

The background features a dark blue gradient with a subtle pattern of white dots. On the left side, there are several overlapping circular elements. A prominent one is a large circle with a scale around its perimeter, ranging from 140 to 260 in increments of 10. Other circles are partially visible, some with dashed lines and arrows, suggesting a technical or scientific theme.

MAPRT MODEL VALIDATION VARIAN – PROBEAM360

SGRT NORDICS – 17.04.2026

DISCLAIMERS / CONFLICTS OF INTEREST

- We have received no funding from VisionRT for this project.
- VisionRT provided a free rayClearanceCheck licence, for MapRT integration with RayStation (3-years)
- OUS has purchased MapRT for one CT scanner (photon clinic):
 - Mutual interest (OUS/VisionRT) in getting ProBeam360 models available.
- VisionRT provided reasonable amounts of chocolate to maintain sufficient focus, required when very accurately avoiding collisions, during late evenings of measurements.

OVERVIEW

- OUS Proton Facility overview
- Validation procedure and results
- Use cases for MapRT

OUS (PROTON) FACILITY

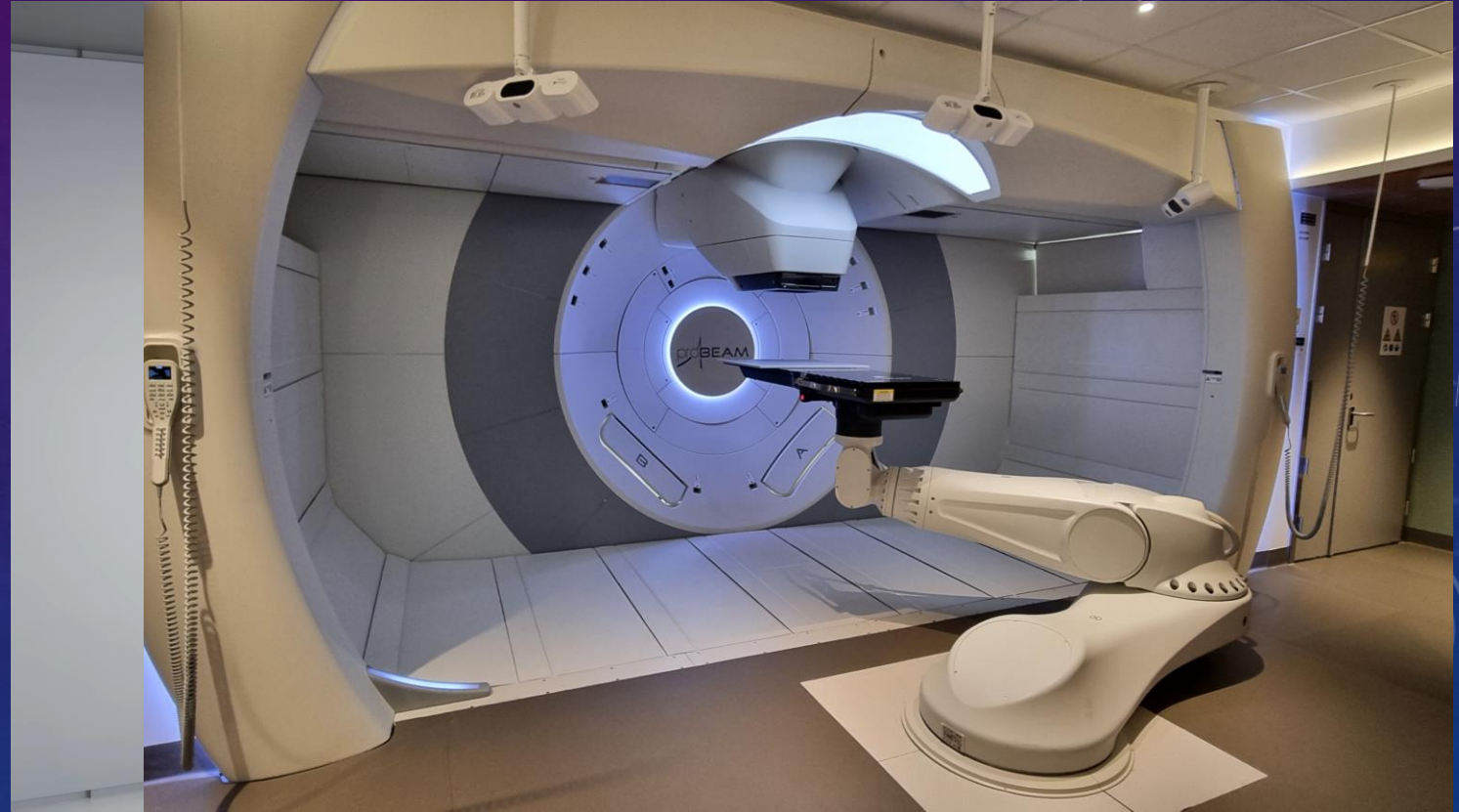
- CT12:
 - MapRT
 - SimRT
- Proton Gantries: 2 clinical, 1 research
 - Clinical gantries with VisionRT
- Software:
 - RayStation integrated with MapRT (photon only)
 - RayStation plan export to MapRT
 - MapRT Clearance via script in RS.

CT Scanner, with MapRT and SimRT



PROTON GANTRIES

- 3 Gantry rooms
 - 2 Clinical
 - 1 Research



PROTON GANTRIES

- Snout for mounting range shifters
- Extends ca. 42 cm from snout



PROTON GANTRIES

Leoni robot arm controls couch position

- Can get in the way of imagers or snout



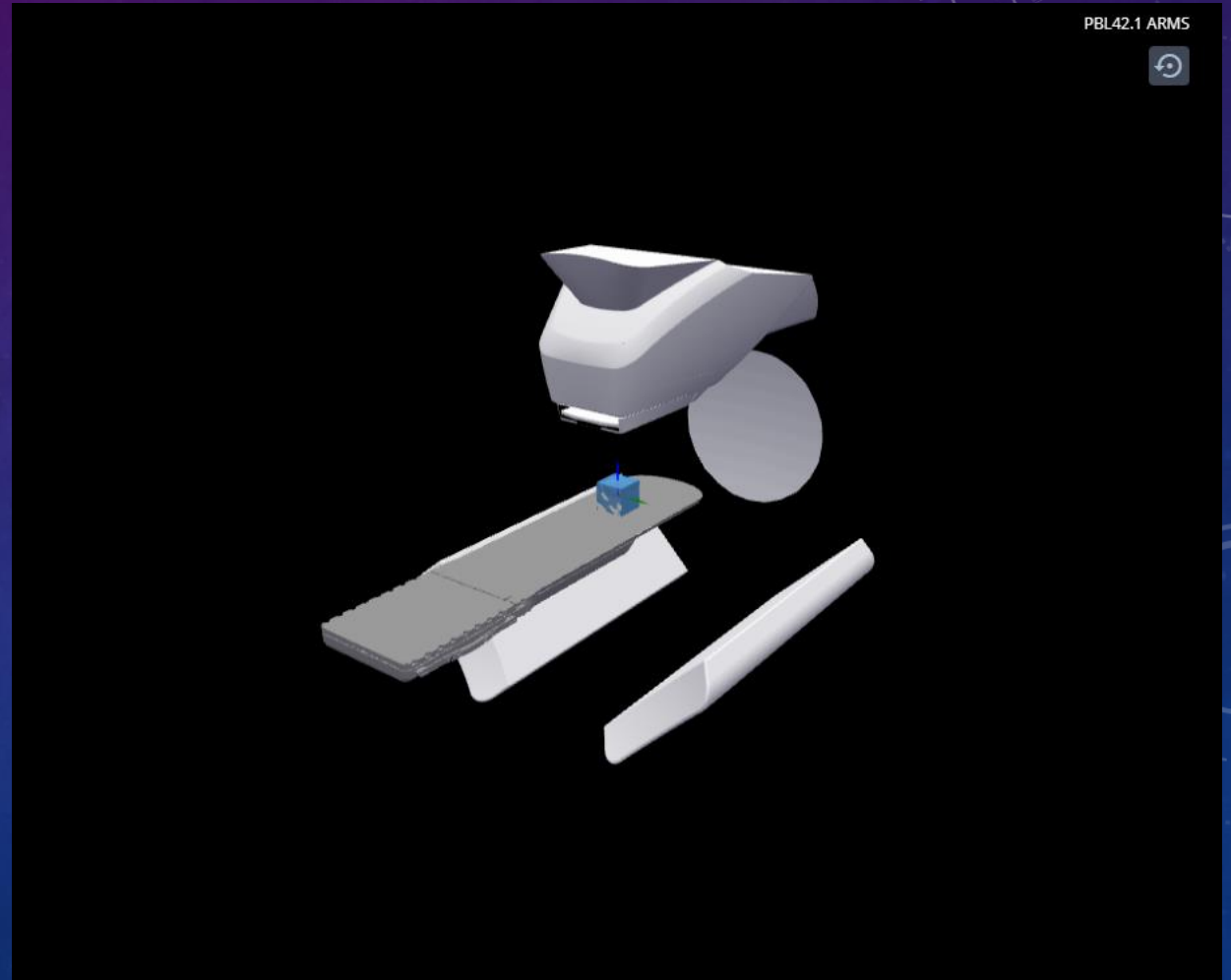
PROTON GANTRIES – ALIGNRT

- Camera pods outside 'rolling floor':
 - Less information directly from sides, compared to linac-rooms.
 - Still, good performance and stability over time.



MAPRT PB360 MODEL

- Components of the model
 - Gantry
 - Snout, various fixed positions
 - Wall indicator disc
 - Couch base
 - Various couch tops
 - Imagers (A, B, A+B)
- What is not included:
 - Leoni robot arm
 - 'Rolling floor' roof

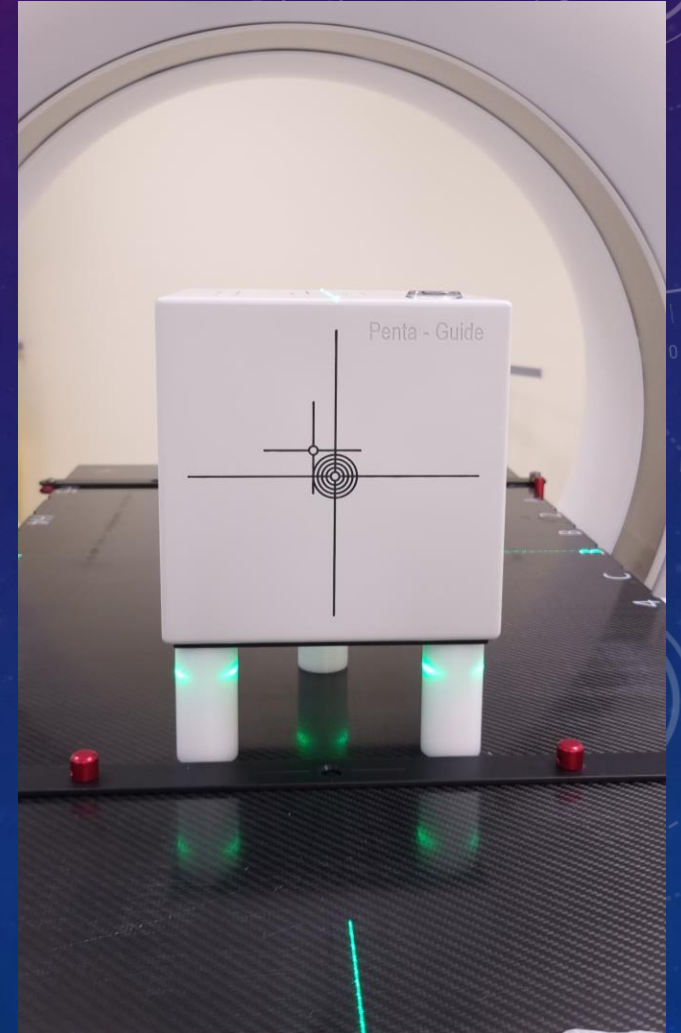


VALIDATION PROCEDURE

- MapRT Capture of phantom.
- Measurements at Gantry:
 - Various scenarios.
 - Compare Model vs Real-world point of collision.
- Control measurements at second Gantry.

MAPRT CAPTURE AT CT

- Select your favourite cubic phantom from your QA storage:
 - Our choice: IBA Penta-Guide.
- Perform MapRT Capture.



MEASUREMENTS AND COMPARISON

- Remember! Set buffers to zero when validating!

- No really, you will forget it!
 - Trust me...

Couch Buffer (cm) 0 Patient Buffer (cm) 0

- Validation results with buffers:

- "Why is the model always 2 cm off?"

Couch Buffer (cm) 2 Patient Buffer (cm) 2

- Validation results without buffers:

- ⚠️ "Warning! You're doing a great job!"
- "Yay!"

Couch Buffer (cm) ⚠️ 0 Patient Buffer (cm) ⚠️ 0

VALIDATION SCENARIOS

- Snout with MapRT Capture object:
 - Corner
 - Top
- Snout with couch (regular):
 - Top, sides, siderail, bottom, front
 - Snout extension
- Snout with couch (BoS)
- Imager with couch
- Etc.

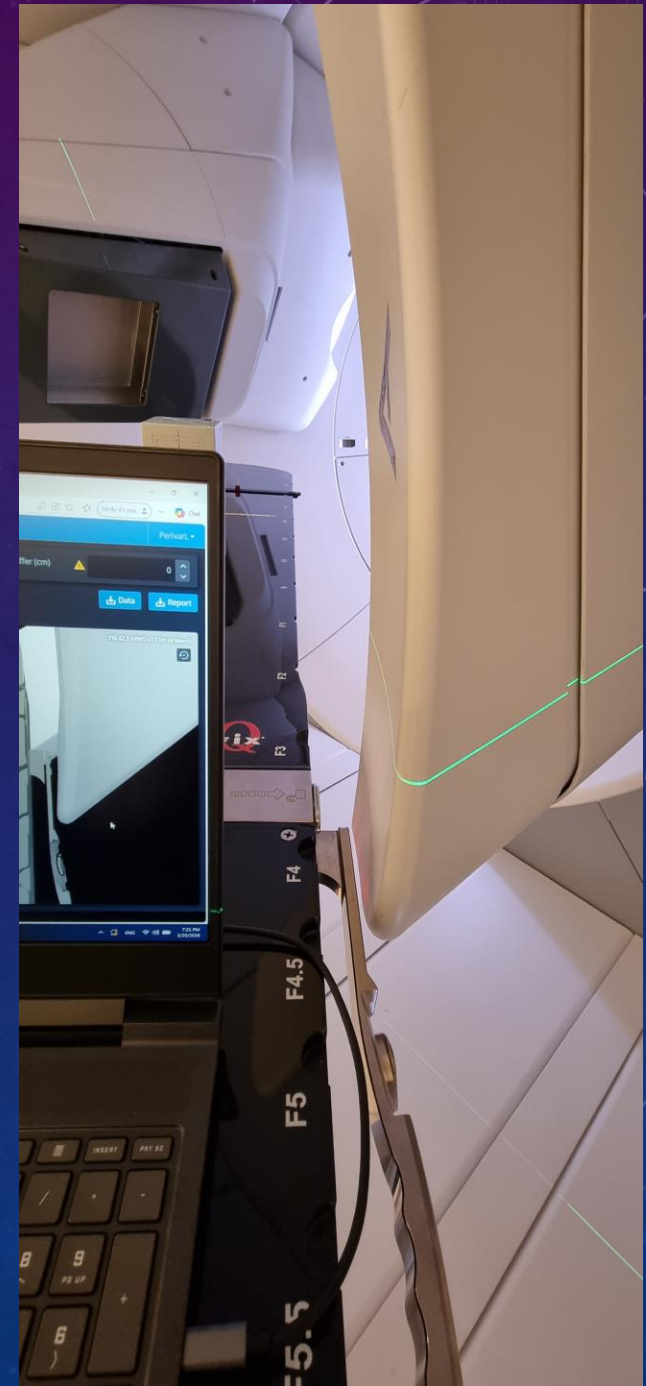


VALIDATION MEASUREMENTS

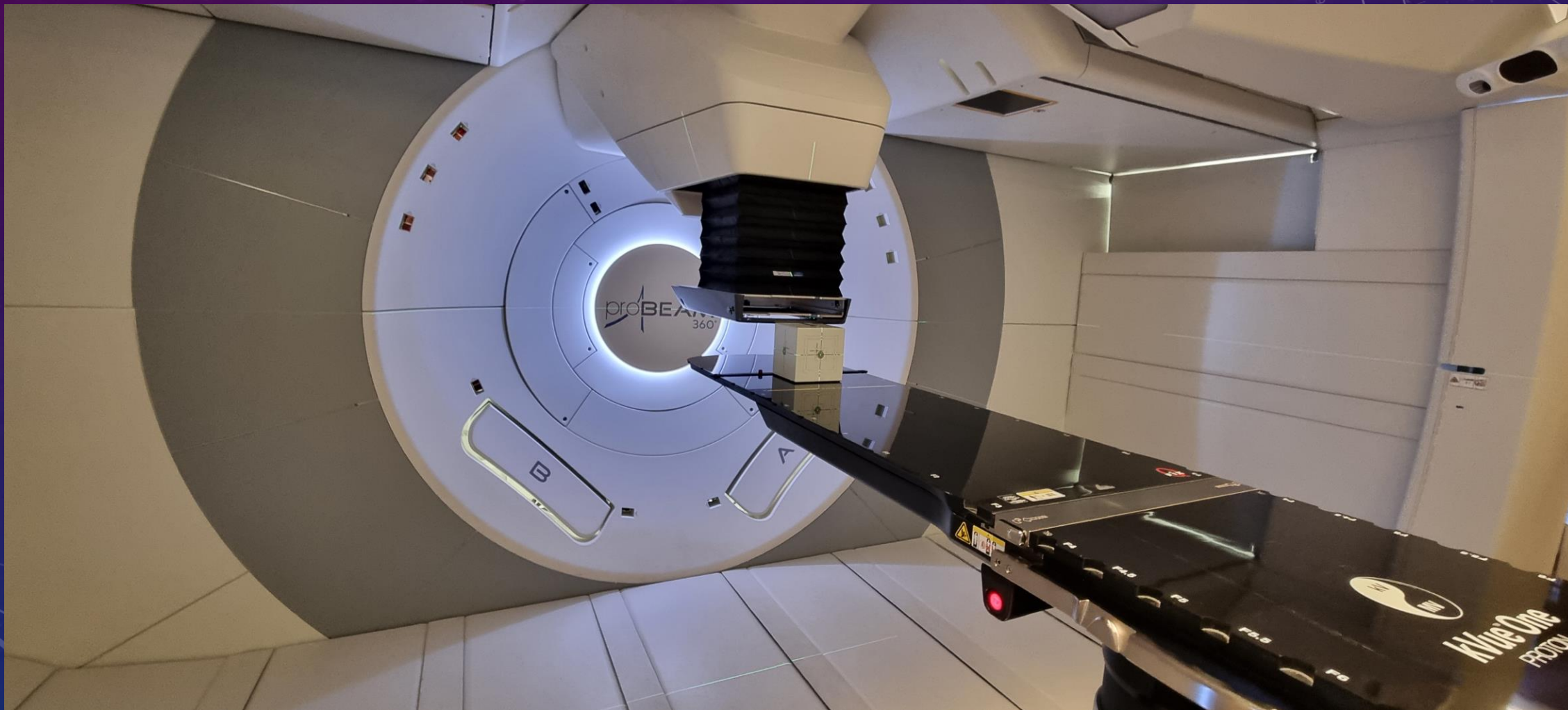
- Order of motions:
 - 1) Couch
 - 2) Imagers (or gantry)
 - 3) Gantry
 - 4) Snout
- Easier to control gantry rotation accurately with hand pendant
 - Varians software collision model will only allow motion using hand pendant during high collision risk.
 - Moving couch rotation using hand pendant result in changes for other axes/DoFs.
 - Snout always retracts before any other motion.
- During validation, we compare gantry angle for collision at given scenarios.

VALIDATION MEASUREMENTS

- Compare model with reality
 - (Please hold your questions about 'life being a simulation' for the break!)

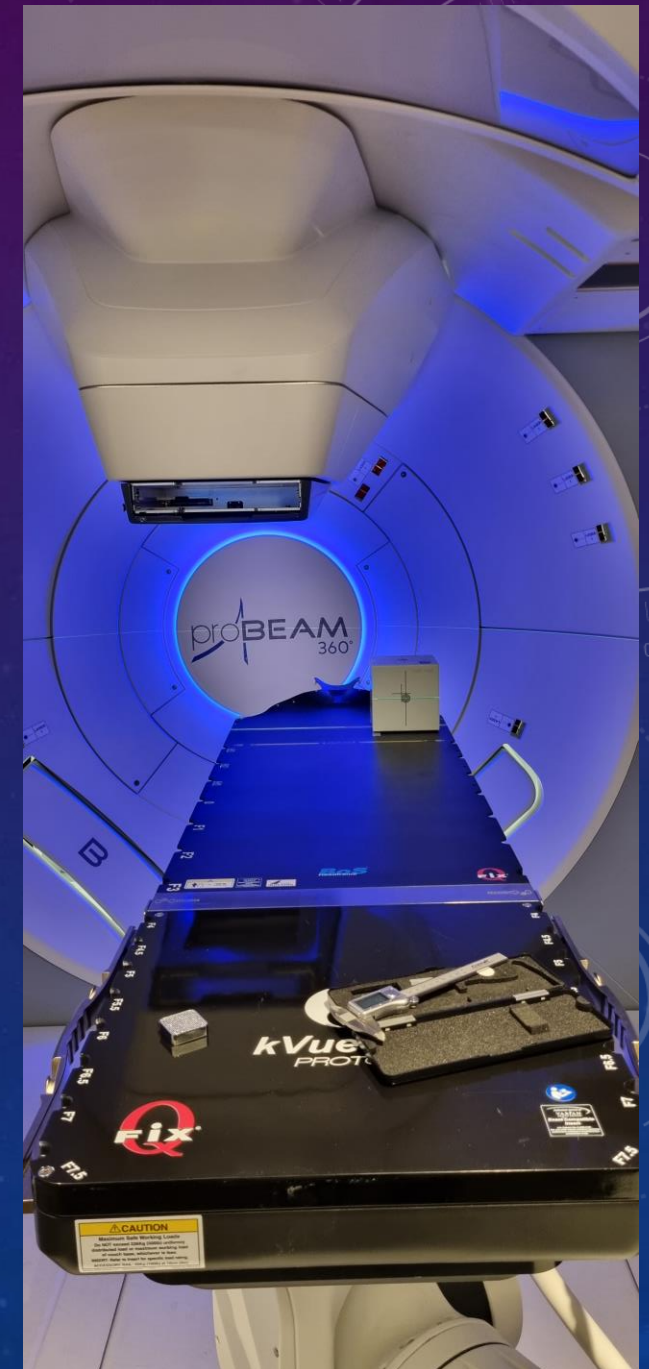
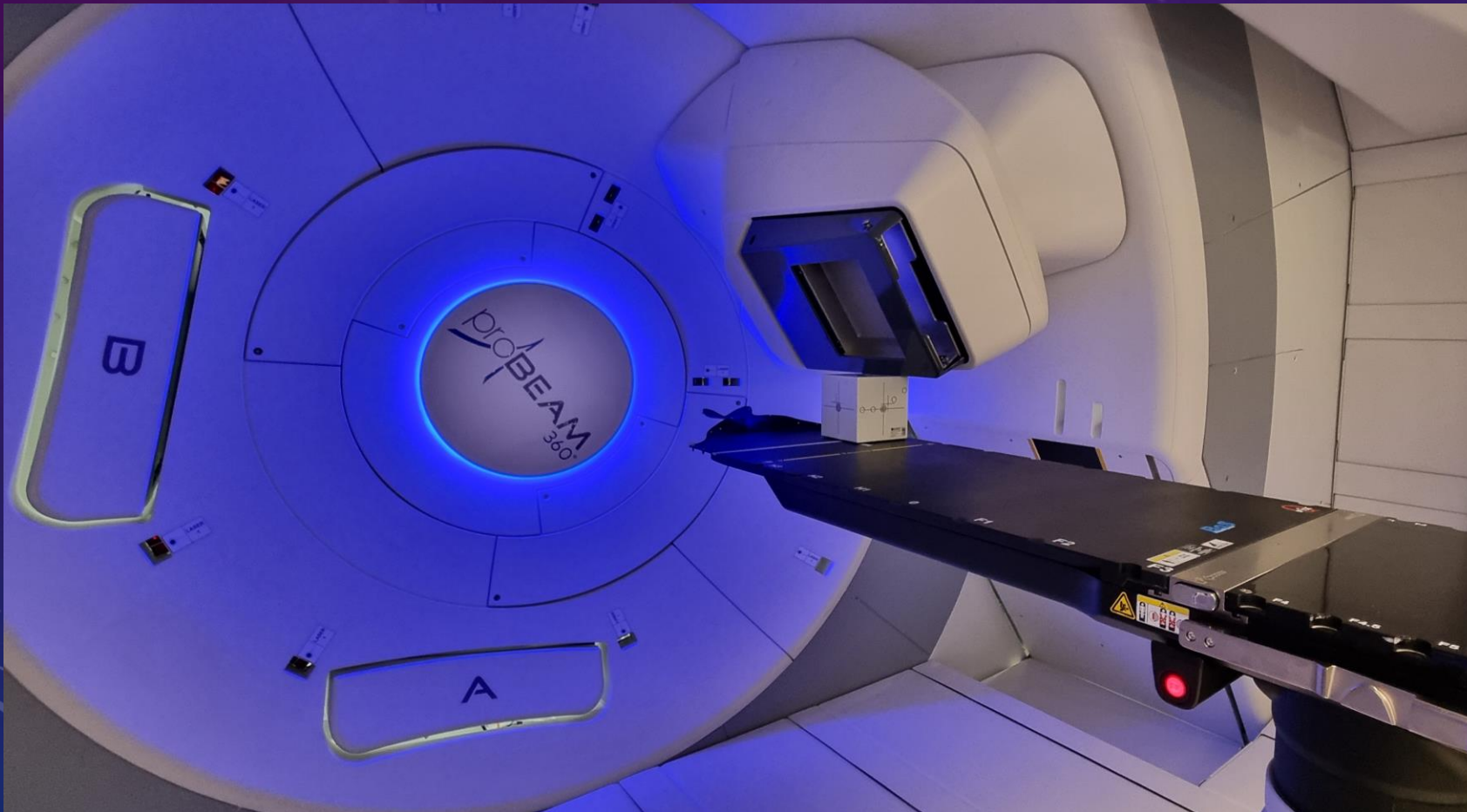


VALIDATION MEASUREMENTS



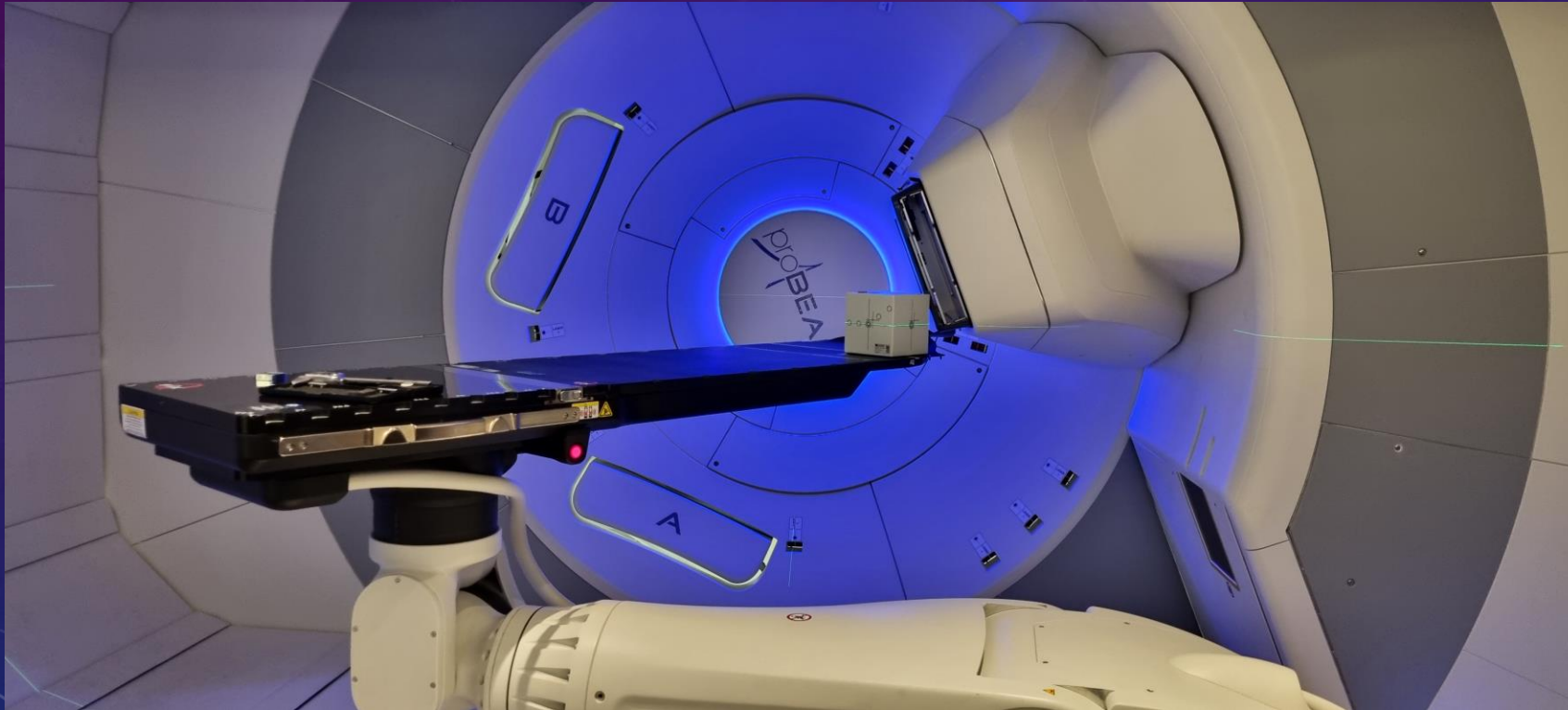
VALIDATION MEASUREMENTS

- Offset position to side of couch, for collision with snout



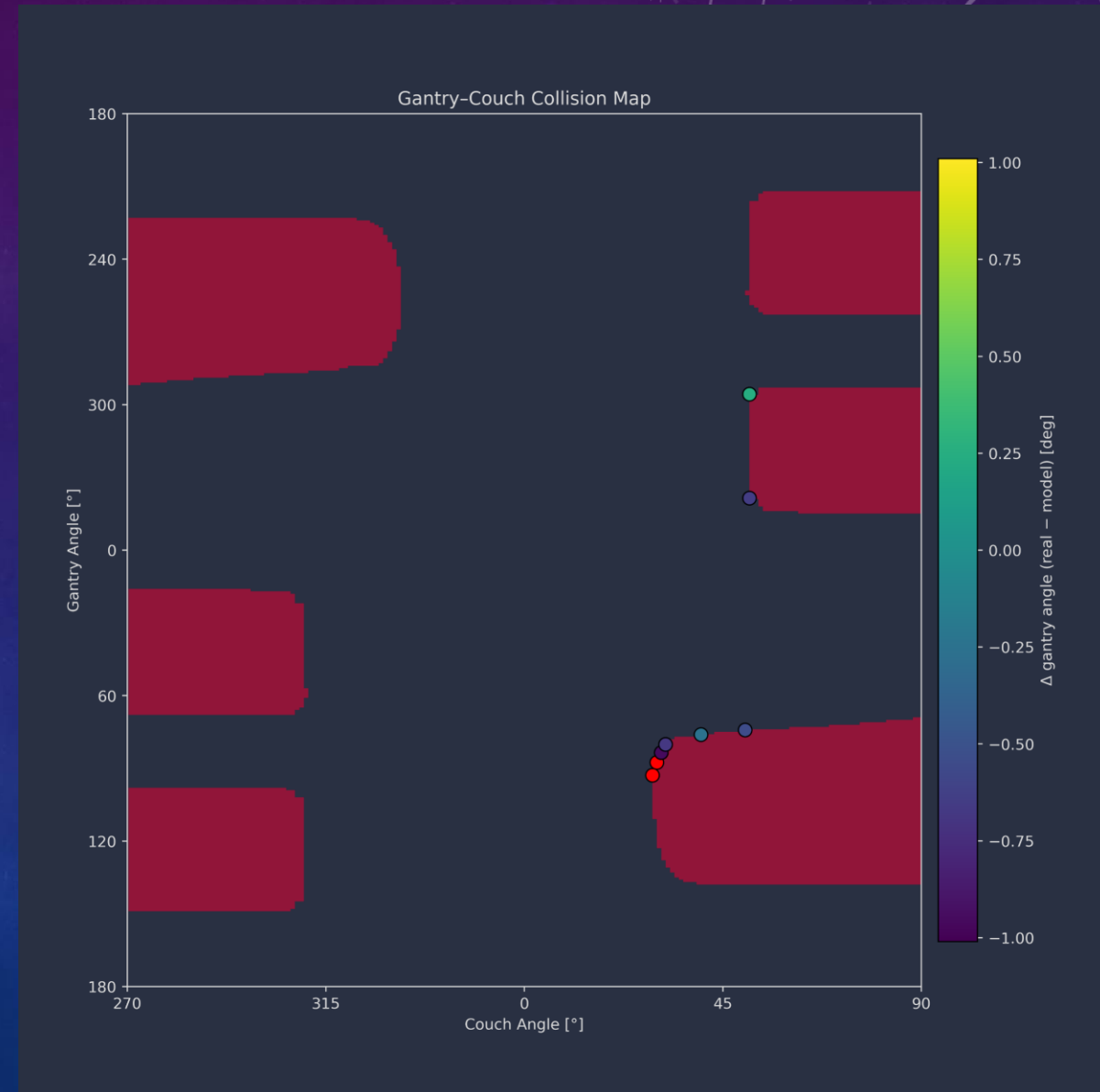
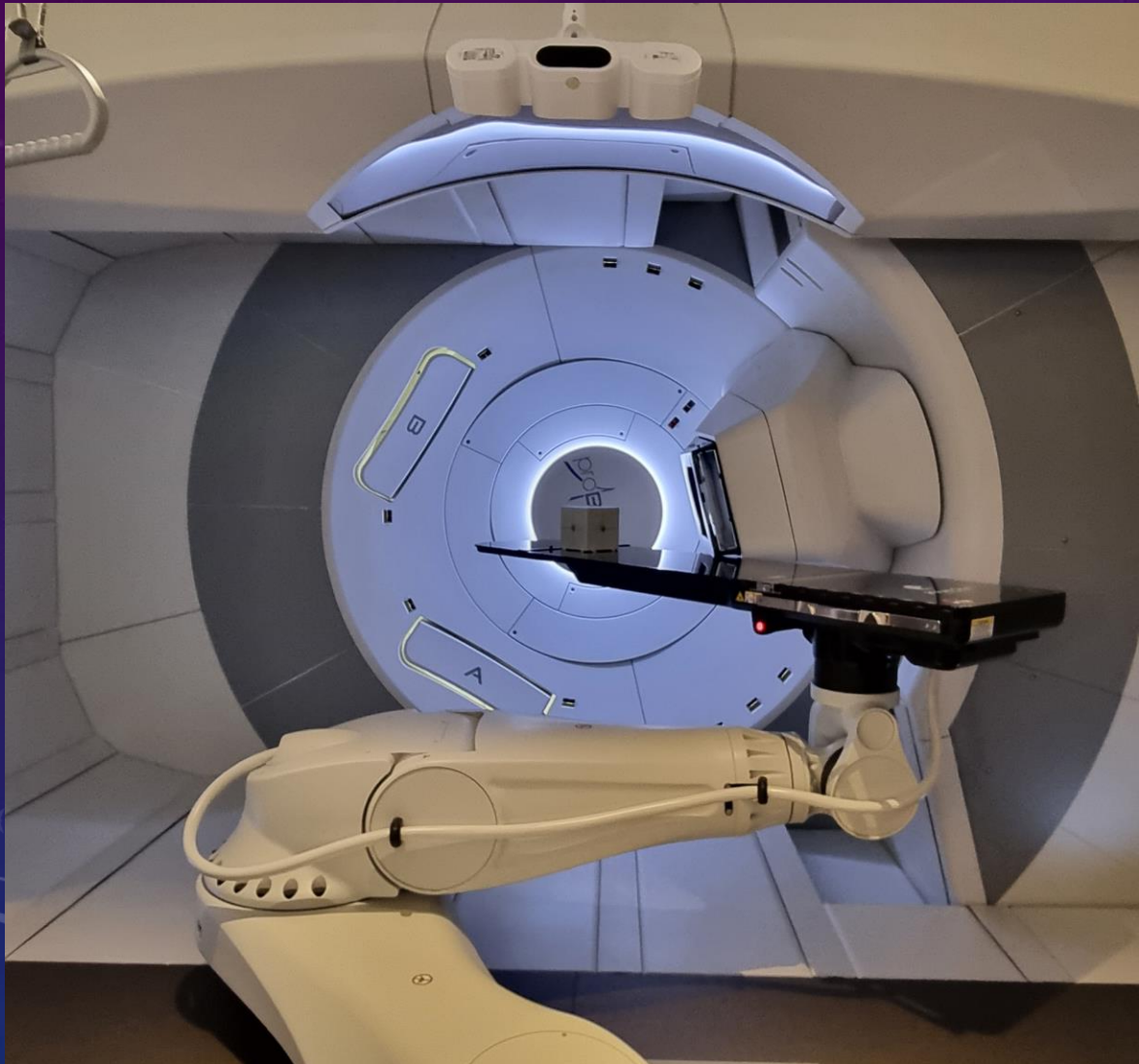
VALIDATION MEASUREMENTS

- Repeated measurements with couch rotation



VALIDATION MEASUREMENTS

- Regular, long couchtop



VALIDATION MEASUREMENTS

- Regular, long couchtop – Side of snout (gray part, bottom)



VALIDATION MEASUREMENTS

- Regular, long couchtop – Side of snout (gray part, side)



VALIDATION MEASUREMENTS

- Regular, long couchtop – Side of snout (white part part)



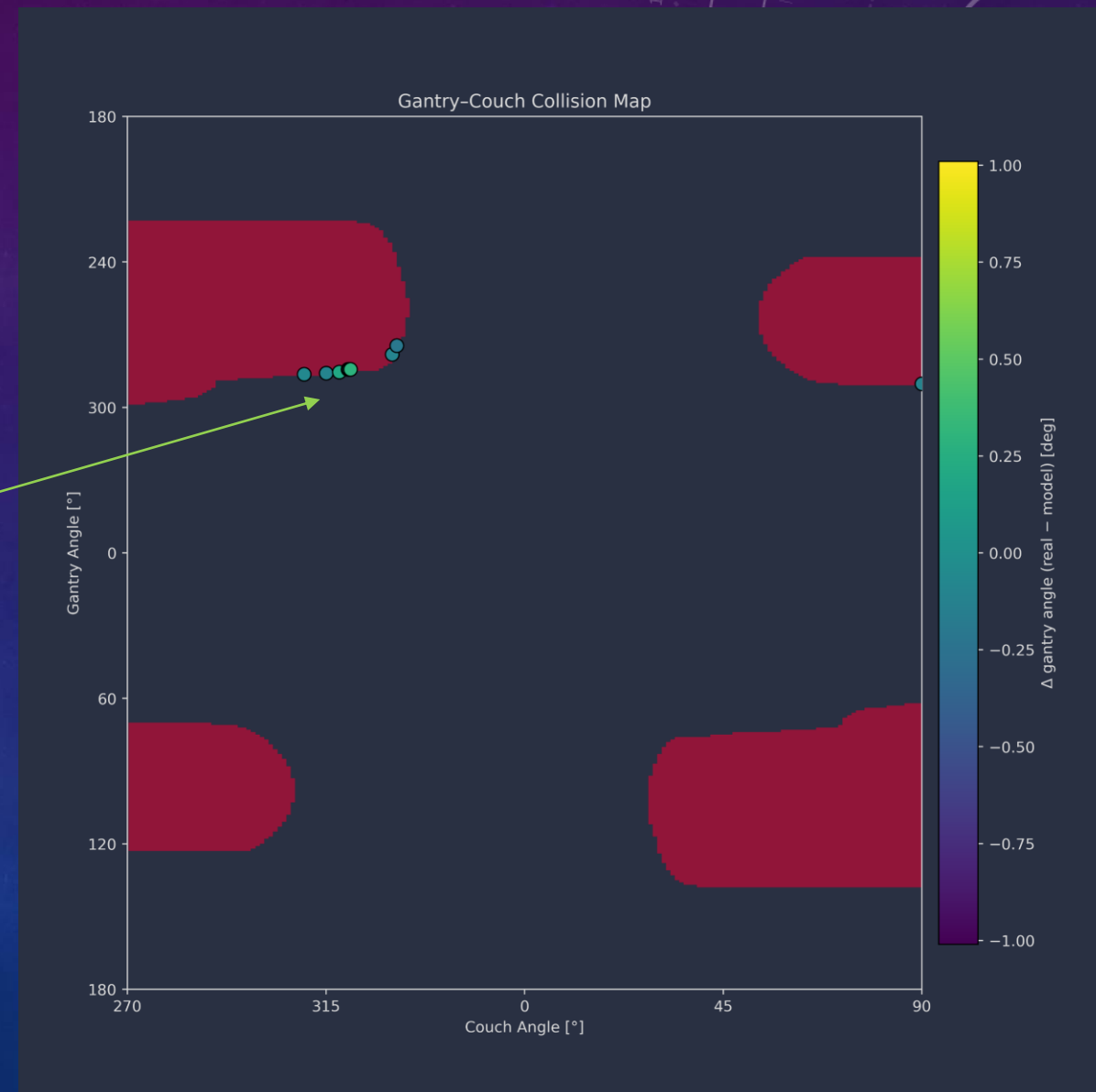
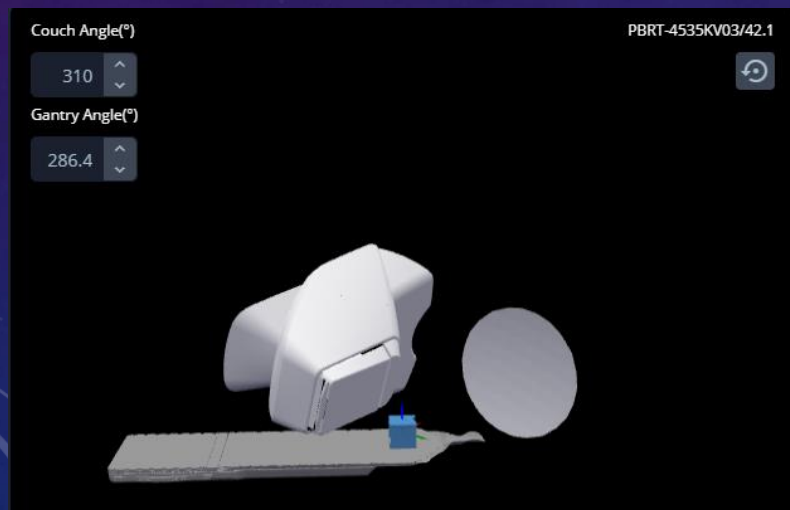
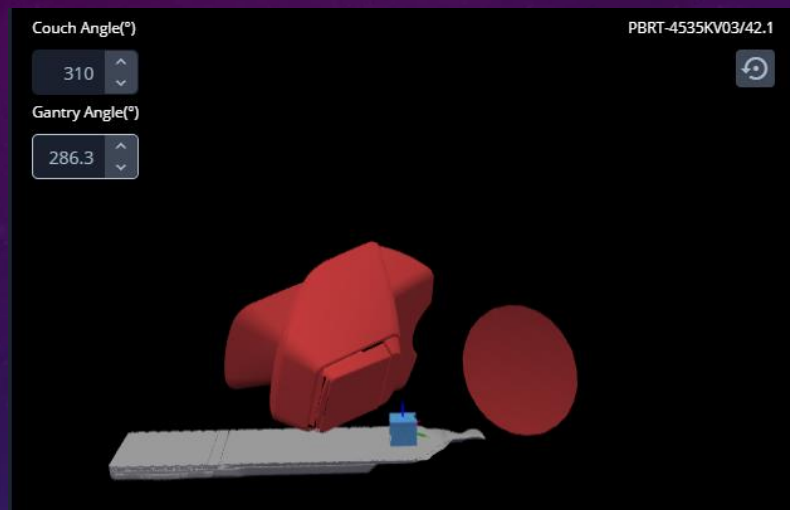
VALIDATION MEASUREMENTS

- Side of snout, RangeShifter lock-bolt



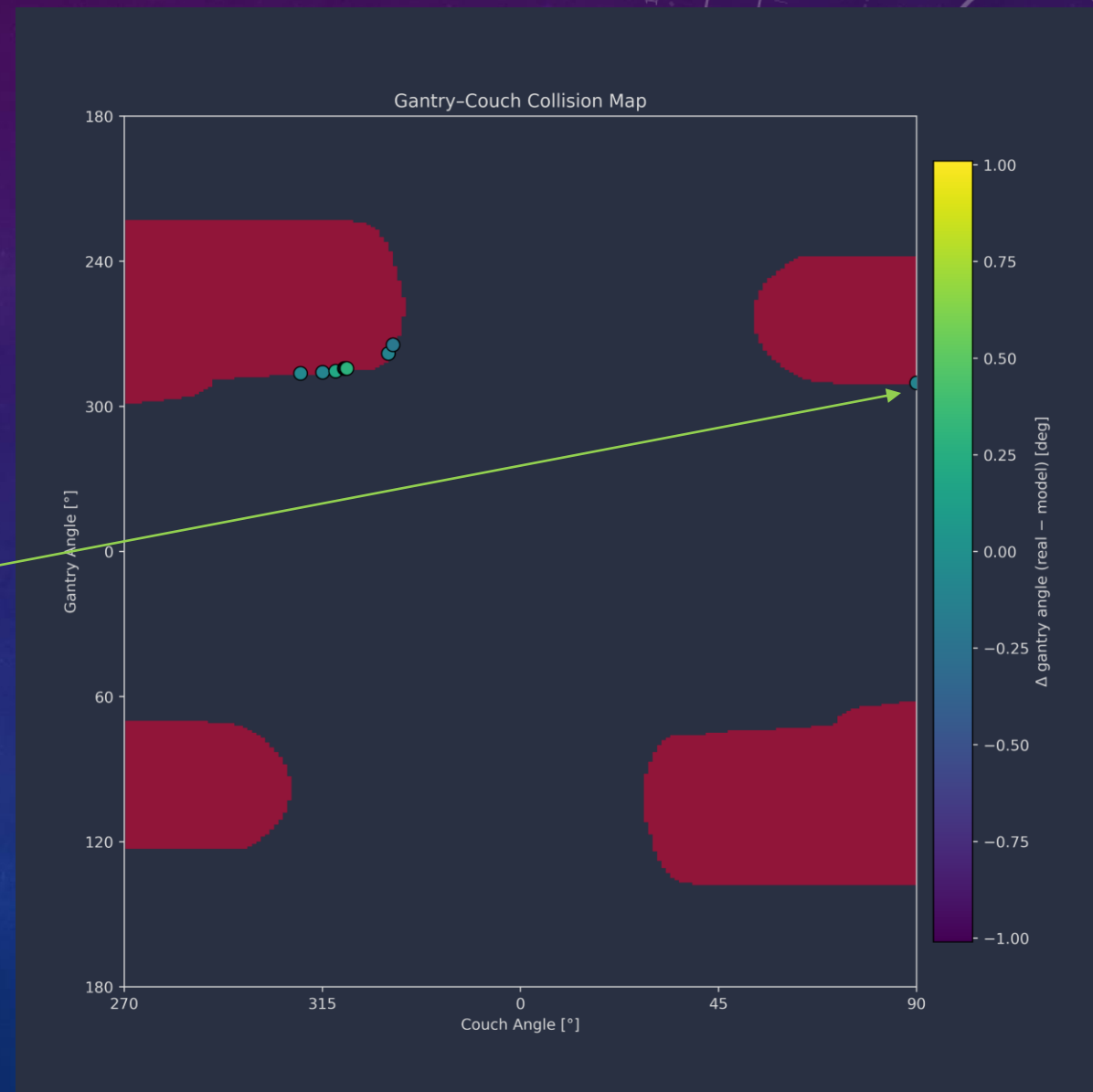
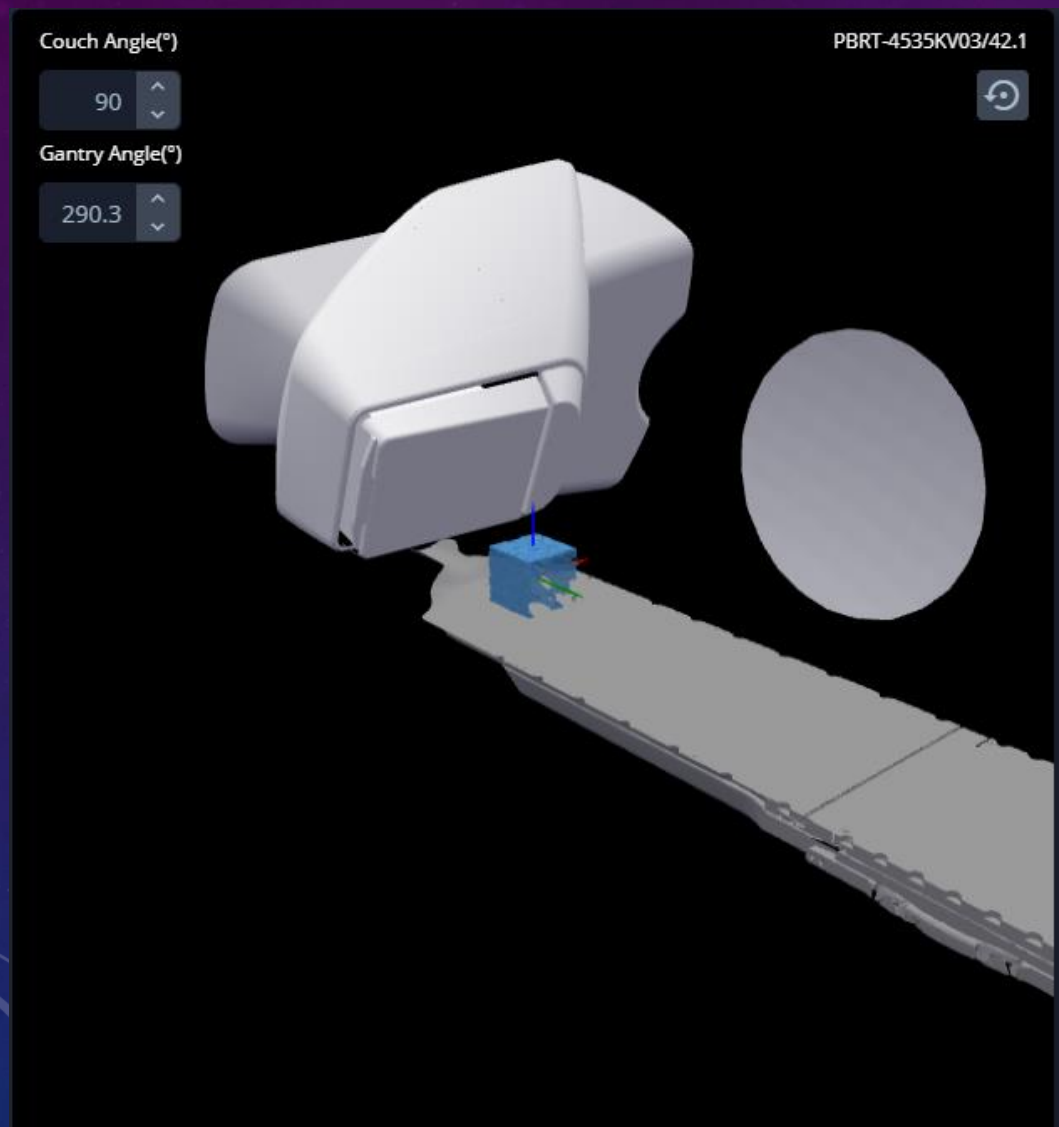
VALIDATION MEASUREMENTS

Base-of-Skull, long couchtop



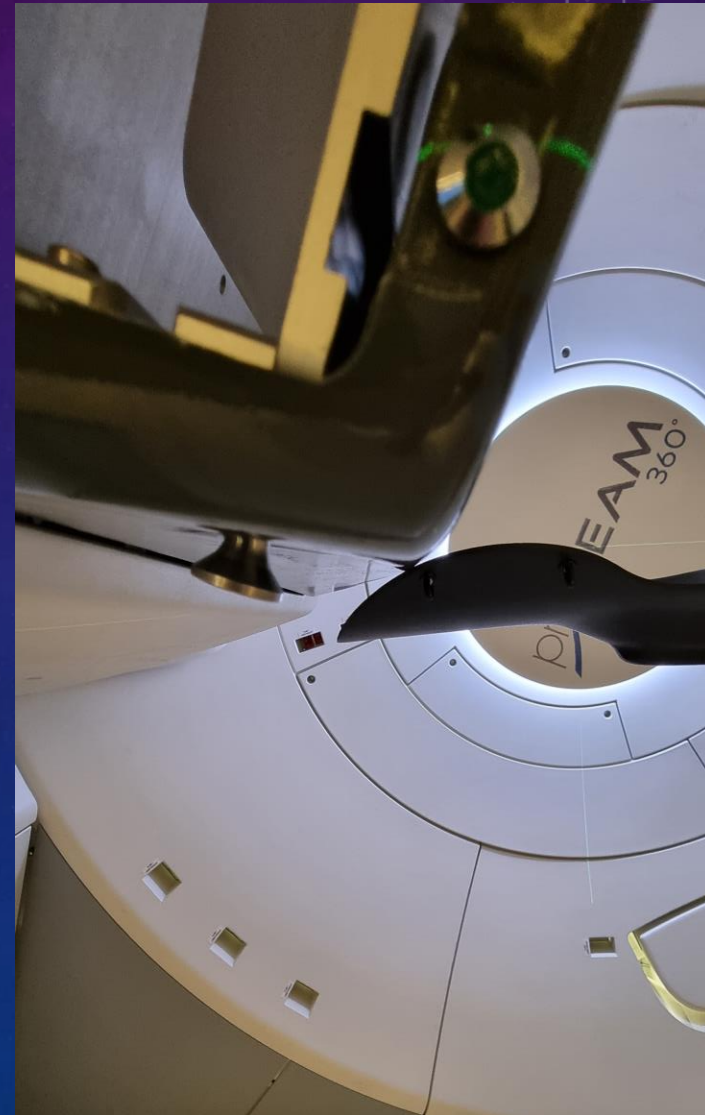
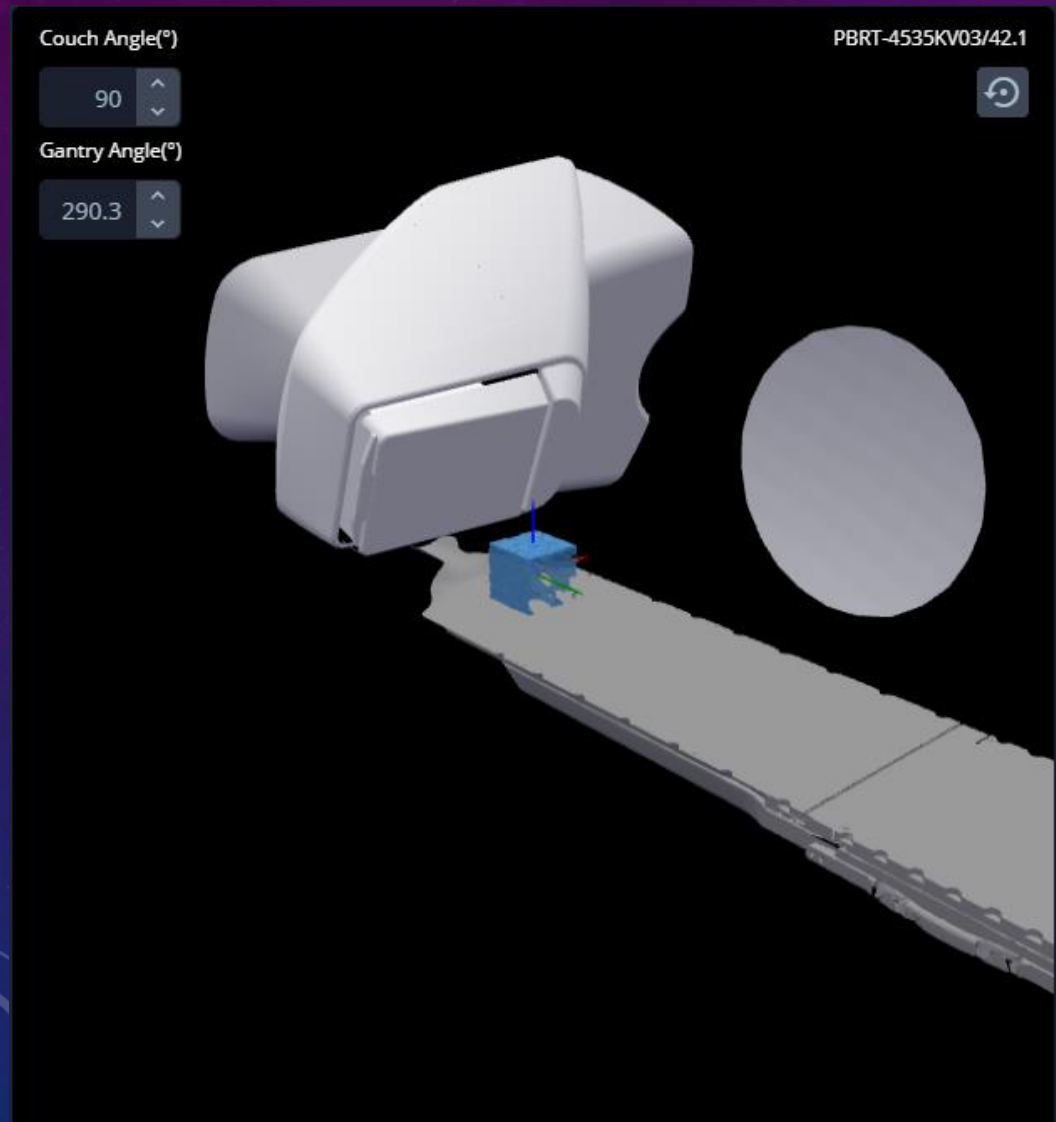
VALIDATION MEASUREMENTS

Base-of-Skull, long couchtop



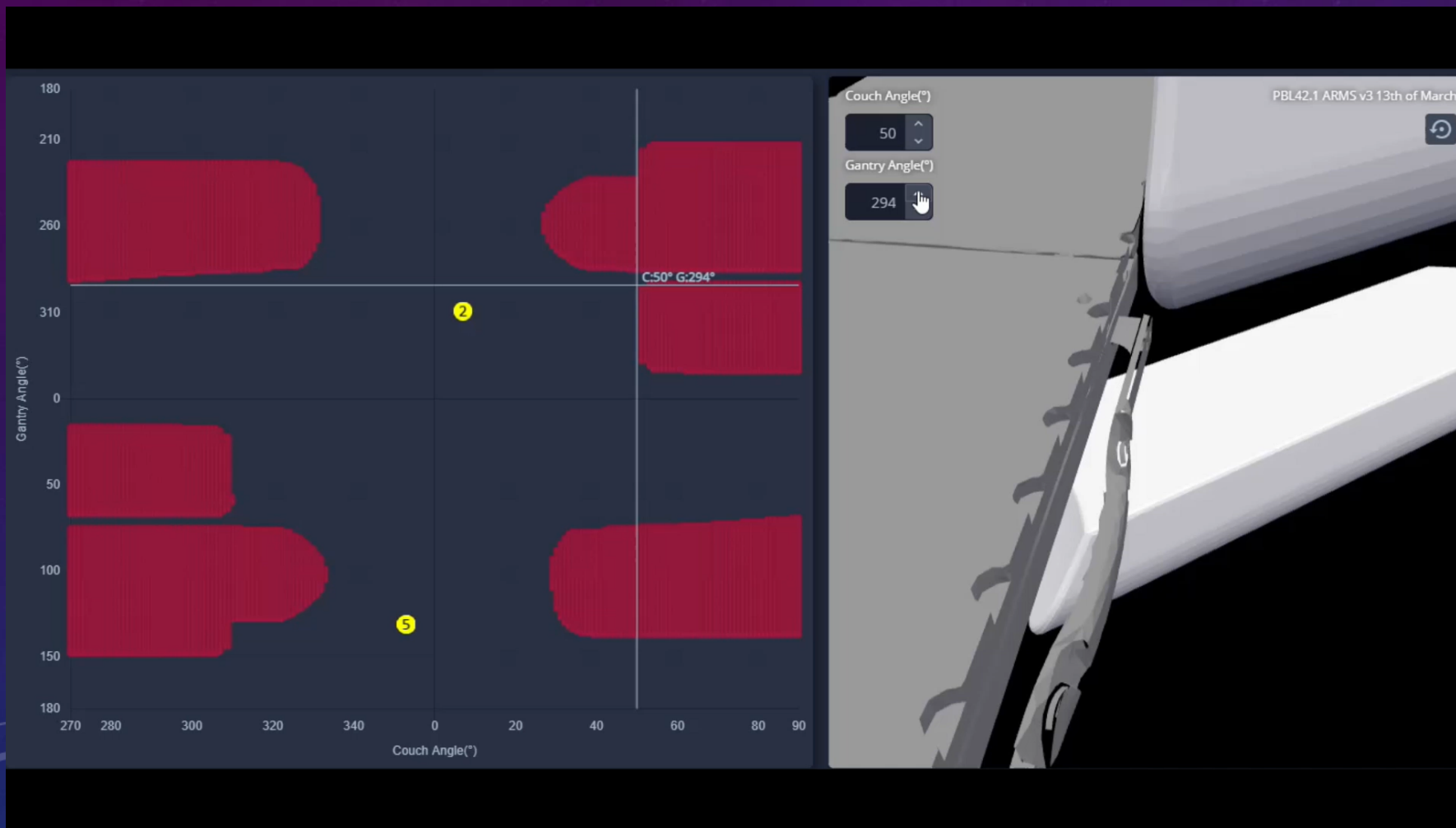
VALIDATION MEASUREMENTS

Base-of-Skull, long couchtop



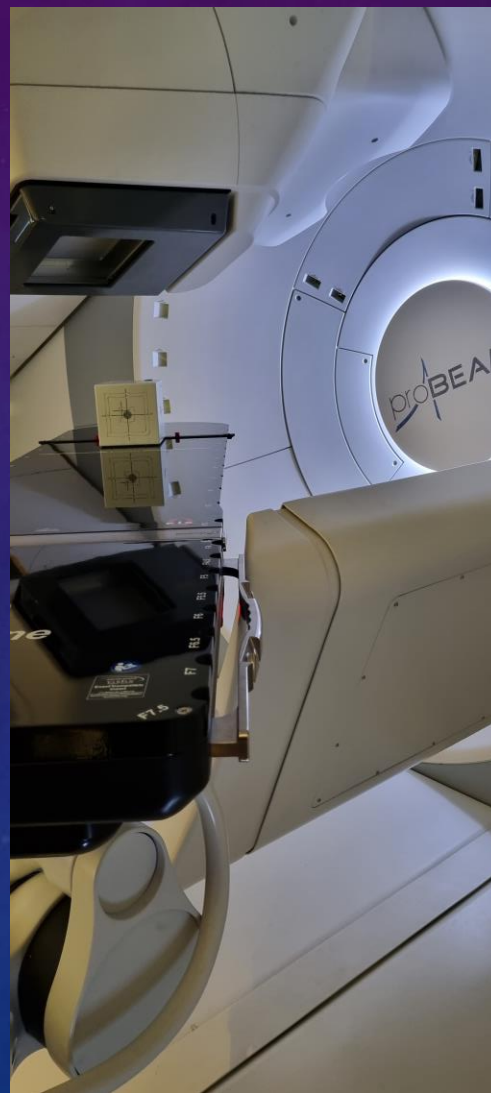
VALIDATION MEASUREMENTS

Couch-base, handrail vs. Imager



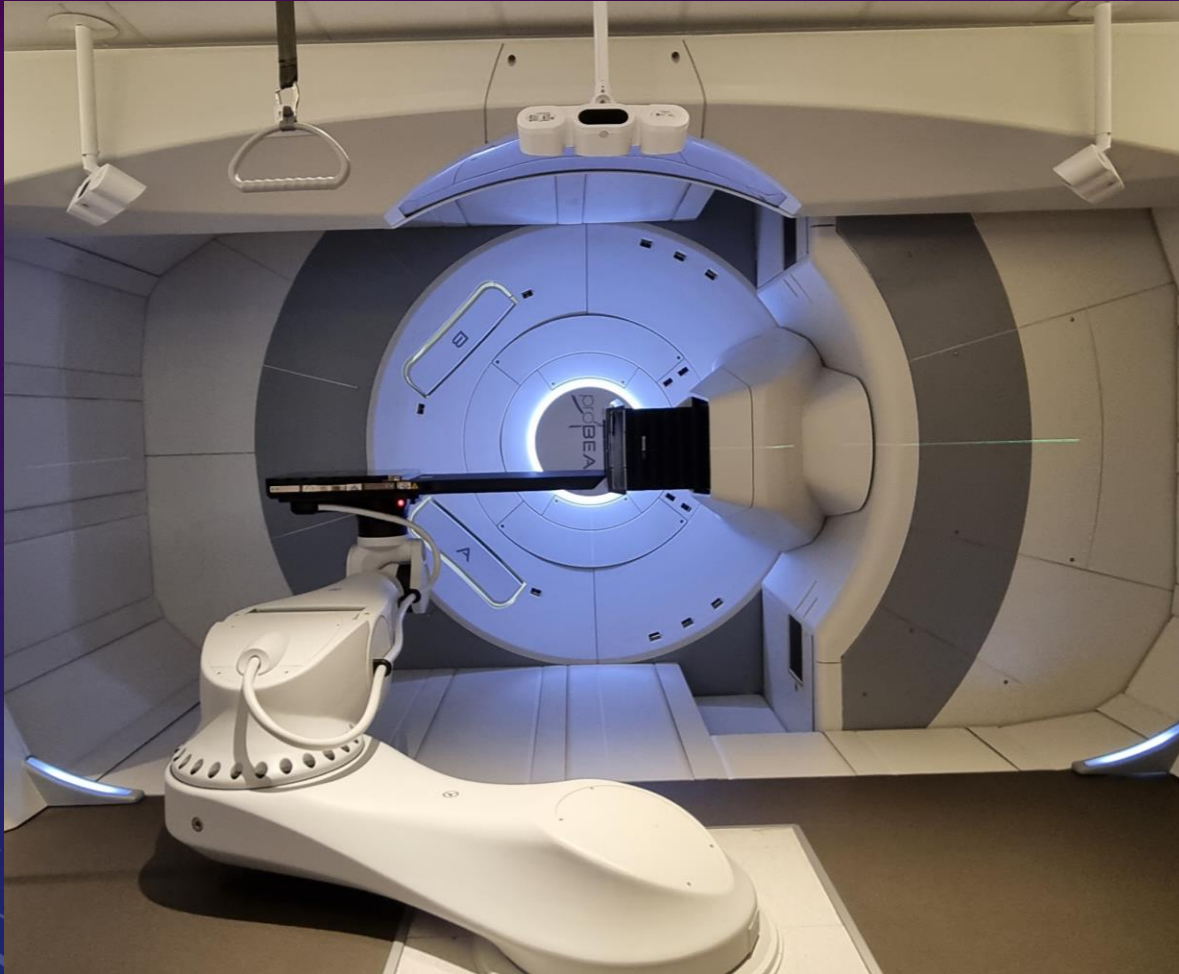
VALIDATION MEASUREMENTS

Couch-base, handrail vs. Imager



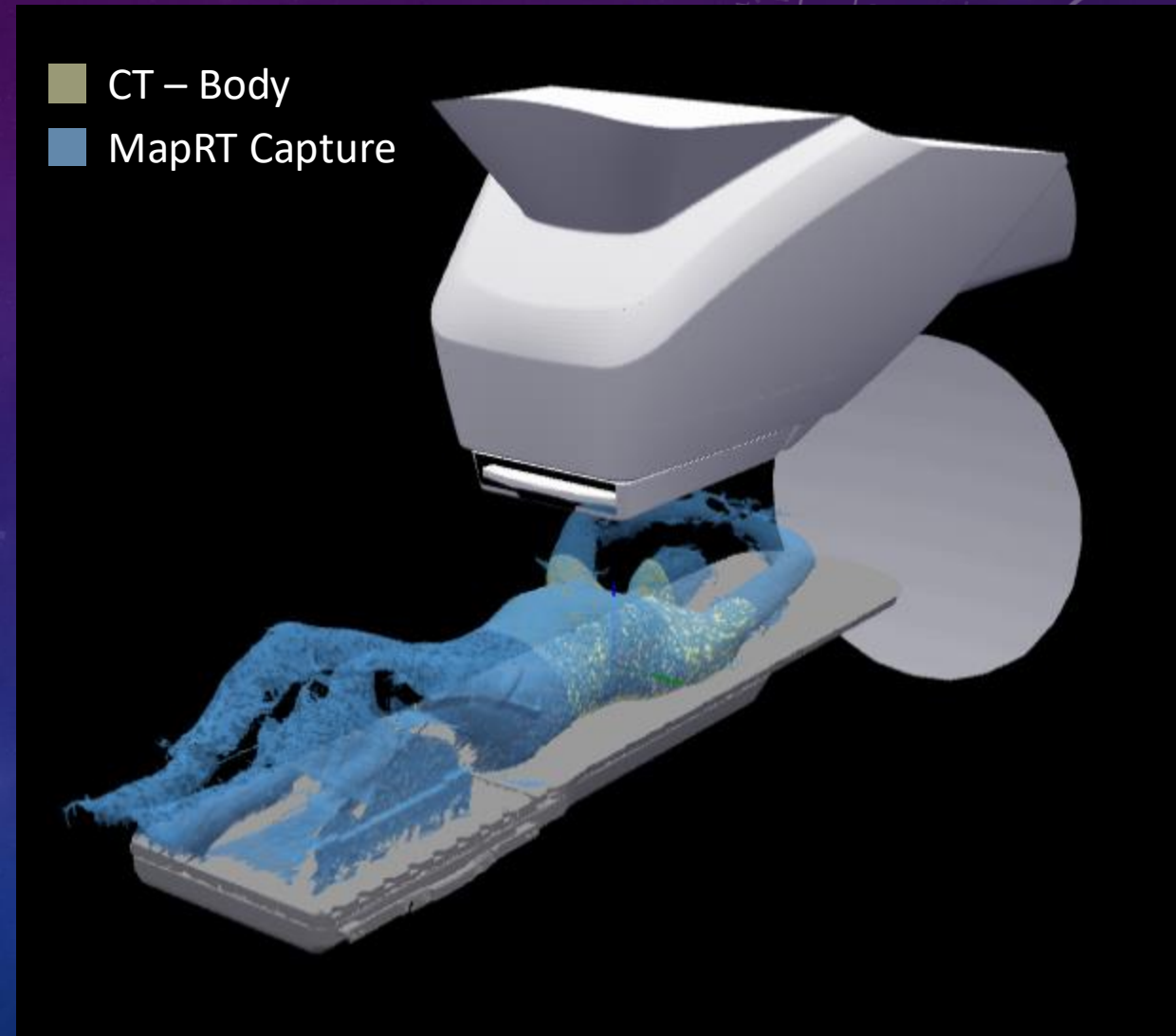
VALIDATION MEASUREMENTS

Position of kVue Base



MOTIVATION

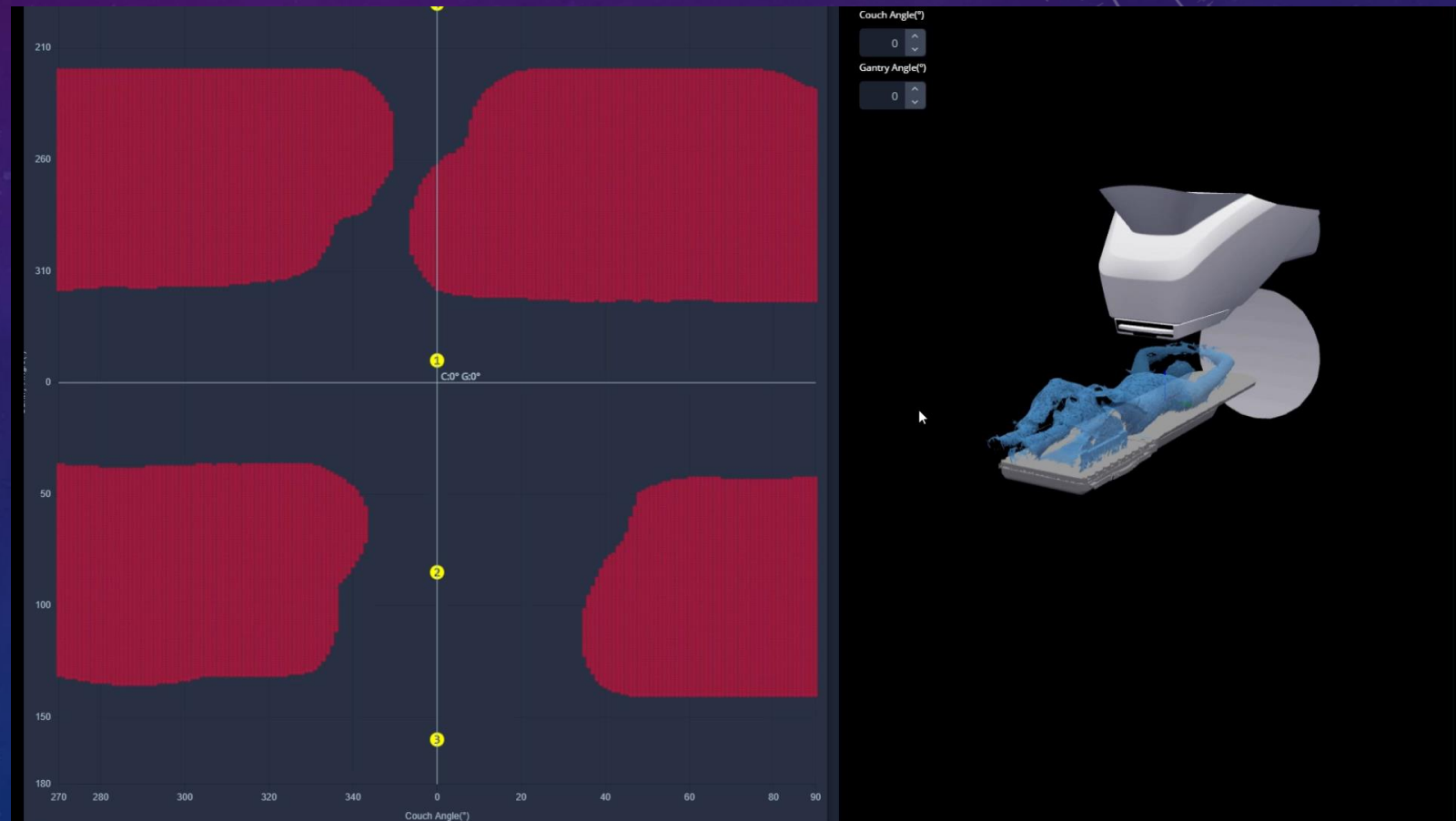
- CT scan length is limited to reduce imaging dose:
 - No information outside scan.
 - Fixation devices, elbows, etc. not visible.
- MapRT provides additional information:
 - Entire patient.
 - Fixation devices.
- Simplifies planning:
 - Collision risk evaluation.
 - Patient- and isocenter positioning.
 - Choice of couchtop (long vs. short).



MOTIVATION

Dry run / Collision risk

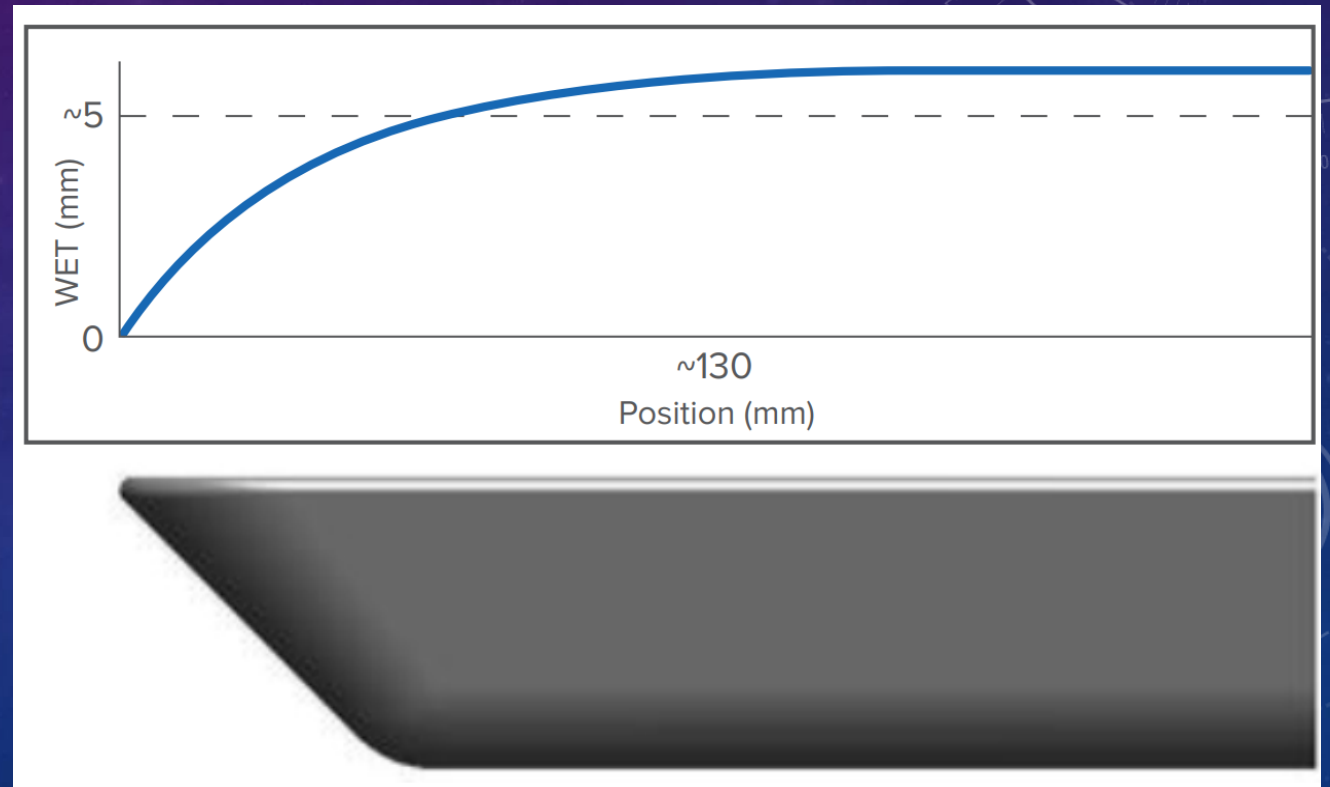
- Lung: Isocenter LAT: -8.6 cm.
- Collision uncovered during dry-run.
 - Elbow not visible in CT.
 - MapRT detects collision.
- Early detection would allow adjustment of isocenter early in planning, and avoid:
 - Plan revision.
 - Repeated plan-QA.



MOTIVATION

Isocenter, longitudinal position

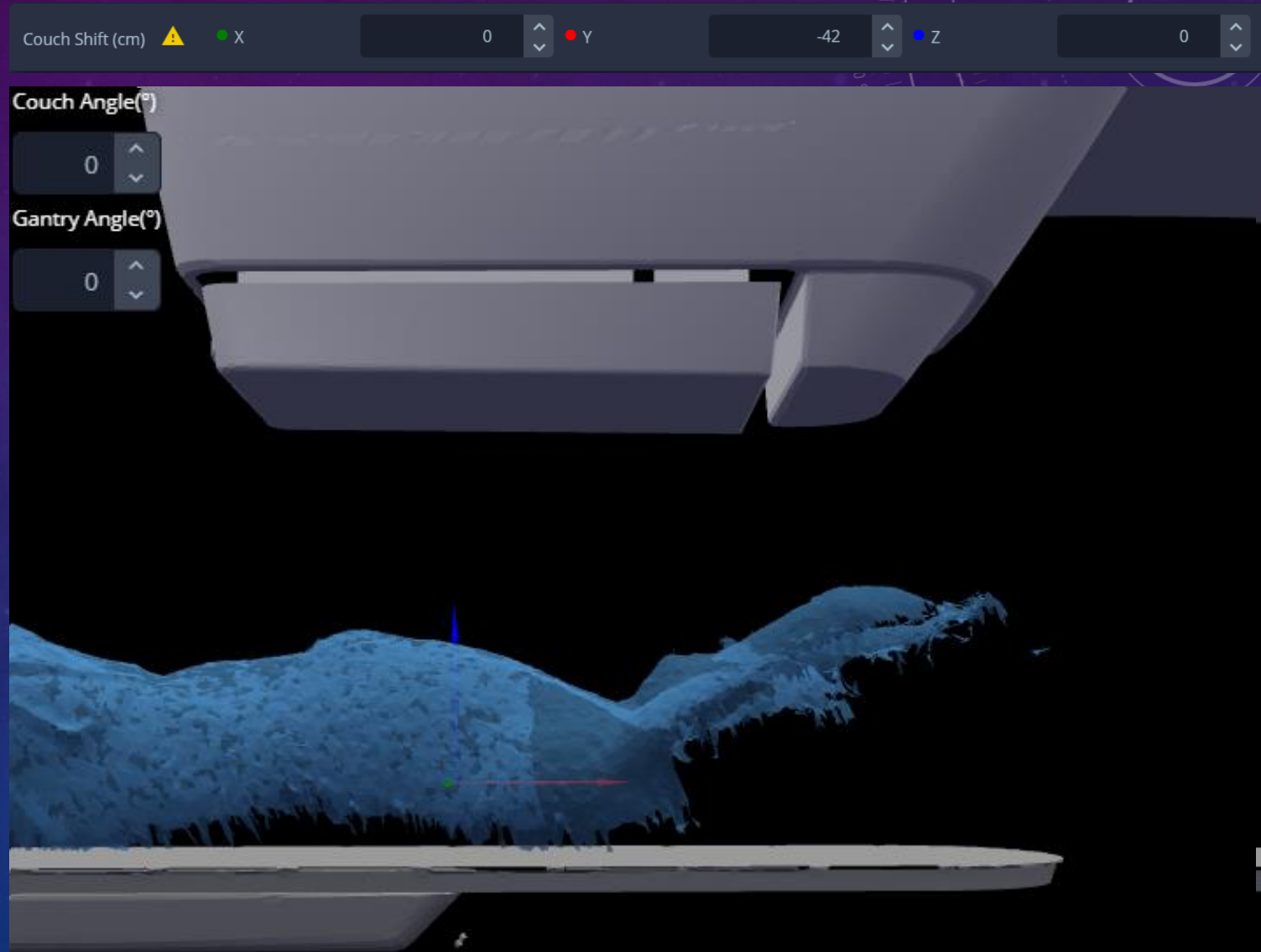
- Different couch top options:
 - Long vs. Short.
 - Make sure patient and fixation fits.
- Avoid 'wedge' at couch base:
 - Higher range uncertainty.
- Without MapRT:
 - Measurements at gantry matched with measurements in RayStation.
 - Time-consuming process.
 - Requires time in treatment room.



MOTIVATION

Isocenter, longitudinal position

- Different couch top options:
 - Long vs. Short.
 - Make sure patient and fixation fits.
- Avoid 'wedge' at couch base:
 - Higher range uncertainty.
- Without MapRT:
 - Measurements at gantry matched with measurements in RayStation.
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VARIOUS EDITS TO THE MODEL

Opening in snout:

- Holes in clearance map
- Snout closed in new models

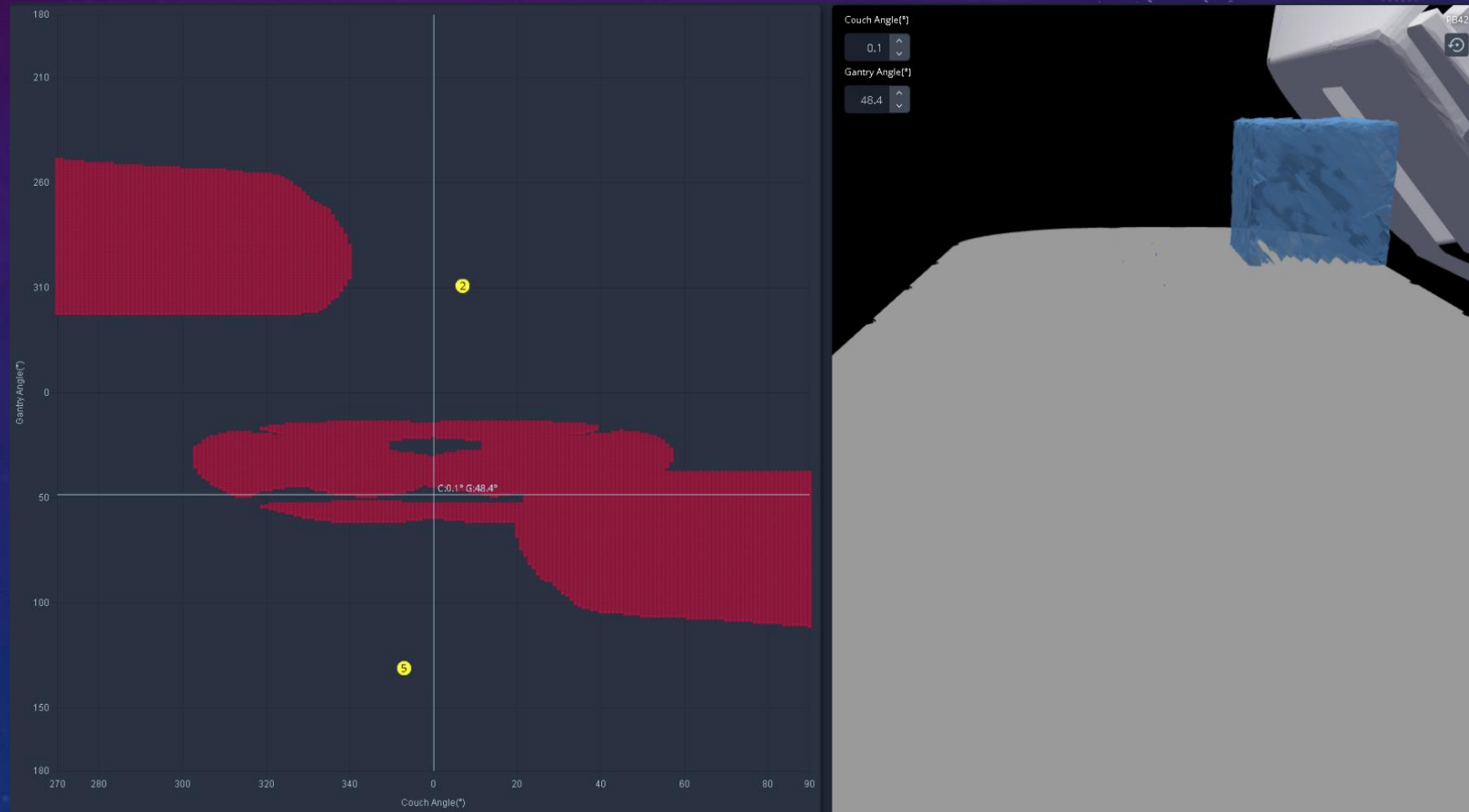
Room indicator:

- 'PB360' circle added to wall

Imager arm position:

- Extension adjusted after measurements

Etc...



THANKS TO THE TEAM!

VisionRT

- Katja
- Thomas
- Karol
- Christopher
- Nik
- Glen

OUS

- Haakon
- Mojgan
- Rob



1



SGRT Surface



IBA_CUBE

VRT_{cm} 0.04

LNG_{cm} 0.00

LAT_{cm} 0.01

MAG_{cm} 0.04

RTN[°] 0.0

PITCH[°] 0.1

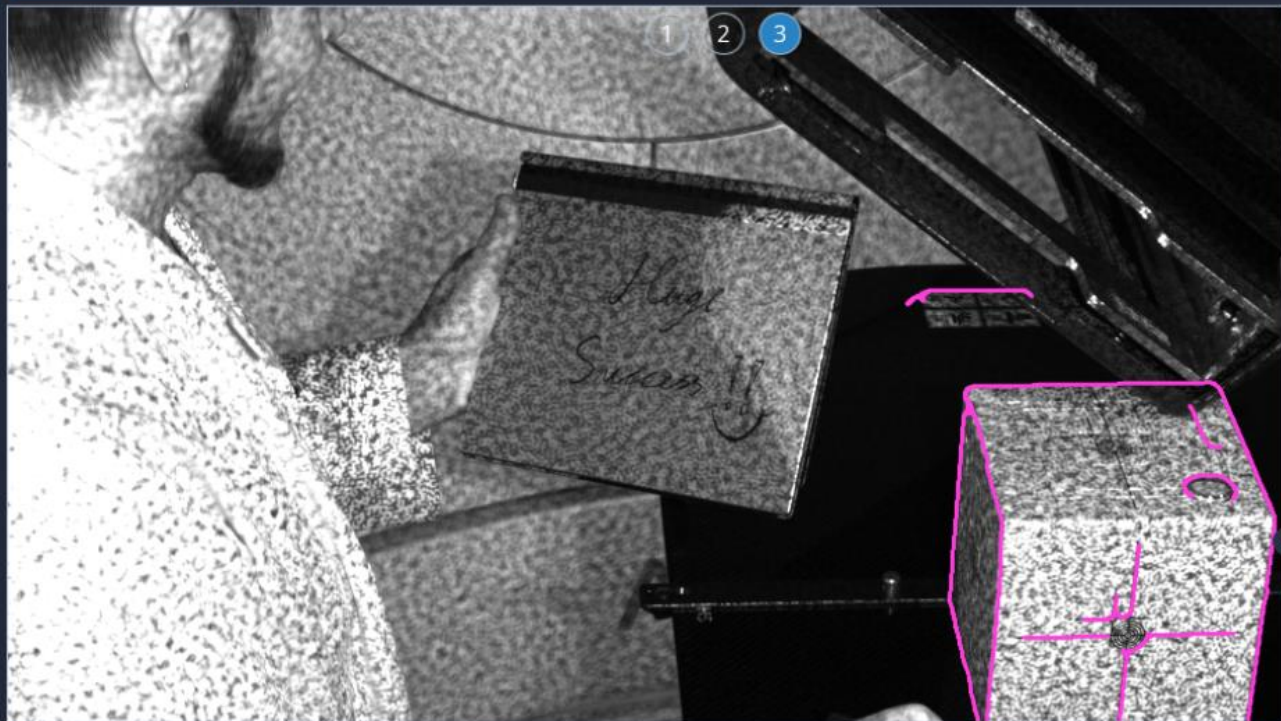
ROLL[°] 0.0

Reference

Treatment

Couch 0.0°

Beam Control OFF



2D Plotter Off

Surface

Deformation

Video

17.6 fps

Field Status

System Status

2026/04