Science & Technology Facilities Council

UK Research and Innovation

AGATA - Phase 4 (2π & 4π)

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STFC Daresbury Laboratory

Legnaro, September 2019

Topics:

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- New honeycomb support & rotating mechanics

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- Honeycomb mounting proposal

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- Initial FEA studies

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- Future installation locations

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- Proposed detector installation/removal system

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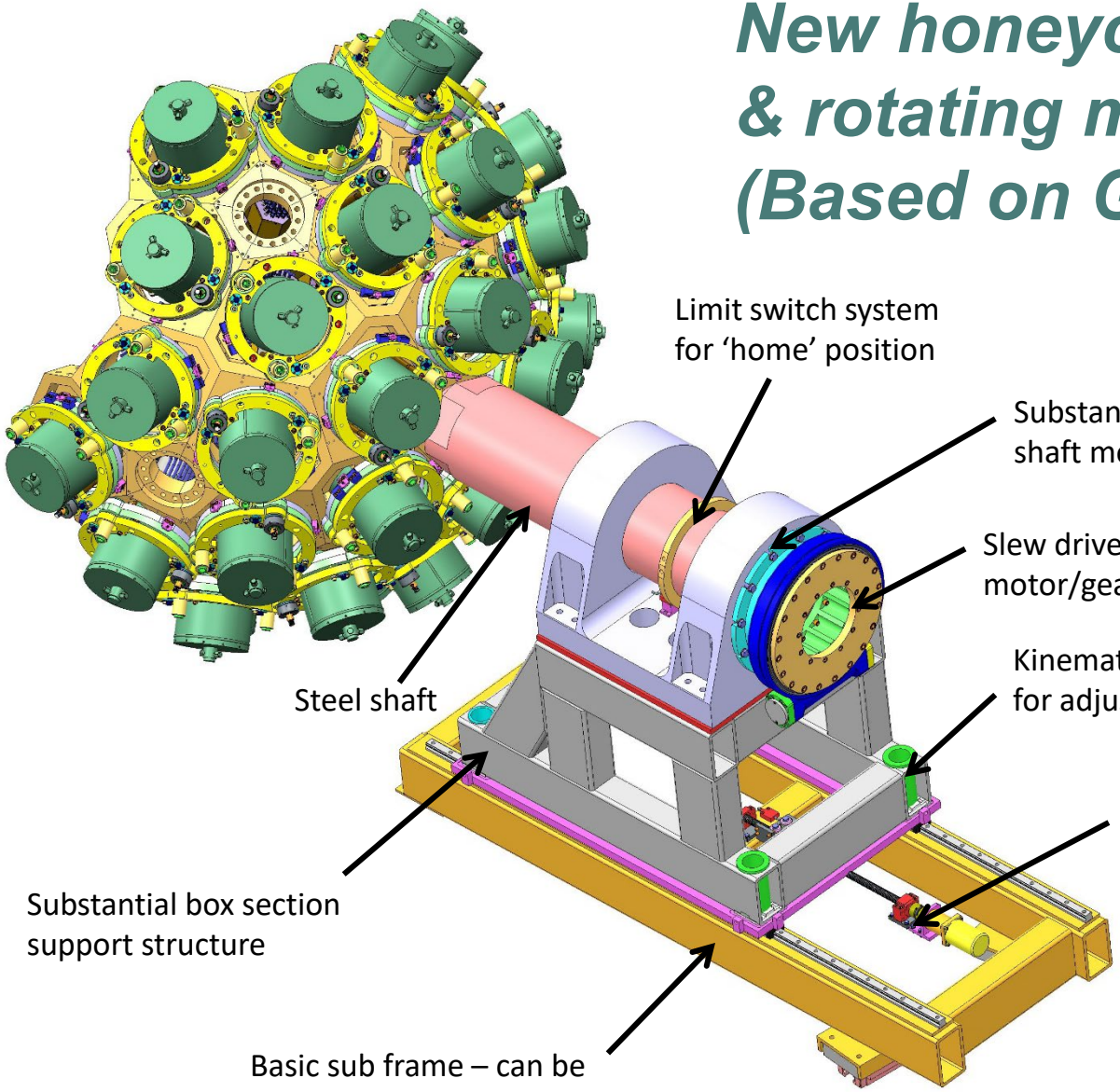
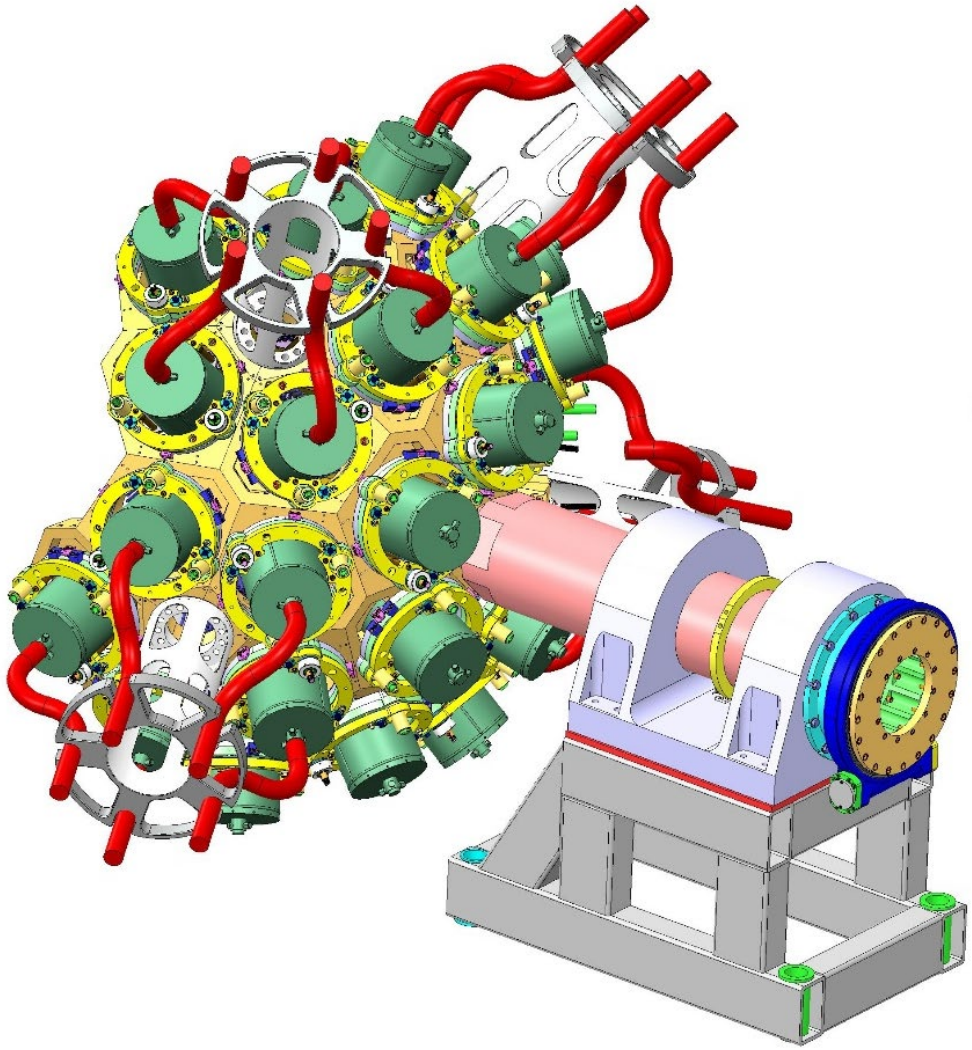
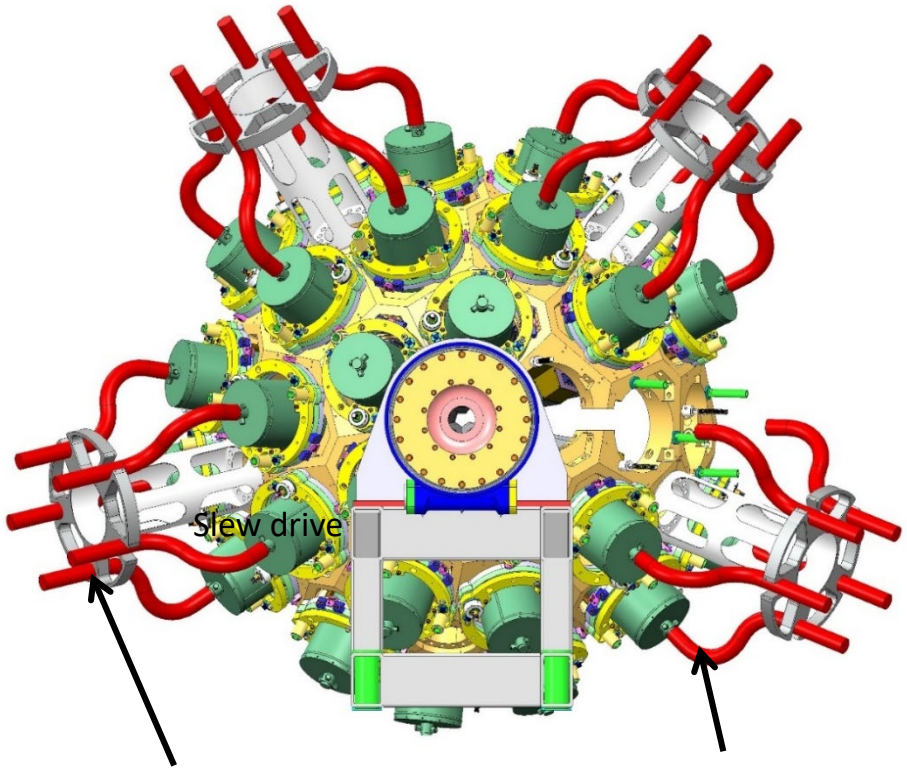
- New honeycomb support & rotating mechanics
- Honeycomb mounting proposal
- Initial FEA studies
- Future installation locations
- Proposed detector installation/removal system
- Issues to be resolved

New honeycomb support & rotating mechanics (Based on GRETA system)



Proposed LN2 & cable support & guidance

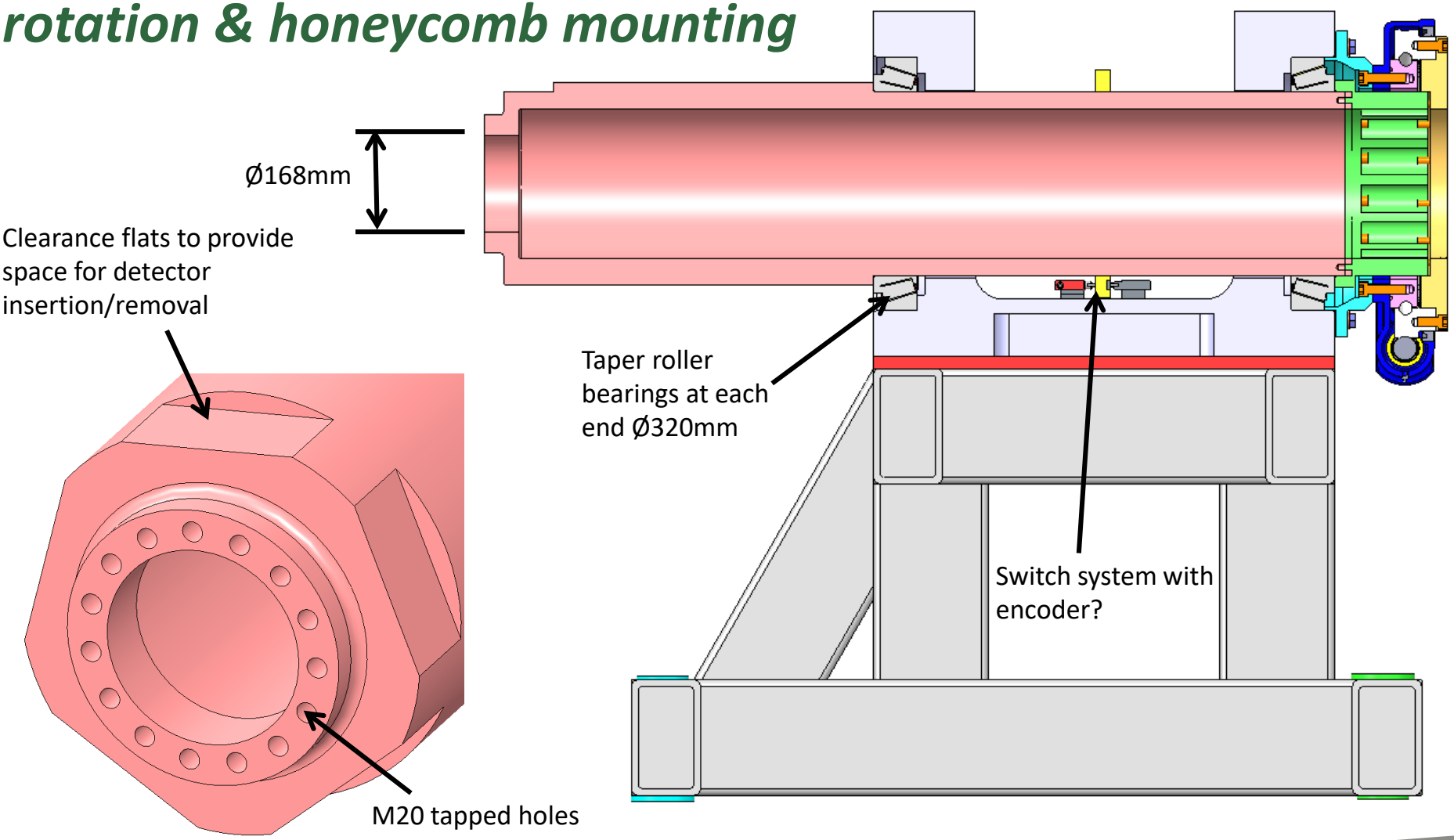




Fabricated aluminium holding/guidance tubes

LN2 hoses shown

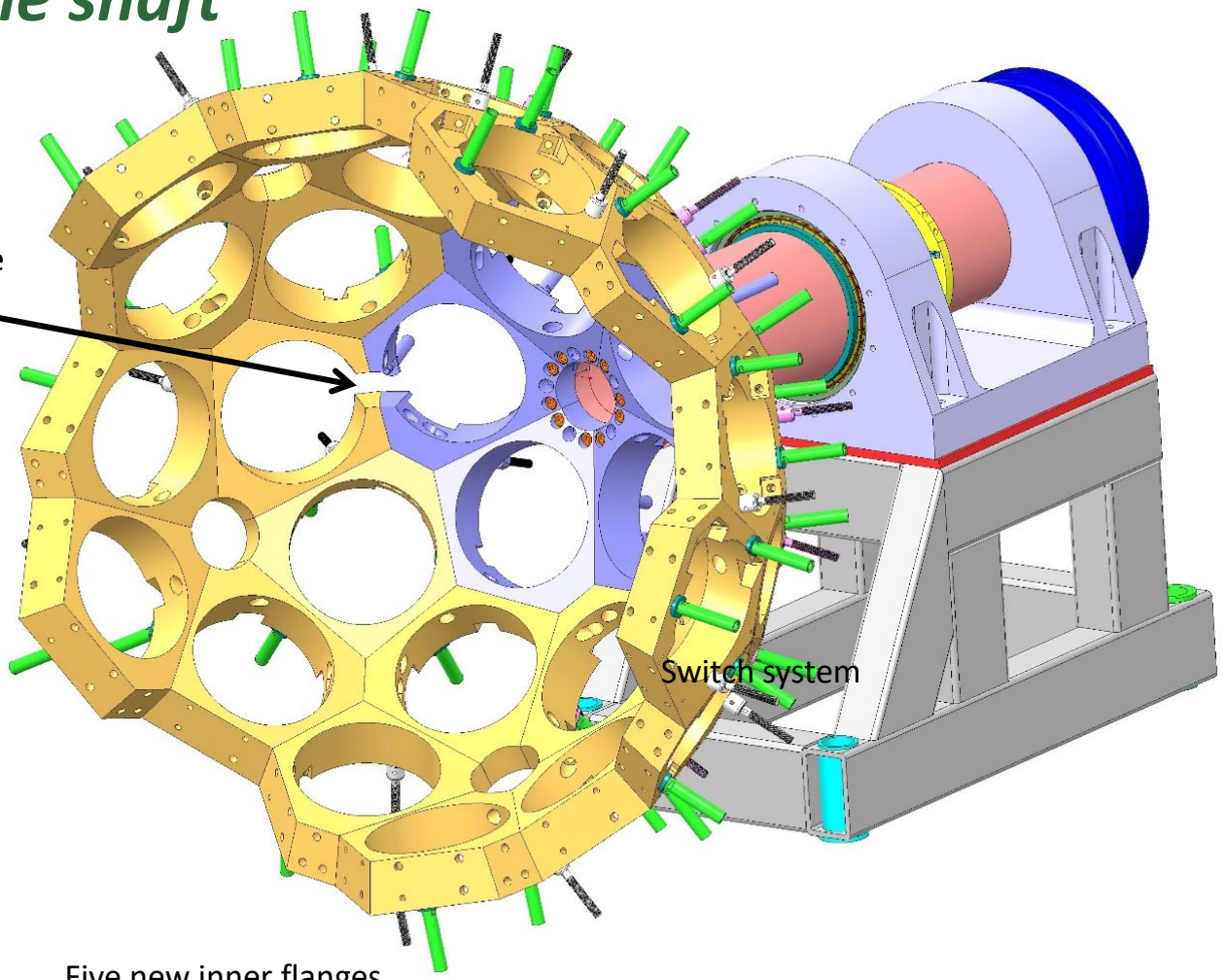
Proposed bearing mechanics for rotation & honeycomb mounting

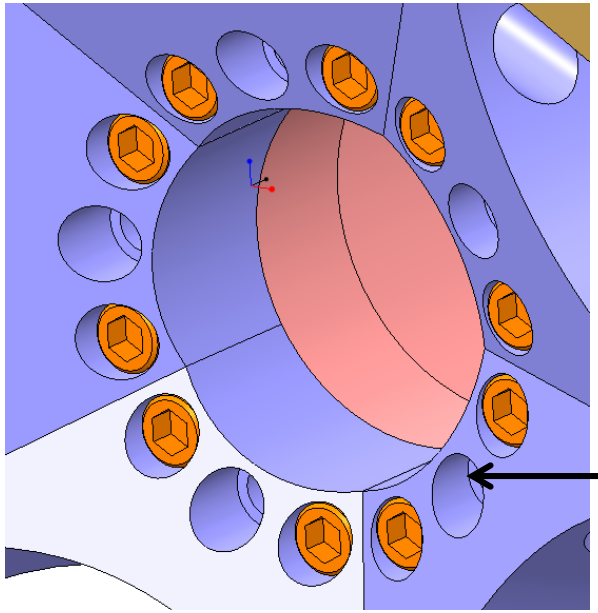


End profile for honeycomb attachment

Proposed mechanics for mounting the honeycomb to the shaft

Two extra flanges to be manufactured with cut-out. One flange with normal tapped holes and one with counter-bored holes – Legnaro only

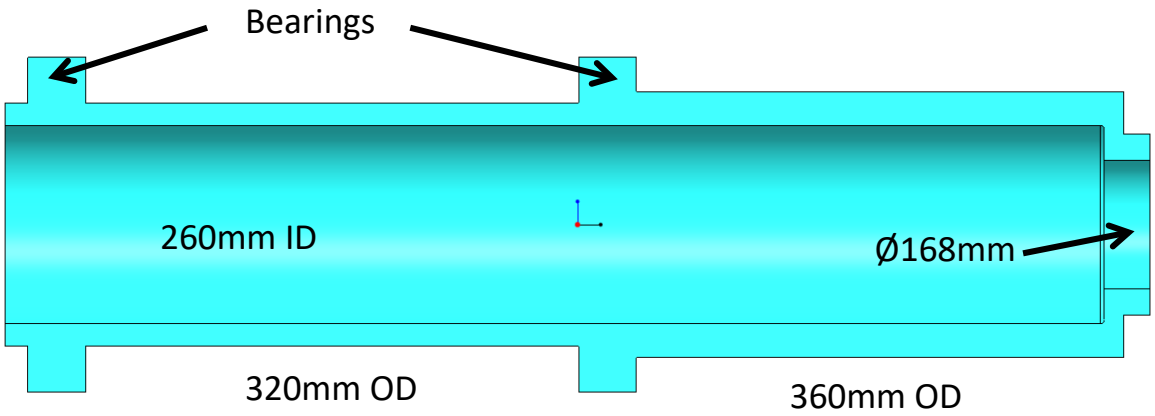


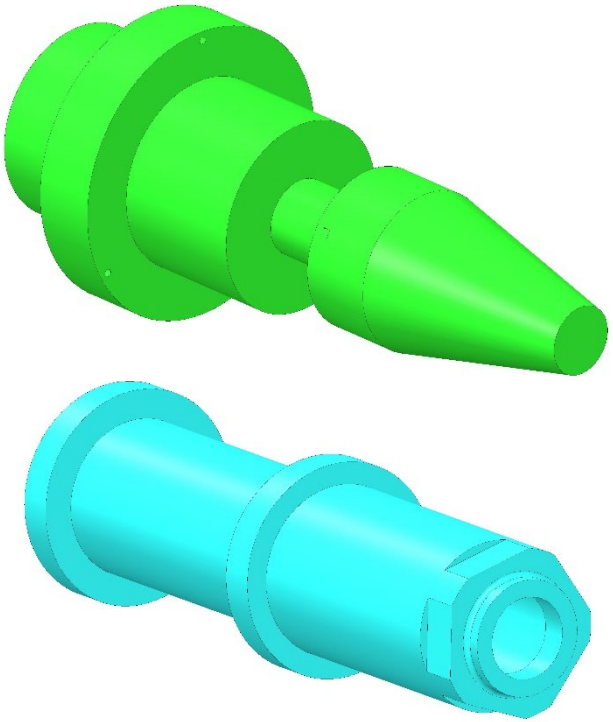


Five new inner flanges with counter-bores to accommodate screws from inside

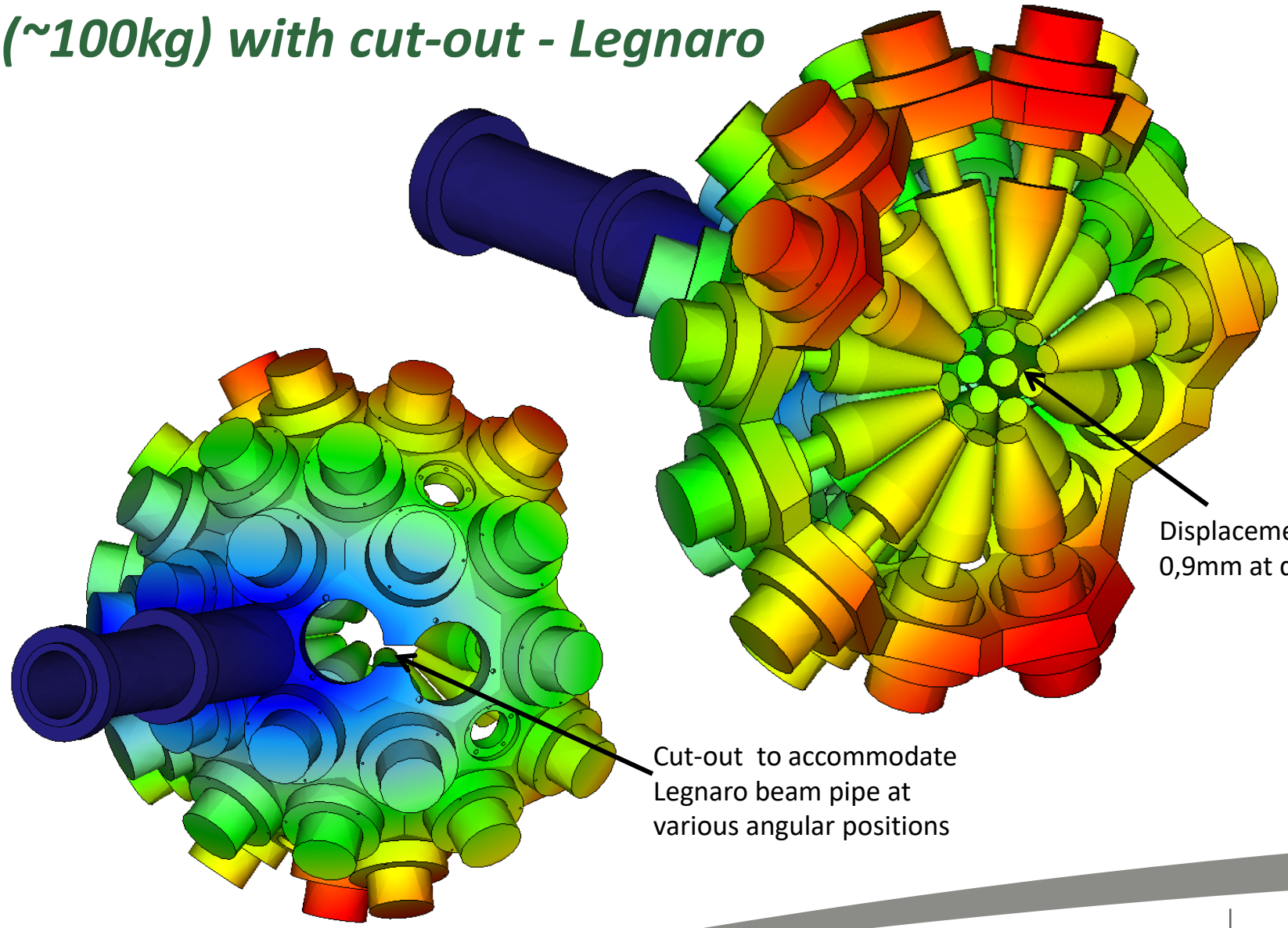
FEA parameters for proposed shaft design & approximate detector model

- Assumed detector weight is 100kg with C of G near adjuster flange
- Detector model shape approximated and mass & C of G adjusted to suit
- Honeycomb segment weighs 20kg, hence honeycomb with 30 segments weighs 600kg. Steel parts ~200kg
- Total weight of honeycomb and detectors taken as ~3800kg
- Cables and LN_2 pipes have been ignored
- Ground is considered to be at the shaft bearings

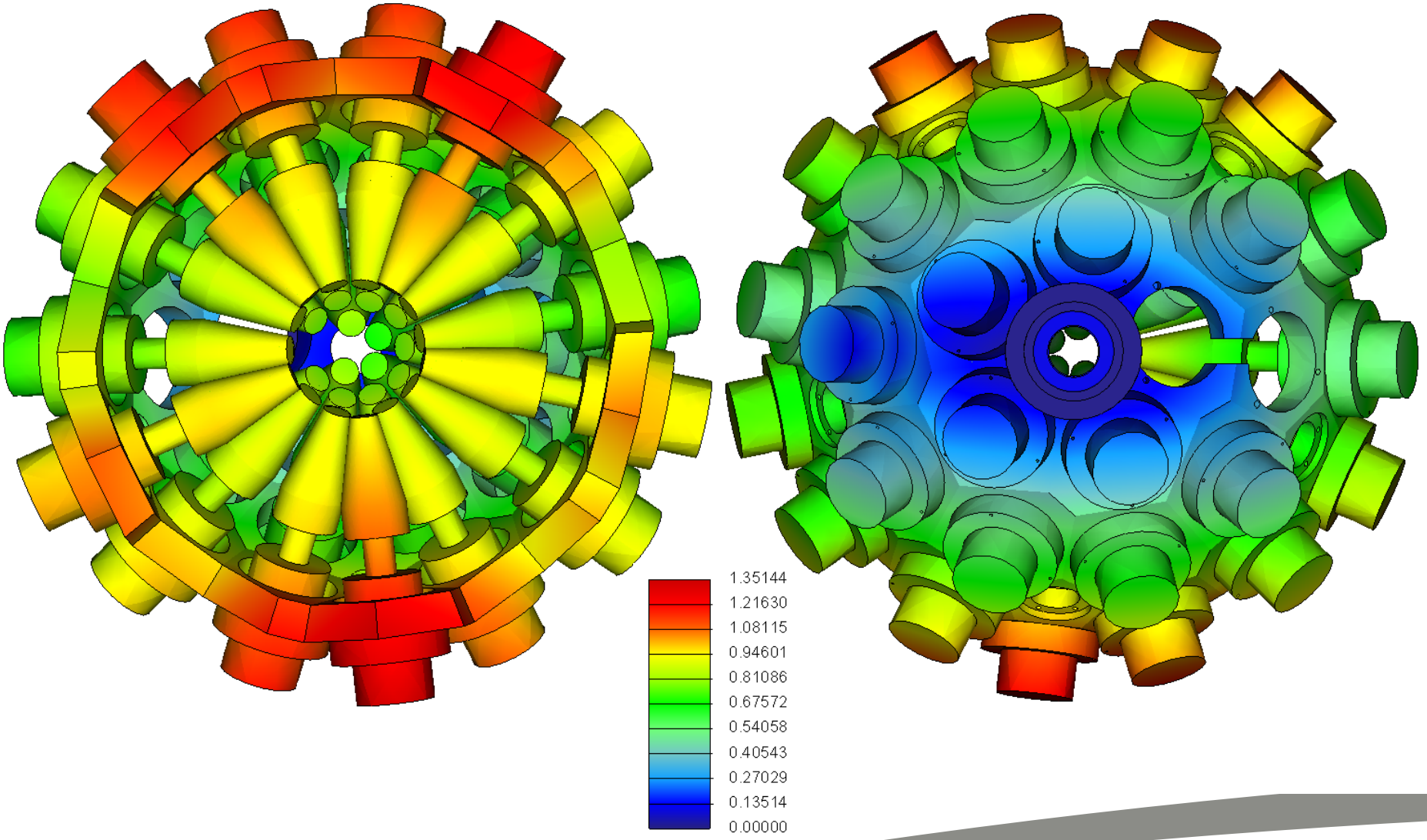




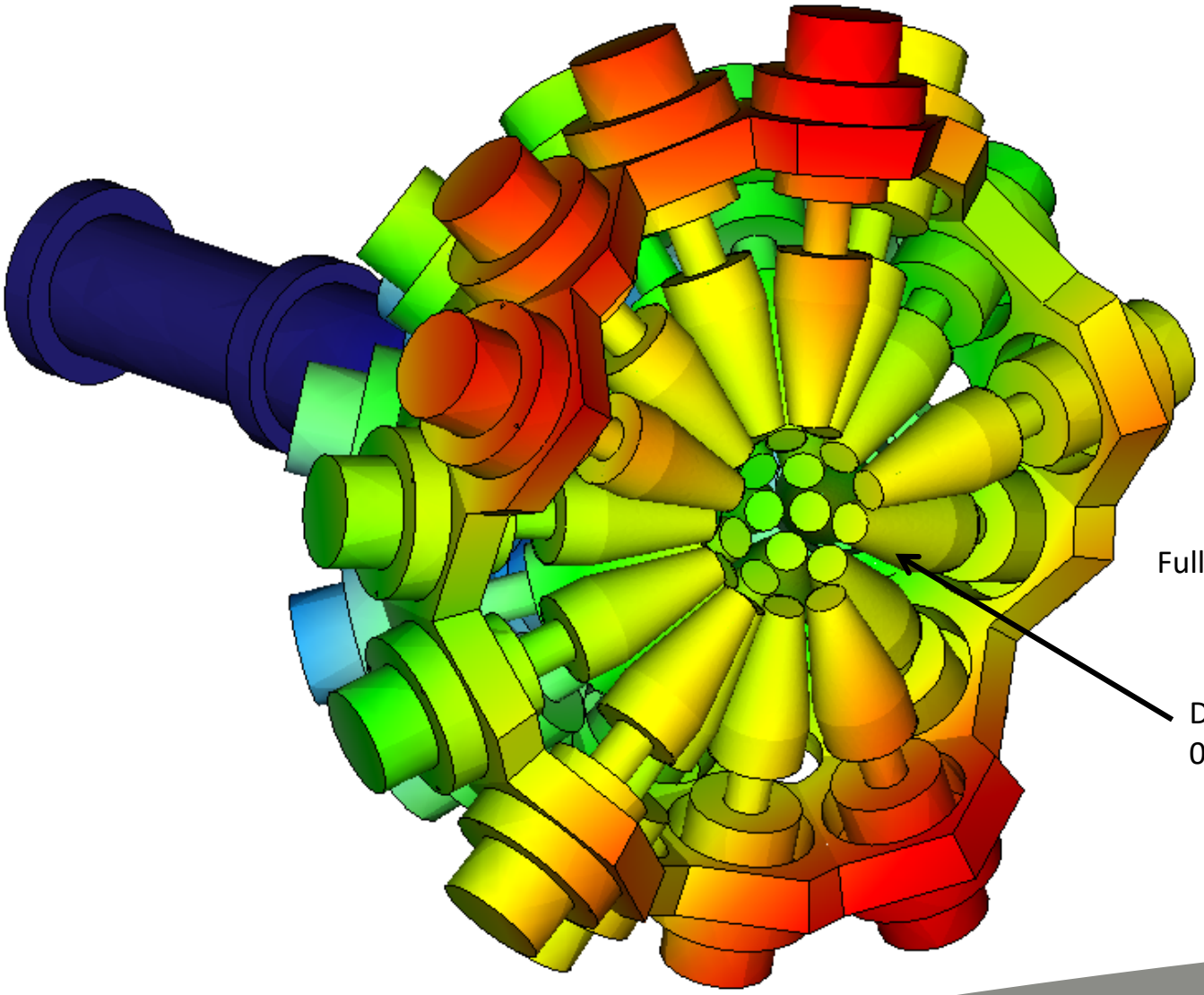
Deflection (mm) for 28 ATC detectors (~100kg) with cut-out - Legnaro



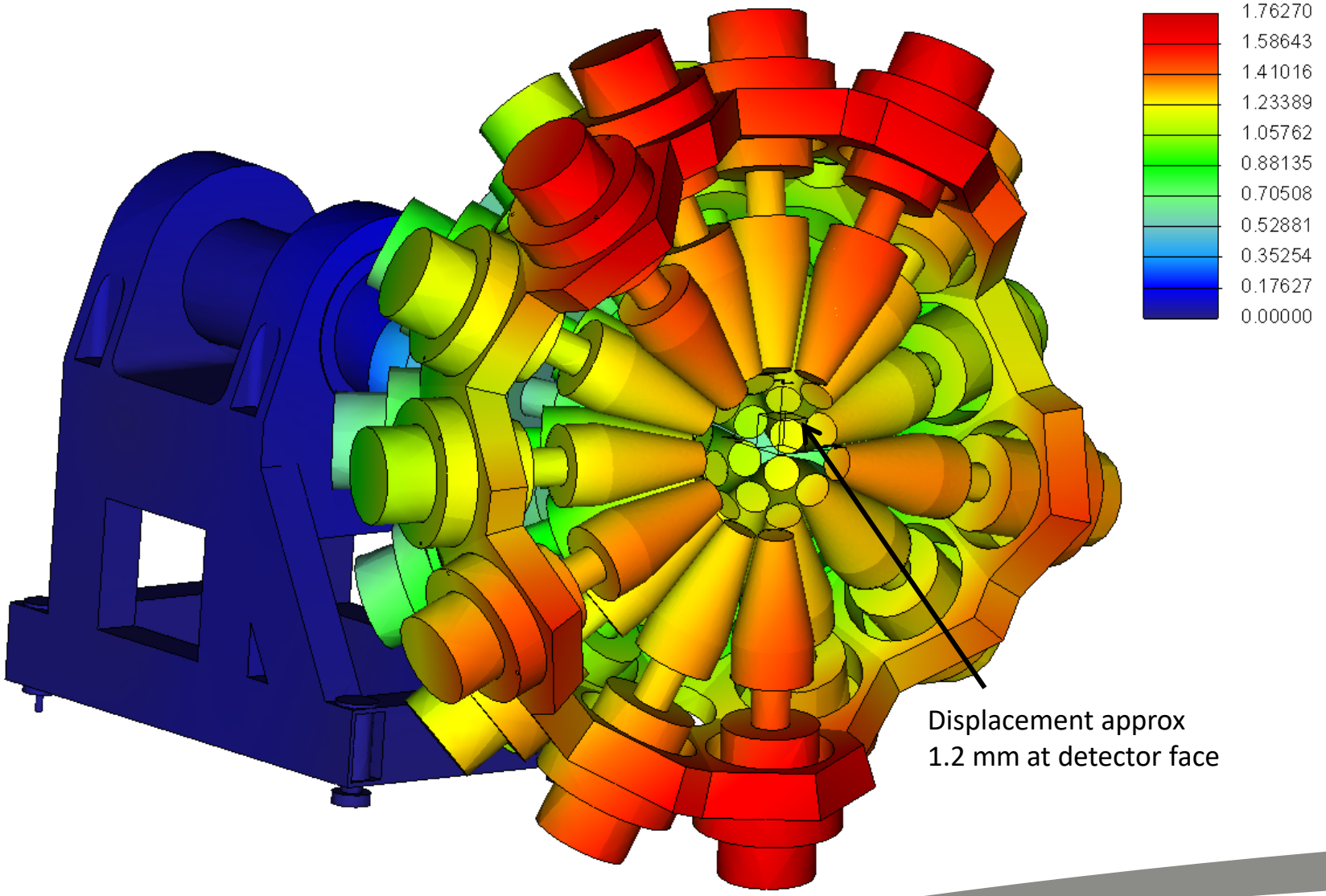
Deflection (mm) of honeycomb & detectors – front & rear
28 ATC detectors (~100kg) with cut-out - Legnaro



Deflection (mm) for 30 ATC detectors (~100kg) – Legnaro, CERN, Jvaskyla & FAIR

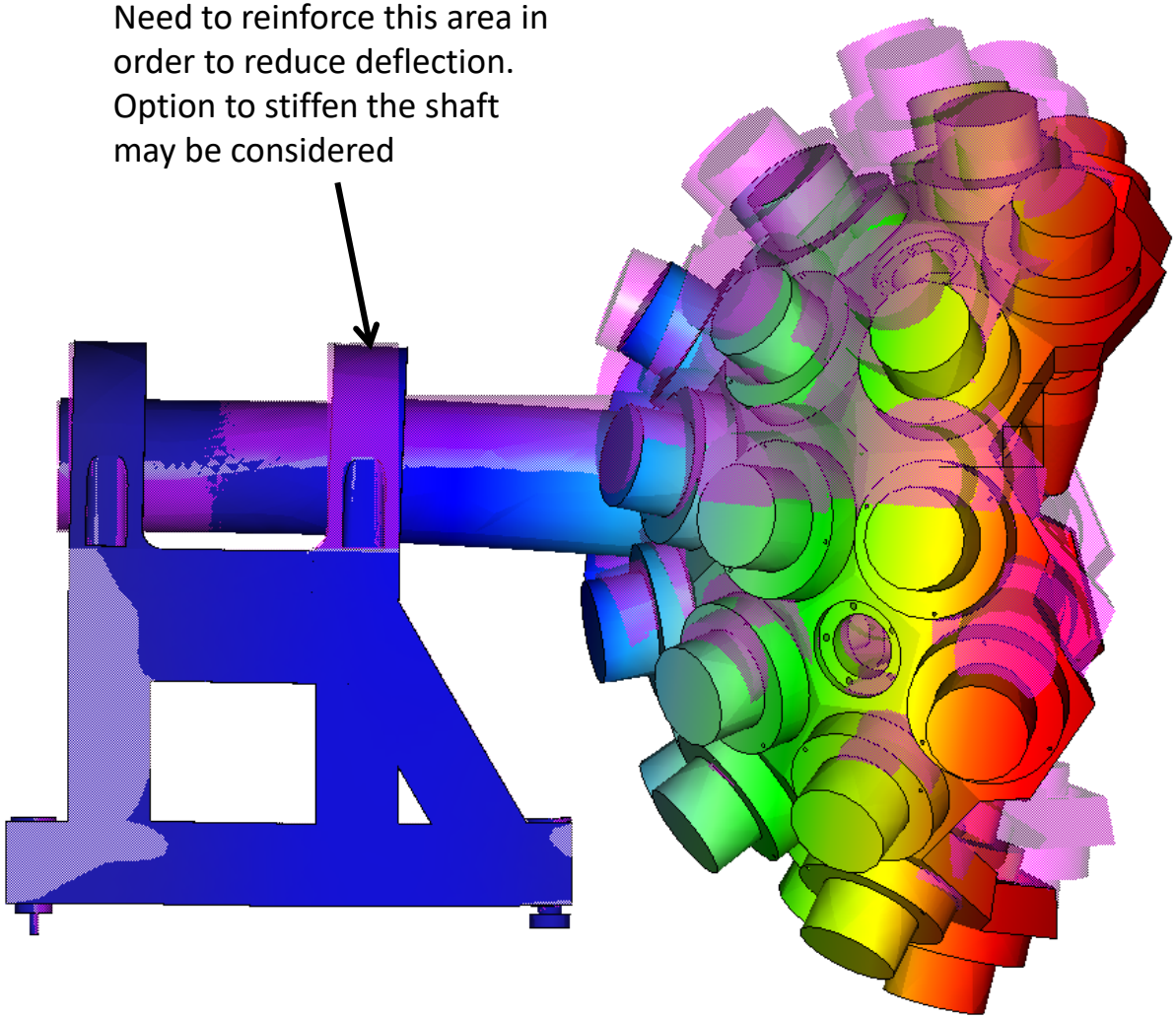


Full system deflection (mm) for 30 ATC detectors (~100kg)

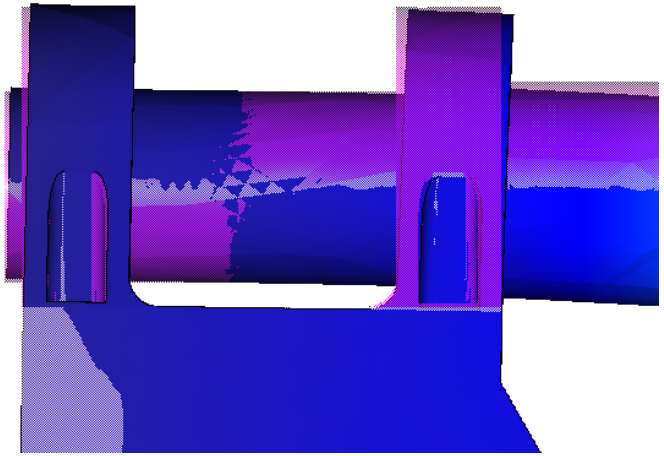


Side view showing deflection (mm) in Z (vertical) direction

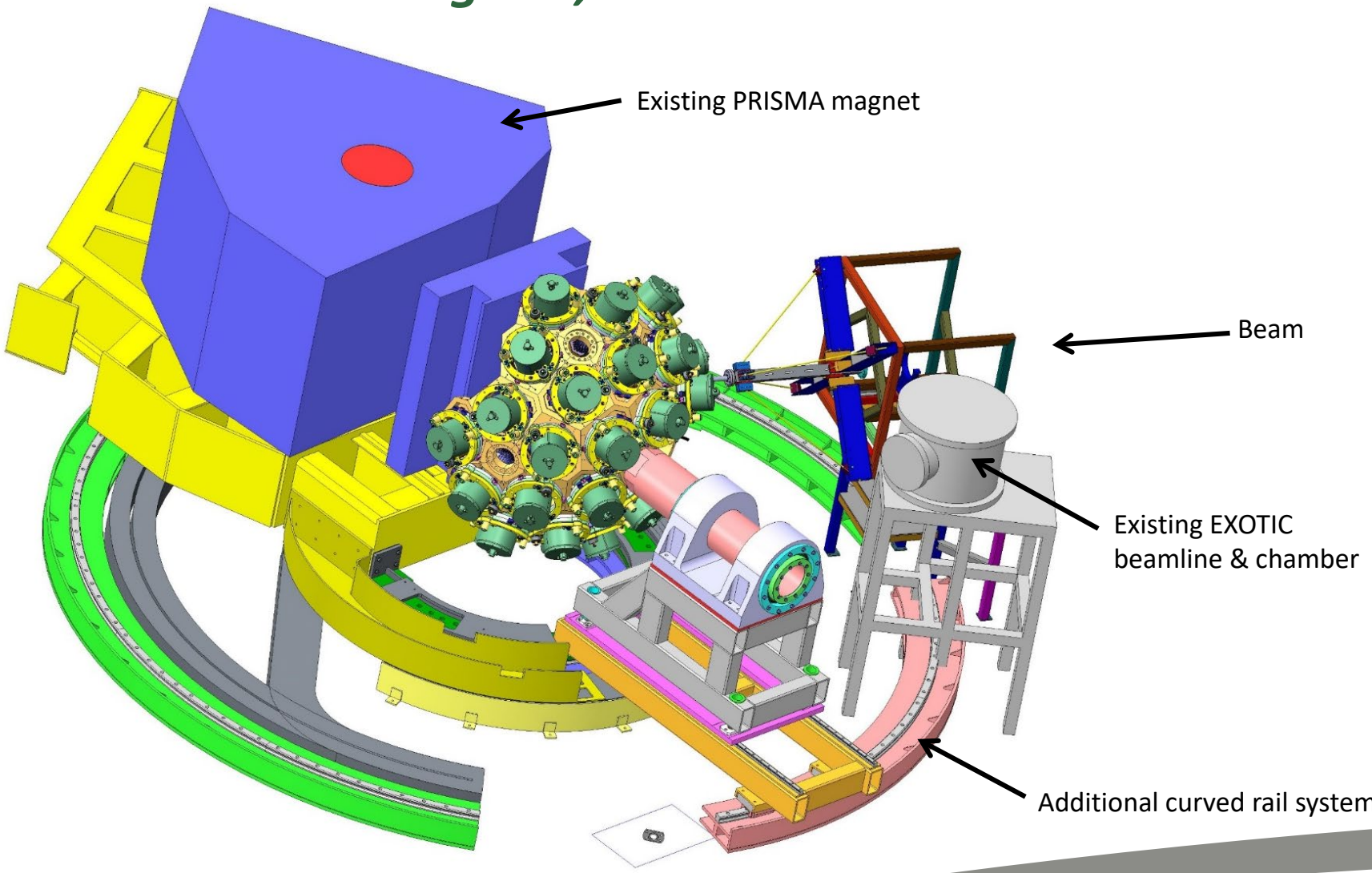
Need to reinforce this area in order to reduce deflection. Option to stiffen the shaft may be considered

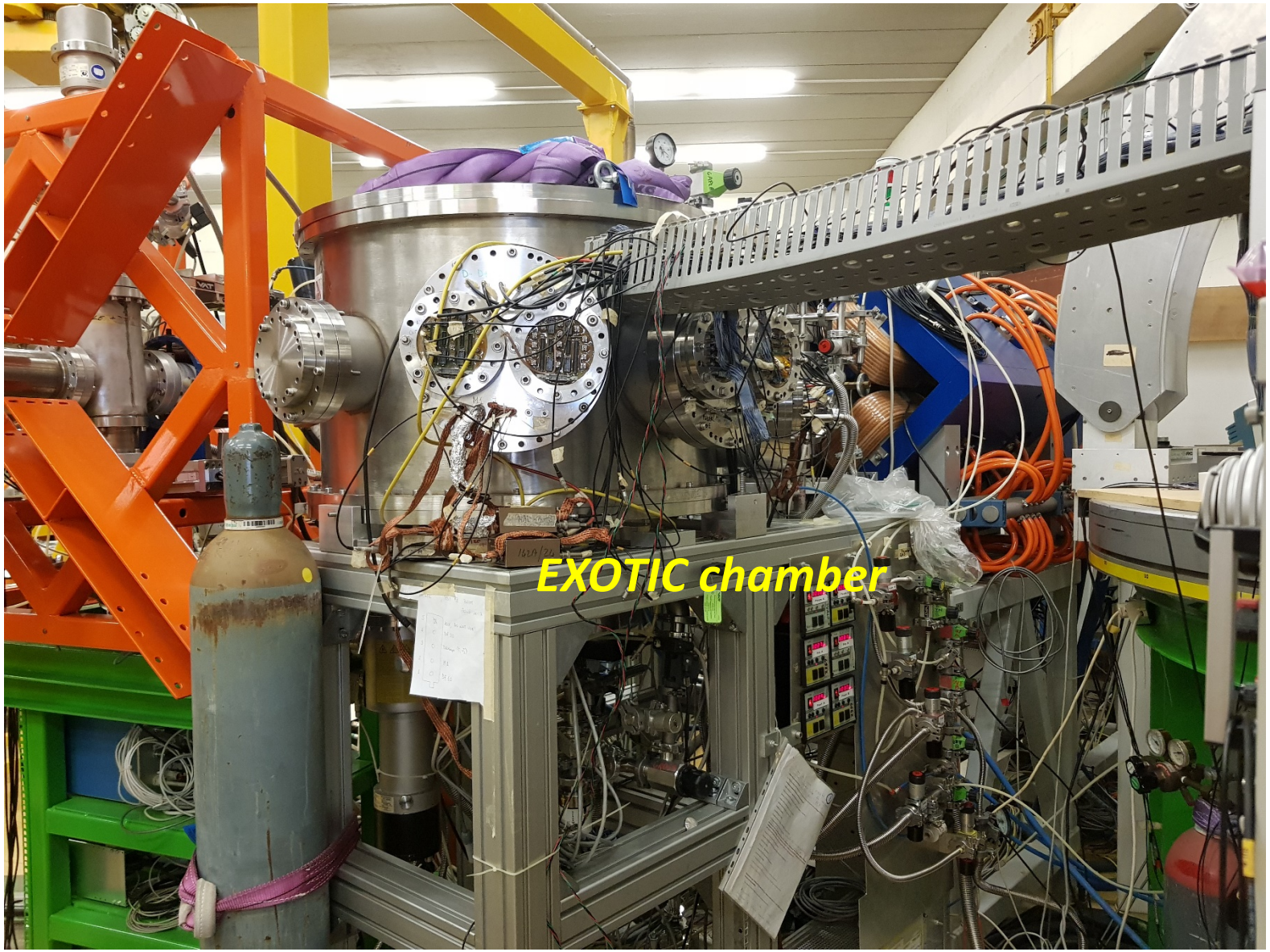


Deflection ~0,14mm



2π AGATA (28 ATCs) with PRISMA, Legnaro
Beam height 1,74m – shown rotated 70˚ to beam



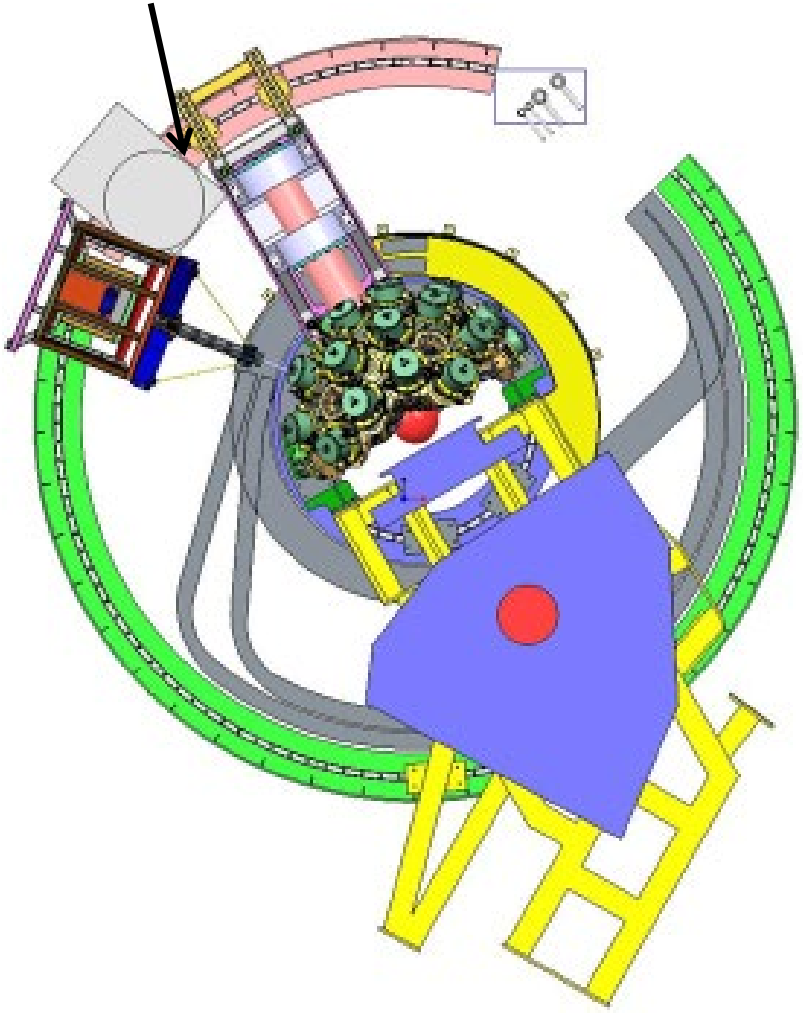


Power & digitiser racks

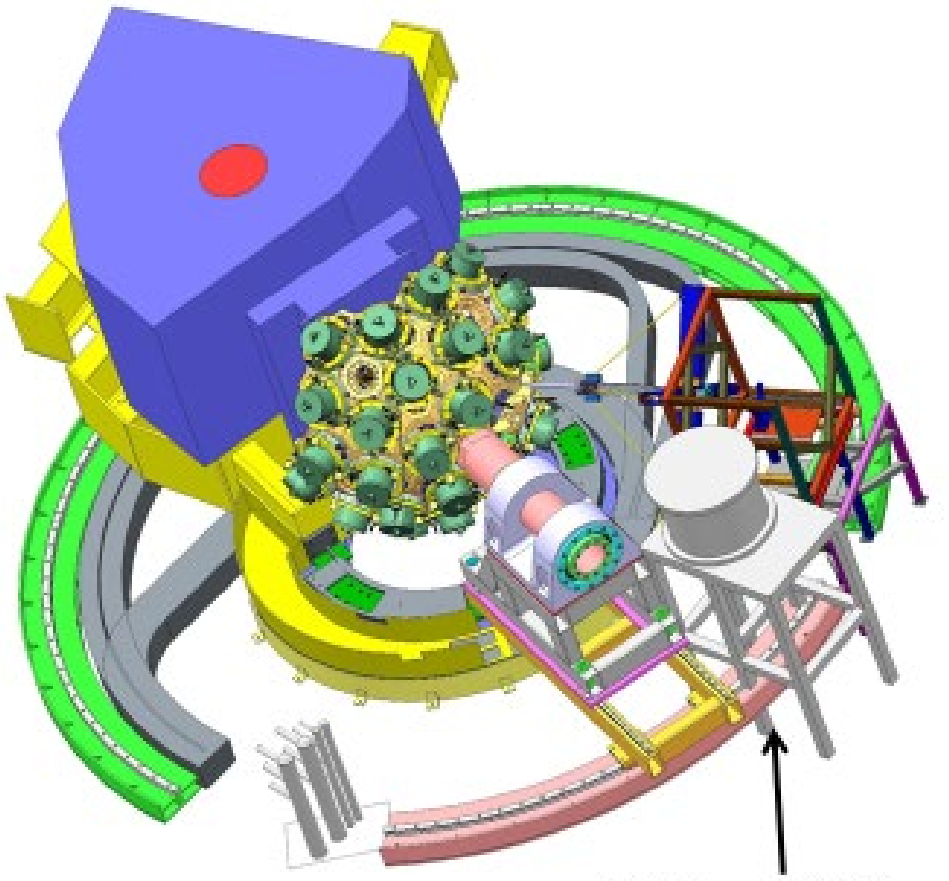
Central LN_2 supply

PRISMA & AGATA at 40˚

Clash with EXOTIC chamber

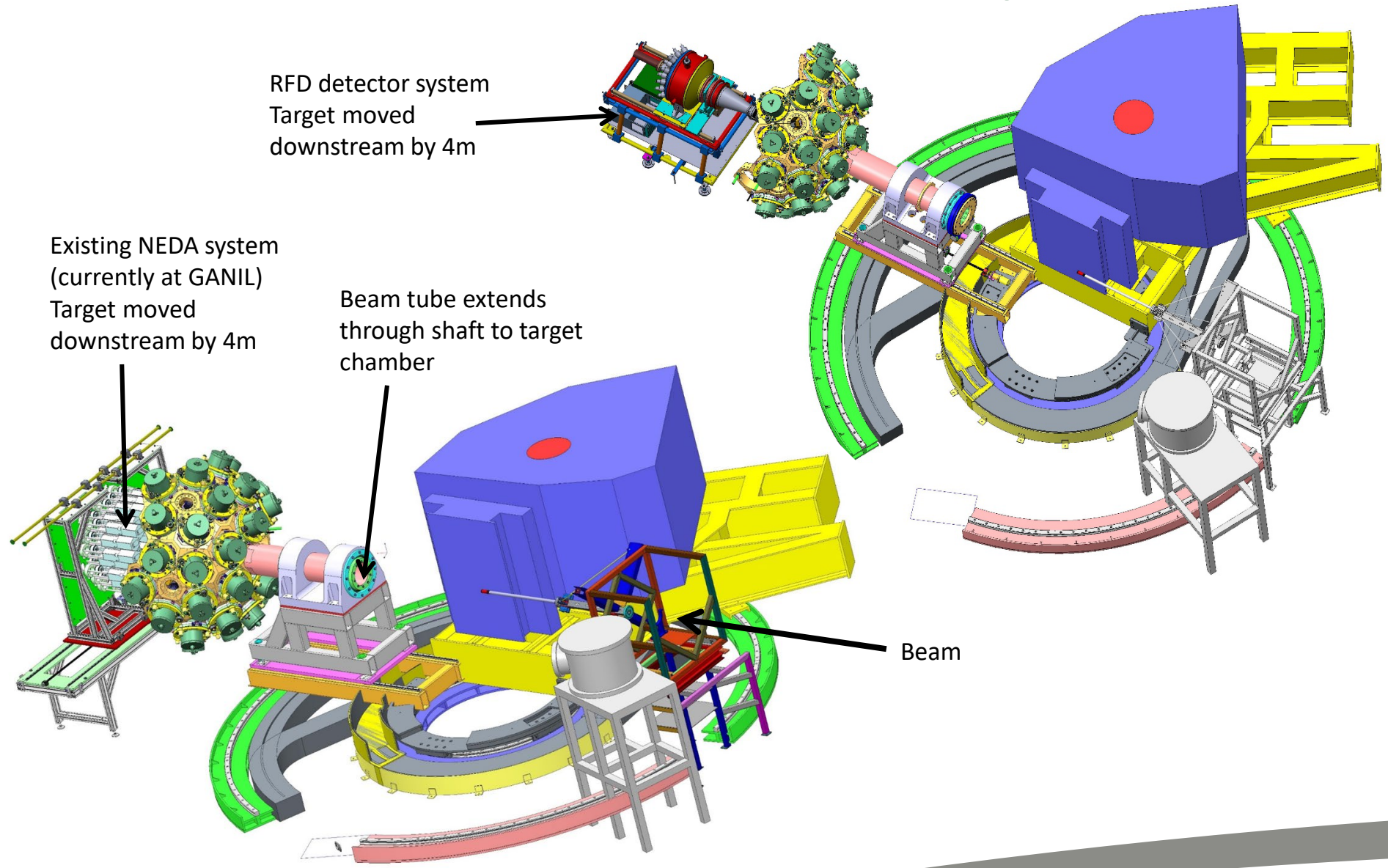


Clash with the EXOTIC chamber restricts angular range from 40˚ to 70˚. Original request was 20˚ to 70˚

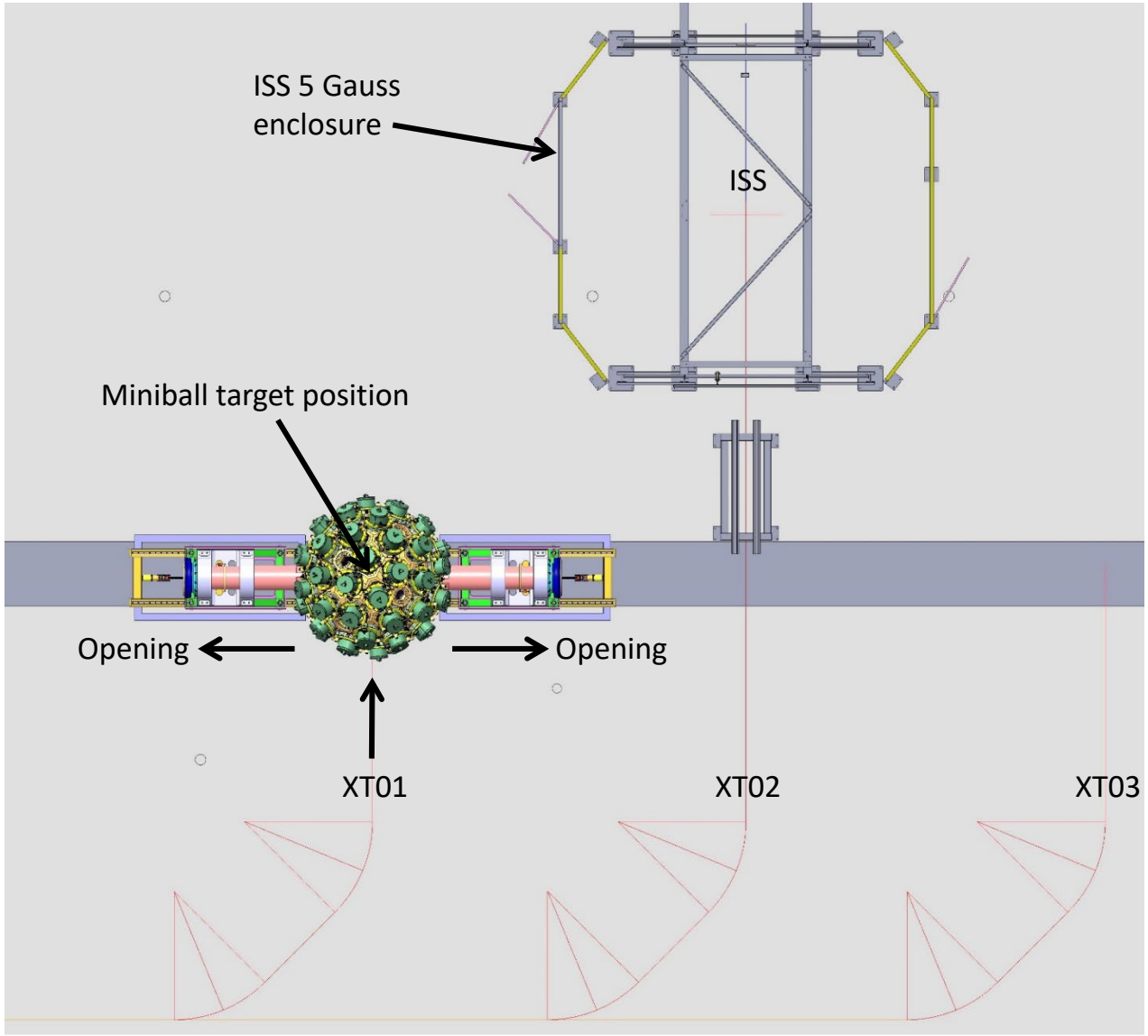


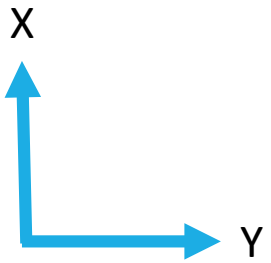
Suggested EXOTIC chamber moved back by 35cm – but will collide with new curved rail system

2π AGATA (28 ATCs?) with NEDA & RFD detector systems



Plan view of ISOLDE hall @ CERN



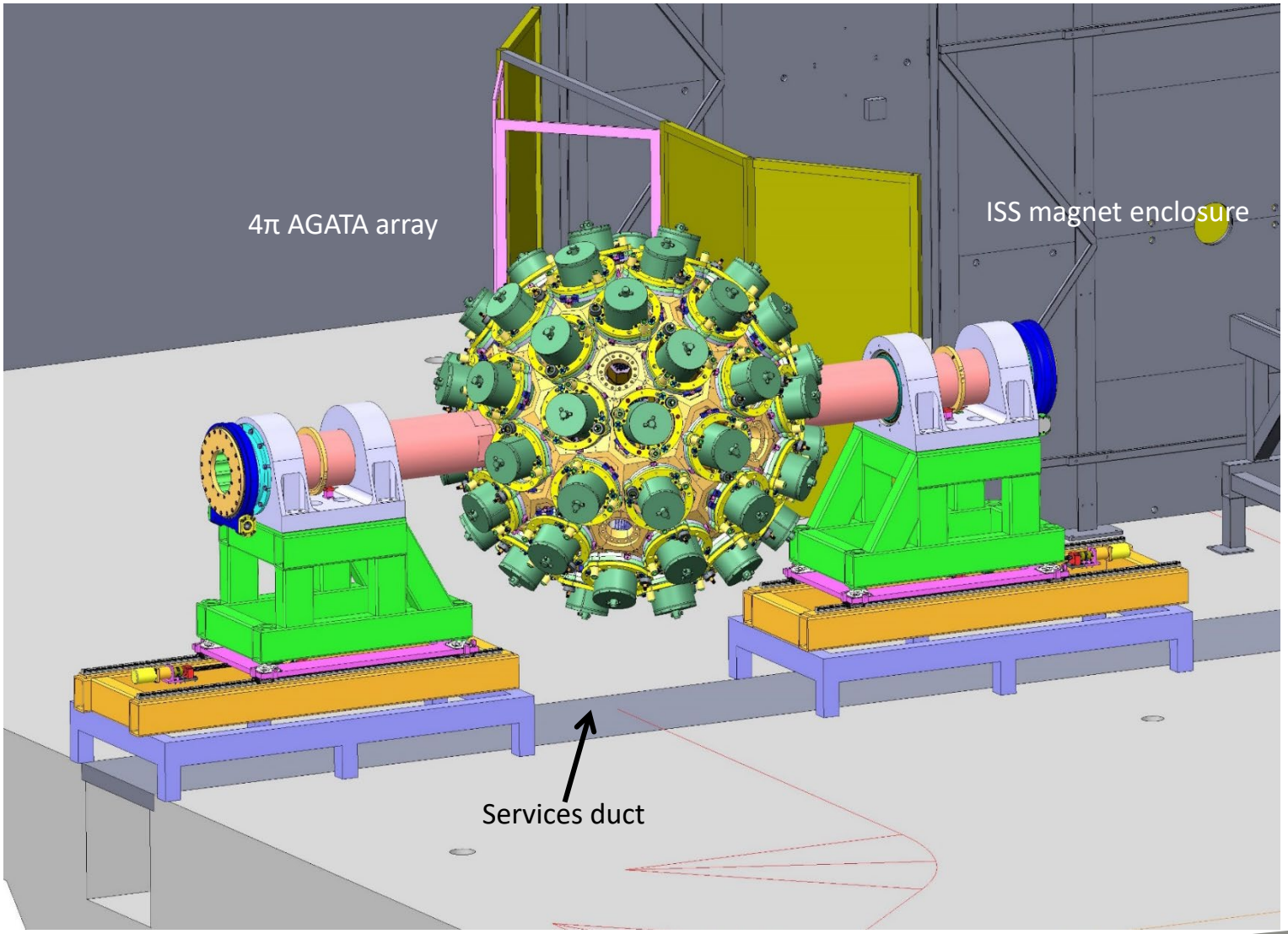


Target position:

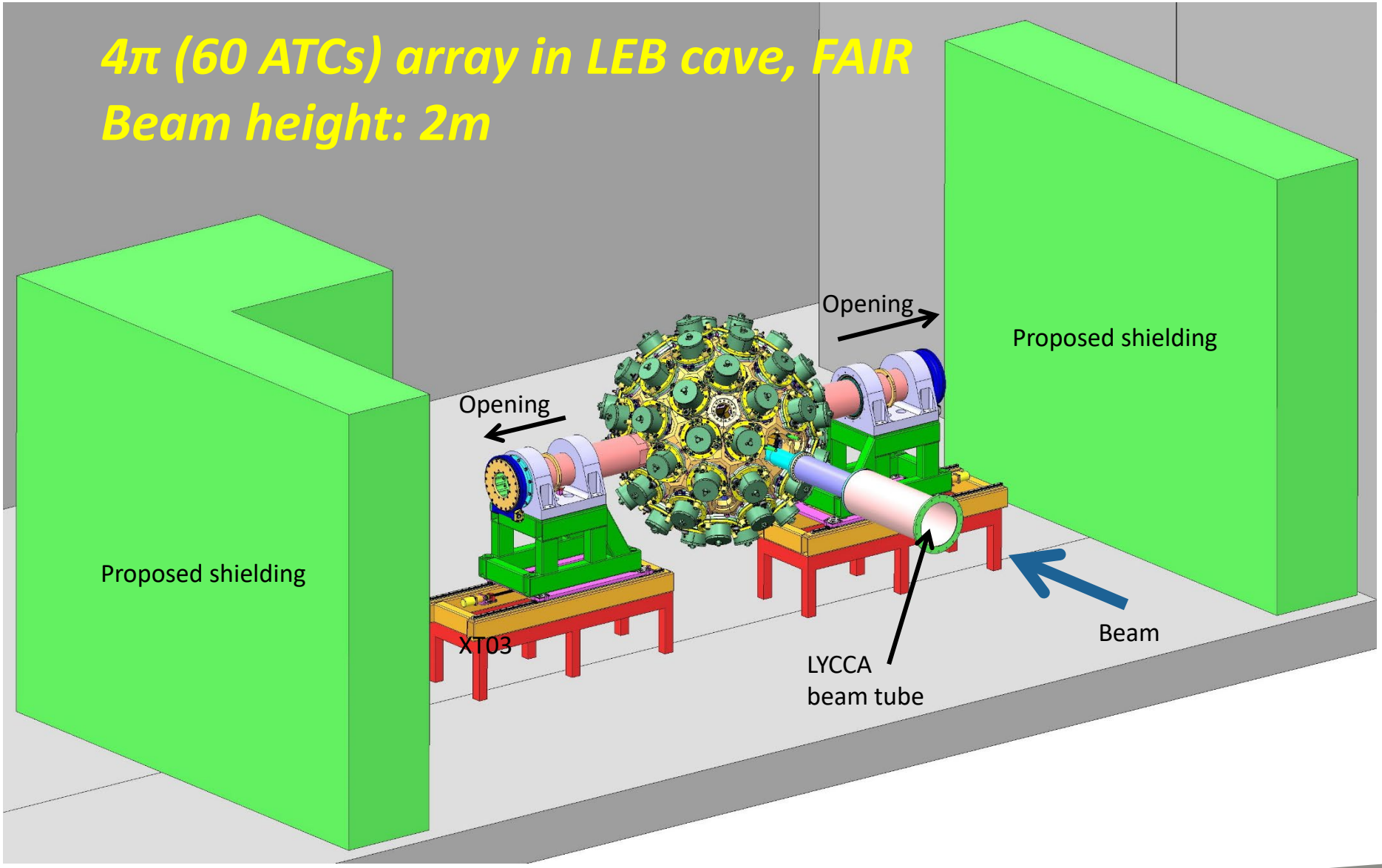
CERN origin:
X +1864,28940 (m)
Y +2282,82486 (m)

ISOLDE origin:
X -6,29288 (m)
Y +34,45941(m)

ISOLDE, CERN XT01 beamline. Beam height: 1,72m/1,75m



4π (60 ATCs) array in LEB cave, FAIR
Beam height: 2m



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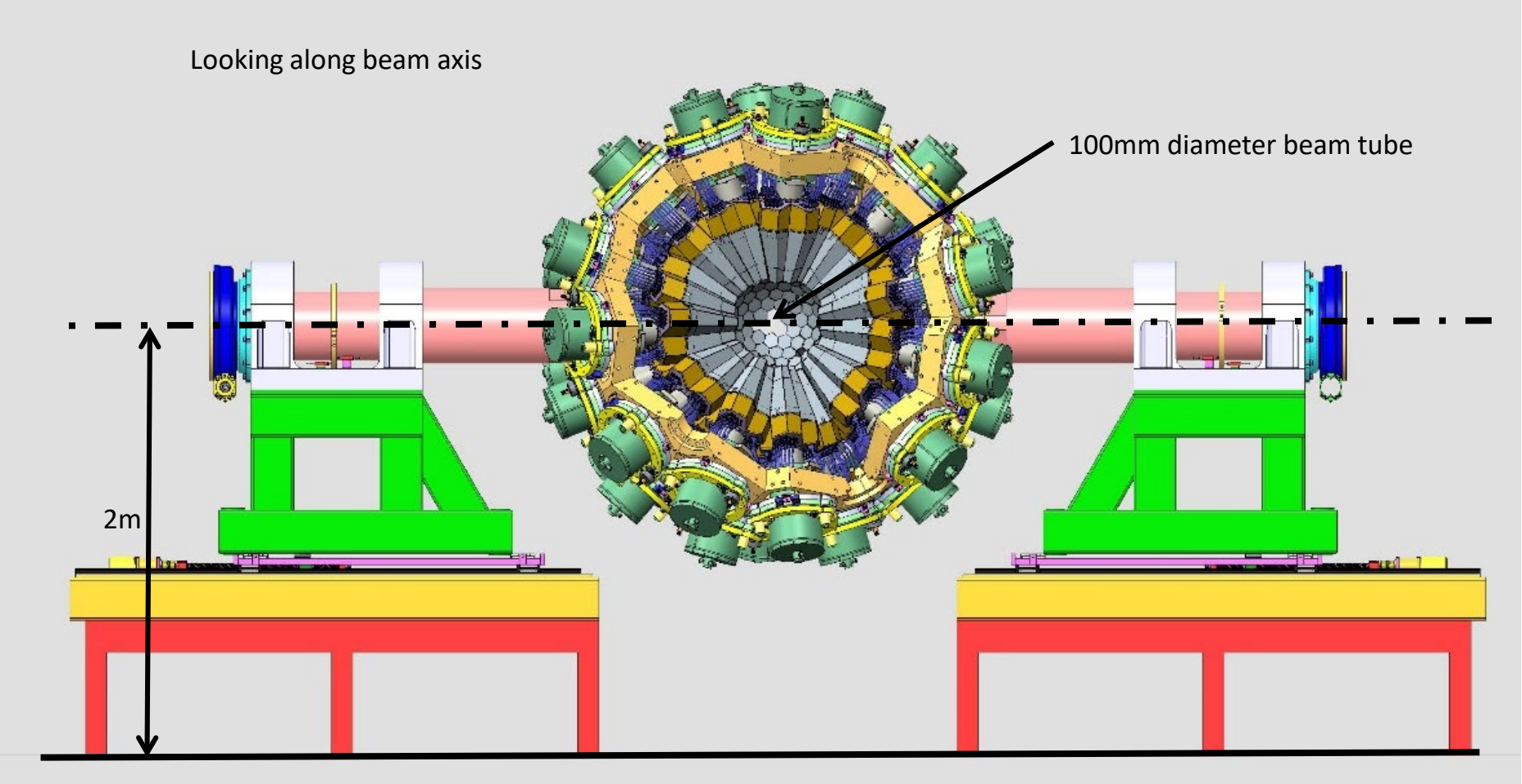
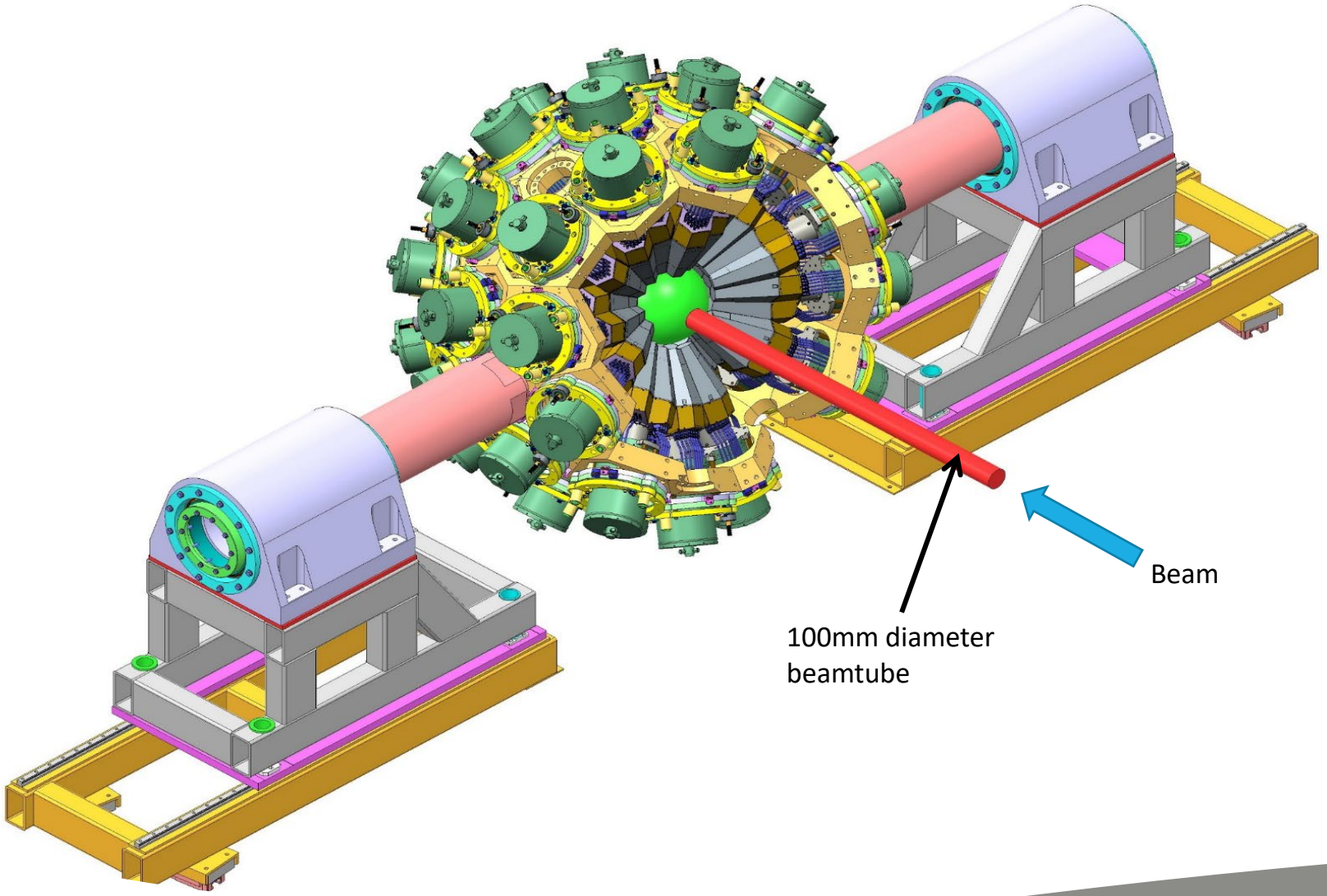
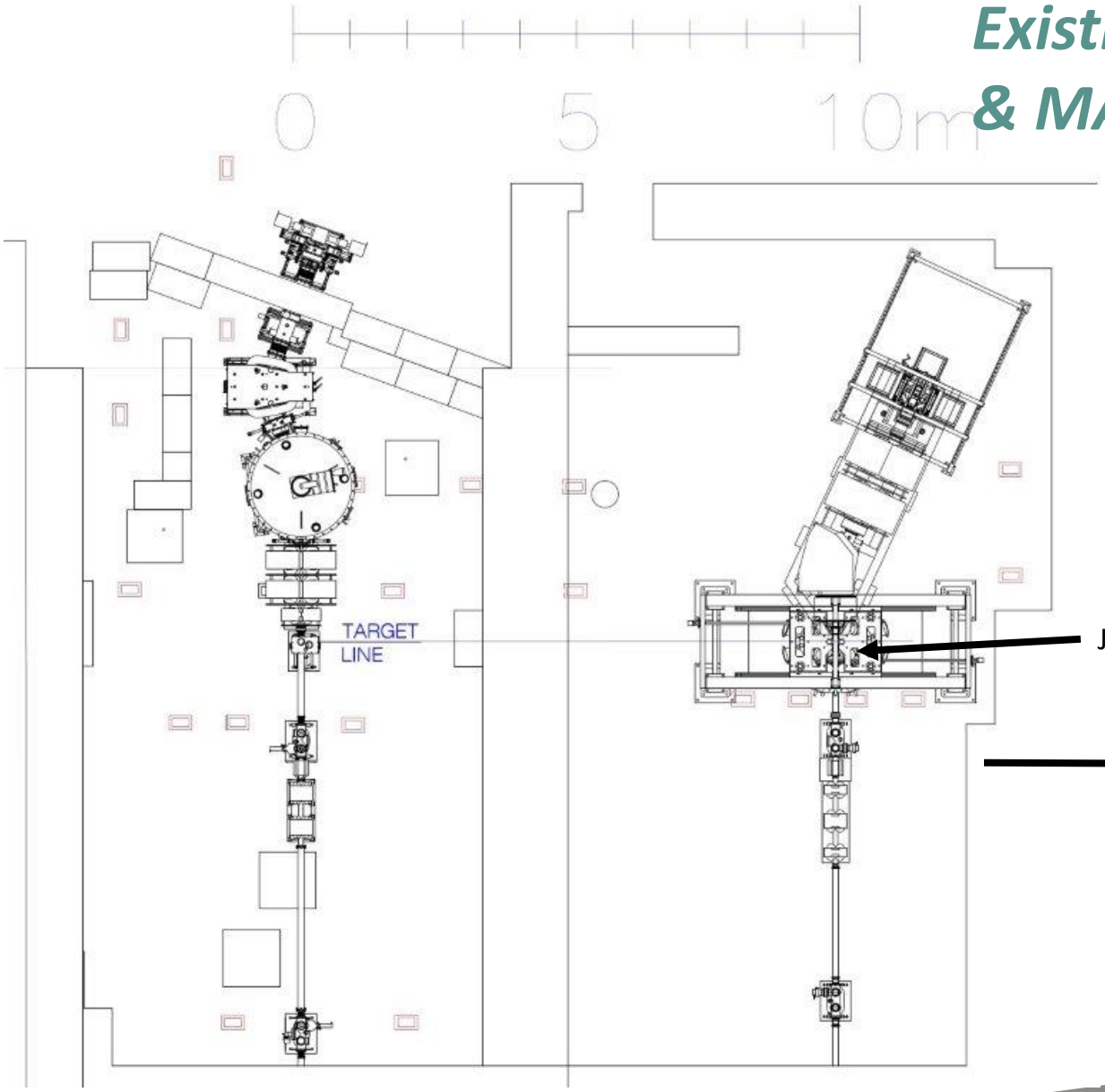
44 detector assemblies (~3π – 45ATCs) in LEB cave, FAIR
Beam height: 2m



44 ATC assemblies in LEB cave, FAIR



Existing layout of RITU & MARA caves, Jvaskyla



Jurogam

Side walls (block construction) could move outwards to increase space)

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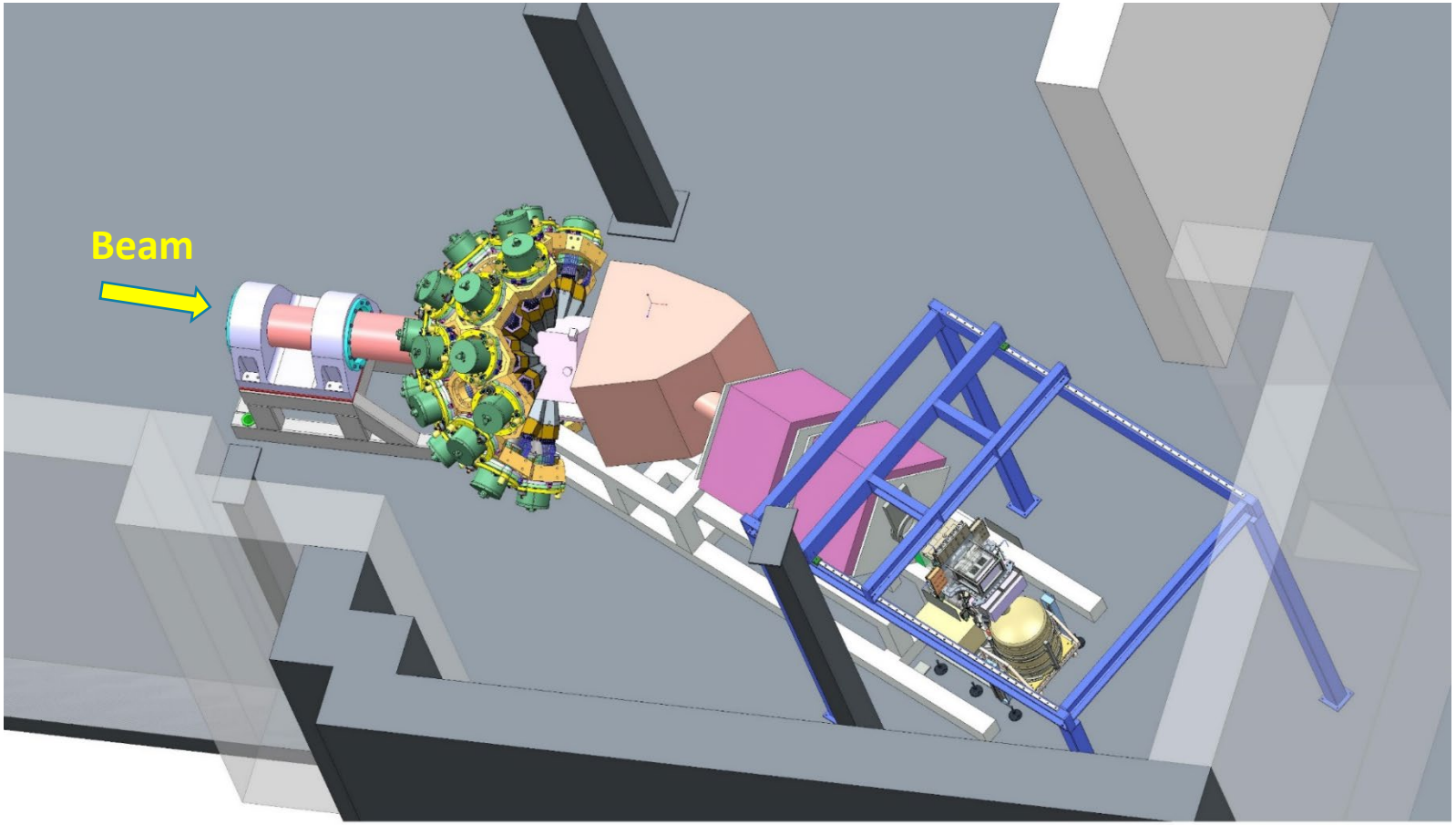
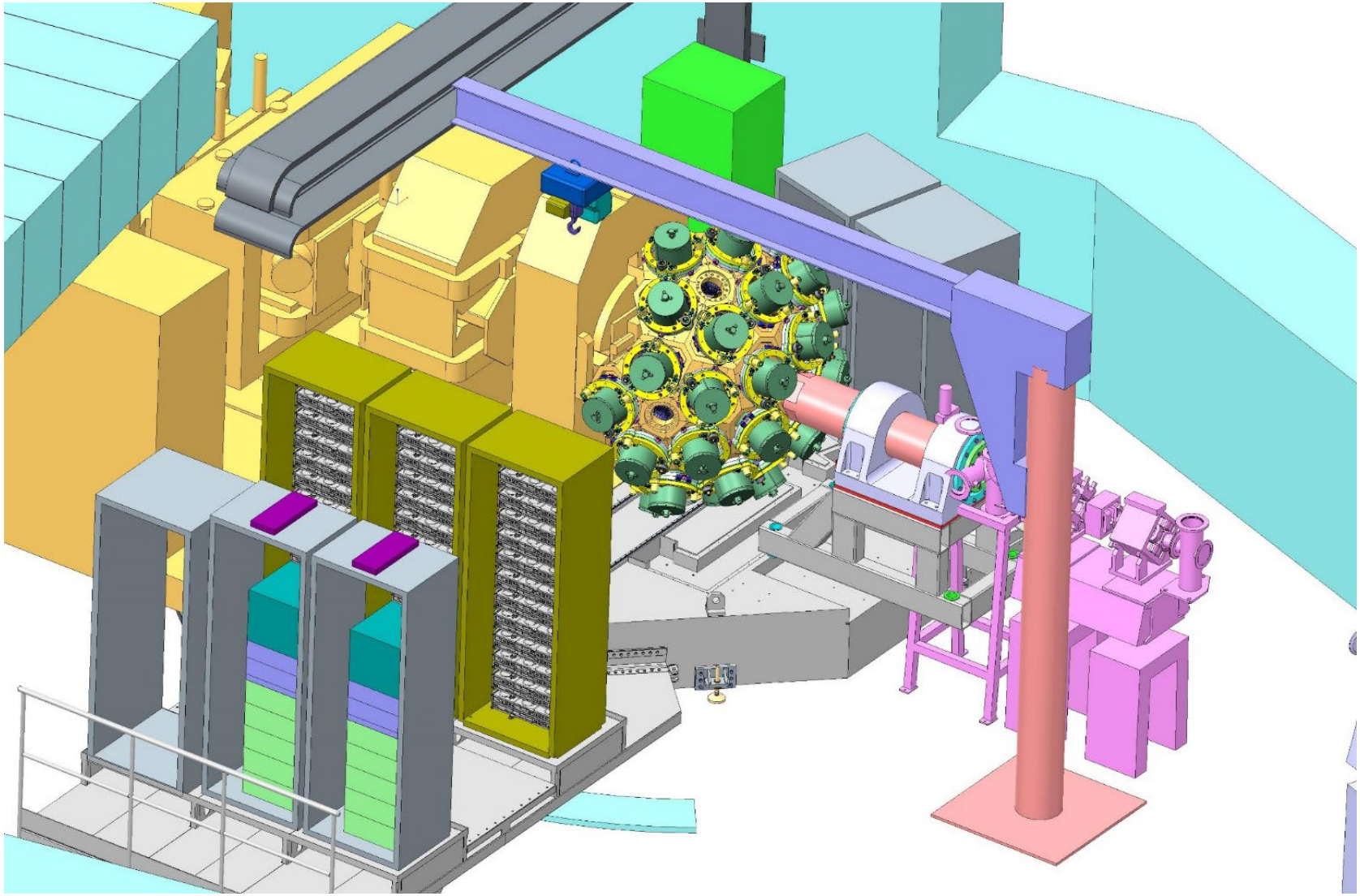
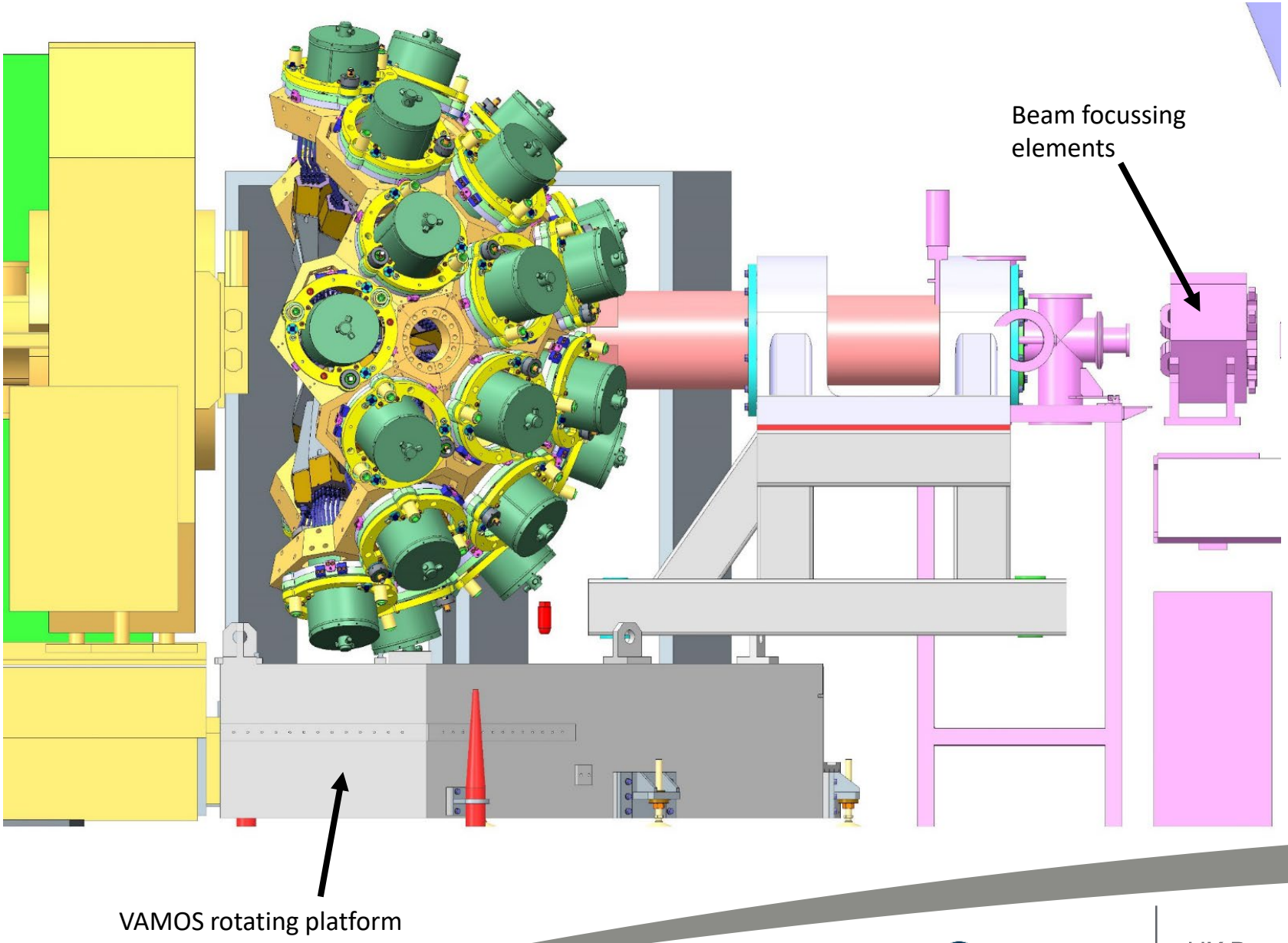
2π AGATA (30 ATCs) in Jvaskyla – target in same position as Jurogam.
Beam height: 1,3m (possibility to create space in floor?)



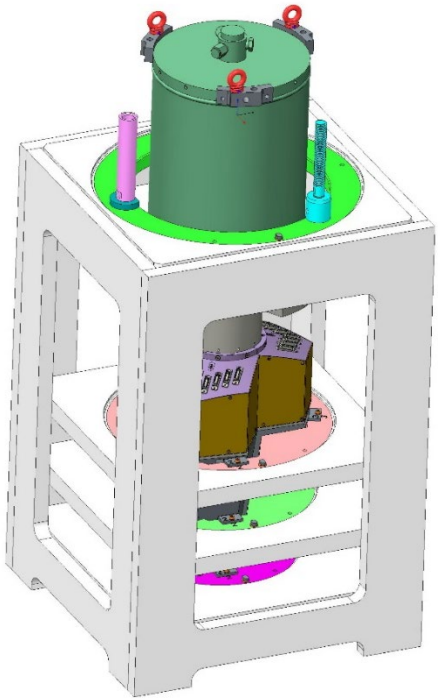
2π (30 ATCs) AGATA in G2 cave @ GANIL



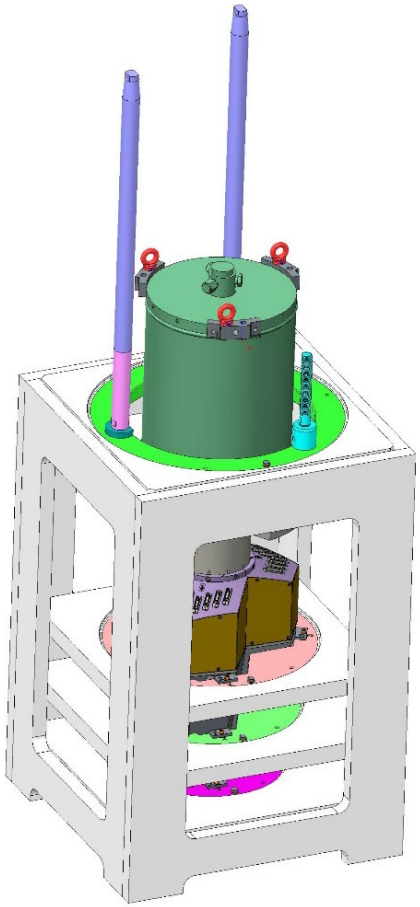
Side view of 2π (30 ATCs) AGATA in G2 cave @ GANIL



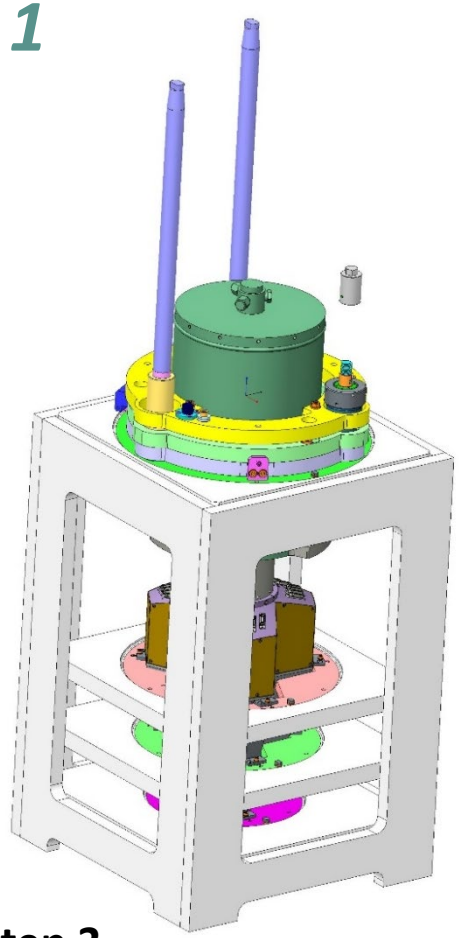
Proposal for detector & ring assembly - 1



Step 1
Fit the detector into the setting stand and adjust as necessary

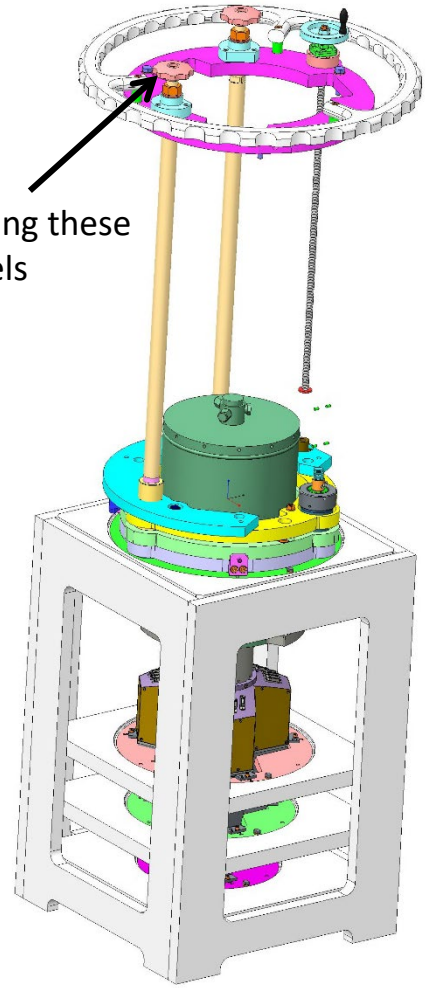


Step 2
Fit the existing guide bars



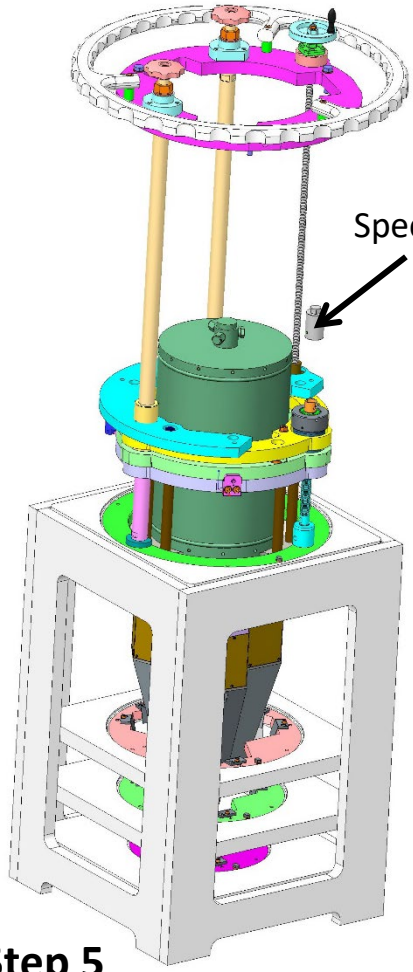
Step 3
Slide the adjusting ring assembly over the guide bars, engage nut and rotate using the special tool. Fasten to the detector then remove the guide bars

Proposal for detector & ring assembly - 2



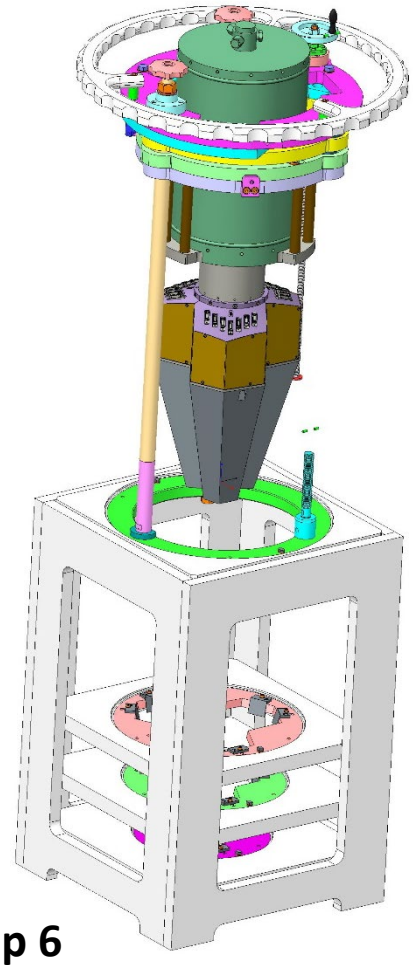
Step 4

Fit the loading fixture and secure the blue plate to the yellow plate



Step 5

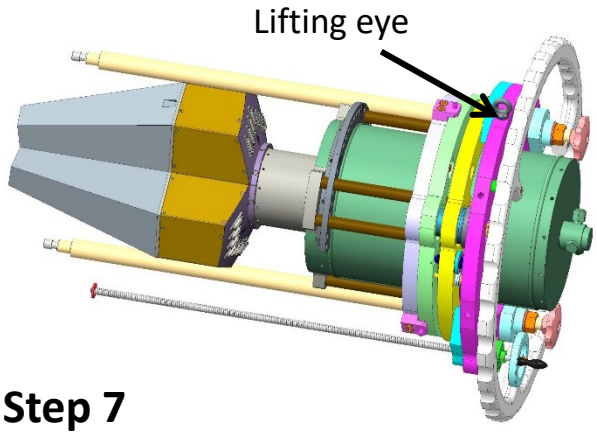
Using the special tool, wind the nut to raise the detector & rings



Step 6

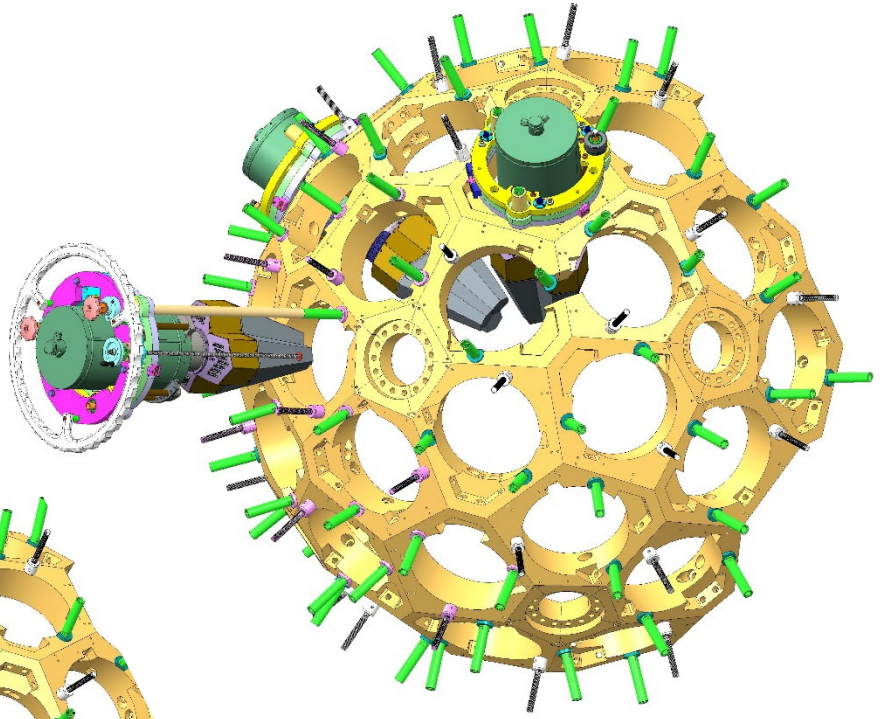
Using the hand wheel. raise the detector & rings to release from the setting stand

Proposal for detector & ring assembly - 3



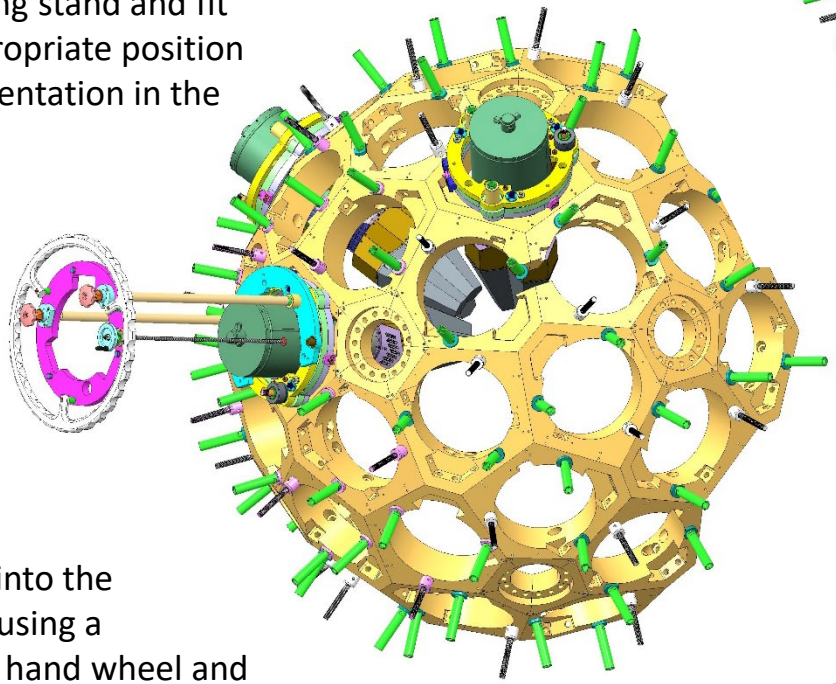
Step 7

Remove from the setting stand and fit a lifting eye in the appropriate position depending upon its orientation in the honeycomb



Step 8

Engage the fixture & detector with the honeycomb



Step 9

Wind the detector into the honeycomb flange using a combination of the hand wheel and special tool. Disconnect and remove the fixture

Issues to Resolve:

General:
Timescales for installation at the future locations
LN_2 distribution system for each location – mounting/support, hoses, etc. (where & how do they run?)
Digitiser/power cables – fibre? There are over 800 to manage with up to 30 cryostats in each 2π system
When rotating, digitiser/power cables and LN_2 pipes must be disconnected
Mounting mechanics and hardware in the future locations
Linear & rotary drive control systems
Who will pay? Where will the system be built and tested?

Legnaro:
EXOTIC beamline clash – limits angular rotation range from 40˚ to 70˚ (20˚ to 70˚ to originally requested)
Re-configuration of beam diagnostic to accommodate NEDA & RFD at 4m beyond existing target position
Option to uses spare diagnostics line for NEDA & RFD?
Mounting mechanics for the NEDA/RFD detector systems
Additional curved rail system – installation & survey
Beam pipes, their associated vacuum systems, target chamber and supports

ISOLDE:
Check if any services ducts are close – cover or span as necessary
Beam pipes, their associated vacuum systems, target chamber and supports

Jvaskyla:
Major re-configuration of the RITU cave required – move walls and trench in floor
Beam pipes, their associated vacuum systems, target chamber and supports

LEB Cave @ FAIR:
Much design work still to be done including additional detector systems and how they interact with AGATA
3π AGATA option to be considered

GANIL:
Considered not an option due to limited space availability

Thank You
For your attention

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For your attention

Questions?

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