T-REX
Instrument Project

75%

Christian Franz, Lead Scientist
Nicolò Violini, Senior Scientist

Marcel Serwe, Lead Engineer
Mario Koenen, Project Engineer
Teddy Kozielewski, Project Engineer

ESS: Mohamed Aouane (Jan. 2025)
Sylvain Desert (Oct. 2025)

25%

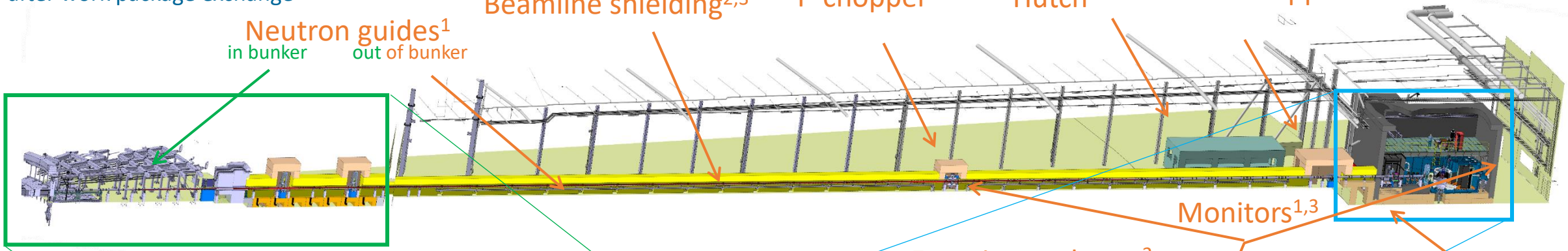
Andrea Orecchini,
CNR Work-package
scientific responsible

Enrico Zanieri, Project Engineer
Francesco Sacchetti, Senior advisor
Alessio Laloni, Engineer

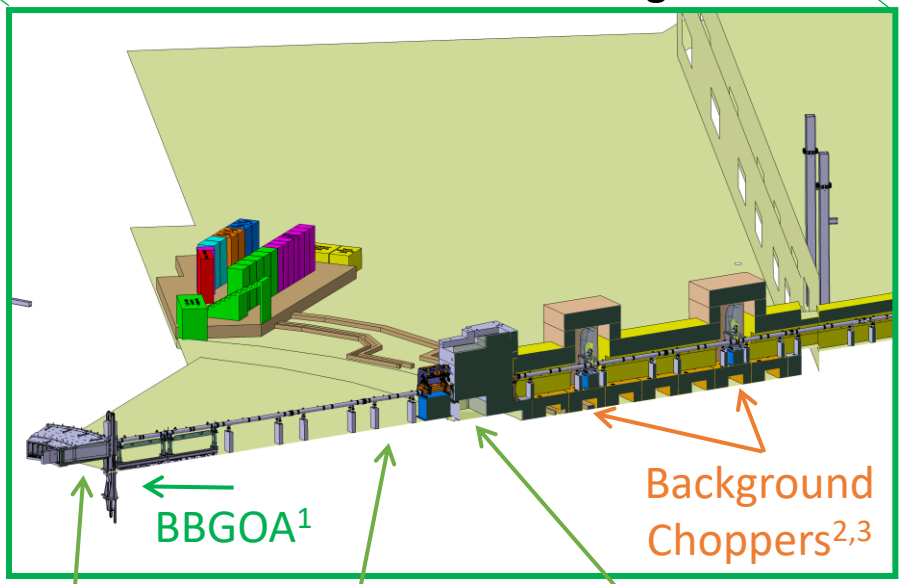
ICEB – 04 Nov 2025

T-REX layout*

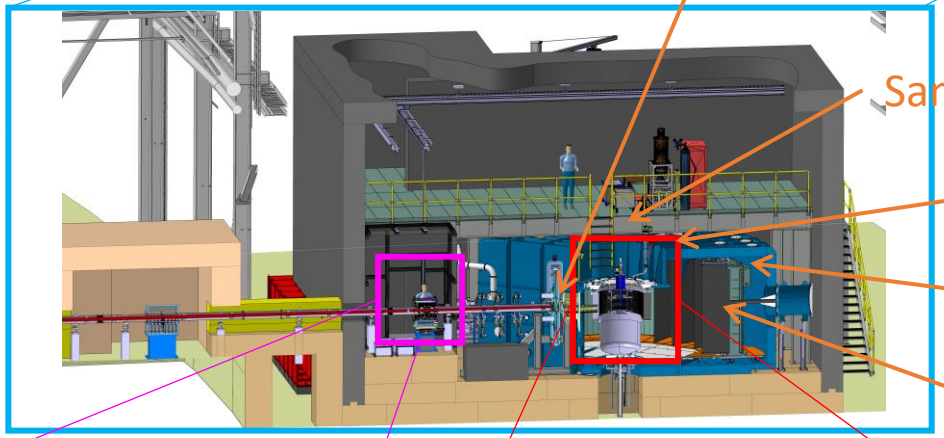
* after work package exchange

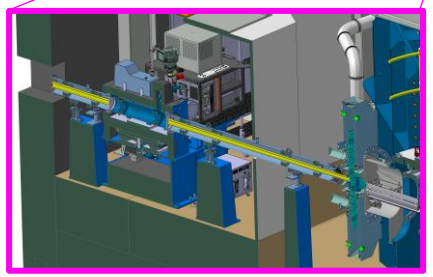


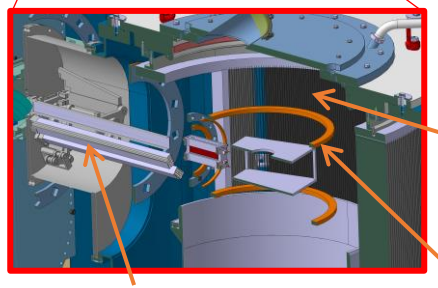
In-bunker + D03 building



Experimental cave[2]




Therm. & cold polariser[1]



Partner:

[1] FZJ

[2] CNR

[3] ESS

Status:

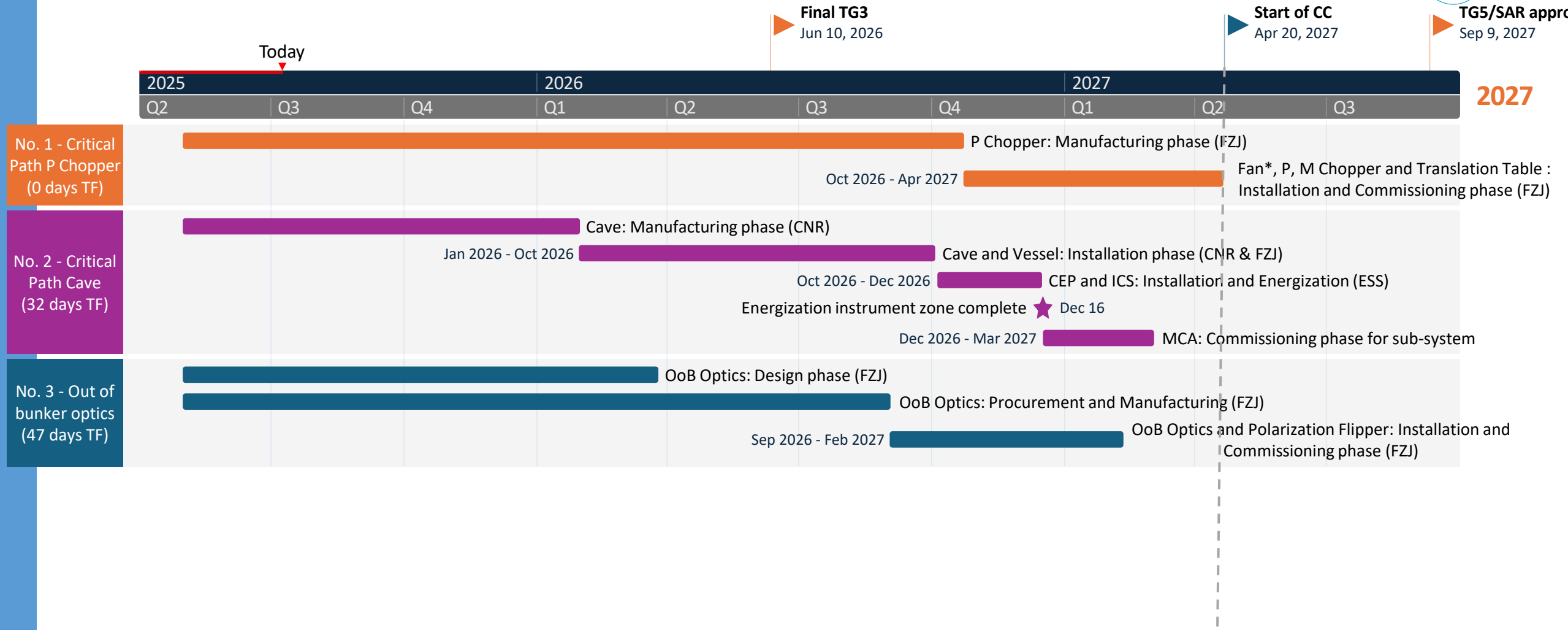
Finished

Ongoing

Not started

TREX Critical Paths

Data from P6 May 2025 Lockdown



Design phase ends at CDR approval
Procurement and Manufacturing phase ends at FAT closure of open points
Installation and Commissioning phase ends at SAT approval
TF: number days of **total float** to Instrument's TG5

* Manufacturing of Fan chopper has 2 months of float
Note: MG detector boxes 2-4 (including 18 modules) is part of the instrument scope but currently not linked to TG5 in P6

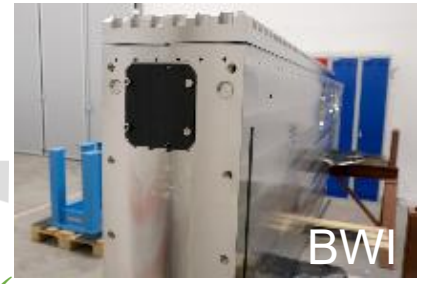
T-REX project overview and status

by work-packages

Neutron guide system & Heavy shutter

S-DH

nob nano optics berlin

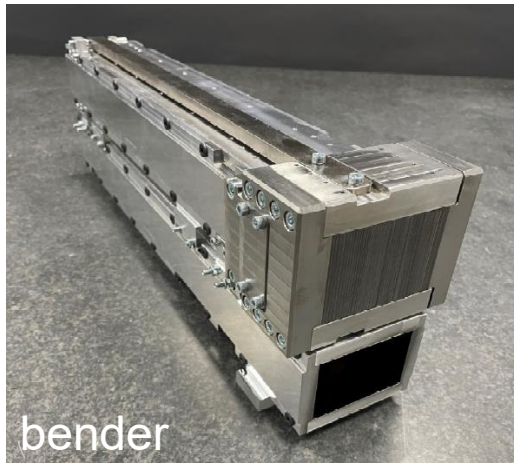


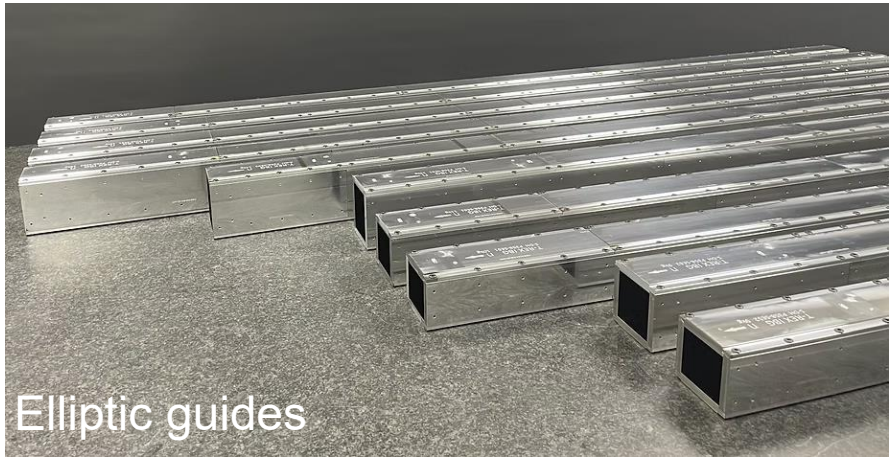
NBOA
- installed ✓

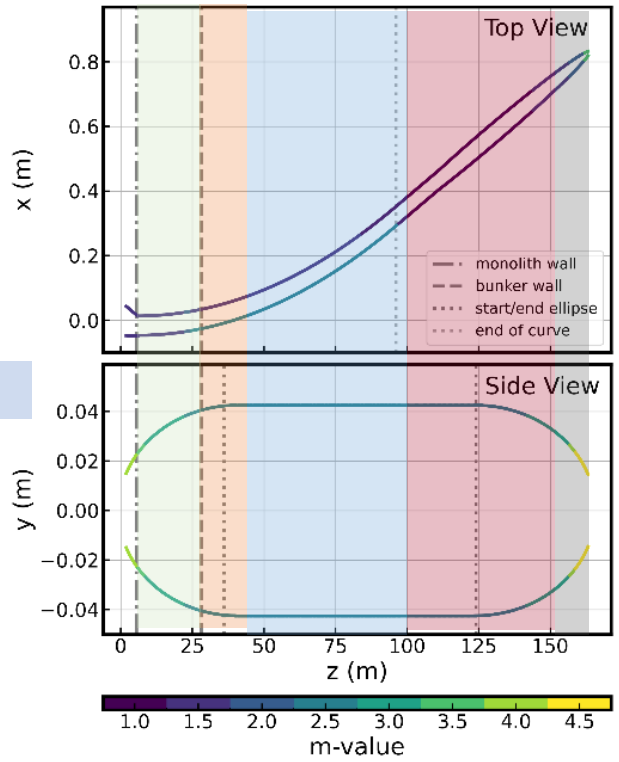
in-bunker & BWI
- Installed ✓

Heavy shutter:
- Installed

out of bunker guides & BBGOA
- Tranche 1A (40-80m) installed ✓
- Tranche 1B (80-96) in 2025
- Tranche 2 (28-40) in manufacturing
- Tranche 3 (96-151m) close to subTG3
- Tranche 4 in design

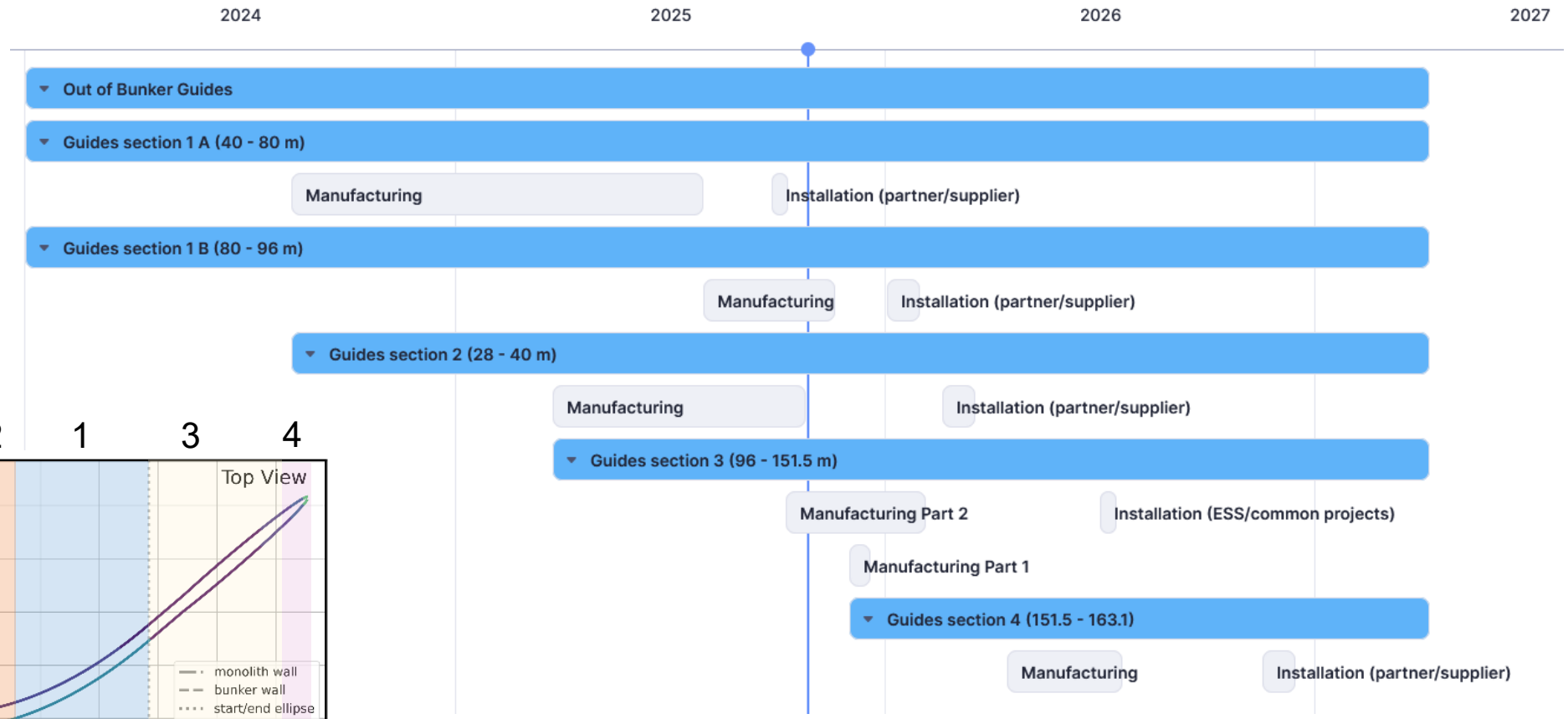


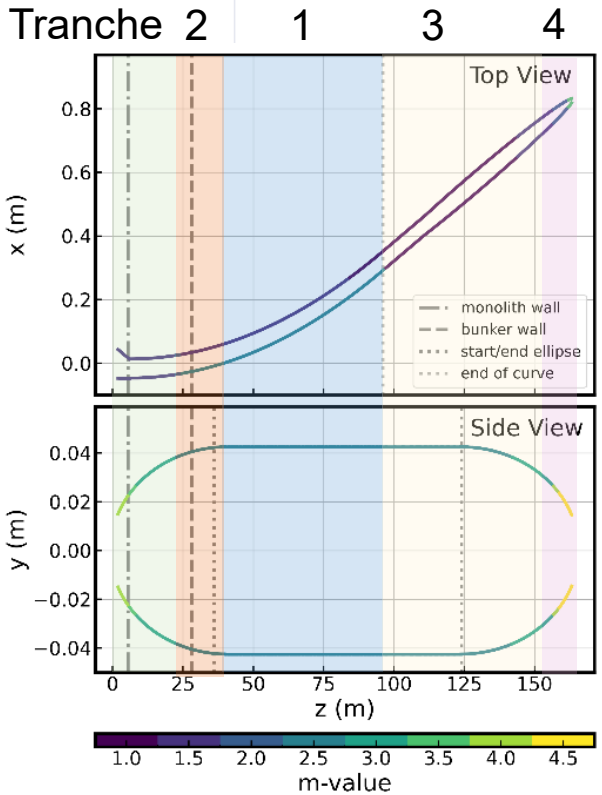




Consiglio Nazionale delle Ricerche

Neutron guide system – out of bunker

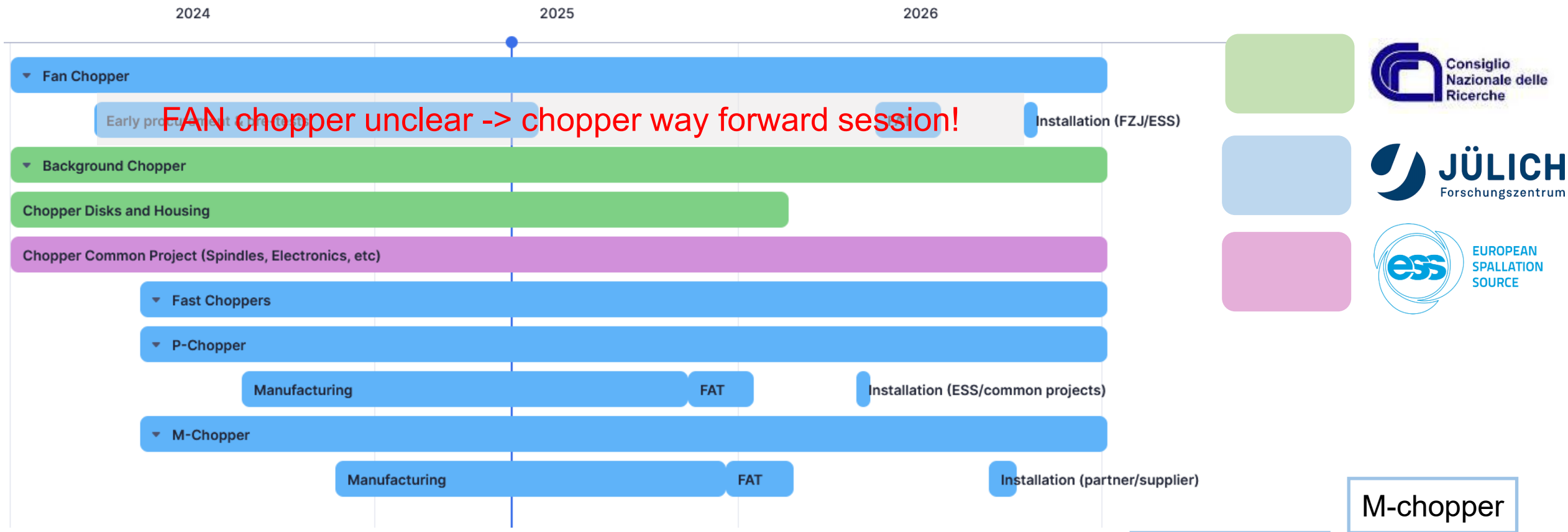




out of bunker guides

- Tranche 1A installed, 1B still in 2025
- Tranche 2 in manufacturing
  Tranche 3 currently in design phase (almost finished)
- Tranche 4 most complex (M-Chopper, primary collimator, polarisation…)

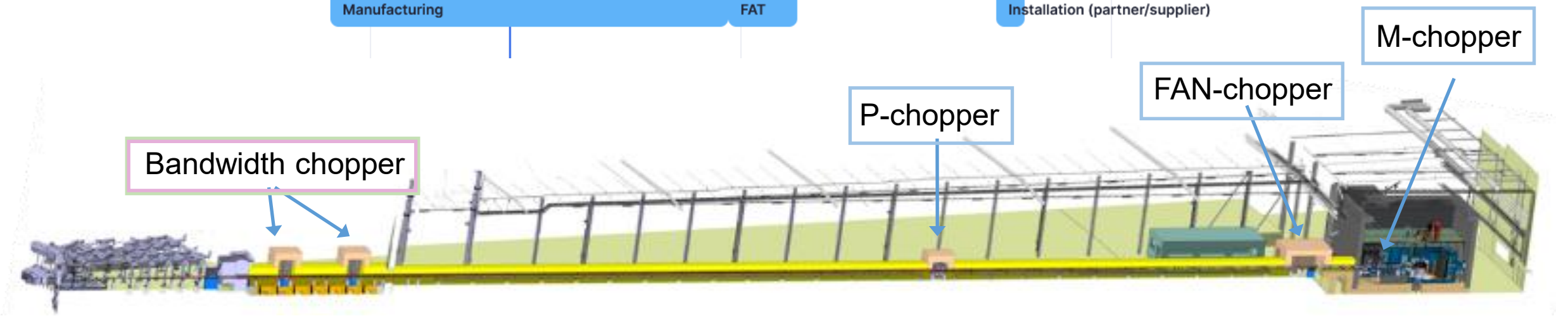
Neutron choppers - Overview



Consiglio Nazionale delle Ricerche

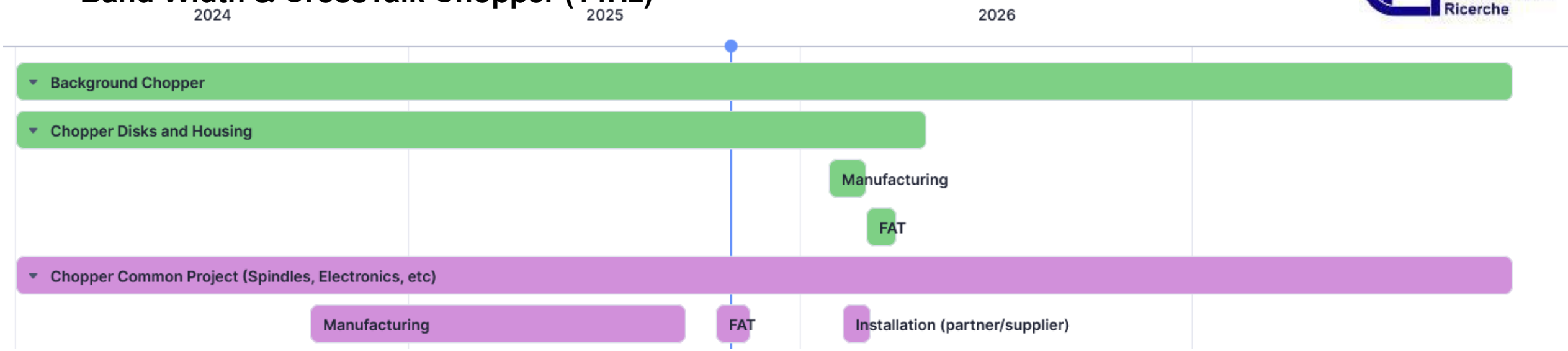
JÜLICH Forschungszentrum

EUROPEAN SPALLATION SOURCE



Slow Neutron choppers

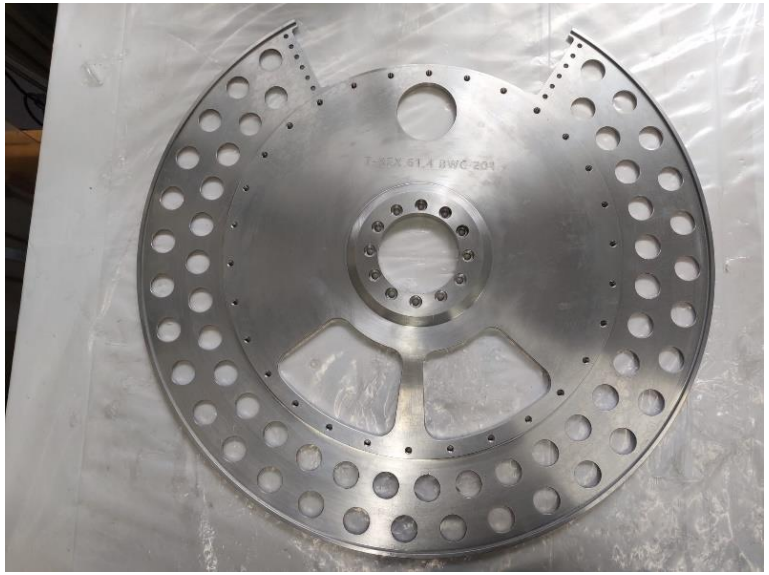
Band Width & CrossTalk Chopper (14Hz)



- subTG3 meeting 14.11
- Discs manufactured early
- Coating by ESS chopper group
- Installation (of support) drives
  Tranche 3 guides installation!

- **Joined the common project – all documents are signed**
  Hybrid solution with hardware from CNR

Bandwidth Copper 1



Bandwidth Copper 2

Fast neutron choppers

P-Chopper (252Hz)

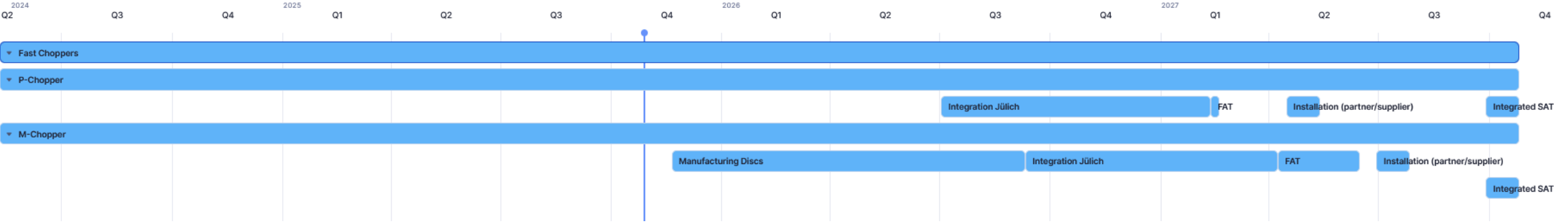
P-01

P-02

M-Chopper (336Hz)

M-01

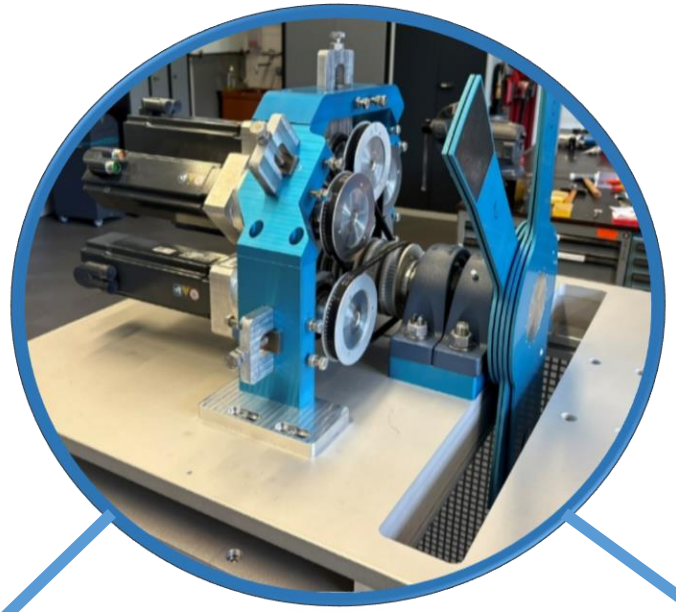
M-02



- Both P-chopper discs were destroyed during first ramp-up in the test stand at high speeds (P-02 higher than operational speed)
- M-02 passed the cycling test (5 cycles at 10% overspeed) and was destroyed during ramp-up at high speeds for long run → possible aging effect?

FAN chopper options

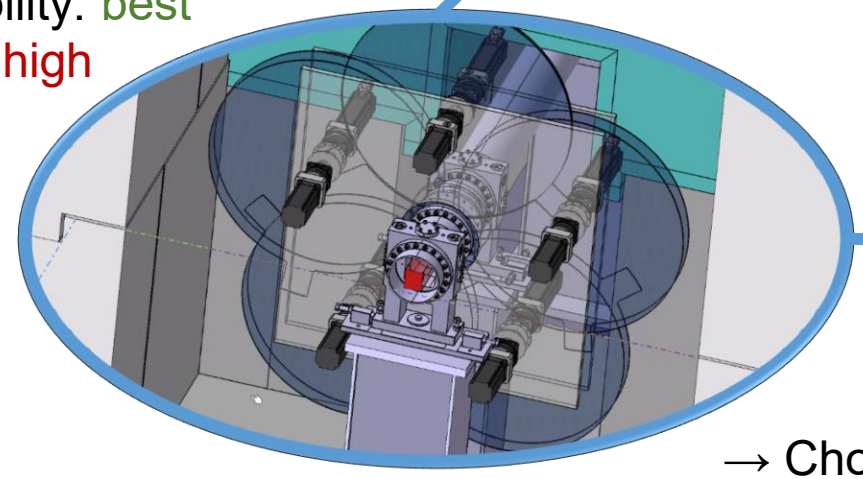
Stacked spindles



Difficulty: high
Flexibility: best
Cost: low

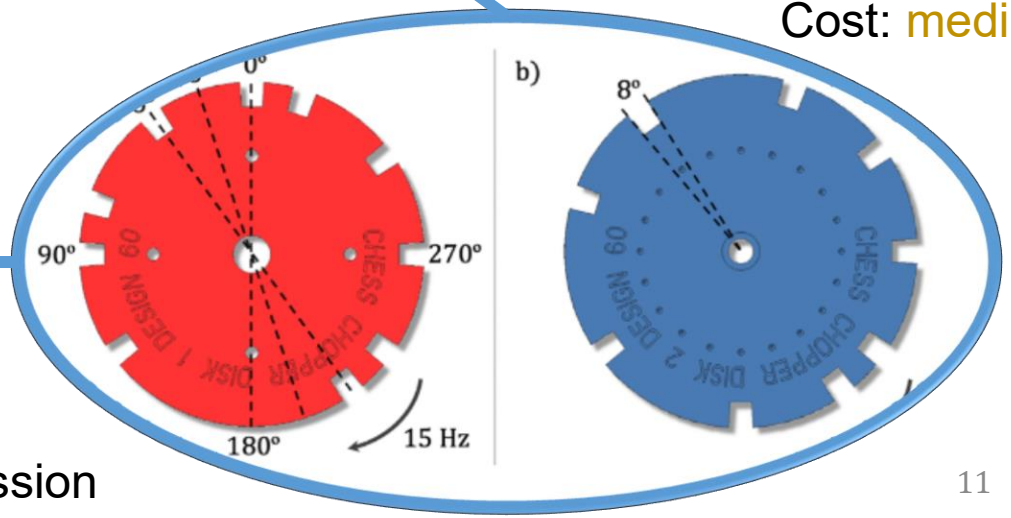
Pentagram

Difficulty: medium
Flexibility: best
Cost: high



Hand chopper

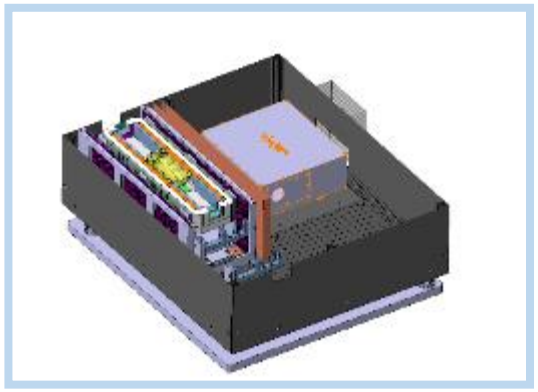
Difficulty: low
Flexibility: medium
Cost: medium



→ Chopper way forward session

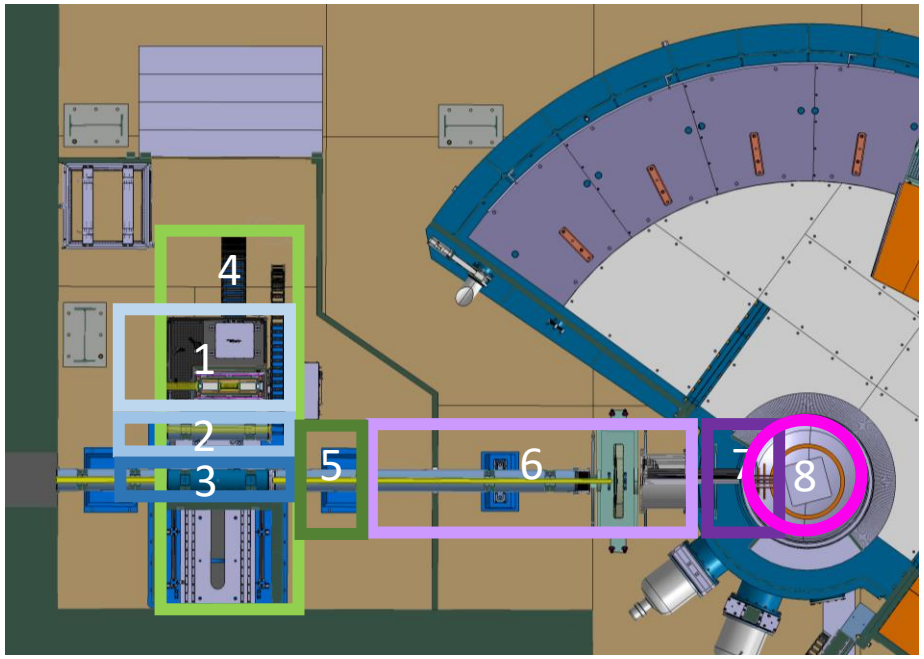
Polarization equipment

1. Thermal polarizer

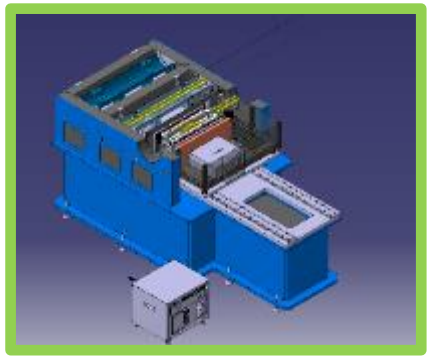


2. Cold polarizer

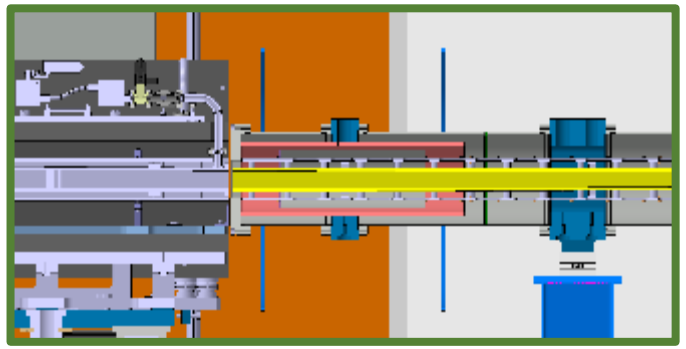
3. Neutron guide



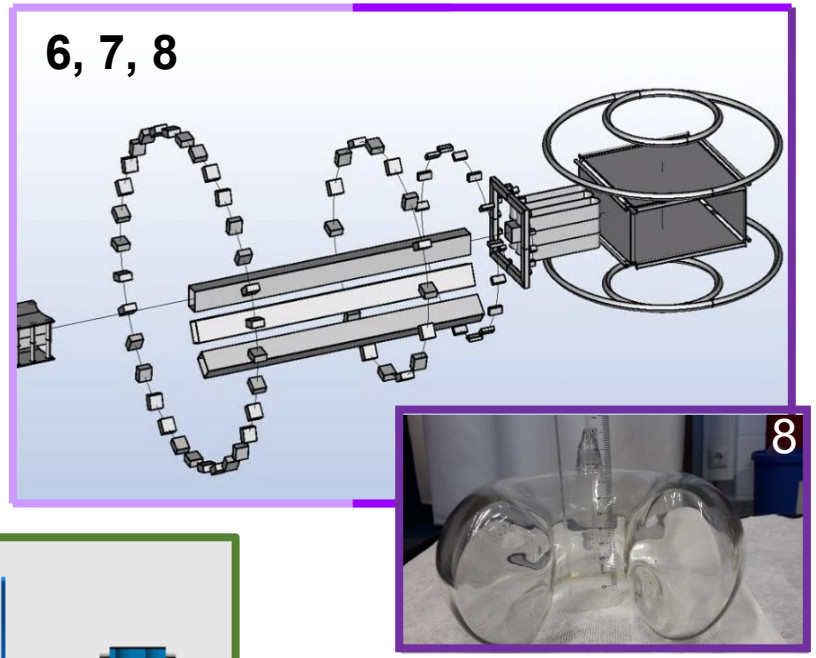
4 Guide exchange unit



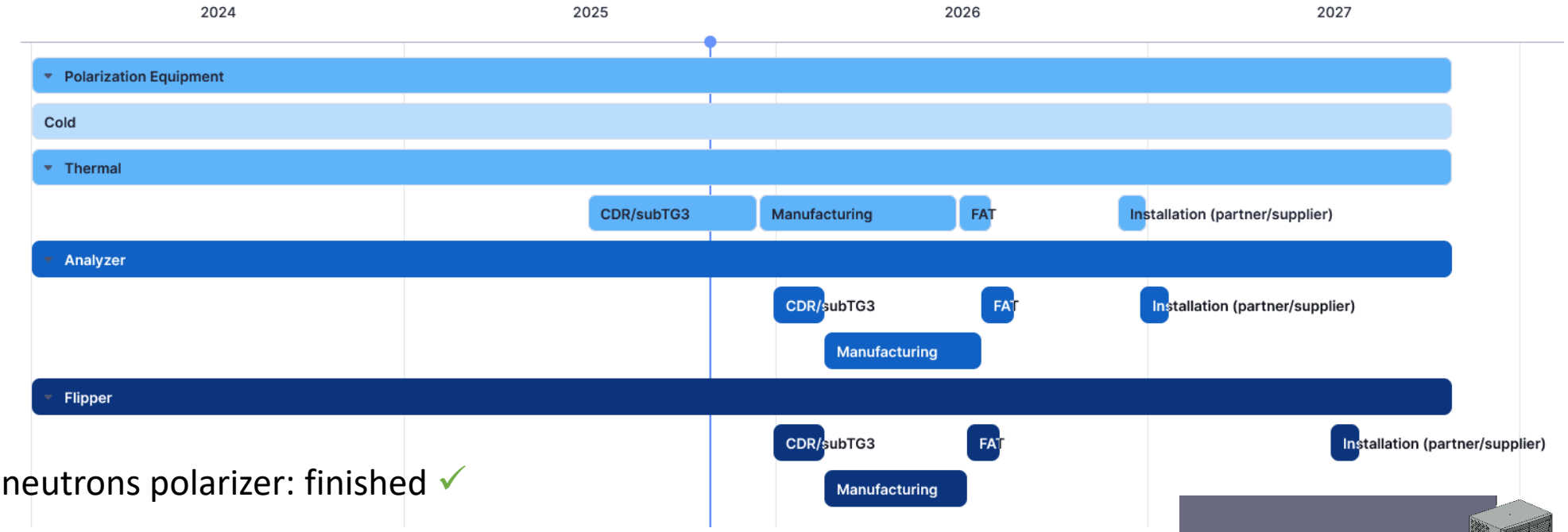
5. Spin Flipper



6. Guide field (spin holding)
7. Adiabatic field (spin rotation)
8. PASTIS setup



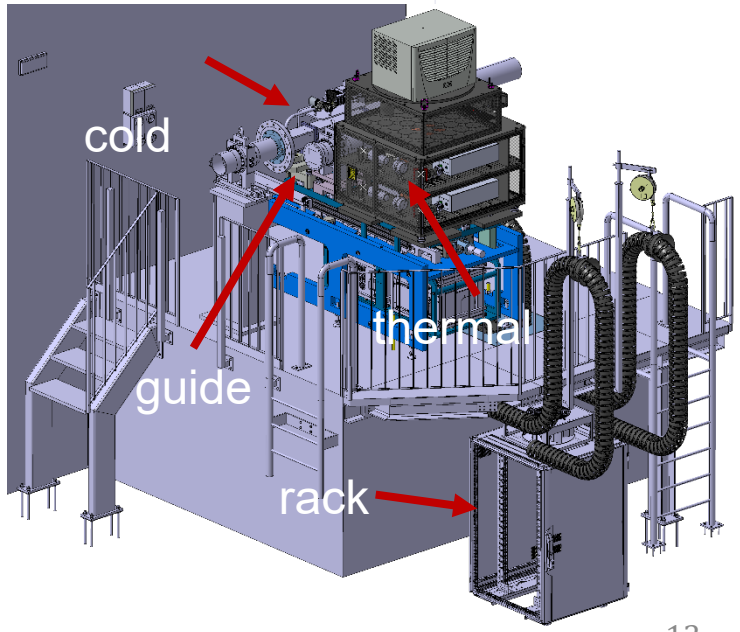
Polarization equipment



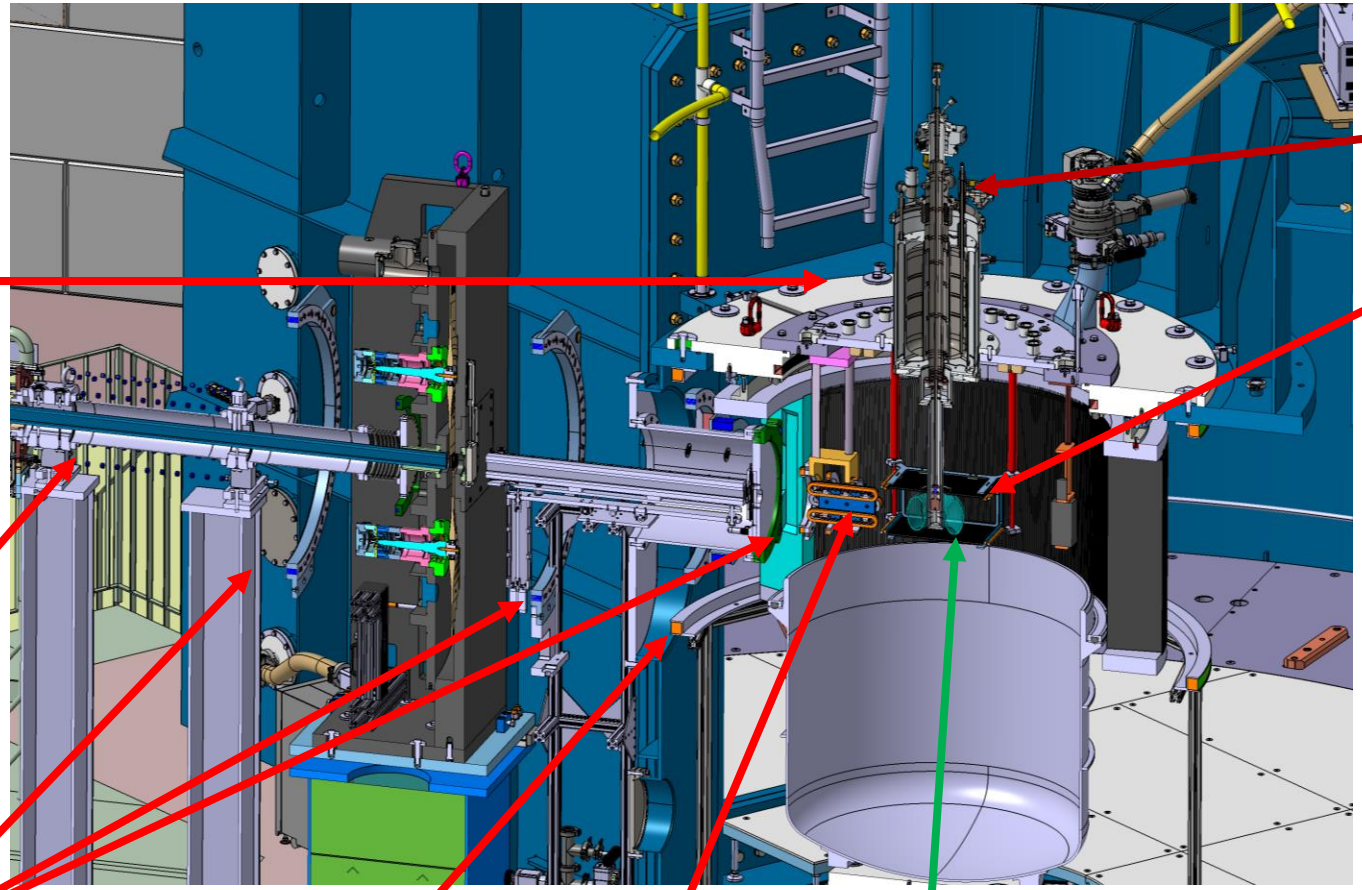
- Cold neutrons polarizer: finished ✓

Subsystem status:

- Thermal neutrons polarizer: subTG3 14.11 ✓
- Thermal polarizer racks: ongoing ✓
- Laser system: early procurement done ✓
- Guide field design: update to Halbach rings ✓
- Spin flipper: in design phase o
- Race-track coils: ready ✓
- PASTIS design finished ✓
- PASTIS racks ongoing o
- Electronics: CE certification needed ✗



Polarization analysis (and dedicated SE)



cryofurnace

L1 flange

Magic pastis
Horizontal field

Guide
field

Hal Lee (ESS): in-situ re-filling of the ^{3}He cell

Halbach rings
(guide field and rotation)

Helmholtz coils
vertical field

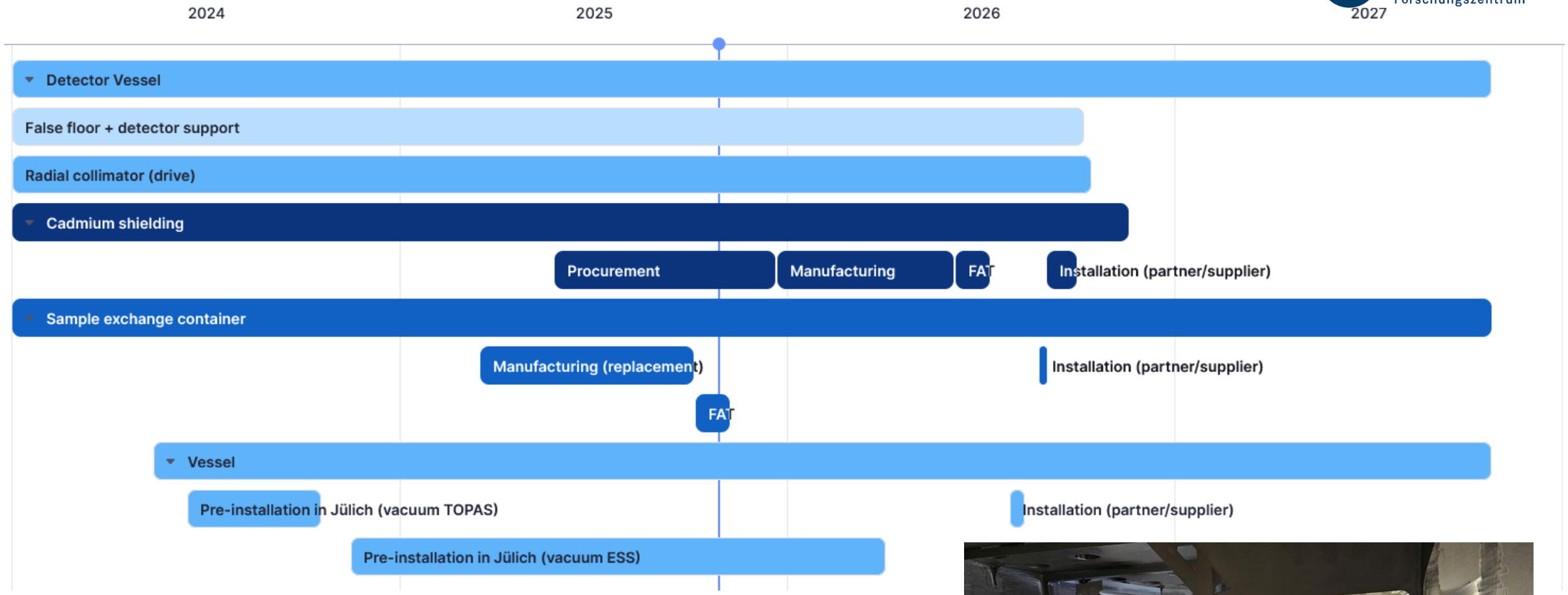
Racetrack coils
(spin rotation)

^{3}He cell

Re-design to make Z^+ method possible

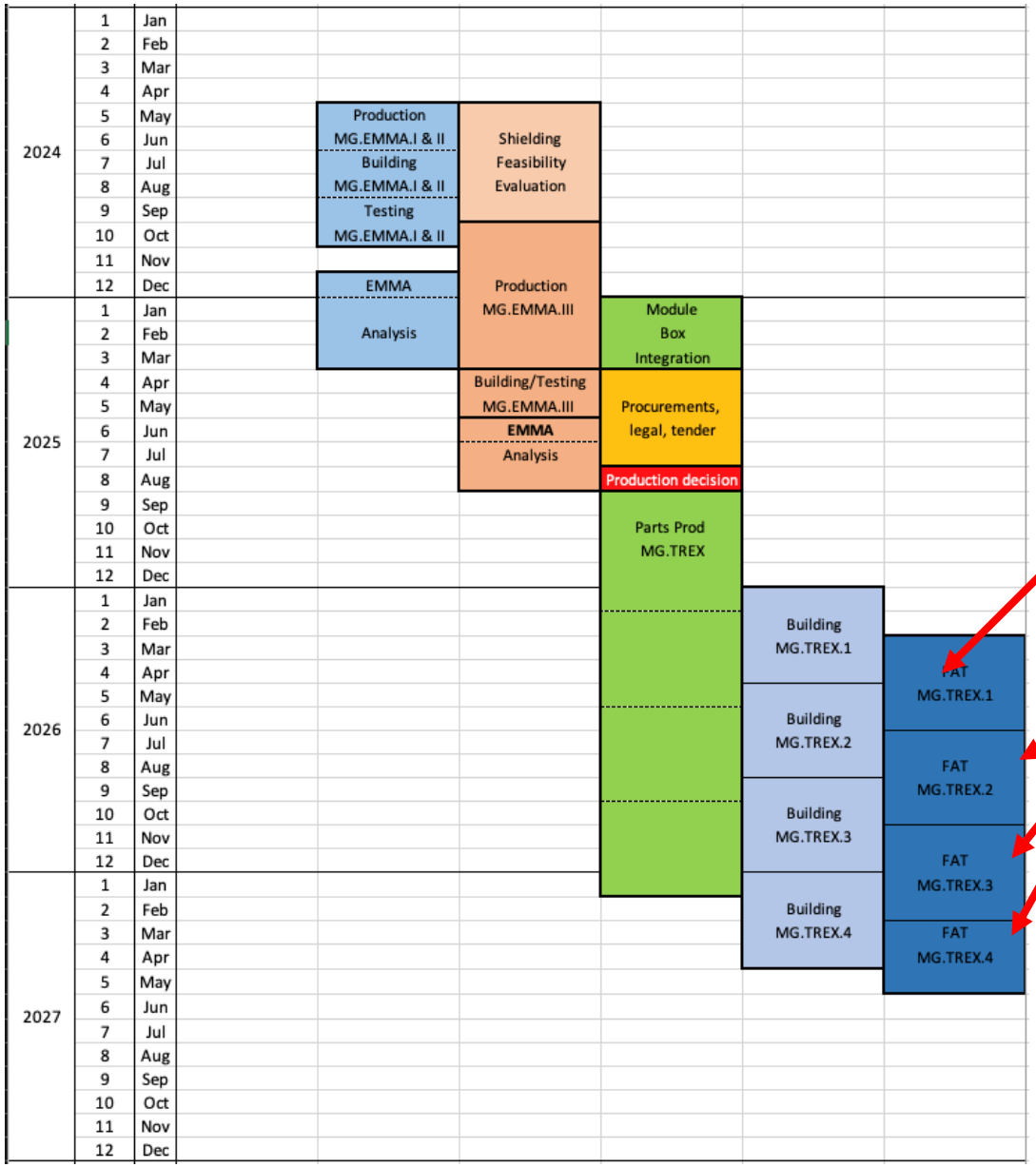
- **FZJ provides** Spin Rotation (Racetrack coils), Magic Pastis and Sample flange with neccessary feedthroughs
- **ESS** Polarisation Group **provides** ^{3}He cell and cryostat with bespoke tail

Detector Vessel



- **Pre-installation in Jülich in full swing**
- ESS vacuum system in use
- Sample exchange container replacement finished
- Tender for Cd shielding failed
- ROC drive integrated

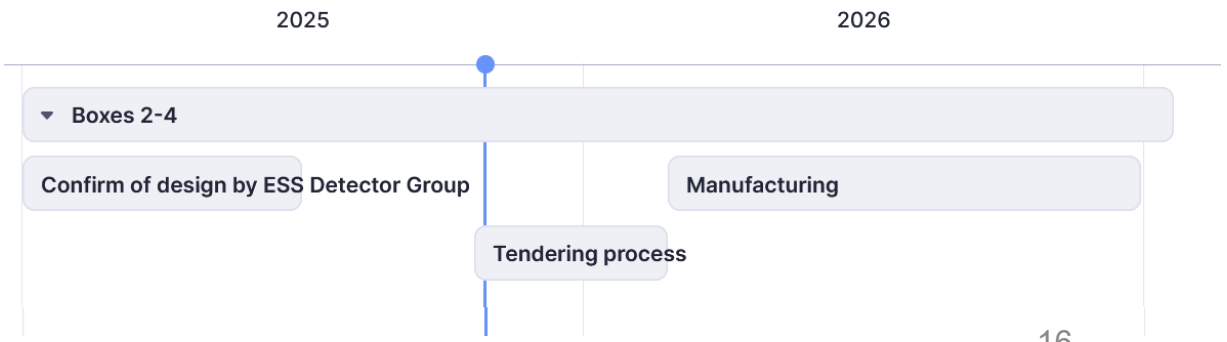
Neutron Detector (Multi GRID)



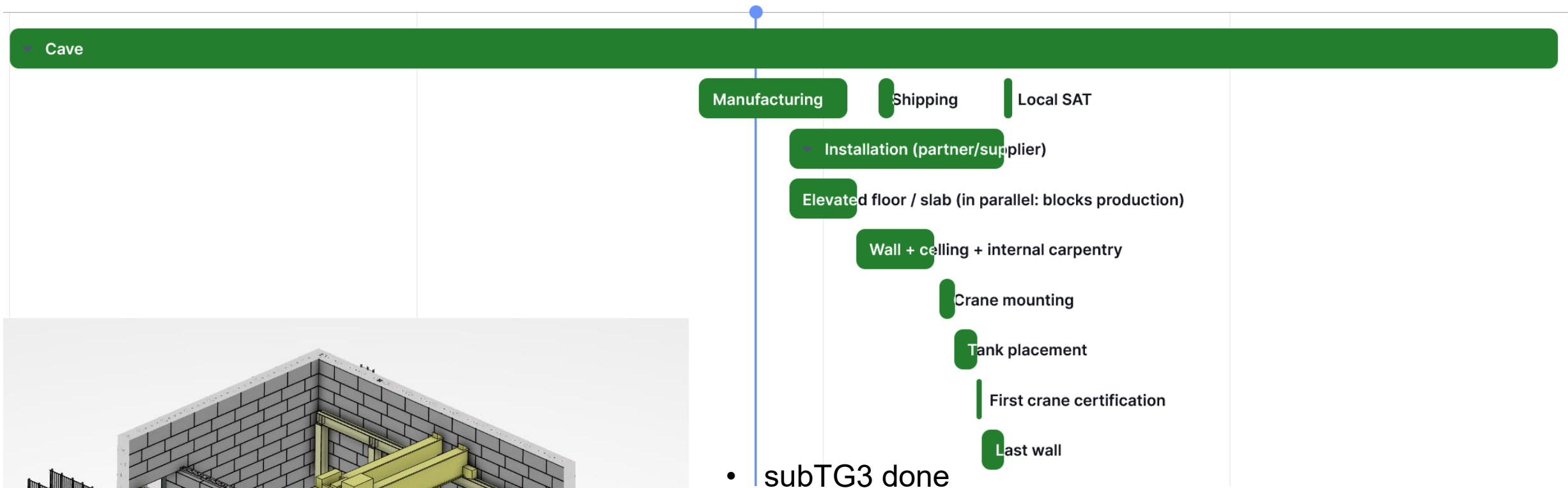
Detector boxes

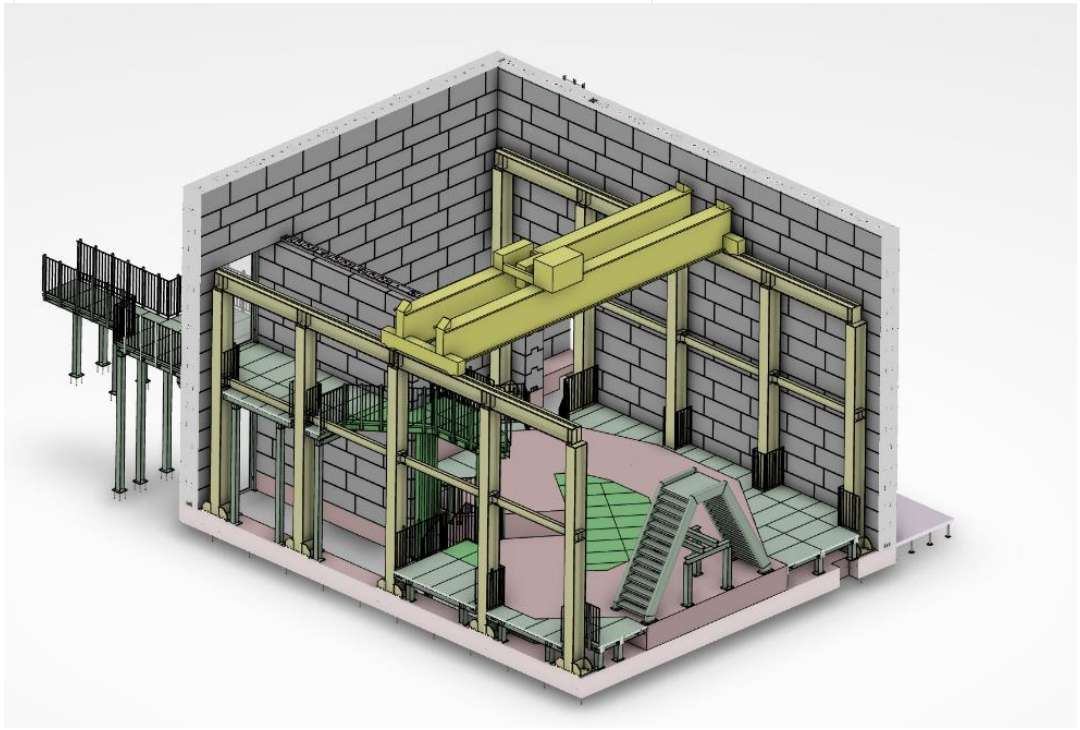
Box 2-4

- Updated design by ESS detector group
- Preparing the tender in Jülich
- Visit to potential suppliers



Experimental cave

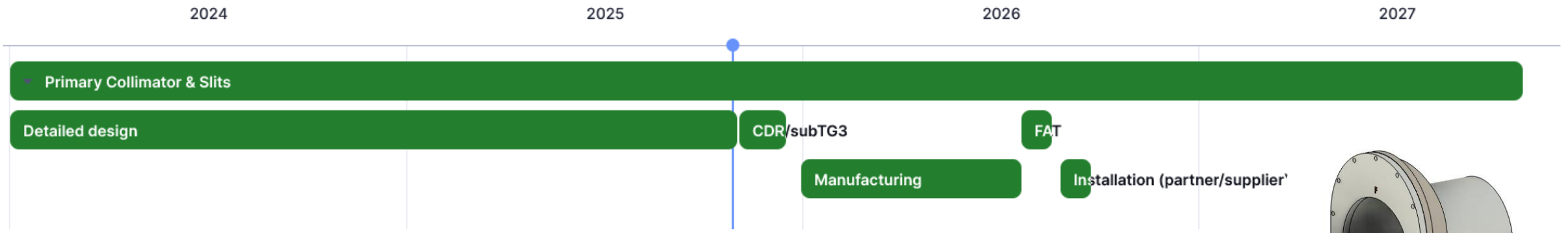




- subTG3 done
- Contract awarded
- Installation via subcontractor with ESS experience
- Close alignment with neighbouring instruments (coordinated by Susanna)

Important: Slab must be ready before detector vessel arrives!

Primary collimator and slits



Re-design of component:

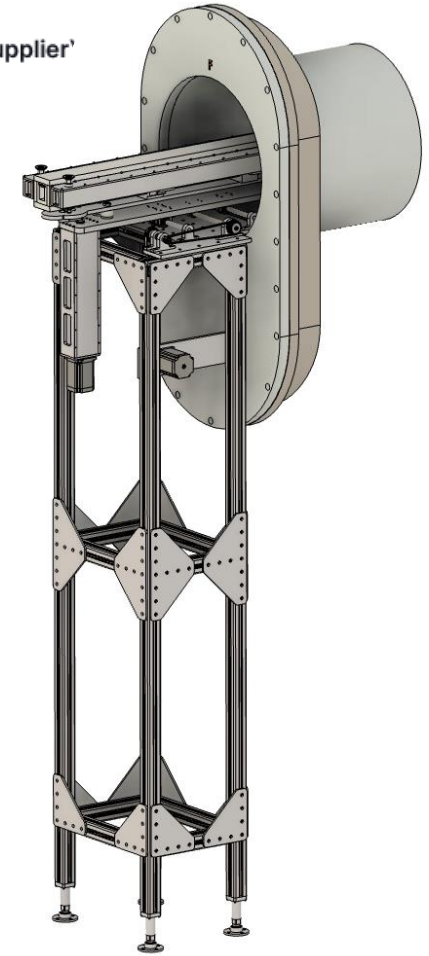
- Goal is to simplify
- Take neutron guides out of vessel vacuum
- Self-evacuated guides
- All motors in air
- Slit system in air
- Beam monitor: ‚old' design by CDT

Technically challenging component!

Gather/check requirements:

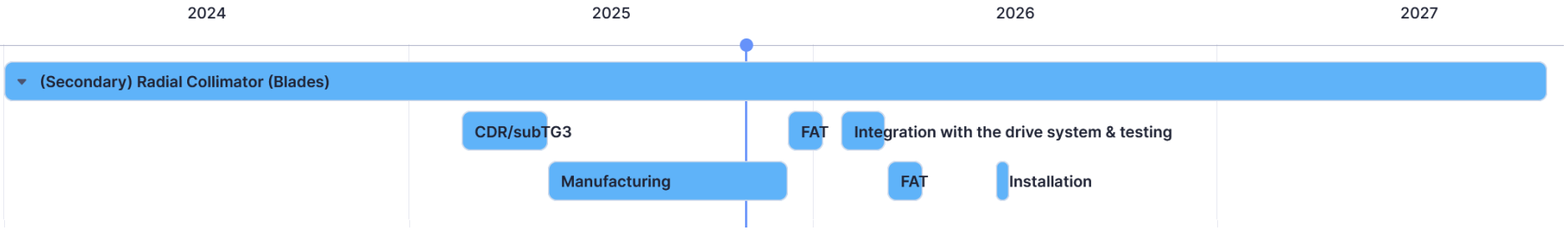
- guide field interface (internal) ✓
- motion control ESS + FZJ for EPICS integration ✓
- metrology group ESS + S-DH alignment strategy ✓
- Sample monitor ✗

subTG3: 14.11



Radial oscillating collimator

The actual collimator (very similar to CSPEC):



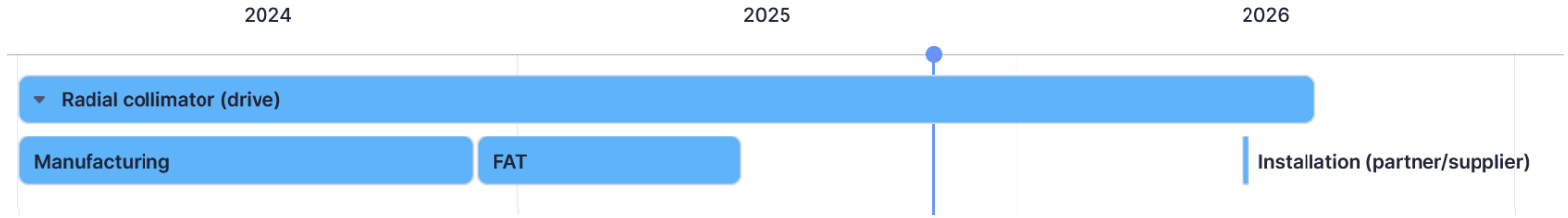


Figure 2. 3D image of the proposed T-REX Radial Collimator.

- subTG3 succesful, component in manufacturing
- Drive: integrated into detector vessel

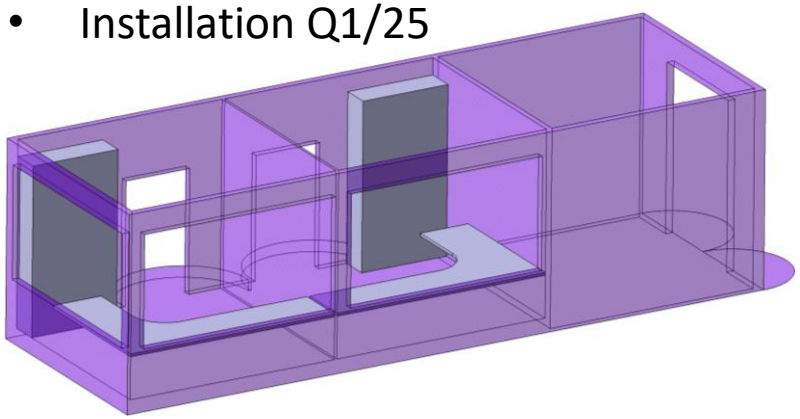
Everything else

Beamline shielding

- CNR joined the common project
- In manufacturing

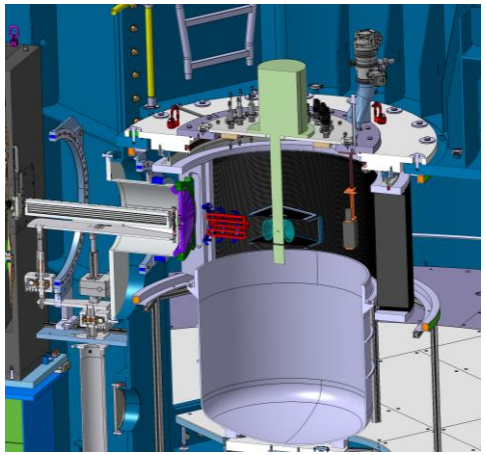
Experimental hutch

- subTG3 done
- Installation Q1/25



Sample Environment

- Assigned to company
- Compatible with ^{3}He analyser

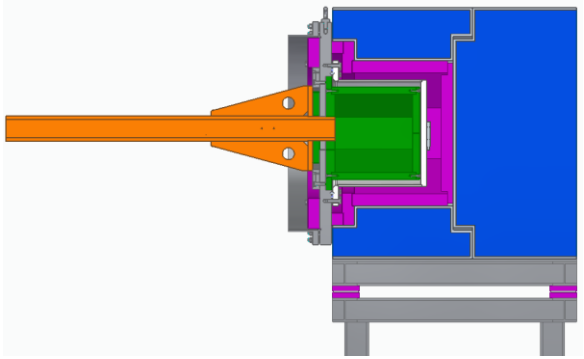


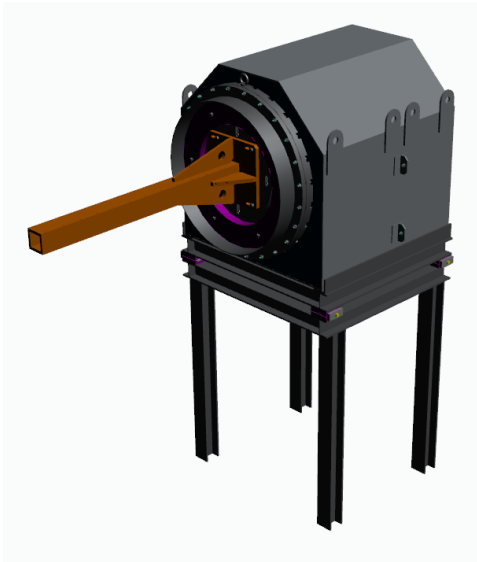
Monitors

- 3 monitors in the scope: after P-chopper, after M-chopper, transmission monitor (after sample)
- Hybrid solution: We purchase the monitors, common project does the integration
- Meanwhile: Discussion with CDT for P-Chopper and sample monitor design

Beamstop

- Preliminary design done
- Final design by ESS design team





Top 5 project risks

Top 5 Risks				
Title	**Rating**	**Category**	**Partner**	**Treatment**
Mulit-Grid Detector not ready for hot commisioning	15	Schedule	ESS Project	Avoid
Detector performance requirements may not be met	15	Quality	ESS Project	Avoid
Final TG3 delayed	15	Schedule	FZJ	Observe
Guide suppliers working at capacity	15	Schedule	FZJ	Observe
FAN chopper does not meet specifications	12	Quality	FZJ	Avoid

Top 5 Issues						
Title	**Rating**	**Category**	**Partner**	**Cost**	**Delay**	**Quality**
M-chopper disc failure	25	Quality	FZJ	25-100k€	4-6 months	The science case of the instrument/system is jeopardized
P-chopper disc failure	25	Quality	FZJ	25-100k€	4-6 months	The science case of the instrument/system is jeopardized

Summary

Take-home message:

- Busy rest of the year!
- Started guides installation ✓
- Detector enters production
- Issues: Chopper discs
  FAN chopper ⚠
- Other risks:
  Cave (Timeline)
  Monitors