

Heimdal Instrument Diffraction STAP Meeting

Dan Mannix

Lead Scientist Heimdal Instrument ESS, Lund Sweden

ESS - October 23th 2023

Heimdal Team: Additional Engineer



Isabel Llamas Scientist (IFE)
Choppers & Neutronics



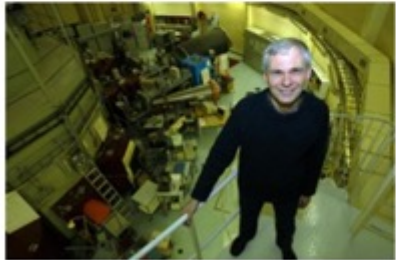
Dan Mannix (ESS)
Lead Scientist



Kåre Iversen (AU)
Lead Engineer



Bengt Jönsson (ESS)
Engineer 2023



Bjørn Hauback
In-kind Partner IFE



P.I. Mogens Christensen
In-Kind Partner AU

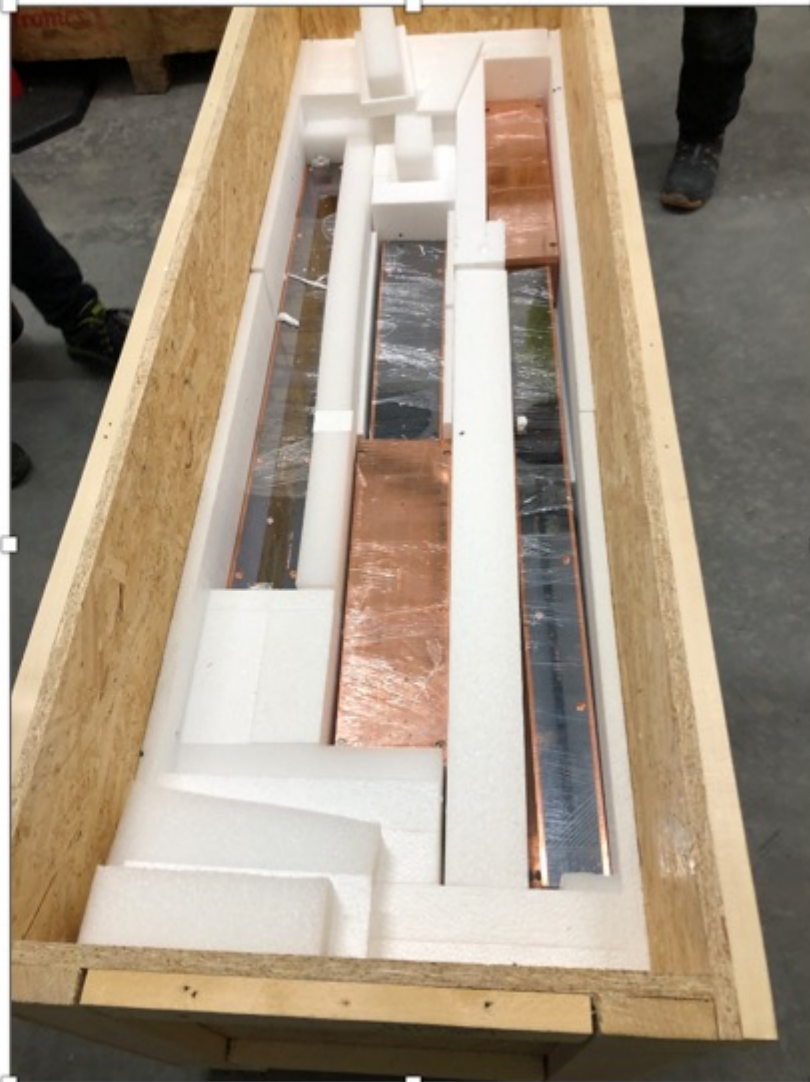


Autur Glavic
In-kind Partner PSI

New Engineer:
Full time @ ESS
Start March 23

Two year contract
AU budget

NBOA Fabricated

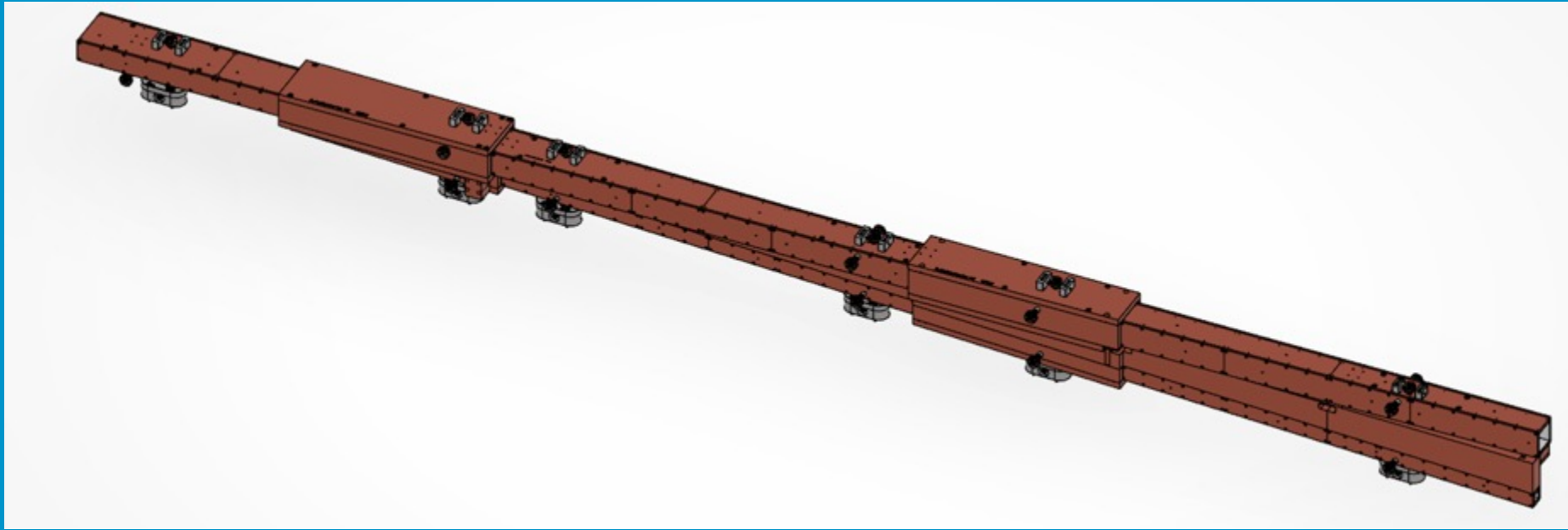


NBOA FAT
Feb. 14 2023
Swissneutronics

Delivered to ESS
NBPI delivered to ESS

Installation May 2023
First installation MS
For Heimdal

BWI Final Design



BWI priority for ESS
schedule

Part of guide project
with swissneutronics

Optics and Housings

sTG3 June23.

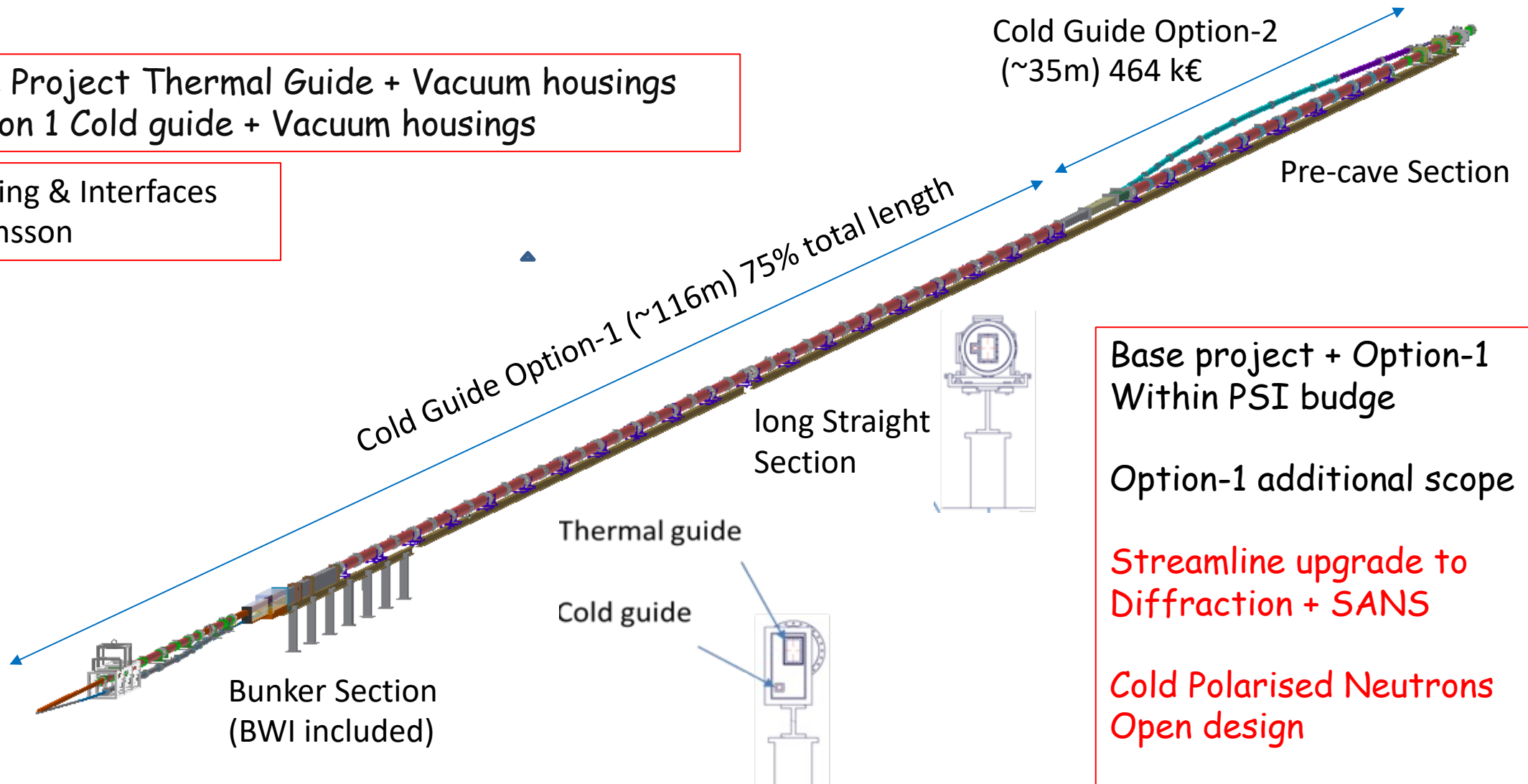
Heimdal Guide (PSI) Project

Project start Swiss Neutronics 13/02/23



- (1) Base Project Thermal Guide + Vacuum housings
- (2) Option 1 Cold guide + Vacuum housings

Engineering & Interfaces
Bengt Jonsson



Base project + Option-1
Within PSI budget

Option-1 additional scope

Streamline upgrade to
Diffraction + SANS

Cold Polarised Neutrons
Open design

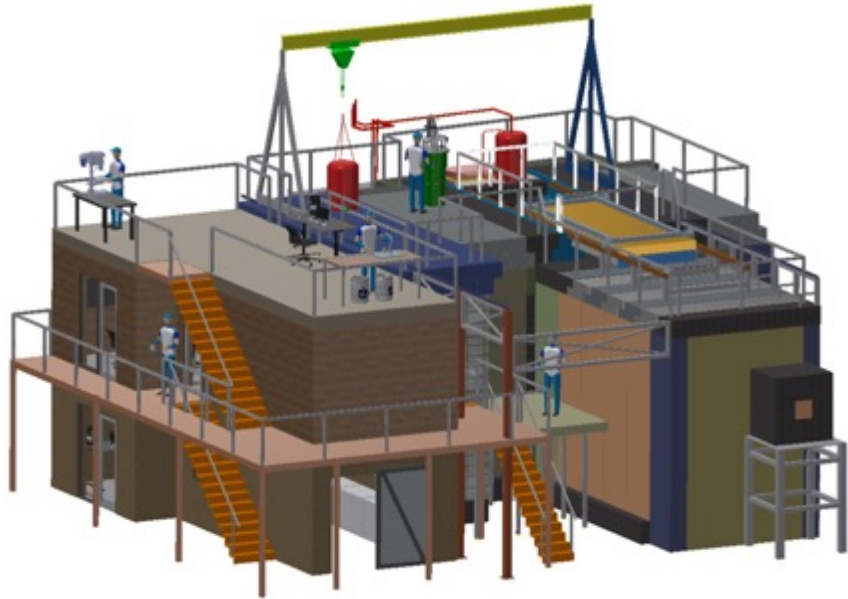
Heimdal RISK Register

Top 5 Risks		Q3 2022		
Title	Rating	Category	Partner	Treatment
RISKS to Heimdal project: Delay, Quality & Costs	20	Cost	ESS	Reduce
SANS upgradability	16	Quality	ESS	Reduce
Delay of 2D Detector Procurement from PSI	4	Schedule	PSI	Reduce
TO Cost / High Background	4	Quality	ESS	Observe
Delay of Guide procurement from PSI	4	Schedule	PSI	Reduce

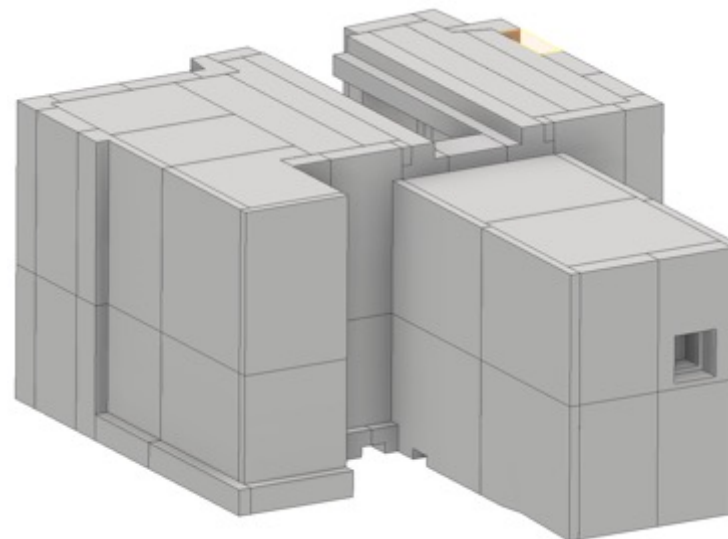
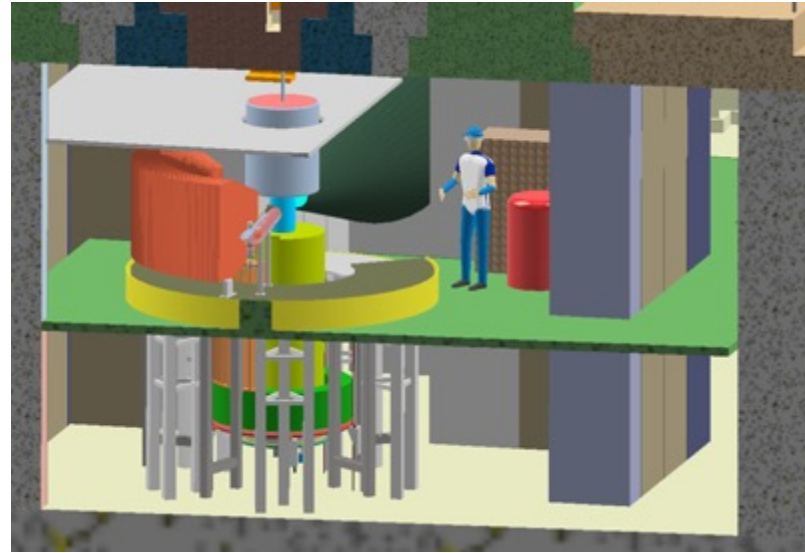
New Engineering support

Cold Guide Option-1

Top 5 Risks		Q1 2023		
Title	Rating	Category	Partner	Treatment
RISKS to Cave project: Costs	10	Cost	IFE	Reduce
Delay in Final Cave Neutronics	0	Schedule	IFE	Avoid
SANS upgradability	0	Quality	ESS	reduce
RISKS to Heimdal project: Delay, Quality & Costs	0	Cost	ESS	Reduce
Delay to cave installation	0	Schedule	ESS	Observe



Modular system:
SANS back-wall demountable
Possibility to extend SANS cave:
Current: 8m SANS
Upgrade: 10-12m+ SANS



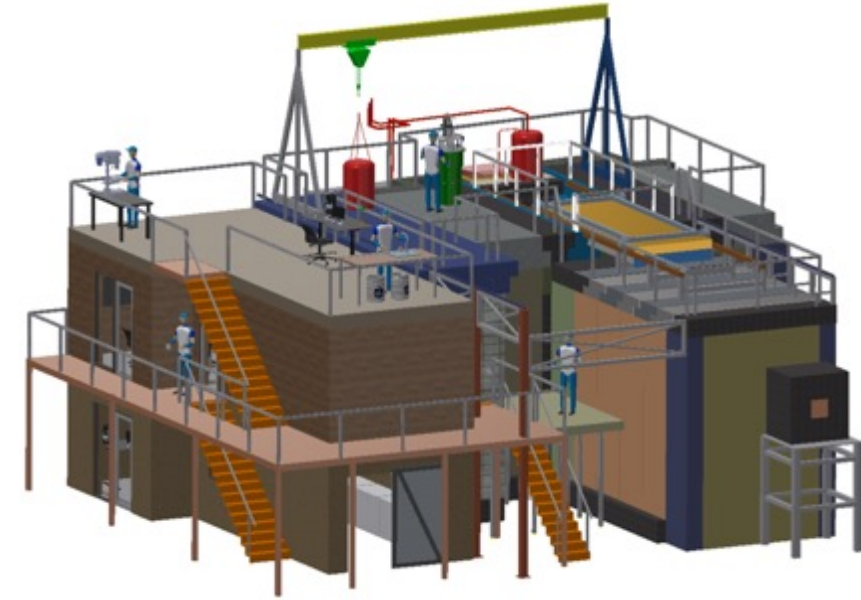
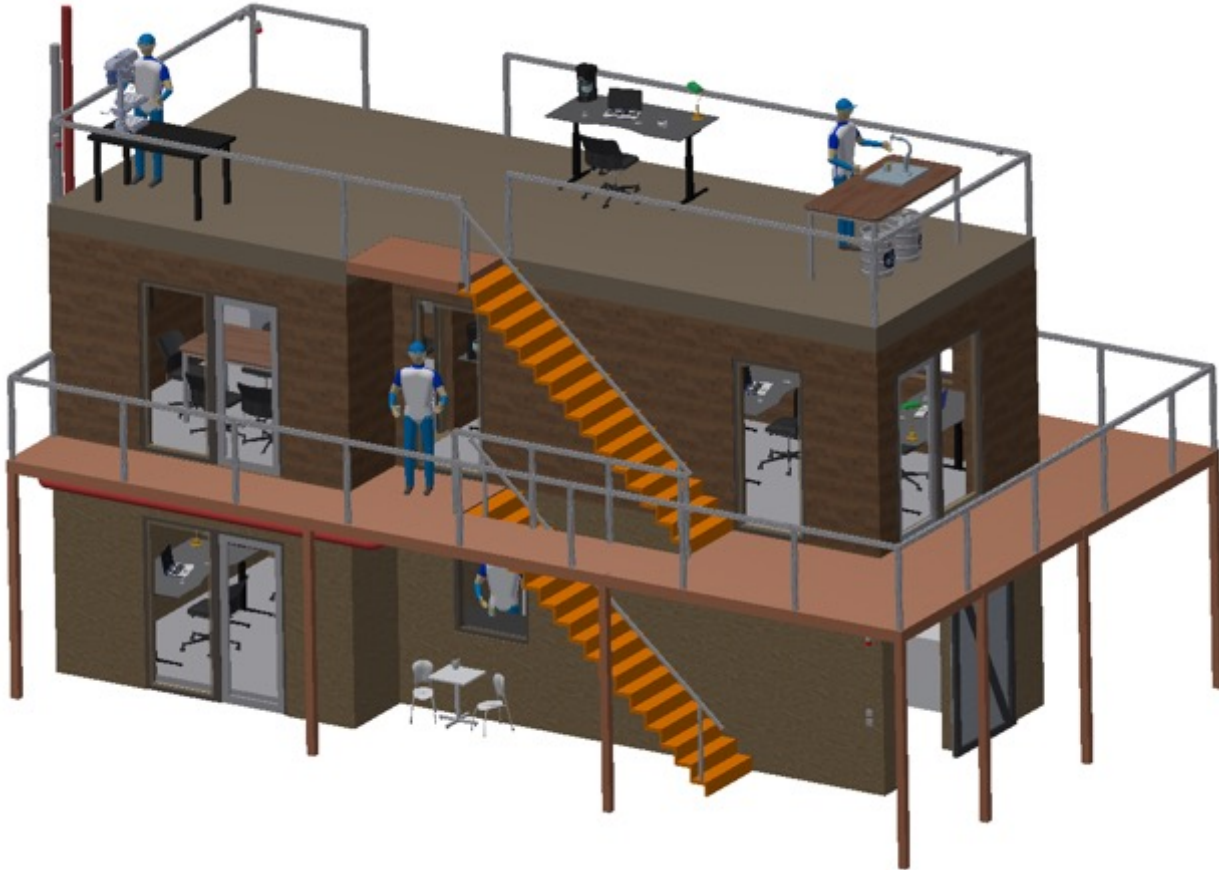
Contract Mirrotron: 711 k€
Budget 711k€
Scope transfer to ESS from IFE + CR.
Cost Variance = 0

PDR November 2022

Work stopped December 2022
“Force Majeure”
Escalating material costs.

New Contract Amendment
March 2023 same final cost
Higher level design pay
structure.

Work restart April 17th.



ESS – Facility Management

Skanska: 27000 sek/m²

Total cost ~196.5k€ (estimate)

Beam Monitors



CDT

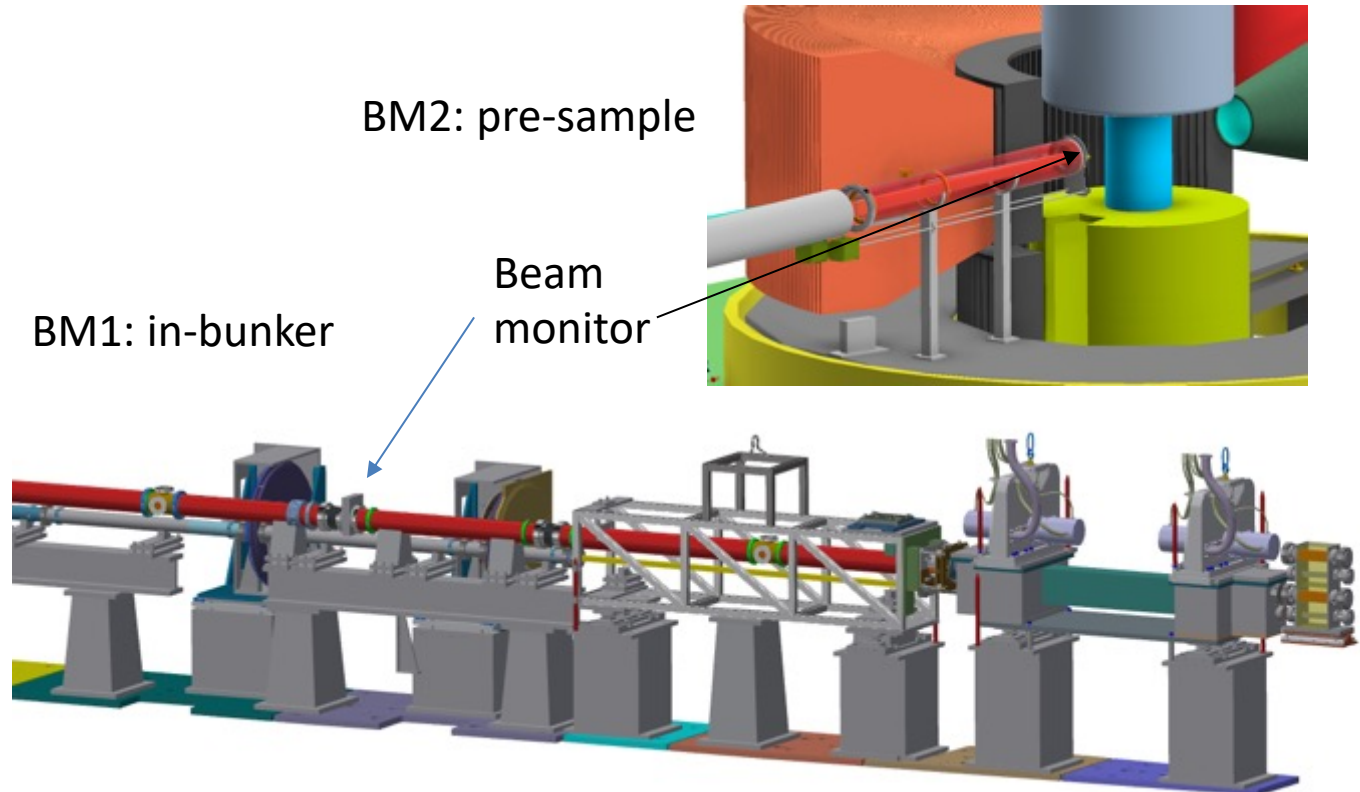
Monitor positions:
Bunker after choppers 3-4
FOC position 80m
Before sample (Cave)

Estimated <30K per monitor (common monitors?)
Total < 60k for 2 monitors
Budget 77k€ (IFE)

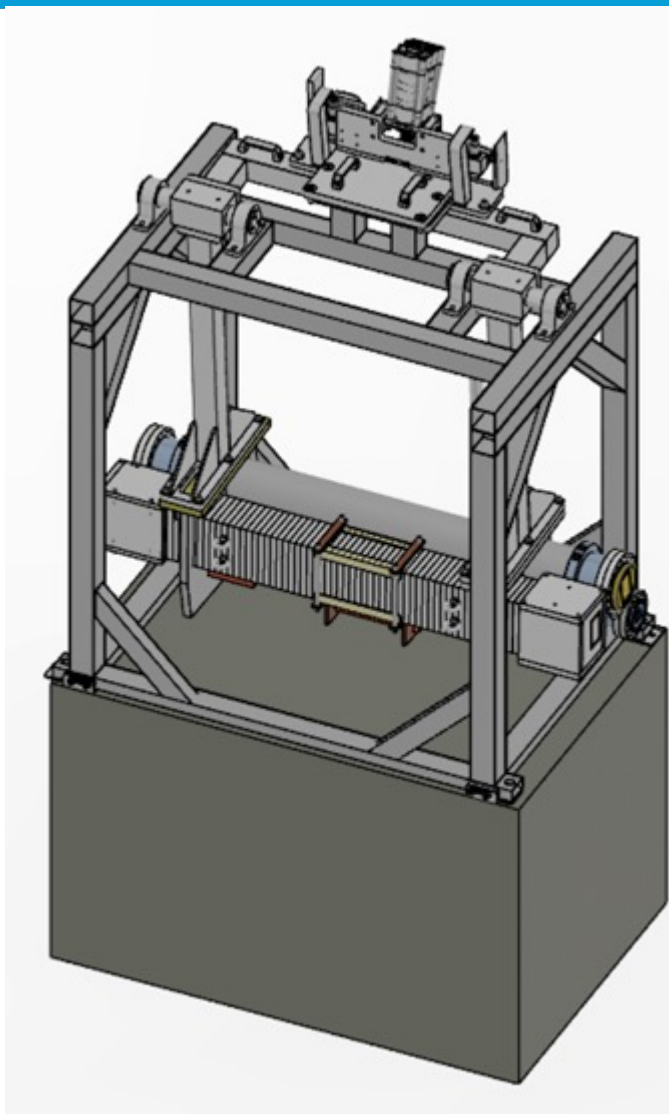
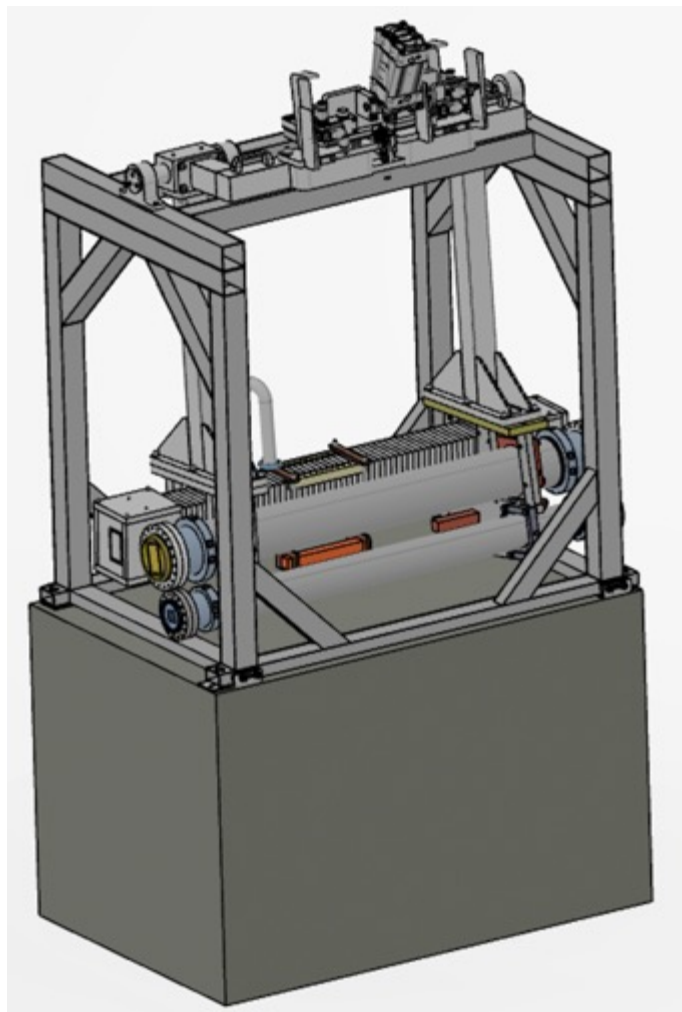


CDT
CASCADE Detector
Technologies
GmbH

Manual for I-BM and TIA-DAQ
21.03.2018



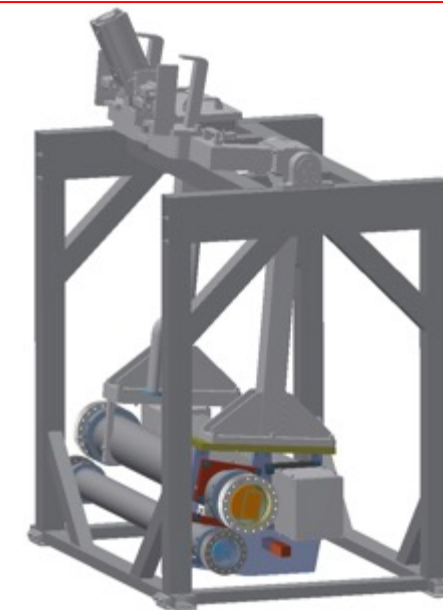
Heavy Shutter



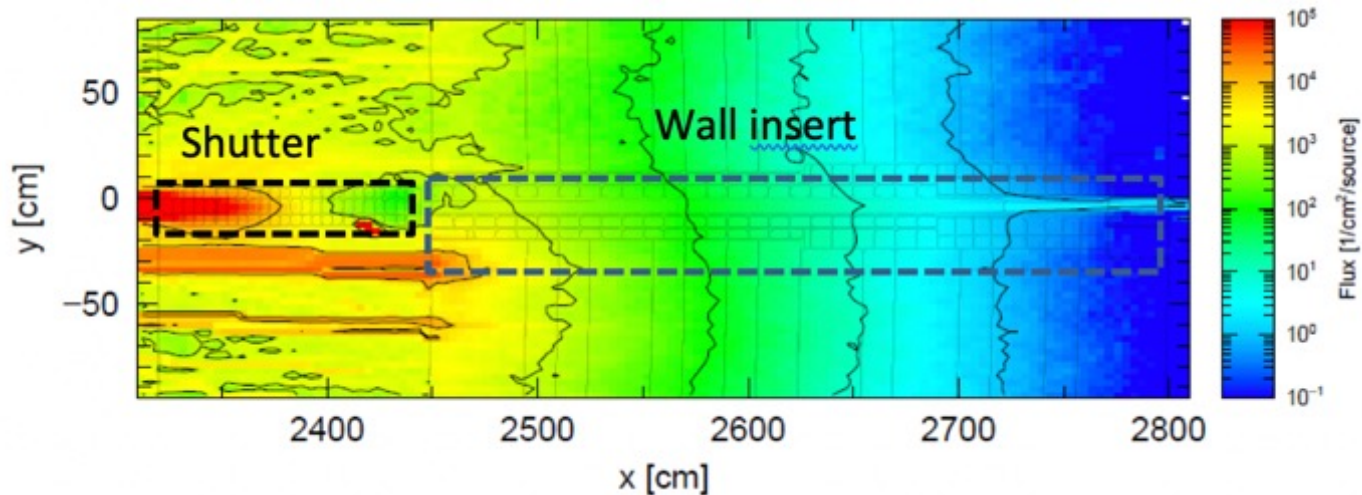
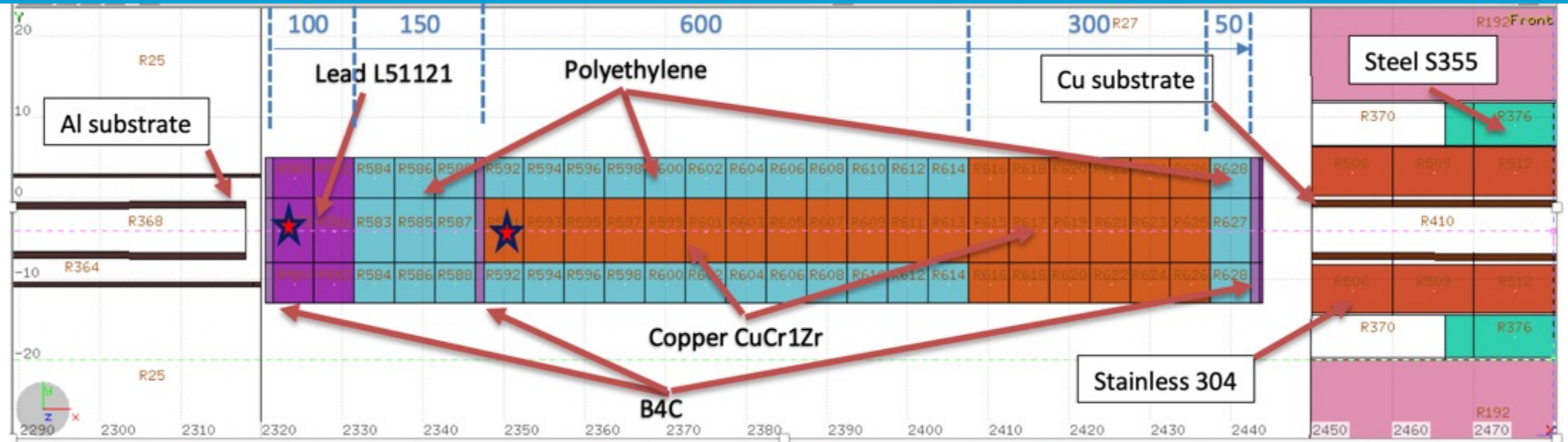
Common design:
Scope transfer AU to ESS ?

Detailed design ESS / swiss
neutronics

Neutronics blocks for thermal
and cold guides



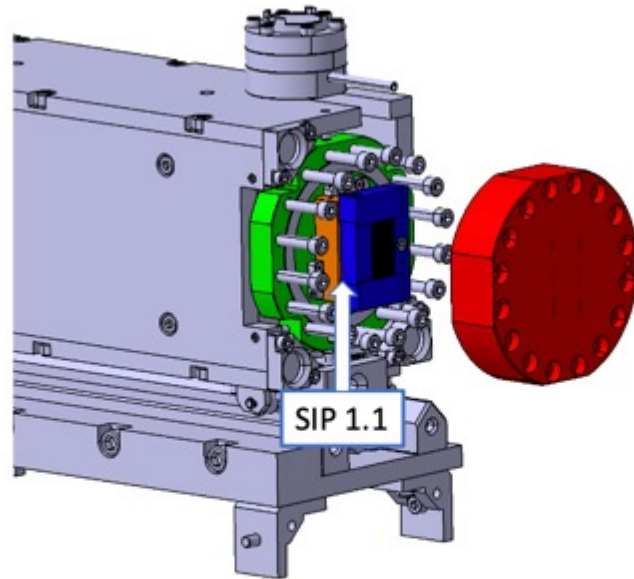
Heavy Shutter Block



Need to include absorbing block for Cold neutrons + neutronics

Light Shutter & Bi-spectral Switch

Dream Bi-spectral switch



Reflects cold neutrons from cold moderator into thermal guide

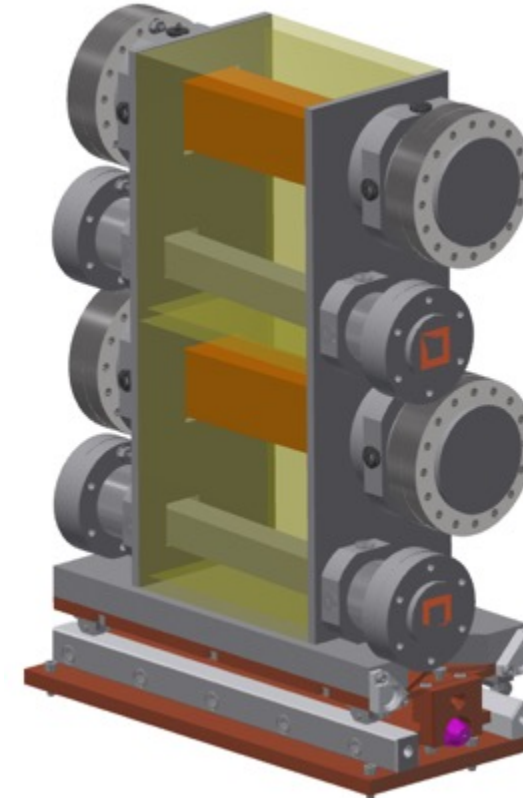
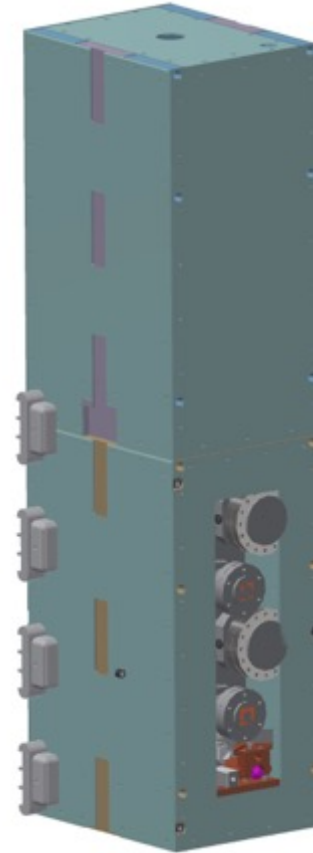
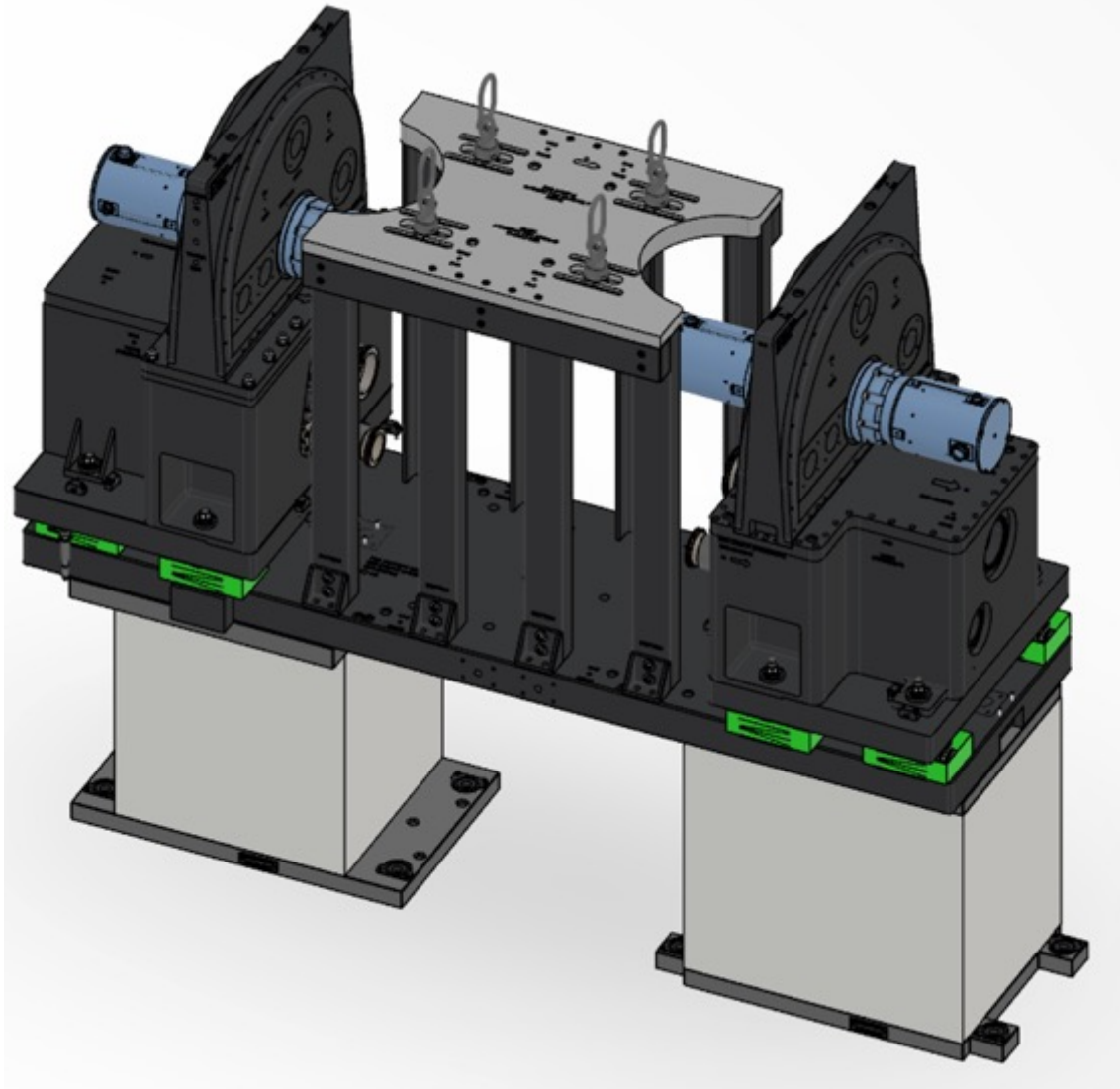


Figure 1 Drawing of the light shutter with bi-spectral switch

Low cost - interfaces with guide project (swiss neutronics)
Part of Swissneutronics Guide project.

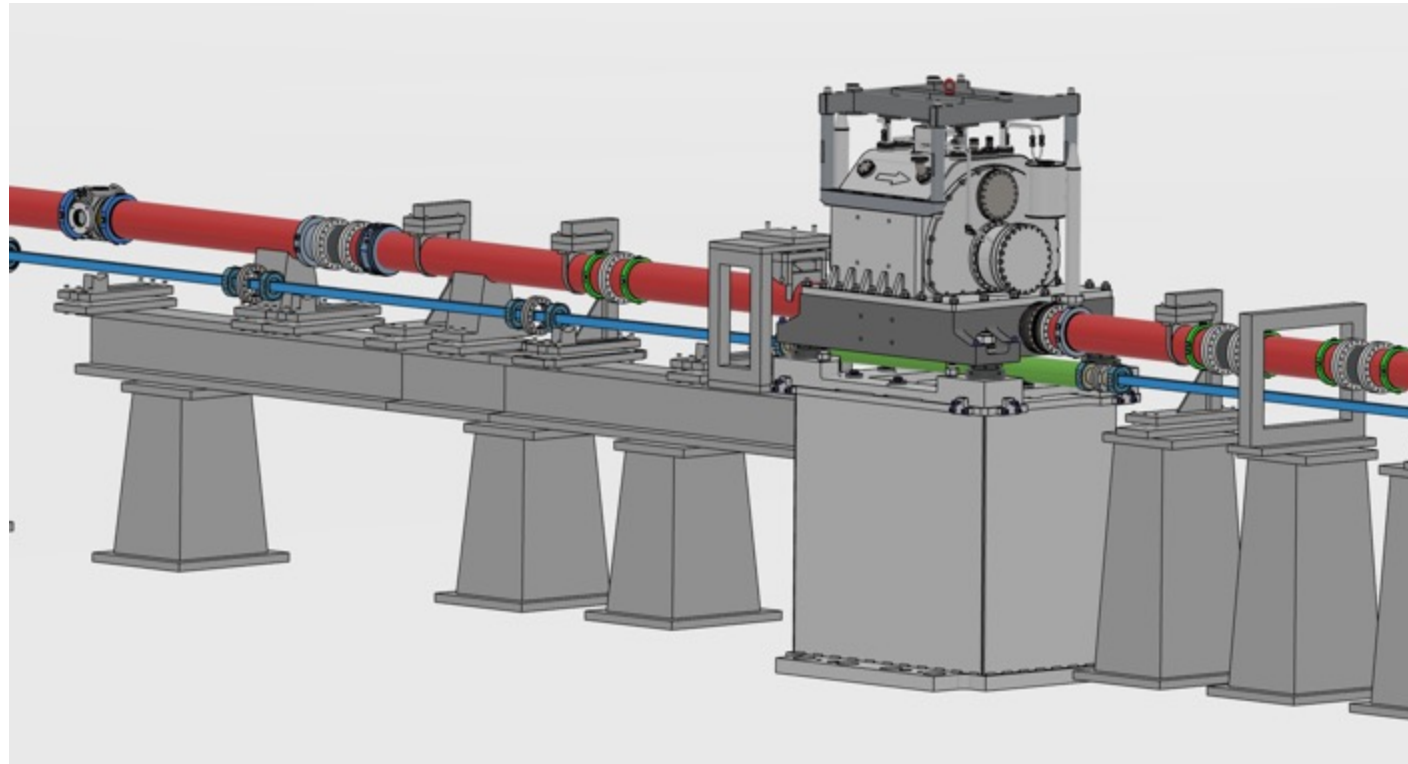
Thermal Choppers



ESS common project

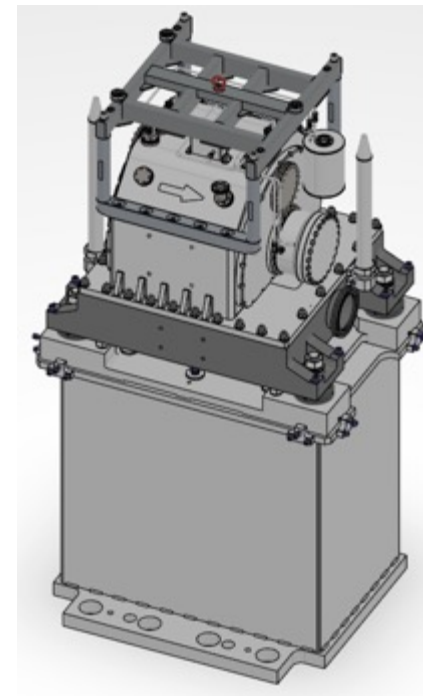
Integration issues resolved: Clashed with TREX.

T0 Chopper

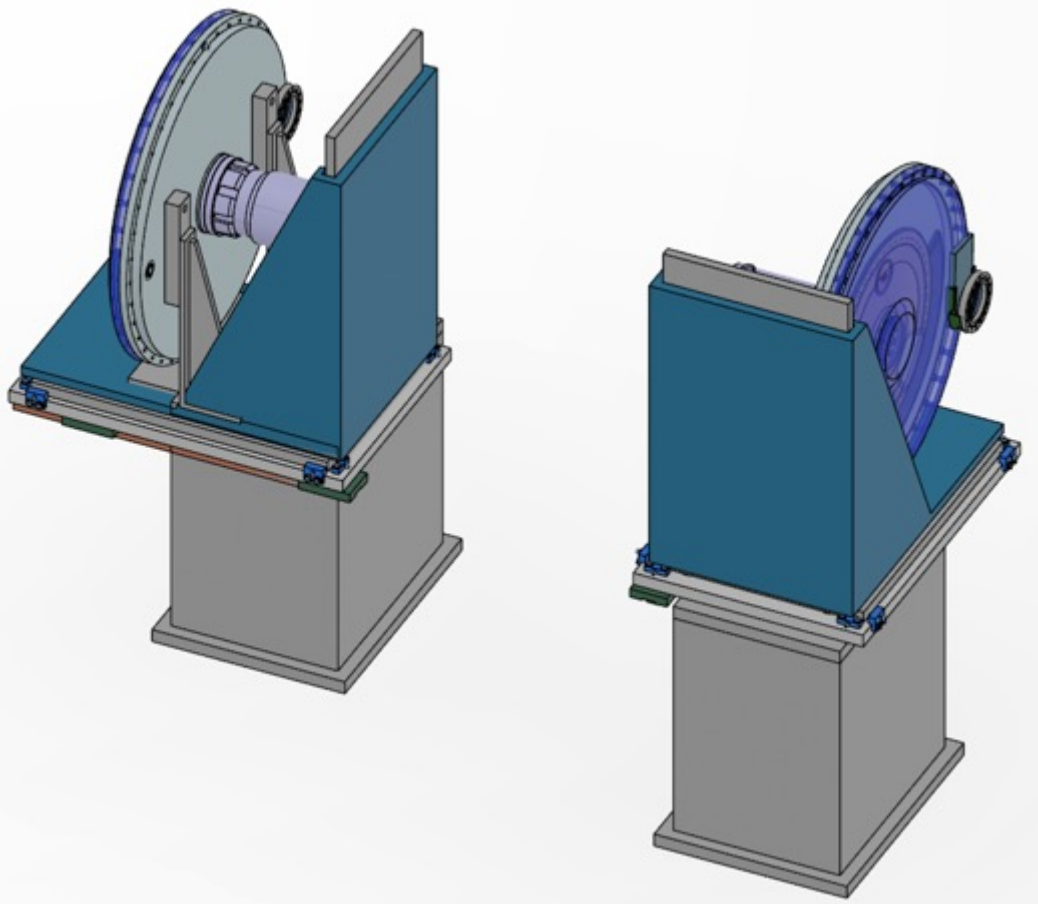


ESS common project

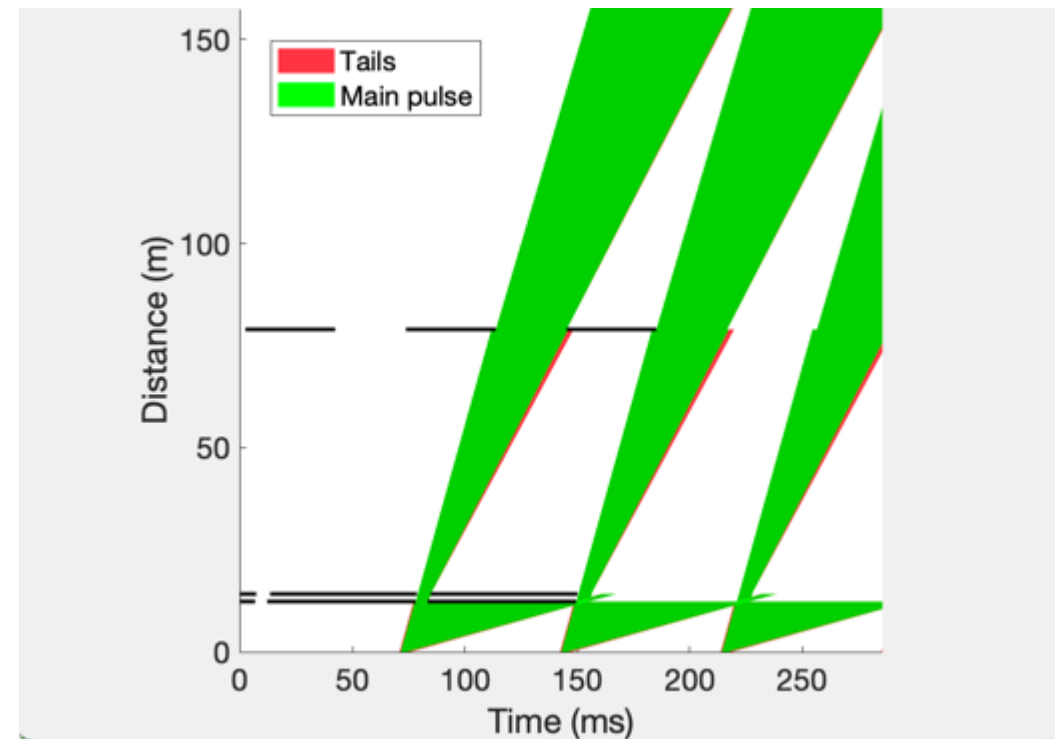
Passed PDR 16th March 2023.
Might not be finished before BOT



Cold Neutron Choppers

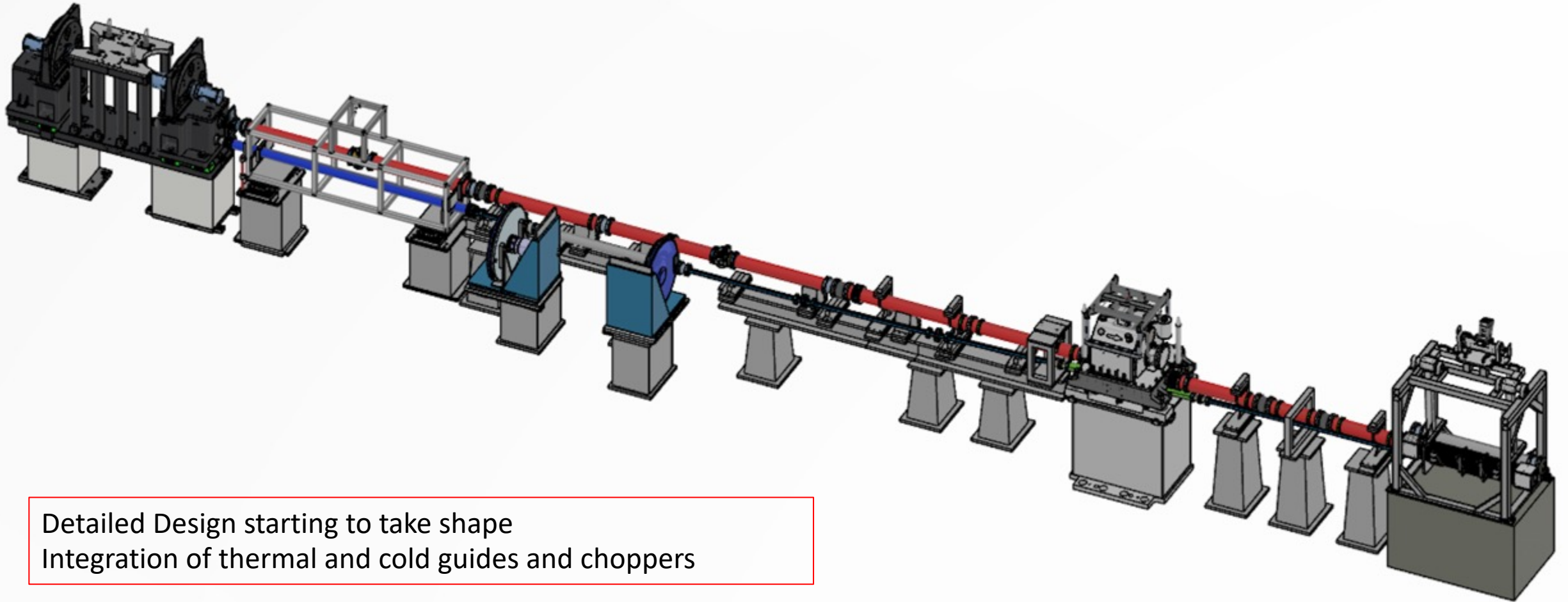


Not in scope: but still need detailed engineering to fit with cold guide



TOF diagrams

In-Bunker Overview



Detailed Design starting to take shape
Integration of thermal and cold guides and choppers

Work toward in-bunker installation before BOT

Current Beam on Target: Nov. 2024 - May 2025

NBOA
Swissneutronics

Choppers
-ESS
Before BOT? : ✓

Monitor
-CDT
Before BOT? : ✓

BWI optics & housings
-Swiss Neutronics
Before BOT? : ✓ Q1 2024
sTG3 June 2023.
Priority.

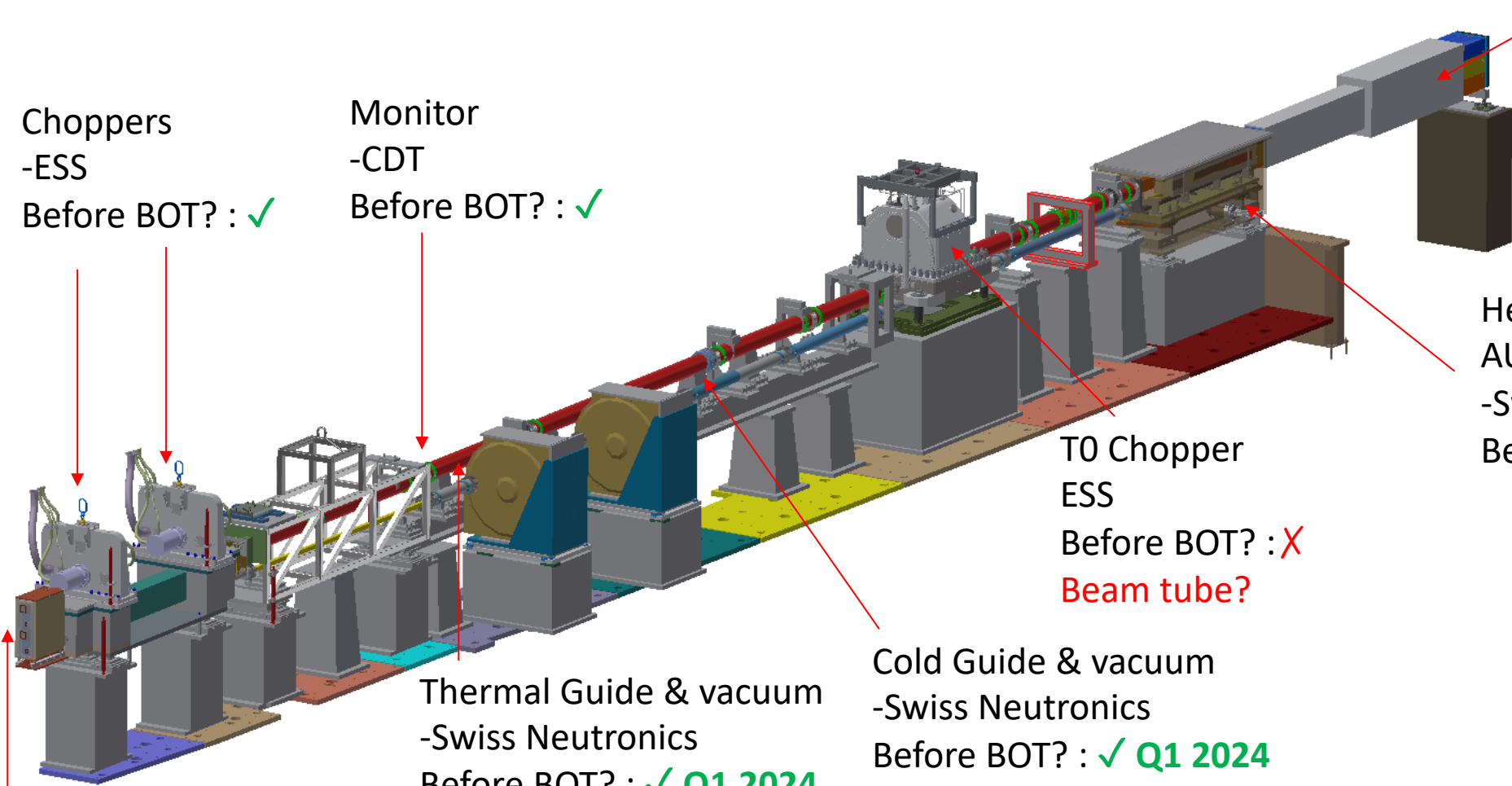
Heavy Shutter & optics
AU / ESS
-Swiss Neutronics
Before BOT? : ✓ Q4 2023

T0 Chopper
ESS
Before BOT? : ✗
Beam tube?

Thermal Guide & vacuum
-Swiss Neutronics
Before BOT? : ✓ Q1 2024

Cold Guide & vacuum
-Swiss Neutronics
Before BOT? : ✓ Q1 2024

BBG & optics (AU)
-Swiss Neutronics
Bi-spectral switch
Before BOT? : ✓ Q4 2023



Summary / Main points



Major items now contracted: Guide shielding (ESS), Choppers (ESS), Cave (Mirrotron), Guides (swissneutronics), 2D detector (CDT) (not costed but can be reduced to be in-budget).

Guide systems contract awarded to Swissneutronics:
Complete thermal guide + Vacuum housing (Base project)
75% of cold guide + vacuum housing also within PSS budget (option-1).
Now proceeding with swiss neutronics guide project.

Additional Engineer support: Located permanently at ESS paid from Heimdal budget:
Started March 2023 for two years.

Current focus of instrument is to have all components installed in-bunker before BOT.
We think we can do this except for T0 Chopper. But this depends on actual BOT date.
NBOA installation May 2023 first installation milestone
BWI sTG3 in June 2023 - ESS priority.

Heimdal Schedule Overview

