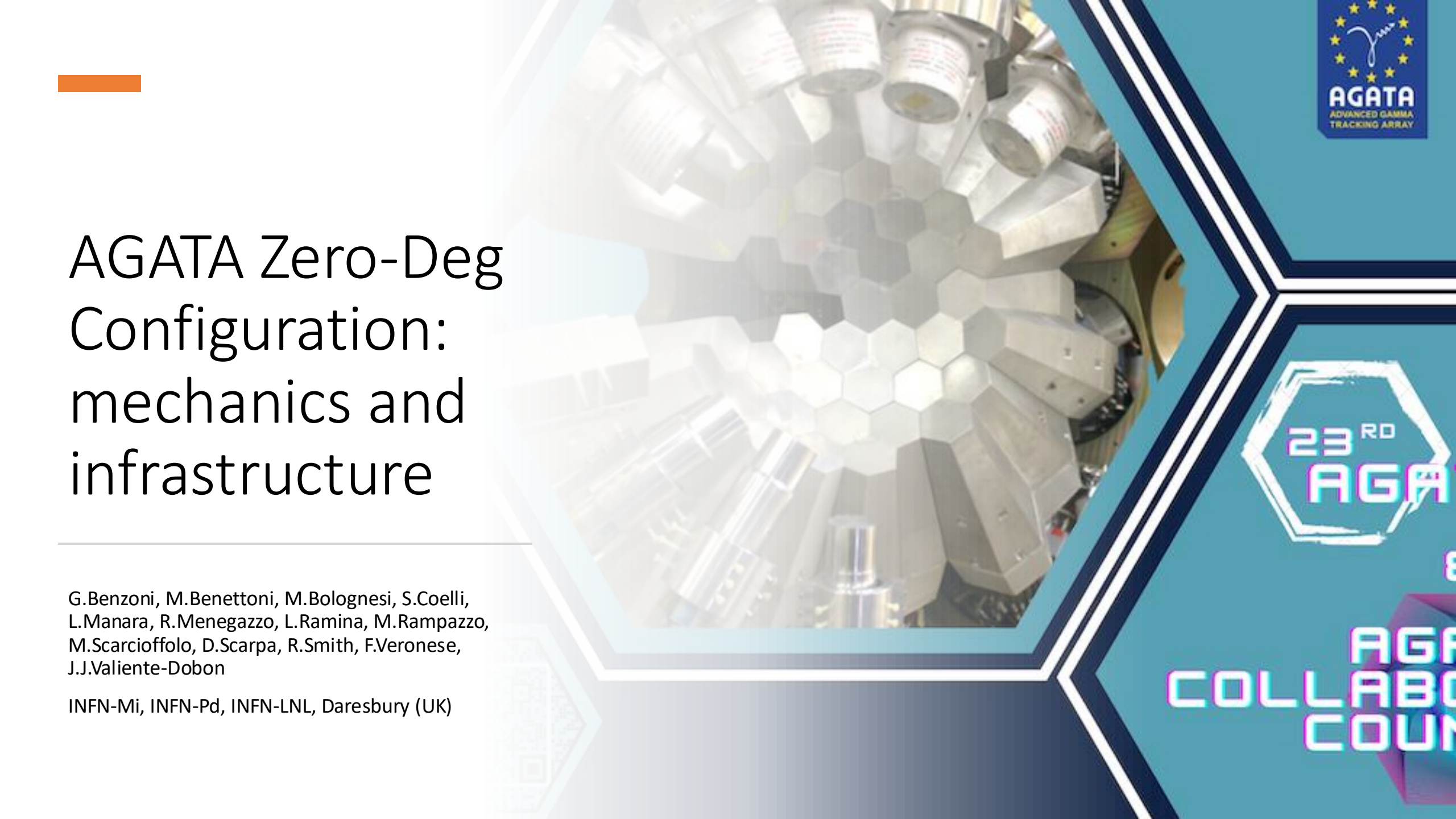
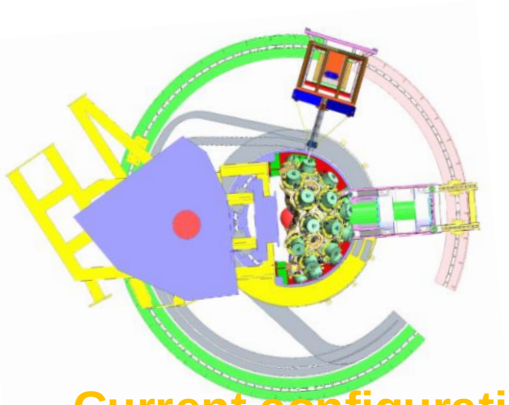
AGATA Zero-Deg Configuration: mechanics and infrastructure



G.Benzoni, M.Benettoni, M.Bolognesi, S.Coelli, L.Manara, R.Menegazzo, L.Ramina, M.Rampazzo, M.Scarcioffolo, D.Scarpa, R.Smith, F.Veronese, J.J.Valiente-Dobon

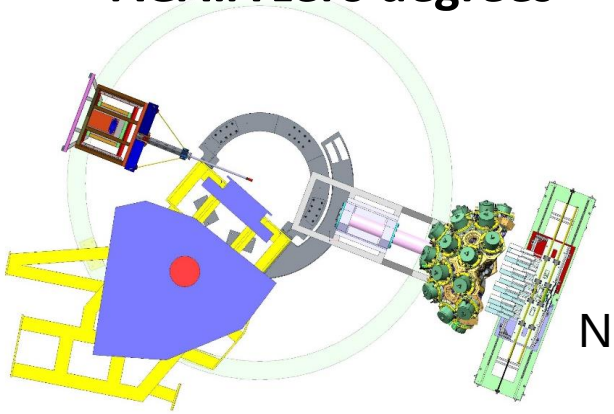
INFN-Mi, INFN-Pd, INFN-LNL, Daresbury (UK)

AGATA Zero-Deg Configuration



Current configuration

AGATA zero degrees



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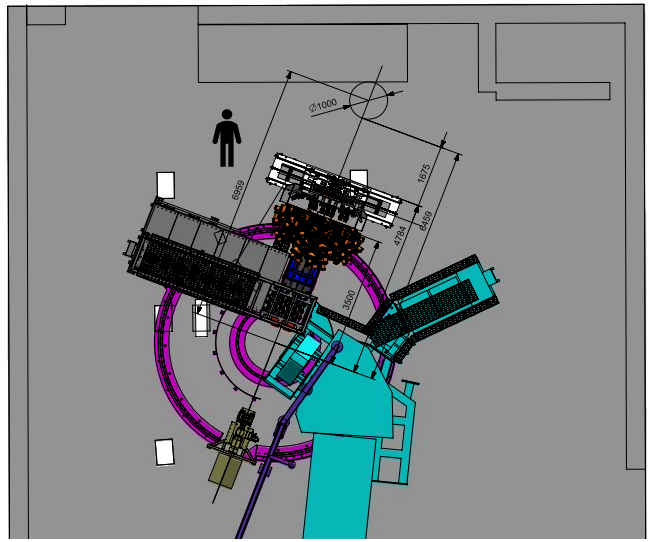
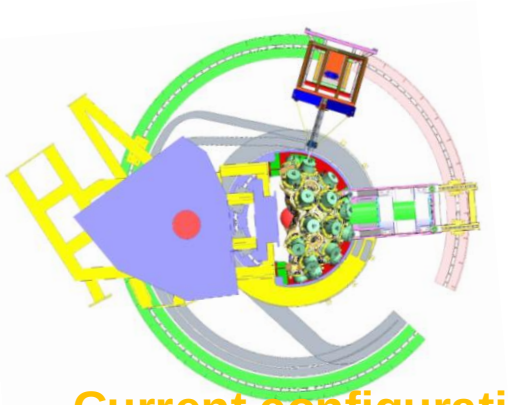


AGATA Zero-Deg Configuration



Current configuration

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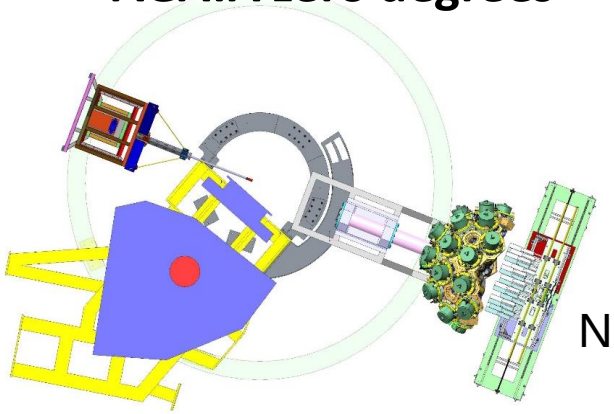

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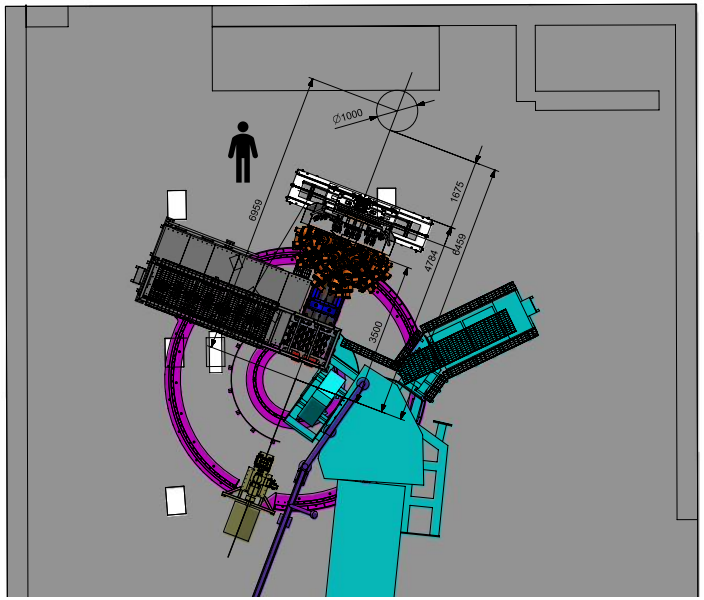
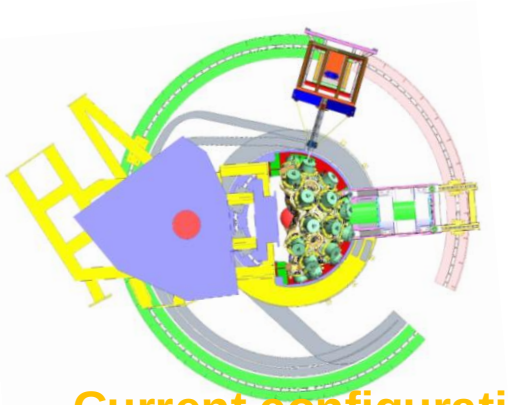
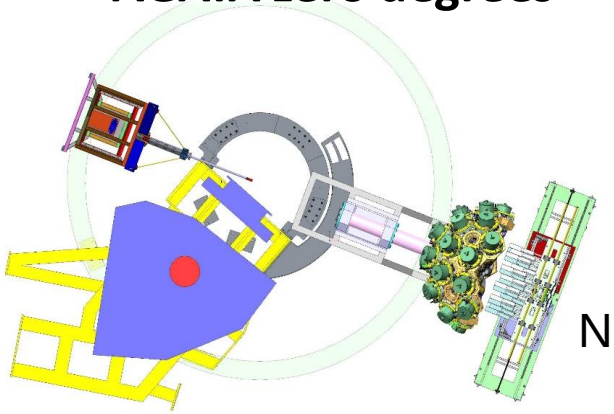


AGATA Zero-Deg Configuration



Current configuration

AGATA zero degrees



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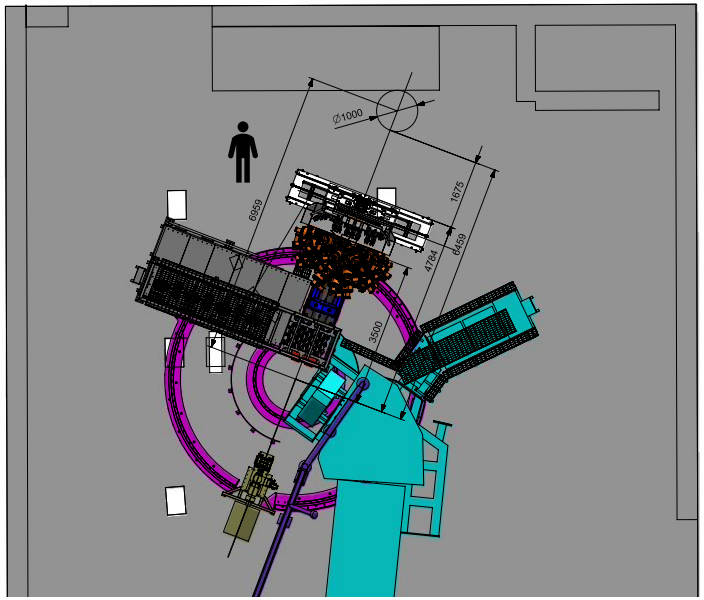
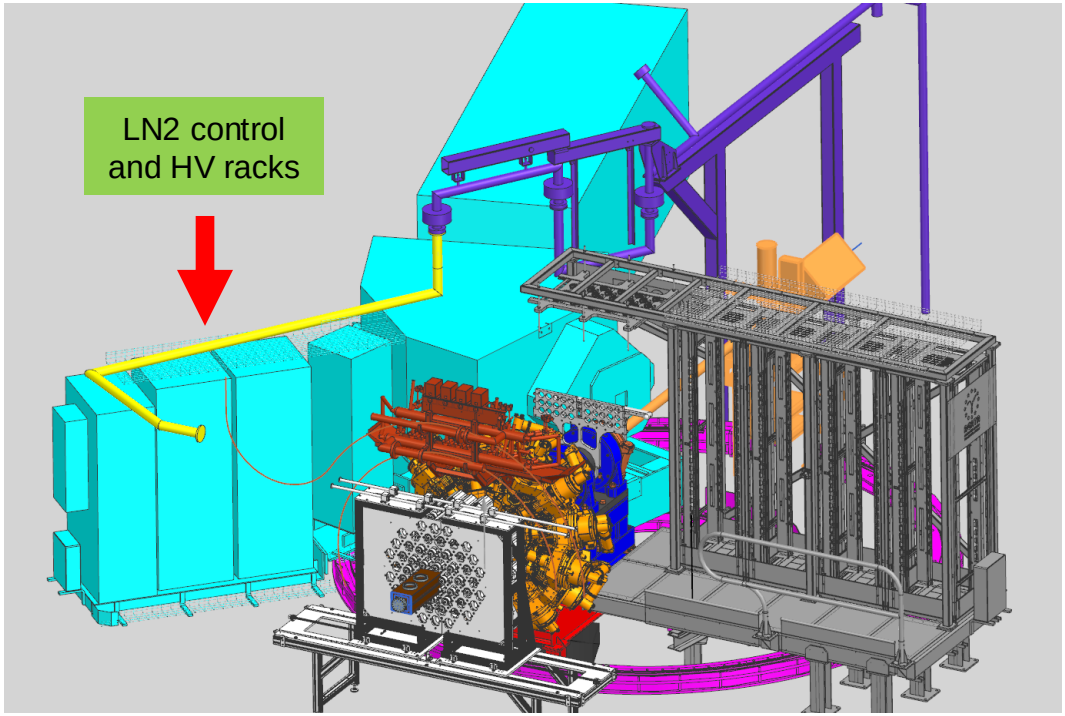
Already designed or in final evaluation stage



LN2 distribution system at the zero-degrees position



Preserve current installation, new vacuum isolated tube and metallic hose, slightly more expensive

Easily restore the present configuration, less components to modify, more space to move the crane

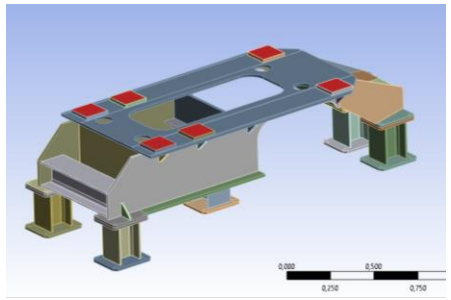
No other changes are required*: cryogenic manifolds and LN2 distribution hardware, cabling, control system hardware (PLC) and software will be the same*

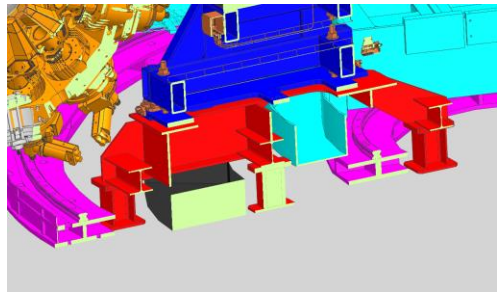
==> elements have been purchased and system to be delivered soon

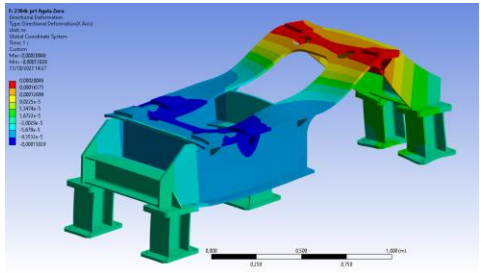
AGATA Zero-Deg Configuration

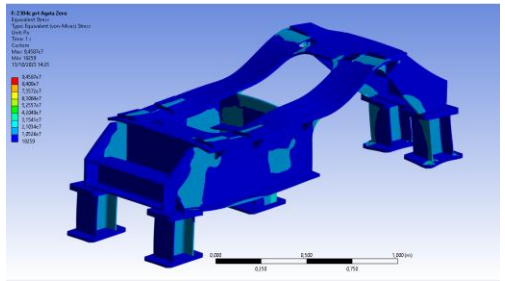
AGATA will be moved in new position and the shaft will be placed on a newly designed support:

- Lean over the rails that allow PRISMA rotation and cabling





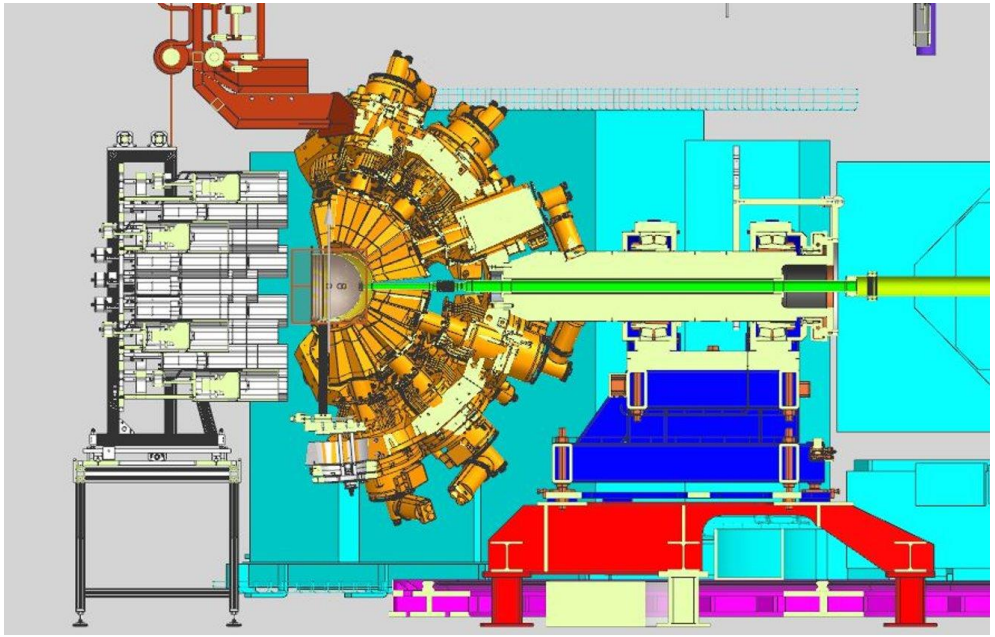




Deformation analysis performed assuming a weight of 10 tons (10^5 N)
Deformations are not uniform on the surface:

- 0.2 mm on the back
- 0.13 mm to the front

==> possible rotation that can be compensated shimming



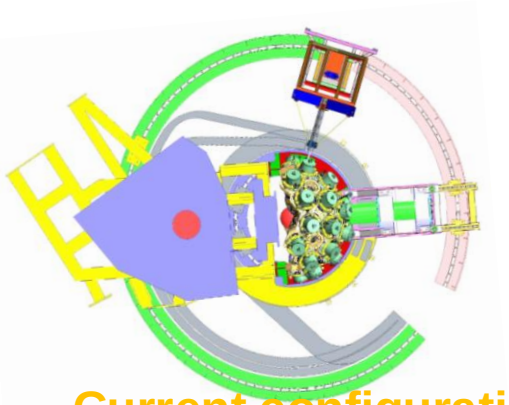
In this new position AGATA will:

- Rotate around its axis for detectors' intervention
- NOT translate along the beam axis to approach target position

NB: PRISMA will be frozen at 110 deg

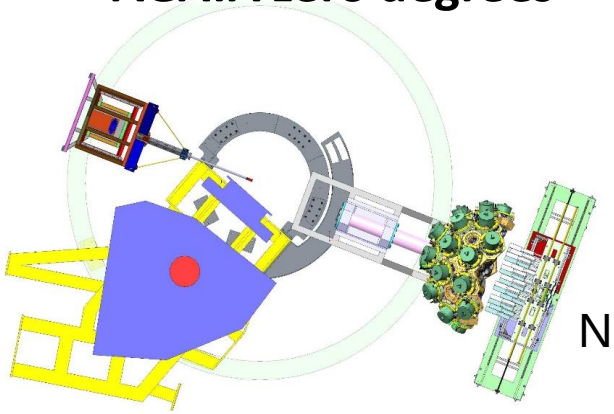
==> elements have been purchased and system ready to be installed

AGATA Zero-Deg Configuration



Current configuration

AGATA zero degrees



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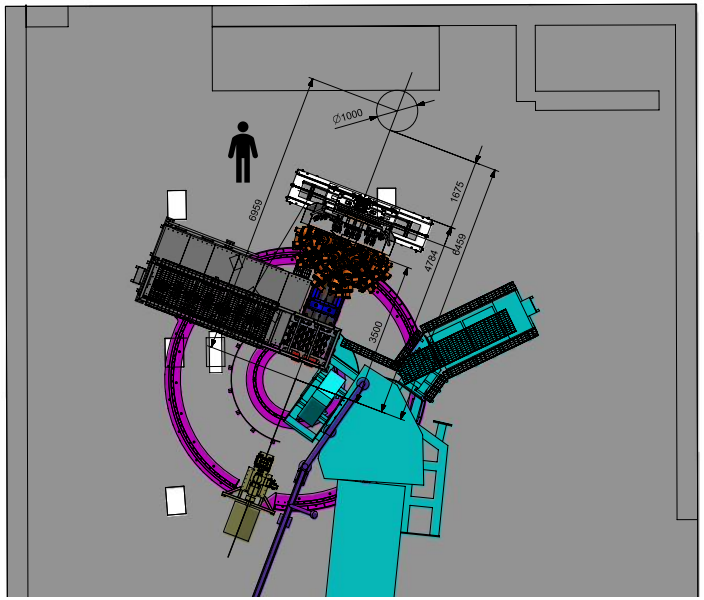
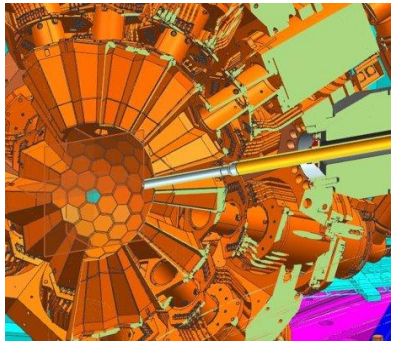
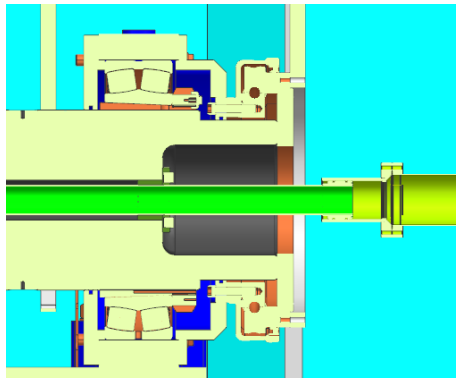


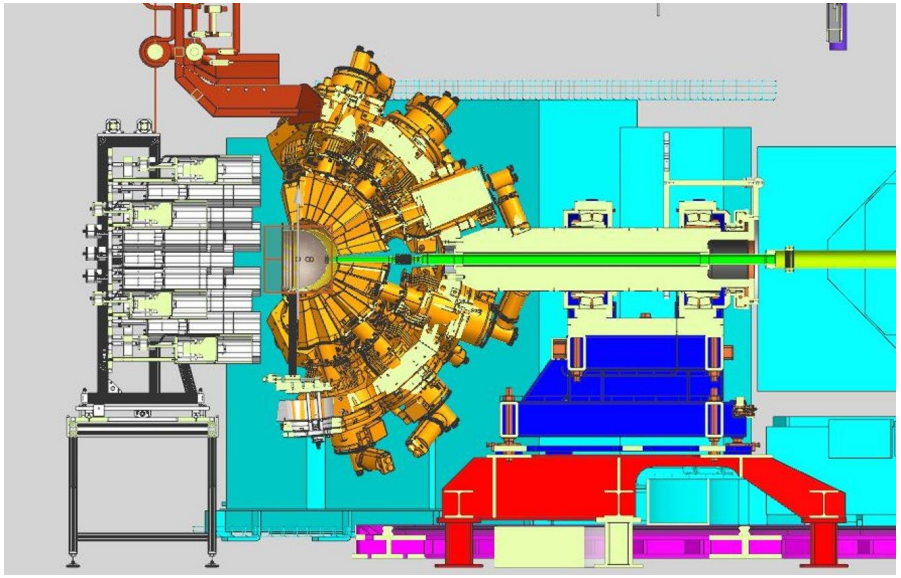
AGATA Zero-Deg Configuration

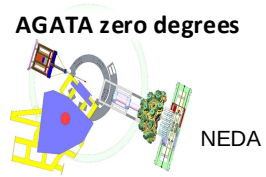
- Beam line goes through the shafts and is connected to the shell of the chamber
- Beamline diameter 55 mm, narrowing down to 33.4 mm at chamber entrance

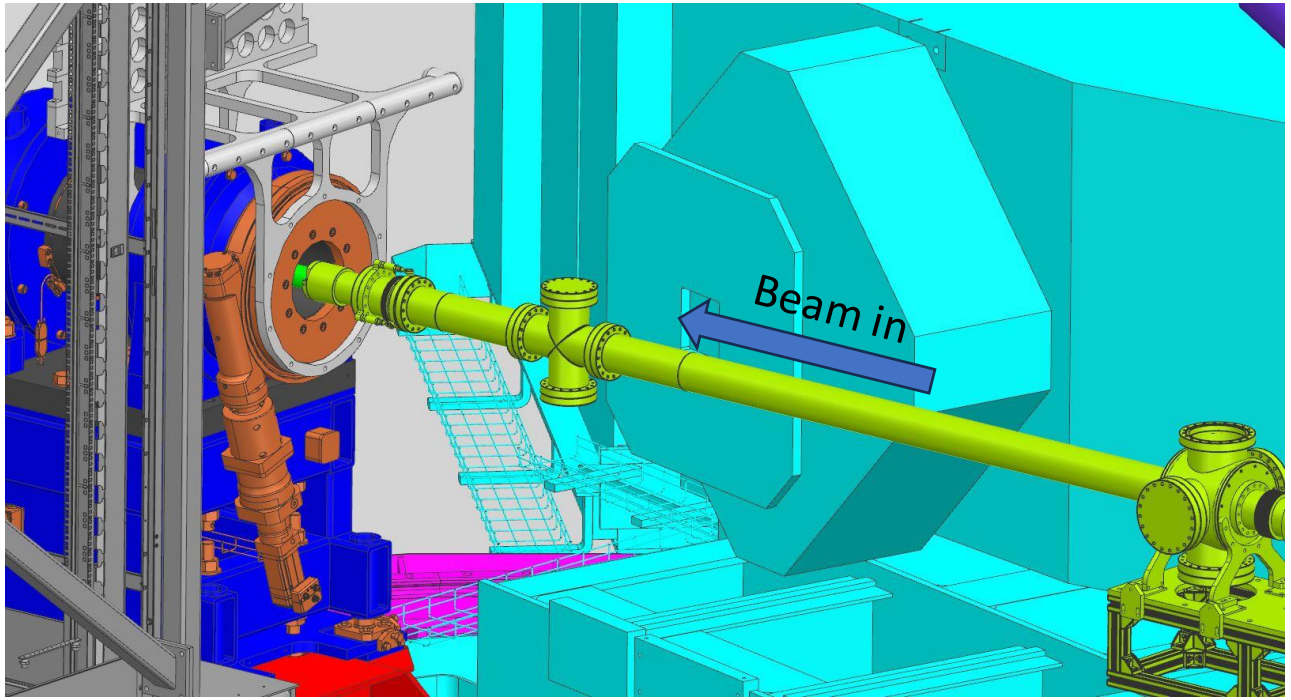


Telescopic movement of the beamline to change detectors-target distance working in high-efficiency configuration: continuous range from 0 to - 55 mm

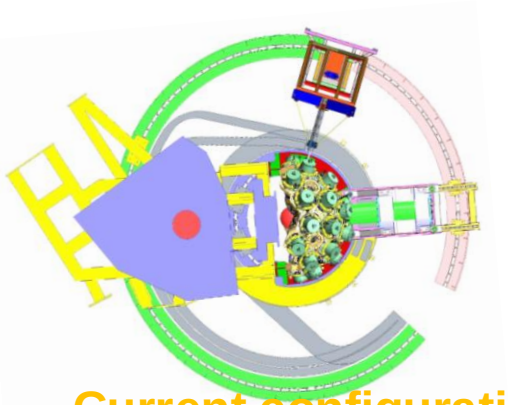






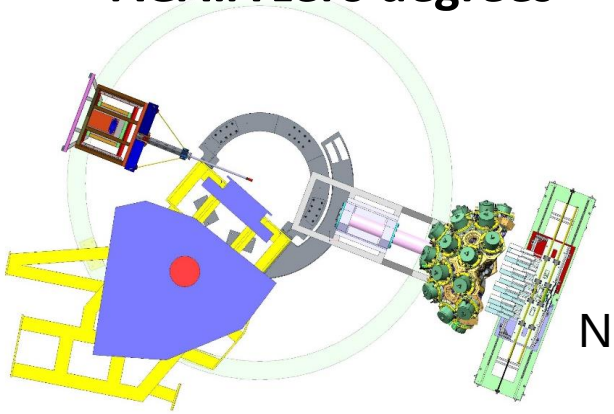


AGATA Zero-Deg Configuration



Current configuration

AGATA zero degrees



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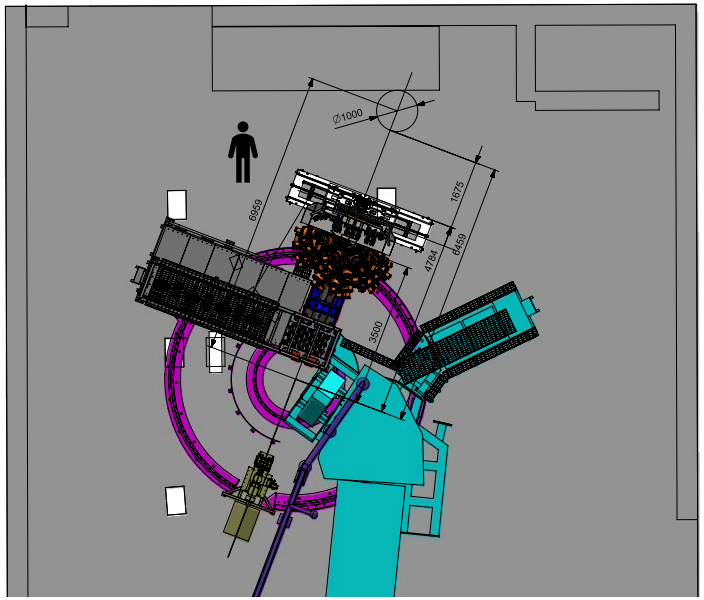
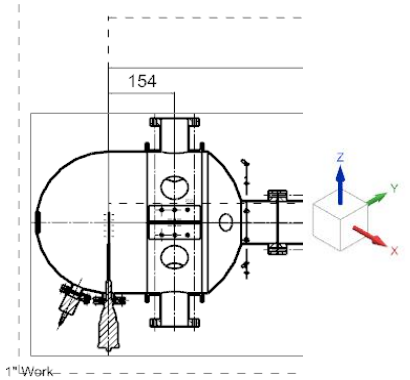
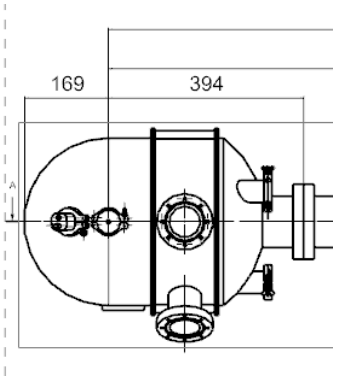


AGATA Zero-Deg Configuration: multi-purpose chamber

Upstream Shell:

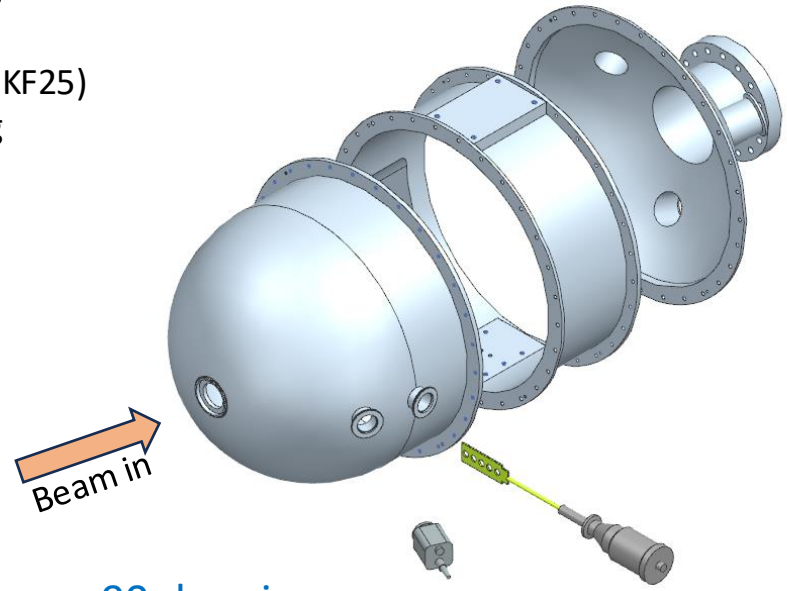
- 2 mm Al thickness; 170 mm radius
- Target holder (KF25)
- Videocamera for beam centering (KF25)
  Flattening towards the 90 deg ring
- (outside AGATA view)





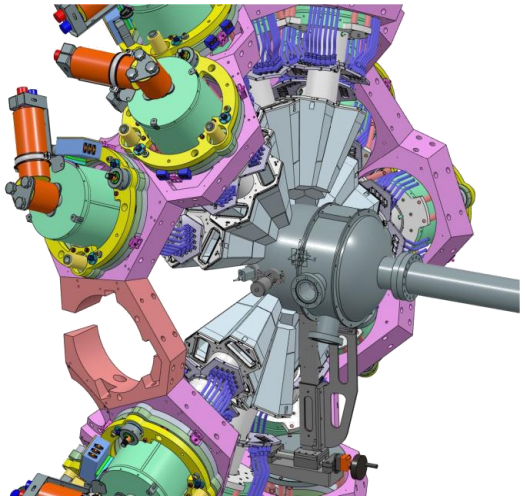
Downstream shell:

- 4 Viewports KF40
- Connecting flange to beamline CF100

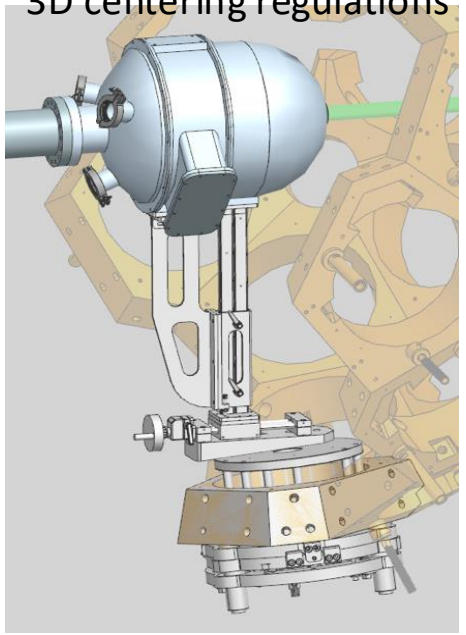


90 deg ring:

- Outside AGATA view, 5 mm Al thickness
- large flange for services in lower hemisphere (detectors' signals and power cables)
- Gauge monitor
- Inserts with blind holes for ancillary detectors holding structures

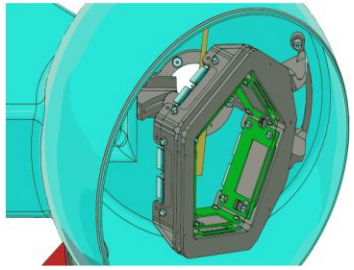
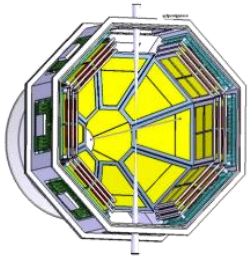
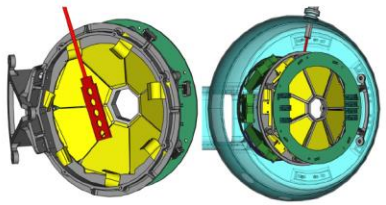
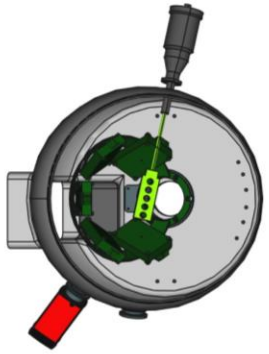
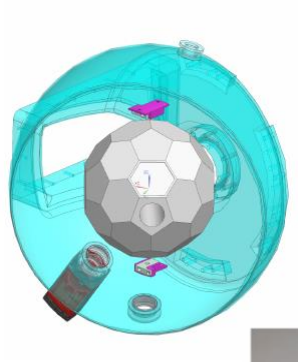


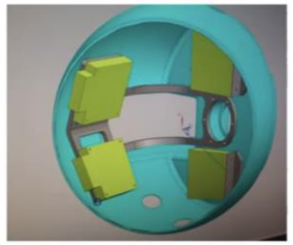
Support on flange:
3D centering regulations



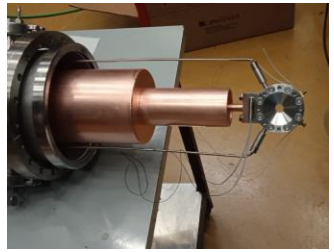
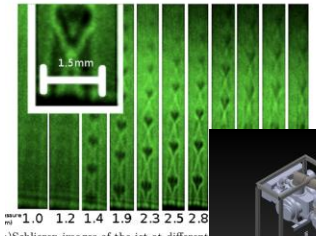
AGATA Zero-Deg Configuration: ancillary detectors

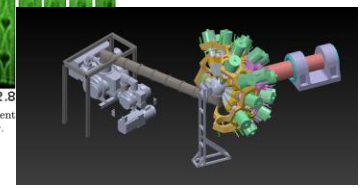
- GAL-TRACE and GRIT
- EUCLIDES
- OSCAR
- SPIDER
- DANTE
- Plunger
- Sauron

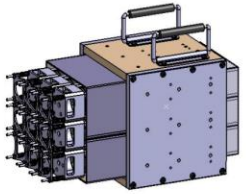


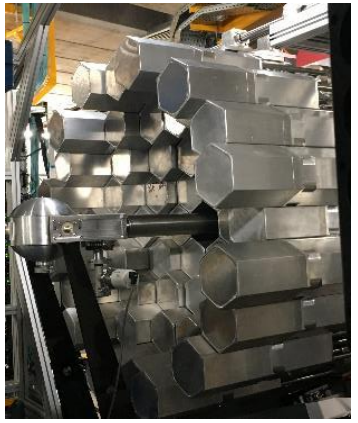
Targets: **CTADIR** + SUGAR + CHYMENE



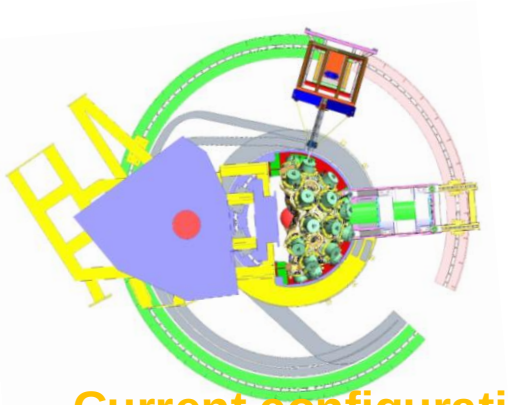

PARIS





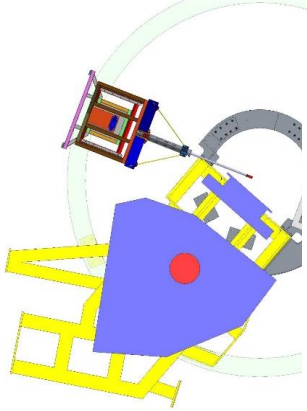
NEDA

AGATA Zero-Deg Configuration



Current configuration

AGATA zero degrees



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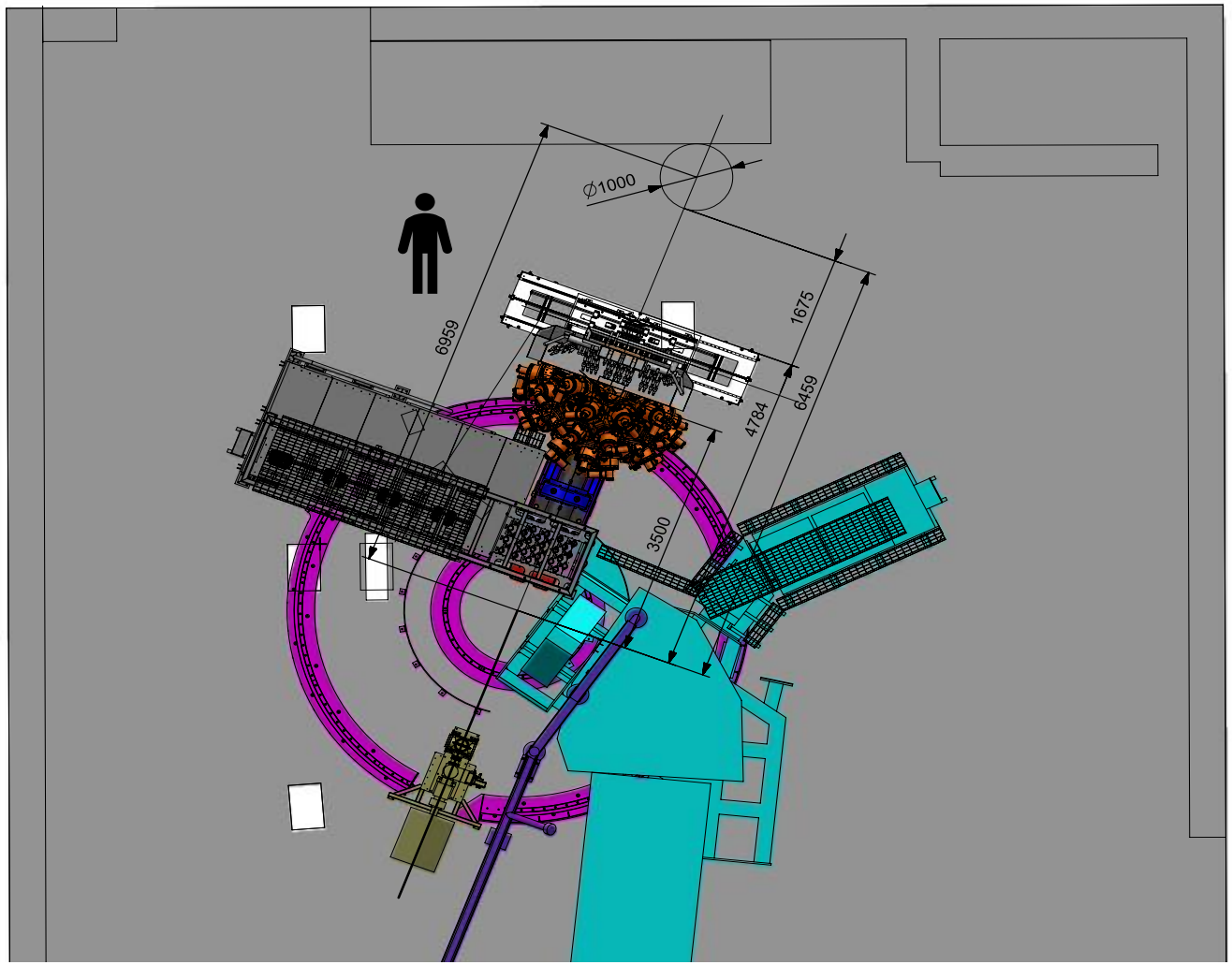
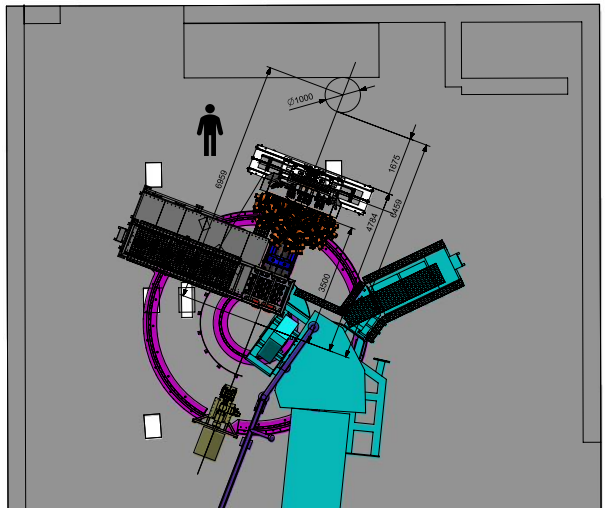
Full Length Article

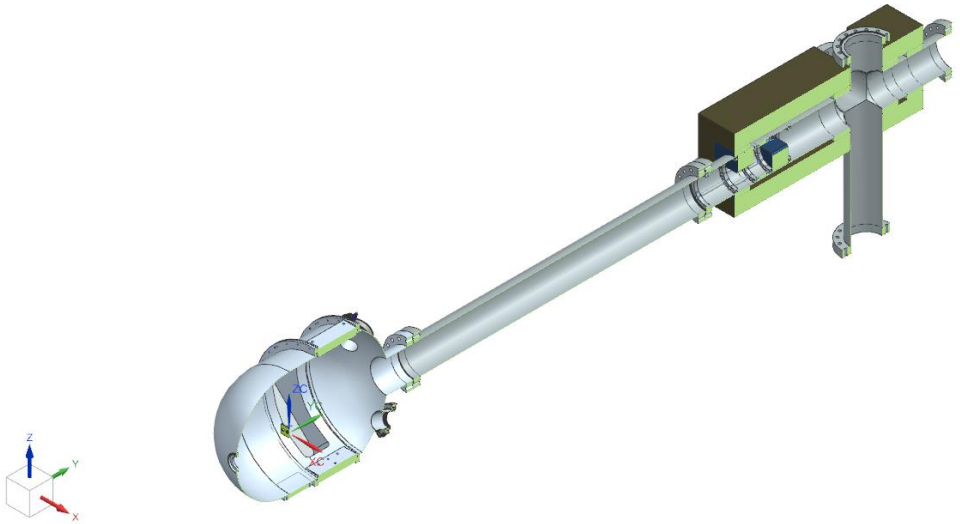
Conceptual design of the AGATA 2π array at LNL

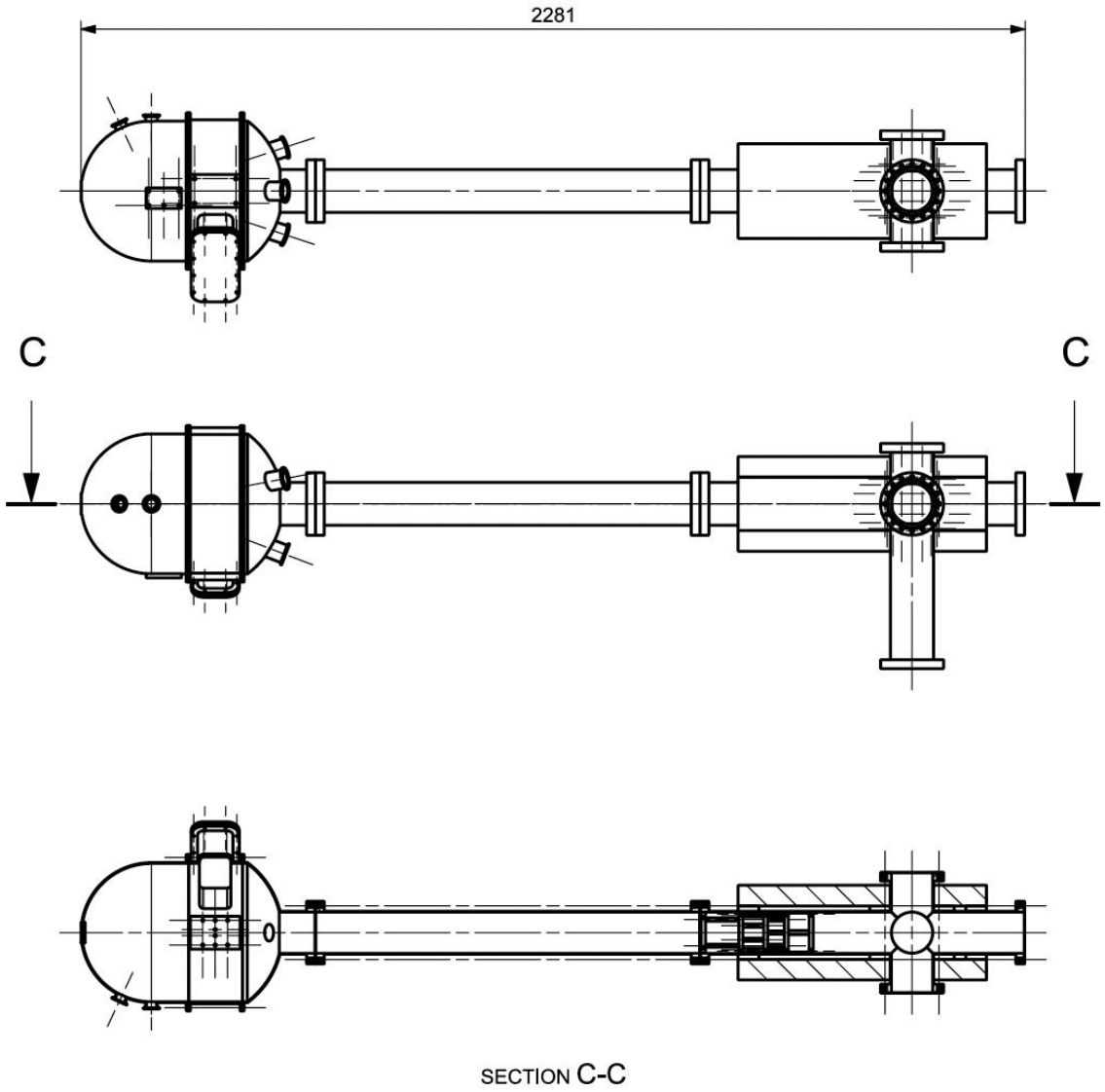


AGATA Zero-Deg Configuration: downstream and beam dump



Limited space available ~ 3m
Need to accommodate beamdump
Beamline easily detached from scat
Additional pumping units

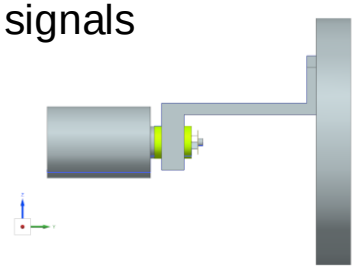


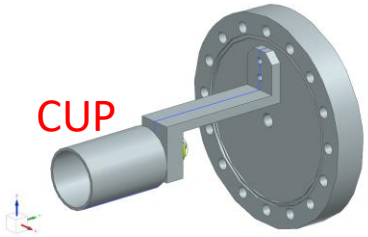


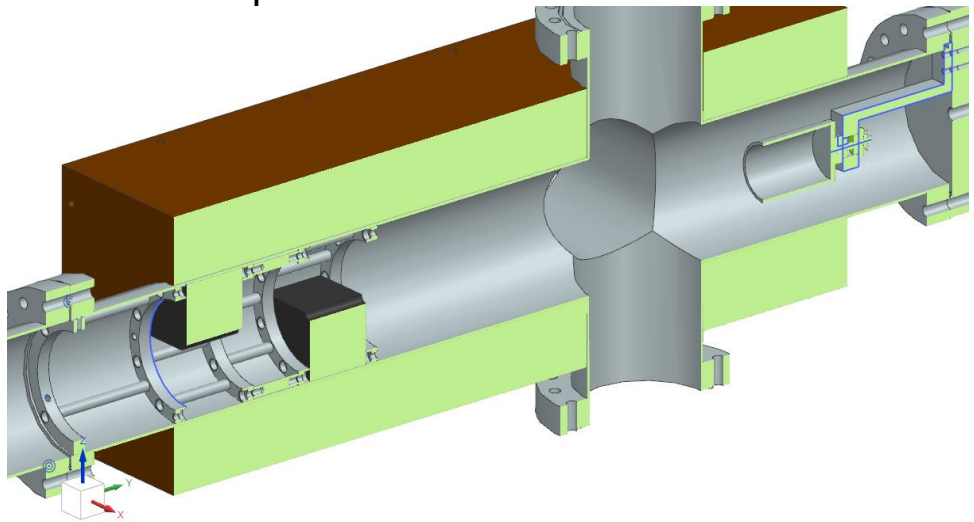
AGATA Zero-Deg Configuration: downstream and beam dump

Details of the beamdump chamber:

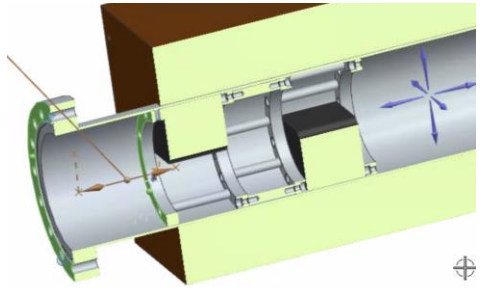
- It is a 4-way cross to allow location of a pumping system
- Beamdump cup located on end flange
- Feedthroughs for signals
- PEEK insulation



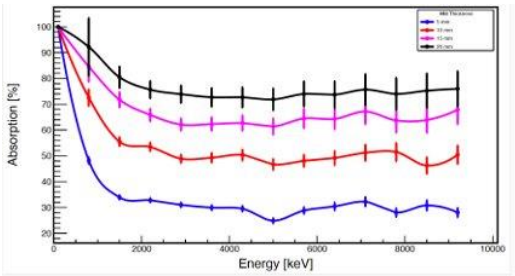


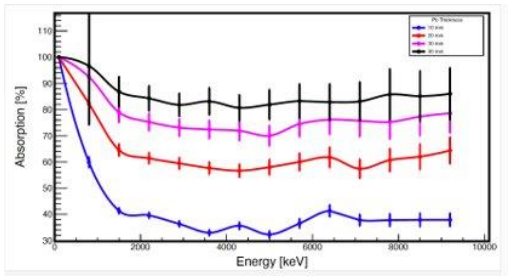


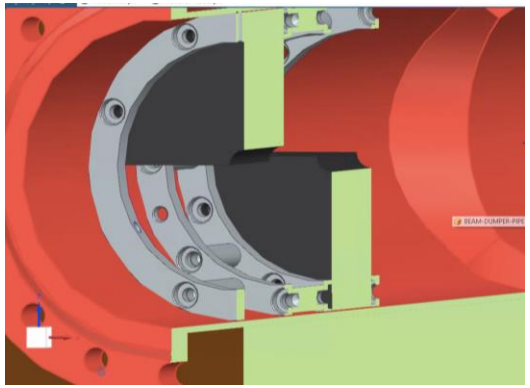
- End-flange closed using flat Viton CF o-ring for easy removal



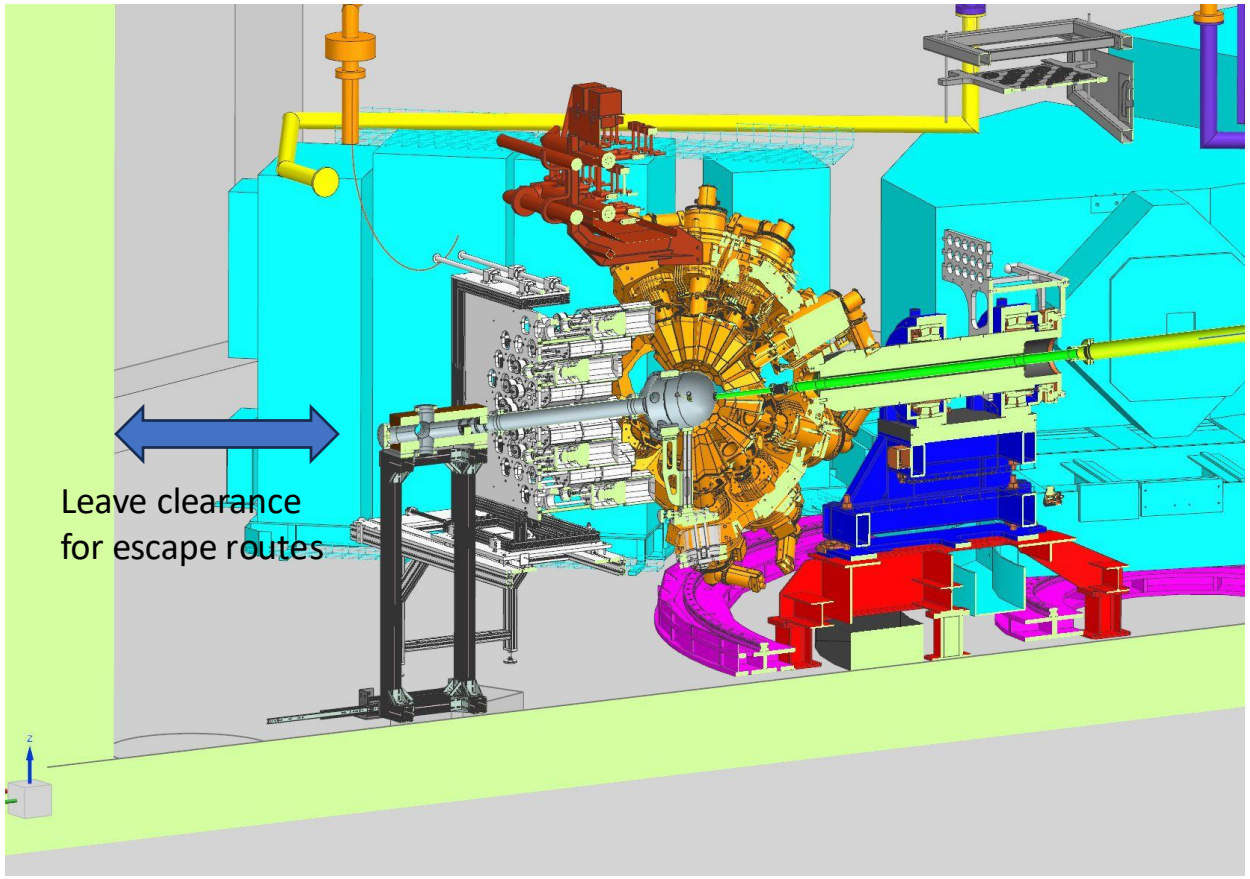
- Shielding:
  - Externally 50 mm Pb
  - Internally at the entrance of the chamber, two blocks pf W alloy to shield from backward scattering radiation
  - W blocks are detached to help vacuum and have a hole (10 mm) to allow beam entering.
  - Absorbs approx. 98% or radiation up to 4-5 MeV



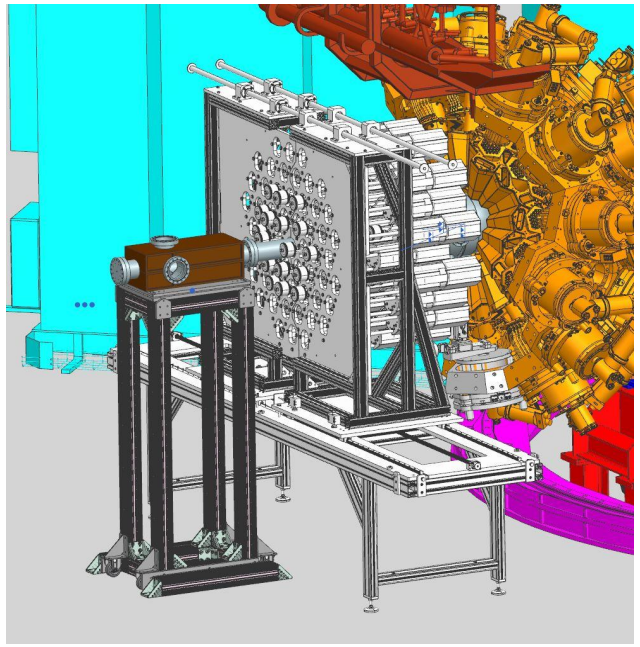




AGATA Zero-Deg Configuration: downstream and beam dump



- Beamdump support structure will be moved along its axis towards or away from the scattering chamber to allow opening operations in the chamber
- The beamdump will also guide the movement of the telescopic upstream beam line for high-efficiency configuration
- Diameter of the beamline 100 mm (CF100 standard), just one middle element between chamber and beamdump



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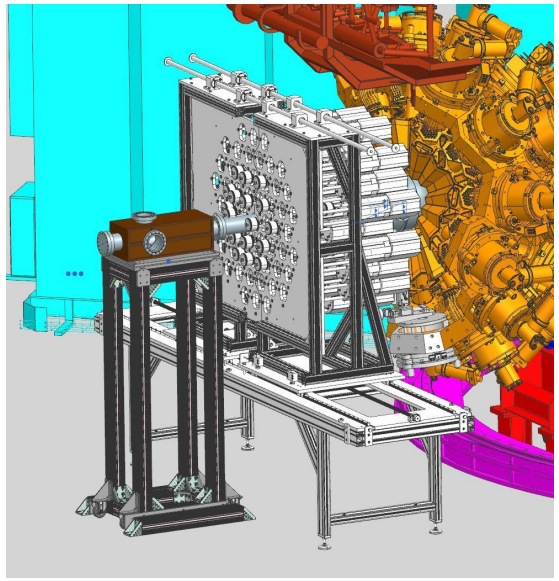
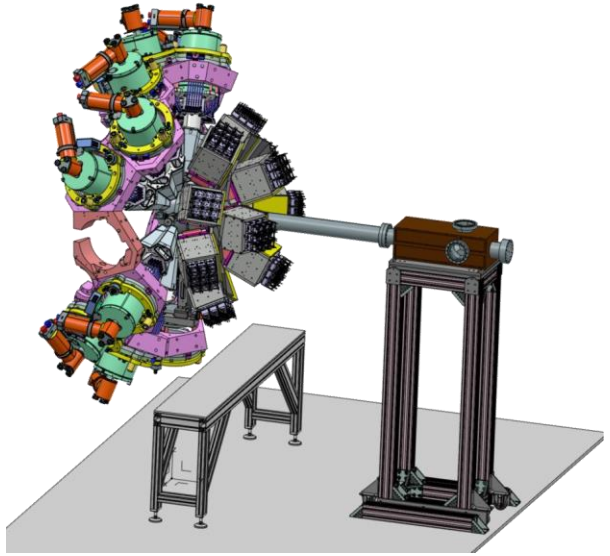
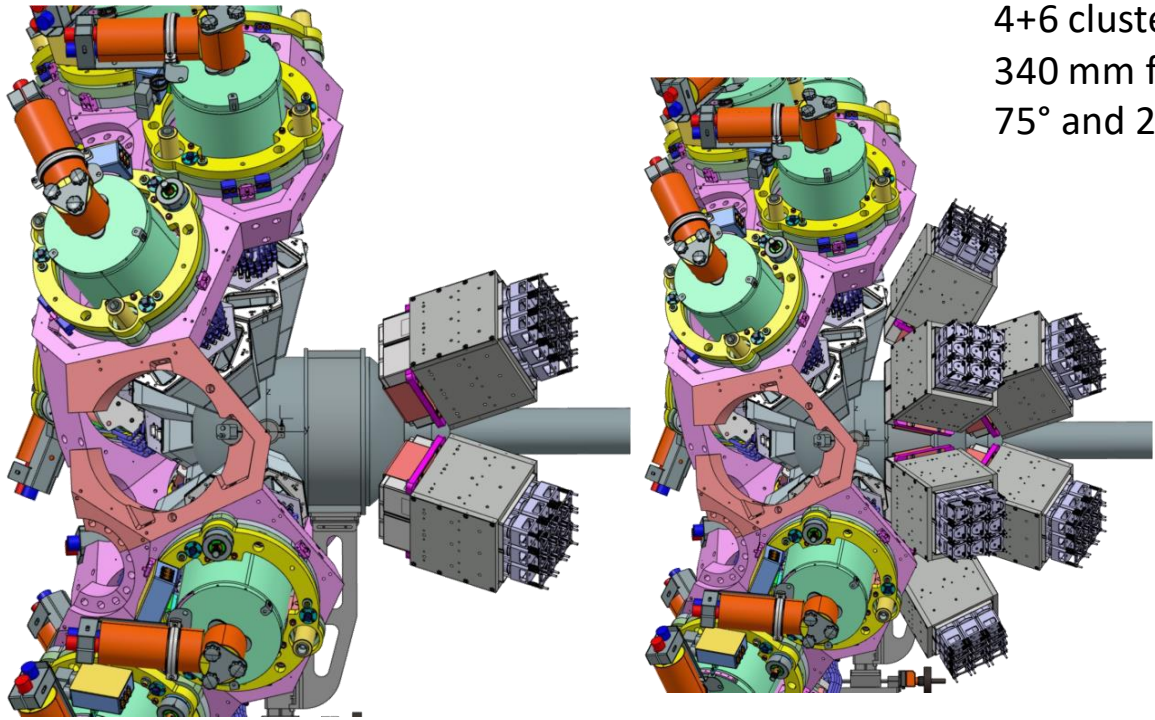




Details on NEDA/PARIS coupling:

- Supported on movable table, possibly on rails for position reproducibility
- Adaptation design on-going
- NEDA support already available
- PARIS support in designing phase (IJCLab+Krakow) ==> aim is to have 10 PARIS clusters at 340 mm from target
- Coupling of the two arrays -NEDA and PARIS- not viable ==> dedicated campaigns



4+6 clusters
340 mm from TA
75° and 28° from vertical axis

AGATA Zero-deg Configuration: Conclusions

- New position and new support for shaft+honeycomb designed and in production
- Solutions for beamline – scattering chamber – beamdump
  ==> designed consolidated
  ==> tendering and production ongoing (before end of 2024)

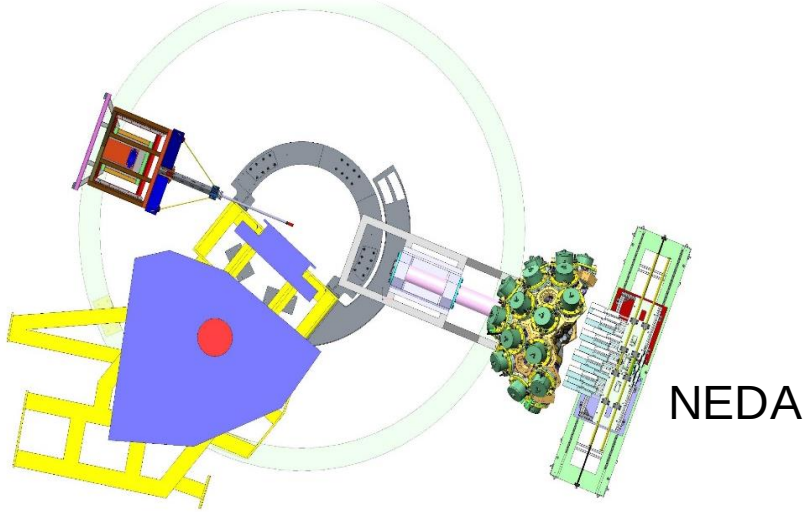
- Capability to host various ancillary detectors and new targets
  ==> opportunities for new physics campaigns

- On-going discussion with PARIS and NEDA collaboration

- Have we missed something out?

- **Time required to complete the new configuration: 6 months**

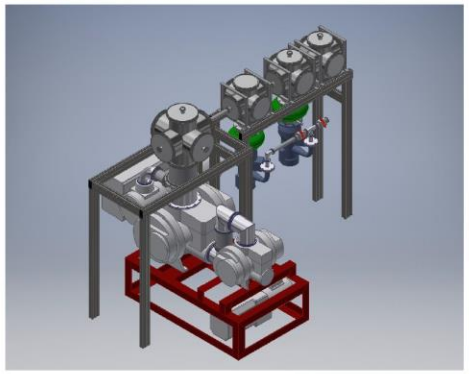
AGATA zero degrees

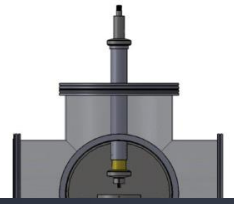


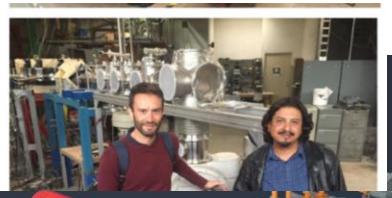
NEDA

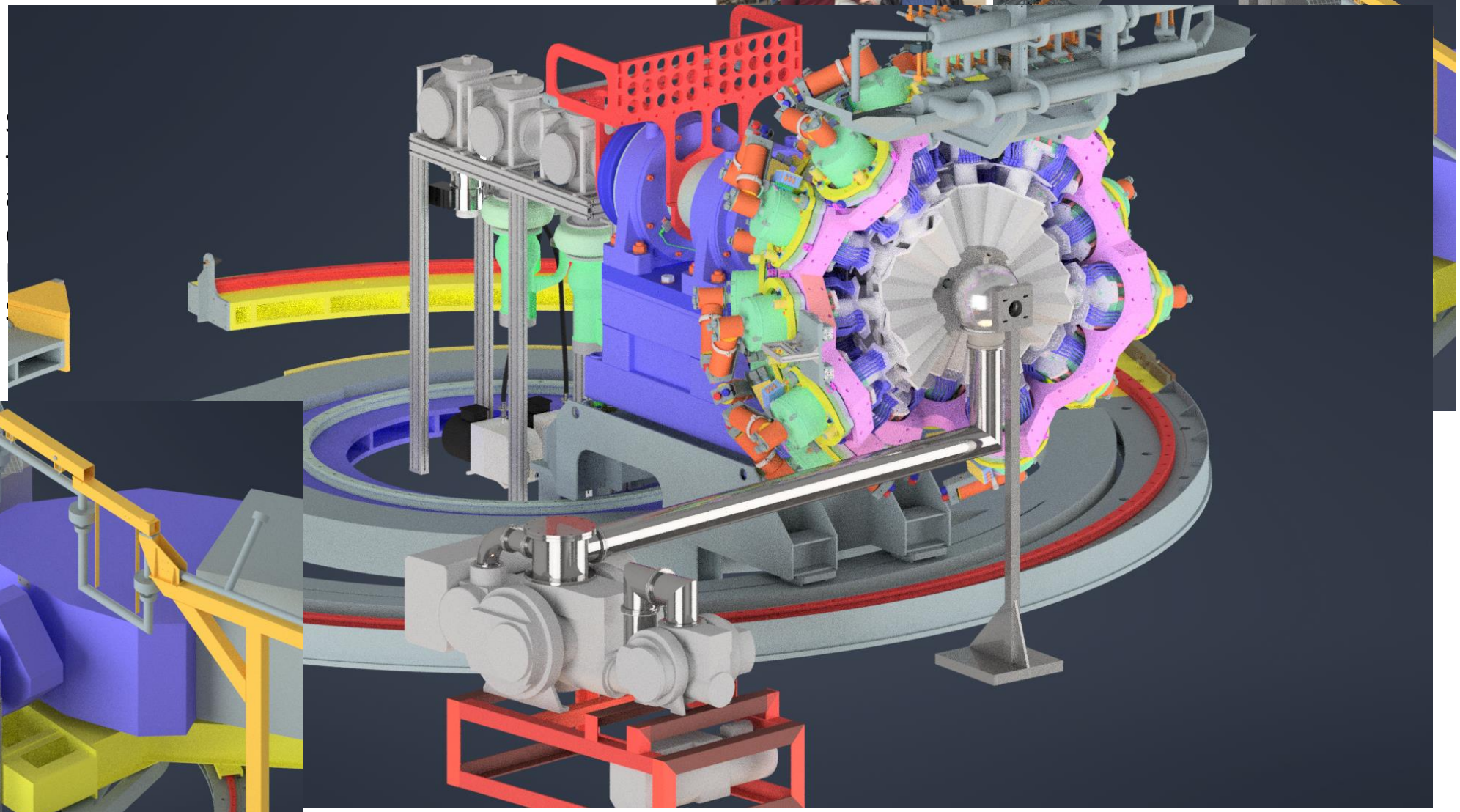
AGATA Zero-Deg Configuration: SUGAR gas-jet target

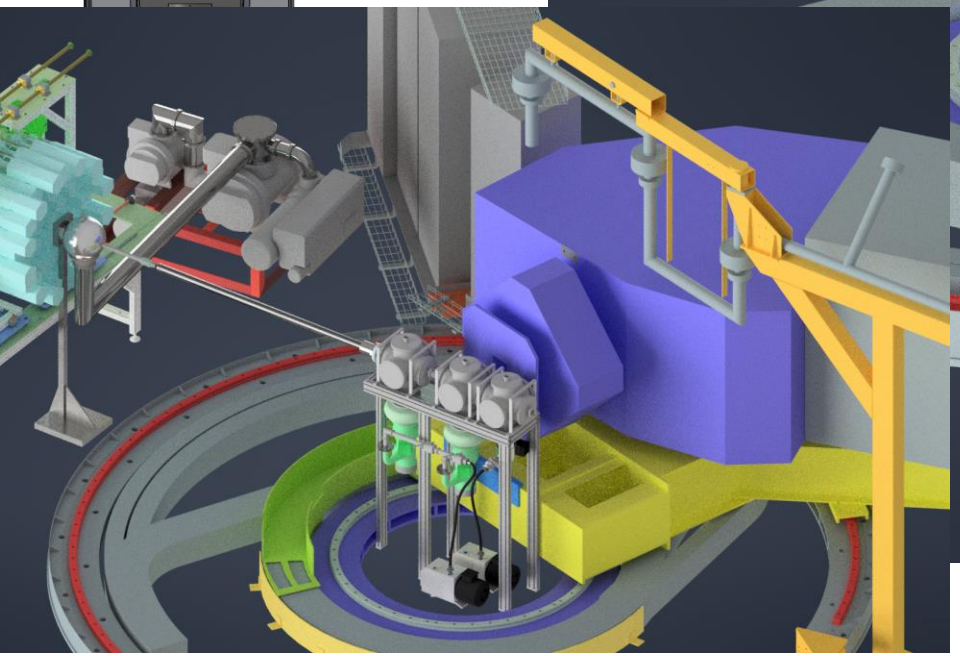
Design: Carlos Flores S.S.

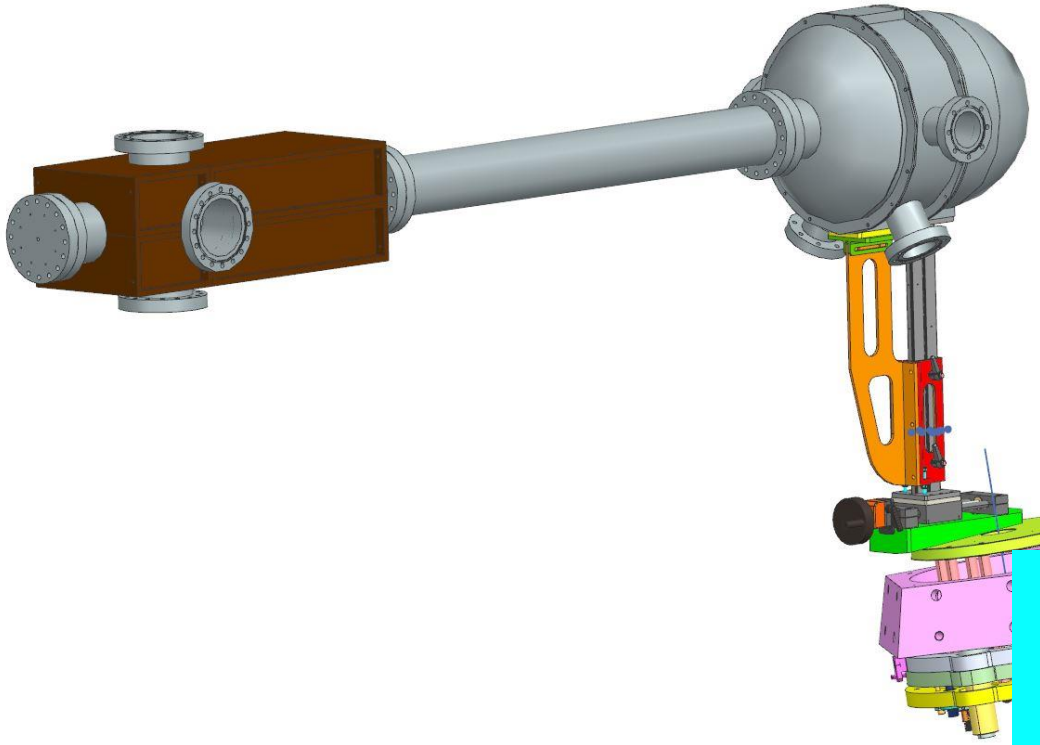


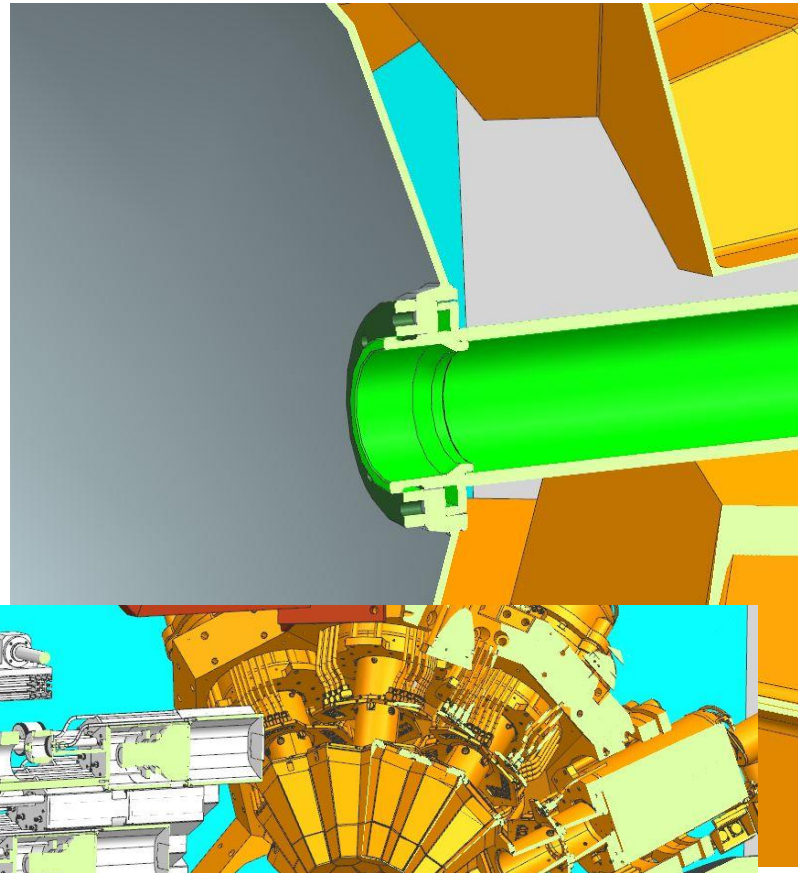


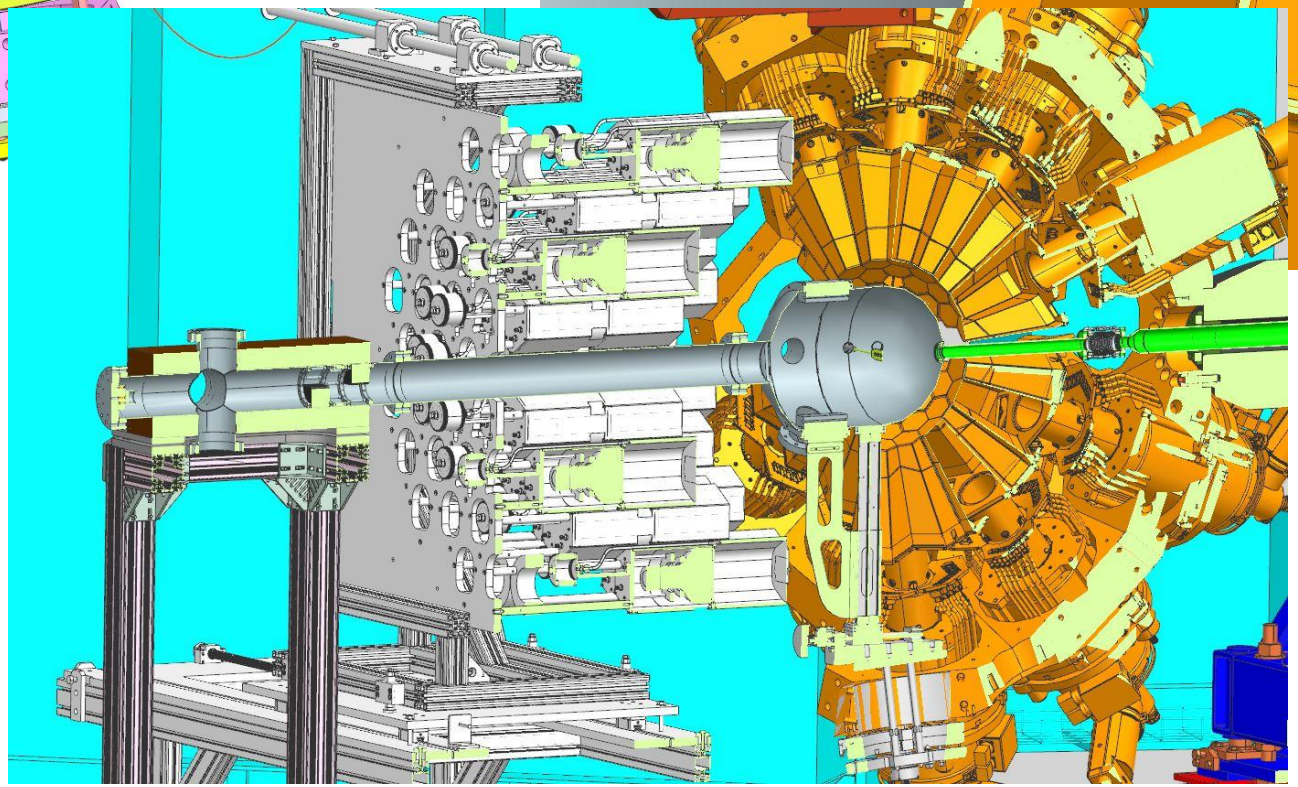




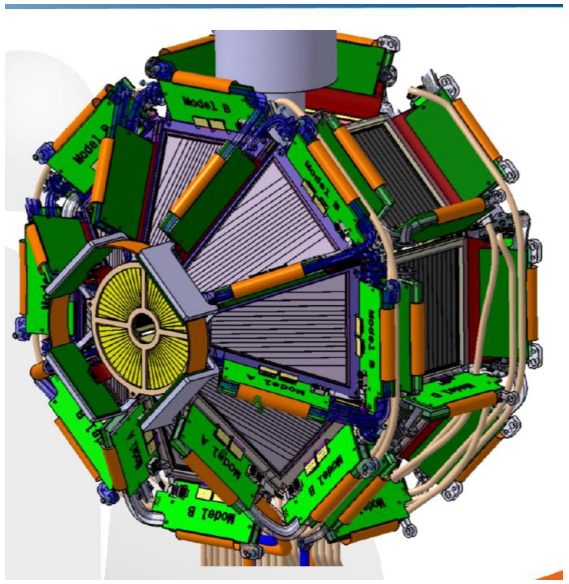








AGATA Zero-Deg Configuration: GRIT



- Chamber required to allow 4pi configuration
- 88 Front End boards under vacuum
- Large number of feedthrough connectors
- Possibility to couple to Chymene under development

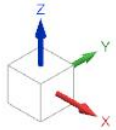
==> to be used with radioactive beams from SPES
==> integration to be further discussed

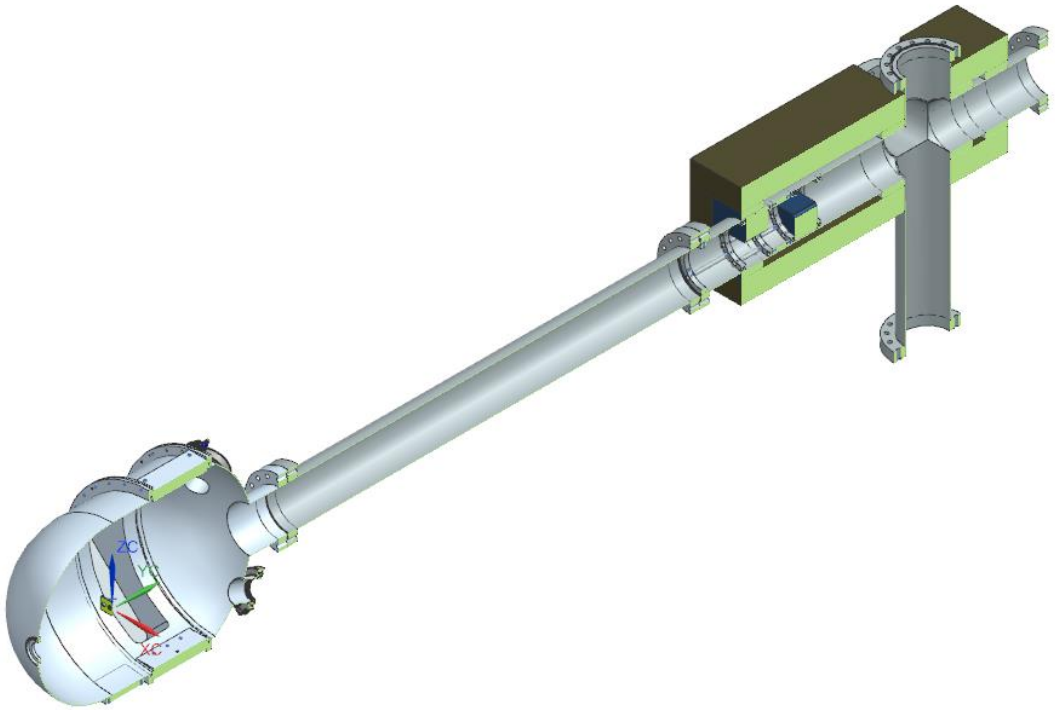
Fori nella calotta a 90 deg: fori M5 ciechi, 6 per piastra interni e 4 esterni;
Anello a 90 deg in acciaio?
KF40 o KF25 sulla calotta a valle

Peso totale linea di fascio sono circa 7 kg, sono a sbalzo, va bene?

PROCEDU

DESCRIZIONE E IMMAGINE ES





DETTAGLIO MONTAGGIO ANCILLARI

Beam dump da modificare come disegni a pagina 8 del pdf, con una linguetta di sostegno e connettero LEMO di lettura

CF100 con o-ring Viton piatto tra beamdump e linea di fascio

Tavolo di NEDA, dimensioni? Allungare per aumentare apertura?
Vasca di raccolta liquido scintillante

Disegno del castello di Pb

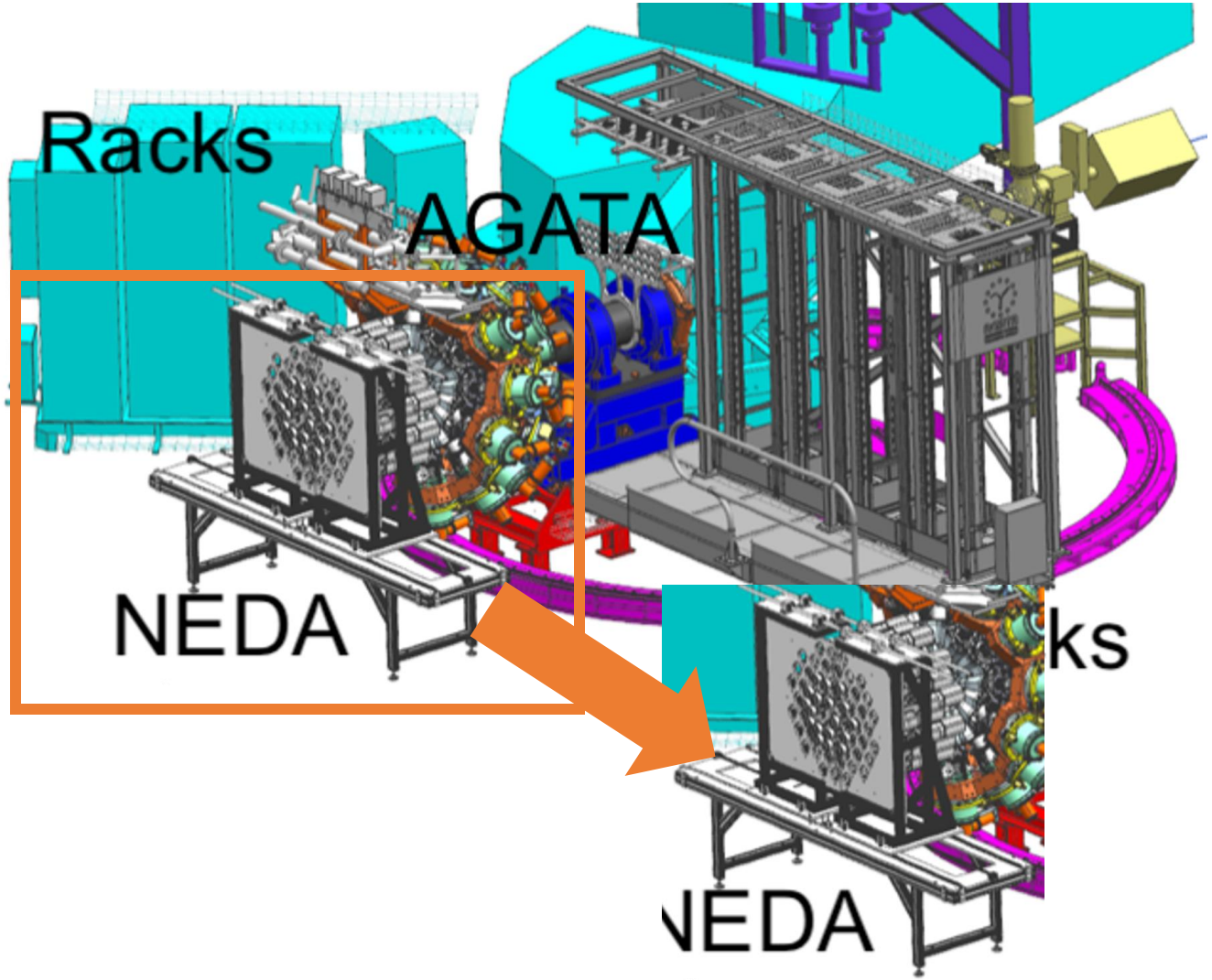
AGATA Zero-Deg Configuration: NEDA and PARIS

NEDA stand/table will need to be redesigned

- NEDA will need to move to the right to allow access to AGATA
- Rails will be installed to help smooth operations and reproducibility of positioning

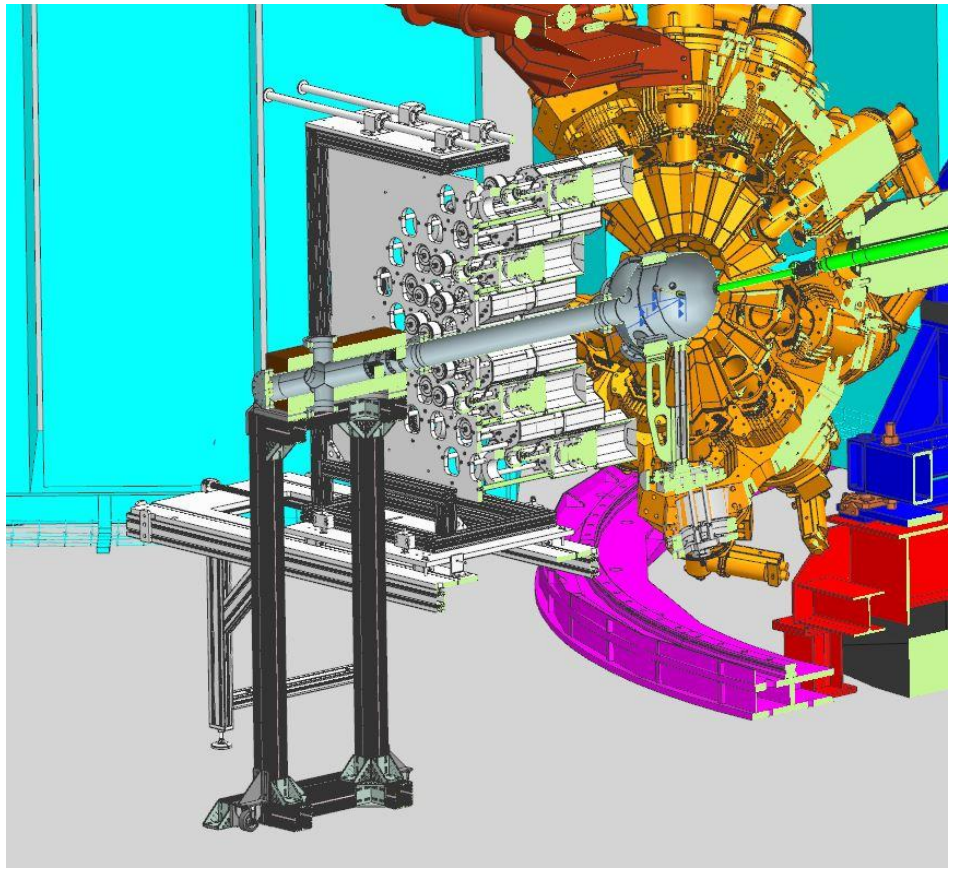
- PARIS wall would need to be adapted to sit on same table

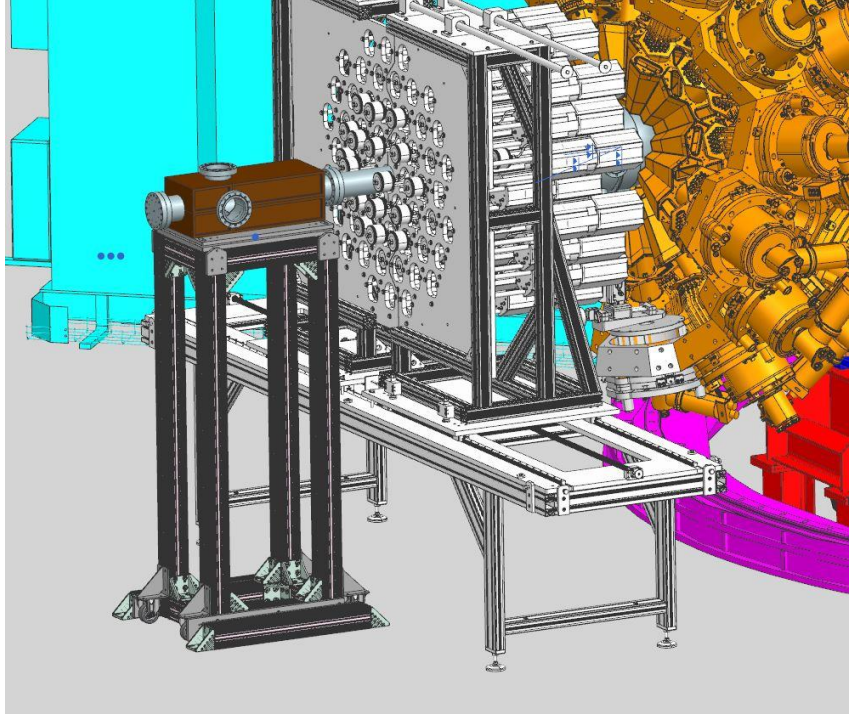
- NEDA+PARIS not viable option



Movimentazione linea di fascio downstream

apro NEDA sgancio calotta; sgancio da linea di fascio; tolgo tubo
traslo NEDA

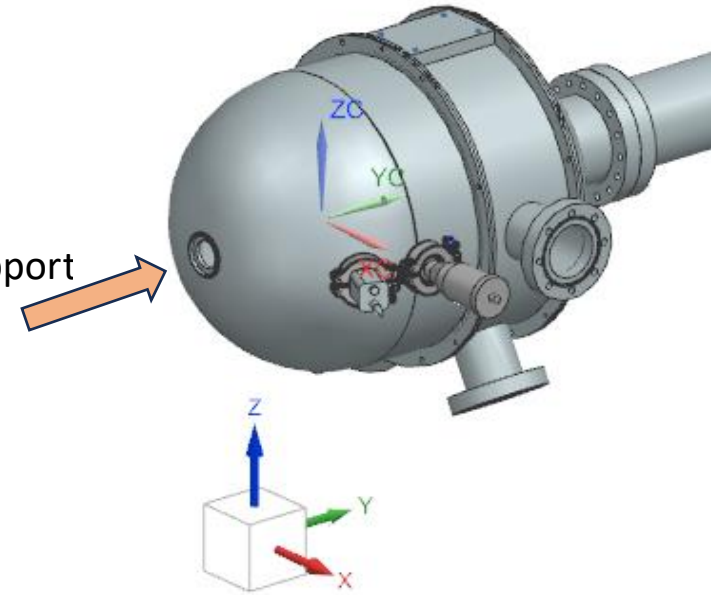


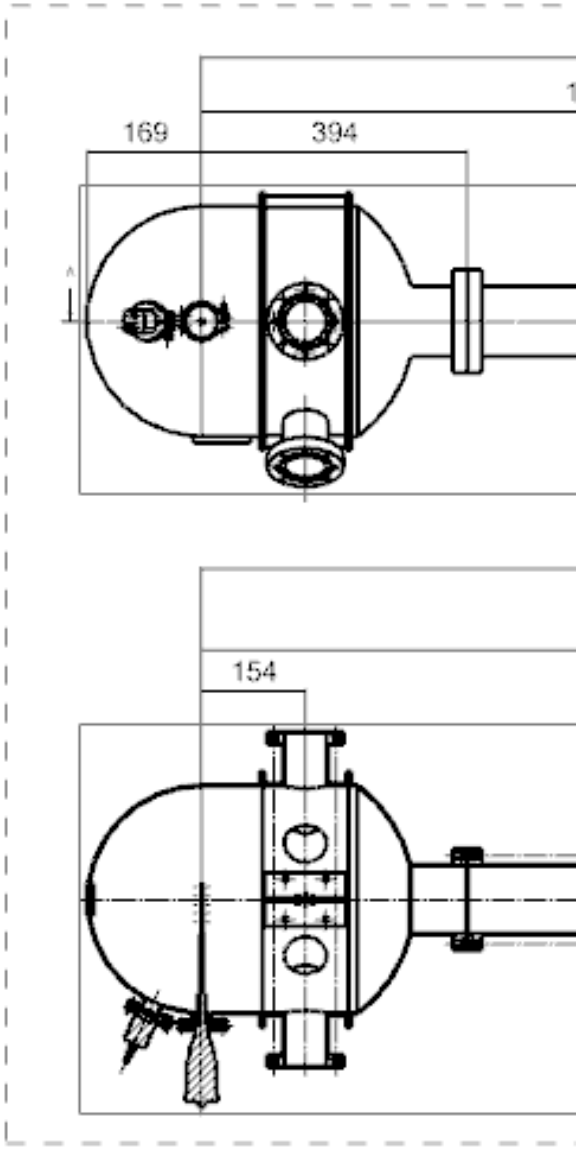


AGATA Zero-Deg Configuration: multi-purpose chamber

Guidelines for scattering chamber:

- Composed of 3 elements:
- Working at $10^{-5}/10^{-6}$ mbar pressure
- Alluminium 2 mm thickness
- radius of ~ 170 mm
- Reproducibility of positioning and centering thanks to support





Service entrances:

- Target holder (existing) KF25
- Vacuum gauges KF25==> anello a 90 deg
- Videocamera for beam centering KF25, backward
- Feedthrough for cabling of ancillari det.: 4 CF63 A 45 DEG

Insertion of CTADIR target uder evaluation
Supported from below (flange # 15)

DETTAGLIO DELL'AGGANCIO SU LINEA DI FASCIO
CF100 LINEA DI FASCIO FINO IN FONDO
SPESSORE ANELLO CENTRALE 5MM
CAVA 0-RING SEMPRE SULLA PARTE FISSA
VIEWPORT CALOTTA A VALLE ==> viewports KF40, 4 in ogni emisfero
Angolo del viewport a monte ==> verificare posizionamento, 30 deg