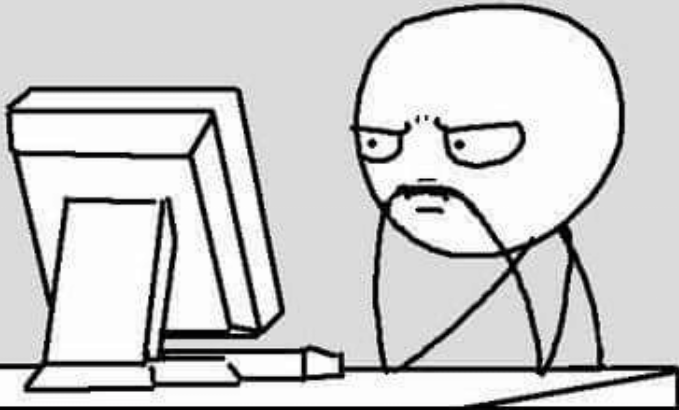
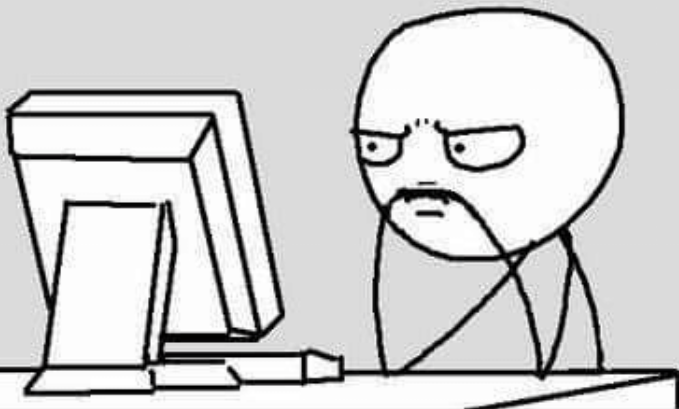


QA for Advanced Applications in SGRT

It doesn't work..... why?



It works..... why?



We Know Memes



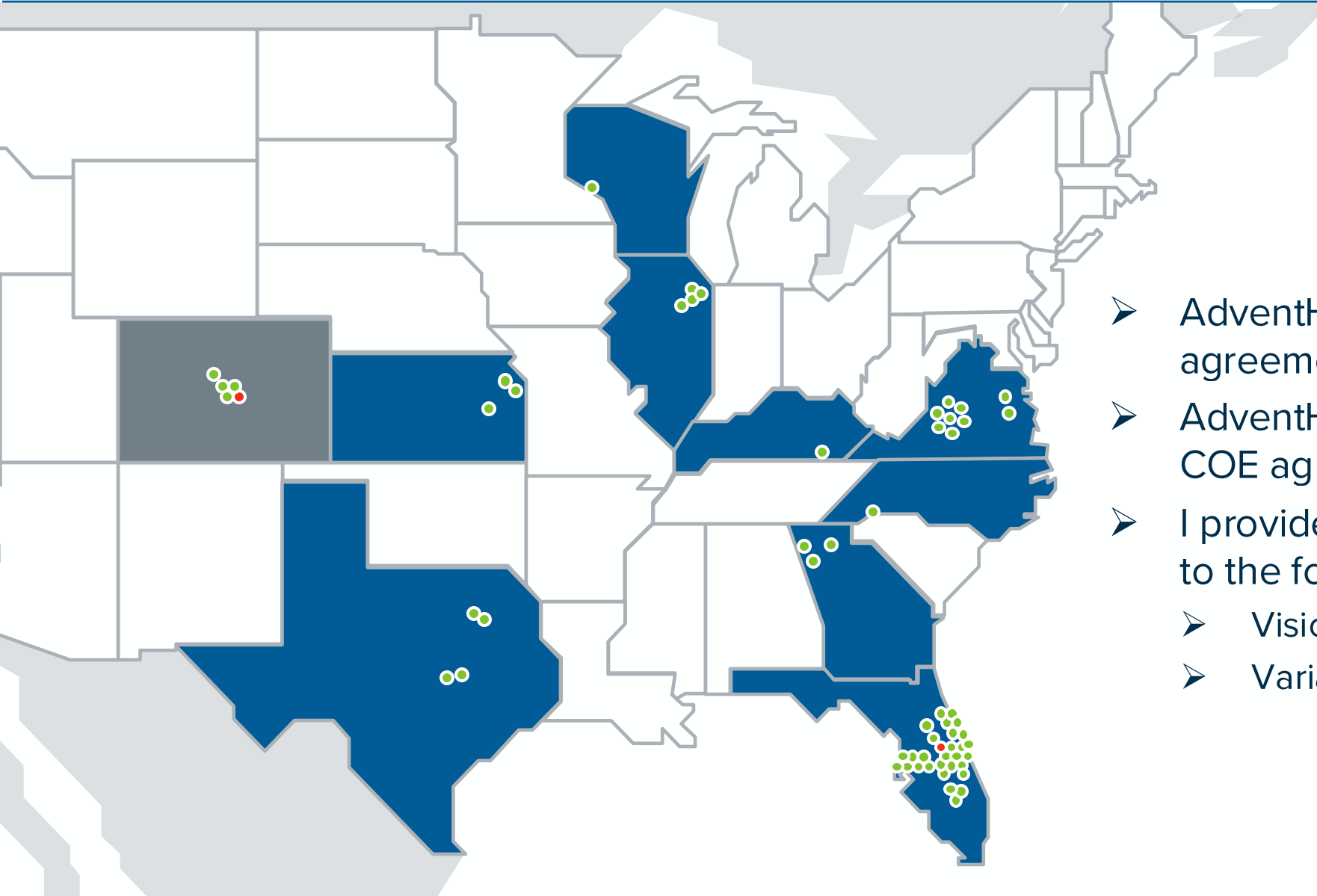
Michael J Tallhamer MSc DABR

Chief of Radiation Physics

AdventHealth Rocky Mountain Region

Michael.Tallhamer@AdventHealth.com

Disclosures



- AdventHealth – Parker has a PSA agreement with Vision RT.
- AdventHealth – Celebration has a COE agreement with Vision RT.
- I provide physics consultation services to the following vendors
 - Vision RT
 - Varian Medical Systems

AdventHealth's SGRT Portfolio



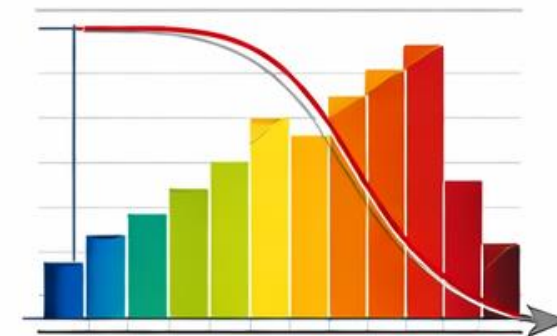
Sim



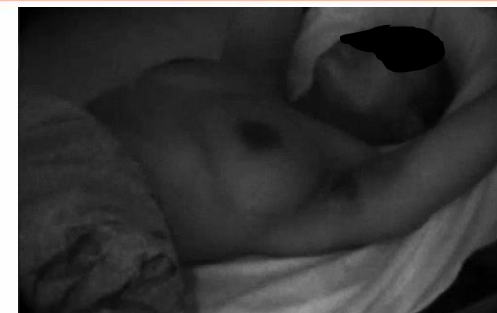
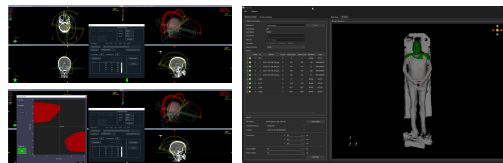
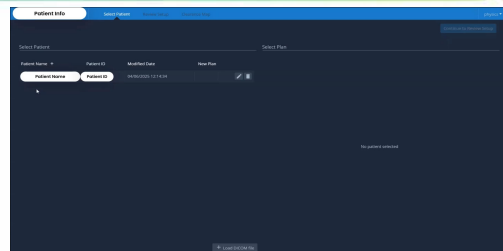
Plan



Treat



Dose

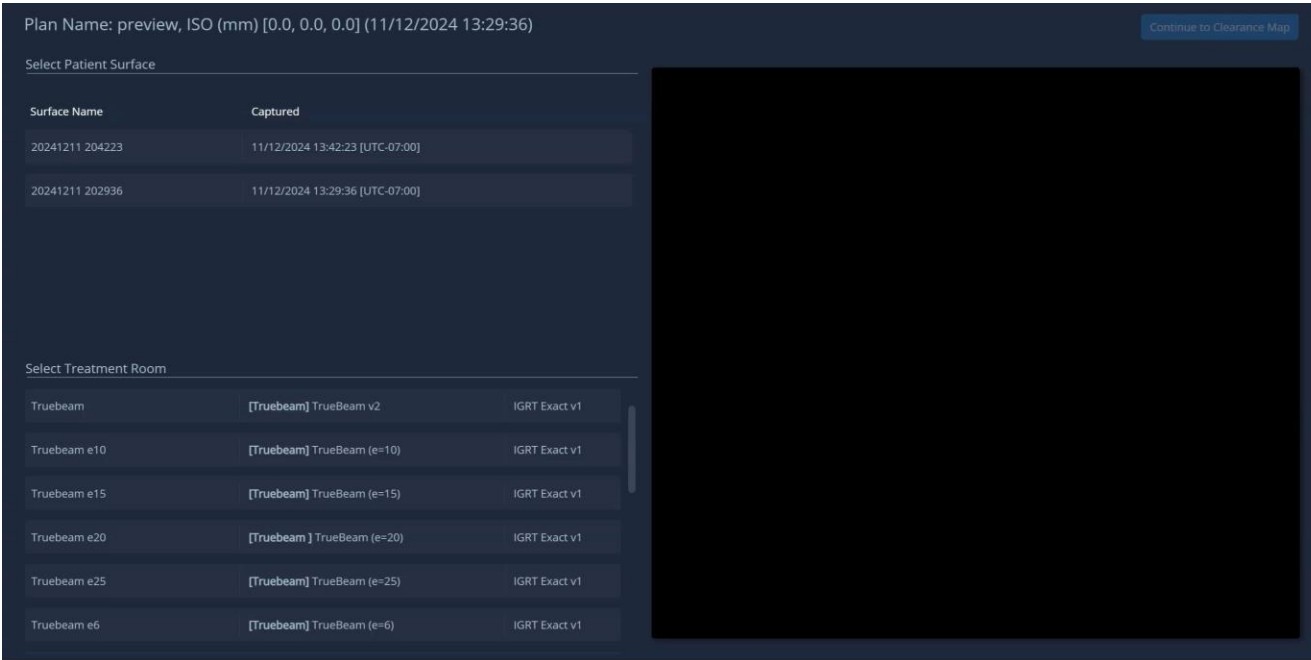


Goals

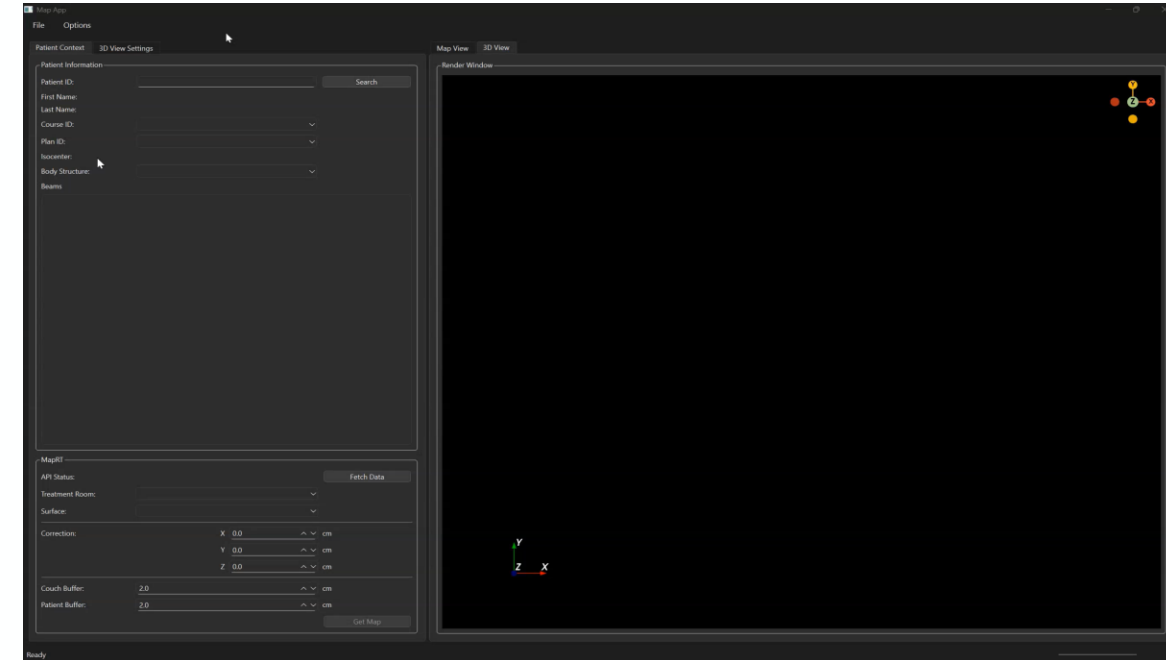
- Introduce emerging QA considerations associated with advanced applications of SGRT.
- Discuss QA objectives and risk-based frameworks relevant to new SGRT systems and modules.
- Highlight case studies demonstrating how scripting solutions can mitigate workflow concerns and support validation of process changes.
- Encourage discussion toward establishing consistent guidelines for Acceptance, Commissioning, and Ongoing Quality Assurance practices as these technologies continue to evolve.



Familiarize Standard Sim Workflows and Perform Work Once



MapRT Web Interface

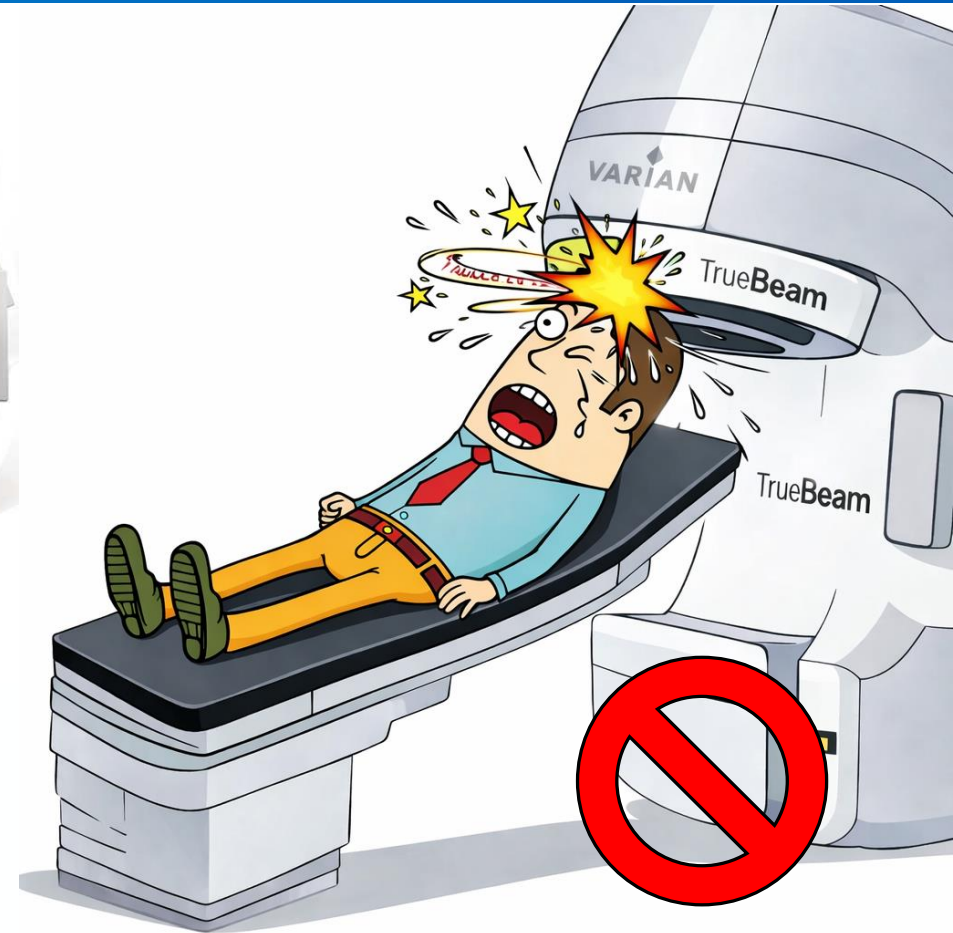


MapRT API

We can work with the therapy teams to

- Design workflow to take advantage of the familiarity of the sim room (e.g. lasers vs axis marker)
- Set isocenter once and compare multiple collision maps
- Cache maps to avoid recalculation with repeated changes

Ensuring Setup Accuracy and Patient Safety



Powerful Pre-Planning Treatment Validation– Noncoplanar Planning

MapRII

3D View Settings

Map View 3D View

Render Window

Patient Information

Patient ID: *****

First Name: HN

Last Name: DEMO

Course ID: F1

Plan ID: HN_Tongue

Isocenter: -6.33 1 -83.54 85.54

Body Structure: body

Beam	Name	ID	Name	Couch	Gantry Start	Gantry Stop	Rotation	Type
1	5	CBCT		0	0	0	NONE	SETUP
2	6	1	G255-105 HN_Tongue	0	255	105	CW	TREATMENT
3	7	2	G105-255 HN_Tongue	0	105	255	CC	TREATMENT
4	8	3	G255-105 HN_Tongue	0	255	105	CW	TREATMENT
5	9	4	G105-255 HN_Tongue	0	105	255	CC	TREATMENT
6	1	G200		0	0	0	NONE	SETUP
7	2	G270		0	270	270	NONE	SETUP
8	3	G090		0	90.1	90.1	NONE	SETUP
9	4	G180		0	180.1	180.1	NONE	SETUP

MapRII

API Status: HTTP Status Code: 200 OK

Treatment Room: Truebeam

Surface: 2025-05-07T18:29:09.B07

Correction

X: 0.0 cm

Y: 0.0 cm

Z: 0.0 cm

Couch Buffer: 2.0 cm

Patient Buffer: 2.0 cm

Get Map

Demo, SGRT
01/01/1984, SGRT001

Preparation

NOT FOR CLINICAL USE

physics

Import DICOM

Set Treatment

Treatment Course

Plan Name: Active

- HN 1 Point [Head and Neck]
- ISO 1 [0.00, 2.11, -1.35]
- CT SIM BODY 04/06/2025 07:03:57

Treat Without Beam Control

ROI1 [Isocentric]

+ Add ROI

- HN 3 Point [Head and Neck]
- HN 5 Point [Head and Neck]
- Prostate [Pelvis]

Changes are saved automatically

alignrt | Database Storage softlock was unlocked

System Status | 04/06/2025 09:56

S

CT AAA

R

Slice: 178/183

W/L: 1000.00 / 500.00

Powerful Post Planning Insights – Noncoplanar Planning

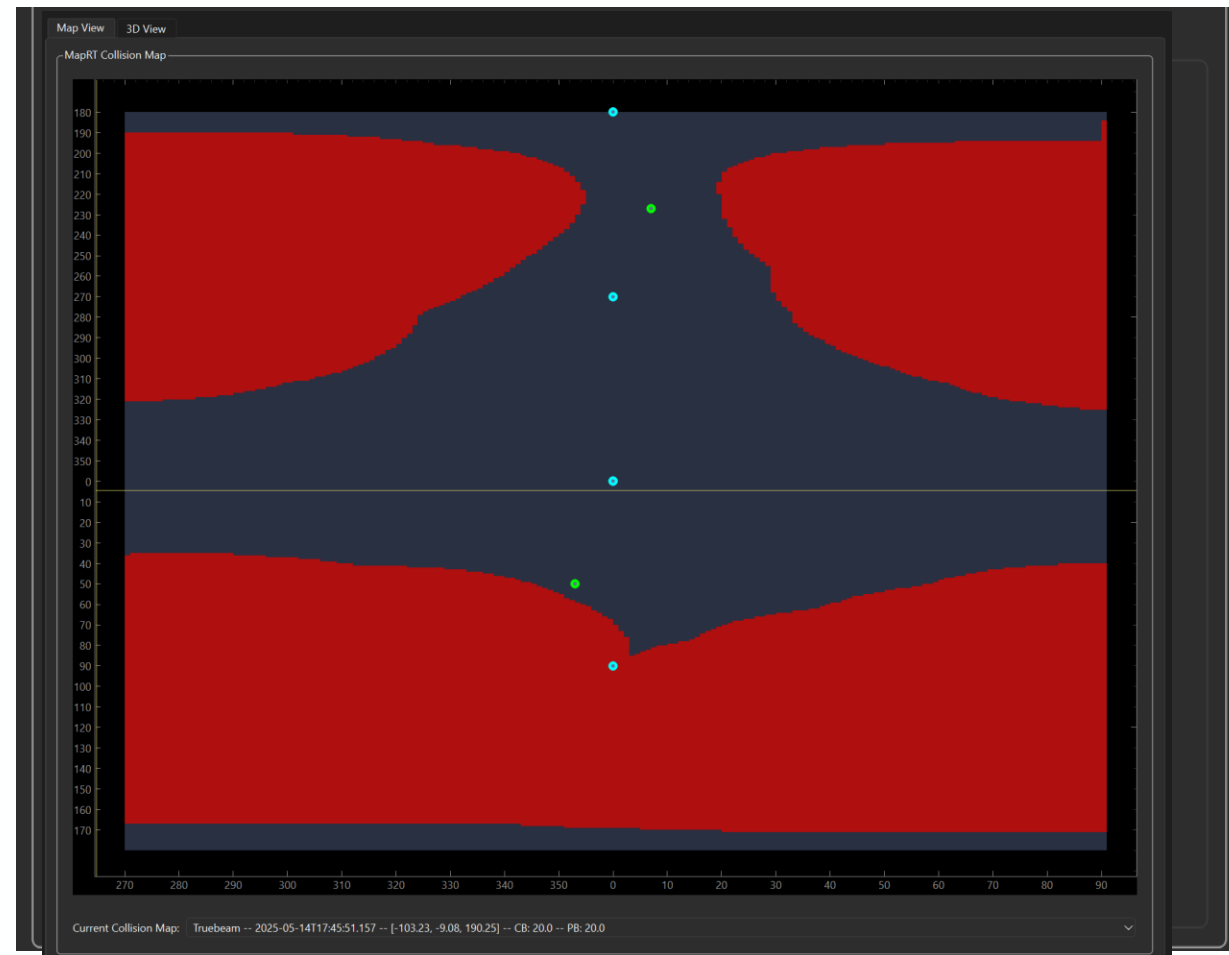
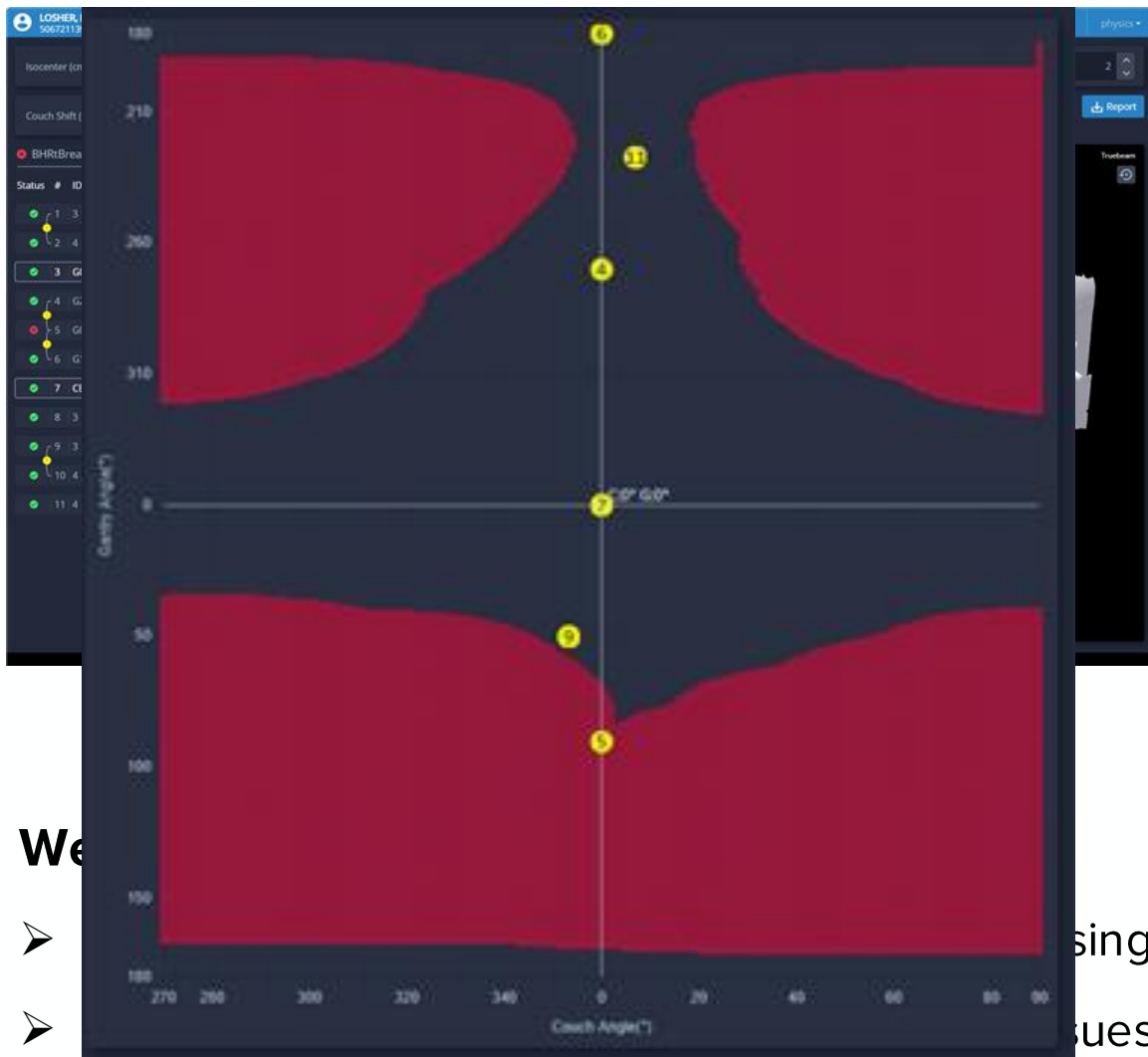
The screenshot shows a software interface with a dark blue header and a main content area. The header contains navigation tabs: "Patient Info" (highlighted), "Select Patient", "Review Setup", and "Clearance Map". On the right side of the header, there is a "physics" dropdown menu and a "Continue to Review Setup" button.

The main content area is divided into two sections: "Select Patient" and "Select Plan". Under "Select Patient", there is a table with the following columns: "Patient Name" (with an upward arrow), "Patient ID", "Modified Date", and "New Plan".

Patient Name ↑	Patient ID	Modified Date	New Plan
Patient Name	Patient ID	04/06/2025 12:14:34	

Below the table, there are edit and delete icons. The text "No patient selected" is displayed in the center of the main area. At the bottom of the interface, there is a "+ Load DICOM file" button.

Powerful Post Planning Insights – Noncoplanar Planning



We

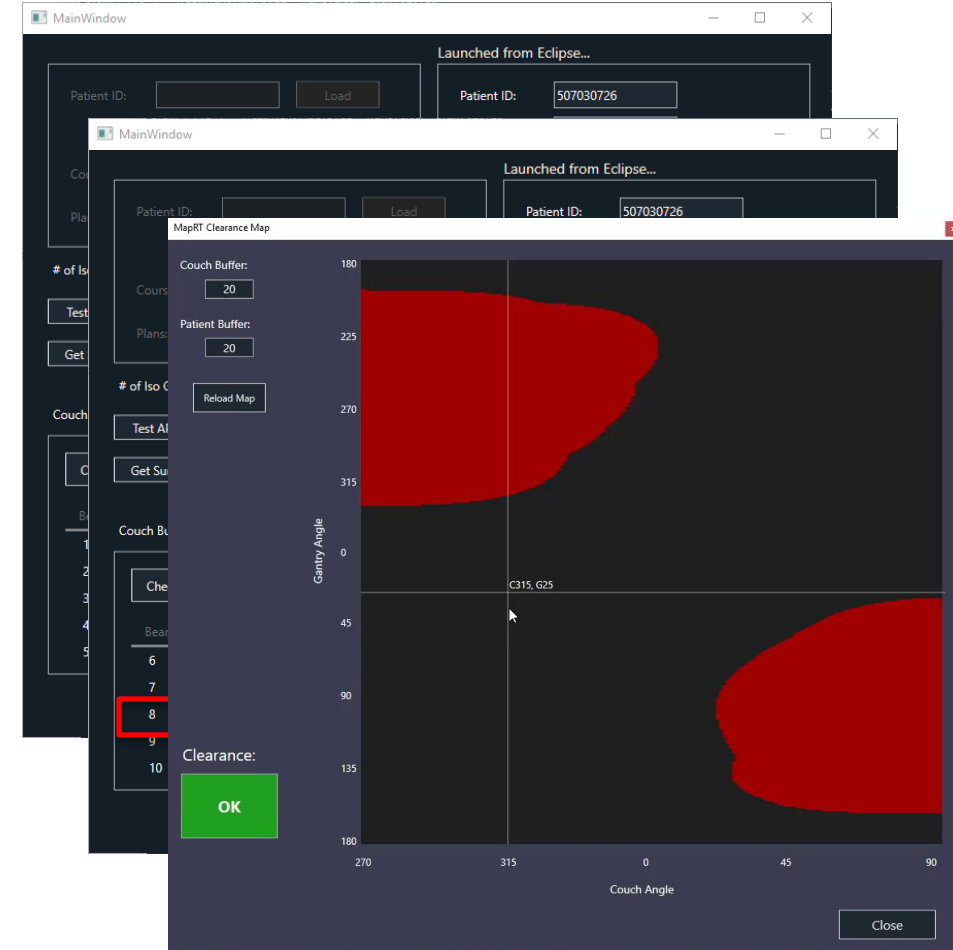
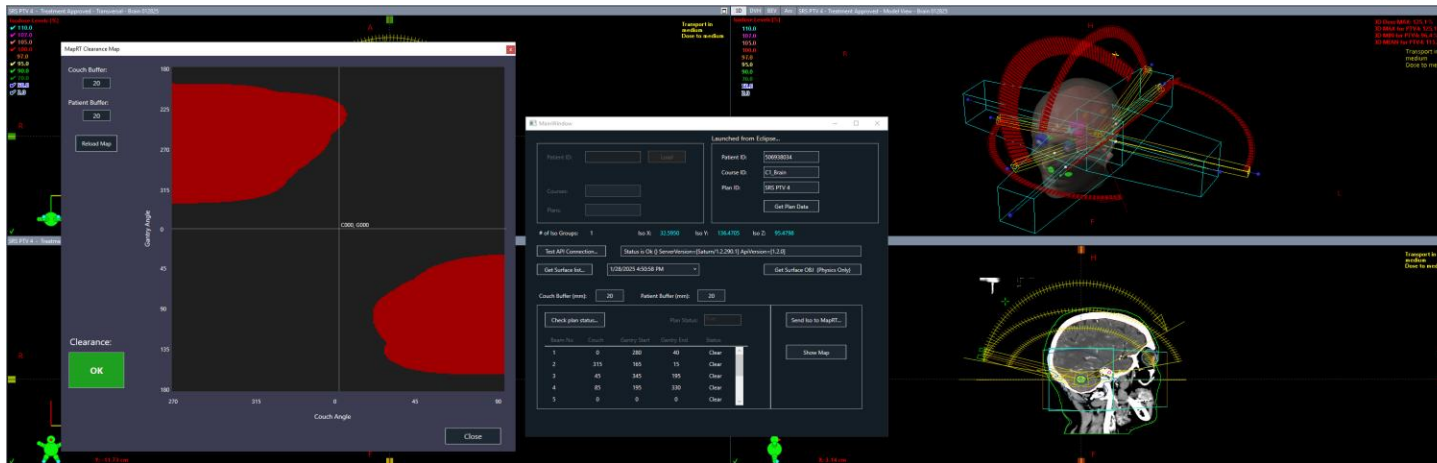
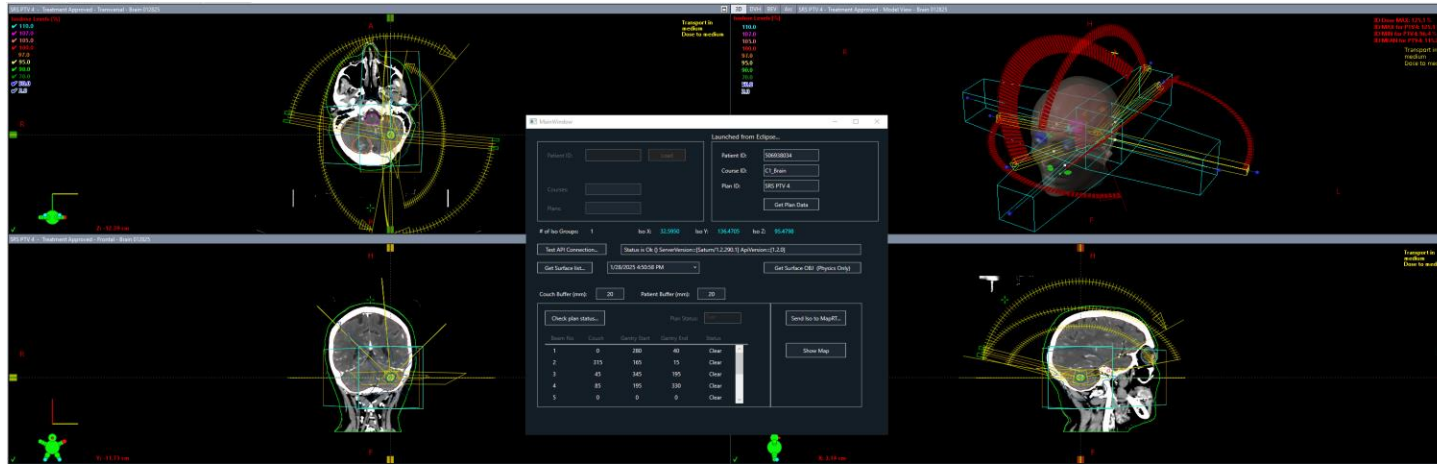


ing

ues from non-issues

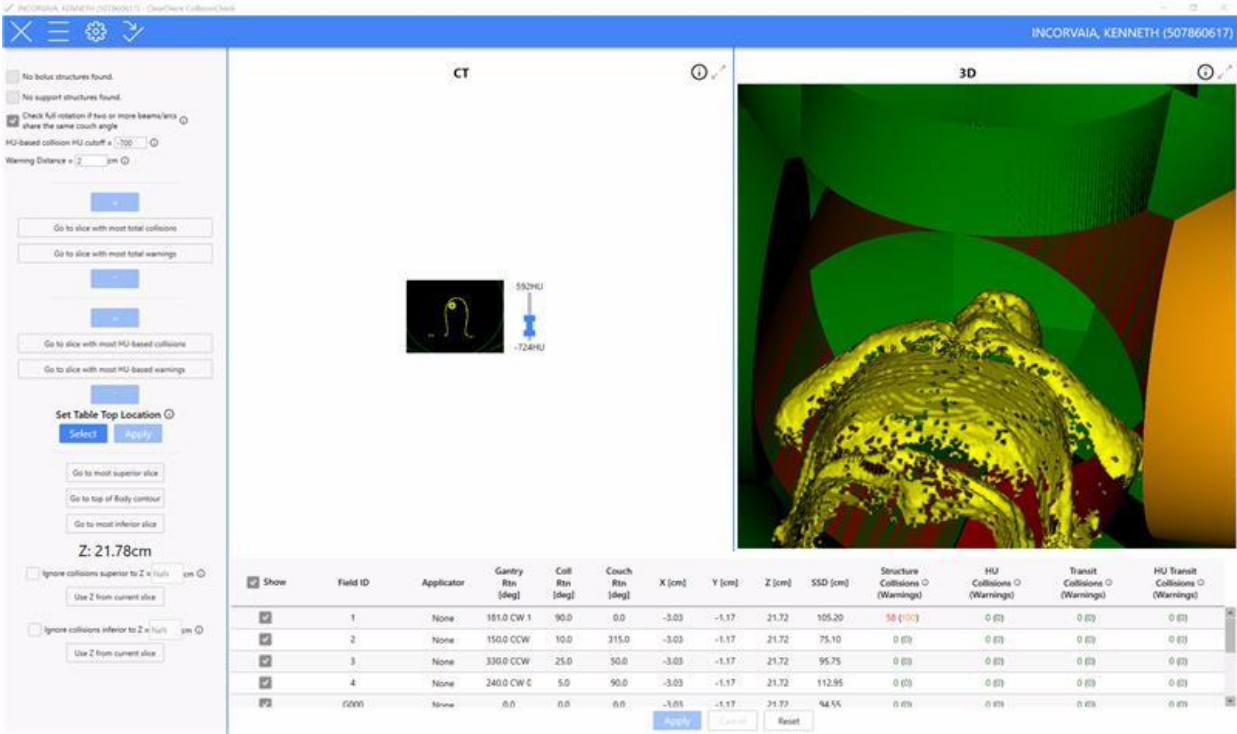
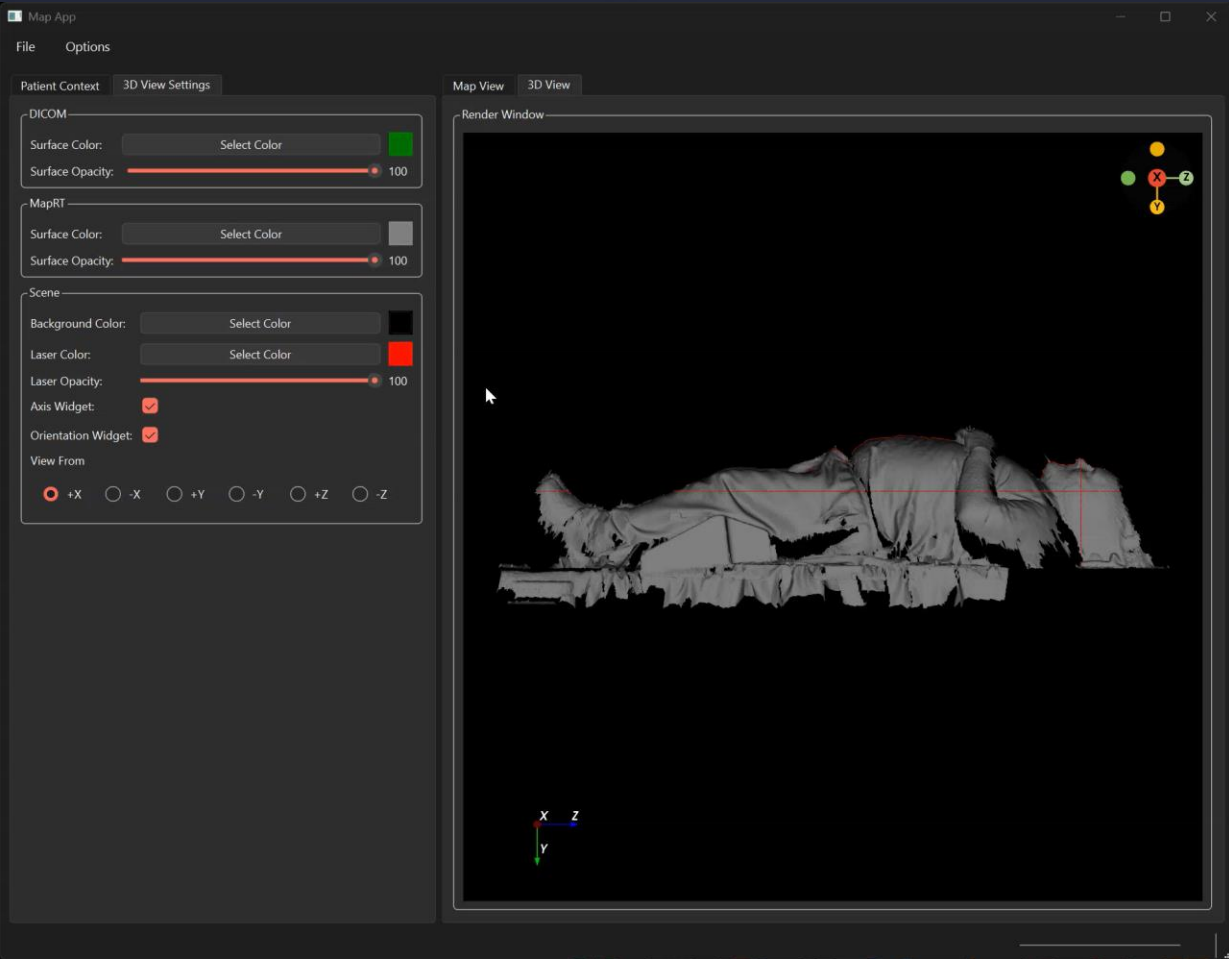
Simply make folks happy

Rapid In-Plan Validation Through ESAPI Integration (C#)

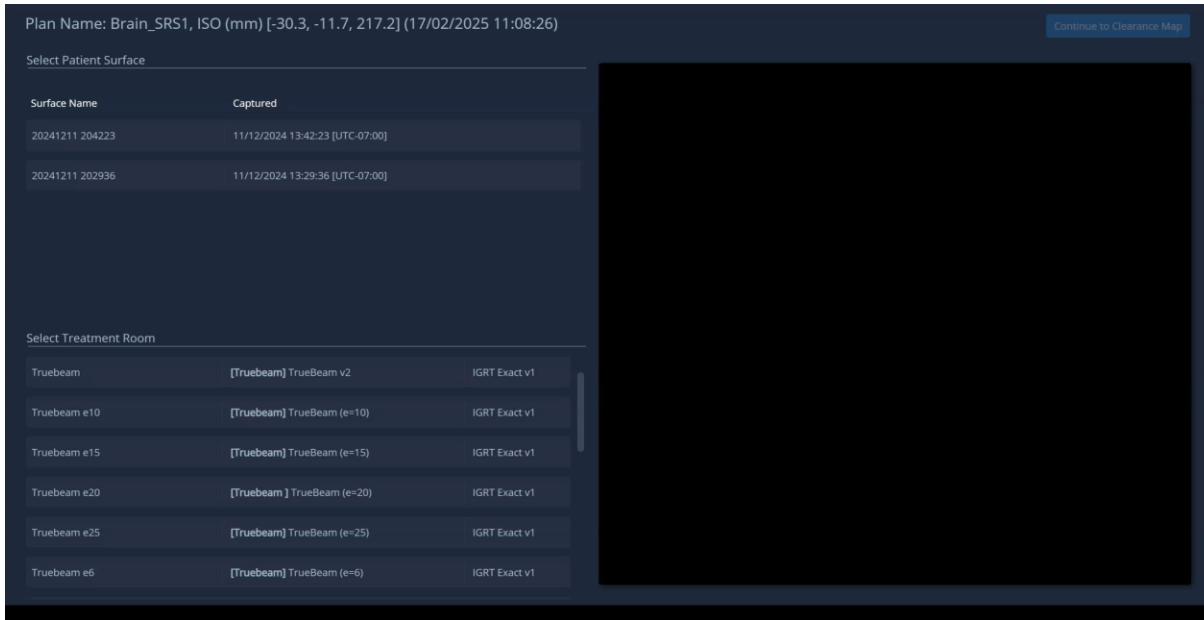


- Leveraging the API allows the user to rapidly evaluate the plan context being worked on while planning.
- The API also allow the user to generate a collision map that can be dynamically explored for alternate solutions for failing fields reducing planning time by more than 30 minutes.

Surface Modification To Help Eliminate False Positives

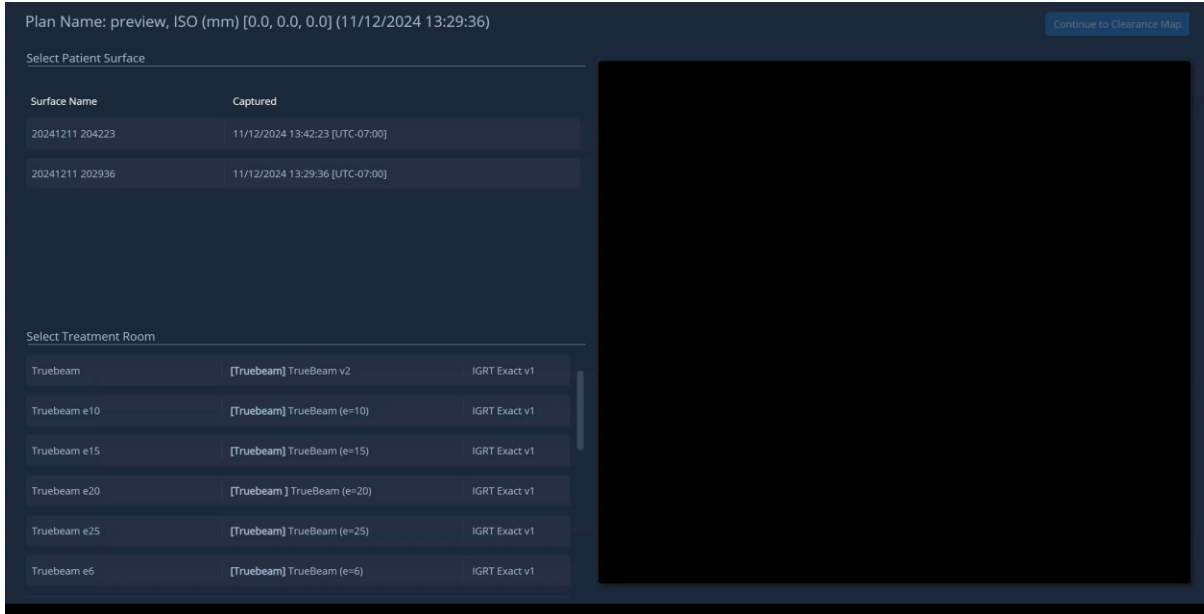


Workflow Dependent Errors: Collision Map Validation

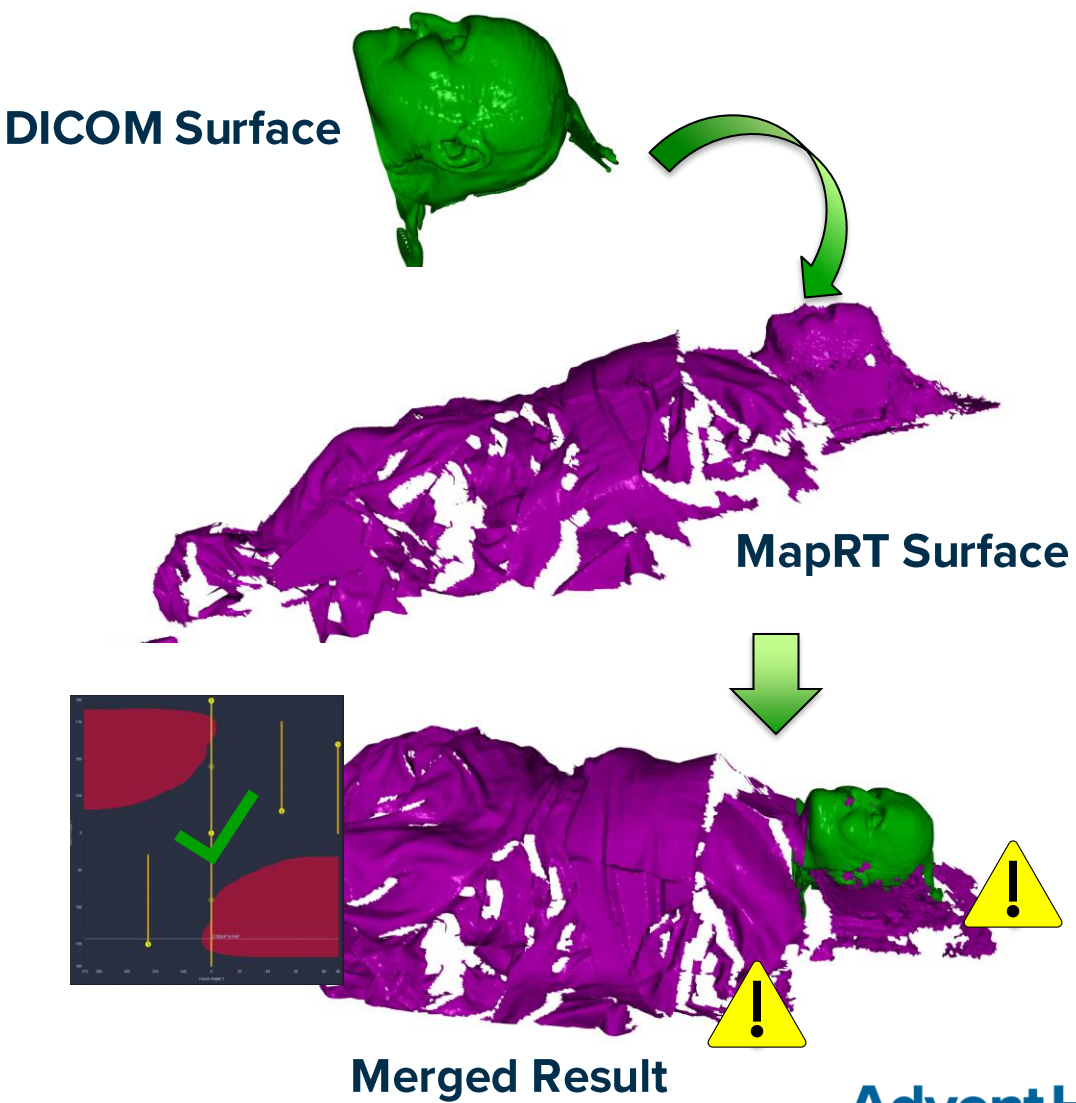
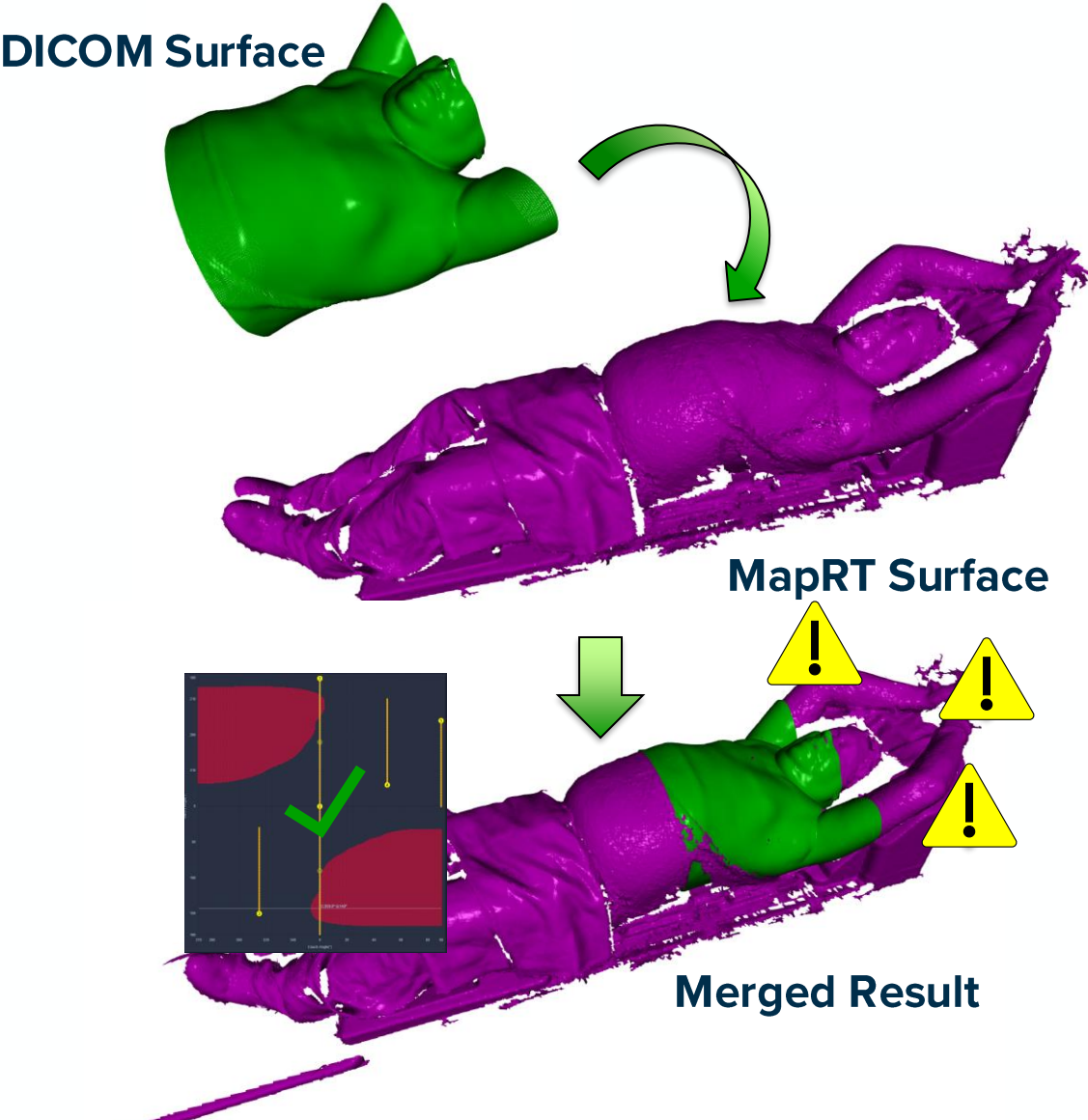


Promoting replacement of safety checks with new methods requires new safety checks

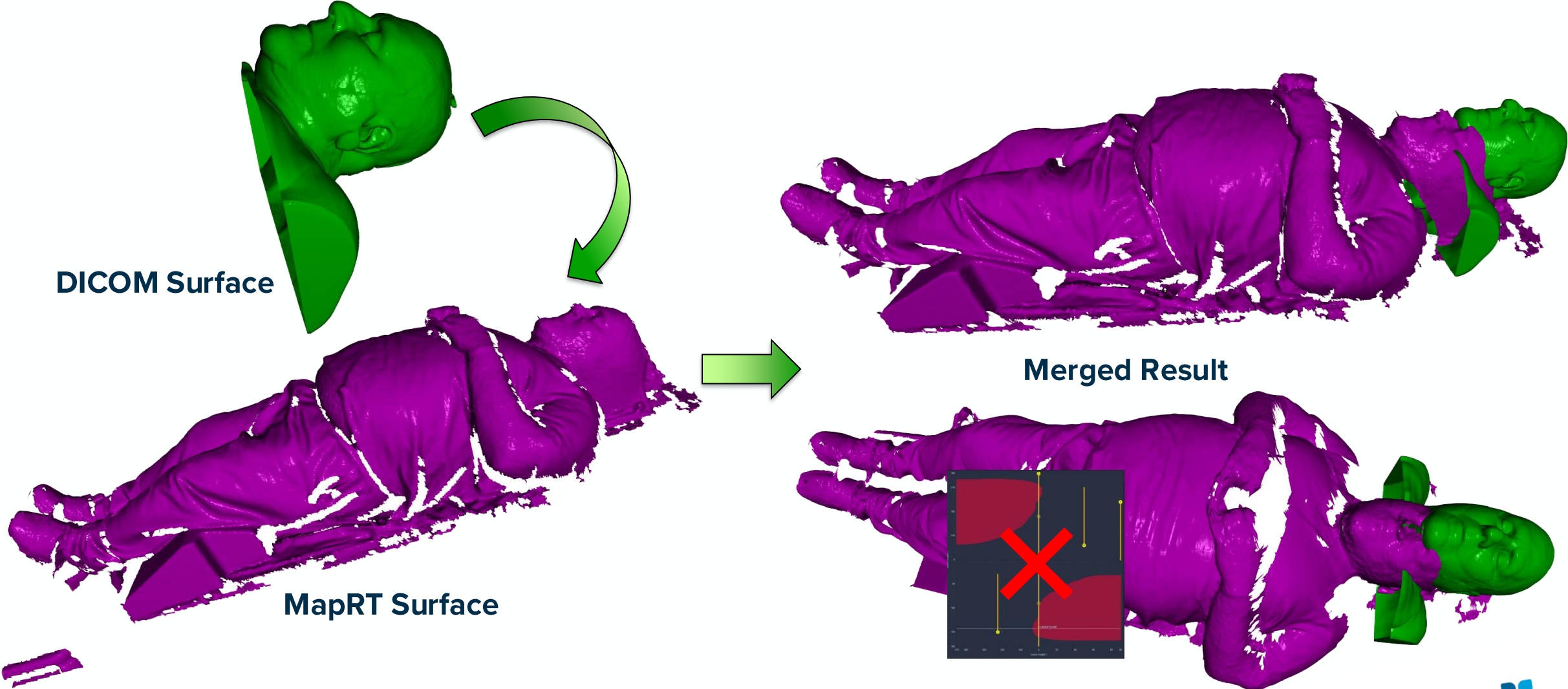
- We need to verification that the proper data is used for collision map calculation if collision maps are going to be used to help guide our planning
- Safety dictates that errors should be readily identifiable if the new check is to replace the old
- **Policies and Procedures** are the lowest level of the **Hierarchy of Effectiveness**



MapRT: API Integration for Additional Isocenter Verification

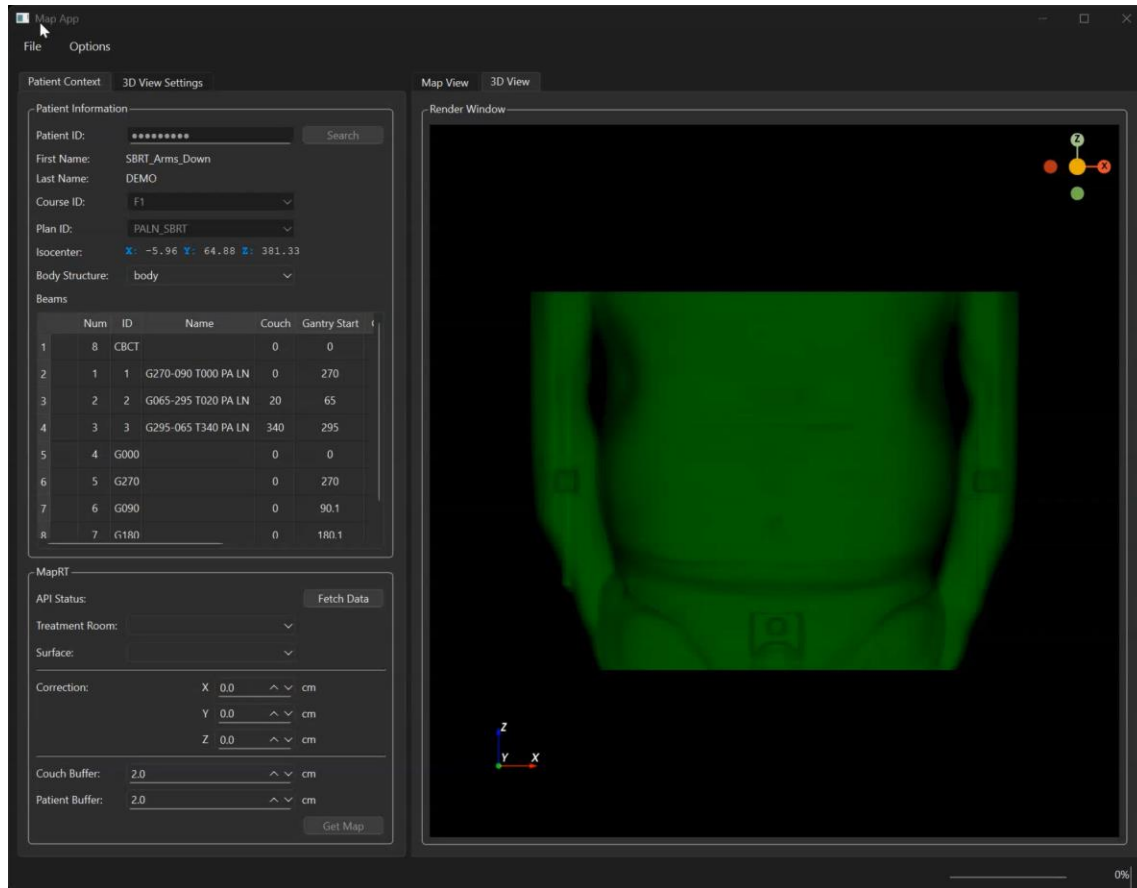


MapRT: API Integration for Additional Isocenter Verification

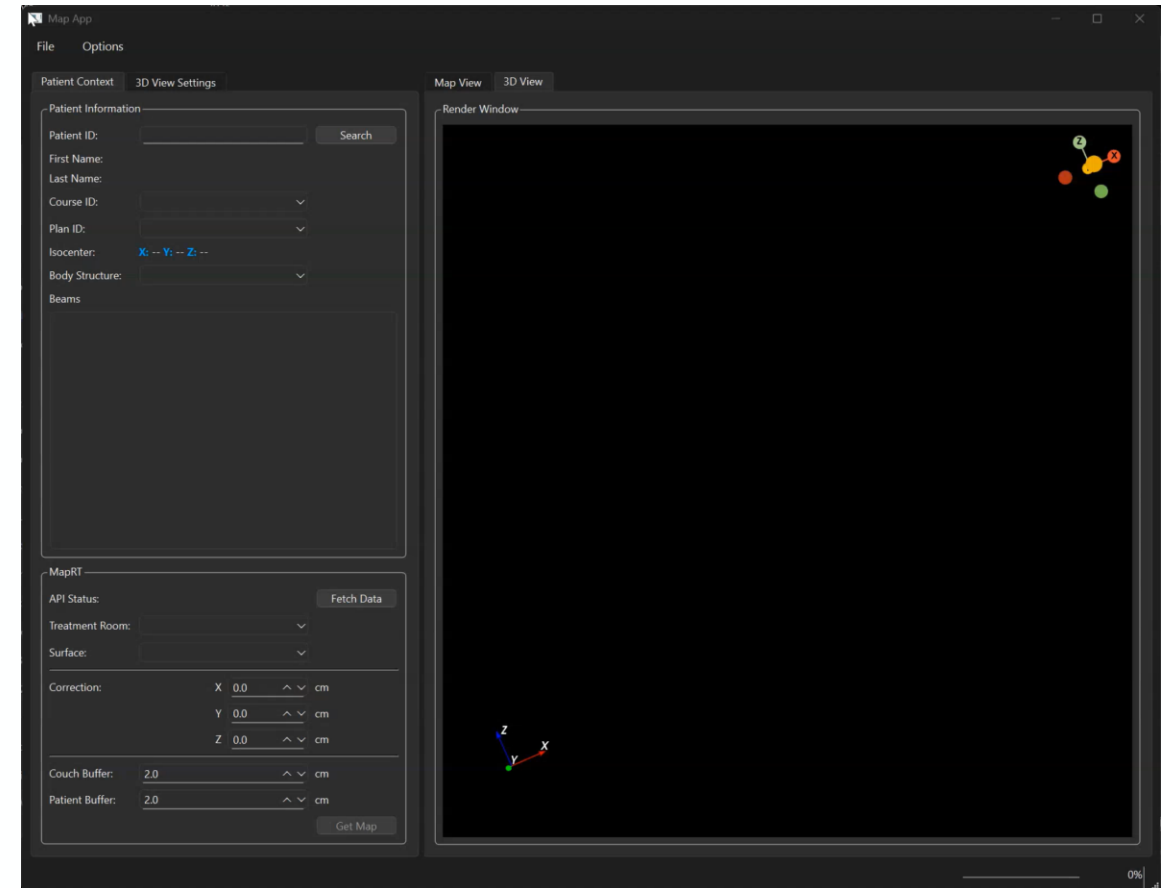


➤ Incorrect captures can result in artificial clearance due to an offset in DICOM isocenter

Two Improper Surface Capture Correction Workflows



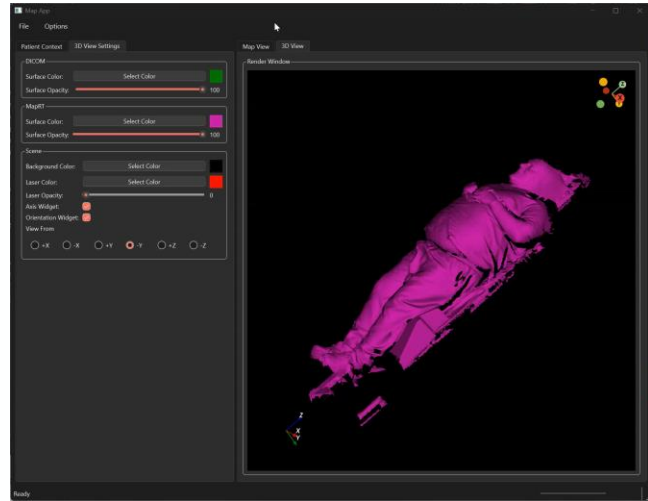
Validation of Correction During Simulation



Correction During Treatment Planning

Adaptive Radiation Therapy Applications

API



Extraction



Reconstruction



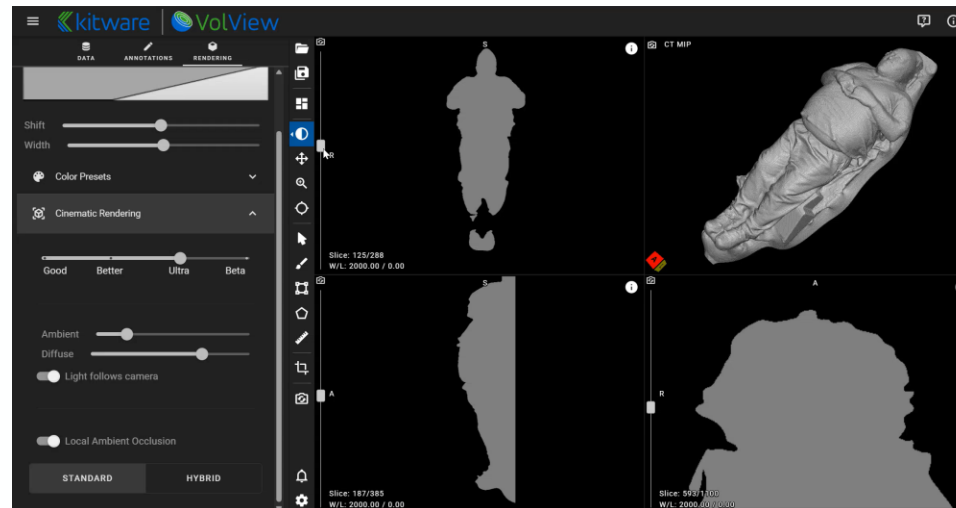
Isolation



Normalization



Voxelization



Adaptive Radiation Therapy Applications

Preparation Treatment


Import DICOM Set Treatment

Treatment Course

Plan Name Active

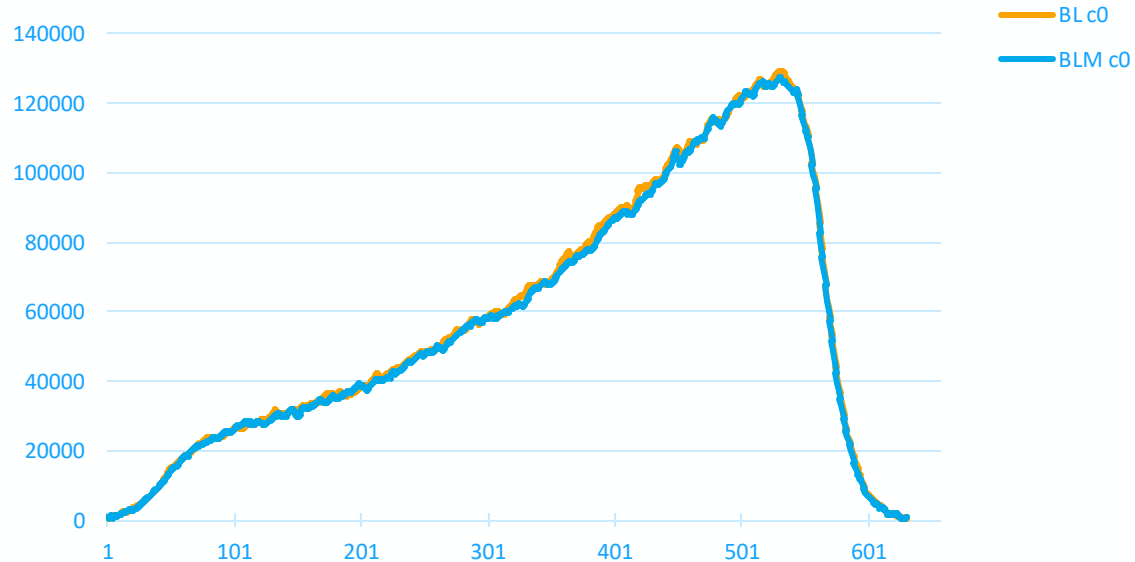
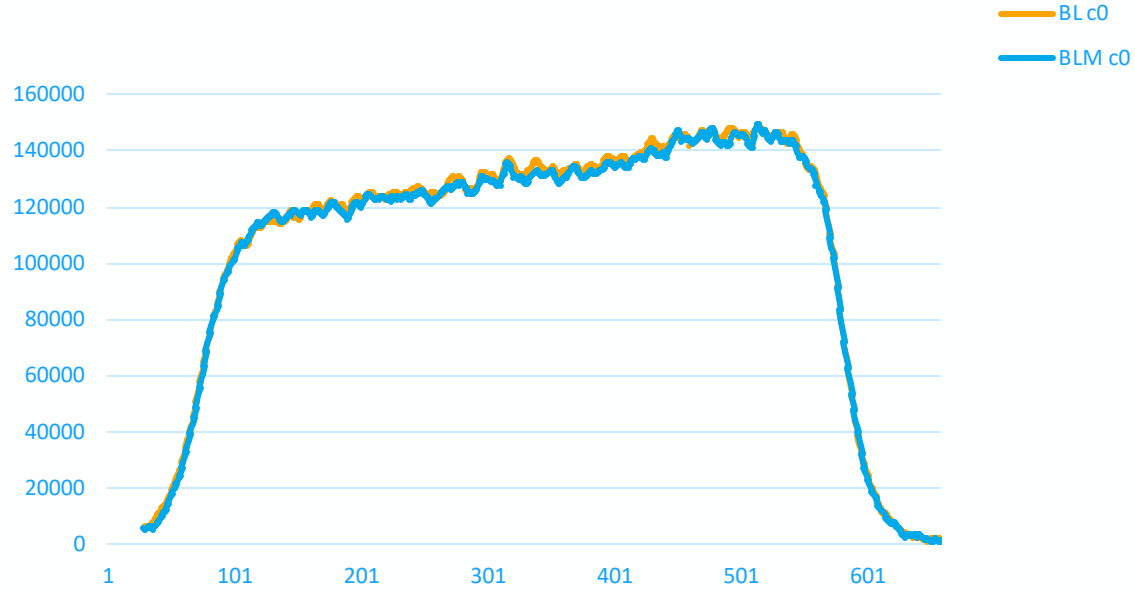
- ▶ SurfaceScan [Chest]
- ▼ Original1 [SBRT]
 - ▼ ISO 1 [-3.12, -0.49, 7.25] ⓘ
 - ▼ CT SIM pBODY 1/5/2026 10:55:12 AM
 - Treat Without Beam Control
 - ROI1 [Isocentric]
 - + Add ROI

Changes are saved automatically



alignrt® | Varian ADI status is Error | System Status | 2/17/2026 3:49 PM

Constancy Checks



QA summary

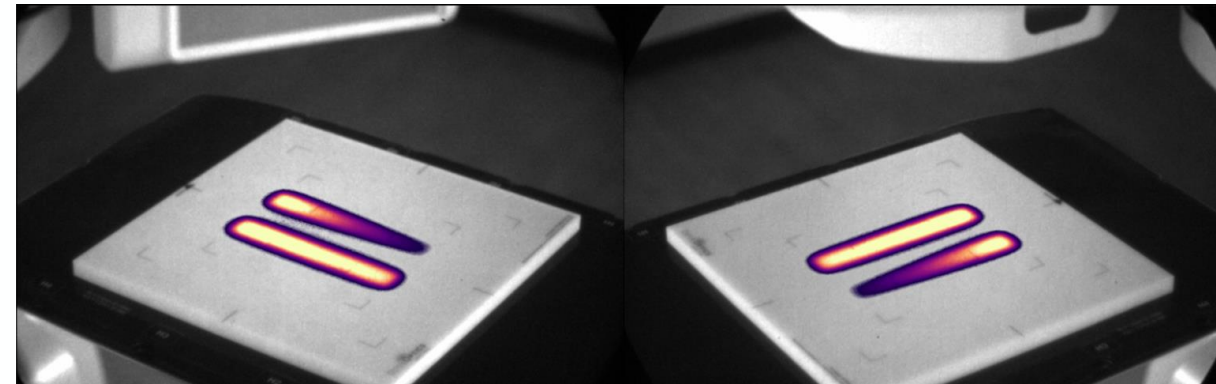
Cam [24011101] relative output

Cam [24011107] relative output

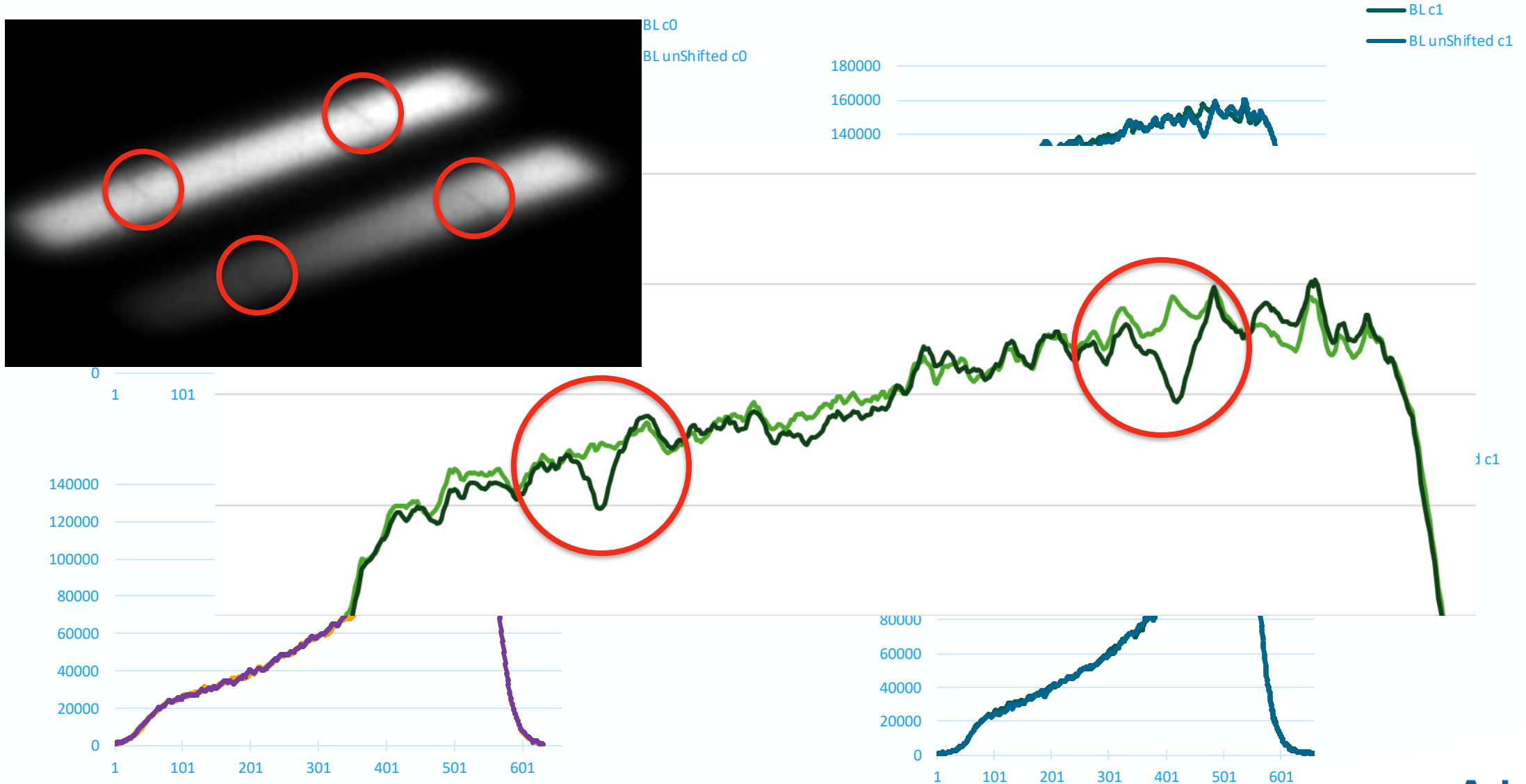
System health check: Pass

System health check: Pass

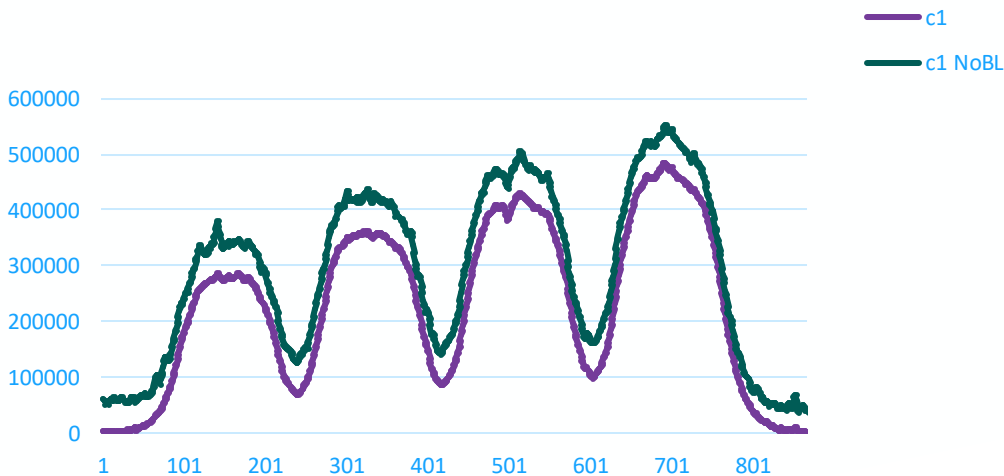
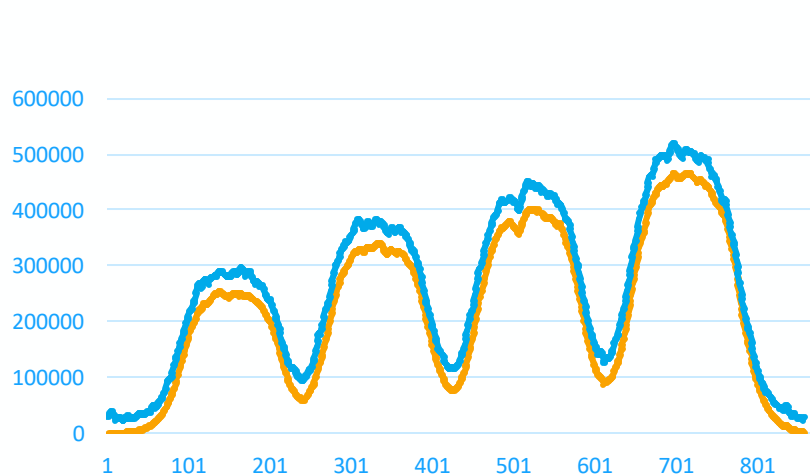
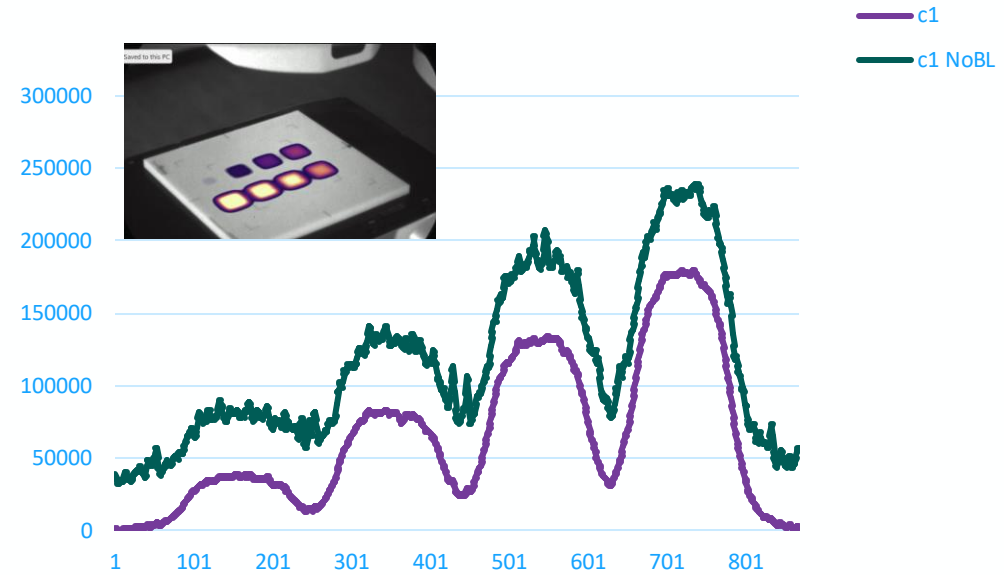
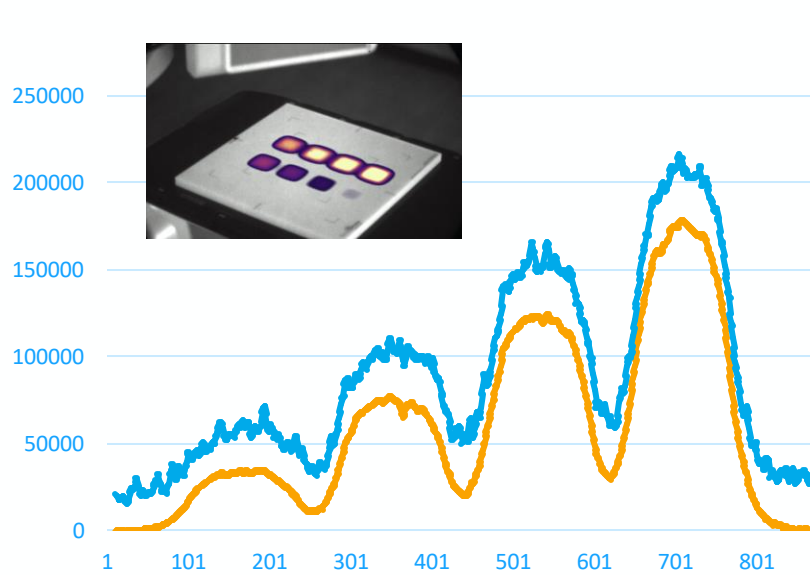
Done



Cherenkov Testing – Phantom Effects

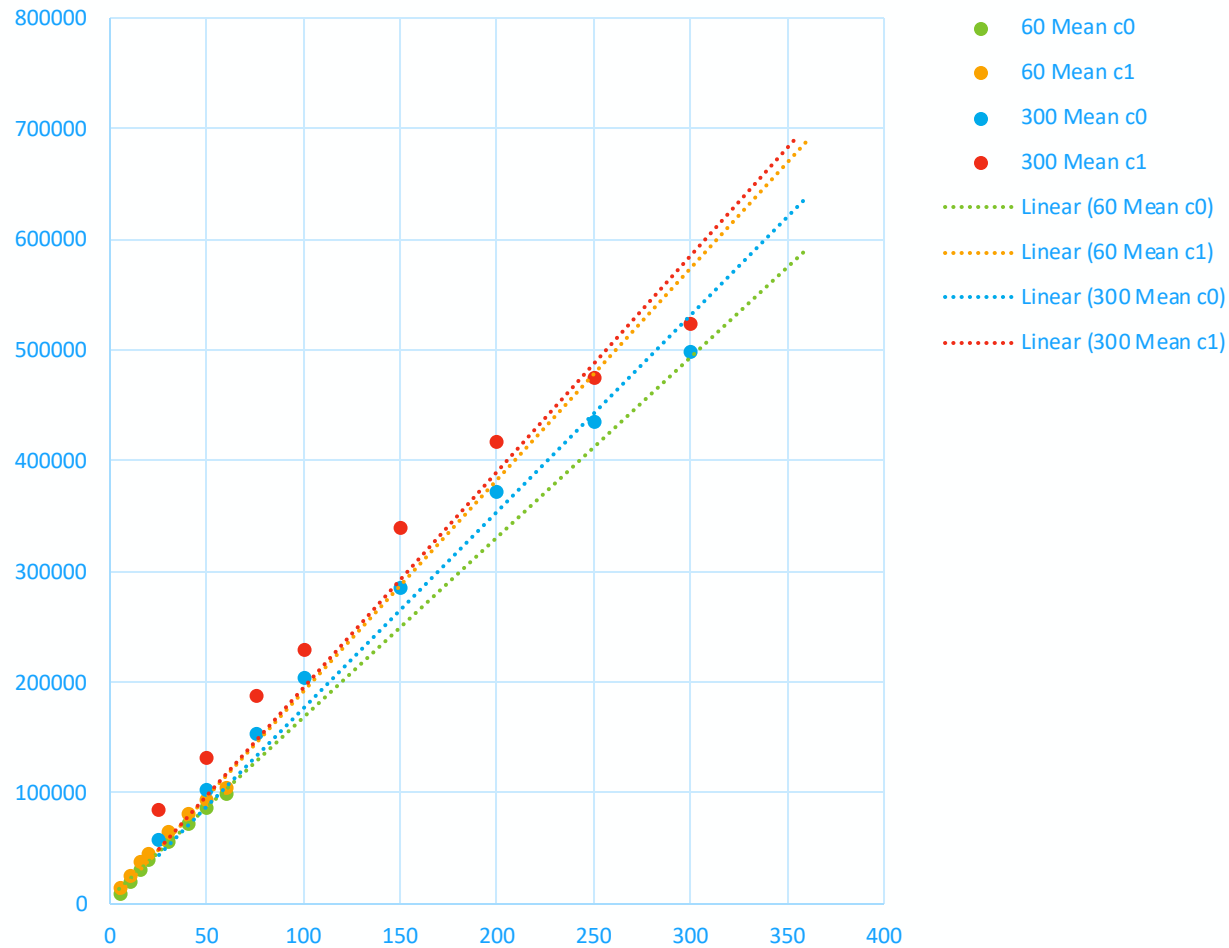


Signal / Noise and Linearity (25-300 MU) – Impact of Beam Lights

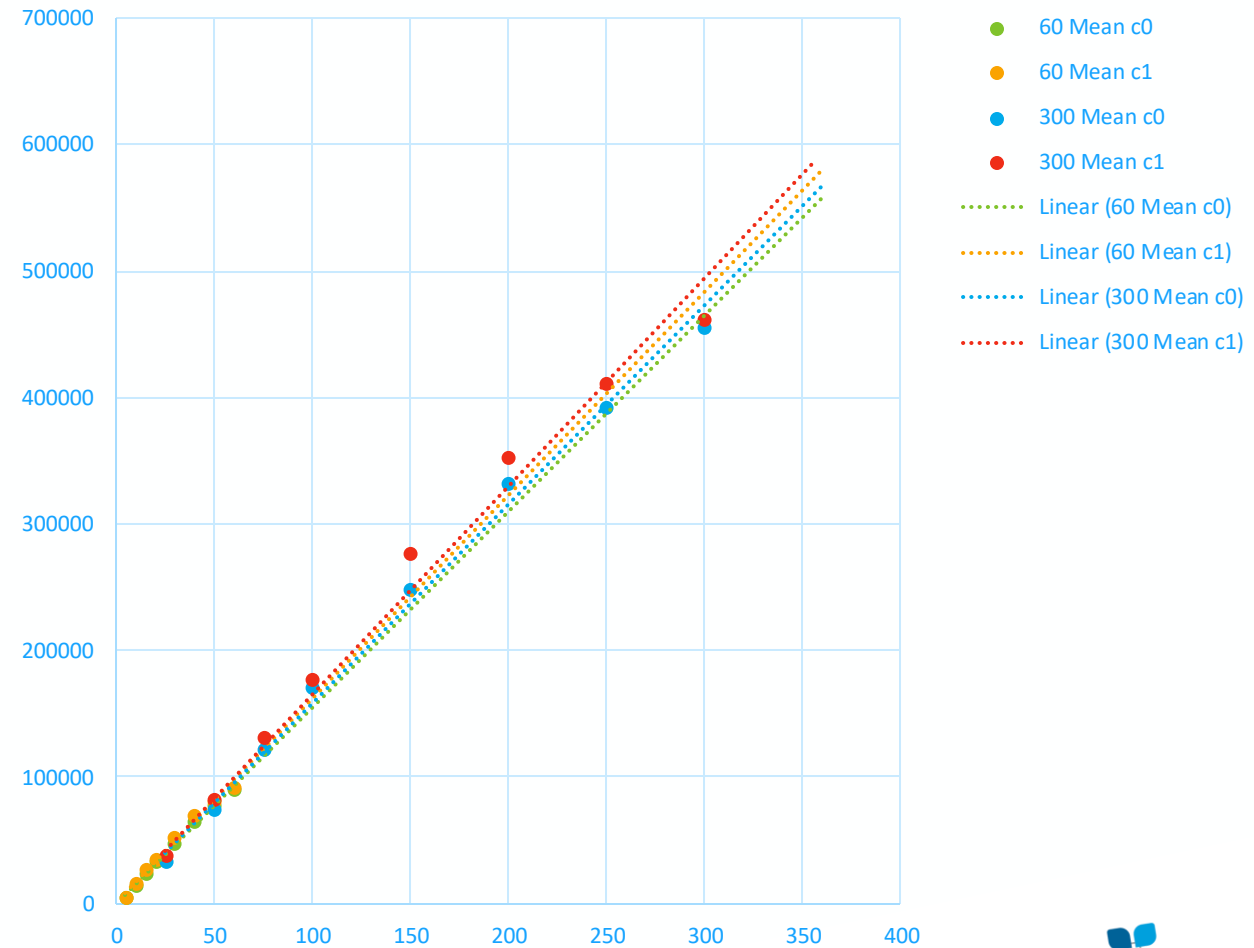


Signal / Noise and Linearity – Impact of Beam Lights

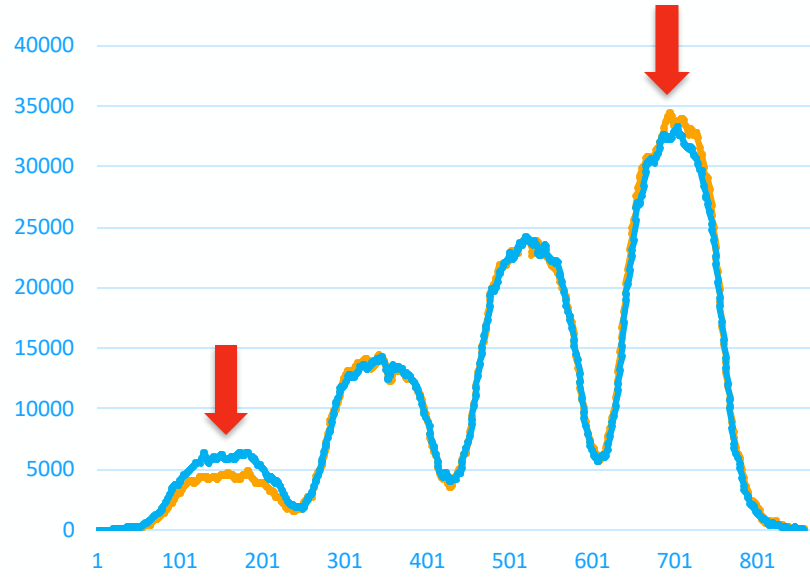
Before Beam Lights



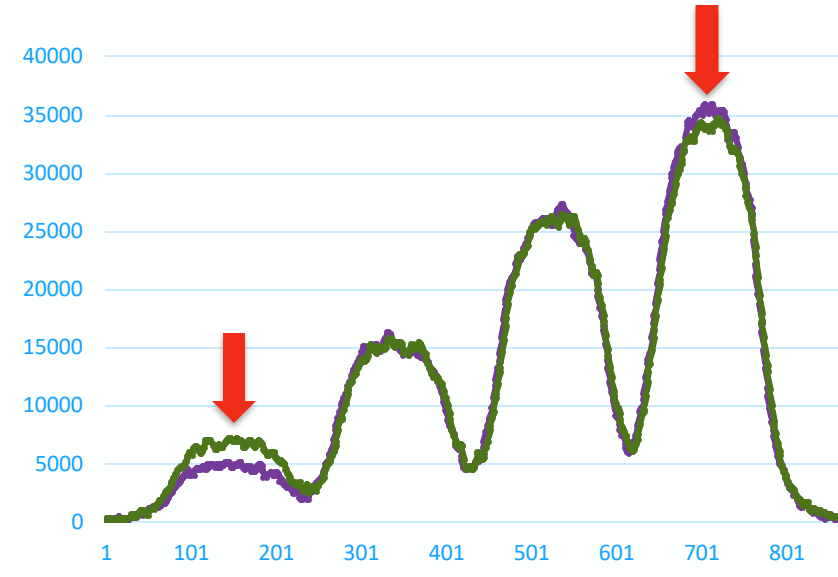
After Beam Lights



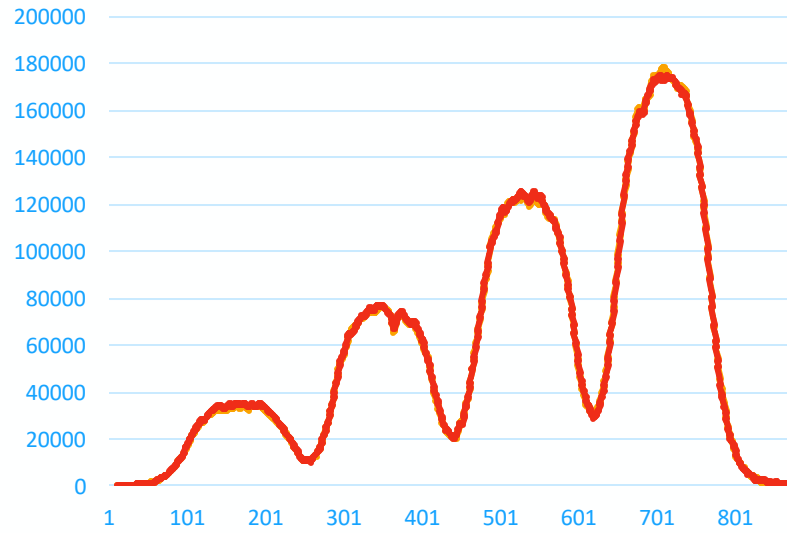
Constancy and Linearity (5-20 MU) – Impact of Latency



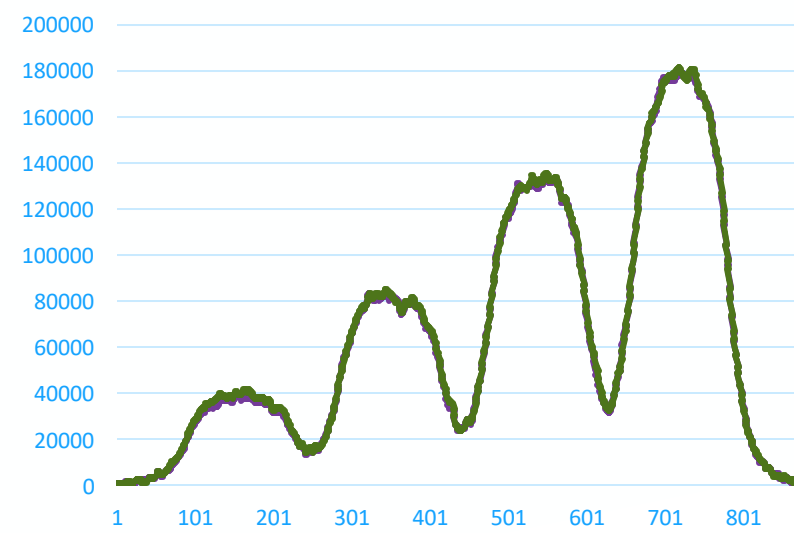
c0
c0 Rev
(5-20 MU)



c1
c1 Rev
(5-20 MU)



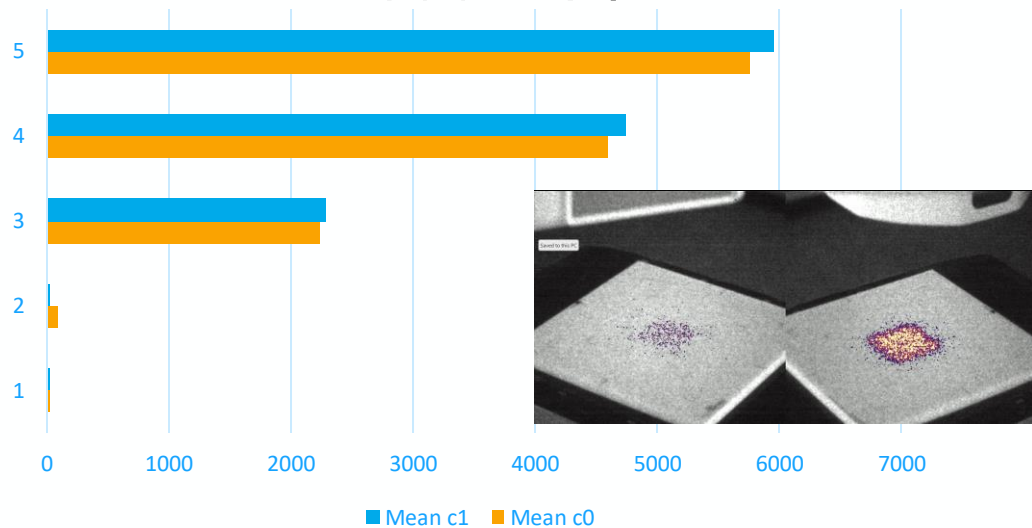
c0
c0 Rev
(25-100 MU)



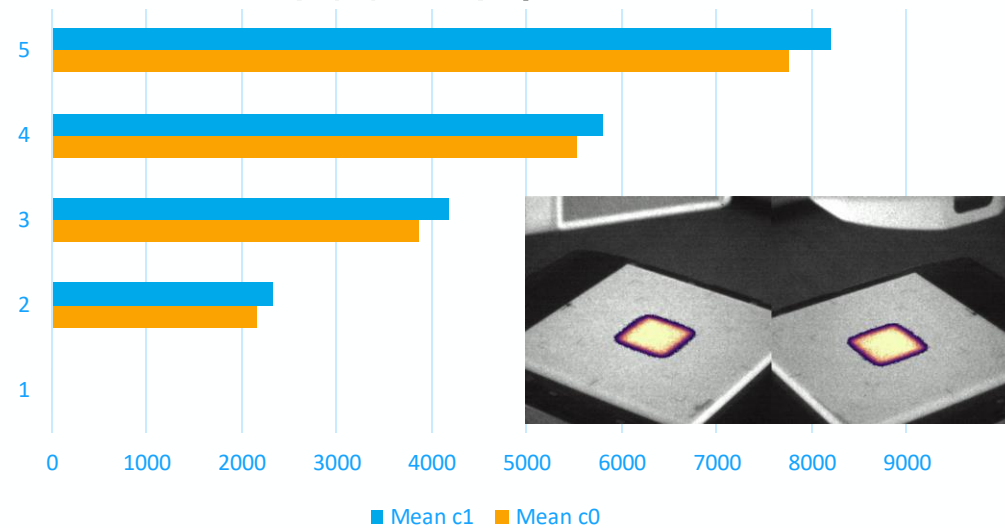
c1
c1 Rev
(25-100 MU)

Cherenkov Latency Testing

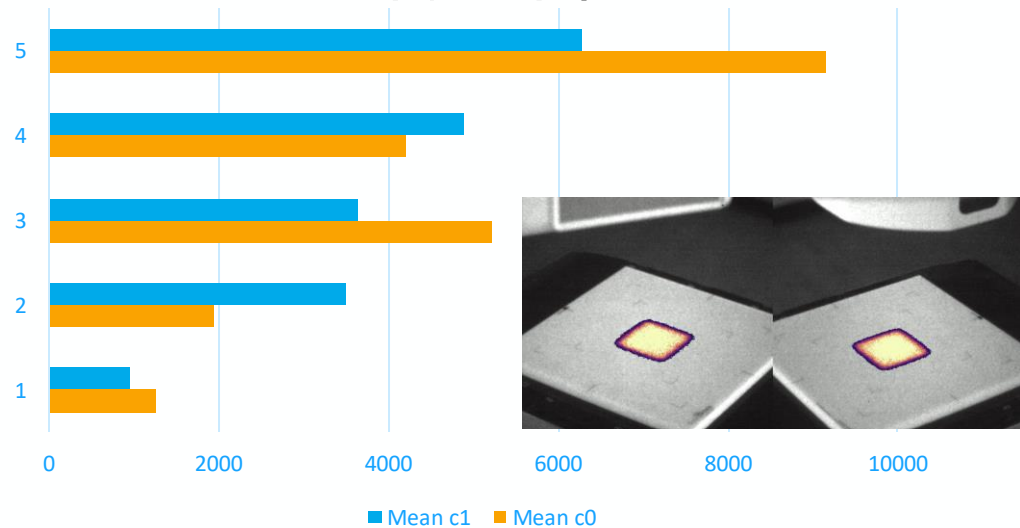
600 MU / Min



300 MU / Min

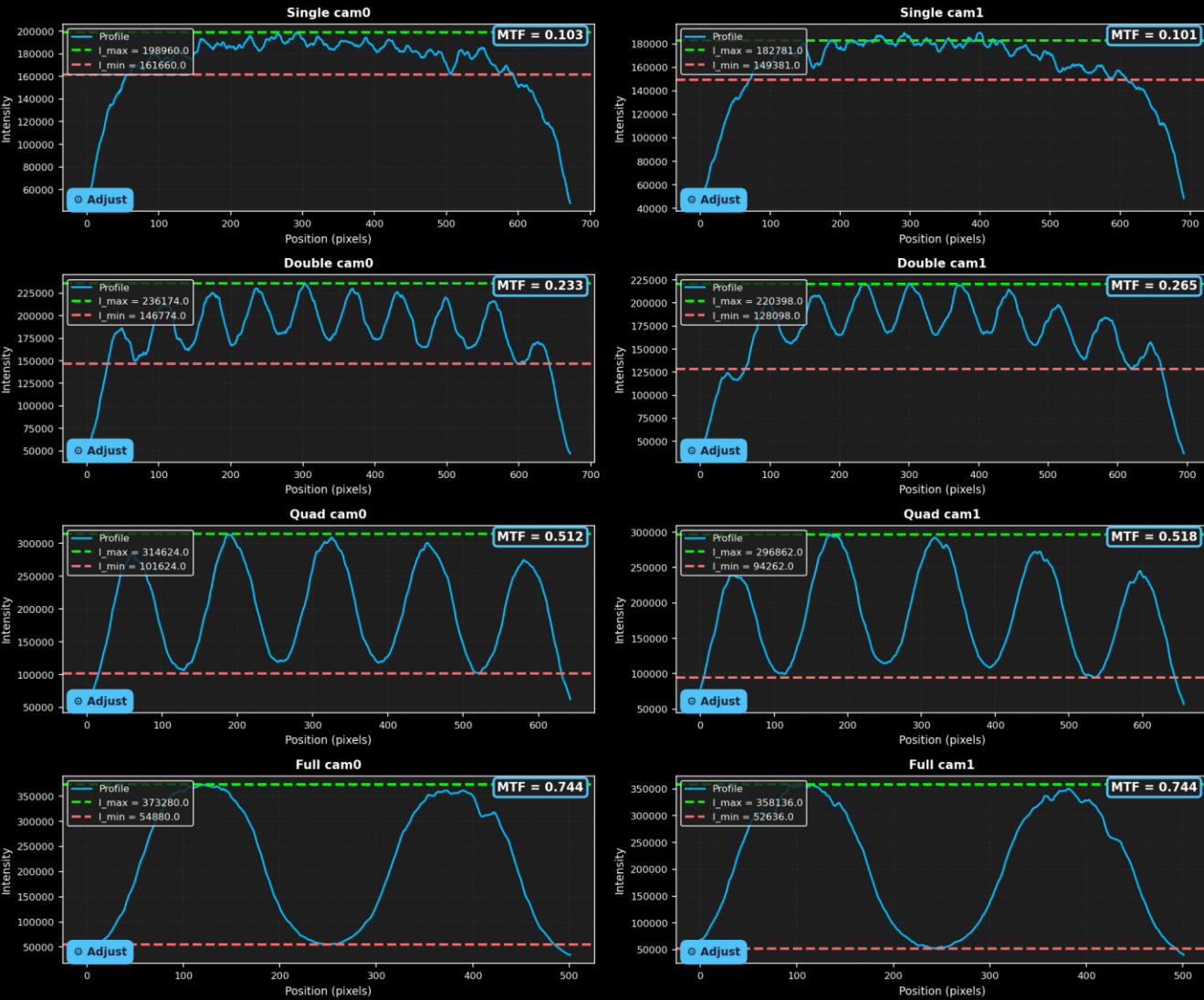


80 MU / Min

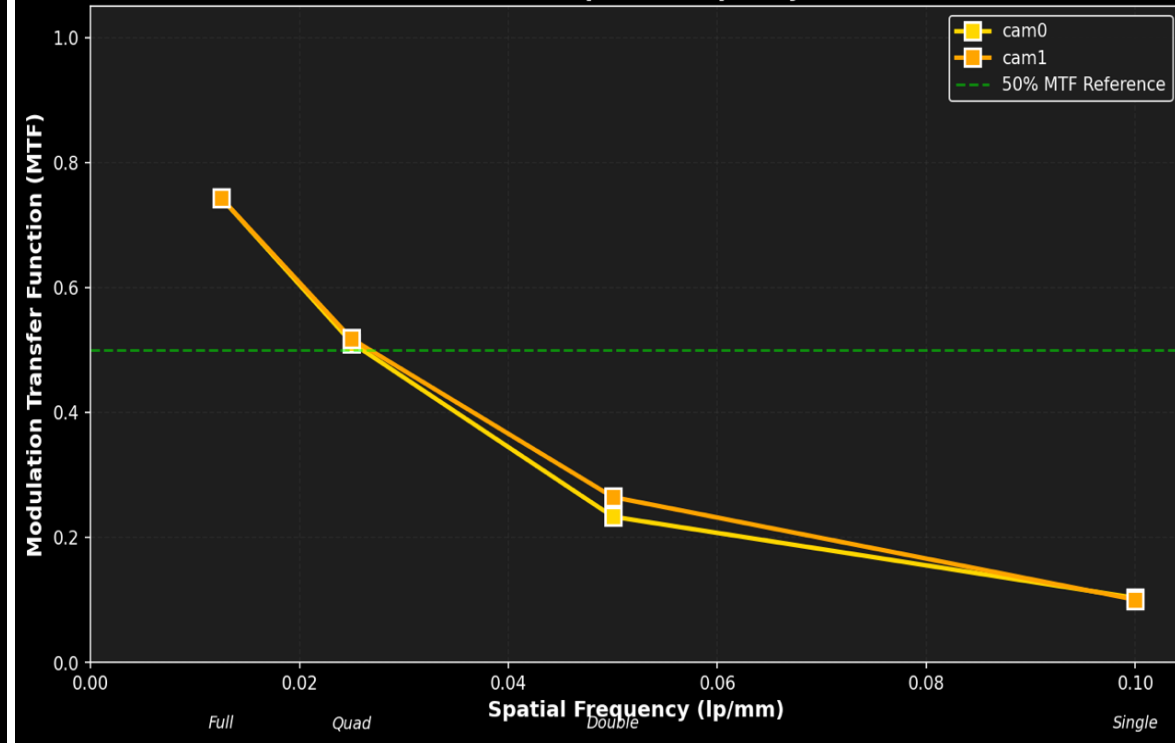


MTF vs Spatial Frequency – Contrast and Detail

Resolution Test: Intensity Profiles & Detection



MTF vs Spatial Frequency



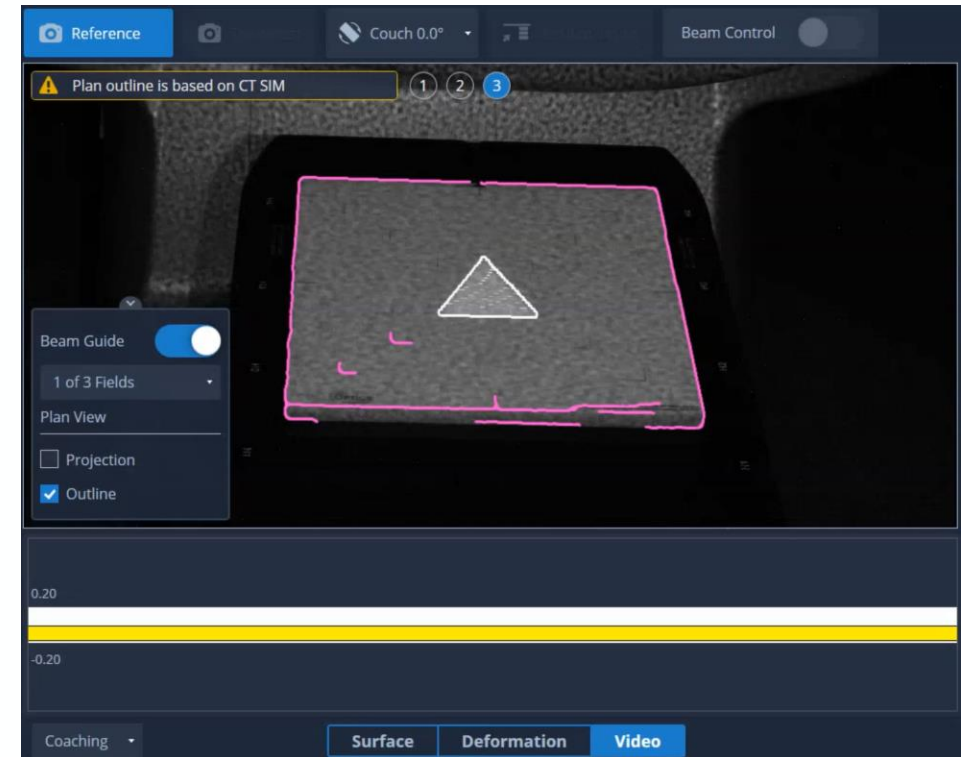
BeamGuide – What is it and what does it do?

- Overlays treatment fields outlines onto the real-time postural video
- Allows therapists to see in real time the impact of postural alignment issues by providing field projection on the live surface
- Can improve accessory placement and verification
- Can help reduce field overlap/gap errors



BeamGuide Outline Validation

- BeamGuide's "Outline" overlay functions as a digital representation of the intended surface intersection of all (or individual fields) with the reference surface.
- BeamGuide's "Projection" overlay functions as a digital representation of the intersection of all (or individual fields) fields with the live surface
- The goal during setup is to maximize the coincidence between these two overlays



Then Why Would I Need BeamGuide With A Light Field

Phantoms VisionRT (PHVRTD1) - External Beam Planning - [Shape2 - Unapproved - Model View - DoseRT Plate]

3D DVH BEV

3D Dose Max: 648.2%
Transport in medium
Dose to medium

Group	Field ID	Technique	Machine/Energy	MLC	Field Weight	Scale	Geny Rn (deg)	Coll Rn (deg)	Coax Rn (deg)	Wedge	Field X (cm)	X1 (cm)	X2 (cm)	Field Y (cm)	Y1 (cm)	Y2 (cm)	X (cm)	Y (cm)	Z (cm)	Calculated SSD (cm)	MU	Ref. D (cGy)
1	Triangle	Static-I	TrueBeam1547-6X	Static	2.493	IEC61217	240.0	0.0	0.0	None	10.0	-5.0	+5.0	10.0	-5.0	+5.0	0.00	0.00	0.00	95.7	500	512.8
1	Diamond	Static-I	TrueBeam1547-6X	Static	2.518	IEC61217	240.0	0.0	0.0	None	10.0	-5.0	+5.0	15.0	-7.5	+7.5	0.00	0.00	0.00	95.7	500	521.6
1	L	Static-I	TrueBeam1547-6X	Static	2.473	IEC61217	240.0	90.0	0.0	None	10.0	-5.0	+5.0	15.0	-7.5	+7.5	0.00	0.00	0.00	95.7	500	

Ready User: Michael Talhamer Group: AdvPhysics Site: Main CAP: NUM: SCRL

Phantoms VisionRT (PHVRTD1) - External Beam Planning - [Shape2 - Unapproved - Model View - DoseRT Plate]

3D DVH BEV

3D Dose Max: 648.2%
Transport in medium
Dose to medium

Group	Field ID	Technique	Machine/Energy	MLC	Field Weight	Scale	Geny Rn (deg)	Coll Rn (deg)	Coax Rn (deg)	Wedge	Field X (cm)	X1 (cm)	X2 (cm)	Field Y (cm)	Y1 (cm)	Y2 (cm)	X (cm)	Y (cm)	Z (cm)	Calculated SSD (cm)	MU	Ref. D (cGy)
1	Triangle	Static-I	TrueBeam1547-6X	Static	2.493	IEC61217	240.0	0.0	0.0	None	10.0	-5.0	+5.0	10.0	-5.0	+5.0	0.00	0.00	0.00	95.7	500	512.8
1	Diamond	Static-I	TrueBeam1547-6X	Static	2.518	IEC61217	240.0	0.0	0.0	None	10.0	-5.0	+5.0	15.0	-7.5	+7.5	0.00	0.00	0.00	95.7	500	521.6
1	L	Static-I	TrueBeam1547-6X	Static	2.473	IEC61217	240.0	90.0	0.0	None	10.0	-5.0	+5.0	15.0	-7.5	+7.5	0.00	0.00	0.00	95.7	500	

Ready User: Michael Talhamer Group: AdvPhysics Site: Main CAP: NUM: SCRL

BeamGuide's Synergy with DoseRT

Treatment Planning

Group	Field ID	Technique	Machine/Energy	MLC	Field Weight	Scale	Center Pt (mm)	Coll Rtn (deg)	Couch Rtn (deg)	Wedge	Field X (mm)	X1 (mm)	X2 (mm)	Field Y (mm)	Y1 (mm)	Y2 (mm)	X (mm)	Y (mm)	Z (mm)	Calculated SSD (cm)	MU	Ref. D (mm)
I	Triangle	Static-I	TrueBeam1547 - 6X	Static	2.493	IEC61217	240.0	0.0	0.0	None	10.0	-5.0	+5.0	-10.0	-5.0	+5.0	0.00	0.00	0.00	95.7	500	\$12.8
I	Diamond	Static-I	TrueBeam1547 - 6X	Static	2.318	IEC61217	240.0	0.0	0.0	None	10.0	-5.0	+5.0	15.0	-7.5	+7.5	0.00	0.00	0.00	95.7	500	\$21.6
I	L	Static-I	TrueBeam1547 - 6X	Static	2.473	IEC61217	240.0	90.0	0.0	None	10.0	-5.0	+5.0	15.0	-7.5	+7.5	0.00	0.00	0.00	95.7	500	

Live Setup w/ BeamGuide

Reference Couch 0.0° Beam Control

1 2 3

Beam Guide

The current postural outline may be incomplete.

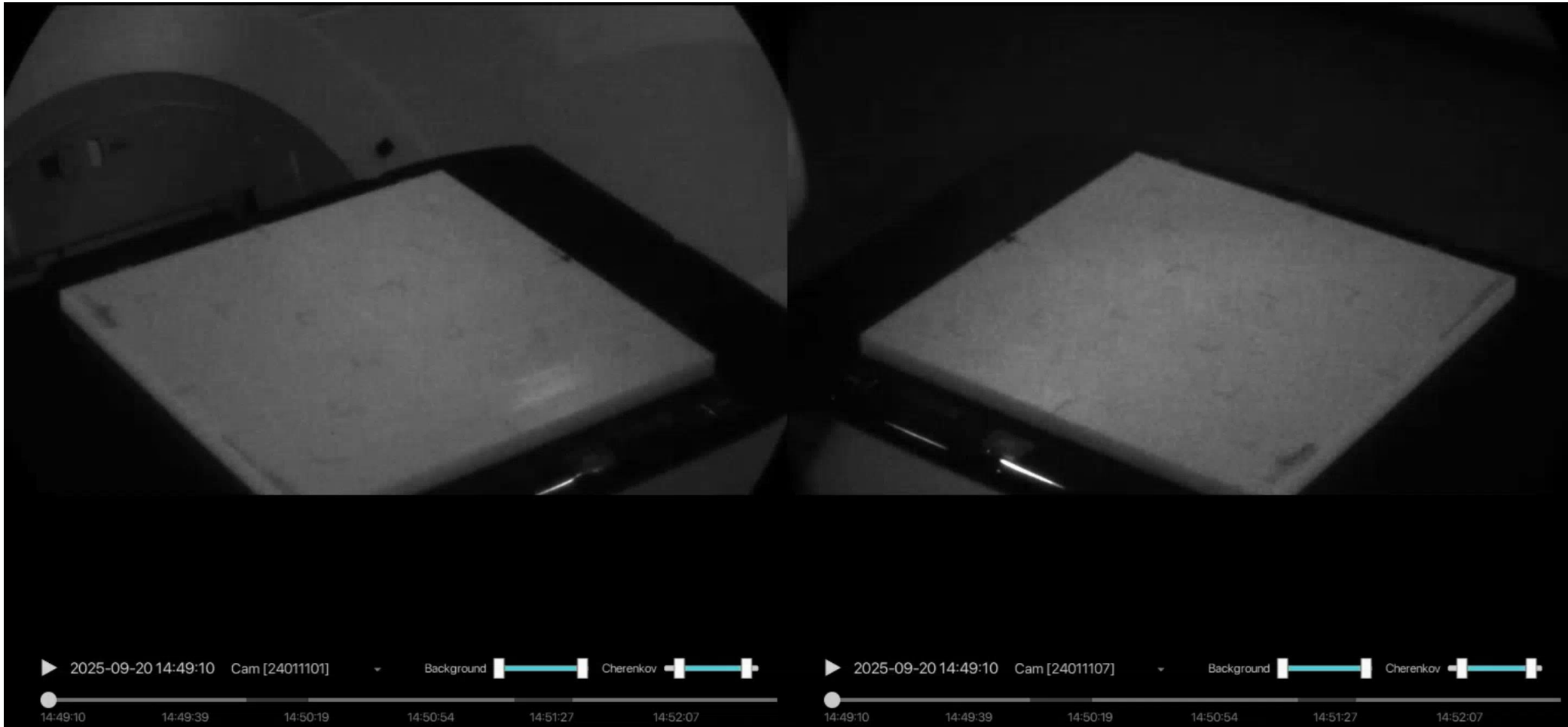
0.20

-0.20

Coaching Surface Deformation Video

BeamGuide's Synergy with DoseRT

Visualized Delivery w/ DoseRT

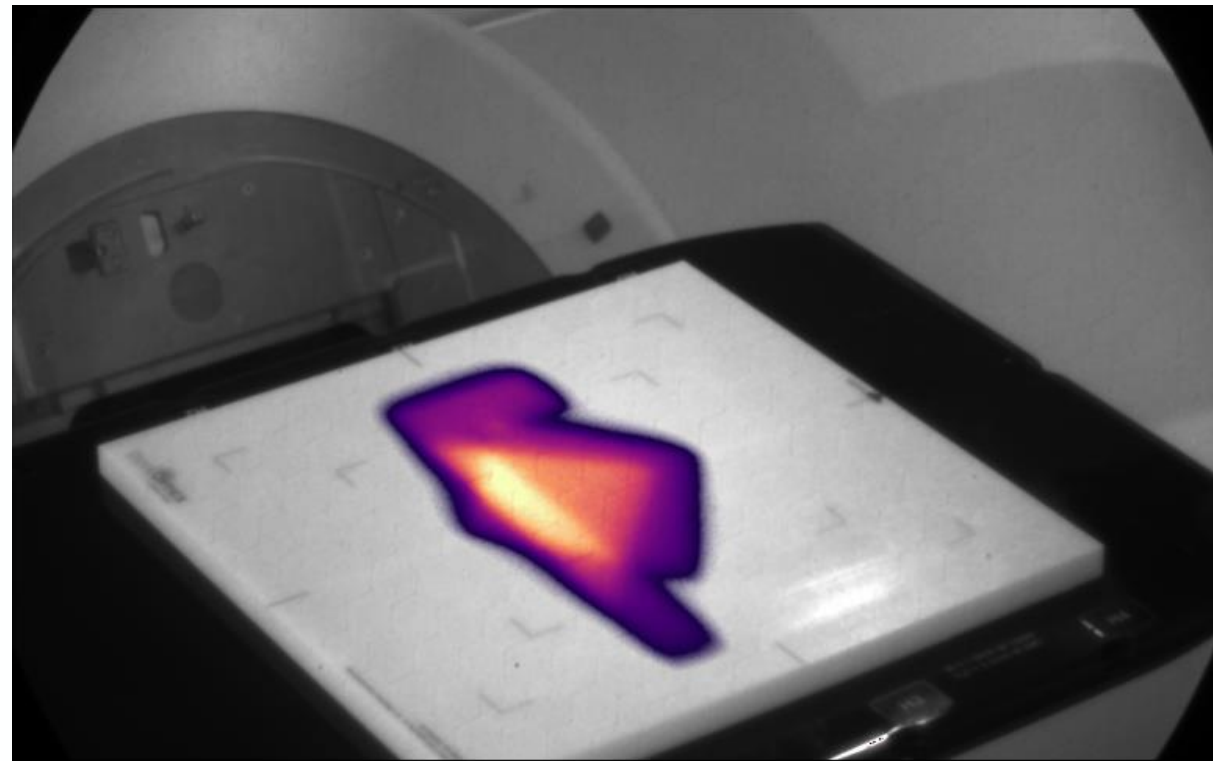


BeamGuide's Synergy with DoseRT

Post Delivery Validation

The screenshot displays the BeamGuide software interface for external beam planning. The main window shows a 3D model of a patient's head and neck with a DoseRT plate overlay. The interface includes a toolbar at the top, a left-hand navigation pane with various tool options, and a bottom table of field parameters.

Group	Field ID	Technique	Machine/Energy	MLC	Field Weight	Scale	Quality Rtn (deg)	Coll Rtn (deg)	Couch Rtn (deg)	Wedge	Field X (cm)	X1 (cm)	X2 (cm)	Field Y (cm)	Y1 (cm)	Y2 (cm)	X (cm)	Y (cm)	Z (cm)	Calculated SSD (cm)	MU	Ref. D (cGy)
I	Triangle	Static-i	TrueBeam1547 - 6X	Static	2.493	IEC61217	240.0	0.0	0.0	None	10.0	-5.0	+5.0	10.0	-5.0	+5.0	0.00	0.00	0.00	95.7	500	512.8
I	Diamond	Static-i	TrueBeam1547 - 6X	Static	2.518	IEC61217	240.0	0.0	0.0	None	10.0	-5.0	+5.0	15.0	-7.5	+7.5	0.00	0.00	0.00	95.7	500	521.6
I	L	Static-i	TrueBeam1547 - 6X	Static	2.473	IEC61217	240.0	90.0	0.0	None	10.0	-5.0	+5.0	15.0	-7.5	+7.5	0.00	0.00	0.00	95.7	500	



Summary

Key Takeaways:

- Evolving QA Needs: Advanced SGRT applications introduce new considerations for accuracy, integration, and clinical safety.
- Risk-Based QA Models: Emerging systems benefit from structured QA frameworks emphasizing risk assessment and performance objectives.
- Automation & Validation: Scripting tools can streamline QA workflows, automate checks, and enhance change validation.
- Consistency & Collaboration: Developing unified guidelines for Acceptance, Commissioning, and Ongoing QA will strengthen reliability across clinics.

Next Step:

- Foster ongoing dialogue within the community to align on best practices for these evolving technologies.



Thank You!

➤ Special Thanks to the AdventHealth Physics team.



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