# *IMAGING TECNIQUES in RADIOTHERAPY*

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ACIBADEM SISTINA

# *University hospital radiotherapy service*

# *University hospital radiotherapy service*

- 2 simulators - 1 clasic, 1 CT
- 3 Varian linacs
- + 2 Electa linacs

# *Private hospital radiotherapy service*


# *Private hospital radiotherapy service*

- MR, PET-CT
- CT simulator
- 2 Varian IX linacs


# *INTRODUCTION*

- Imaging modalities used in medicine
  - Radiography
  - Ultrasound
  - Computer Tomography
  - Magnetic Resonance Images
  - Positron Emission Tomography

# *INTRODUCTION*

- Radiotherapy treatment goal
  - deliver as high as possible dose to the volume of interest
  - spear the surrounding healthy tissues as much as possible

# *INTRODUCTION*

The delivered dose should be the same as the predicted one.

That dose should be delivered on the certain volume (PTV)

# *Q1: How we are sure that the delivered dose is the same as the predicted one*

Delivered dose accuracy depends on:

-machine functionality,
-beam calibration errors
-calculation algorithm uncertainty

# *Q2: How we are sure that the dose is delivered at the right place?*

Delivered dose accuracy depends on:

-patient position errors
- volume of interest delineation precision

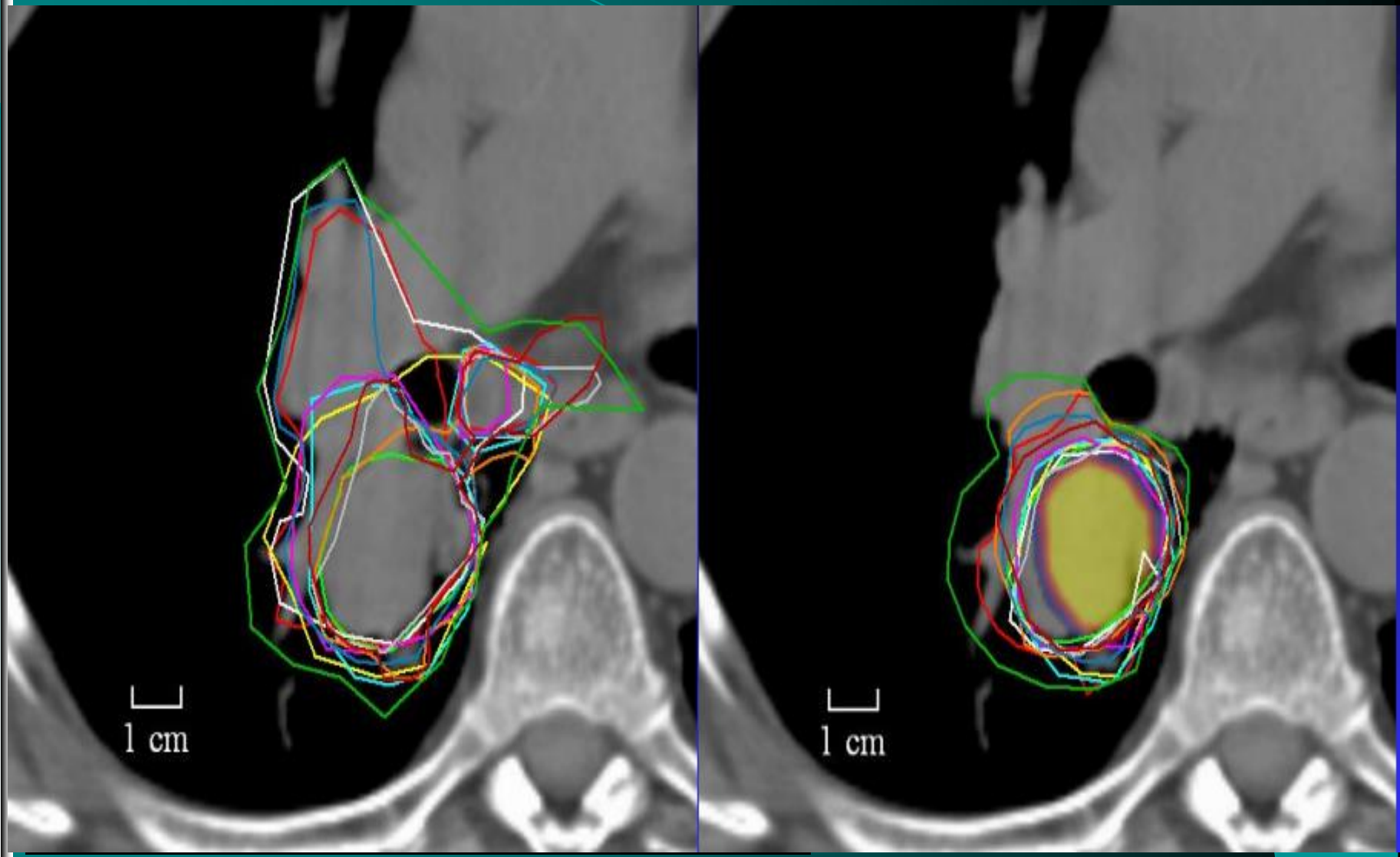
Medical IMAGES are necessary for structures contouring and patient position following

# *How we are sure that the delineation is correct?*

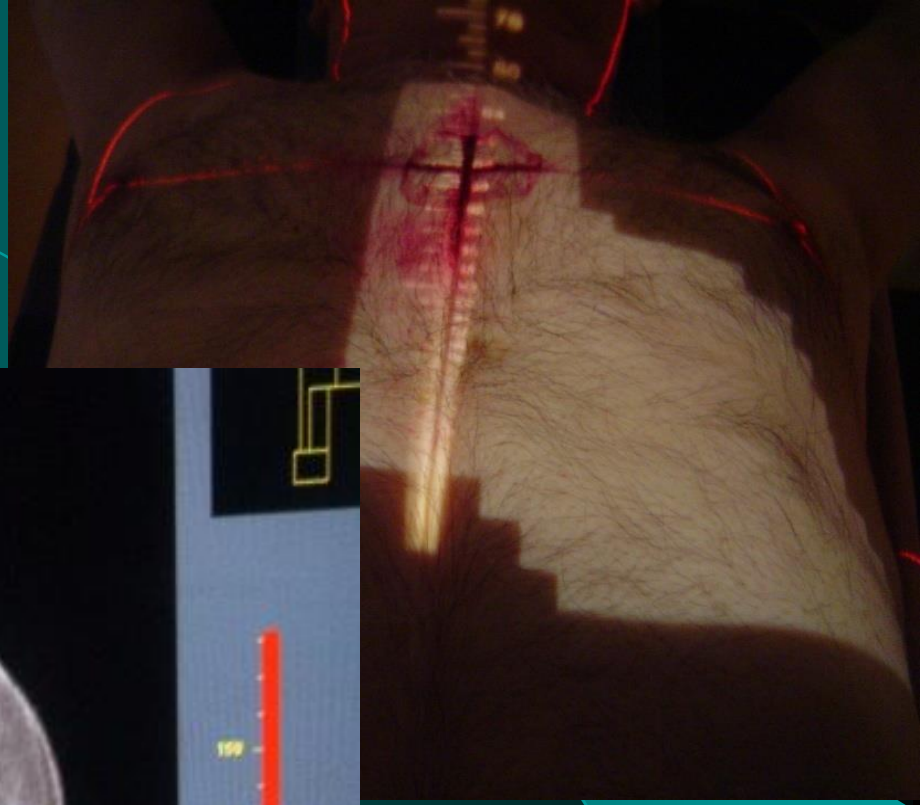
Delineation accuracy depends on:

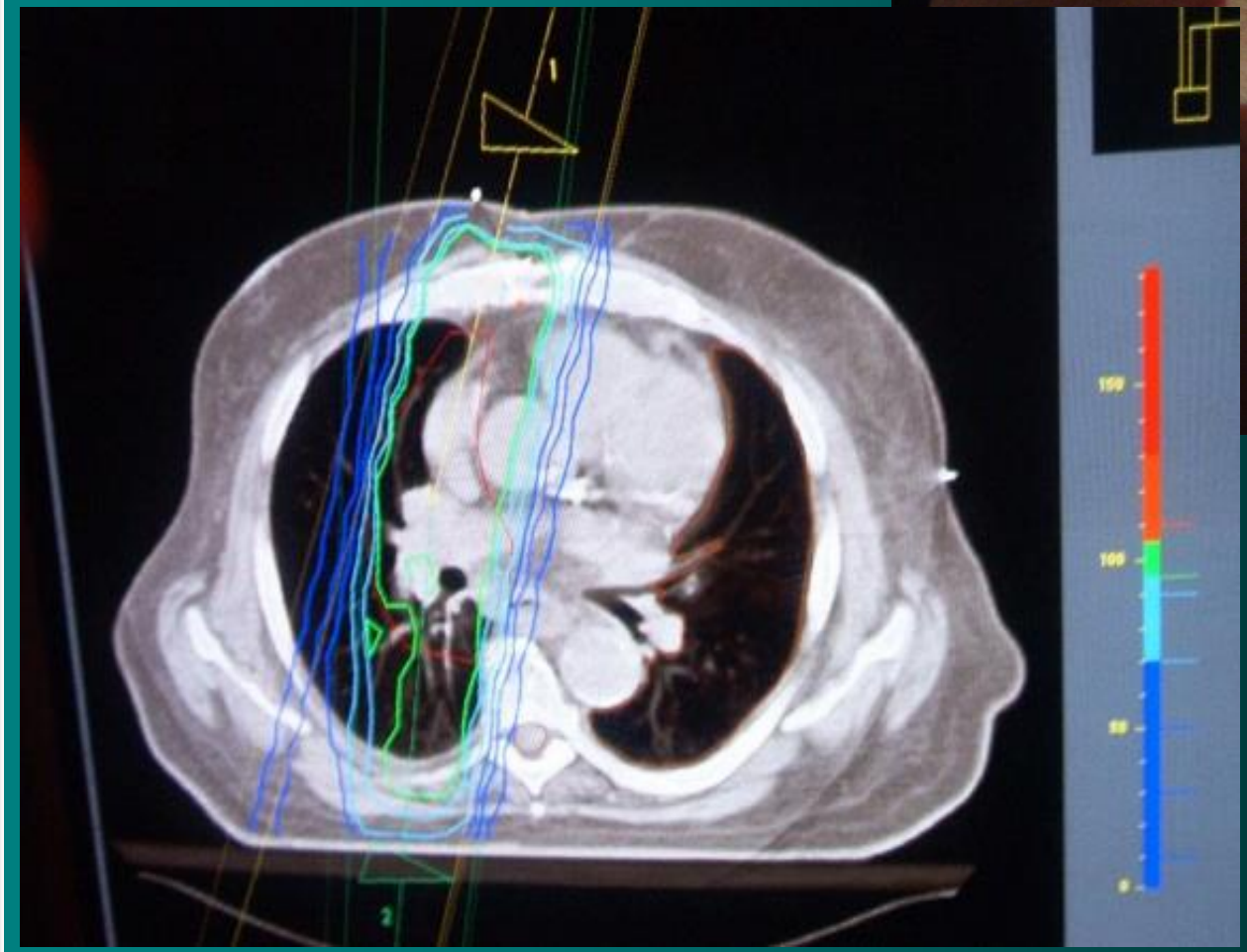
- tumor tissue visibility
- radiation oncologist experience

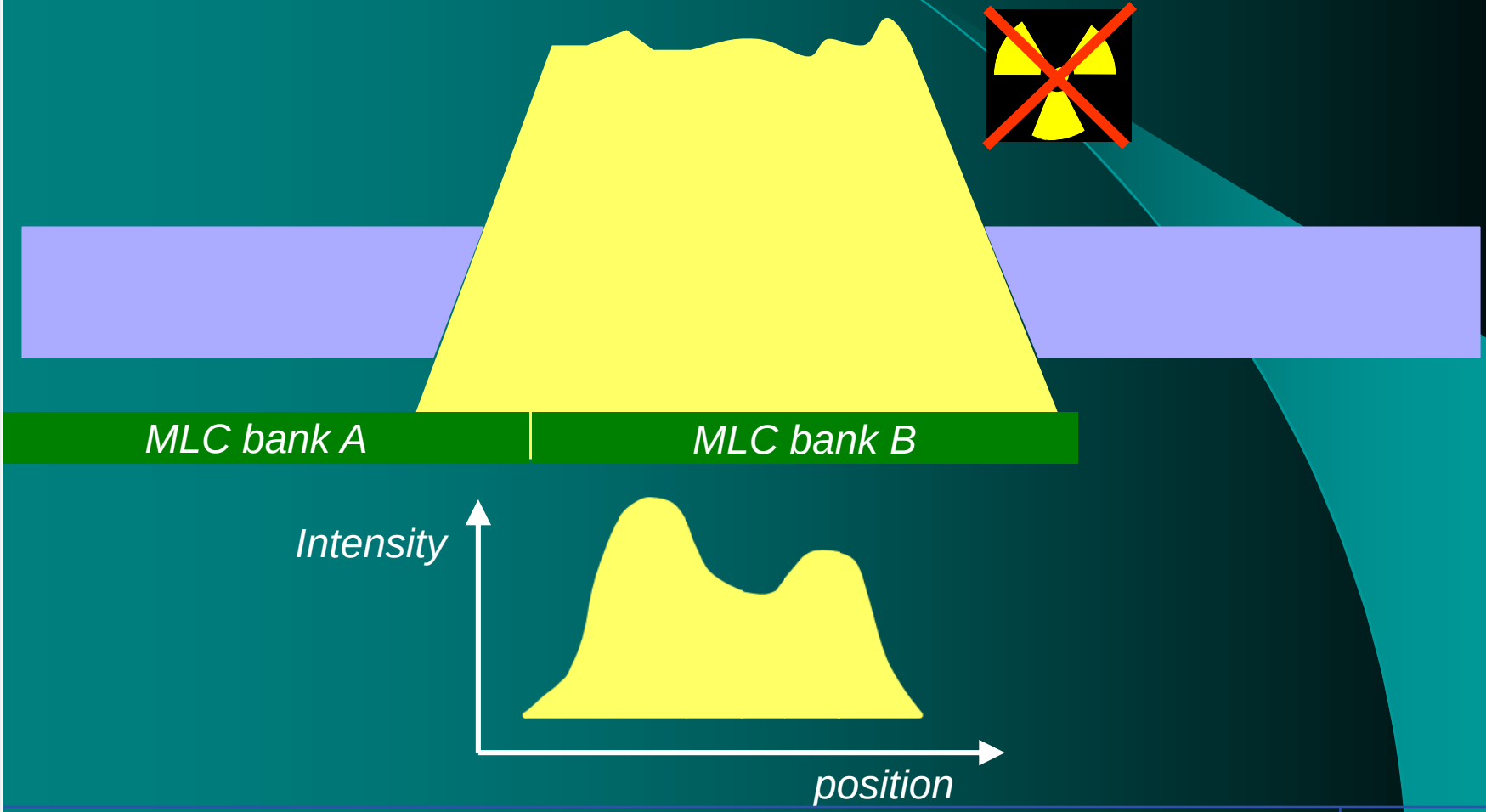
# IMAGING



# IMAGING





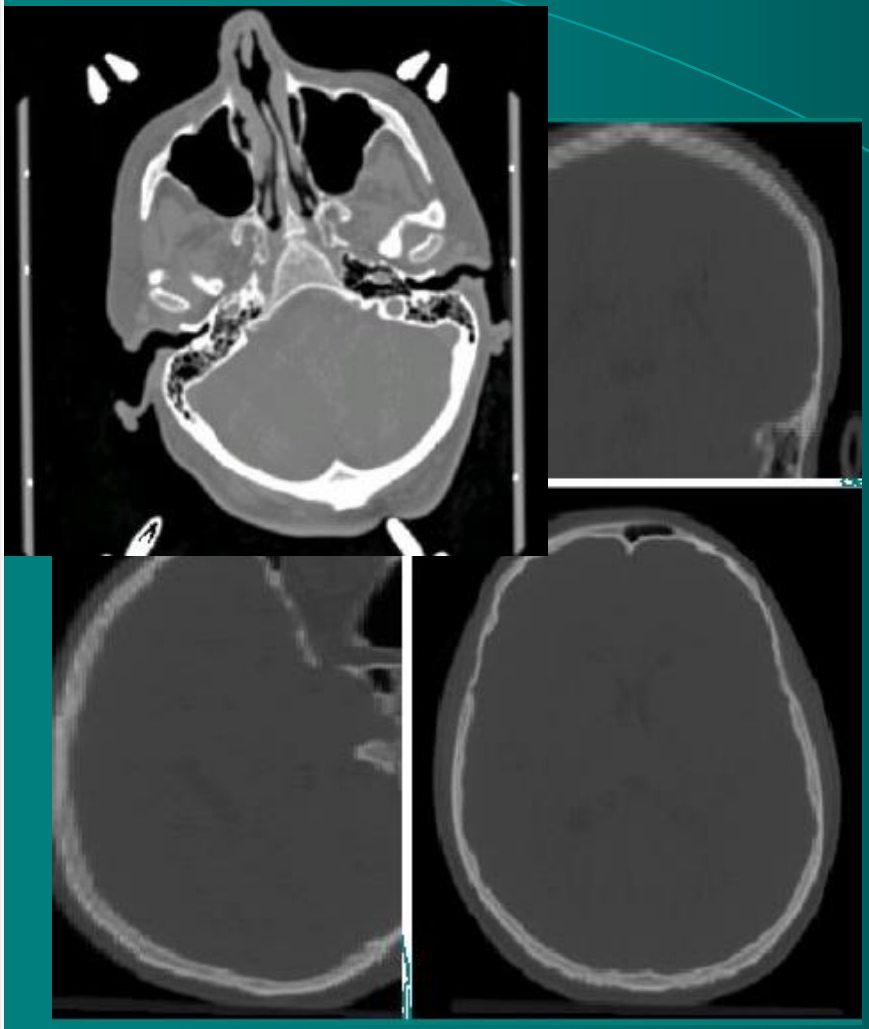

MLC bank A
MLC bank B
Intensity
position

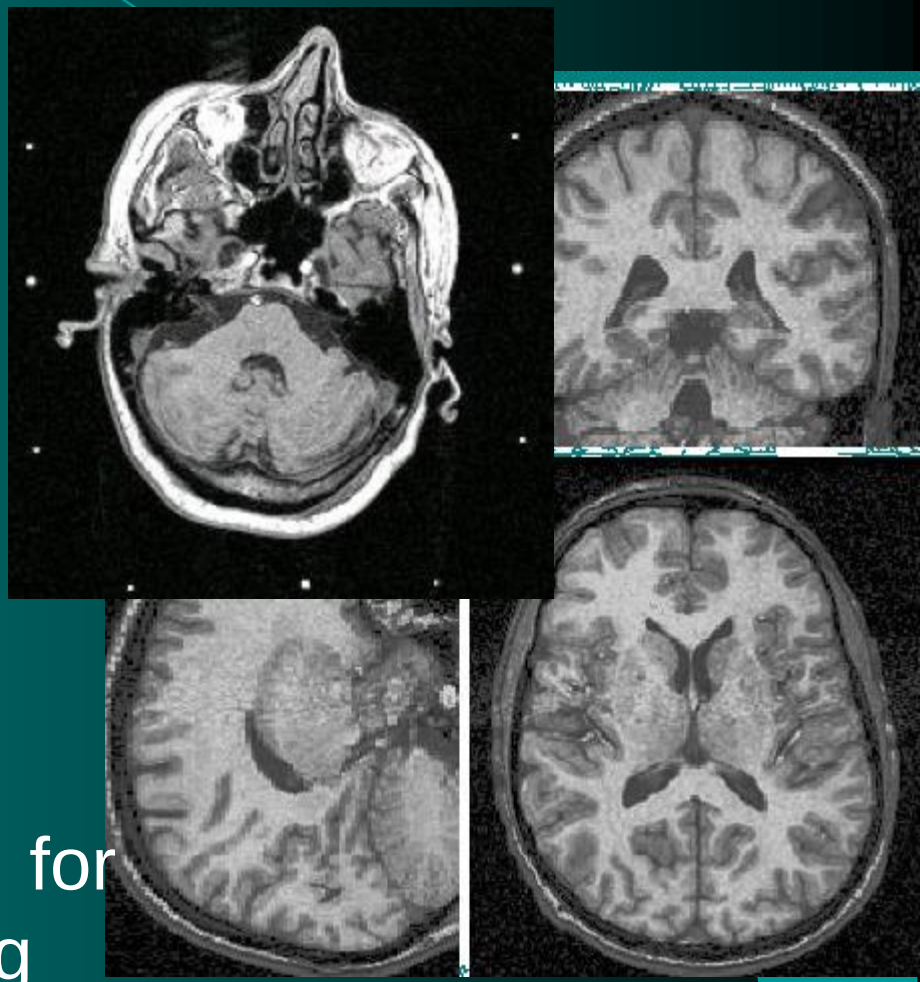
# *IMAGING*

Integration of multimodality imaging data for radiotherapy treatment planning is beneficial and indispensable for perfect delineation.

- *CT* *for planning*
- *MRI* *for registration*
- *PET-CT*

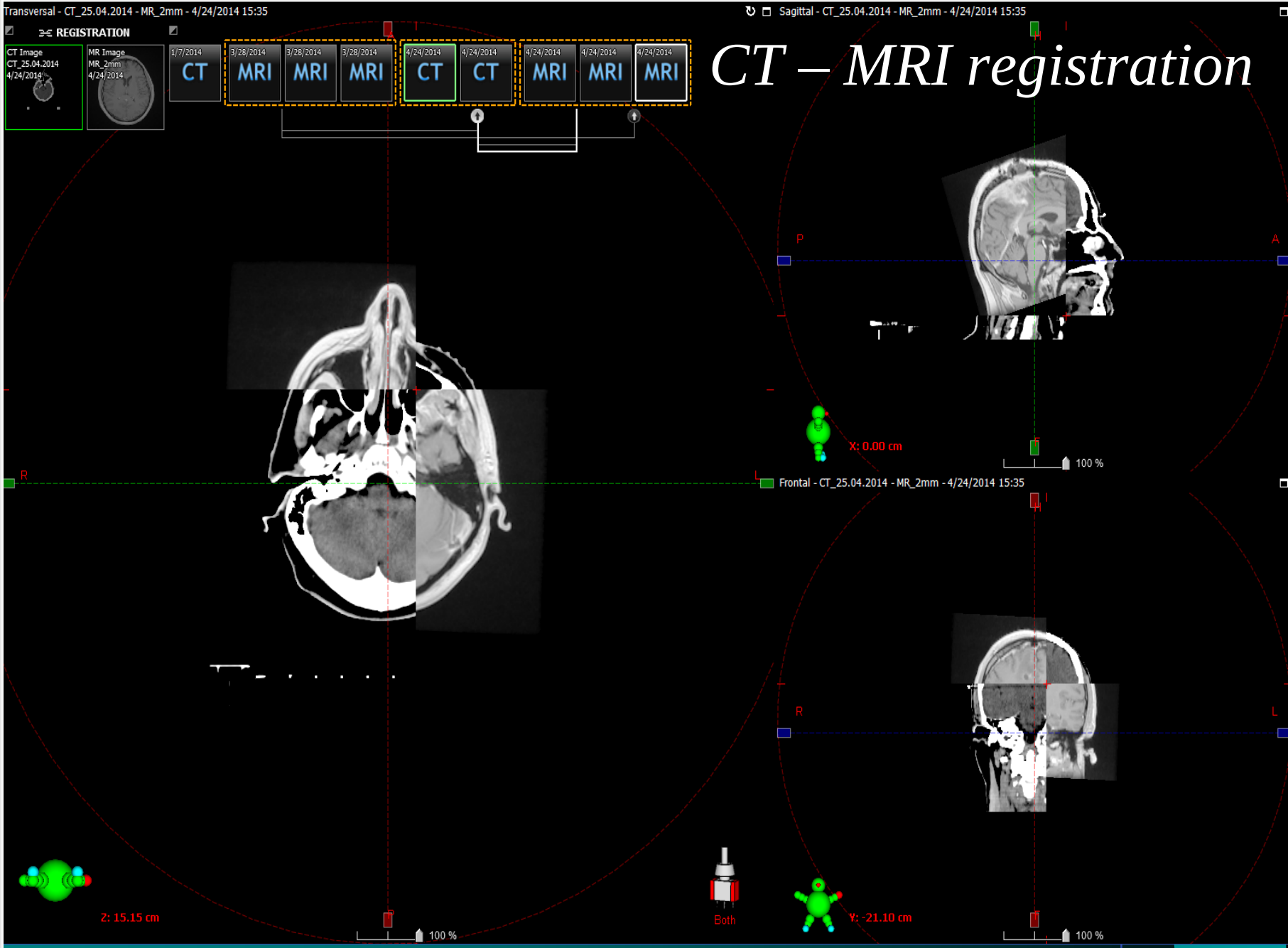
# *Q3: Why MRI*





Because MRI is superior for the soft tissues recognizing

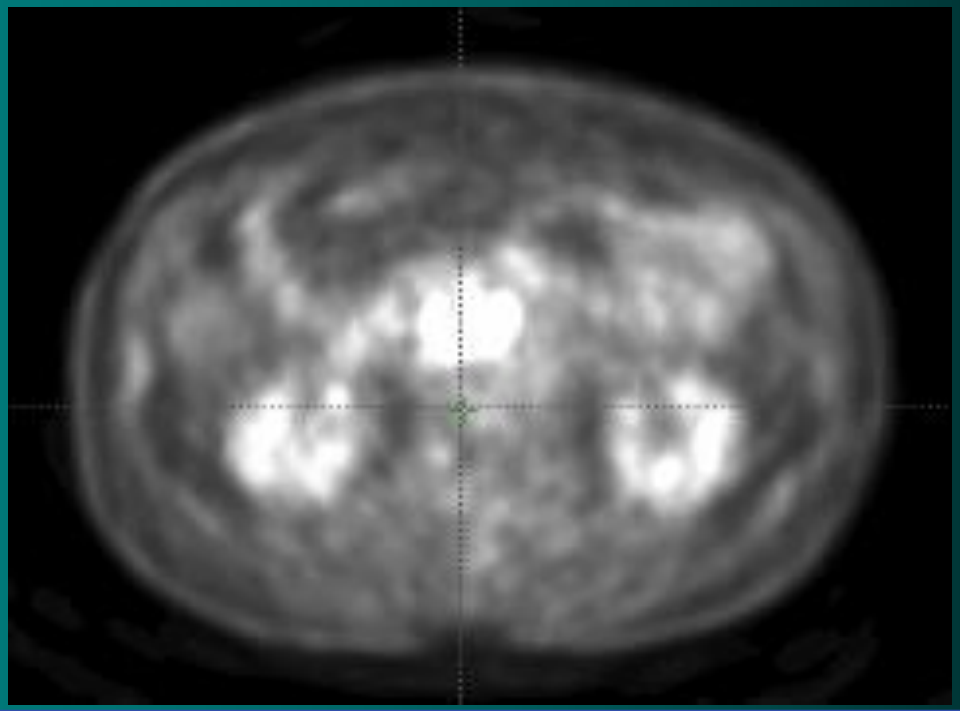
# CT – MRI registration



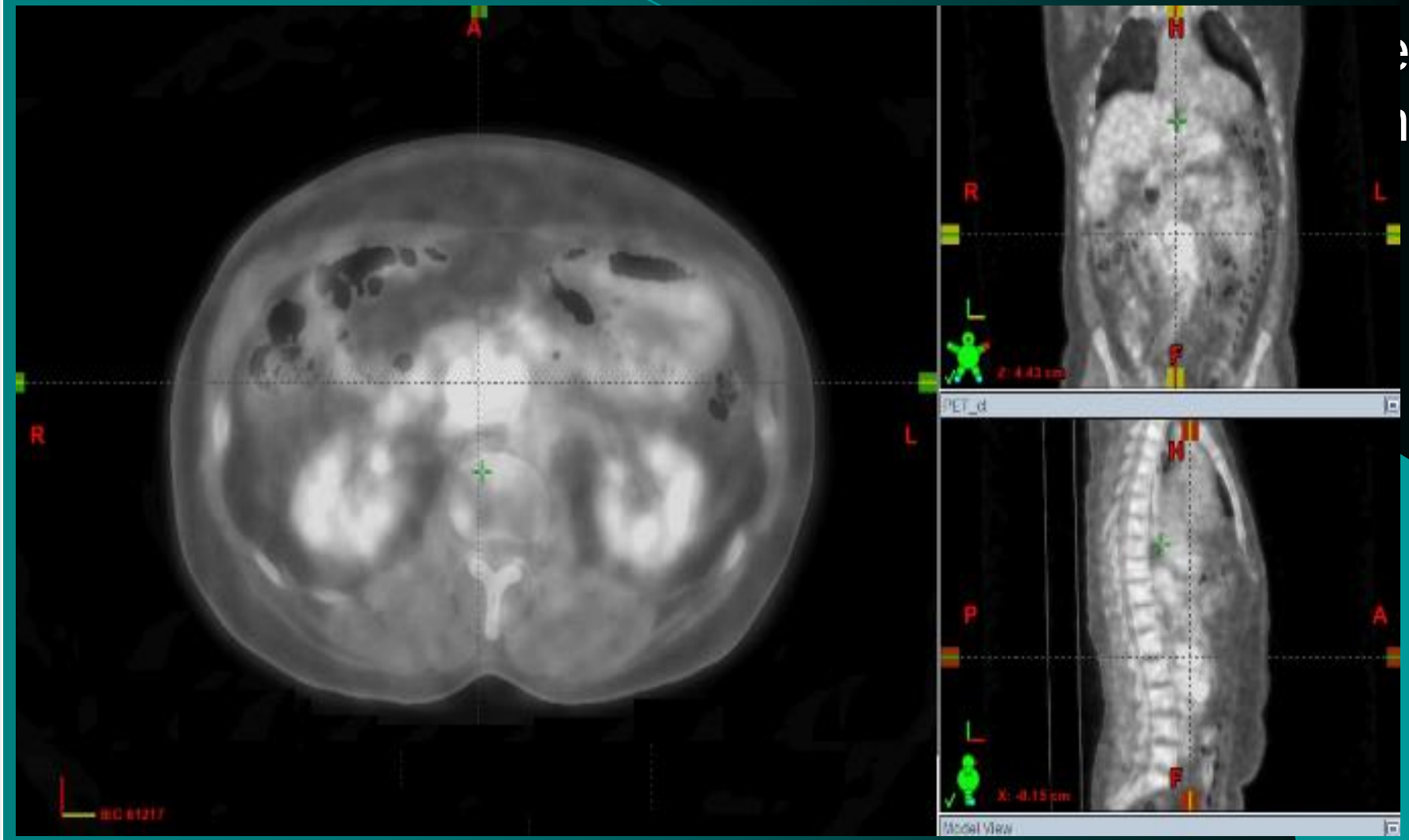
# *Q4: Why PET/CT*

# *Q4: Why PET/CT*

Functional imaging with PET can provide information that can influence RT planning, it can reveal targets that are not well visualized by CT/magnetic resonance (MR) structural imaging.

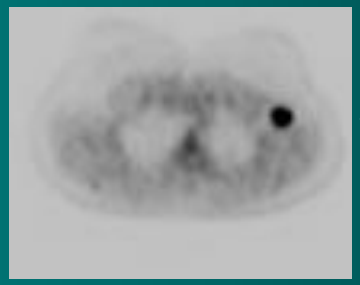


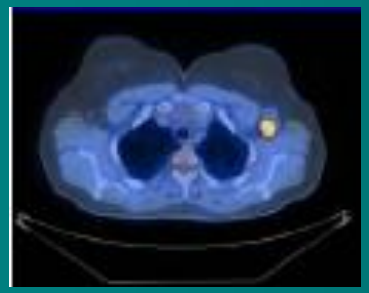
# *PET/CT registration*



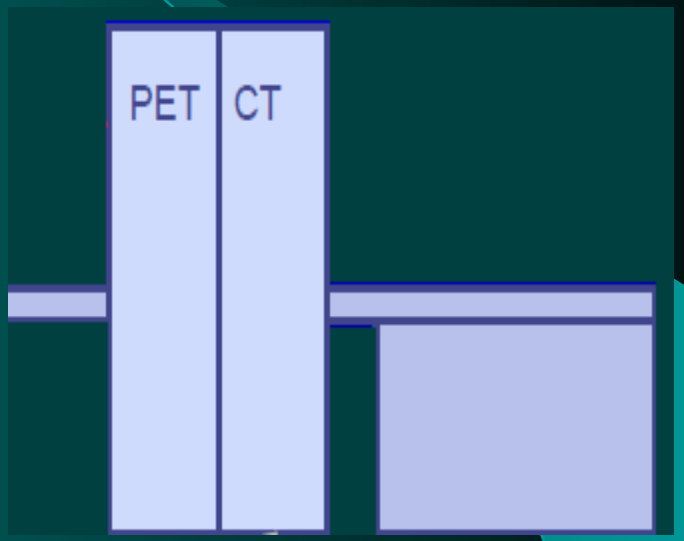
# *Integrated PET/CT Imaging System*

*BENEFITS of COMBINED* TECHNIQUE





*attenuation correction*

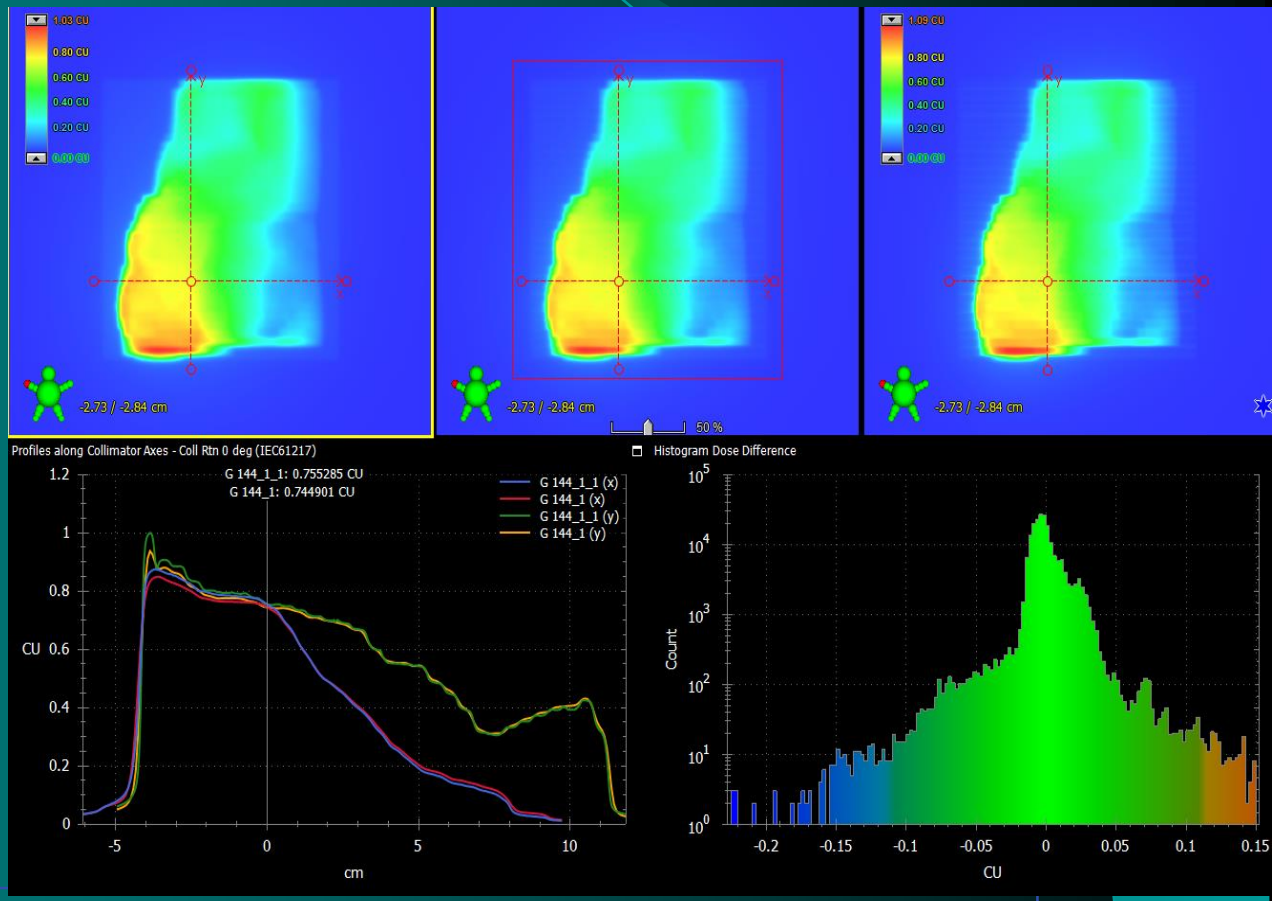



*anatomical localisation*

# *Imaging for treatment verification*

On-board MV imaging capabilities:

- EPID for pretreatment plan verification
(without patient)



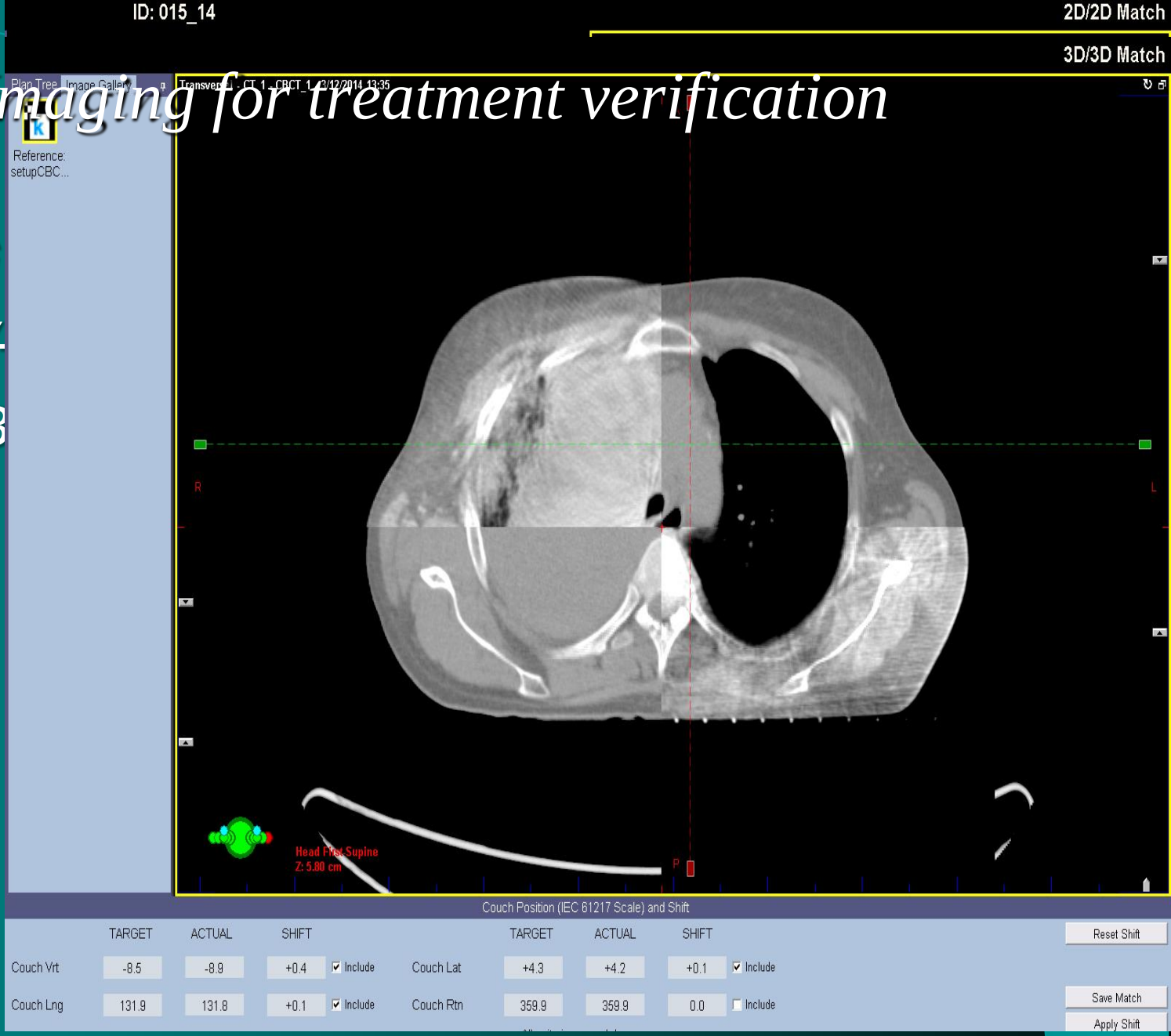
# *Imaging for treatment verification*

On-board kV imaging capabilities:

-Radiography (2-D), fluoroscopy (2-D),
(on site patient positioning)
-cone-beam CT (3 beam CT (3-D)
(on site tumor positioning)

# Imaging for treatment verification

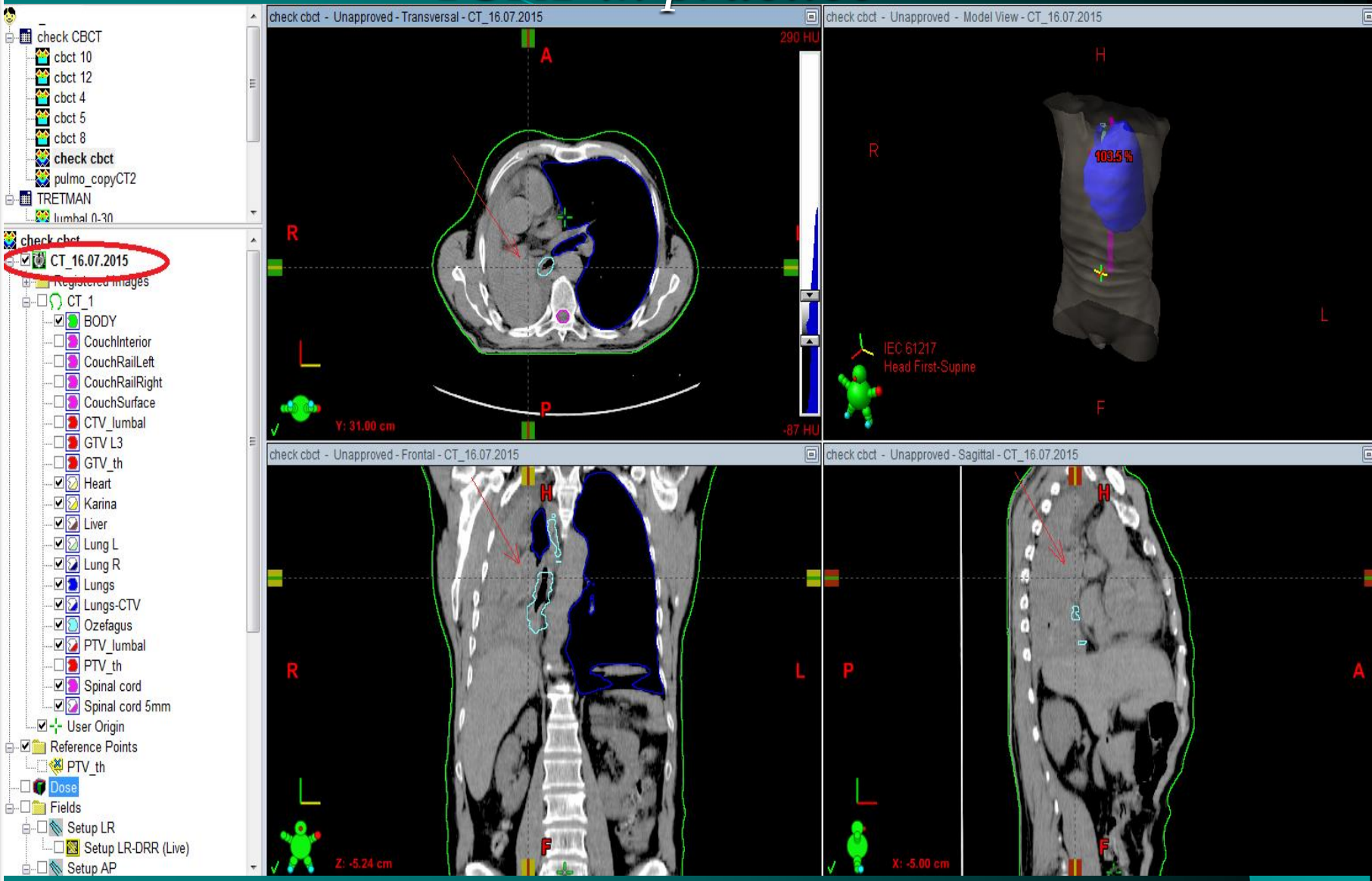
- LUNG
  - kV-
  - CB



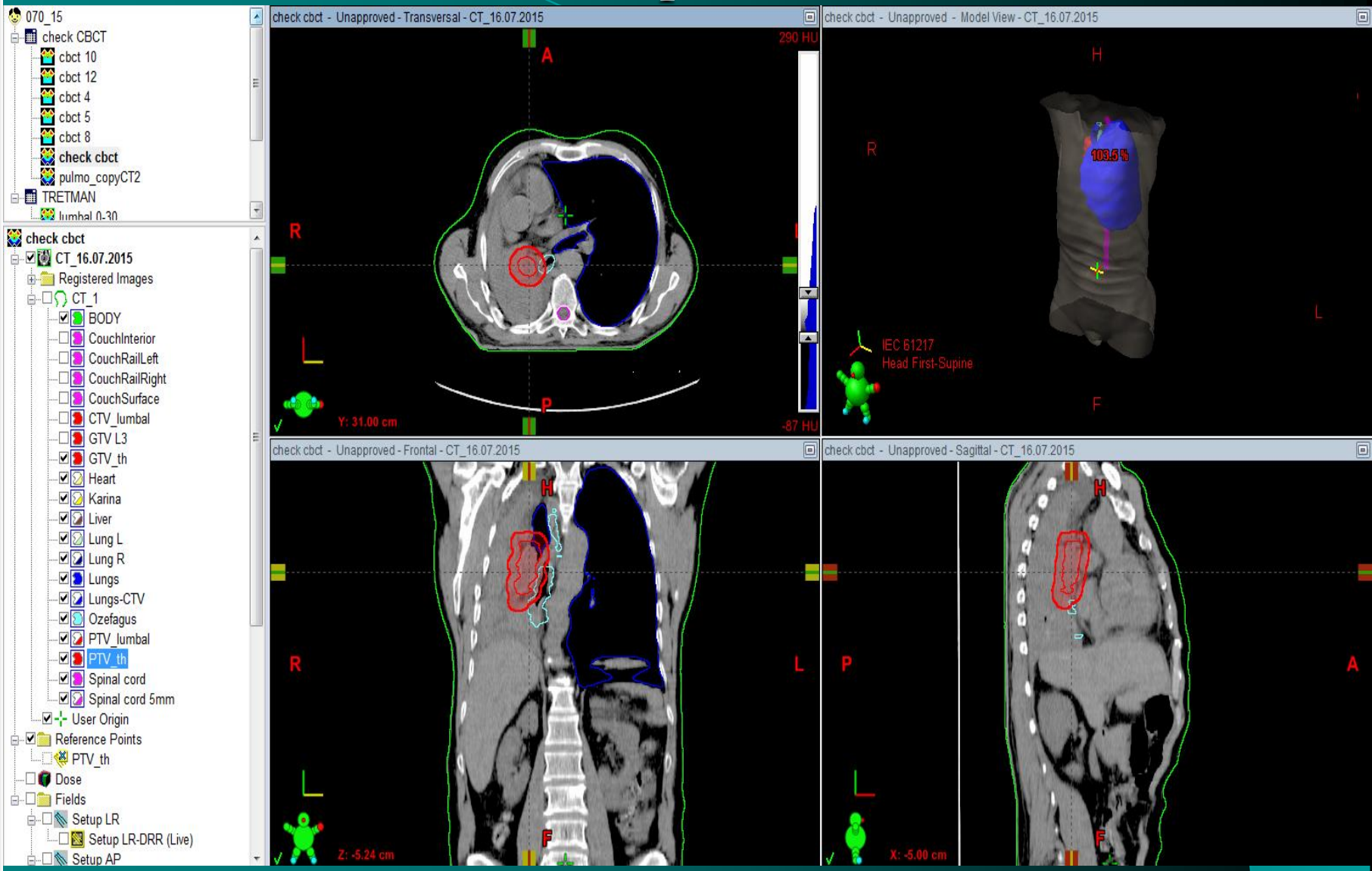
# *Imaging for treatment verification*

- CBCT verification plan

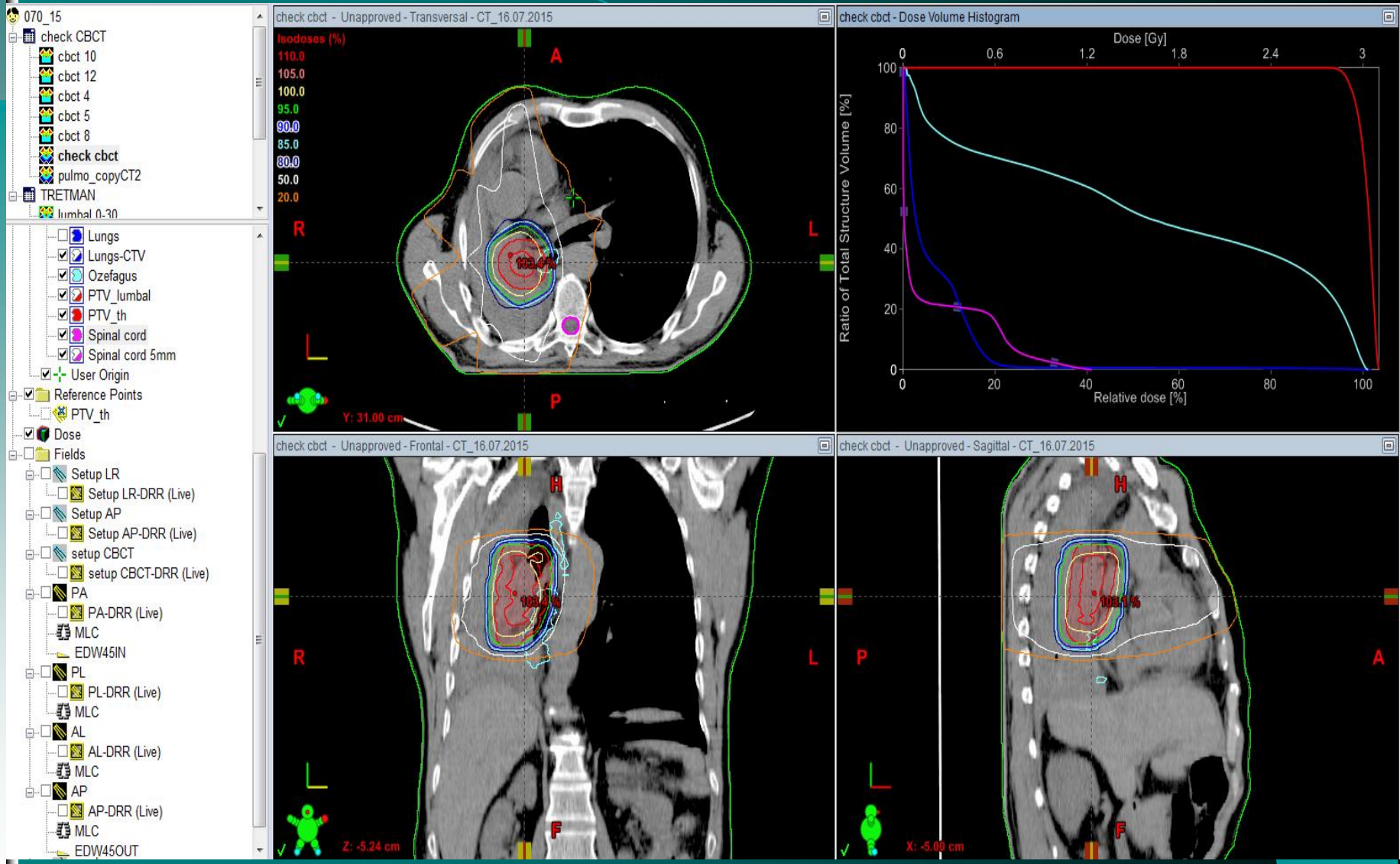
# IGRT in practice



# IGRT in practice



# *IGRT in practice*



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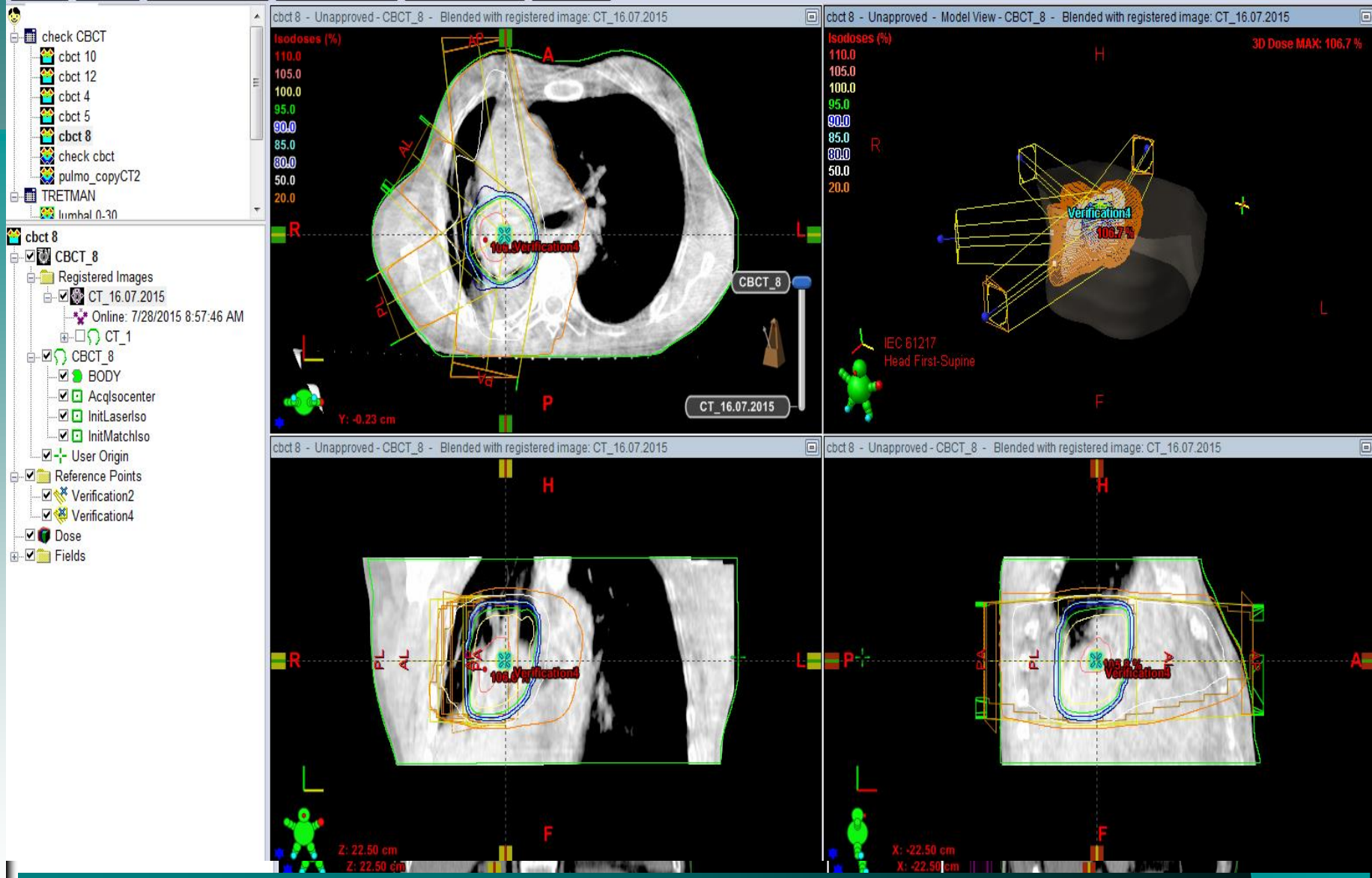

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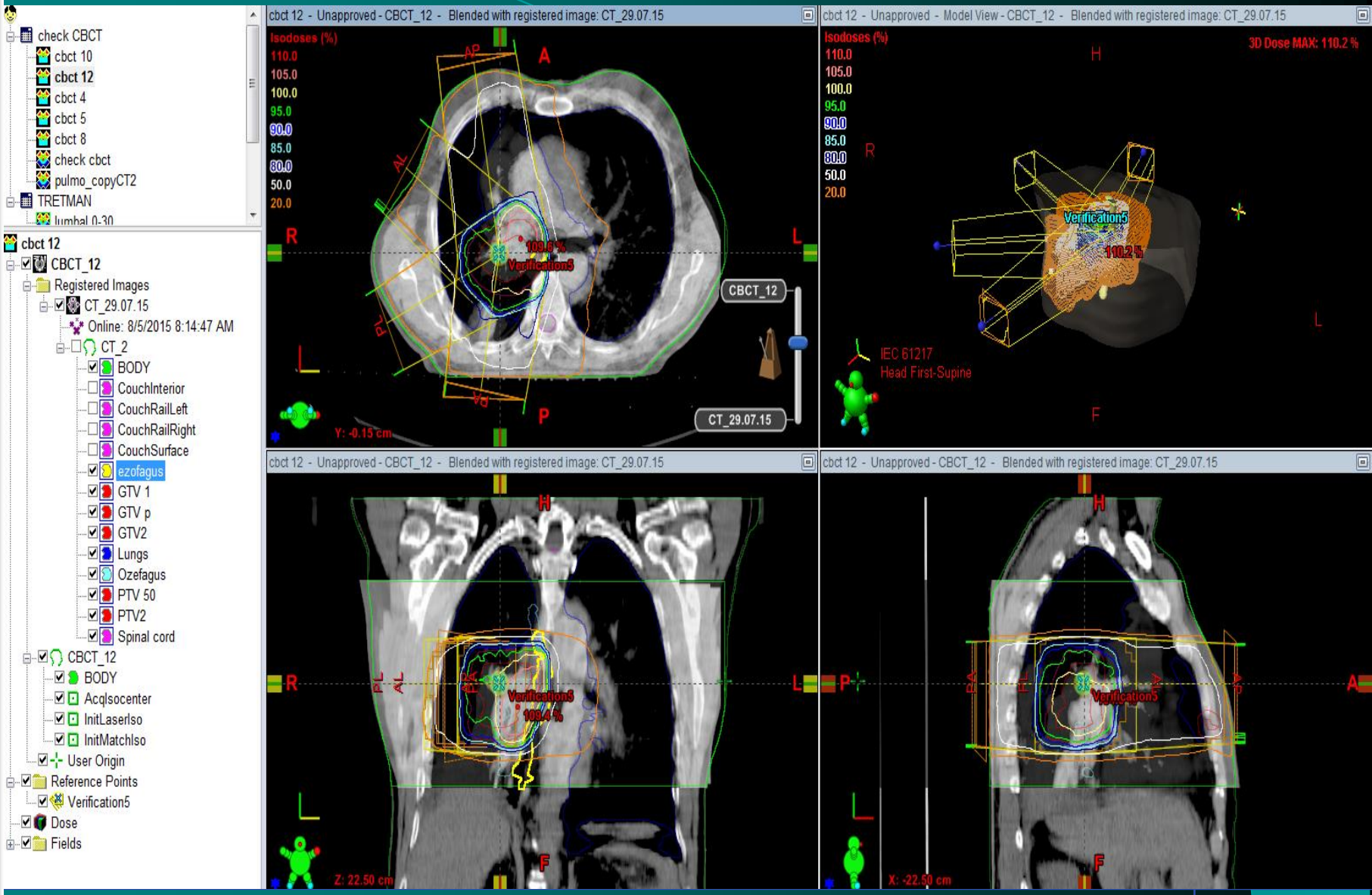

# *CONCLUSION*

Radiotherapy uses image guidance procedures to:

- ❖ delineate target volume and organs at risk

- ❖ Identify and correct problems arising from inter- and intra-fractional variation in patient setup, anatomy, target volume, and organs at risk

# *CONCLUSION*

Excessive dose from intensive imaging procedures could be a limitation in IGRT

❖ Imaging doses must be balanced with demonstrable improvements in the delivery of therapeutic dose.

❖ Team: radiotherapist – physicist - technologists is crucial in IGRT using and developing