



AdventHealth

**New SGRT innovations
aiding safety and
efficiency across the RT
pathway**

Adi Robinson Ph.D., DABR
AdventHealth Celebration

Disclosures

- AH Celebration has a COE agreement with VisionRT

Outline

- Surface Guided Simulation
- Surface Guided Planning
- Surface Guided Treatment with SGRT
- Surface Guided Dose Visualization

AdventHealth Florida



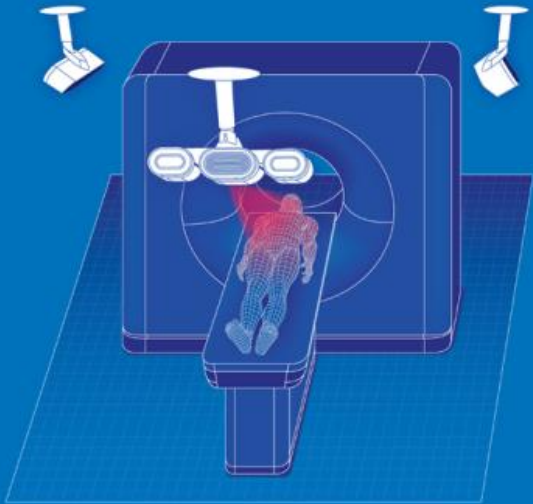
AdventHealth Celebration

- 2 Varian Truebeam
- Siemens SOMATOM Confidence CT
- 2 AlignRT systems
- SimRT
- MapRT
- DoseRT
- PatientID



The Radiation Oncology Workflow

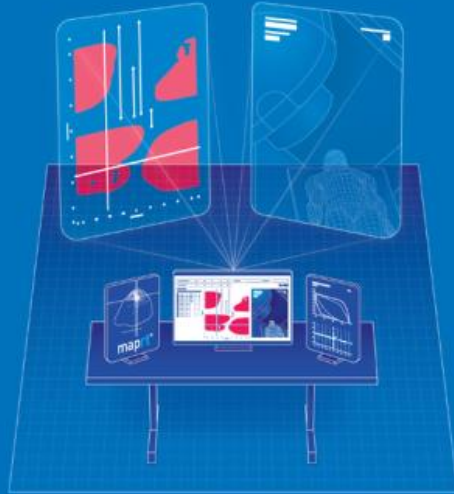
SIM



4D AND BREATH HOLD CT

simrt™

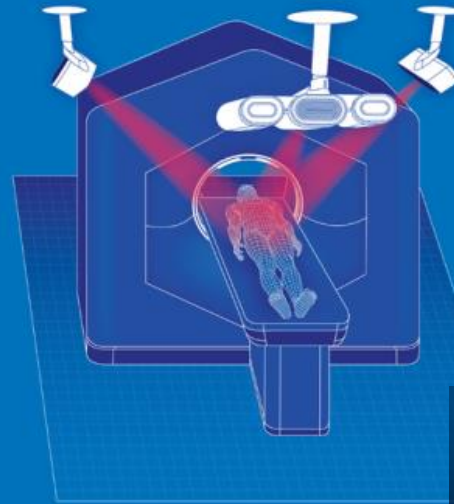
PLAN



CLEARANCE MAPPING

maprt®

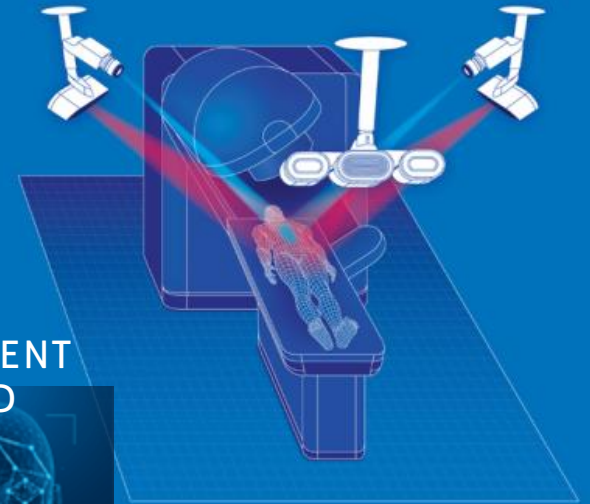
TREAT



MOTION MANAGEMENT

alignrt®

DOSE



DOSE VISUALIZATION

dosert™
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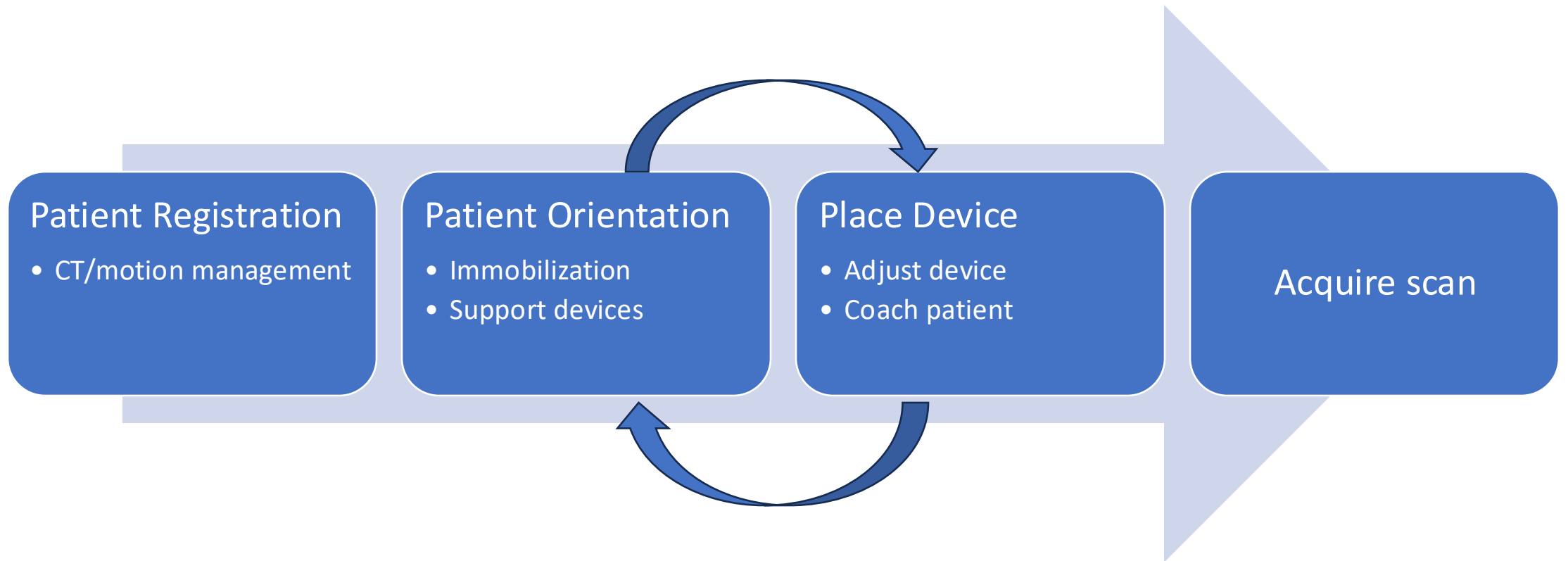


Surface Guided Simulation

The Ideal CT Simulation

- Should be able to accommodate different treatment positions and patient's anatomy
- Should be non-invasive and contactless
- Should not compromise the physician's treatment and immobilization strategy
- Easy to use and learn with simple workflows that are designed around clinical needs

Standard CT Simulation Workflow



CT Simulation with SimRT

- SimRT is deviceless. A virtual tracking point is placed on the patient
- Quick and easy comparison between different tracking points to find the optimal position
- Workstation is available near the patient for visual feedback to both patient and therapist
- Appointment time is shortened to about 20 minutes



Surface Guided Simulation - Workflow



More Surface Guided Simulation!

- More information about SimRT workflows and implementation can be found on the SGRT community website



BIRMINGHAM STUDY DAY

SimRT: Workflows and Optimising DIBH Planning

Julie Kilkenny
Technical Lead Practitioner (Pre-treatment)
University Hospitals Birmingham

[View video](#)



Surface Guided Simulation for Improved Accuracy in Breast Treatments

Samantha Maldonado, RT(T)
Lead Radiation Therapist
Adi Robinson, PhD, DABR
Senior Medical Physicist
AdventHealth Orlando

[View video](#)



Surface Guided Planning

Surface guided Planning

- Capture the 3D surface of the patient prior to simulation and provide a clearance map to detect collisions.
 - Patient positioning and immobilization device collision check
- The planner can use the clearance map data to optimize planning
 - Plan with “allowed” fields
 - Non-coplanar treatment
- No need for dry run or collision check

The Simulation Room

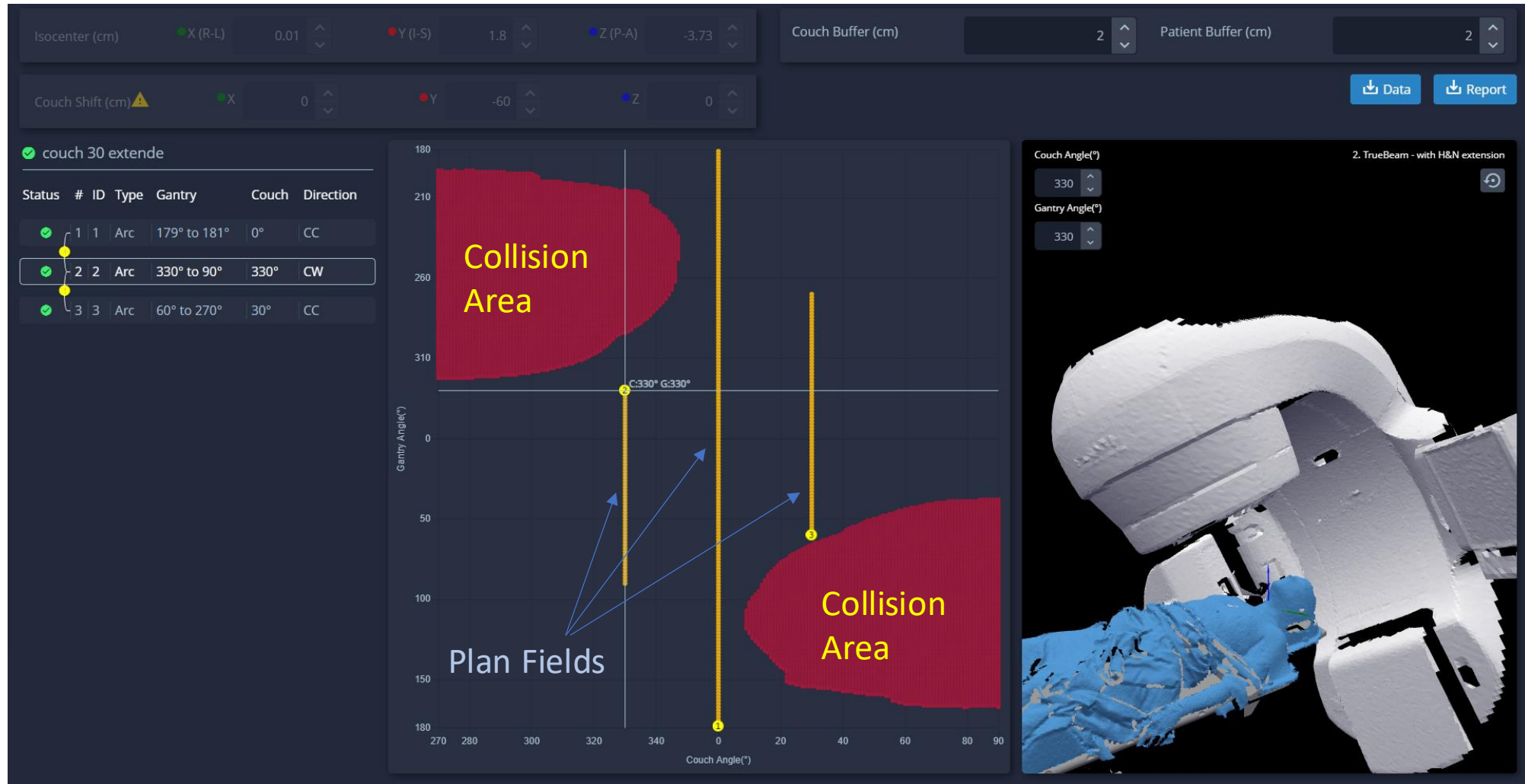
MapRT Cameras

SimRT Camera



The Clearance Map

Imported Plan



Surface Guided Planning Workflow

- In the CT sim room
 - Capture surface prior to CT sim
 - Check for collisions
 - Adjust patient position or immobilization device accordingly.
- Treatment Planning
 - Use clearance map to optimize the plan
- Treatment
 - Plan can be safely delivered

Planning with a Clearance Map – SBRT Lung



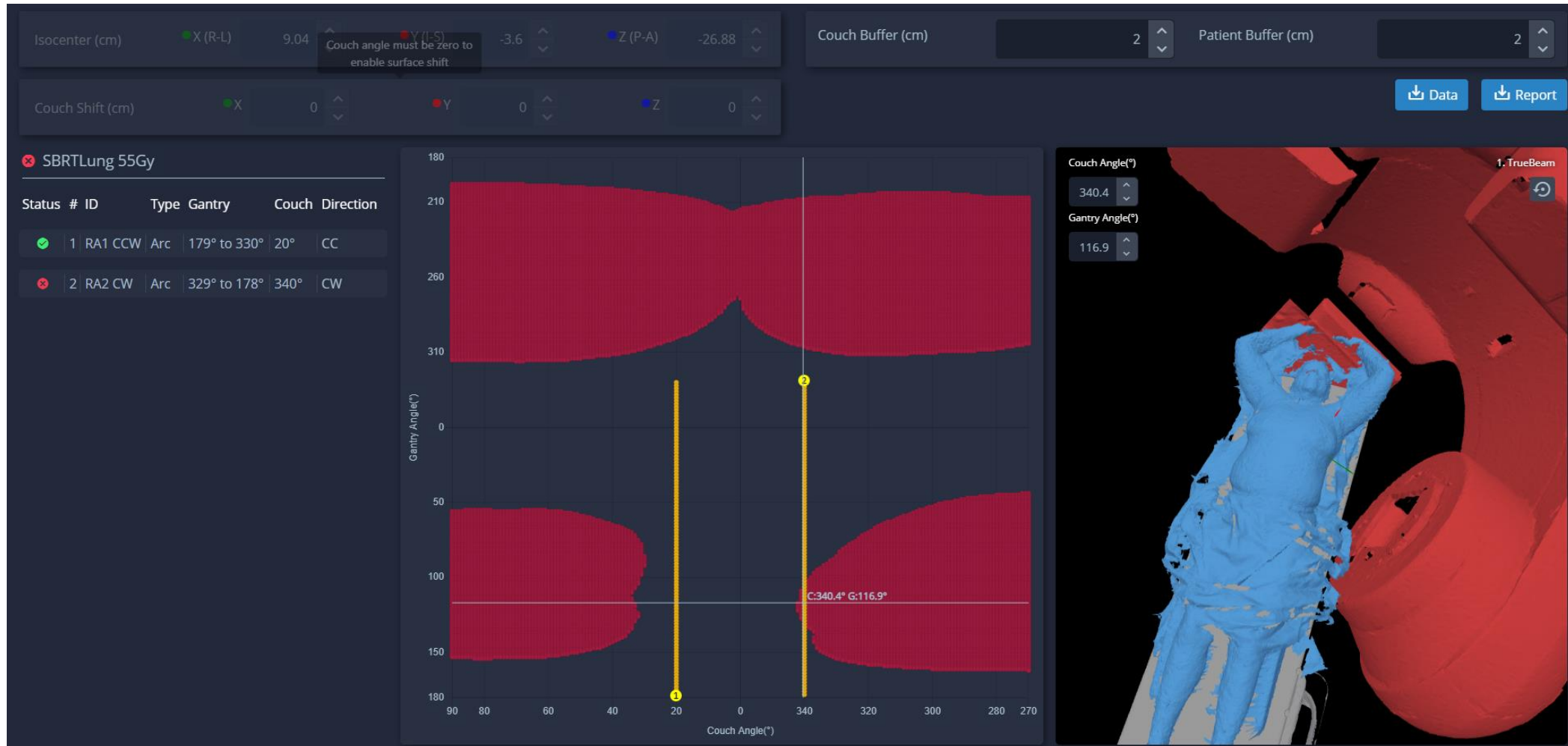
- 75-year-old female with a solitary pulmonary nodule
- 15.3 cc lesion located in the left lung near the heart
- SBRT plan, 1100 cGy x 5

Plan comparison: Coplanar or Non-Coplanar

- 2 arc VMAT plan
 - CCW 179.0-330.0
 - CW 329.0-178.0
 - 5415 MUs
- 2 arc VMAT plan with Non-Coplanar Fields
 - CCW 179.0-330.0, T20
 - CW 329.0-178.0, T340
 - 4147 MUs

Structure	Constraint	SBRT Lung 55Gy	SBRT Lung CoPlanar	Difference
PTV	V90%≥95%	98.53%	100.00%	-1.47
PTV	CI100% 1.2-1.5	0.833	1.164	-0.331
PTV	CI 50% 4.652-5.729	3.847	5.81	-1.963
RTOG 2cm	MaxDT 52.164-60.704	46.27%	66.06%	-19.791
Lungs	V2000cGy≤10%	2.01%	2.33%	-0.315
Heart	Max≤3800cGy	3490.4cGy	4445.9cGy	-955.5
Heart	V3800cGy≤0.03cc	0cc	0.052cc	-0.052
Heart	V3200cGy≤15cc	0.009cc	0.502cc	-0.493
Esophagus	Max≤3500cGy	530cGy	664.8cGy	-134.8
Chestwall	V3000cGy≤30cc	6.496cc	19.792cc	-13.296
BrachialPlex_L	Max≤3200cGy	9.3cGy	8.9cGy	0.4
BrachialPlex_R	Max≤3200cGy	7.9cGy	6.5cGy	1.4
Great_Vessels	Max≤5300cGy	1295.2cGy	1875.9cGy	-580.7
Trachea/Bronchus	Max≤4000cGy	744.3cGy	991.8cGy	-247.5
Skin	Max≤3850cGy	1477.8cGy	2498.9cGy	-1021.1

Clearance Map– Lung SBRT



TPS Integration

RayStation Astro24 - R Patient name: PBI2 MapRT ID: MapRT_PBI2 Case: Case 1 Not for clinical use - Evaluation use only v14.0.100.46

Automated planning Patient data management Patient modeling **Plan design** Plan optimization Plan evaluation QA preparation Treatment delivery

Virtual simulation **Plan setup** 3D-CRT beam design Electron beam design Lt Partial Breast 2... LtPartialBr. 270 Plan dose

PBI2 MapRT
MapRT_PBI2
1 Jan 2024
Other

Plan Setup: New plan, Edit plan, Copy plan, Delete plan, Close plan, Dose grid, Set default grid, Adjust plan, Move isocenter, Move to intersection, DRR settings, Rotate gantry, Rotate collimator, Rotate couch, Collapsed Cone, Final dose, Scale dose, Inspector, Define views for report, Auto scale to primary prescription

267 cGy x 15 fx = 4005 cGy
SITE: PTV_LtPartBrst

ROIs: Targets (2), Organs at risk (10), Fixation & support (6), Unknown (7)

2D | Image 3D Room view Clearance map Room view 3D

Plan dose: Lt Partial Breast_270deg CT: (CT:2) Approximate: Undefined

2D | Image 2D | Image 2D | Image BEV DRR

Plan Beams Control points Jaw assignment Beam dose specification points Prescriptions

Copy from... Patient setup... Create bolus... Rename beams... Load template... Save as template...

No.	Name	Description	Isocenter [cm]	R-L	I-S	P-A	SSD [cm]	To surface	To skin	Energy [MV]	Gantry [deg]	Coll. [deg]	Couch [deg]	Collision check	No. of segm.	MU/fx	Bolus	Jaw max aperture [cm]	X1	X2	Y1	Y2
1	D1_350		Lt PBI	16.75	-1.60	29.66	93.65	93.65	6	350.0	315.0	0.0		✓	166	250.36	(None)	-6.00	6.25	-6.00	5.50	
7	D2_178		Lt PBI	16.75	-1.60	29.66	74.16	82.16	6	179.9	43.0	0.0		✓	166	190.24	(None)	-7.00	6.25	-6.00	5.00	
8	D3_350_R355		Lt PBI	16.75	-1.60	29.66	93.60	93.60	6	350.0	298.1	350.0		✓	166	235.05	(None)	-6.00	6.25	-6.00	6.00	
9	D4_330_R50		Lt PBI	16.75	-1.60	29.66	92.04	92.04	6	330.0	265.0	310.0		✓	166	306.23	(None)	-6.25	6.75	-6.00	5.50	
10	D5_325_R20		Lt PBI	16.75	-1.60	29.66	92.54	92.54	6	325.0	313.5	270.0		✓	166	275.38	(None)	-6.25	5.50	-7.00	5.50	

Showing geometry status for: CT 2

ROI material management ROI/POI details

More Surface Guided Planning!

- More info about:
 - Workflows
 - Plan optimization
 - TPS integration



Use of MapRT to optimise noncoplanar planning for head and neck patients

Helen Convery
Senior Dosimetrist (Development and Clinical Trials)
Raigmore Hospital Inverness, UK

[View video](#)



SGRT in Planning: Our Clinical Experience in Surface Guided Clearance Mapping

Siqiu Wang, PhD
Medical Physics Resident
University of Texas Southwestern

[View video](#)



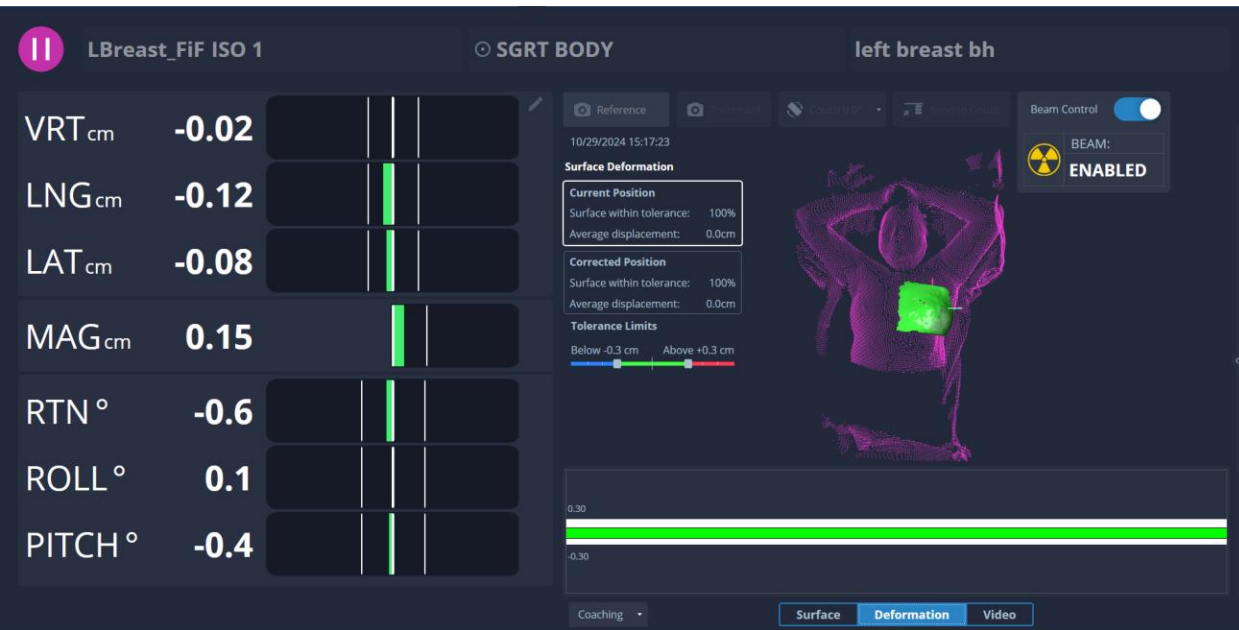
Surface Guided Treatment With SGRT

The SGRT Advantage

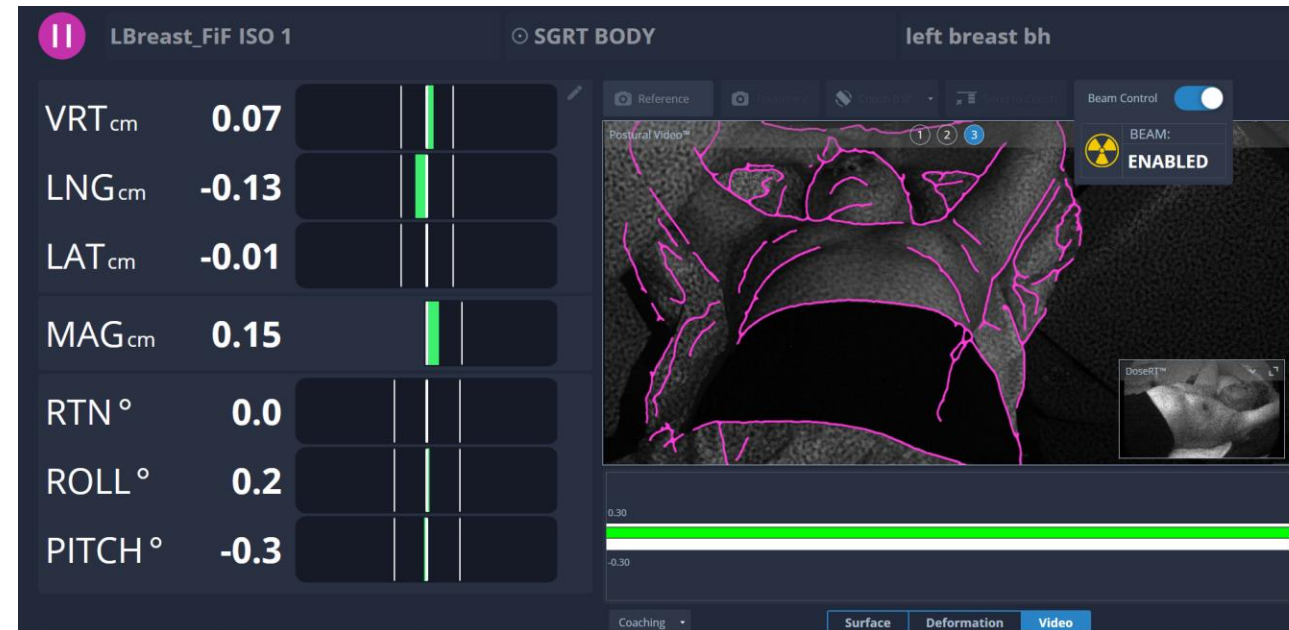
- Biometric Patient Facial Recognition
- Patient Setup
 - Postural video – improves patient setup accuracy and efficiency
 - Markerless treatments – surface setup vs. 3 marks
 - Deformation view – quickly assess changes in patient's body habitus
- Motion Management
 - Respiratory management – DIBH with beam hold
 - Monitoring motion in real time throughout the treatment – less immobilization
- Submillimeter accuracy from head to toe

AlignRT in Action

Deformation View

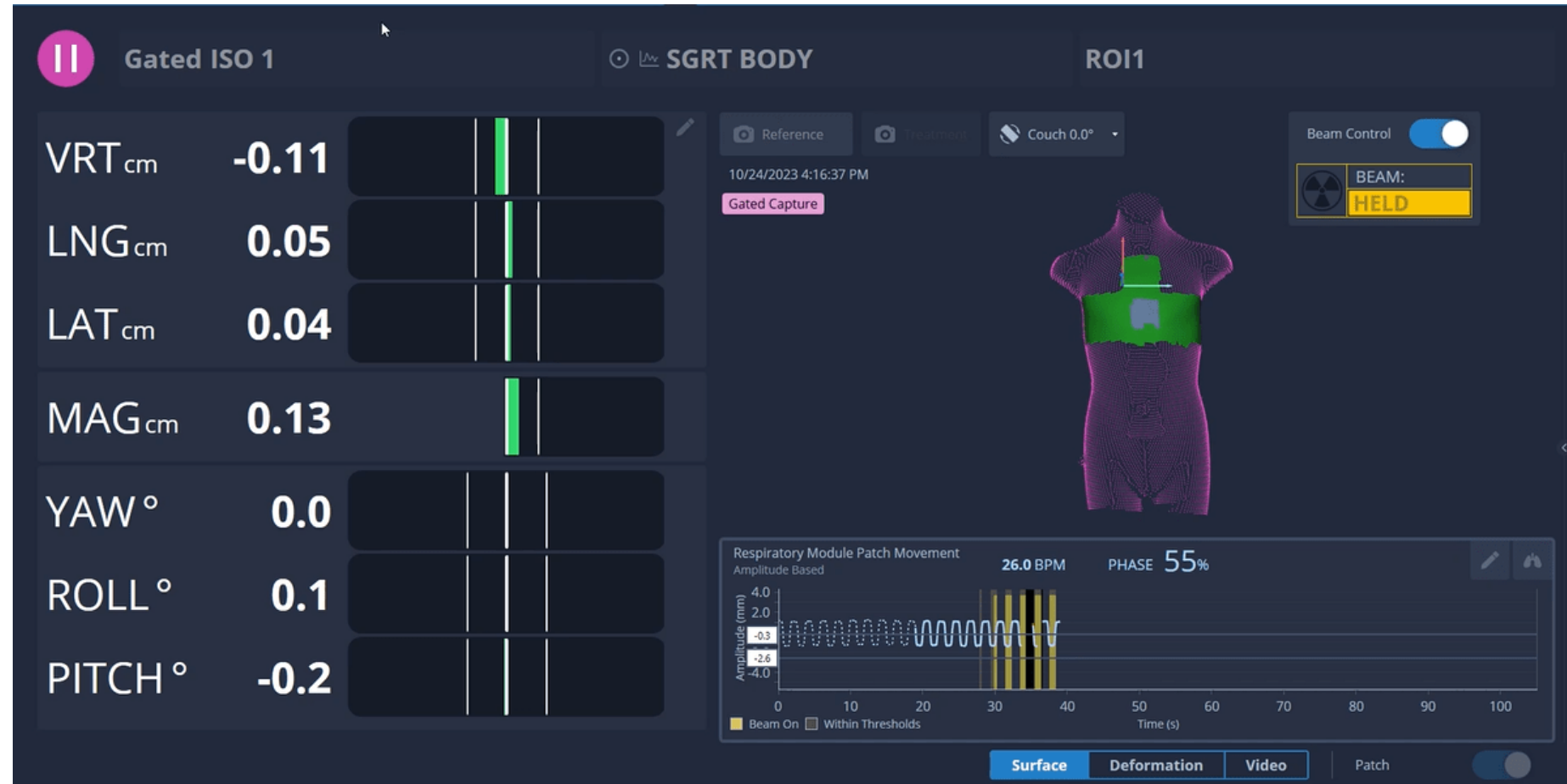


Postural video



Respiratory Module

- Phase and Amplitude Gating
- AlignRT Integration
 - Continues monitoring in 6 DoF
- Deviceless Delivery



More Surface Guided Treatment!

- More information about AlighRT:
 - DIBH and beyond
 - Going tattooless
 - SBRT/SRS
 - In-Bore



AlignRT's Respiratory Module: Results of Pre-clinical Testing and Initial Experiences

Josh Naylor, MPE, MSc
Principal Physicist
University Hospitals Dorset

[View video](#)



Accuracy and Time Savings of Tattooless DIBH Breast Setups: Our Five-Year Experience

Margaret Barker, MS
Medical Physicist
MemorialCare Todd Cancer Institute

[View video](#)



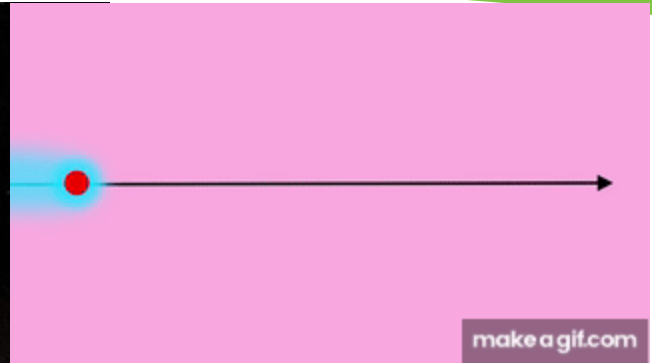
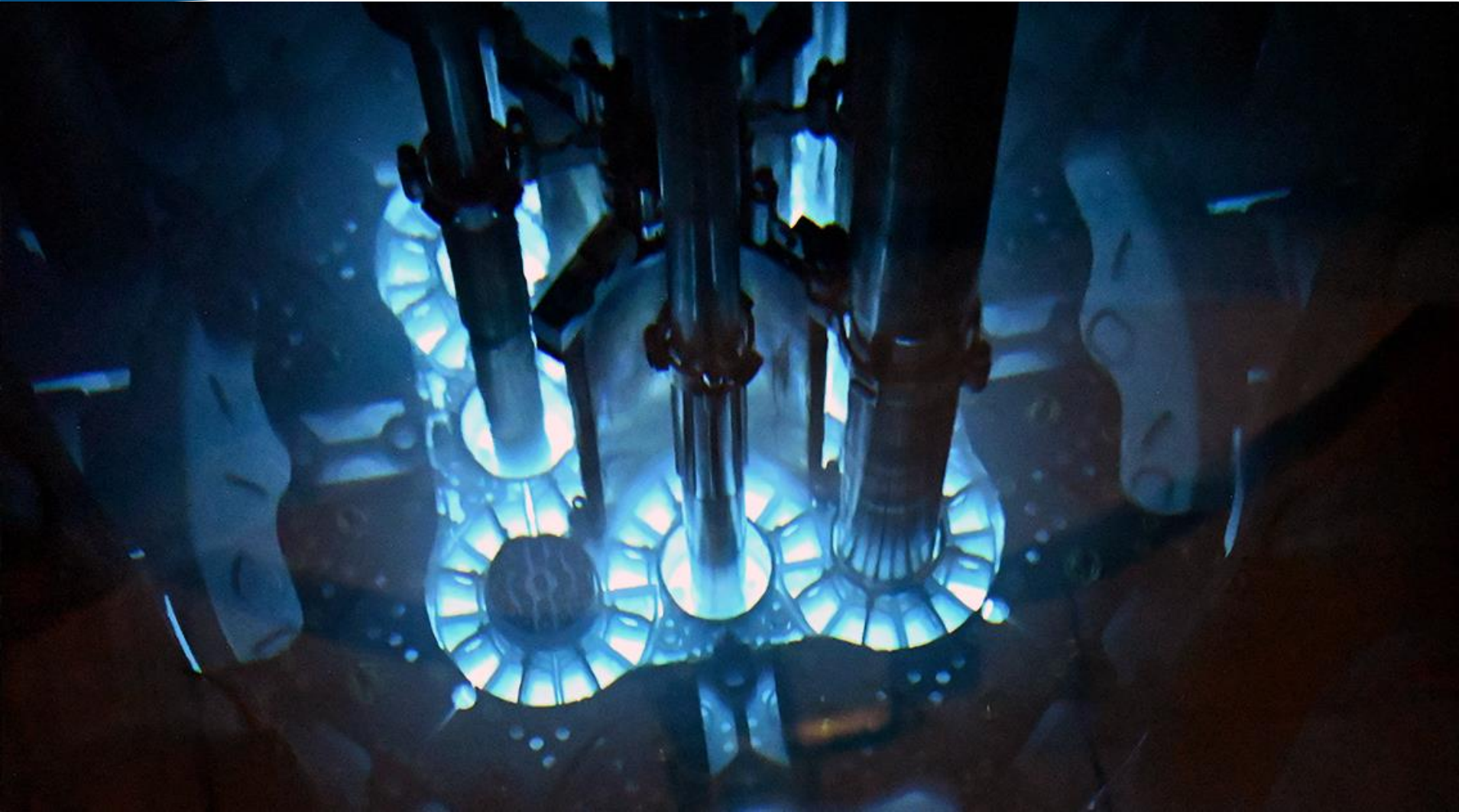
Surface Guided Dose Visualization

SGRT with Dose Visualization

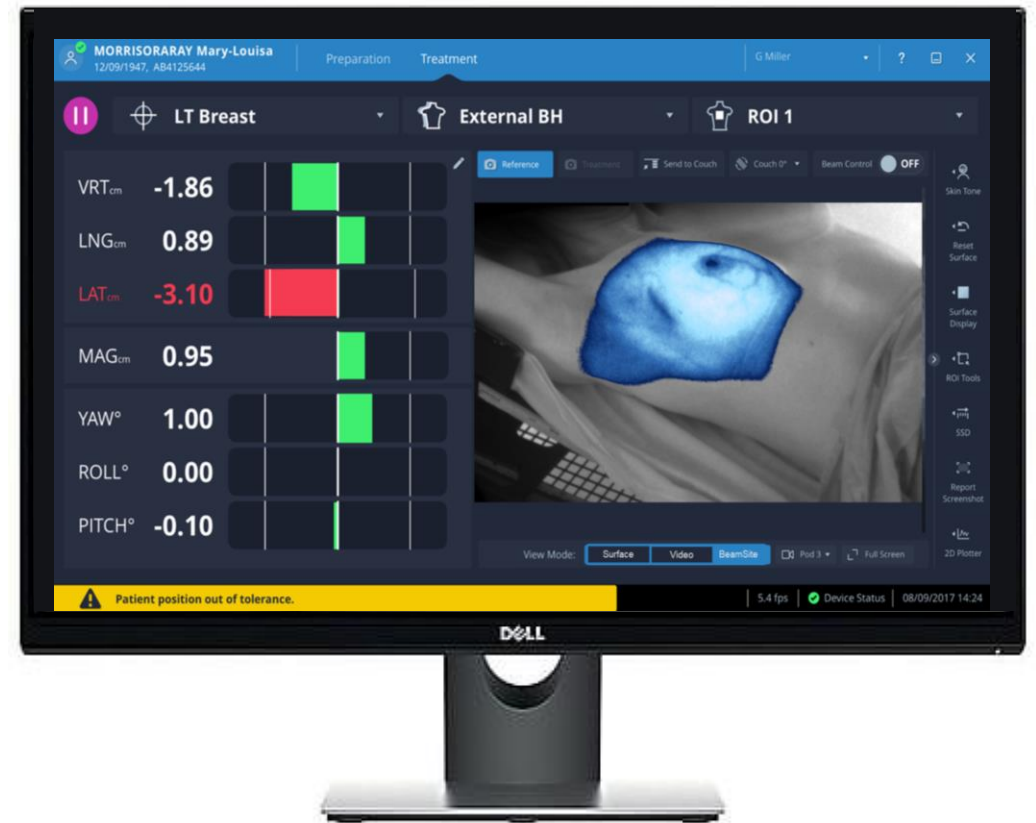
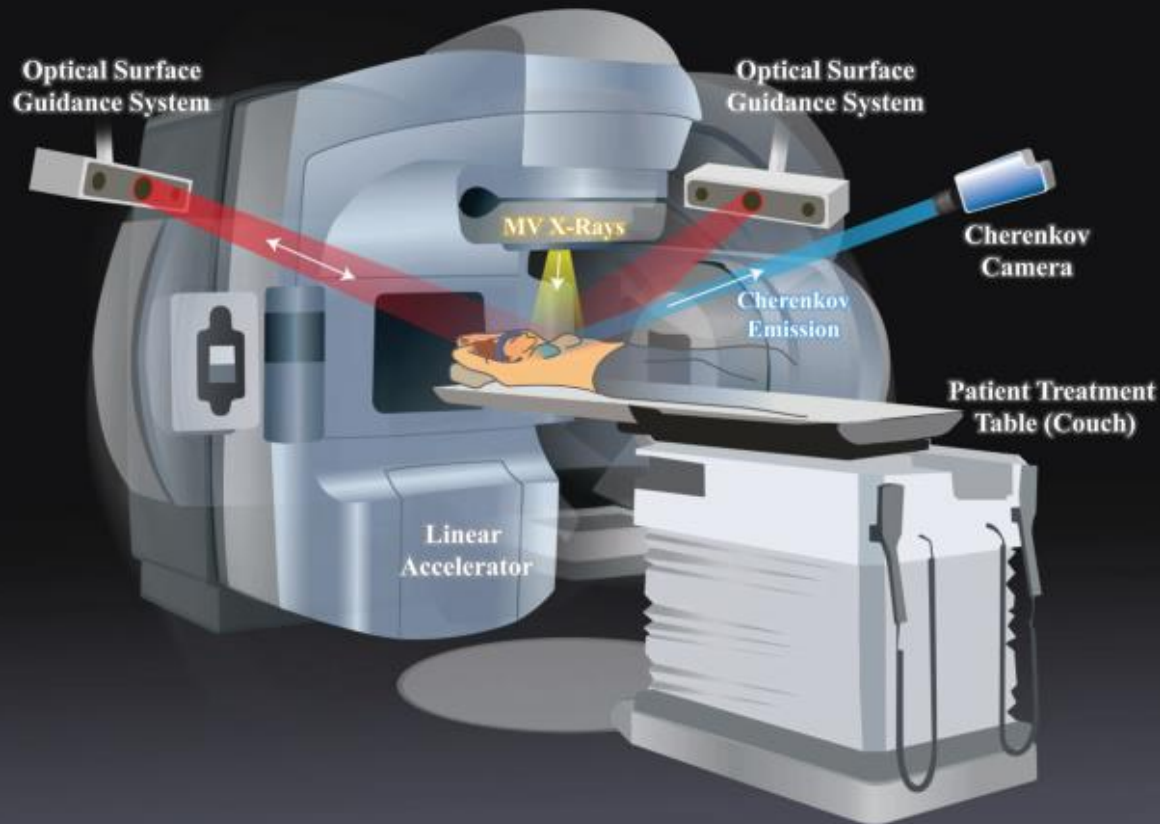
- Simultaneous real time visualization of dose delivery and patient positioning.
- Can help prevent treatment errors in real time and improve clinical outcome



Cherenkov Radiation

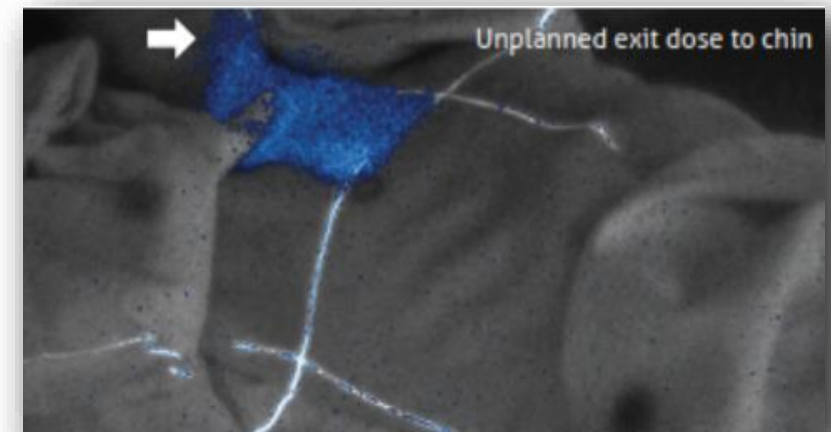


Cherenkov Imaging

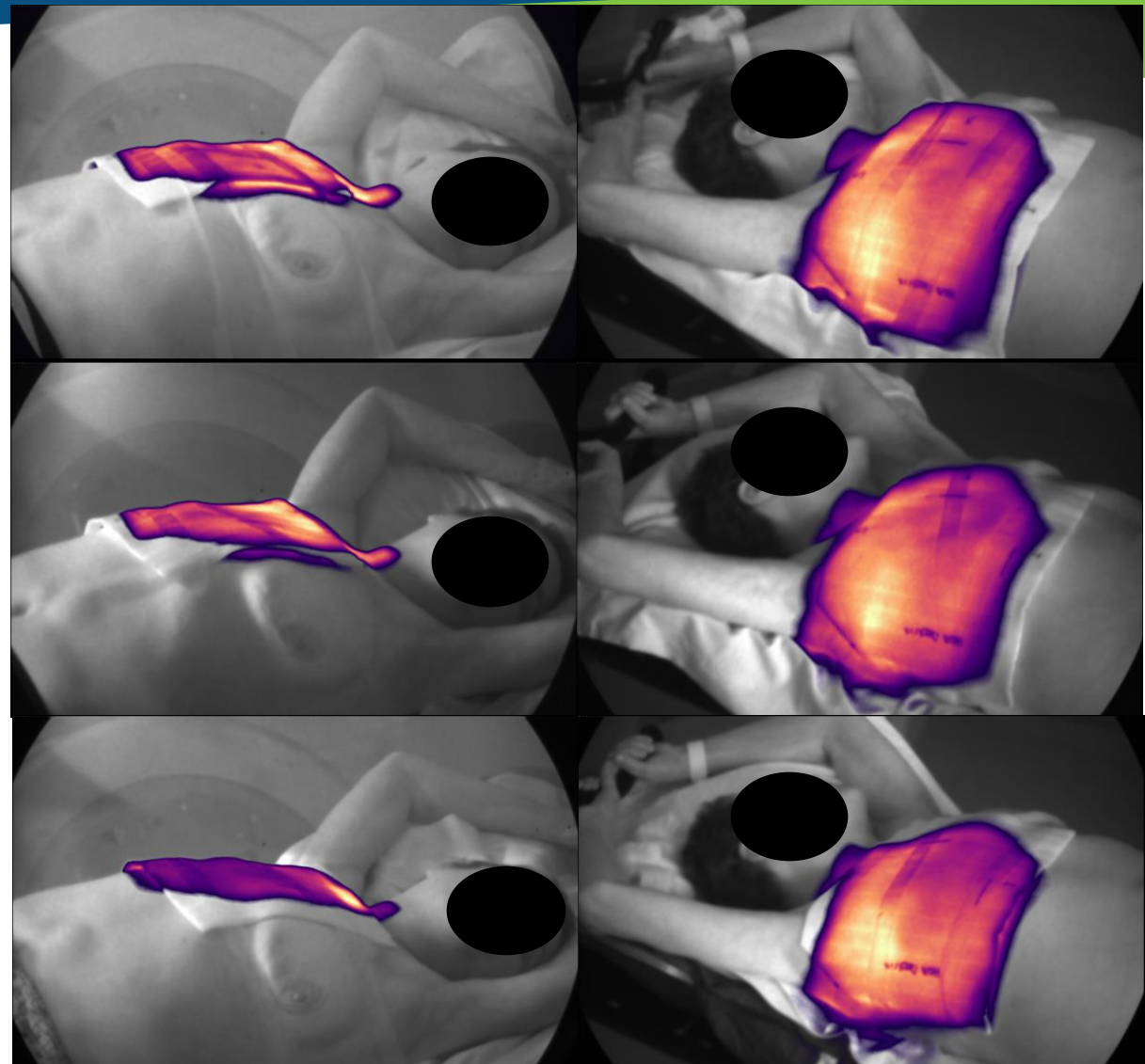
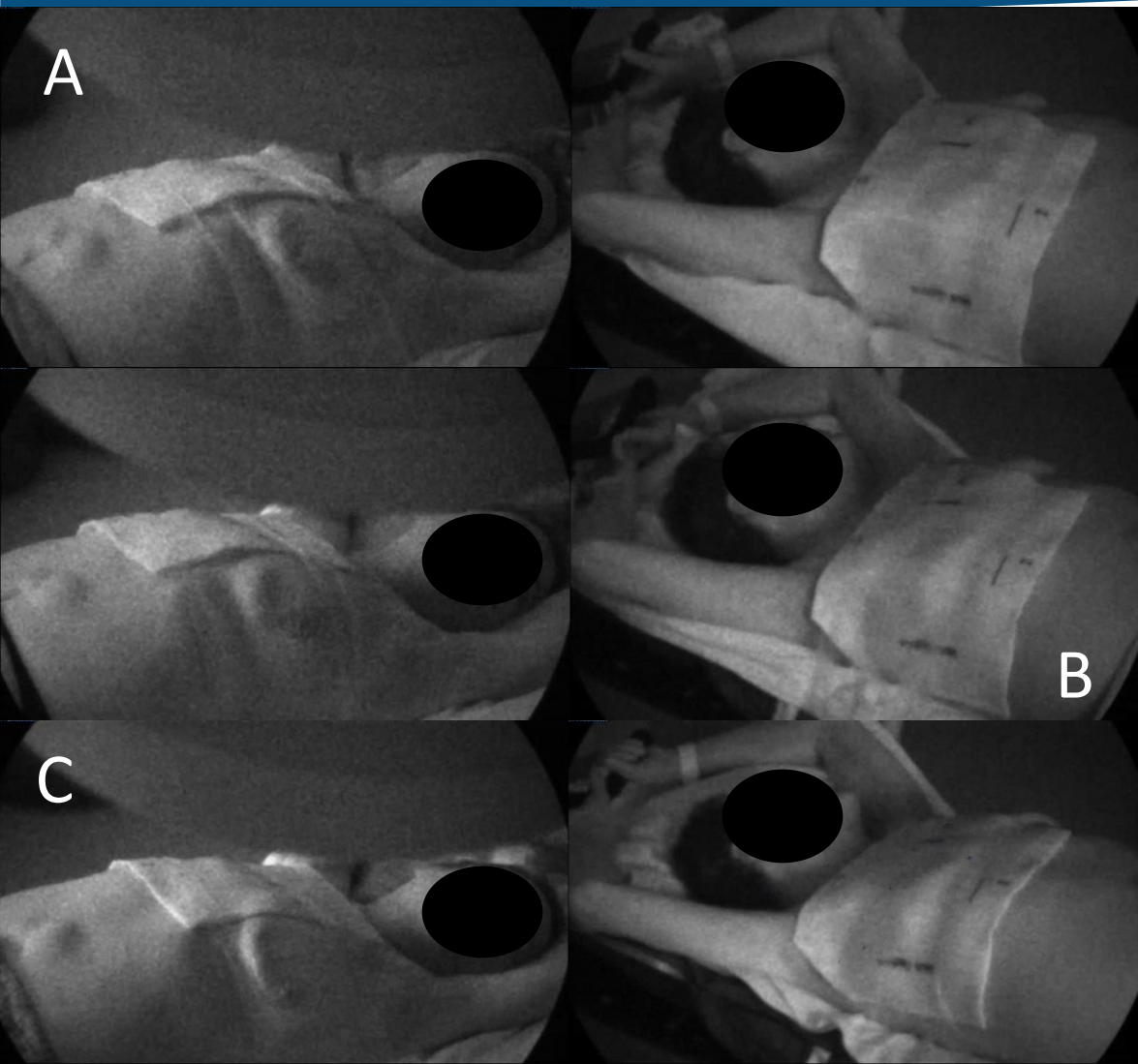


Benefits of Cherenkov Imaging

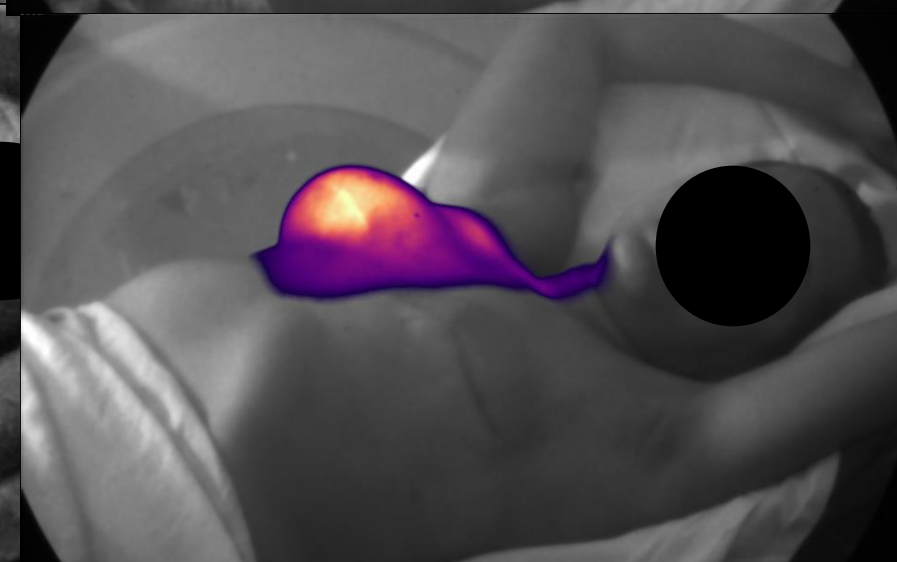
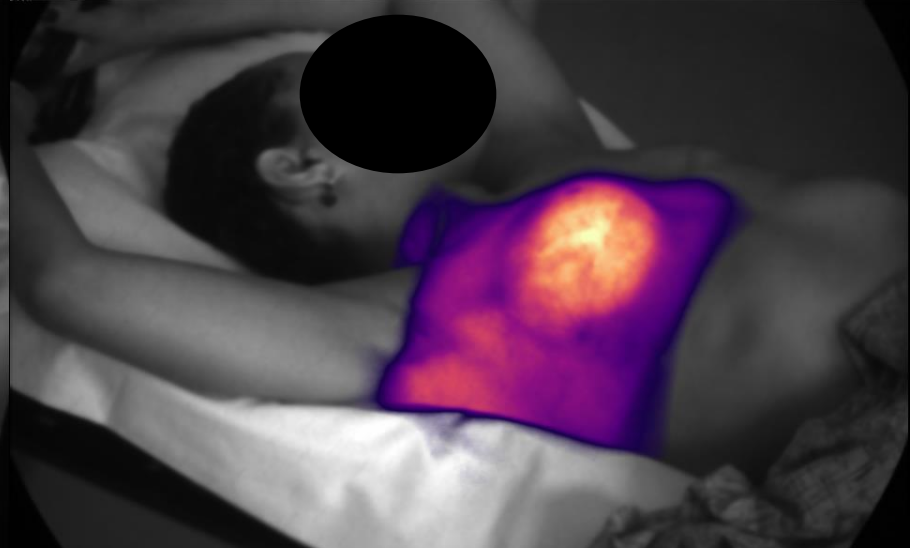
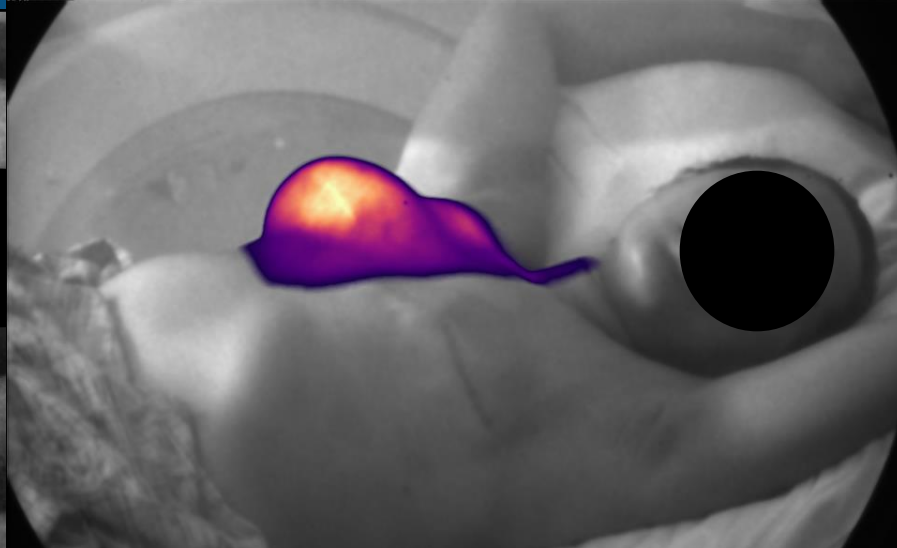
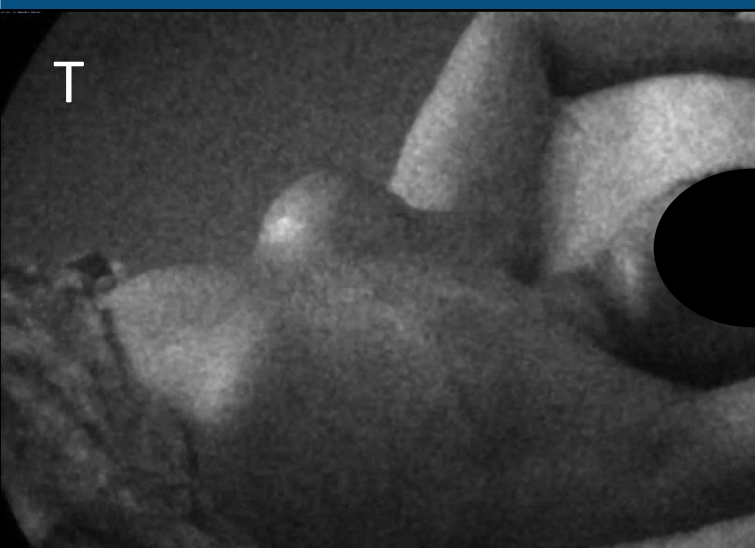
- Initial study out of Dartmouth suggests that about 10% of patients experience issues that could not be visualized without Cherenkov imaging. For example:
 - Chin irradiated during supraclavicular fields
 - Arm irradiated during tangential breast fields
 - Bolus misplacement
 - Open MLC leaves
- We can now detect these With DoseRT!



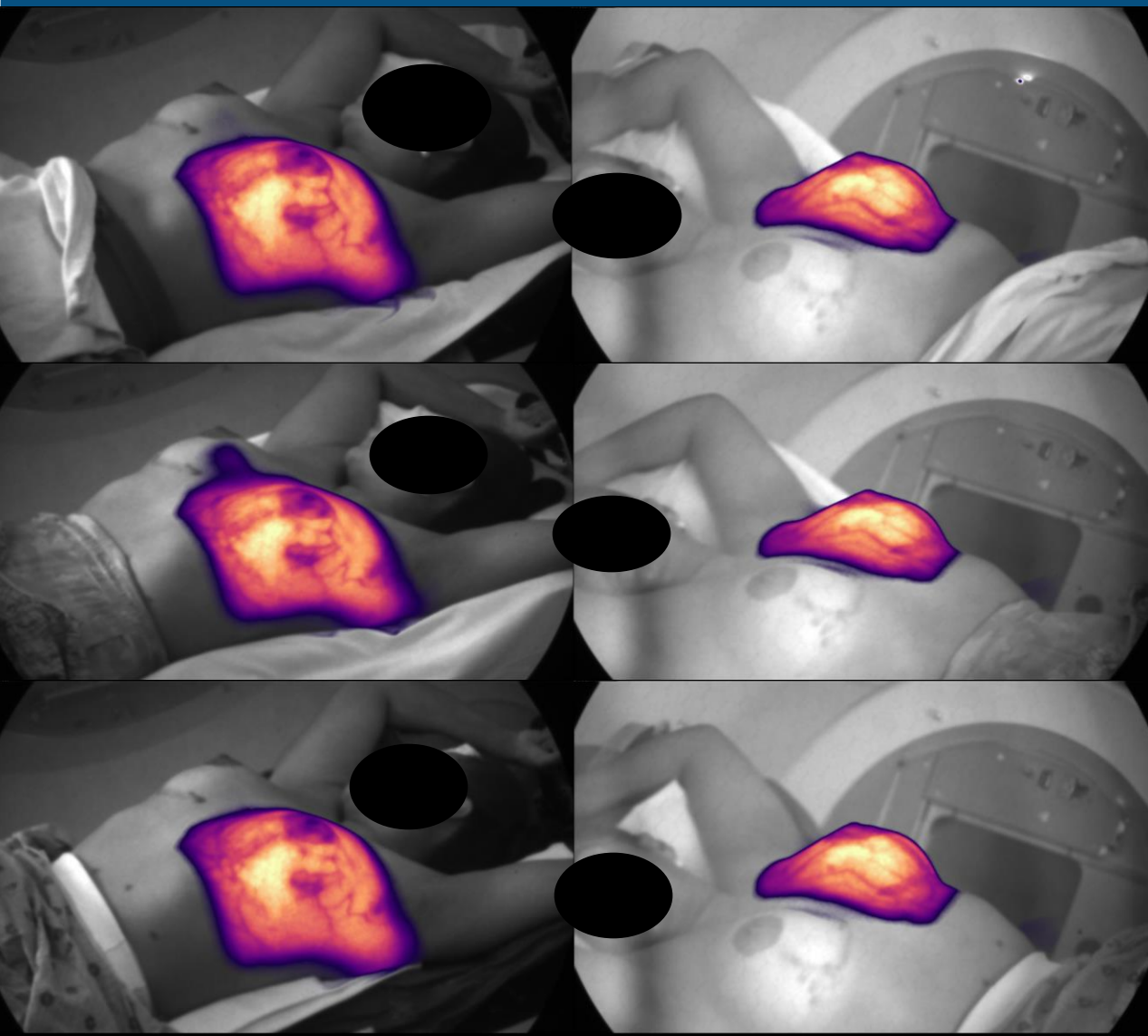
Case #1



Case #2



Case #3



5

L Brst_DIBH_F ISO 1 SGRT BODY left breast BH

VRT _{cm}	-0.17	
LNG _{cm}	0.09	
LAT _{cm}	-0.05	
MAG _{cm}	0.20	
RTN [°]	-0.1	
ROLL [°]	-0.2	
PITCH [°]	0.1	

6

L Brst_DIBH_F ISO 1 SGRT BODY left breast BH

VRT _{cm}	0.12	
LNG _{cm}	-0.27	
LAT _{cm}	0.02	
MAG _{cm}	0.30	
RTN [°]	0.6	
ROLL [°]	-0.1	
PITCH [°]	0.0	

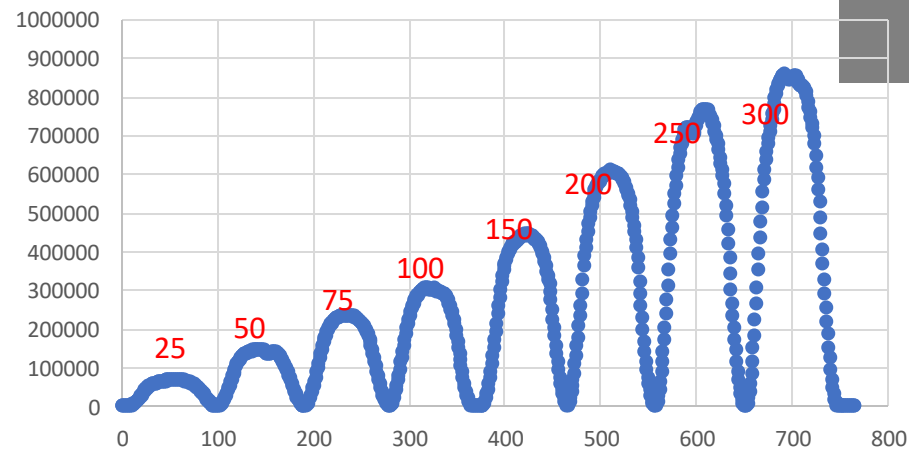
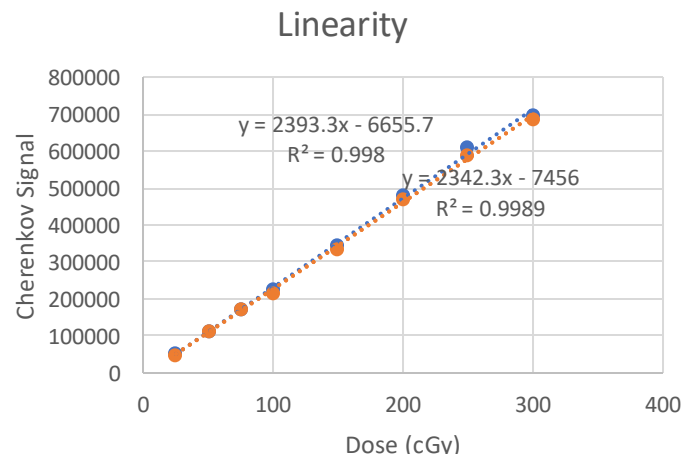
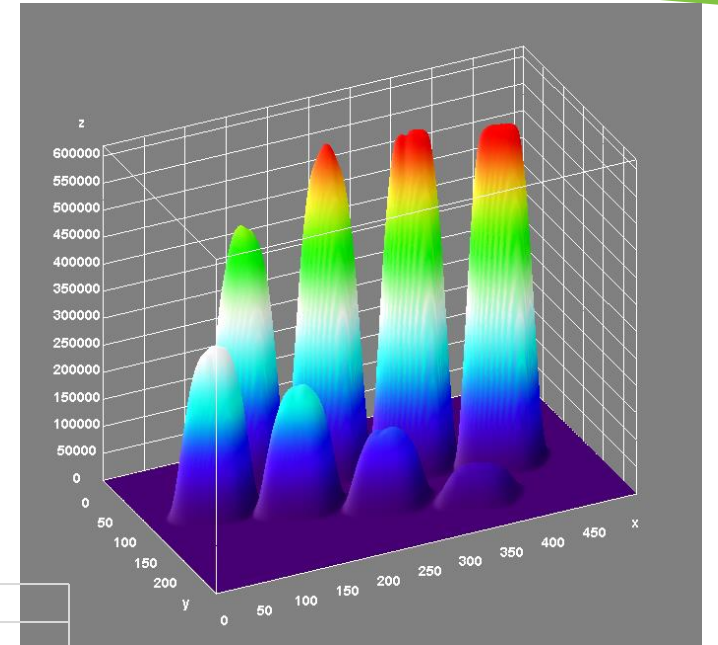
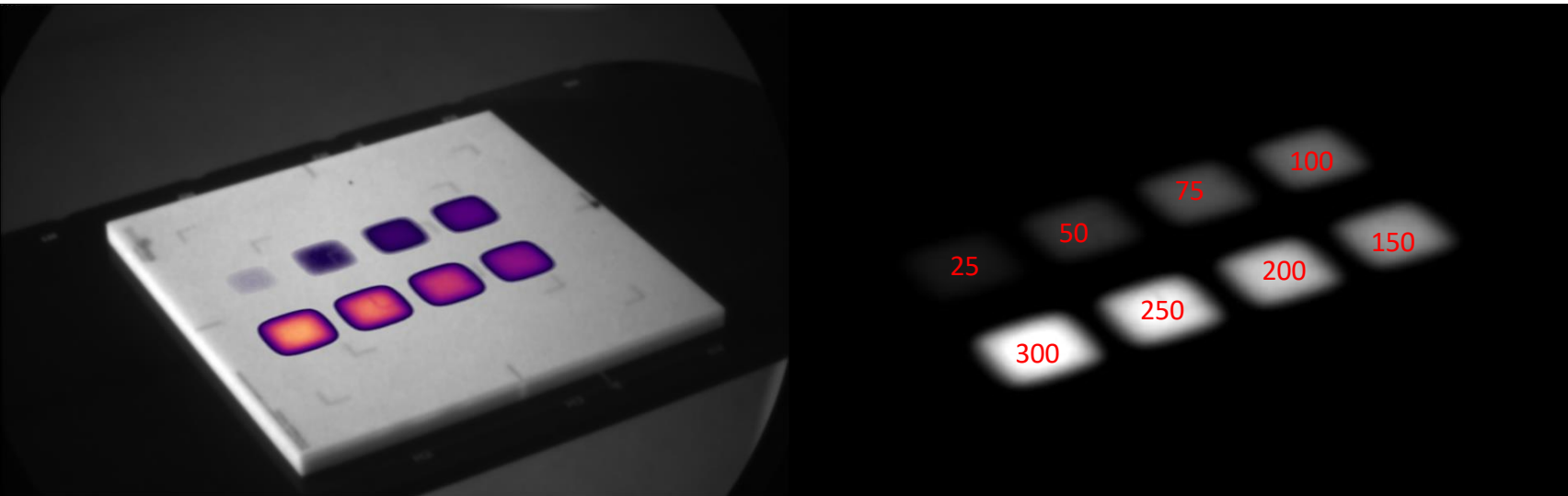
7

L Brst_DIBH_F ISO 1 SGRT BODY left breast BH

VRT _{cm}	0.07	
LNG _{cm}	-0.12	
LAT _{cm}	0.00	
MAG _{cm}	0.14	
RTN [°]	0.3	
ROLL [°]	0.0	
PITCH [°]	0.2	

Each software panel includes a 'Postural Video' window with a 'BEAM: ENABLED' indicator and a 'Beam Control' toggle. The video windows show a 3D reconstruction of the patient's chest with pink outlines.

Potential Application



More Surface Guided Dose Visualization!

- More information about DoseRT:
 - Clinical applications
 - Potential applications



First experiences with DoseRT

Mike Tallhamer
Chief of Physics
Advent Health, Colorado, USA

[View video](#)



Our Journey with DoseRT; Latest Clinical Results

Michael Tallhamer
Chief of Medical Physics
AdventHealth Parker, USA

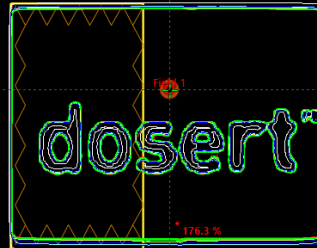
[View video](#)

Another (Fun) DoseRT Application

visionrt
Guiding Radiation Therapy™



dosert™
Powered by BeamSite®



SGRT
COMMUNITY
SURFACE GUIDED RADIATION THERAPY



Let's Play a Game



Conclusion

- SimRT provides a quick and easy way to capture respiratory motion information during CT simulation. It is effective, non-invasive and simple to use.
- MapRT provides a clearance map that eliminates the need for collision checks and dry runs while assisting in improving the quality of the treatment plan
- AlignRT provides a marker-less patient positioning and monitoring. Greatly reduces the need for reposition and reimaging the patient.
- DoseRT provides dose visualization in real time. assists in improving the quality and safety of treatment delivery.

Acknowledgements

- ChatGPT
- Josh Naylor
- Mike Tallhamer
- AdventHealth team



Thank you!
Questions?

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