-6 Beam Delivery System (in-bunker guides)	13.6.16.1.3 - Choppers and modules	13.6.16.5 - Cave	Scattering Spectrometer	Experimental Area (E01)	Beamline (out-of-bunker)	Beamline (in-bunker)	
			13.6.16.7 - Sample Preparation Area	13.6.16.1.4 Slits	13.6.16.5 - Cave	13.6.16.1.2.7-10 Beam Delivery System (out-of-bunker guides)	13.6.16.1.2.1&3-6 Beam Delivery System (in-bunker guides)	
			13.6.16.2 - Sample Exposure System	13.6.16.1.8.6 Beam Stop	13.6.16.7 - Sample Preparation Area	[Beam monitors & BL shielding to ESS]	13.6.16.1.9.1-2 Beam Delivery Vacuum System	
				13.6.16.3 - Scattering Characterization System: [Vessel, Secondary Spectrometer, Detectors]	13.6.16.2 - Sample Exposure System	13.6.16.11.1.1 MCA (Shutter)	13.6.16.1.3.3.1-2 Control Rack PWD-PS	
				13.6.16.3.3.5 Vacuum (vessel)		13.6.16.1.3.2 Pit Assembly FO	13.6.16.1.3.1 Chopper module PWD + PS	
				13.6.16.11 Integrated Control: MCA (Vessel), PSS (ESS), DMSC (ESS),...		13.6.16.1.3.3.3 Control Rack FO	13.6.16.1.10.1 In-Bunker Shielding	