JOHANNES GUTENBERG UNIVERSITÄT MAINZ JG|U

panda

HELMHOLTZ Helmholtz-Institut Mainz

Progress of the Hyperatom setup

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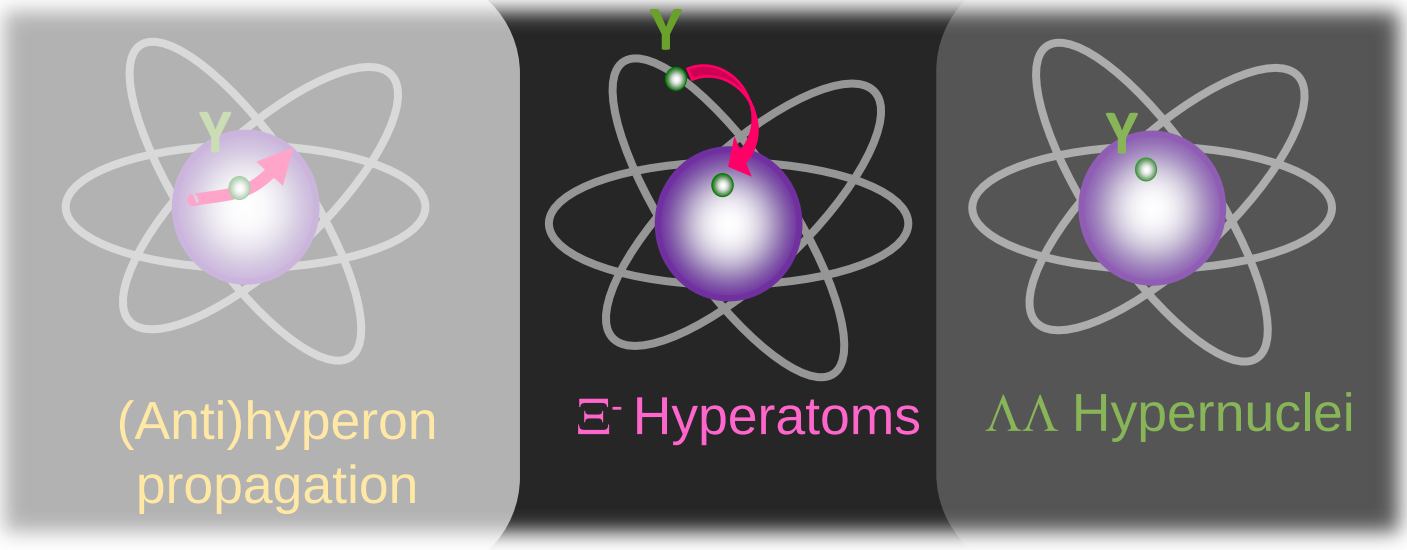
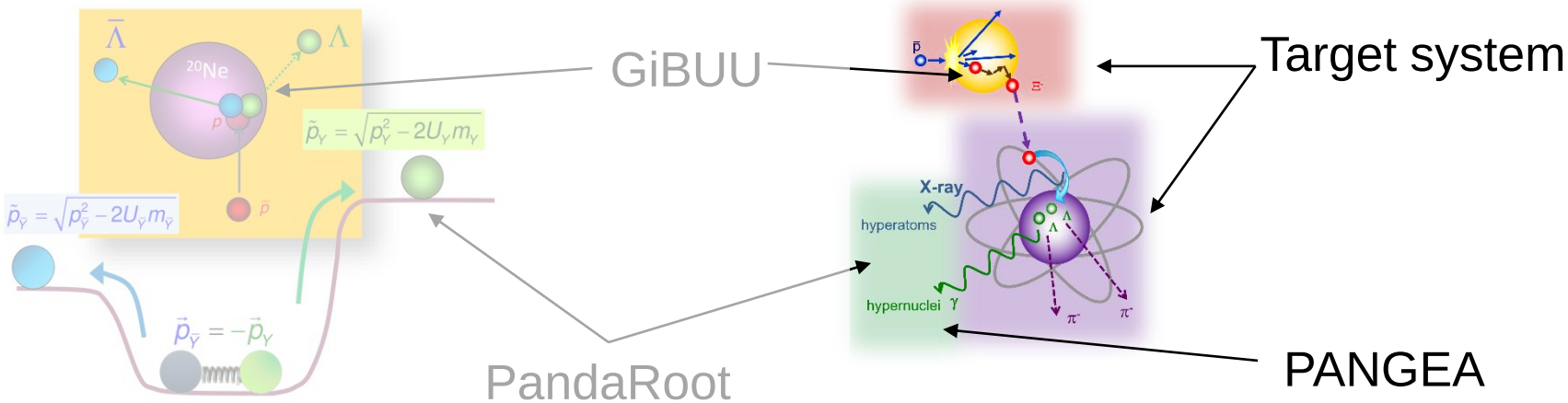
Helmholtz-Institut Mainz

Panda Meeting 22-3

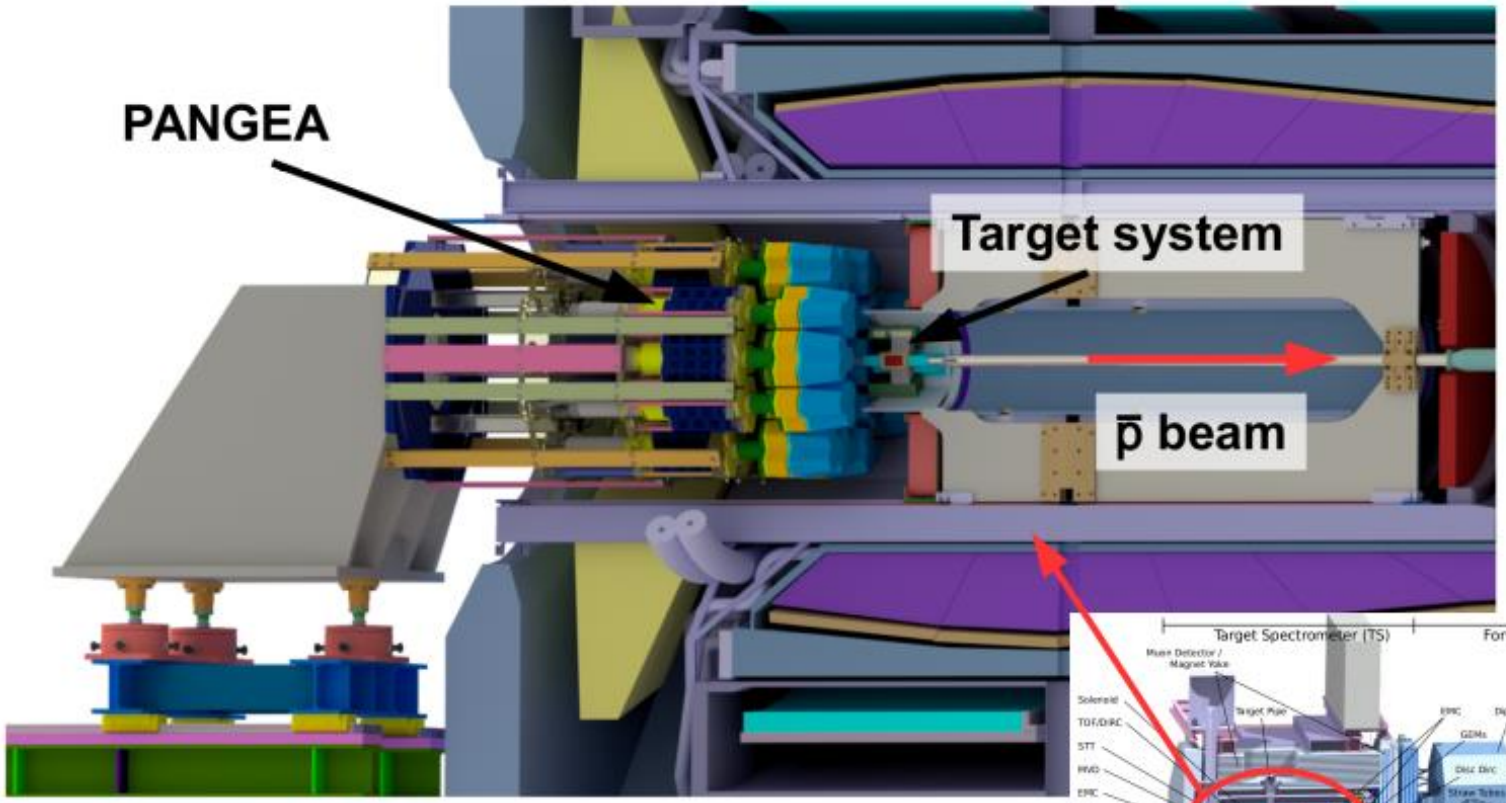
Outline

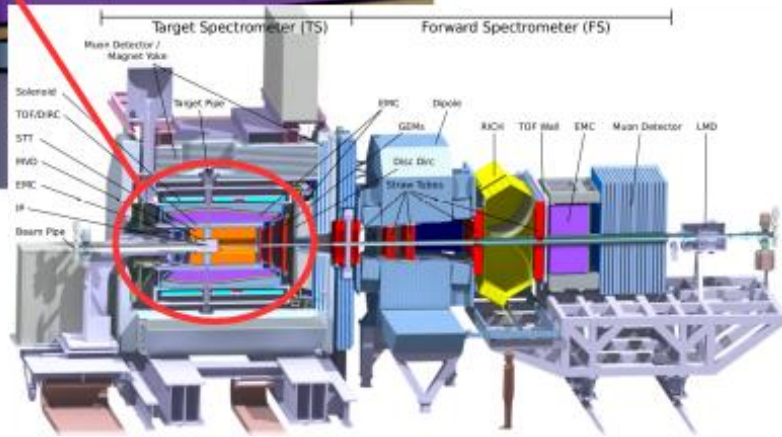




Falk‘s talk(s)

Hyperatom/hypernuclei setup



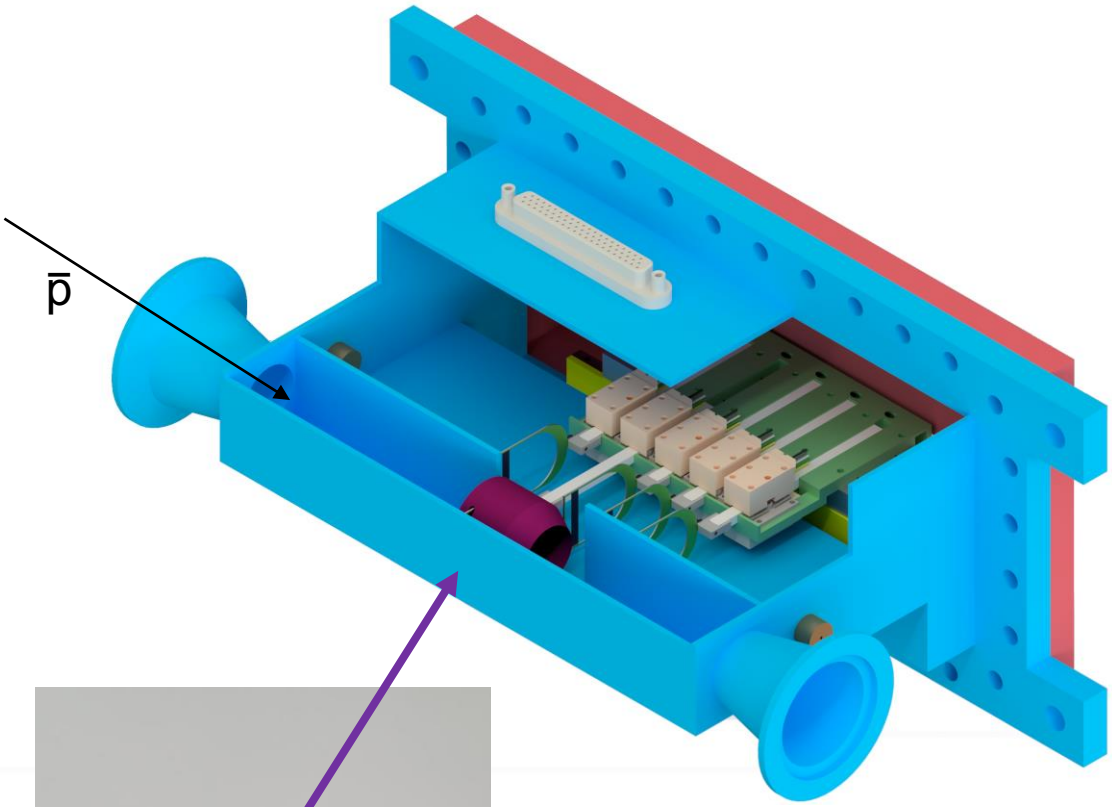


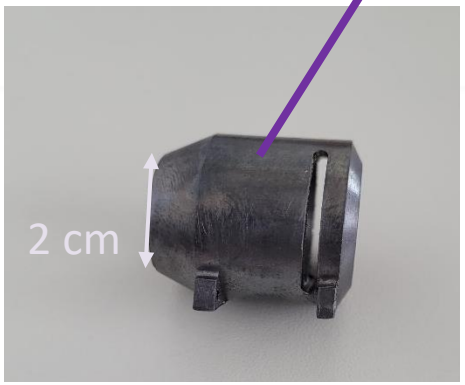
- Dedicated target system
- PANGEA

Outline

- Target system
  - Mechanical design
  - 3D printed Vacuum chamber
  - Z Motor positioning
- PANGEA
  - Holding structure
  - Detector manufacturing

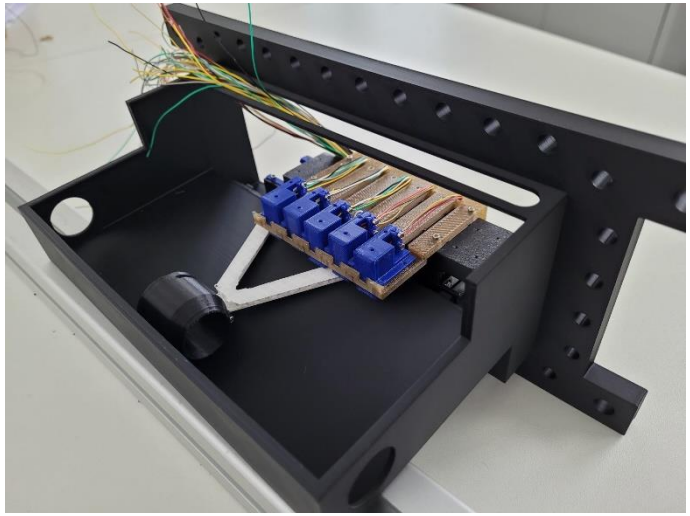
Target system – Design





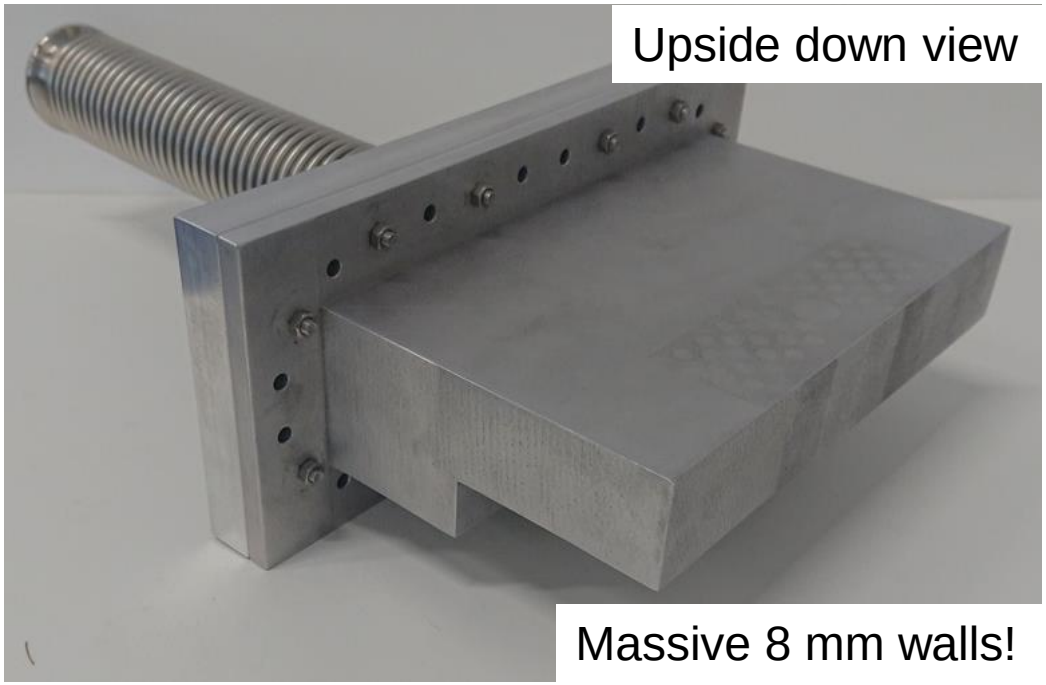
Lead secondary target

3D printed model:
- Handling
- Cabling

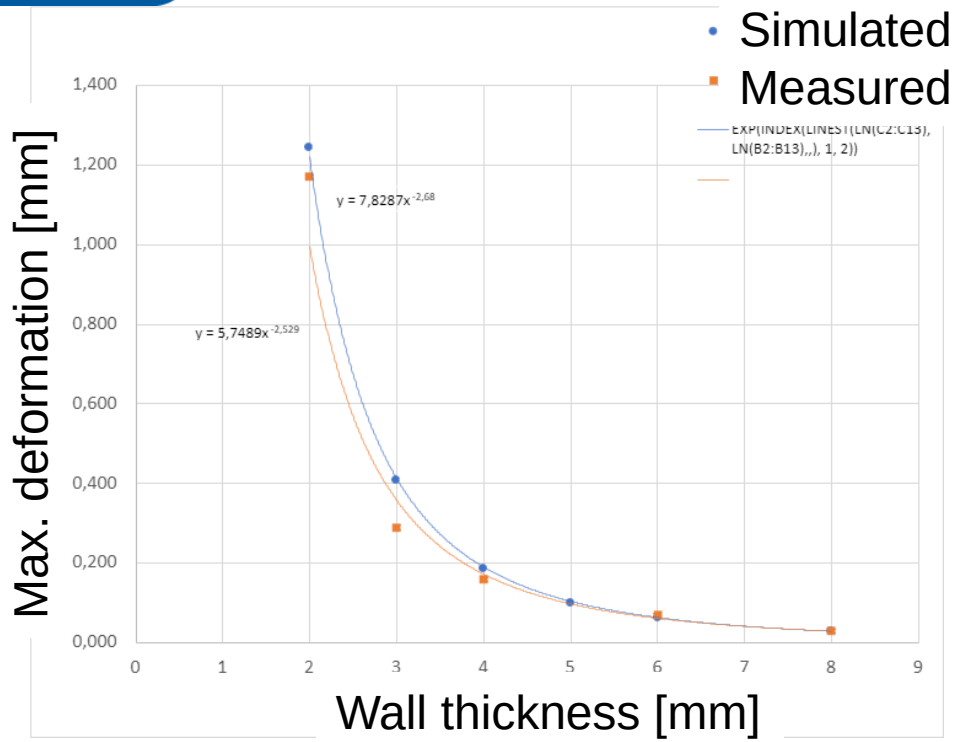


Target system - 3D printed chamber

- Small chamber with comlex design
- Hard to mill/weld -> Al 3D print
- Vacuum capabilities? Mechanical stability?

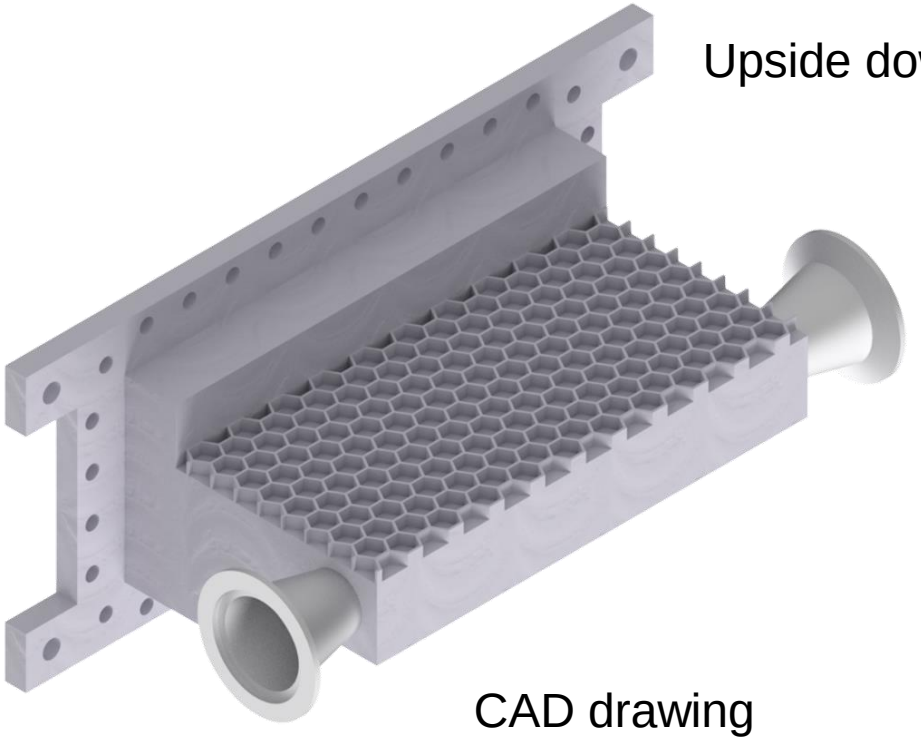


Target system - 3D printed chamber (2)



- γ absorbed in chamber material must be reduced
- Deformation measured after evacuation
- Measurements better than FEM simulations
- Deformations for 2 mm walls too high

Target system - 3D printed chamber (3)

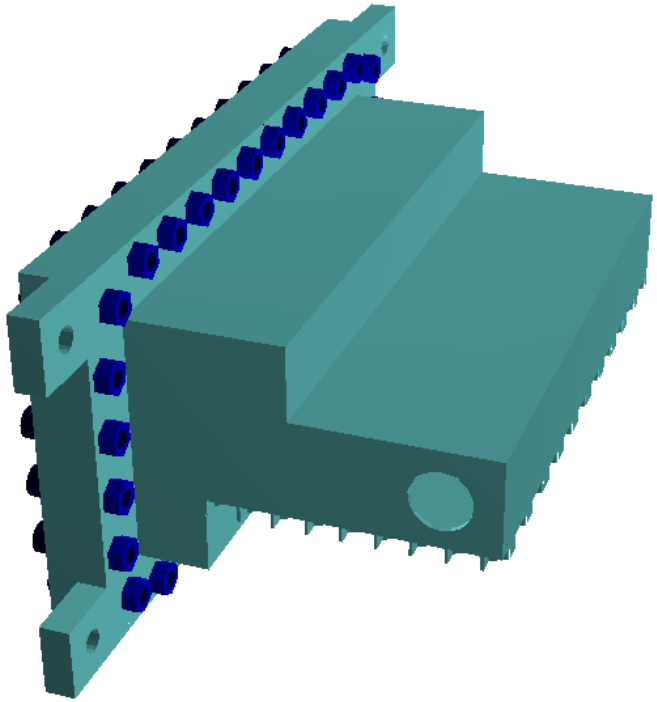


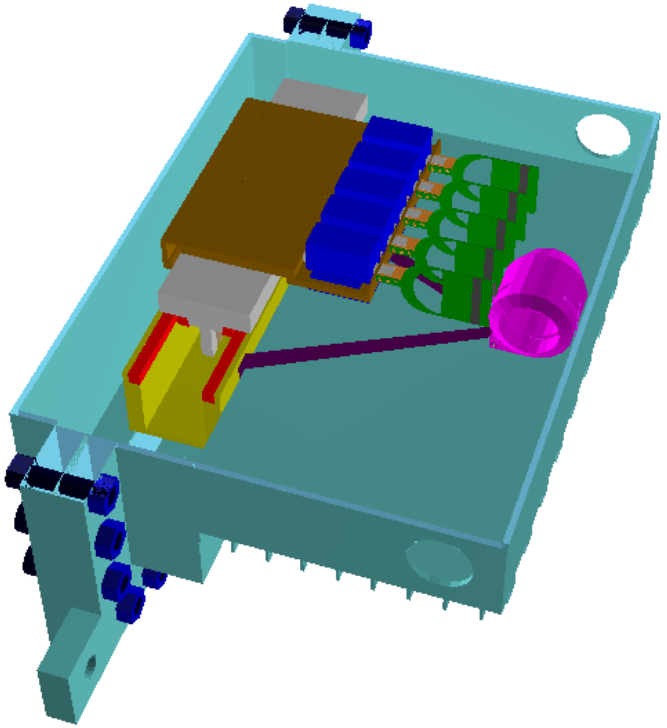
Upside down view

CAD drawing

- Honeycomb structure to improve stability
- Minor vacuum issues with this model
  -> Post processing of 3D printed model by heat/pressure treatment for next version

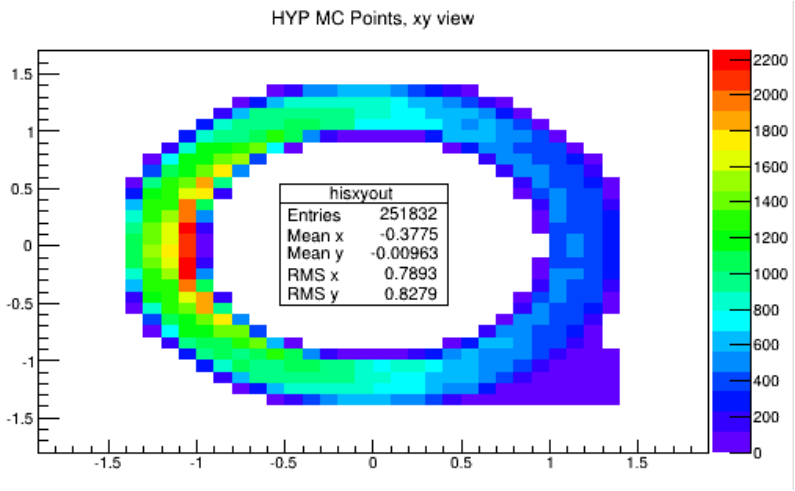
Target system - simulations

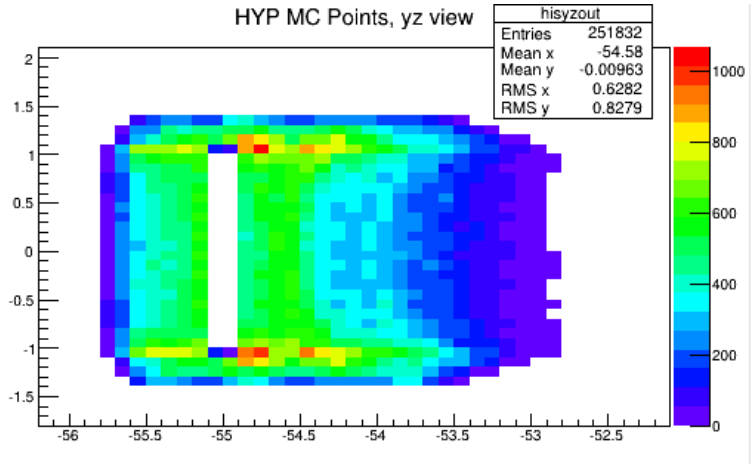




- Detailed model in PandaRoot

Target system - simulations (2)

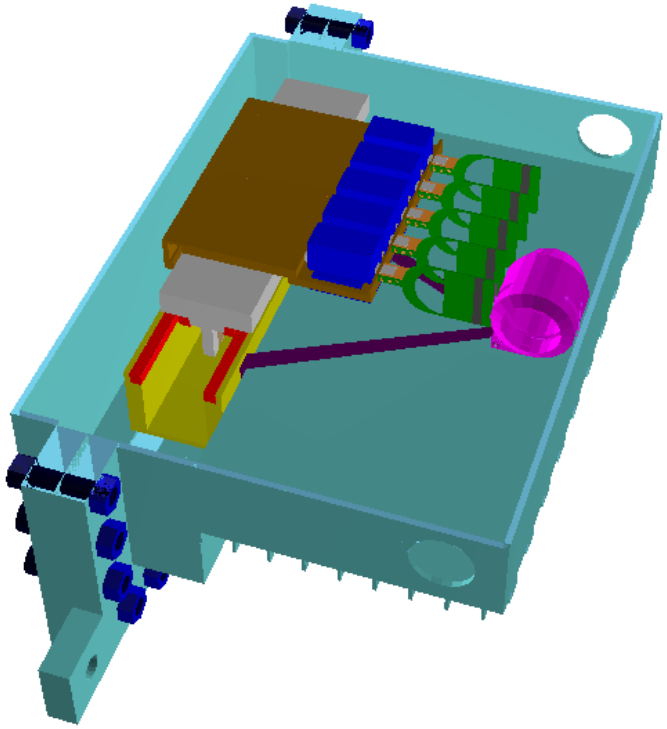




- Ξ^- stopping:
  - Sligthly below previous designs (0.49 % vs. 0.57)
  - Mainly caused by slit in target (required!!)

Target system - simulations (2)

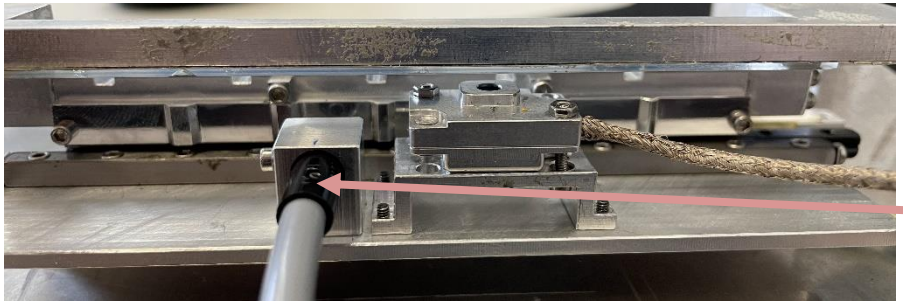
- γ efficiency:
  - Compared some variations of the target chamber

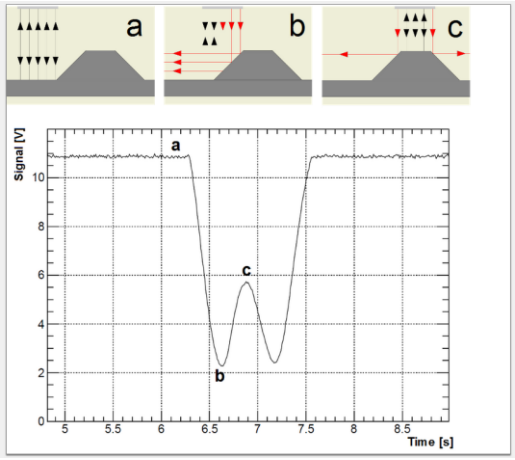


	γ eff @ 559 keV
No chamber	5.49 %
2 mm, no honeycomb	4.84 %
2 mm	4.76 %

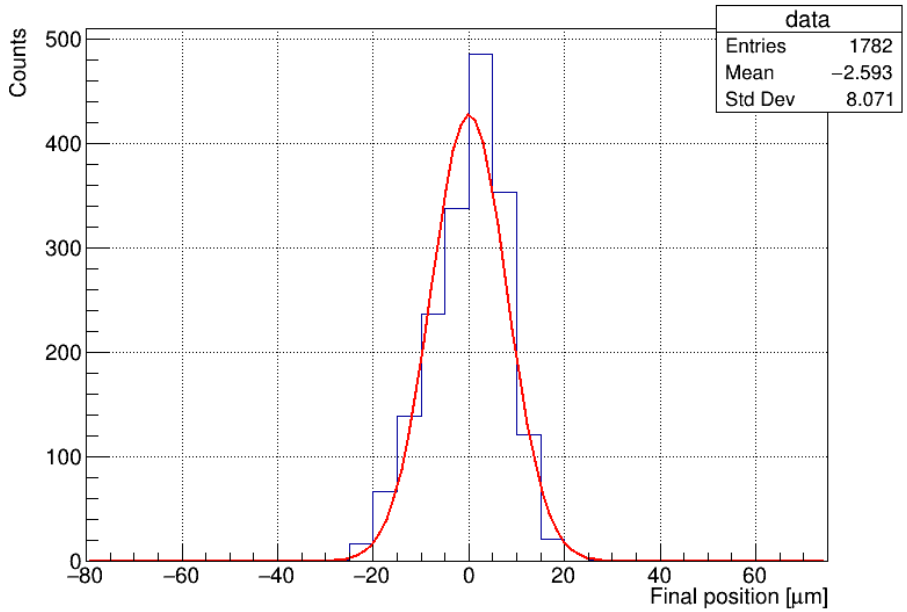
Target system – position system

- Crucial to hit the slit in the absorber when changing target
  - Z positioning (beam axis): better than 100 µm
- Radiation hard position system based on IR reflection





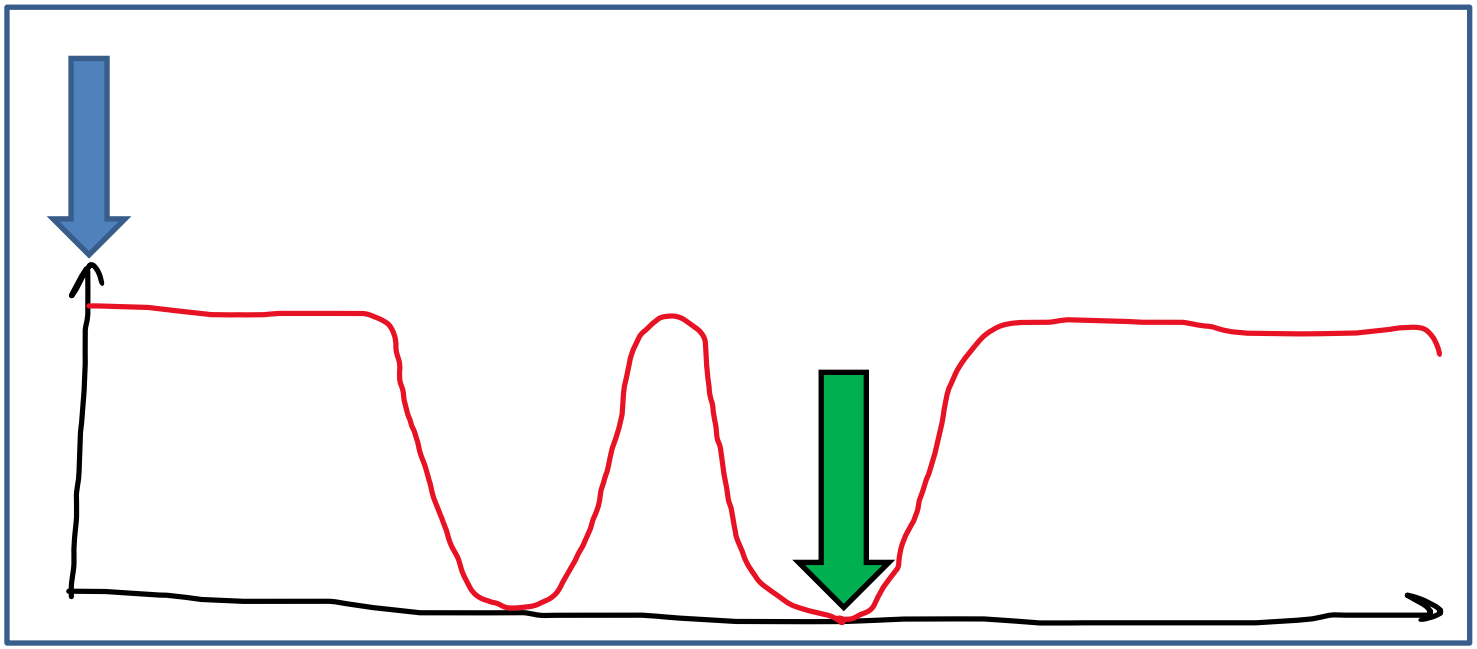
Target system – position system (2)



- Target moving full range
  - FWHM: (18.71 +- 0.38) µm
  - Max deviation: 30µm
- Paper in preparation (Falk)

Target system – position system (3)

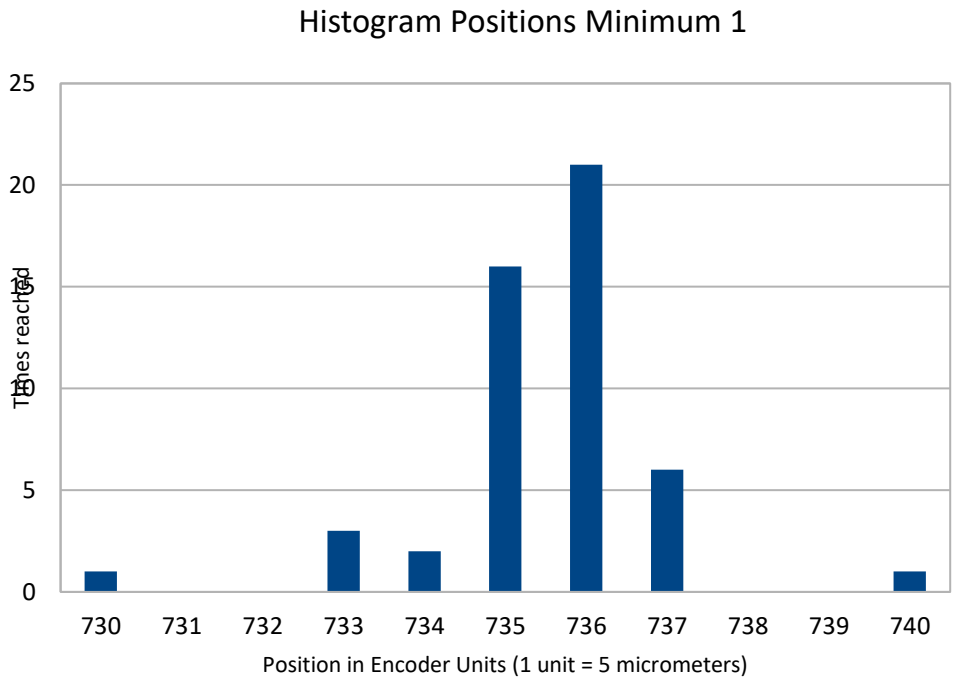
- Algorithm required to steer the system to a specific position
- Precision? Repeatabity?



Summer student: Héctor Sanchis Perez

Target system – position system (4)

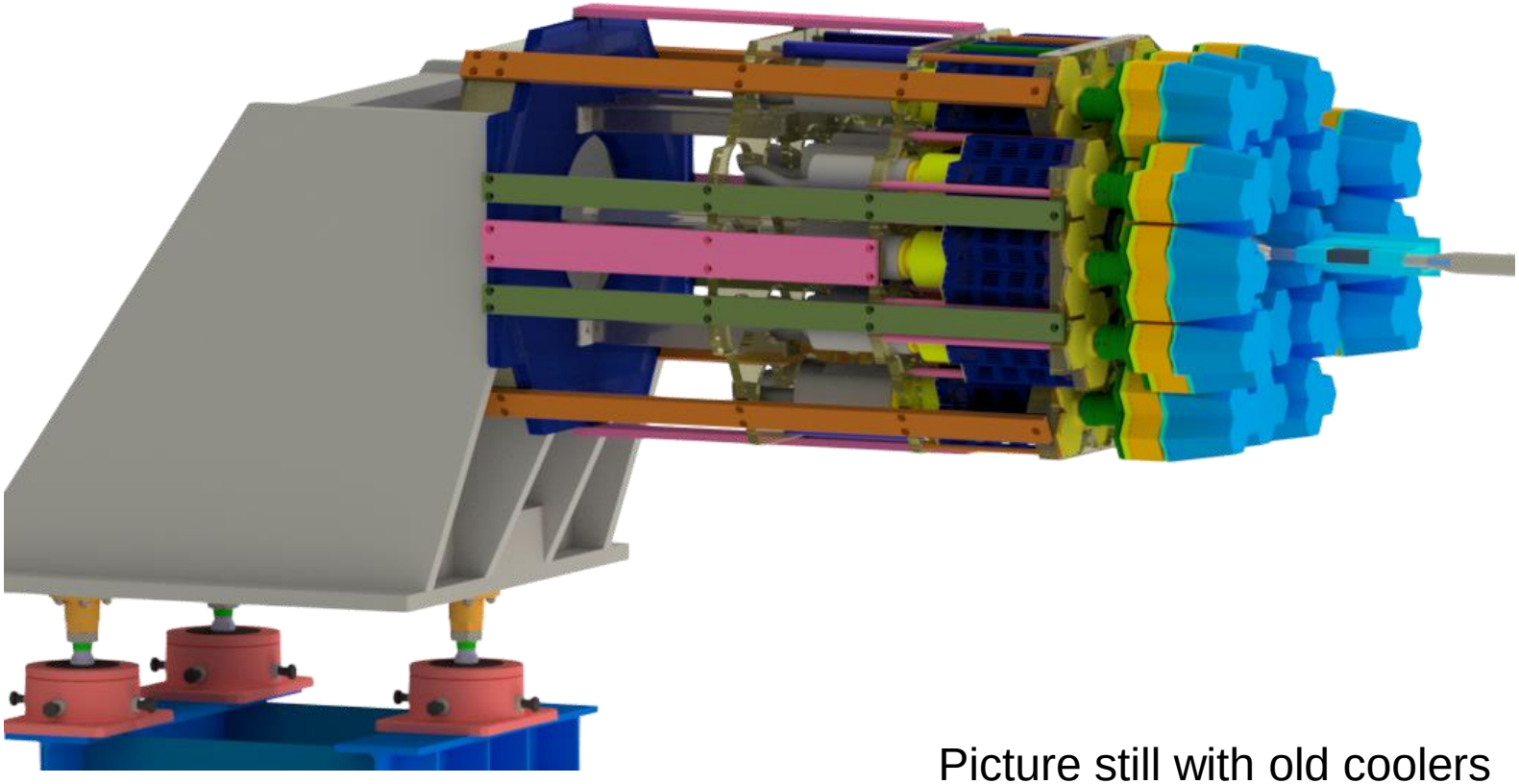
- Avg std. dev.: 8 µm
- Avg interval: 48 µm
- Max. interval: 75 µm



- Outliers:
  - Improvement of the readout electronics in progress

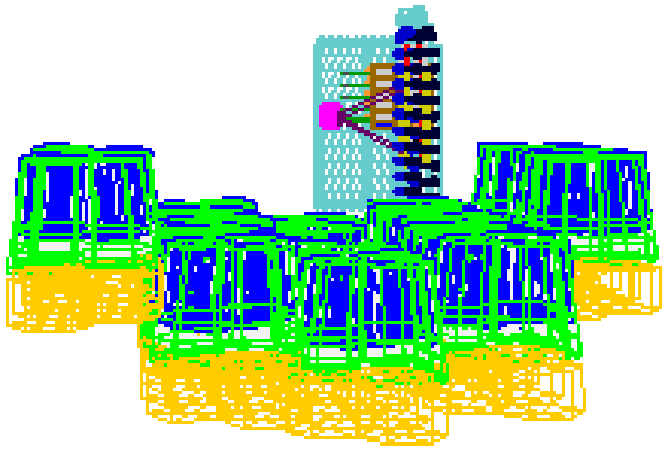
Summer student: Héctor Sanchis Perez

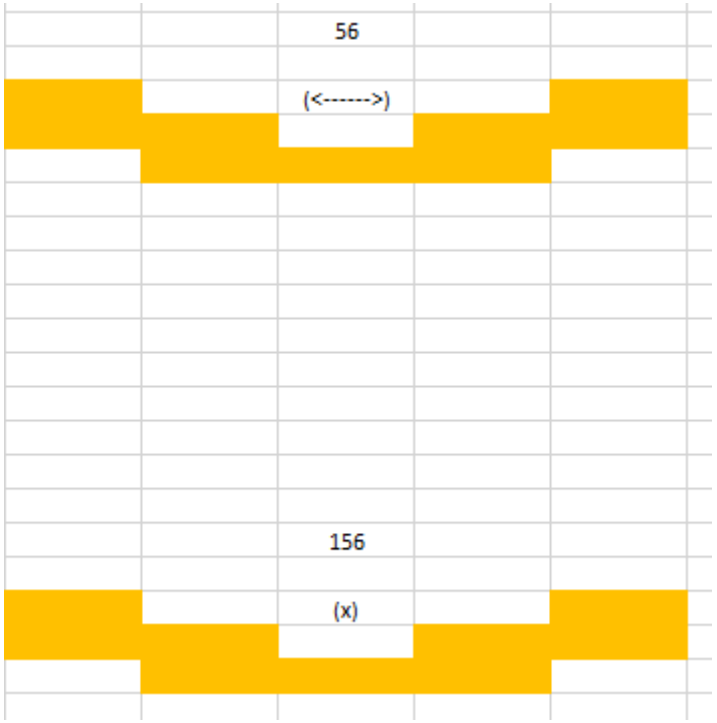
PANGEA



Picture still with old coolers

PANGEA - Orientation



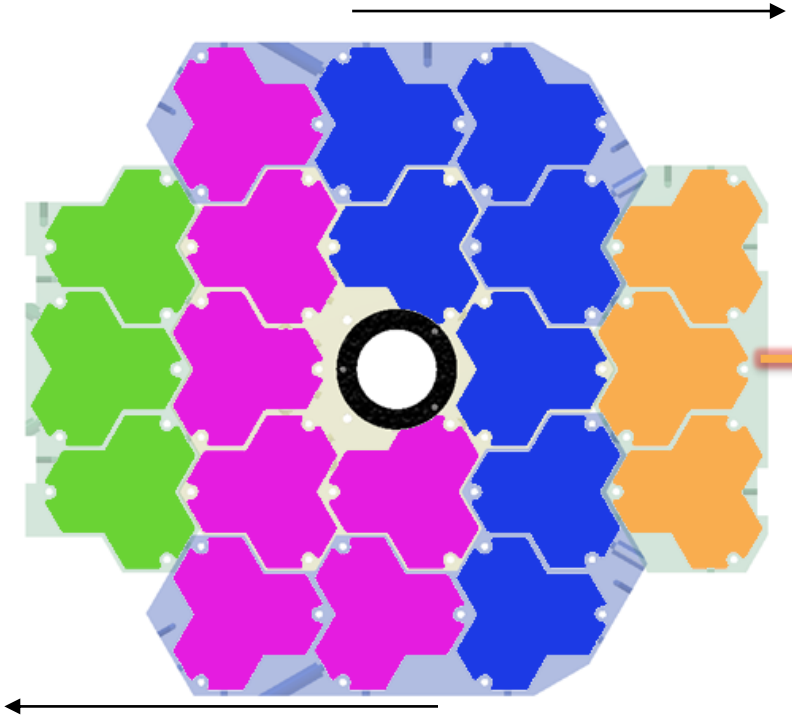


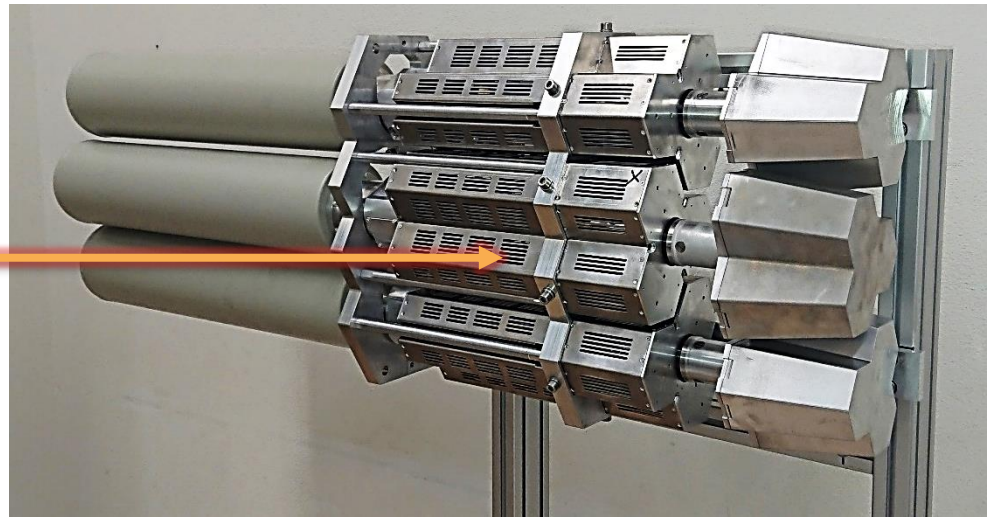
- Absorbed γ in the target system
  - Orientation of PANGEA?

- No improvement!
  - No need for 90° rotation with more complex frame

	γ eff @ 559 keV
Horizontal PANGEA (56)	4.76 %
Vertical PANGEA (156)	4,75 %

PANGEA – Holding structure



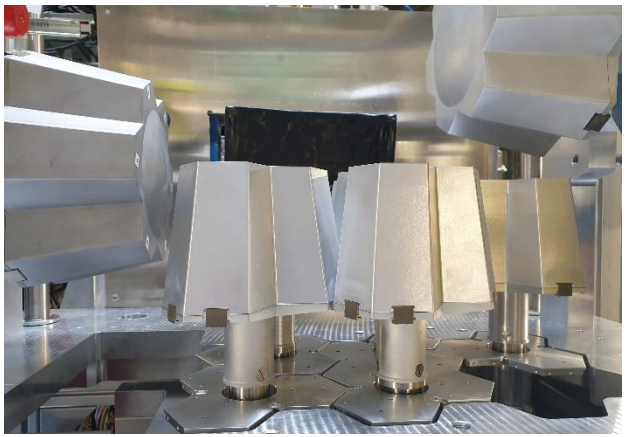


- 4 submodules
- Splitting in half for installation and maintenance
- First submodule fully designed, produced and tested

PANGEA – manufacturing

- Components fully available:
  - 25 detectors (PANGEA: 20)
- fully assembled (prel. Electronics):
  - 8 detectors
- Partly assembled
  - 8 detectors
  - Staged assembly,
    small noise issues must be
    fixed
- Further assembly in progress
- More components ordered

Components delivered by TIFR-Mumbai.



8 detectors used in DESPEC S450
at FSR(GSI) (May 22)

Summary

- Target system (hyperatom):
  - Redesign in progress (components now available)
  - Successful tests of stability and vacuum capability of 3D printed vacuum chamber
  - Precision of the position system better than required and very stable repeatability
- PANGEA
  - Orientation of columns is irrelevant for the performance
  - First submodule of the holding frame successfully tested
  - Manufacturing of PANGEA is ongoing
  - 8 detectors successfully used in DESPEC experiment