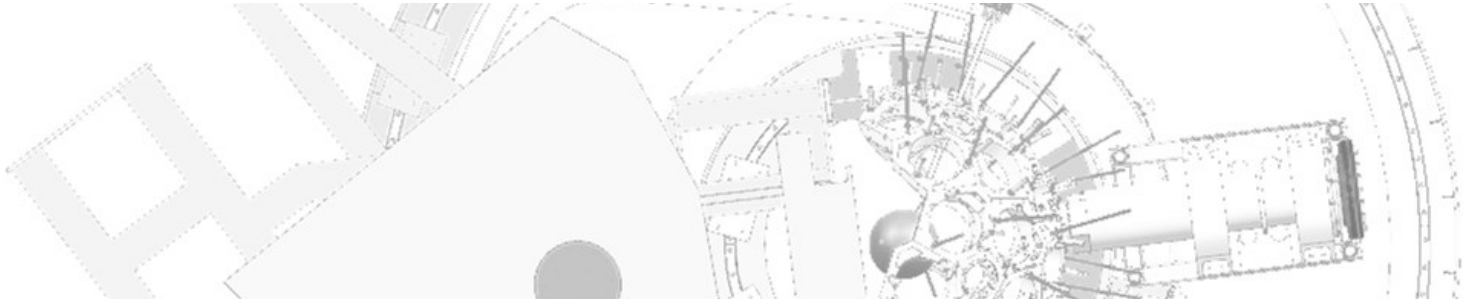
AGATA@LNL



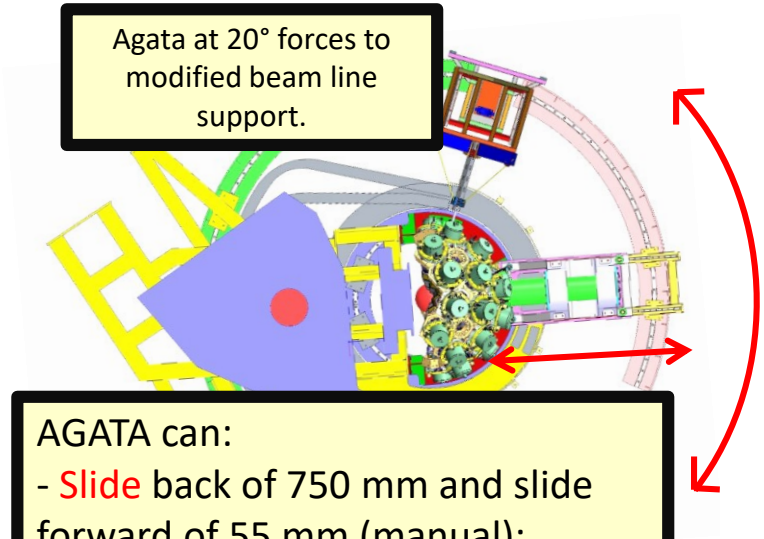
Task 2 - Mechanics

INFN – PD: Nicola Bez, Mirco Rampazzo, Loris Ramina, Fabio Veronese
INFN – LNL: Marco Scarcioffolo, Diego Giora

AGATA week 17th March 2021

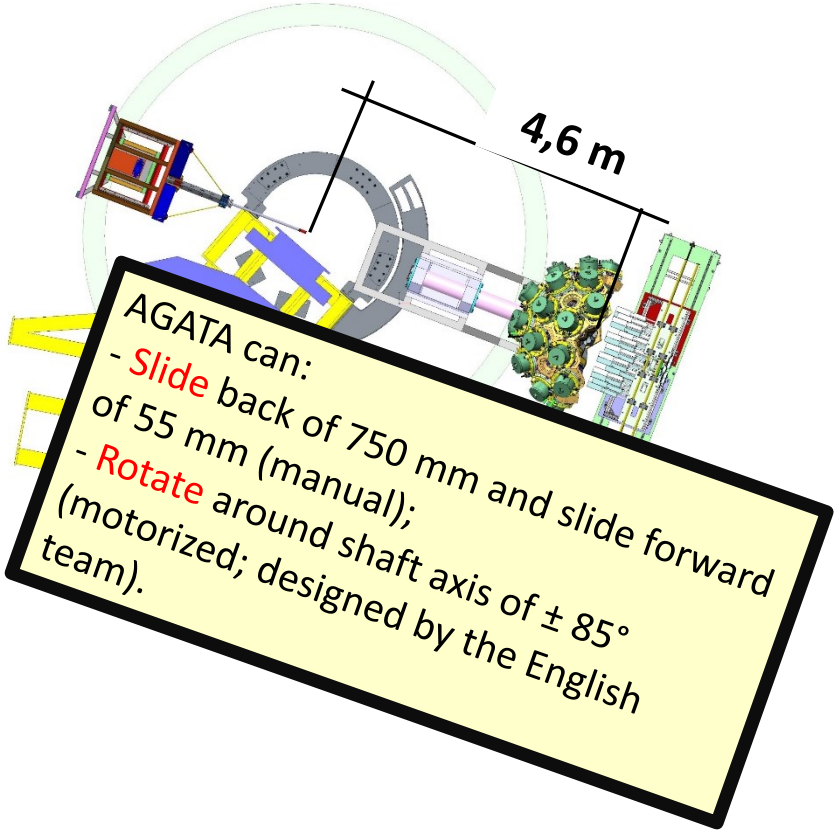
Two possible configurations

AGATA coupled with PRISMA (~~27~~ 19 ATC) 2021-2022



AGATA can:
- Slide back of 750 mm and slide forward of 55 mm (manual);
- Rotate with PRISMA from 20° to 110° (motorized);
- Rotate around shaft axis of ± 85° (motorized; designed by the English team) -> **only at 100° Prisma position!!!**

AGATA coupled with NEDA (30 ATC) 2023-2024



AGATA coupled with PRISMA

Some critical points regarding…

… MECHANICS

- Large interaxle spacing between circular rails (2 m)
- Small vertical gap between honeycomb (detectors array) and circular rails
- System compatibility even in NEDA configuration

… ELECTRONICS

- Great cables number (29 for each detector: 21 MDR + 3 HV + 2 LV + 3 PT100) ⟹
- Limited cables lenght (MDR: 10 m; other cables: 15 m) ⟹ racks close to Agata

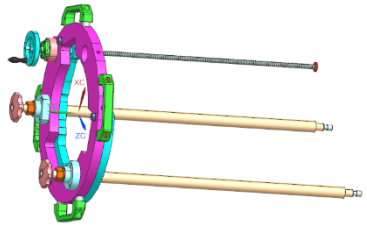
Cables are joined in a bundle of about 70 mm diameter! Weight: 3-4 kg/m

… LN2 LINE (inside Prisma hall)

- Flexible hoses as short as possible
- Accessible solenoid valves
- Horizontal manifolds
- Loading and unloading system guaranteed in the entire range of Agata roto-translation and spaced no more than 6 hours

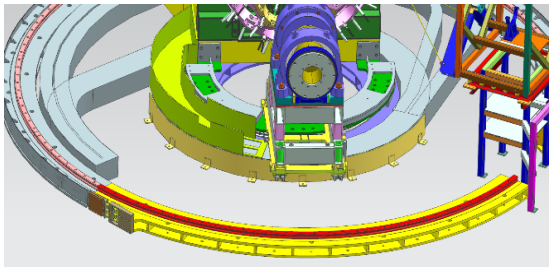
… BEAM LINE

- Conflict between the old support and Agata at 20°
- Impossibility of making a single telescopic section



Each design choice must take into account the detector insertion system: lowered from above and inserted horizontally into the honeycomb

Circular rail

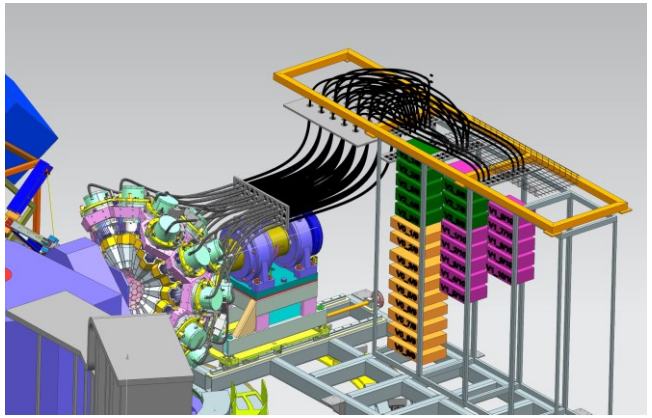


Design of the missing piece of rail.

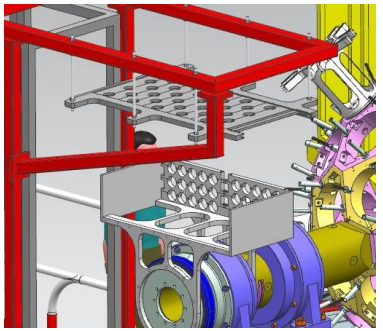
Need to create a new hole in the floor for the services, between inner and outer rail.
This hole was made 2 days ago.

The rail support will be positioned within a few weeks, thanks to the help of Daniele Scarpa with the laser track.

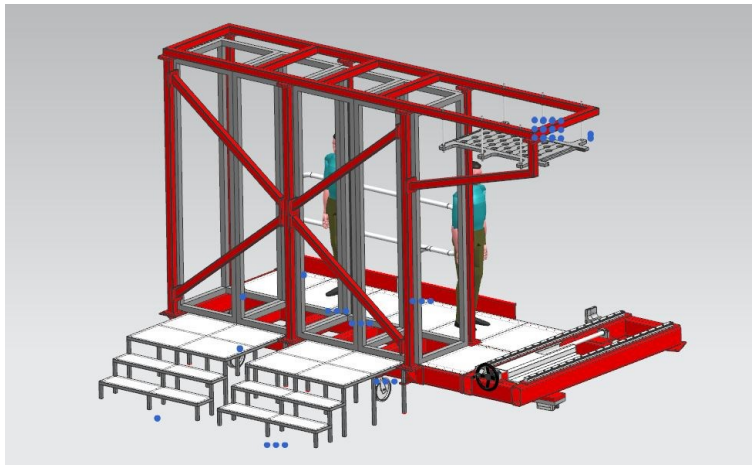
Cables management



4 racks for electronics as close as possible to Agata -> aligned on a platform accessible in front and behind, attached to Prisma and also containing Agata.



Each cable from the digitizer is already intended for its detector. Missing detectors allow you to have more freedom in cable placement.



The 30 bundles of cables are clamped on 2 modular plates: one (horizontal) near the racks, the other attached to the shaft.

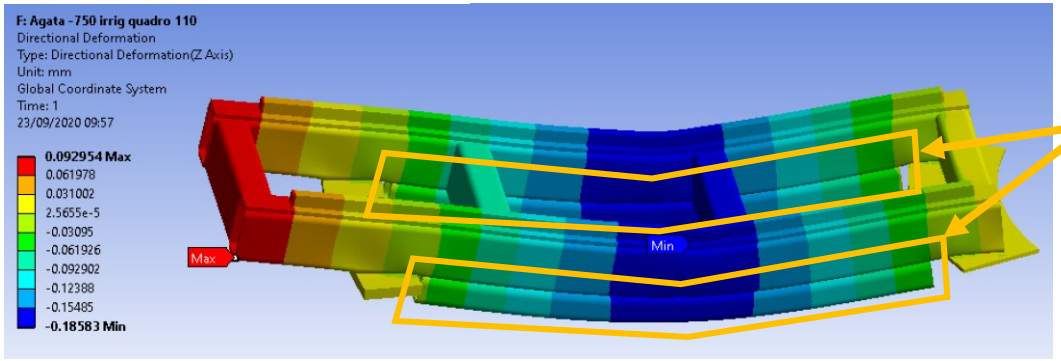
During Agata rotation the torsion will be absorbed by the section of cable between the two plates.

The section of the bundle, blocked by the plats, is covered with a protective sheath.

Platforms

The platform, to facilitate transport, has been divided into two: **The Agata platform and the Racks platform**

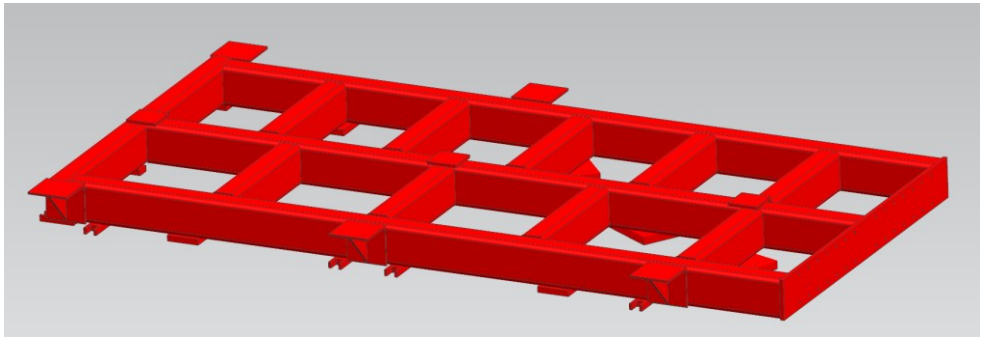
The Agata platform



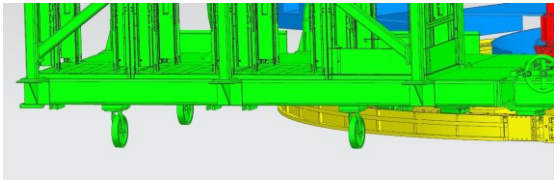
Stiffening elements have been added that will need to be removed in NEDA configuration

The structural analysis in the figure refers to the heaviest case with all the detectors mounted and Agate set back by 750 mm.

The Racks platform

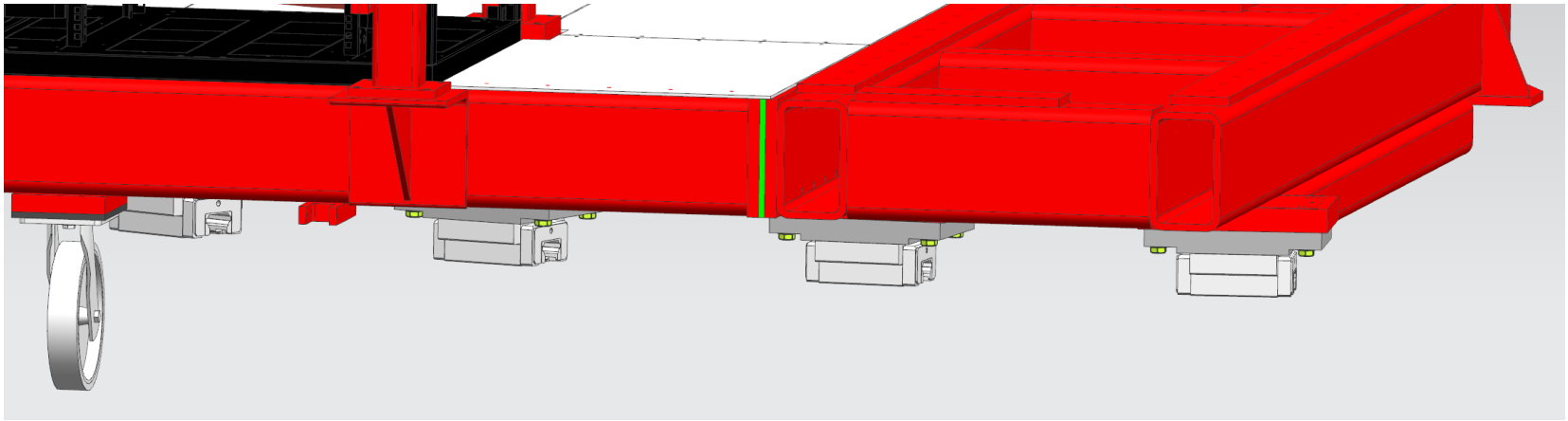


The Racks platform rests on 3 circular skates and on 3 floor wheels.



Platforms

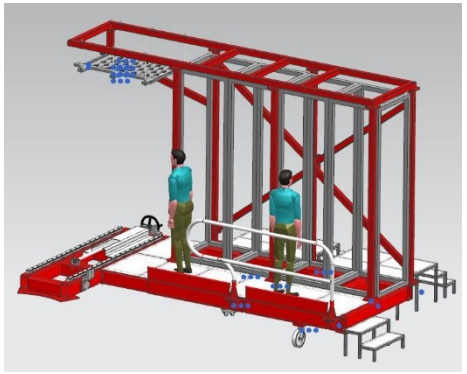
The irregularities of the floor are absorbed by elastic elements placed between the Racks Platform and the supports, and, moreover, between the Racks Platform and the Agata Platform.



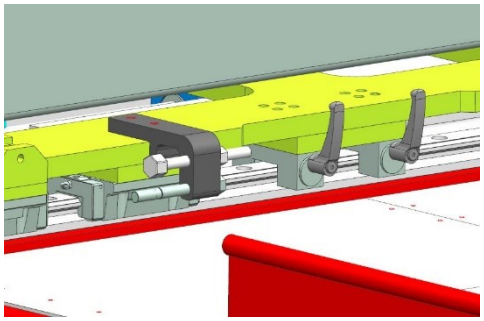
Agata platforms

The platform will also carry the Agata manual translation system:
- Rails and skates
- Front limit switch and rear limit switch
- Handwheel for handling

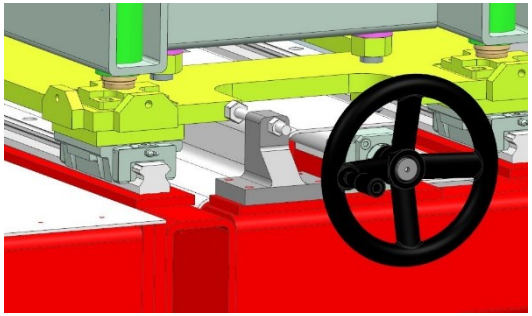
The platform is designed to be used (without stiffening elements) even with NEDA.



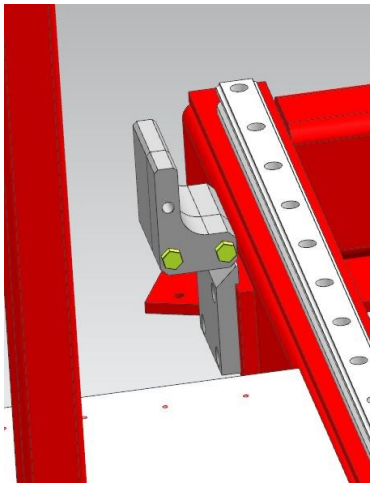
It will probably be necessary to insert a reducer to ensure manual handling, this will be evaluated during the nitrogen line connection test.



Manual brakes and front limit switch.

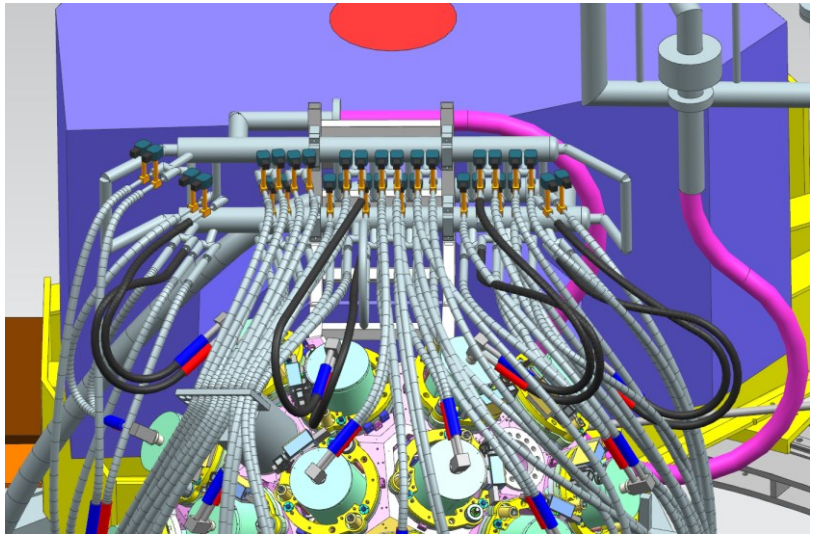


Handwheel and rear limit switch.



Locking system in 0 position and +55 mm.

LN2 line



It was decided to place the two collectors (loading and unloading) as close as possible to the detectors and attached to Agata; ADVANTAGES: 60 relatively short hoses, but with custom lengths.

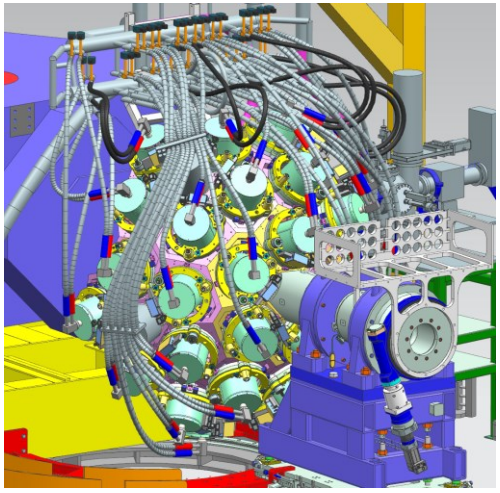
The proposal is to collect the hoses inside the pentagons among the flanges (instead of old “fungus”).

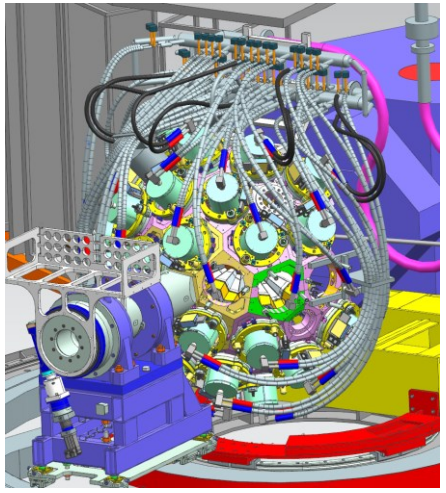
In the "right" hemisphere, however, the external cut flange can be used to avoid possible conflicts between hoses and beam line.

Hoses lengths

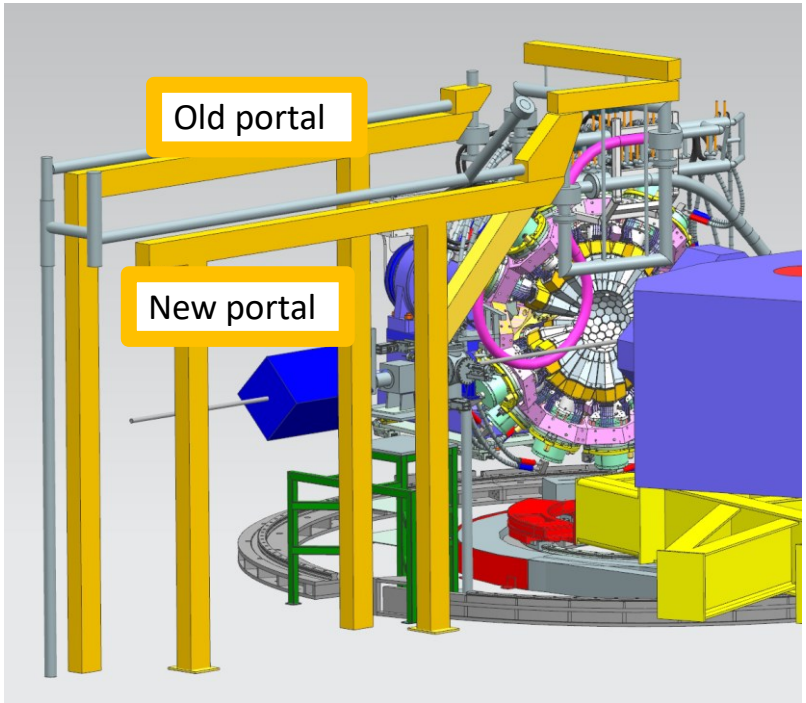
Lunghezza (mm)	q.tà TOT	Bypass
1460	10	1
1900	15	
2400	15	
3000	7	
3700	13	
4000	1	
TOT	61	

Lunghezza flessibile (mm)	
carico	scarico
5000	7300

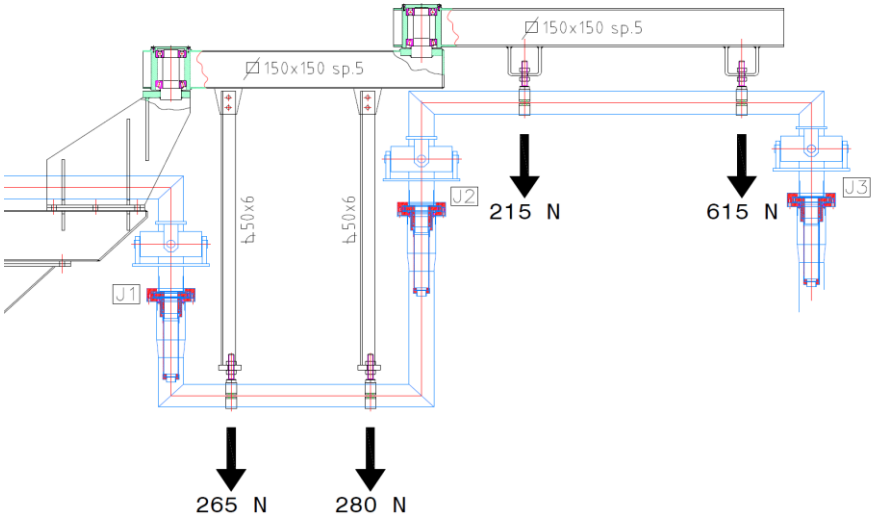


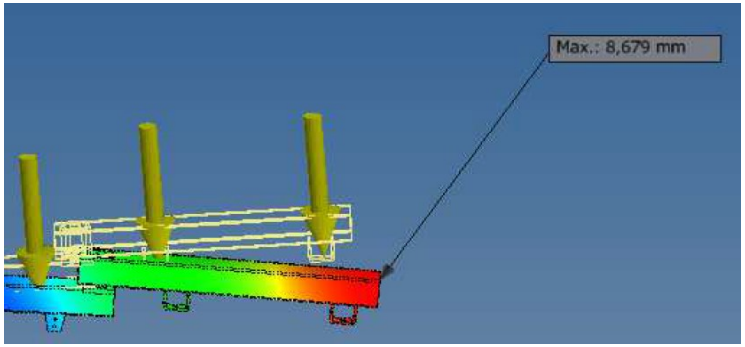


LN2 line



The project of the new portal has been defined in collaboration with CI.TI.

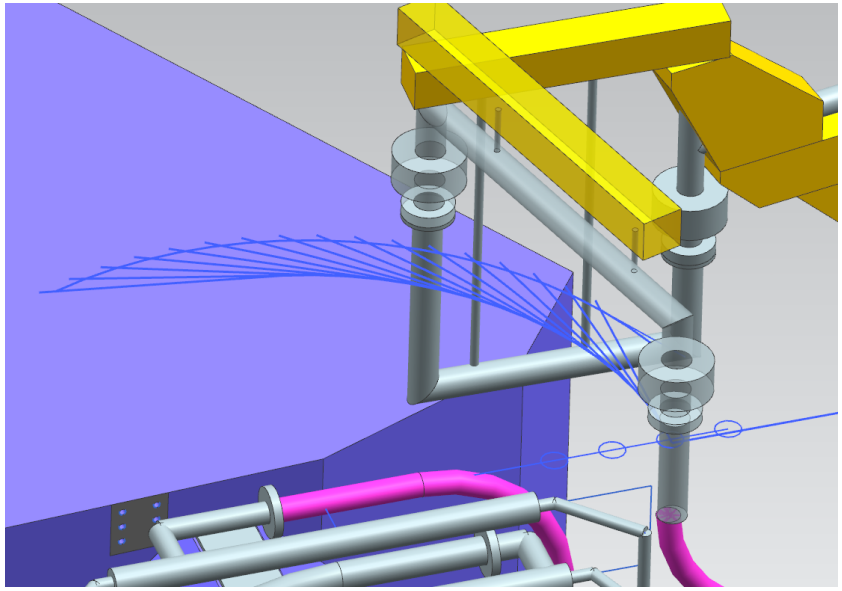




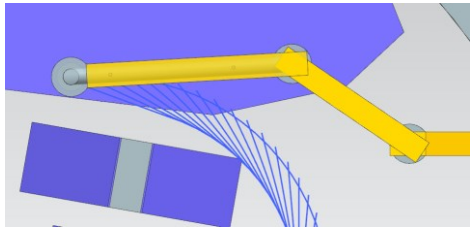
The deformation at the tip is compensated by the adjustments on the line which remains almost horizontal.

LN2 line

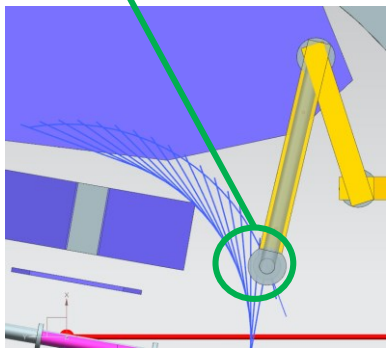
The system of articulated arms must guarantee the coverage of the blue areas that represent the positions of the Johnston 3 (J3) during the roto-translation of Agata



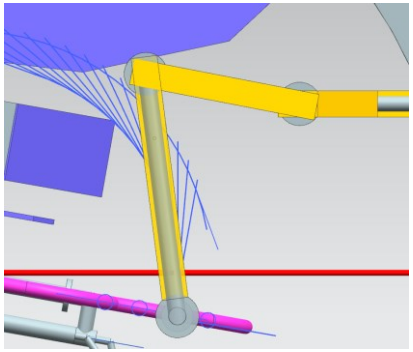
More critical positions for the joint given the reduced angles between the arms. This places a large load on the towing system of the J3 (about 40 kgf). Further investigations will be carried out.



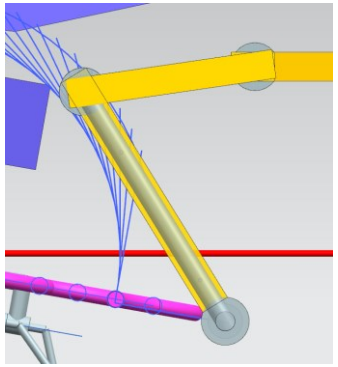
Agata/Prisma 20°



Agata/Prisma 100°



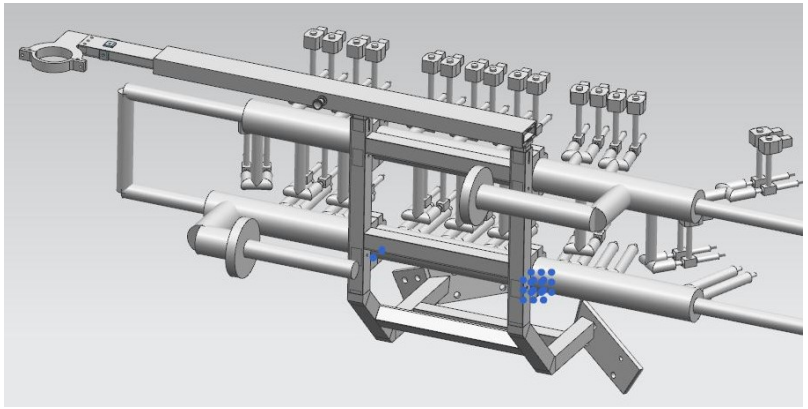
Agata/Prisma 100°, slide back of 750 mm

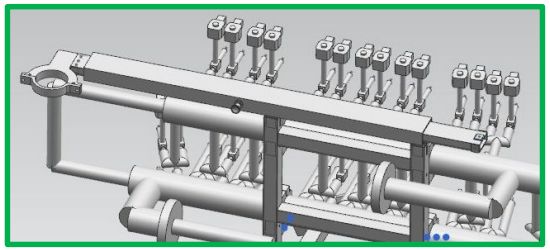


Agata/Prisma 100°, slide back of 750 mm and translated

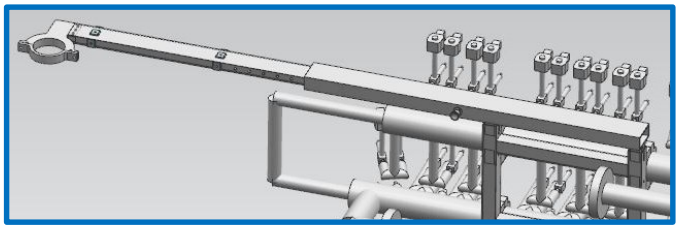
LN2 line

A telescopic arm integral with Agata allows the dragging of the Johnston J3, which must be released only to rotate Agata around its own axis. When it rotates clockwise it must also be manually brought into the extended position. This requires an indicative force of 10 kgf.

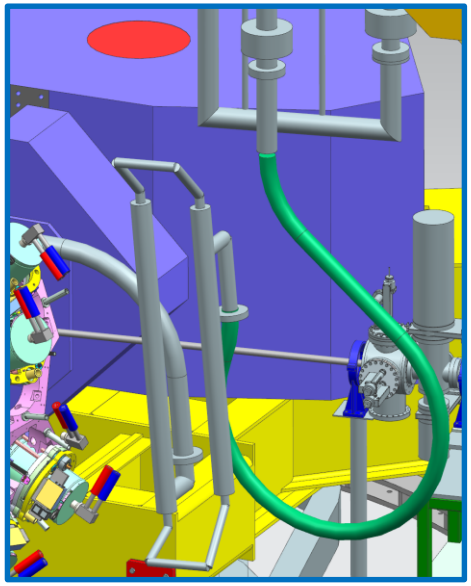




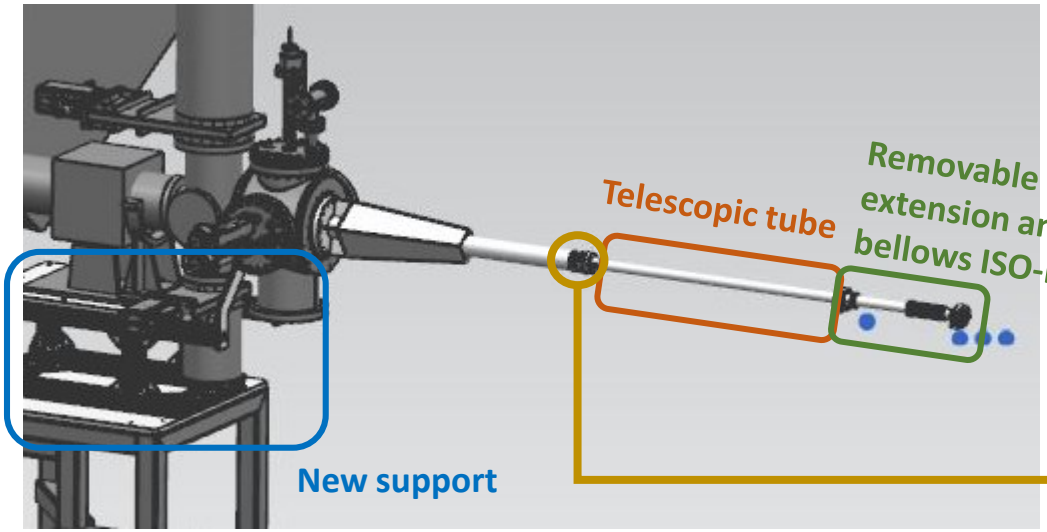
Retracted position to reduce efforts in the most critical configurations

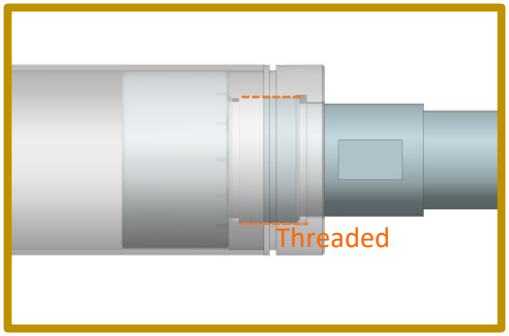


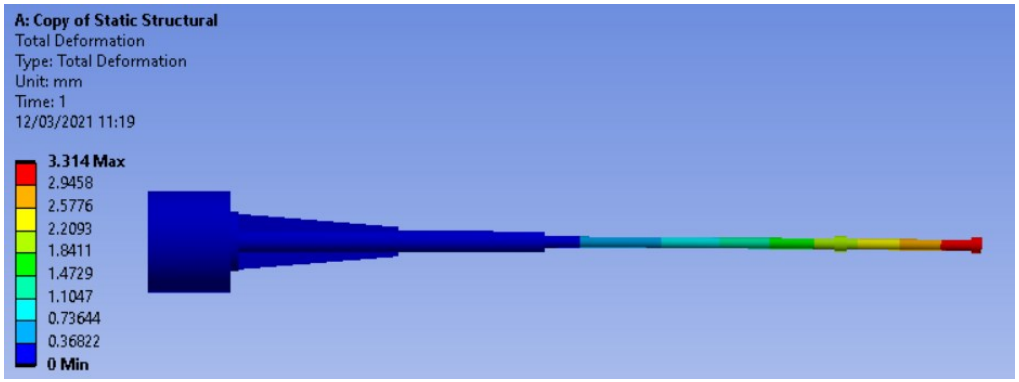
Pulled out position to ensure "soft" bends to the load hose in the +85° rotated configuration



Beam line



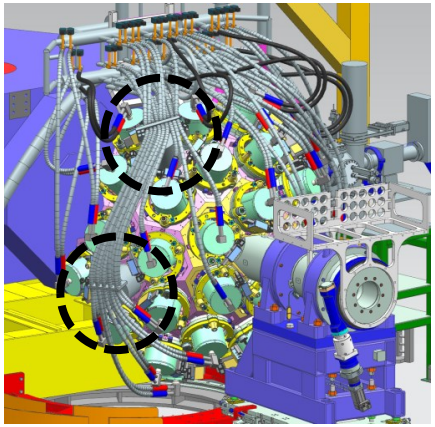


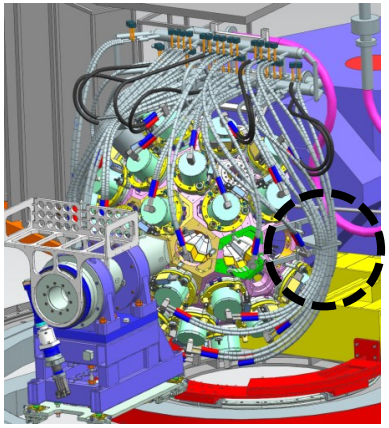


In order to extract the beam line it's necessary to unhook the line from the chamber, unscrew the telescopic tube, pull it back and remove the removable part.

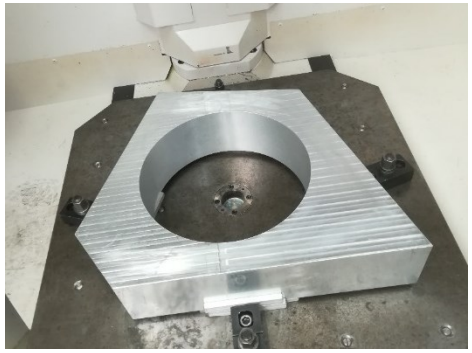
Currently working for

1 Improve cable and hose management by designing 3 collection points





2 To end the manufacturing of 5 flanges



Upcoming work…

Assembly of carpentry

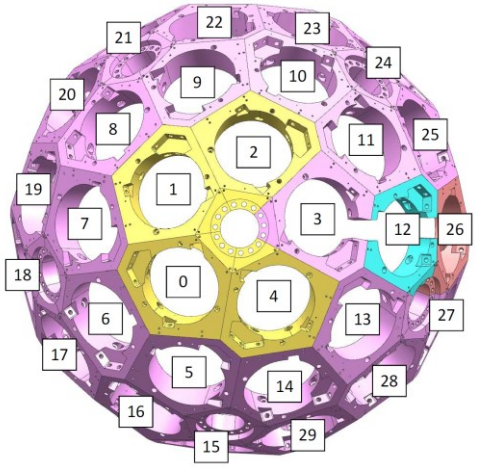
Summary

- Agata will be able to rotate in the plane of the rails integral with Prisma between 20° and 110°; the range used will be between 20° and 100°; for the physics campaign between 20° and 88° with the beam line always inside the cut in the 3 flanges of the honeycomb.

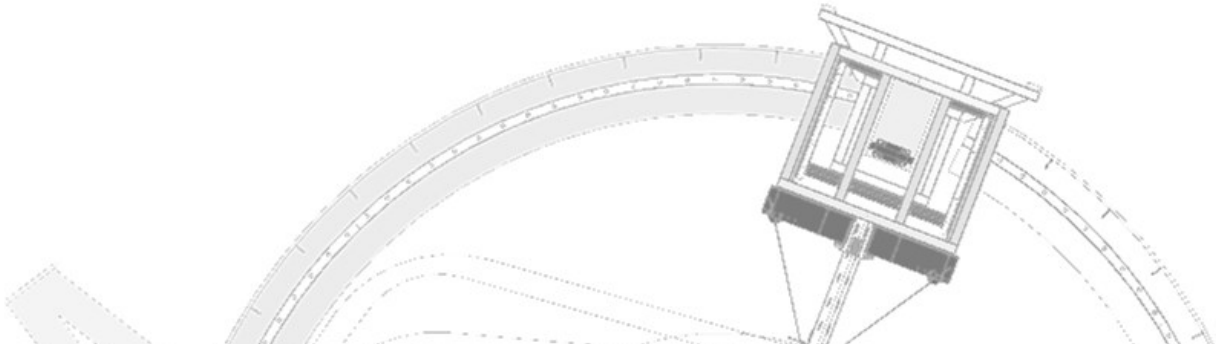
- Agata can move backwards up to a maximum of 750 mm to allow access to the reaction chamber and forward (towards Prisma) by 55 mm;
LIMIT: in most cases it will be necessary to remove the last piece of the beam line

- Only with Agata/Prisma at 100° and with Agata back by 750 mm is rotation around the shaft guaranteed.

- In the Agata-Prisma configuration it will not be possible to mount the detectors nr 15, 16, 17, 18, 19, 27, 28, 29, in addition of course to detectors nr 3, 12, 26.



Backside view



Thank you for your attention