# 2D Radiotherapy Planning in Ca Breast

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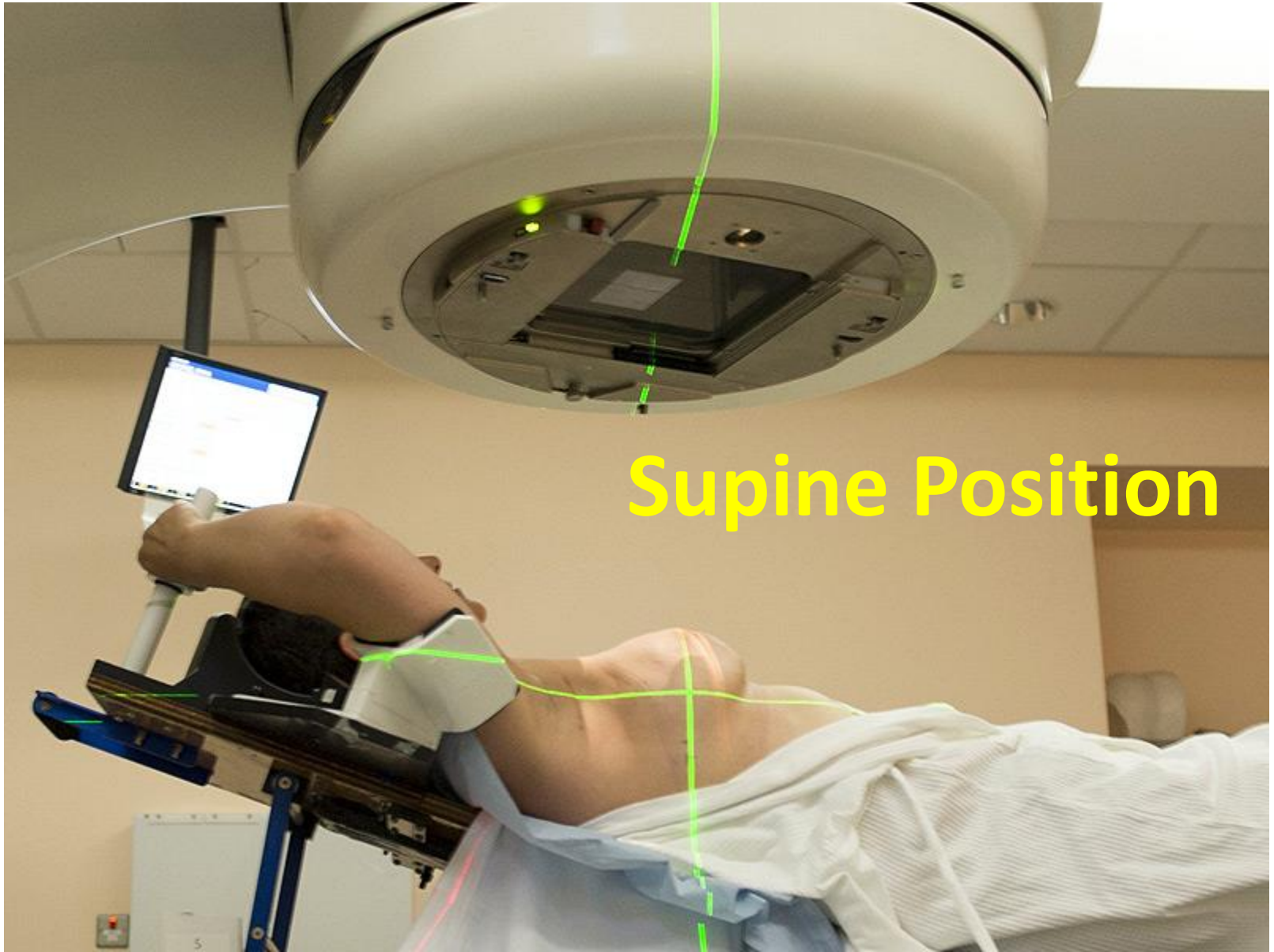
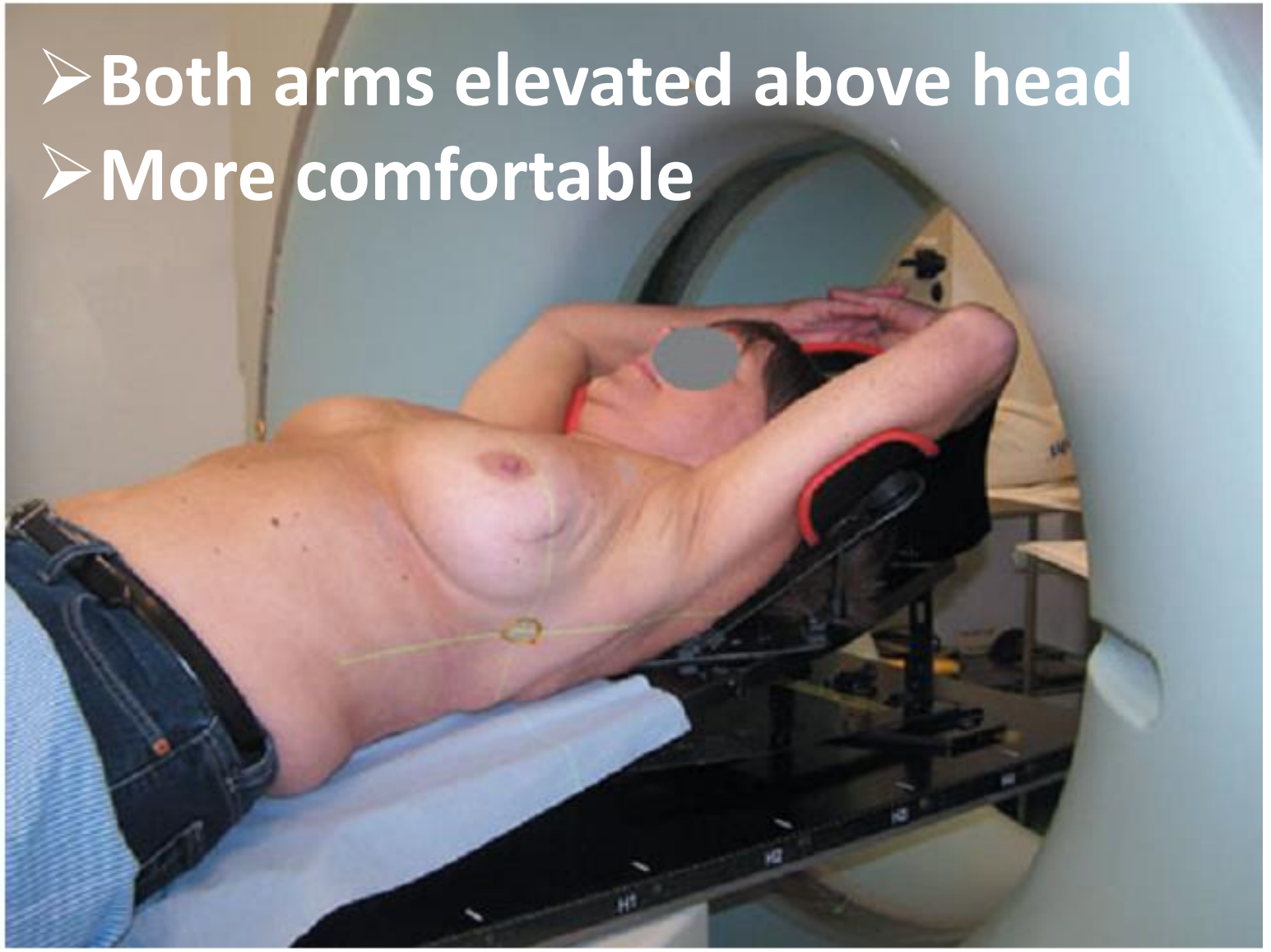
**Head, Radiation Oncoogy**
**AIIMS, Rishikesh**

# Position of the Patient



# Position of the Patient

## Symmetrical



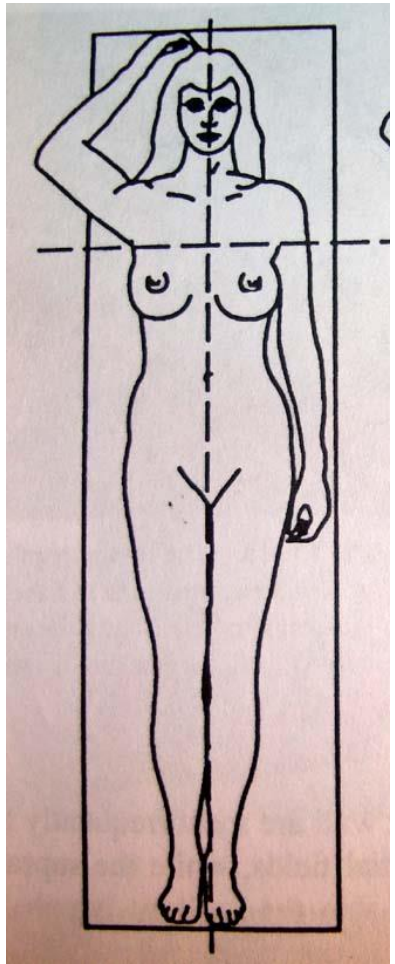
# Position of the Patient

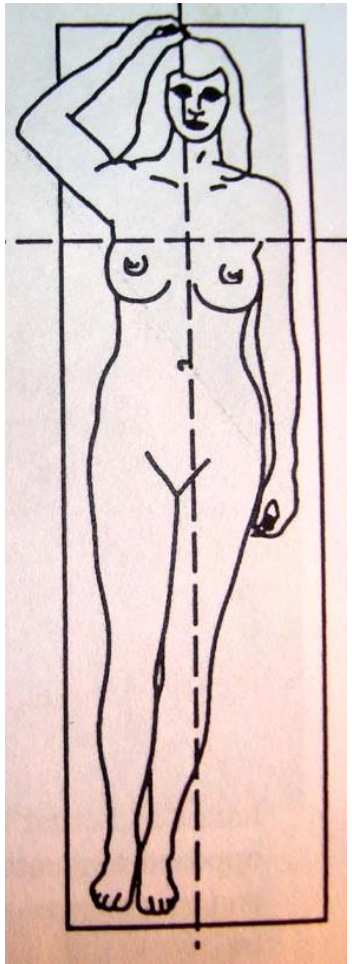
## Asymmetrical

**Arm on involved side elevated above the head and face turned away from involved side**

# Special Precautions & Difficulties

A small misalignment of the patient on the treatment couch will have the same effect as if the couch were angled.

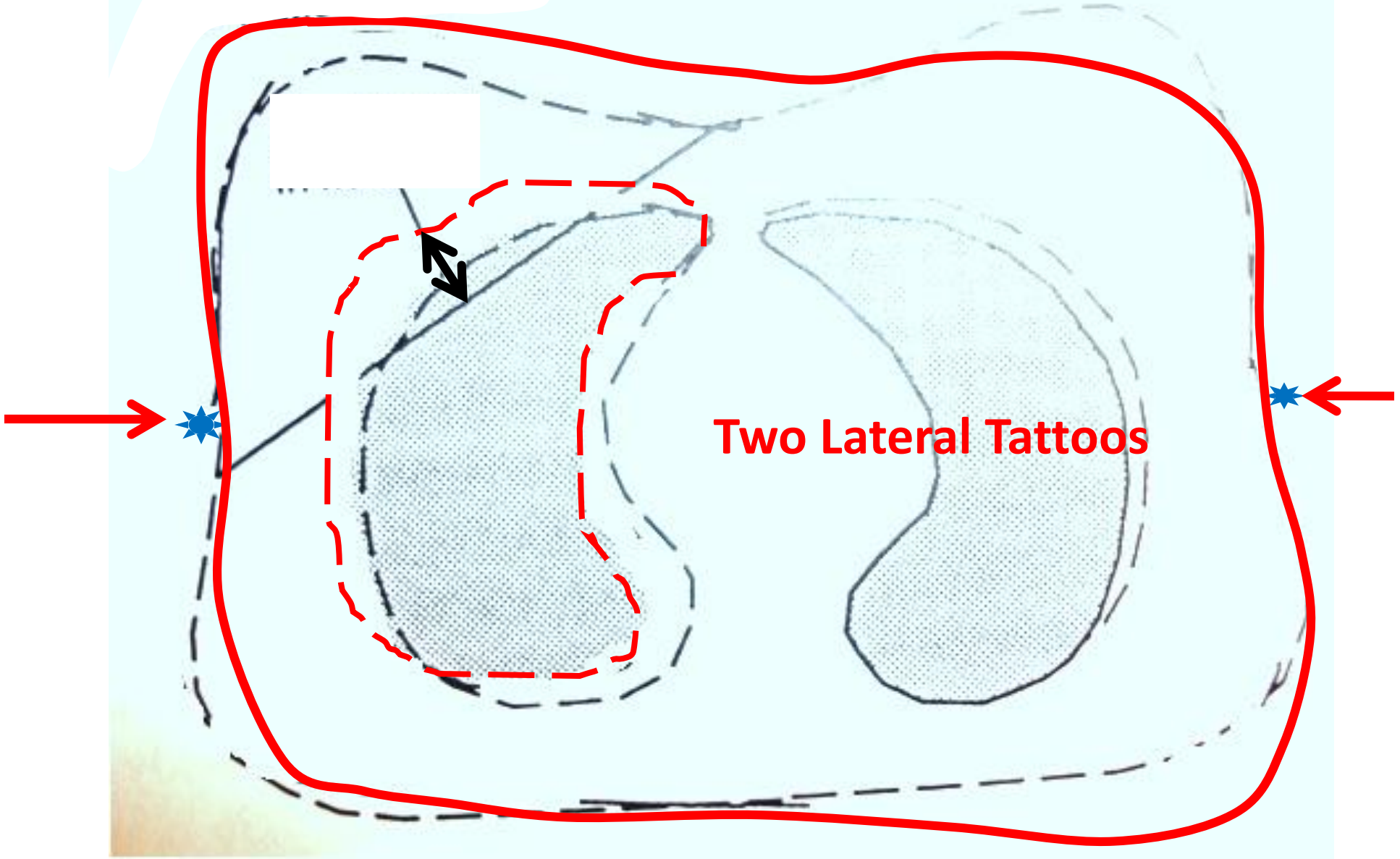




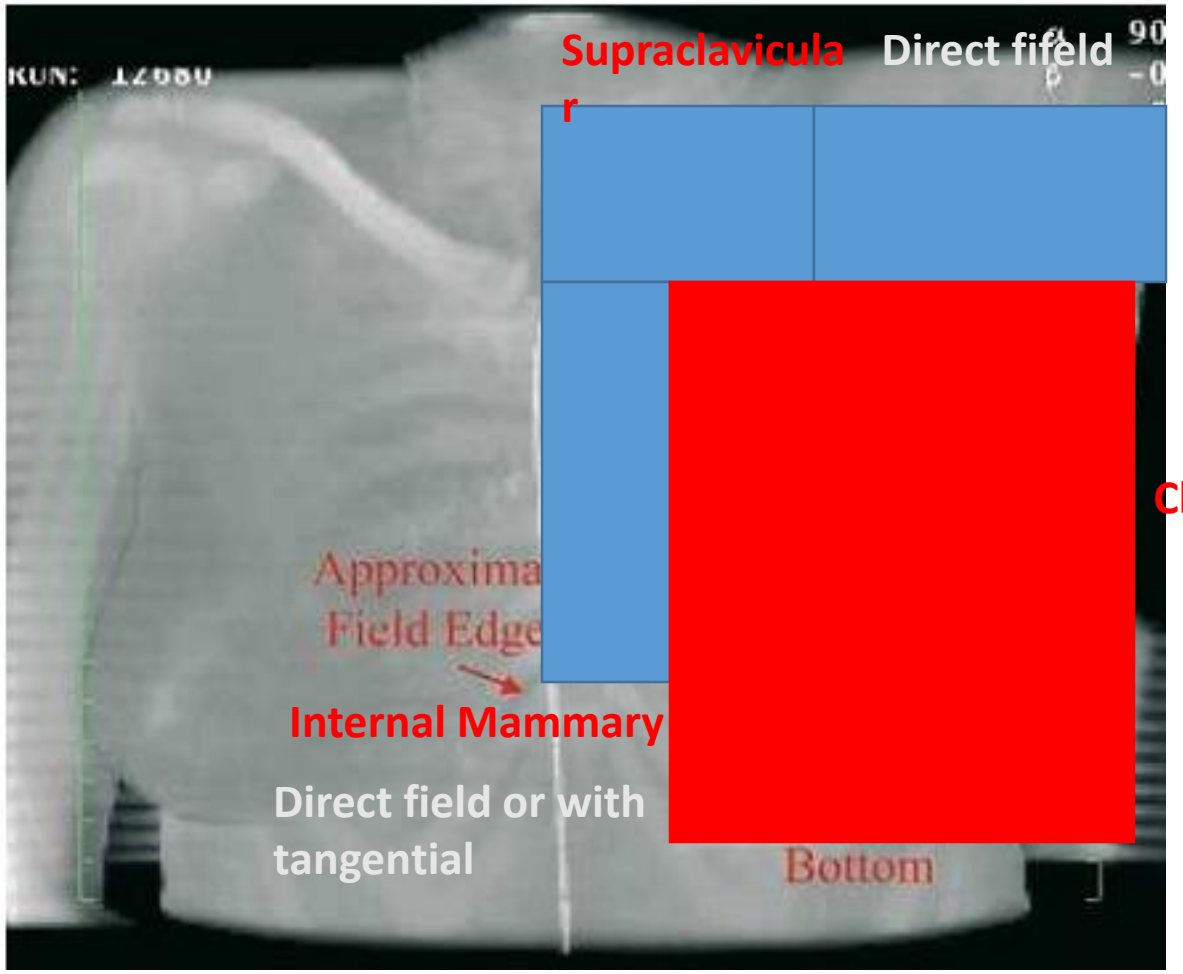
## Tilt

Tattoos are put over anterior surface so that patient remains straight throughout the treatment.

# Rotation

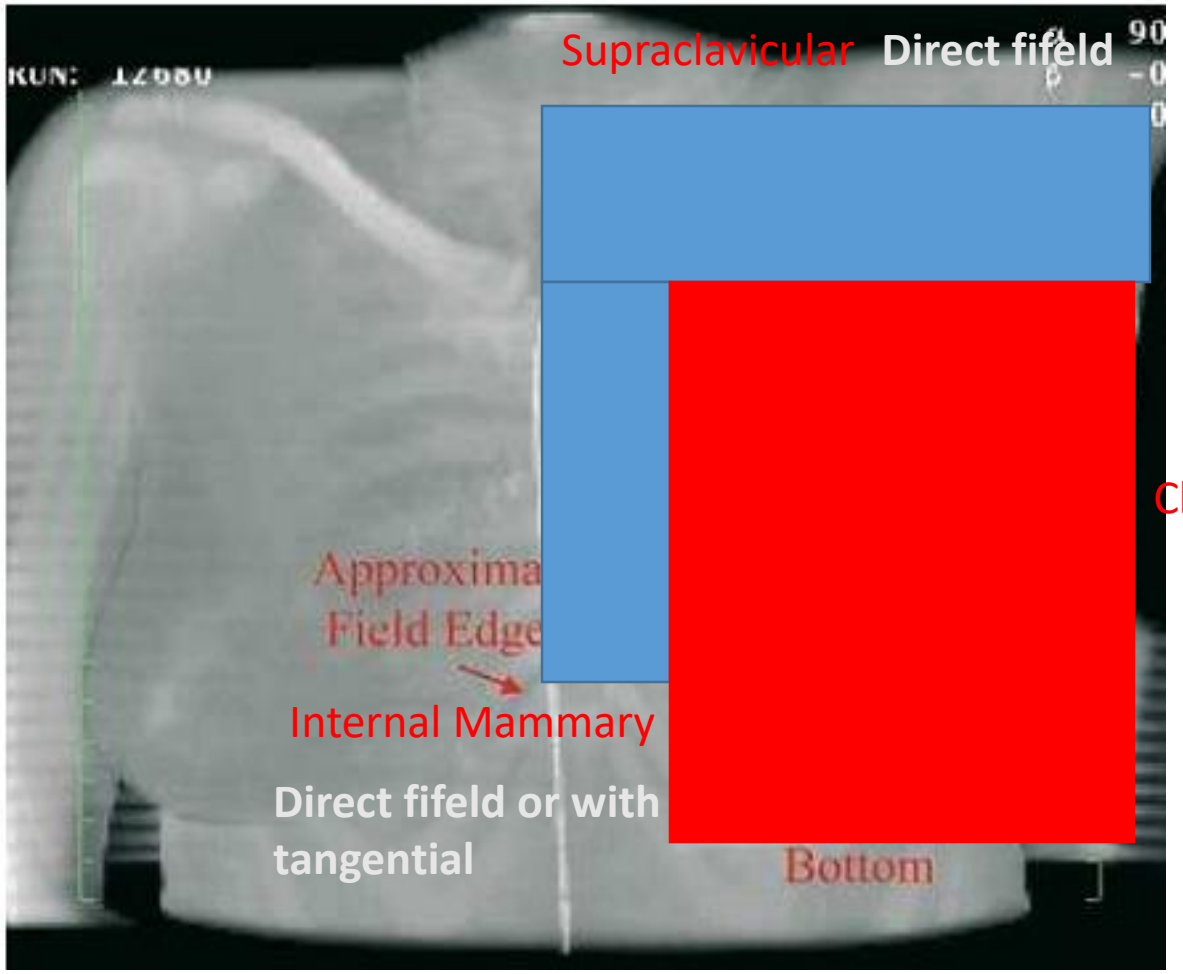


# REGIONS TO BE TREATED AFTER MRM



# Difficulties in RT Delivery

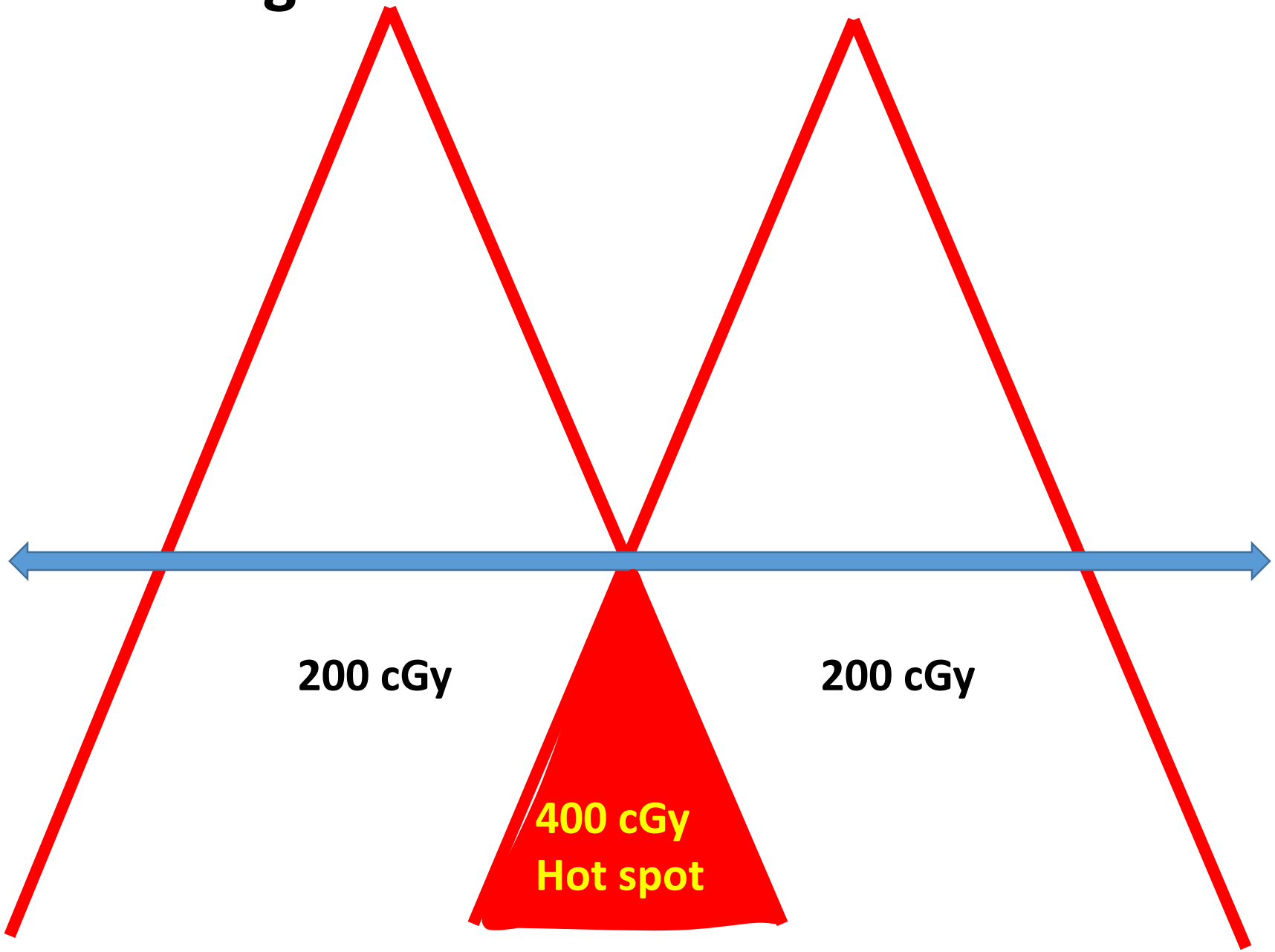
# 1.Matching of the adjacent Radiation Fields



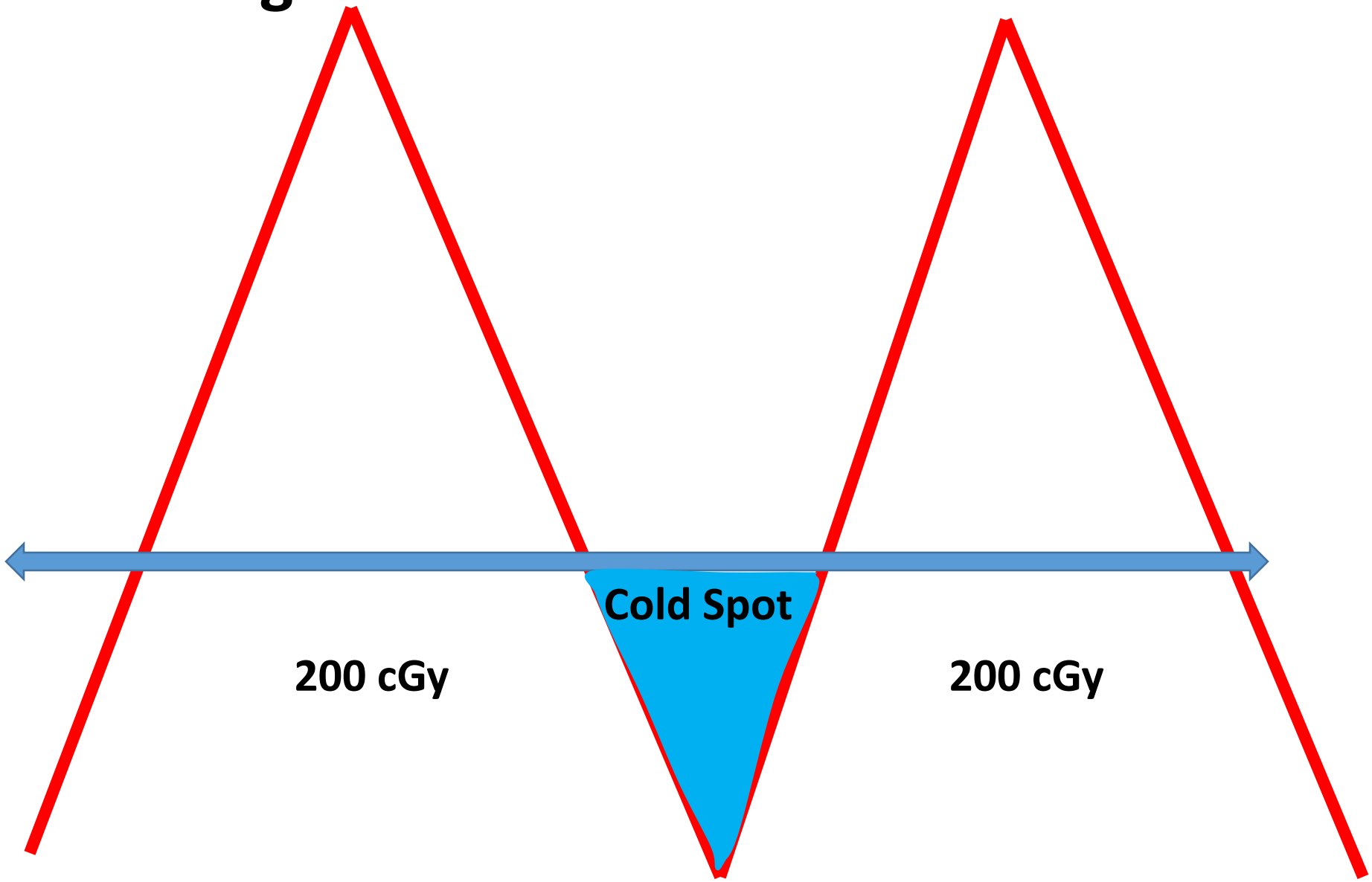

Axilla **Direct fifeld**

Chest wall **Tangential**

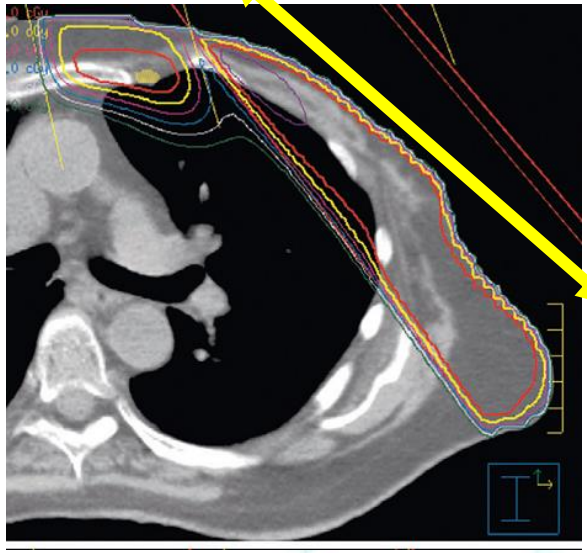
# Divergent Nature of the Radiation Beam

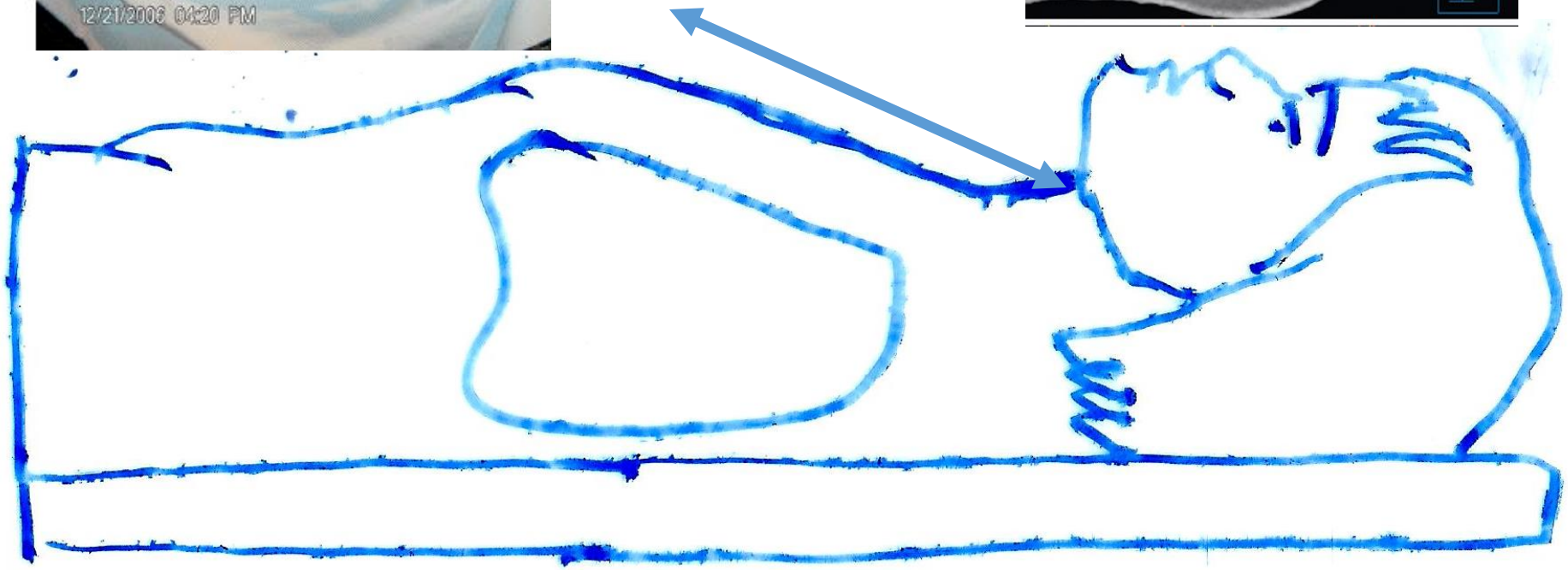


# Divergent Nature of the Radiation Beam

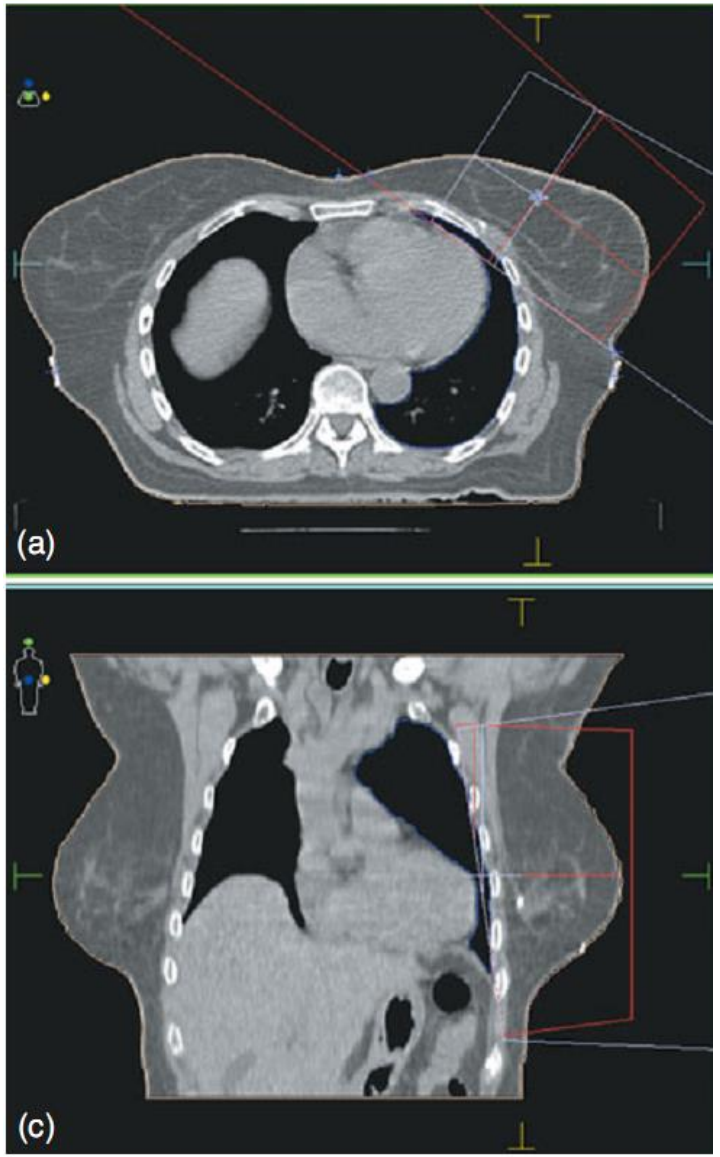


# 2. Sloping Chest Wall



# 3.Underlying Heart and Lung



# Matching of the Adjacent radiation fields

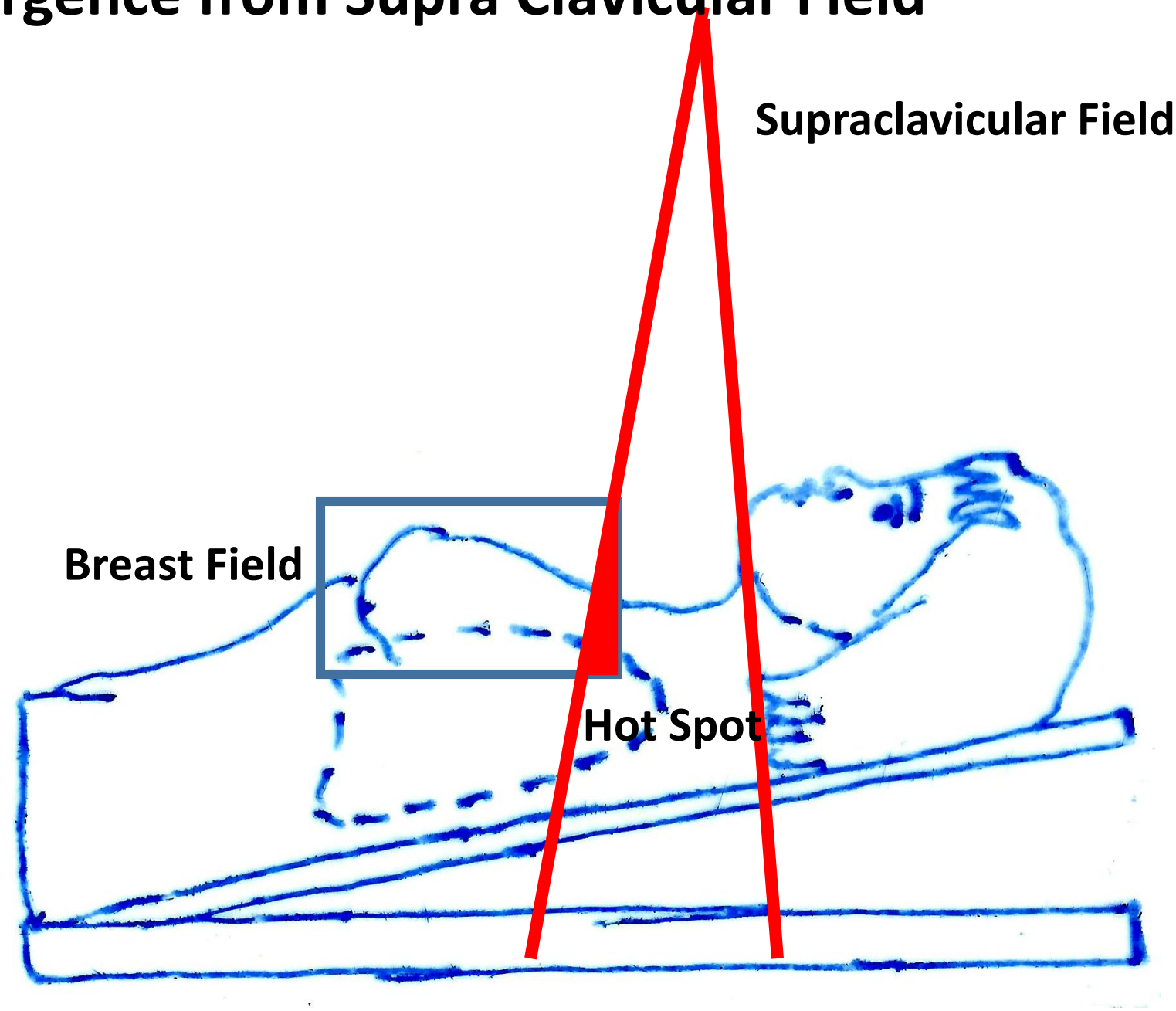
- **Matching of S/C and Tangent fields**

## Two Divergence

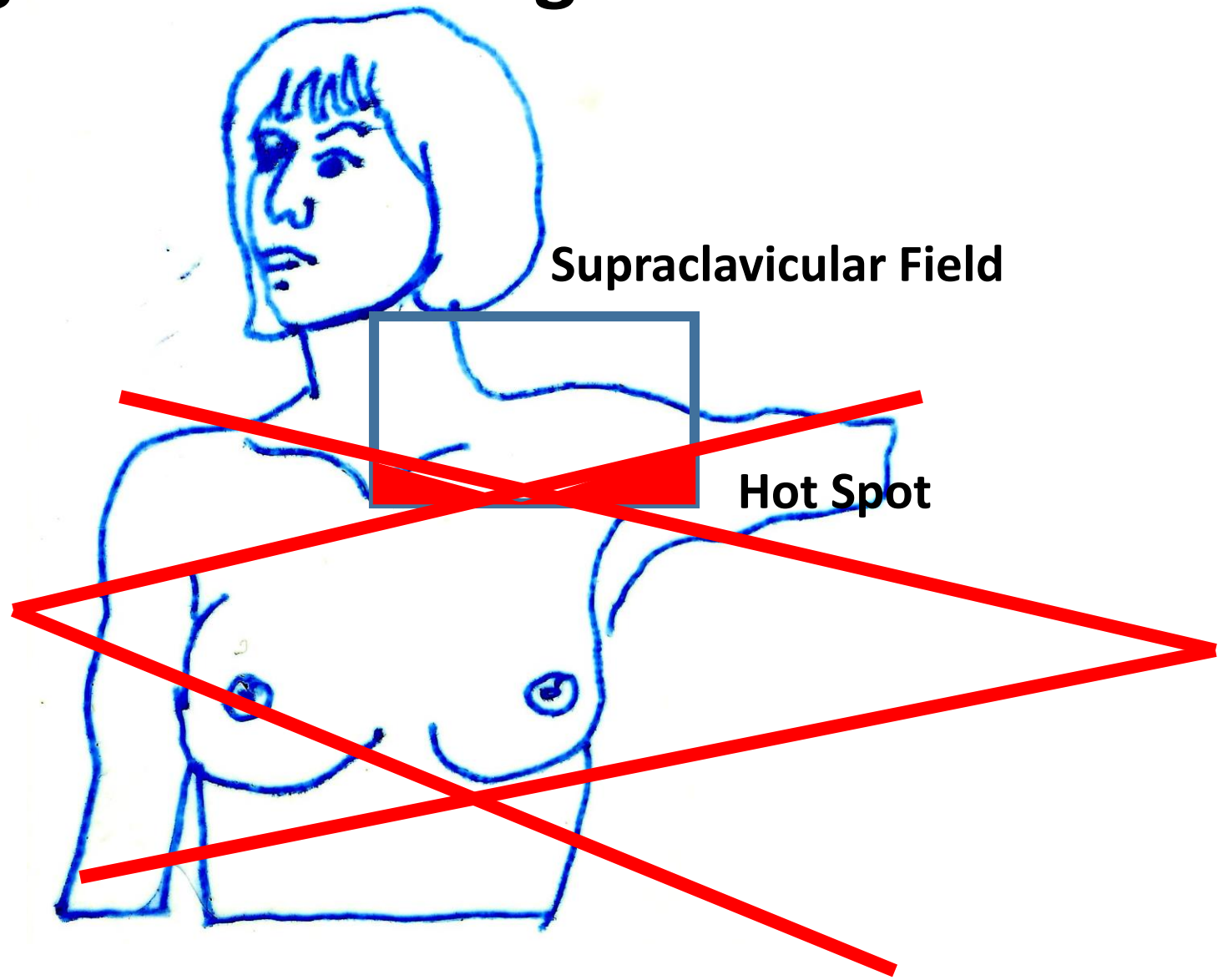
1. **Divergence from Supra clavicular field**

2. **Divergence from Tangential field**

# Divergence from Supra Clavicular Field

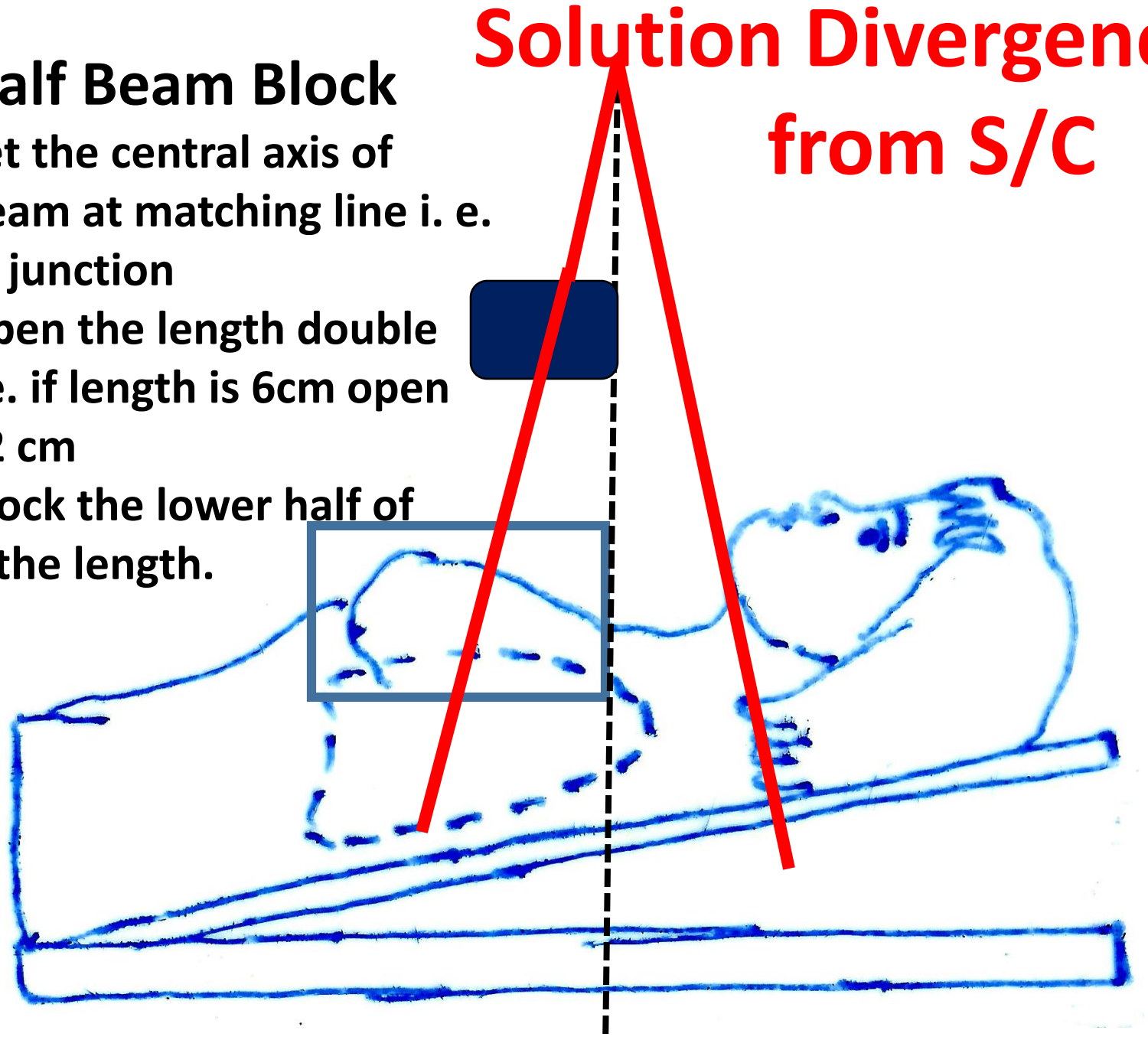


# Divergence from Tangential



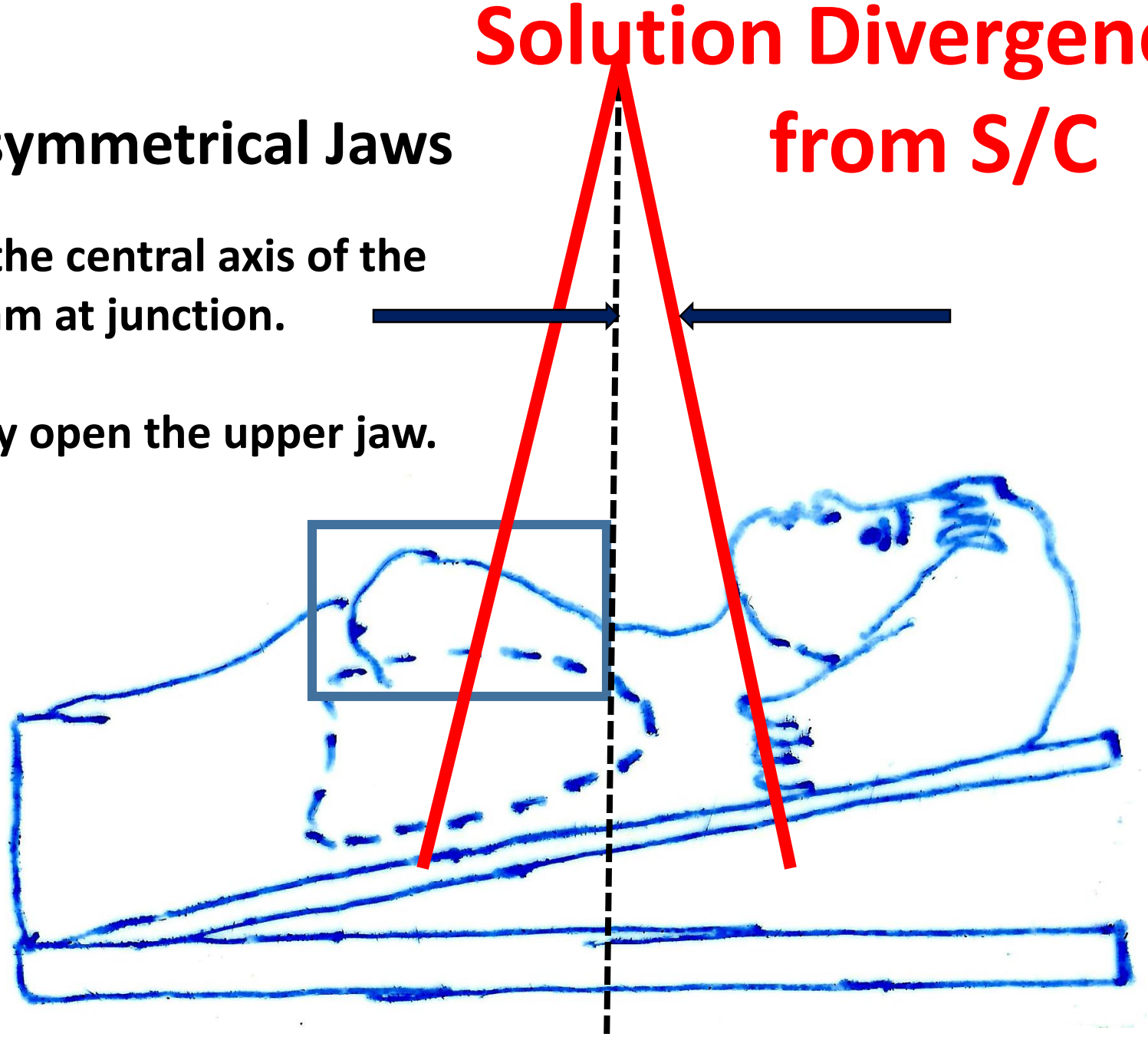
# 1. Half Beam Block

- Set the central axis of beam at matching line i. e. at junction
- Open the length double i.e. if length is 6cm open 12 cm
- Block the lower half of the length.



## 2. Asymmetrical Jaws

- Set the central axis of the beam at junction.
- Only open the upper jaw.



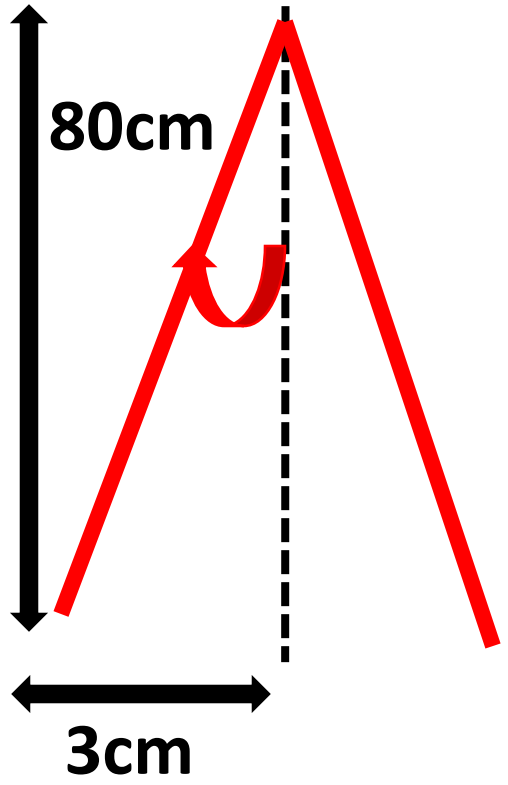
# Solution Divergence from S/C

## 3. Gantry Rotation:

- First calculate the angle of divergence from s/c field

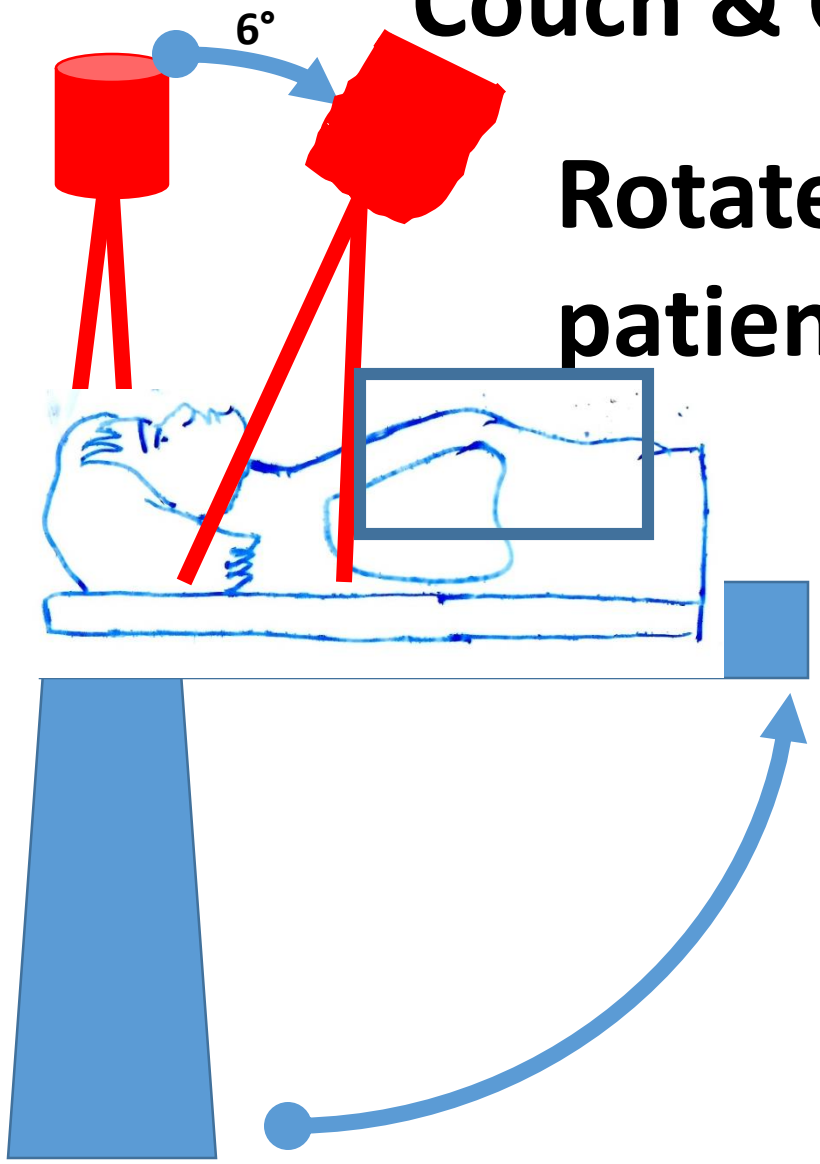
$$\text{Tan}\emptyset = \frac{\text{Half field length}}{\text{SSD}}$$

$6^0$




- Move couch 90°
- Rotate gantry 6° towards patient feet

# Couch & Gantry Rotation




Rotate towards patient's feet


Equinox

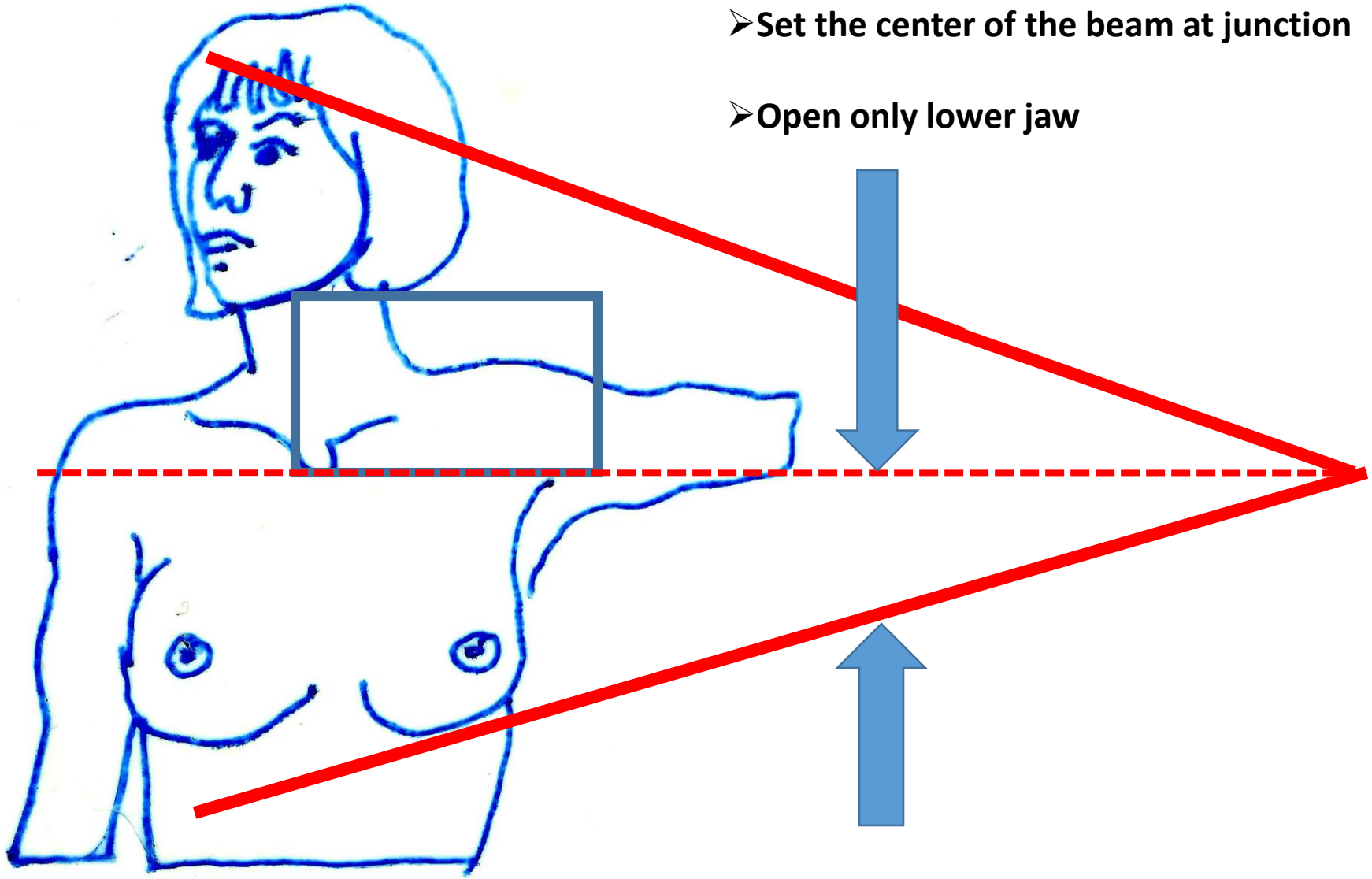

Equinox


Equinox

# Solution Divergence from Tangent

## Asymmetrical Jaws

- Set the center of the beam at junction
- Open only lower jaw



# Solution Divergence from Tangent

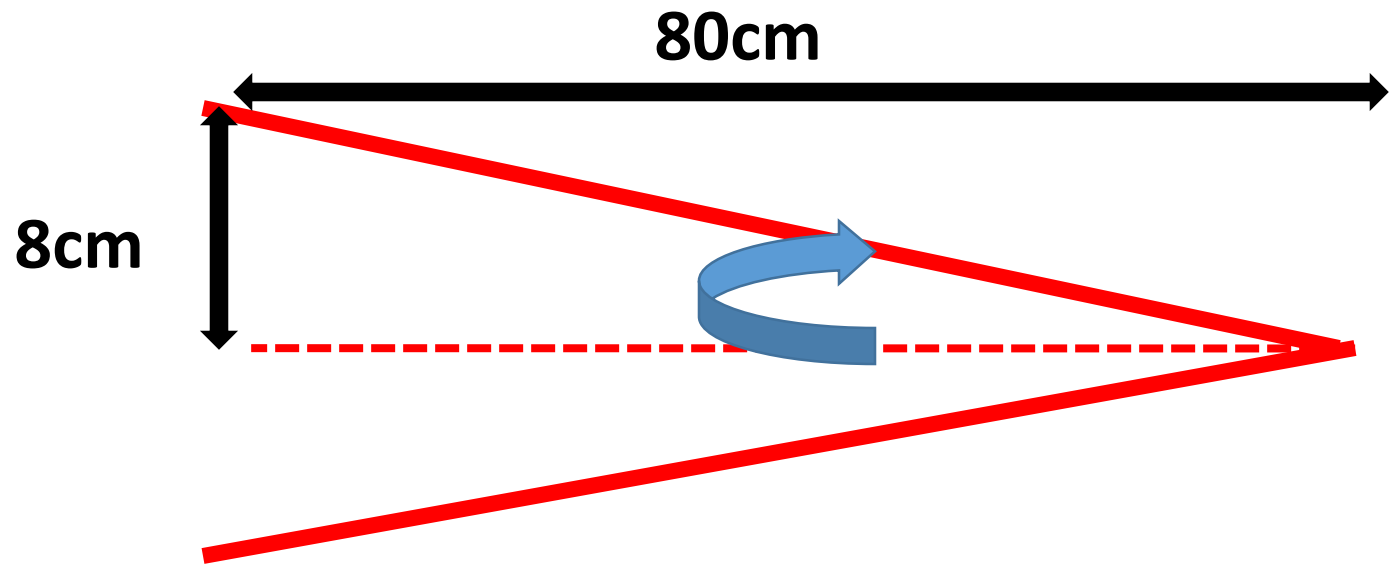
## Couch Rotation

(a) Calculate the angle of divergence

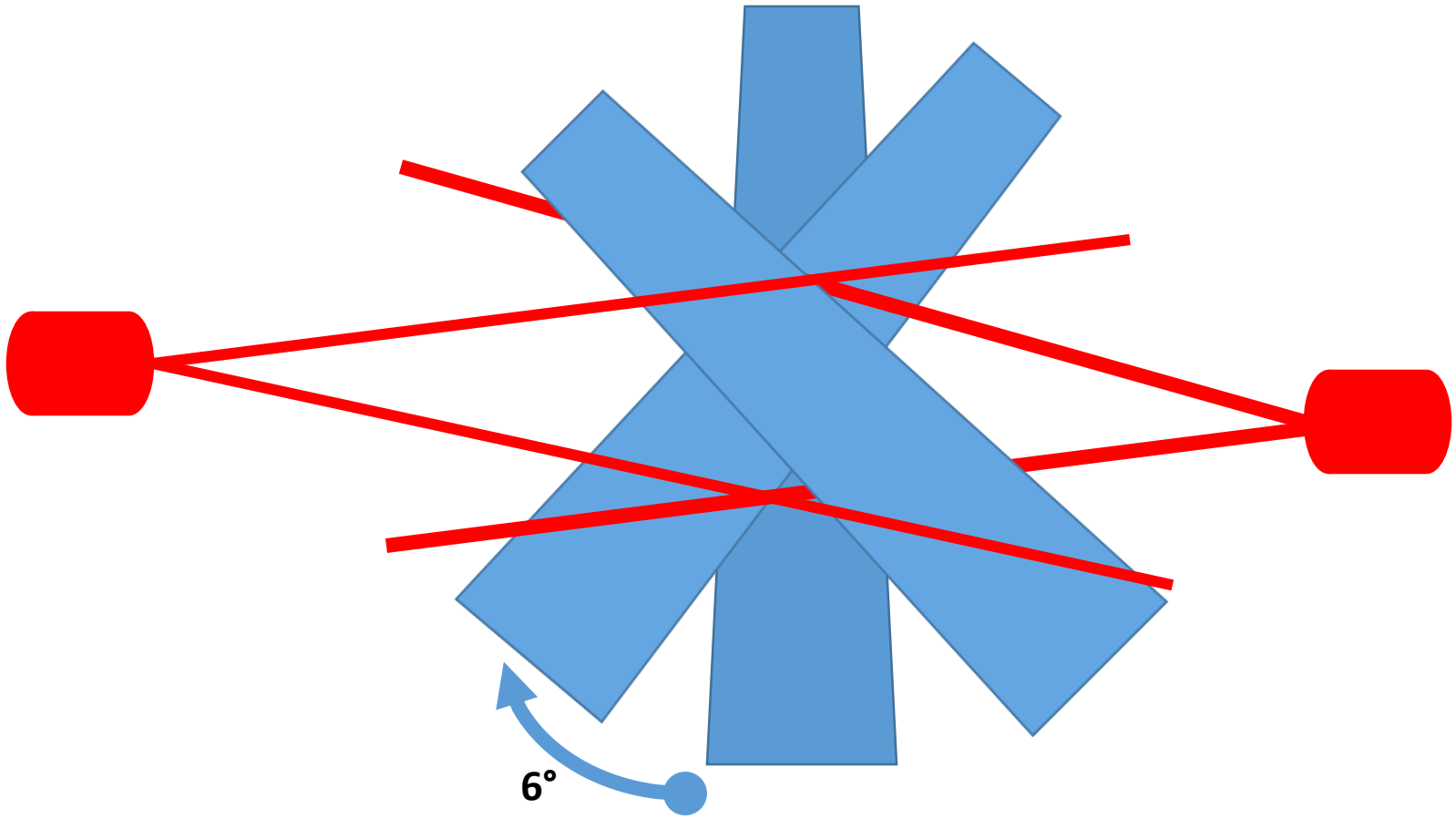
6°

(b) Set the tangential field as usual

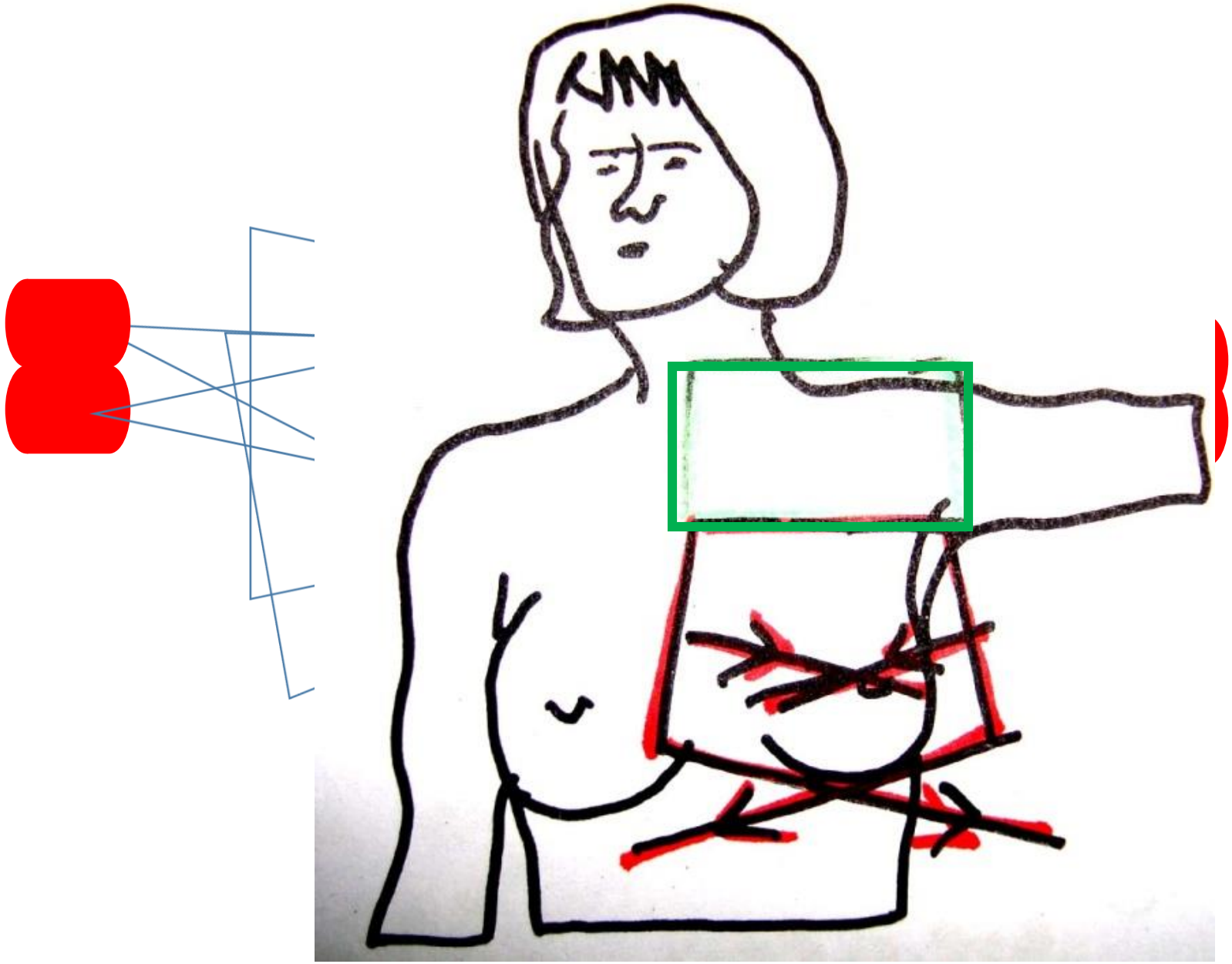
(b) Give couch twist 6° away from gantry in both MT and LT



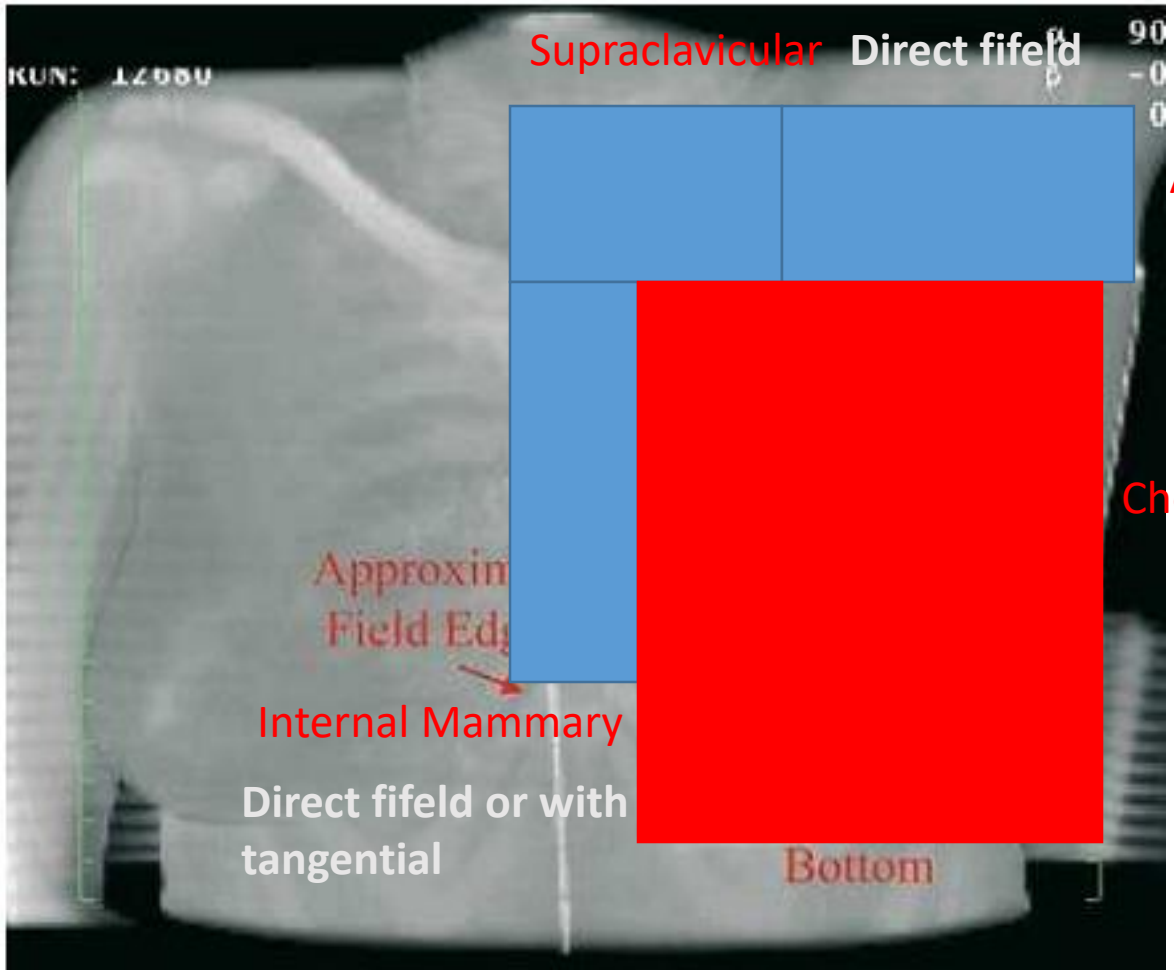
# Couch Rotation: Away from the Gantry



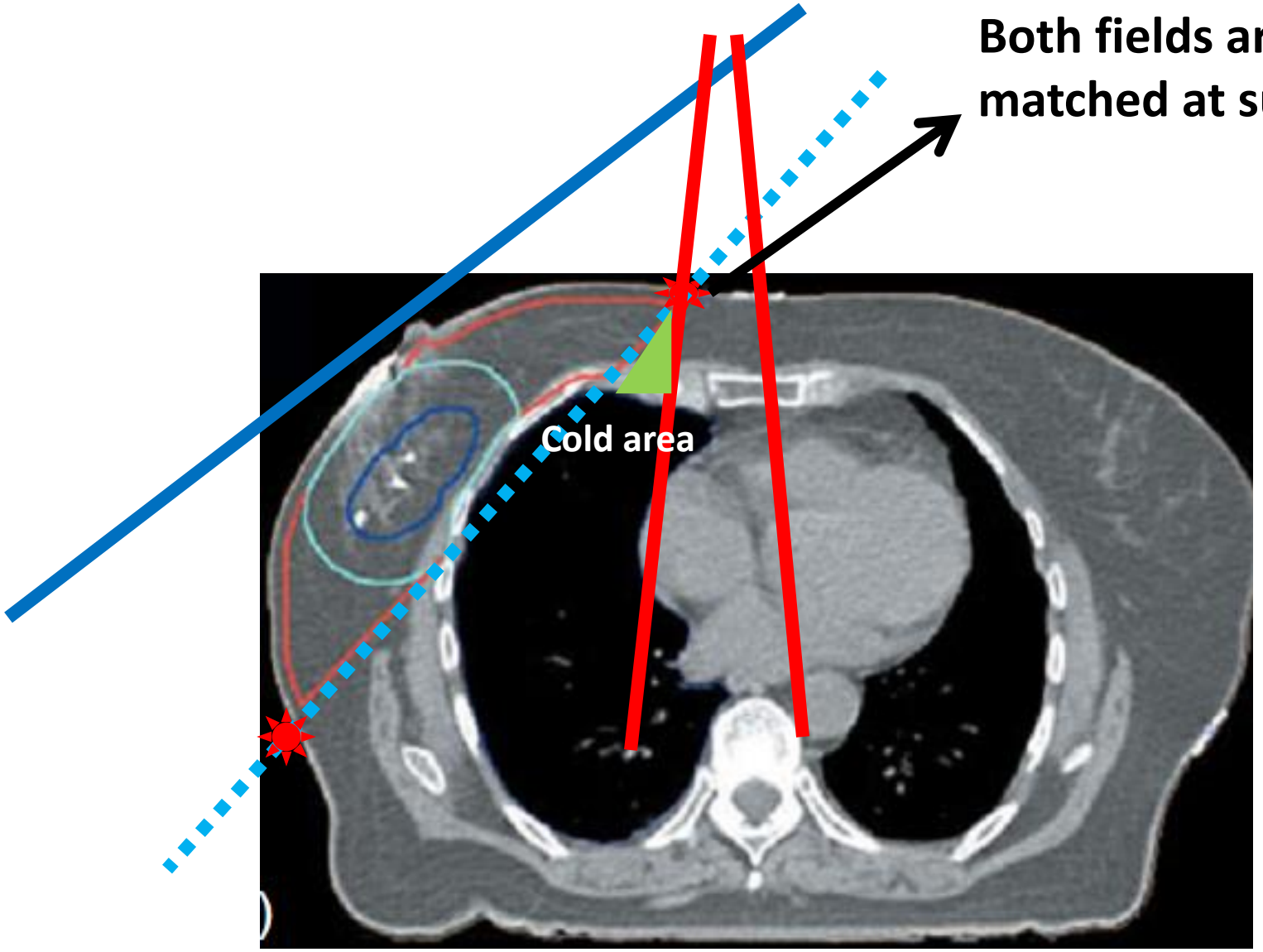
# Couch Rotation: Away from the Gantry



# Matching between Internal Mammary and Tangential fields



Both fields are matched at surface,.

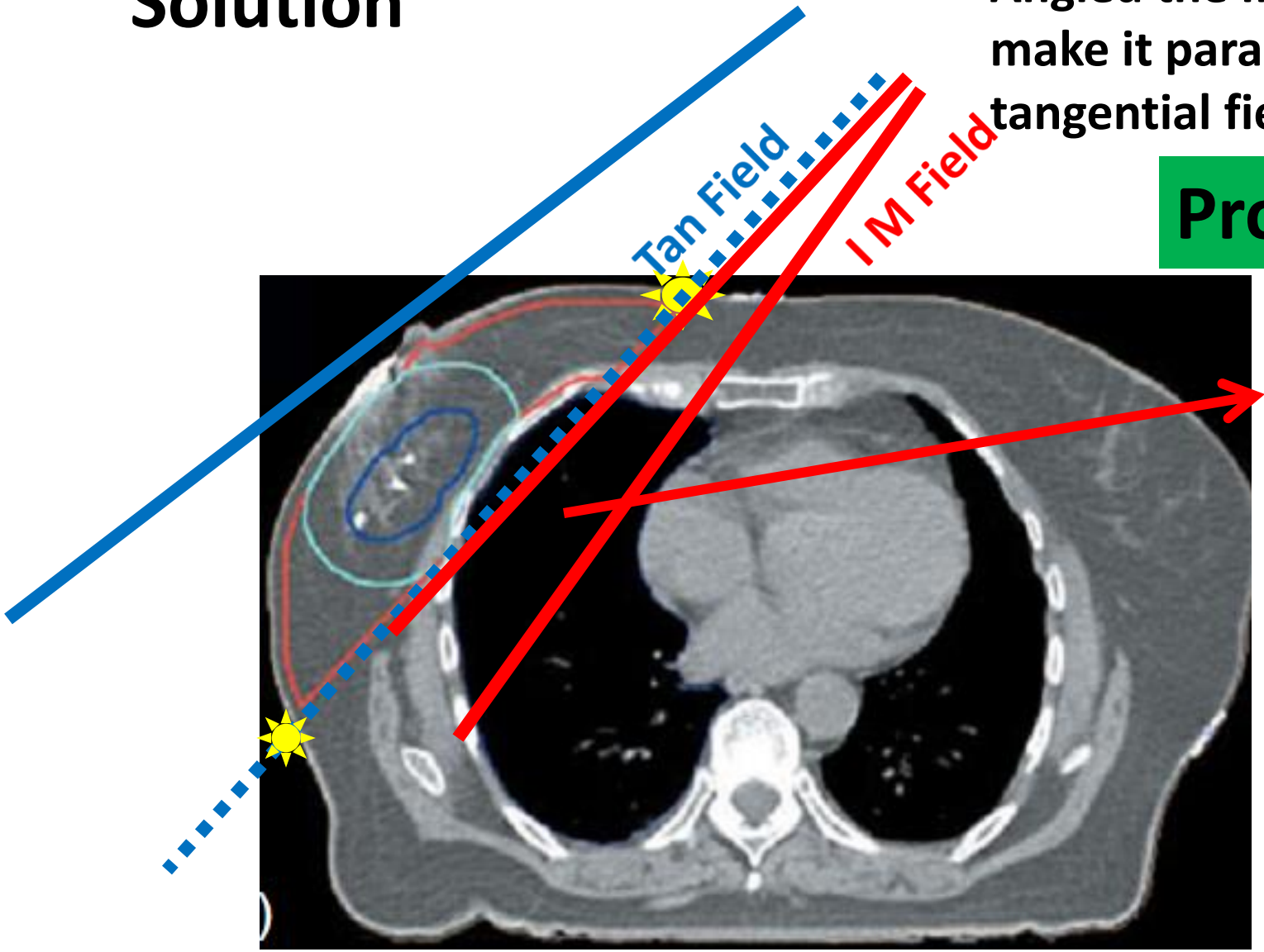



WHY?

Because both fields are angled in different direction

# Solution

Angled the IM field to make it parallel to the tangential field




**Problem**

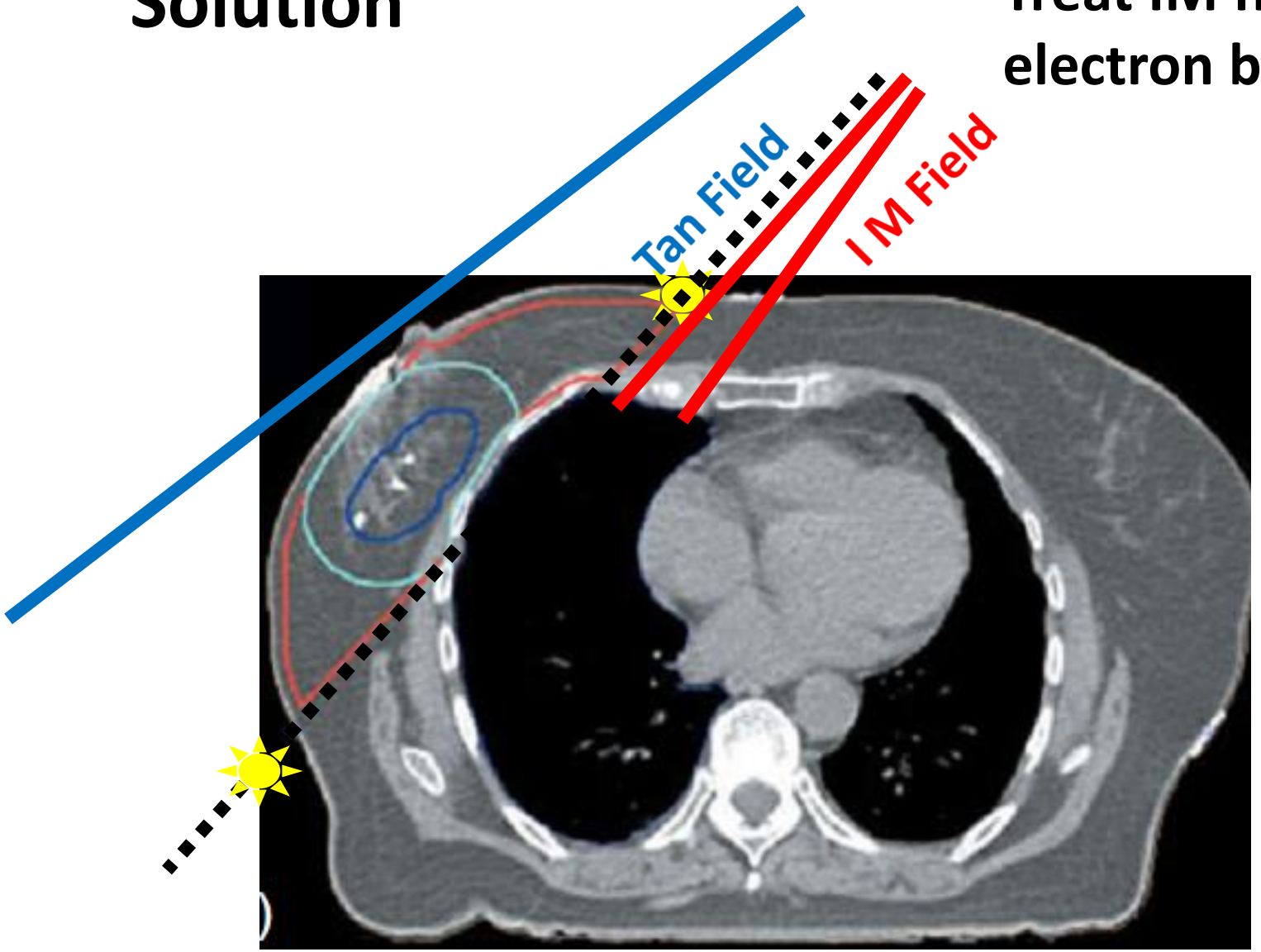
More lung will be irradiated by IM field.

**Solution**

Treat IM field with electron beam

# Solution

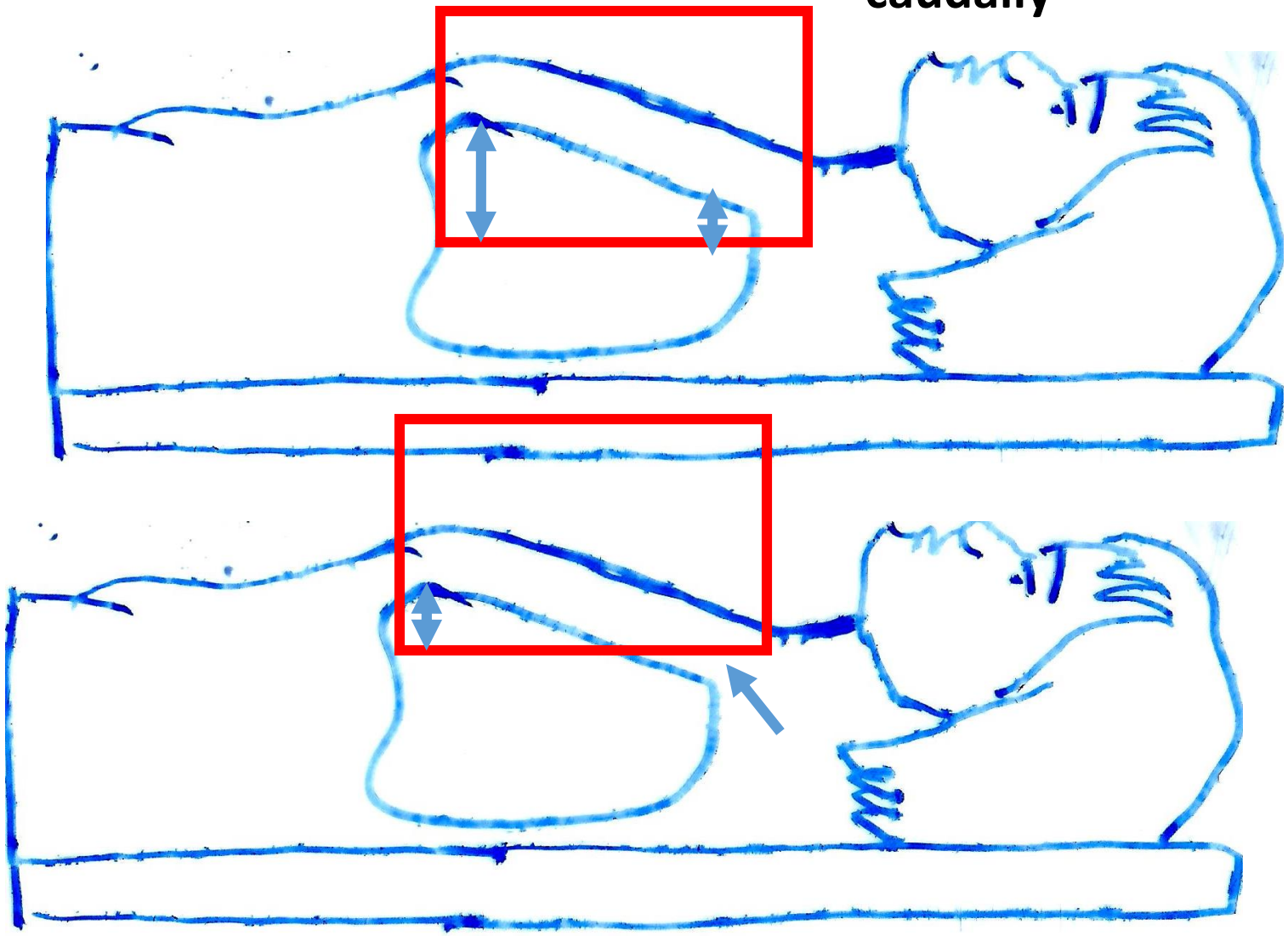
Treat IM field with electron beam



# Sloping Chest Wall

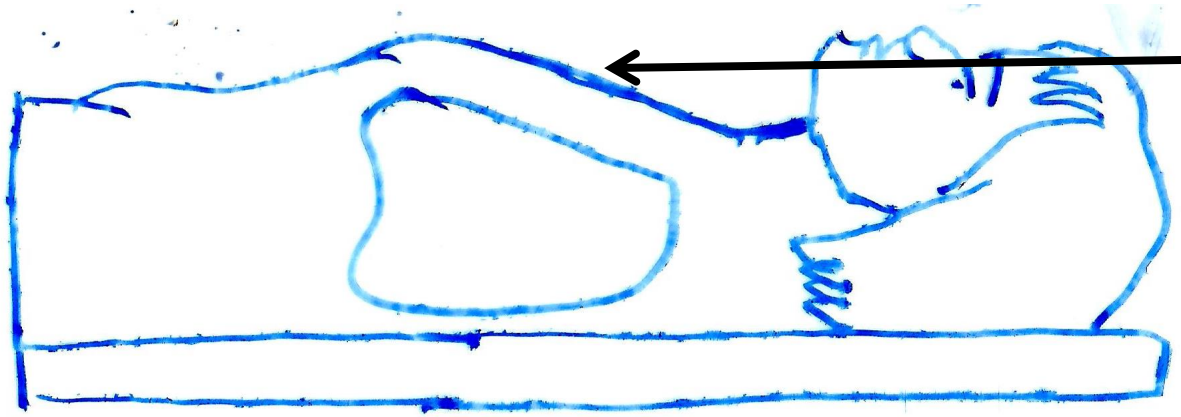
# Problems

More lung comes in Tang field caudally

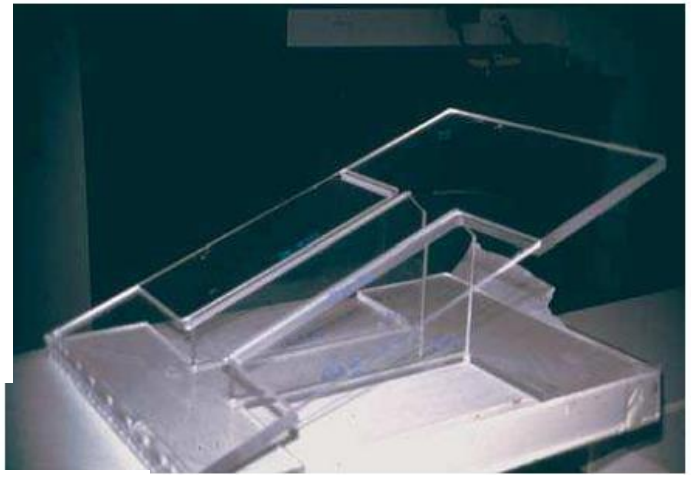


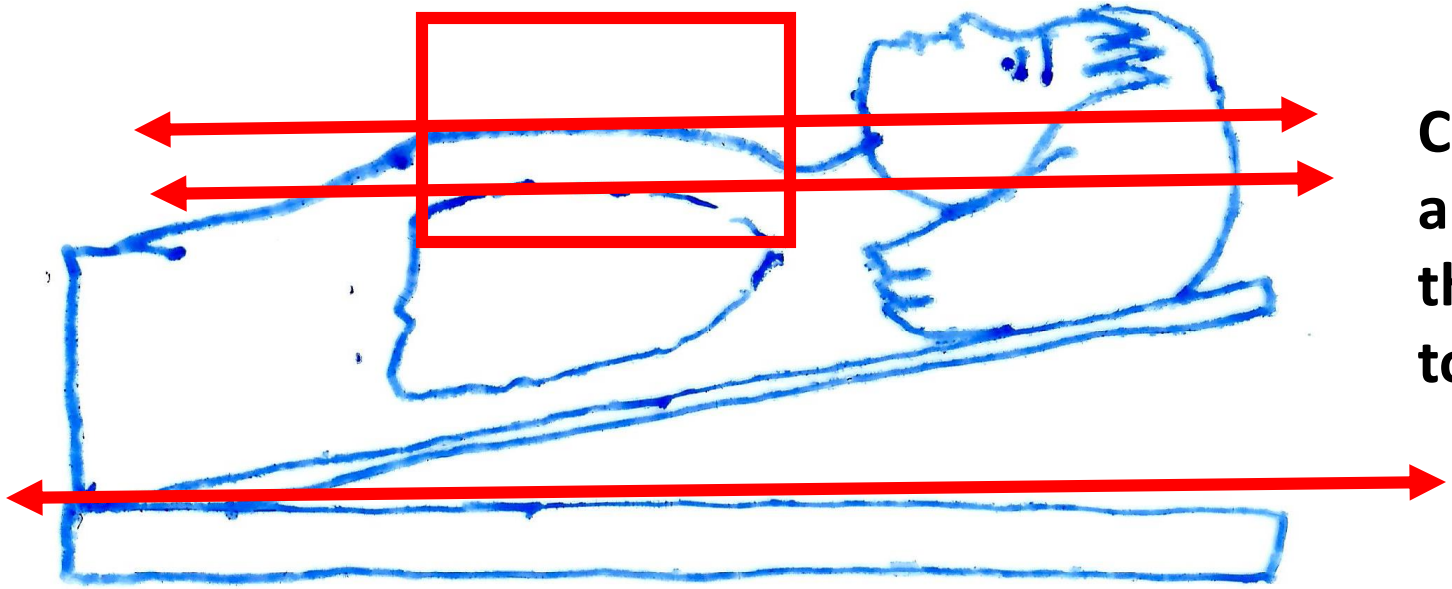
If field is set to reduce the lung caudally, then chest wall cranially will be missed

# Solution 1



Sloping Chest wall



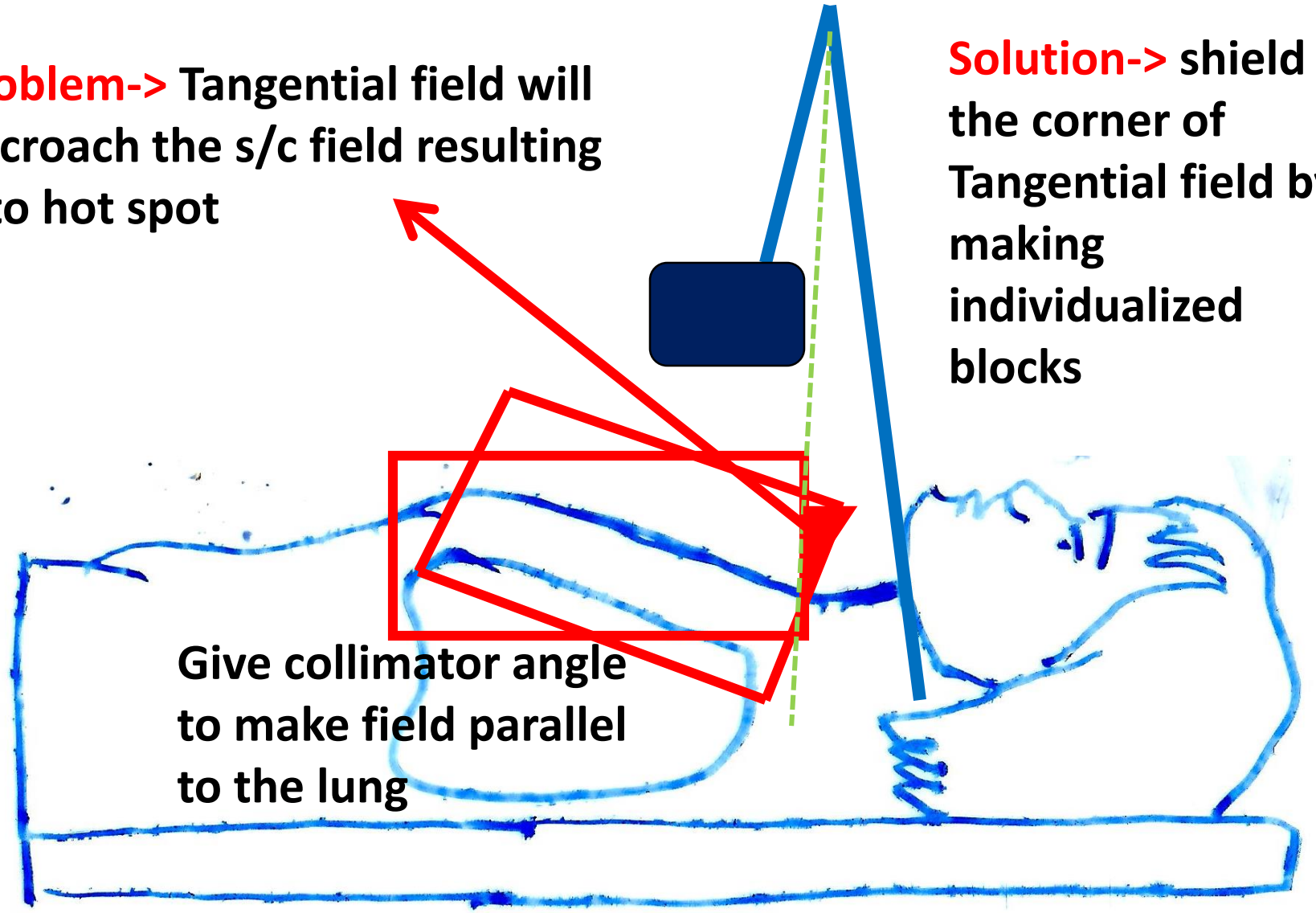


Chest wall and anterior border of the lung is parallel to the couch

# Solution 2 → If Breast Board not available

**Problem->** Tangential field will encroach the s/c field resulting into hot spot

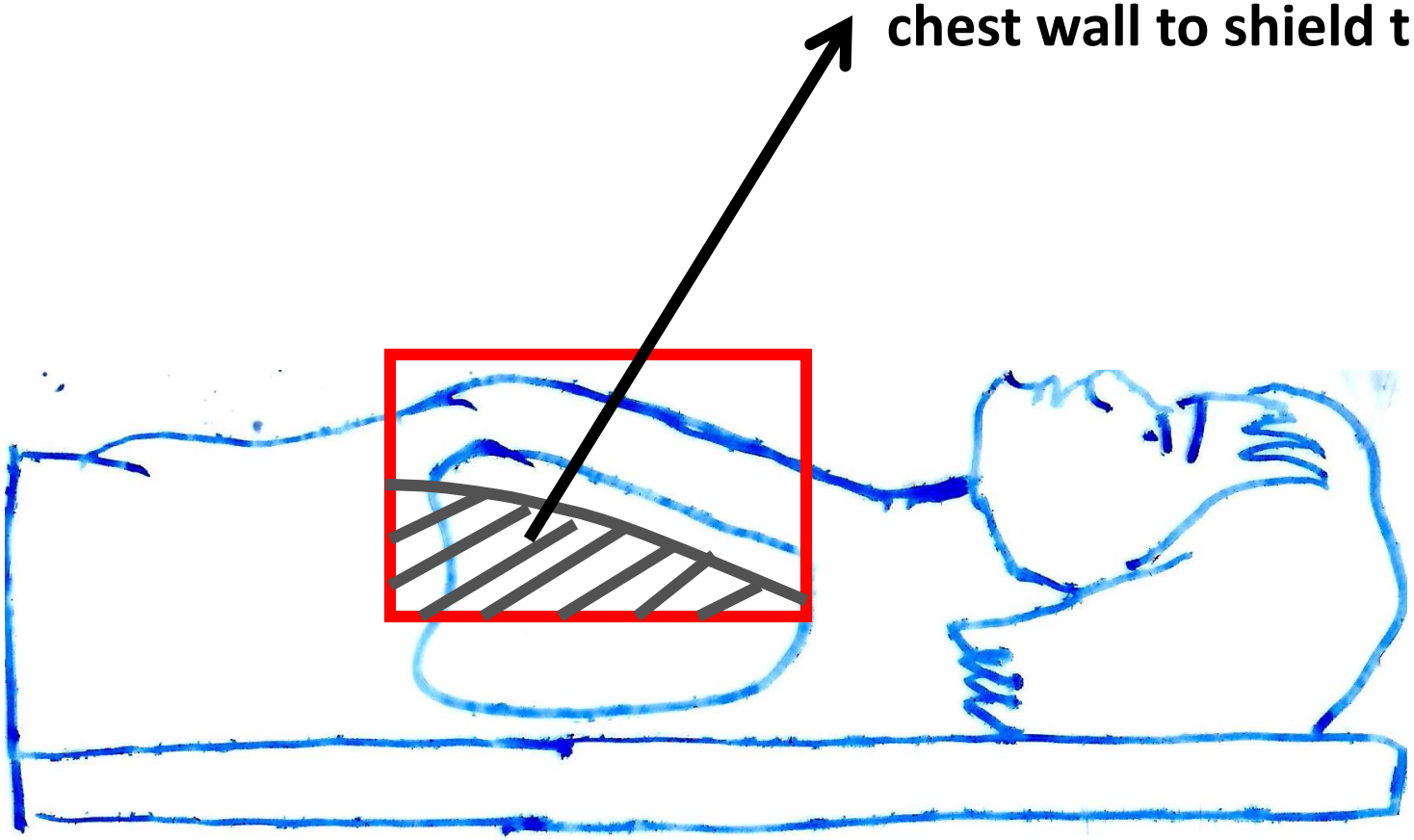
**Solution->** shield the corner of Tangential field by making individualized blocks



Give collimator angle to make field parallel to the lung

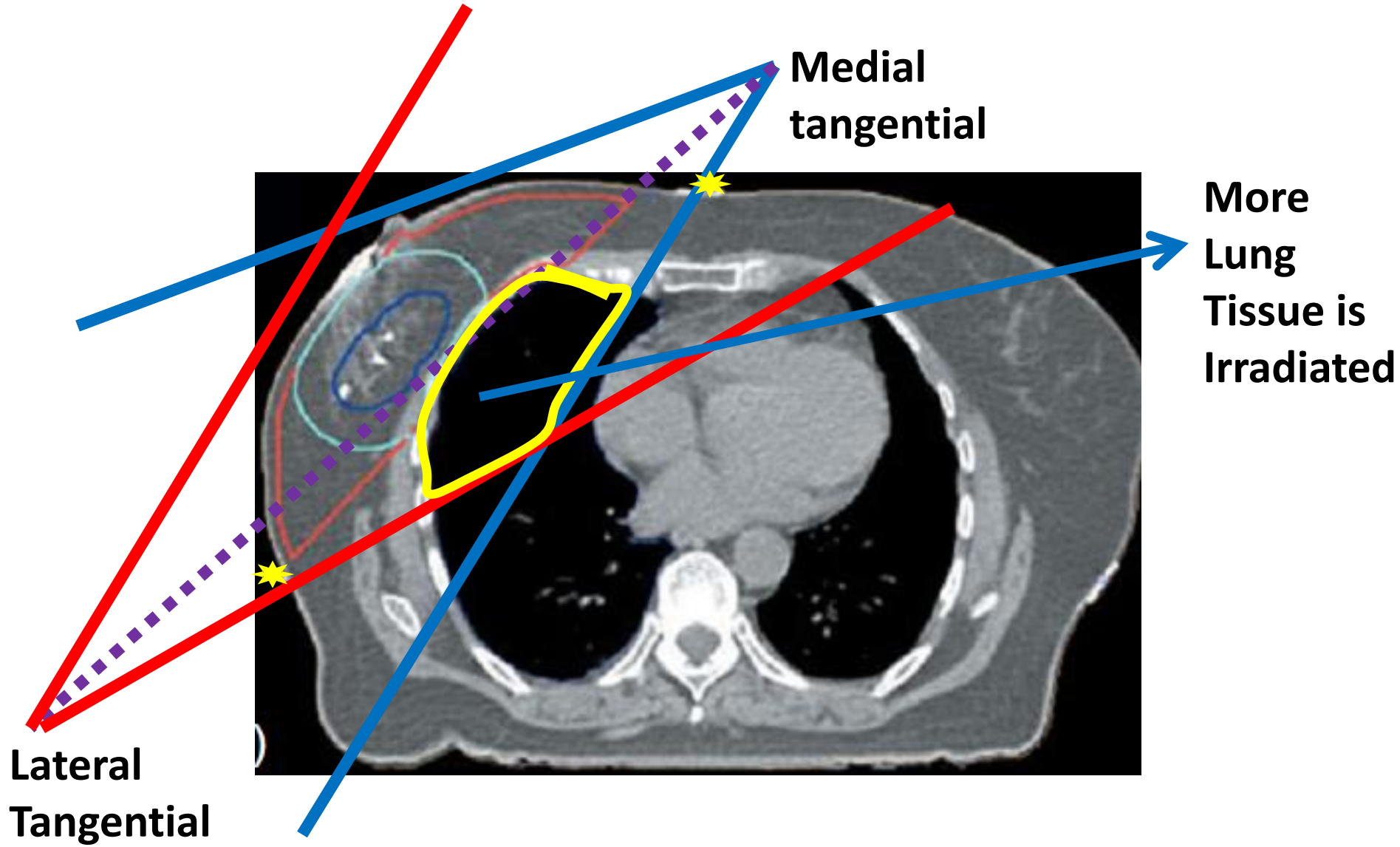
# Solution 3 → If Breast Board not available

Shaped Blocks to be made individually parallel to the chest wall to shield the lung



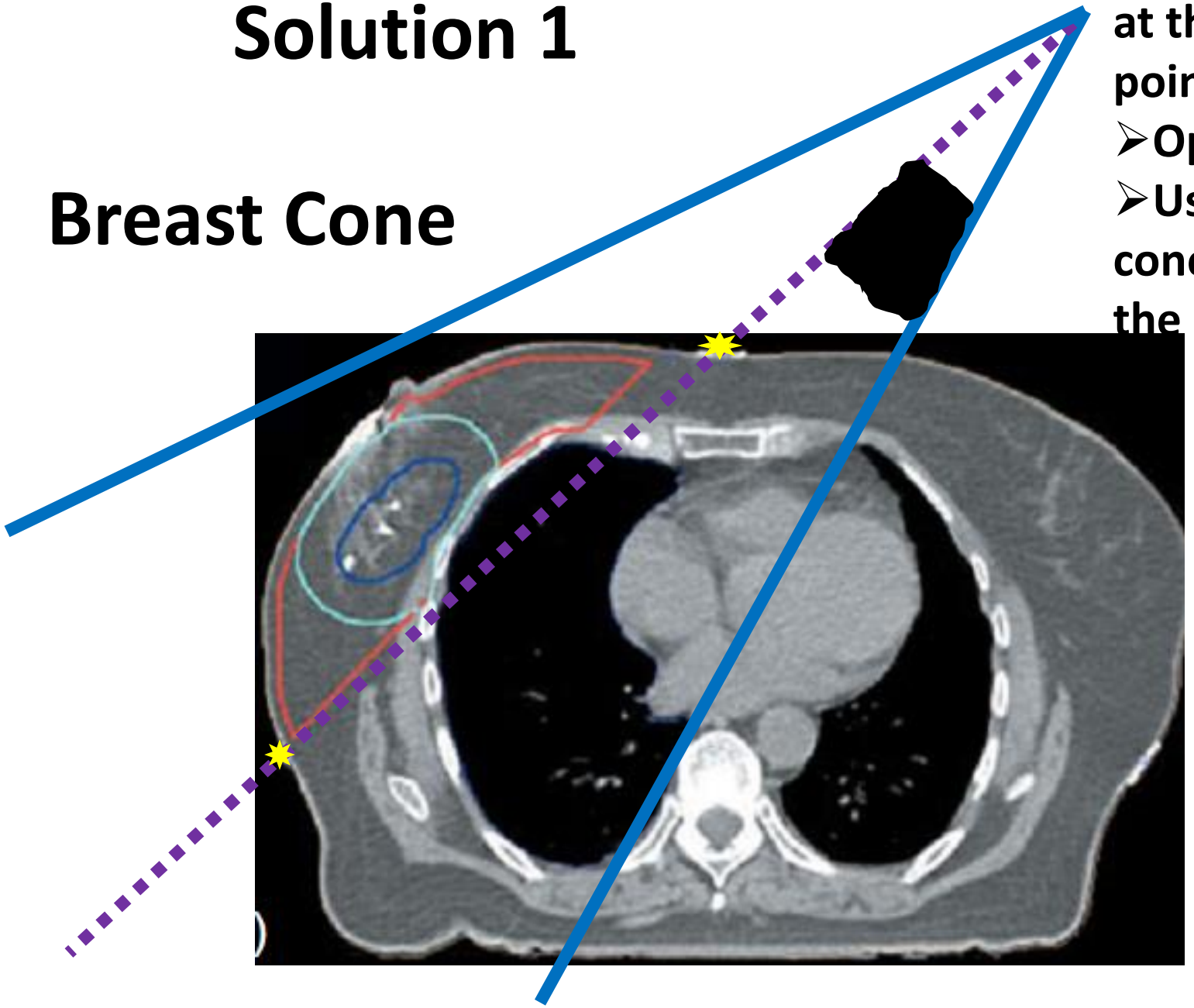
# Underlying Heart and Lung

# Divergence in Lung from Tangential field



# Solution 1

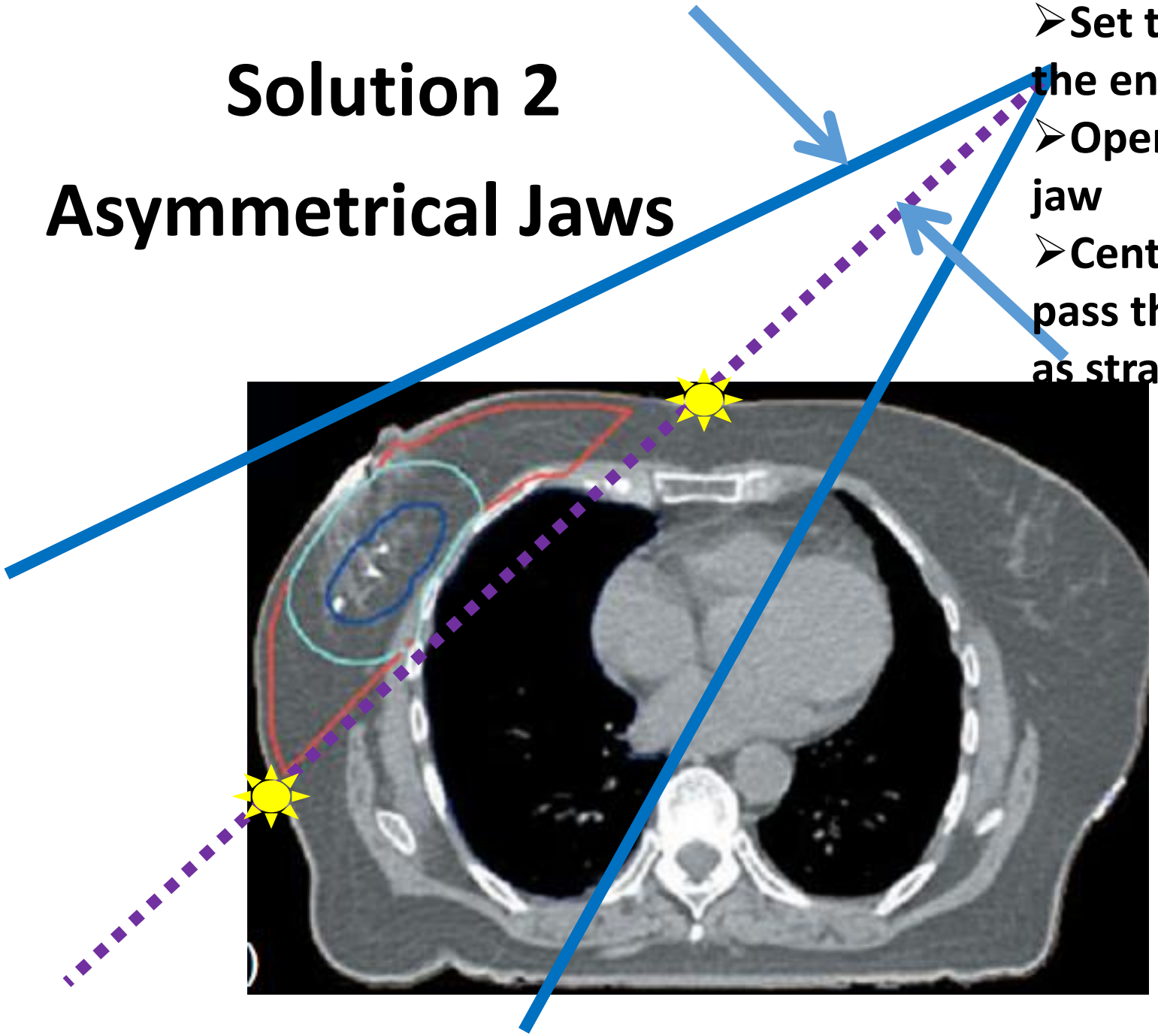
## Breast Cone



- Set the center at the entry point
- Open the field
- Use breast cone to shield the inner half

# Solution 2

# Asymmetrical Jaws



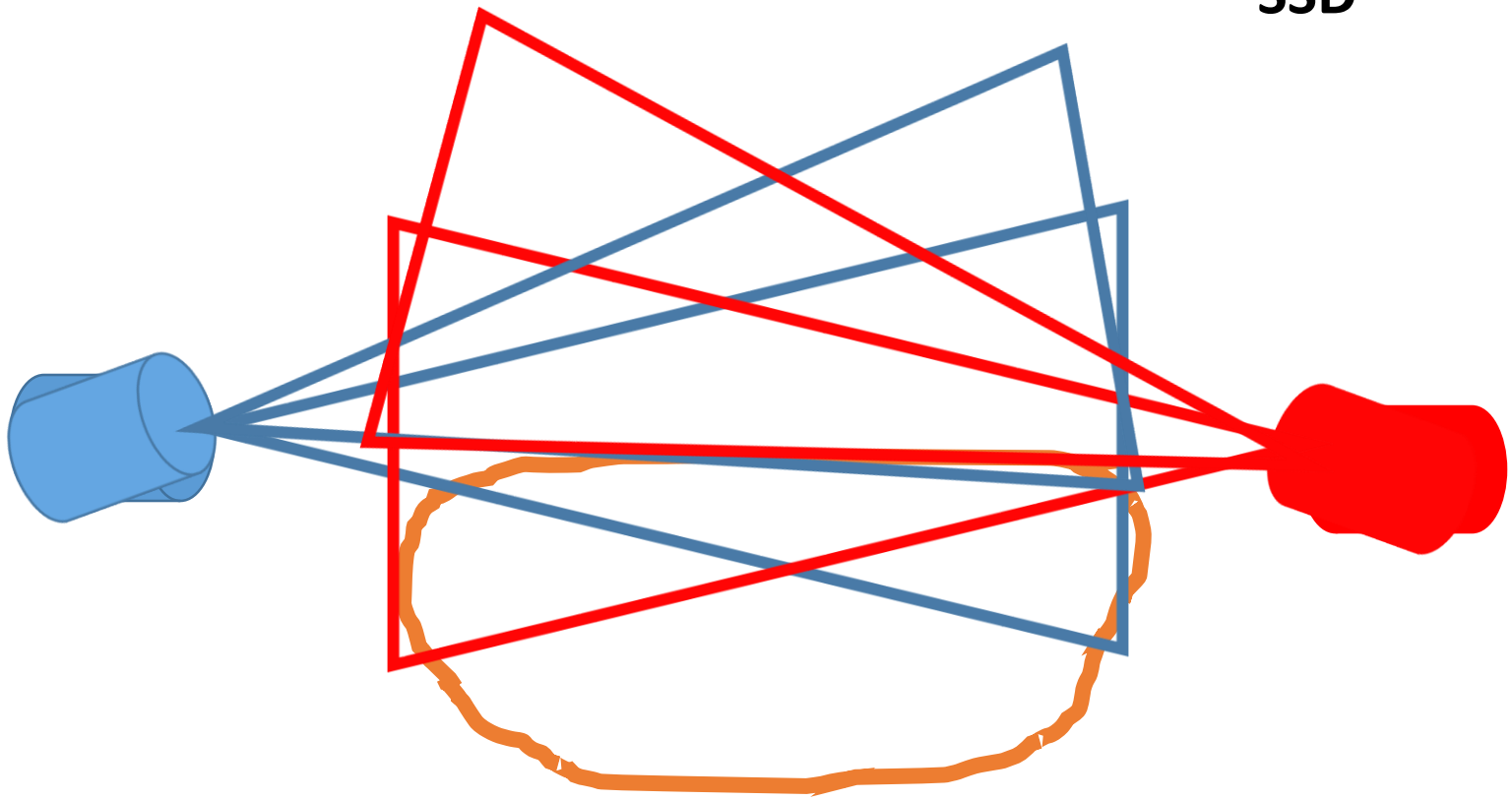
- Set the center at the entry point
- Open only one jaw
- Central axis will pass through lung as straight line

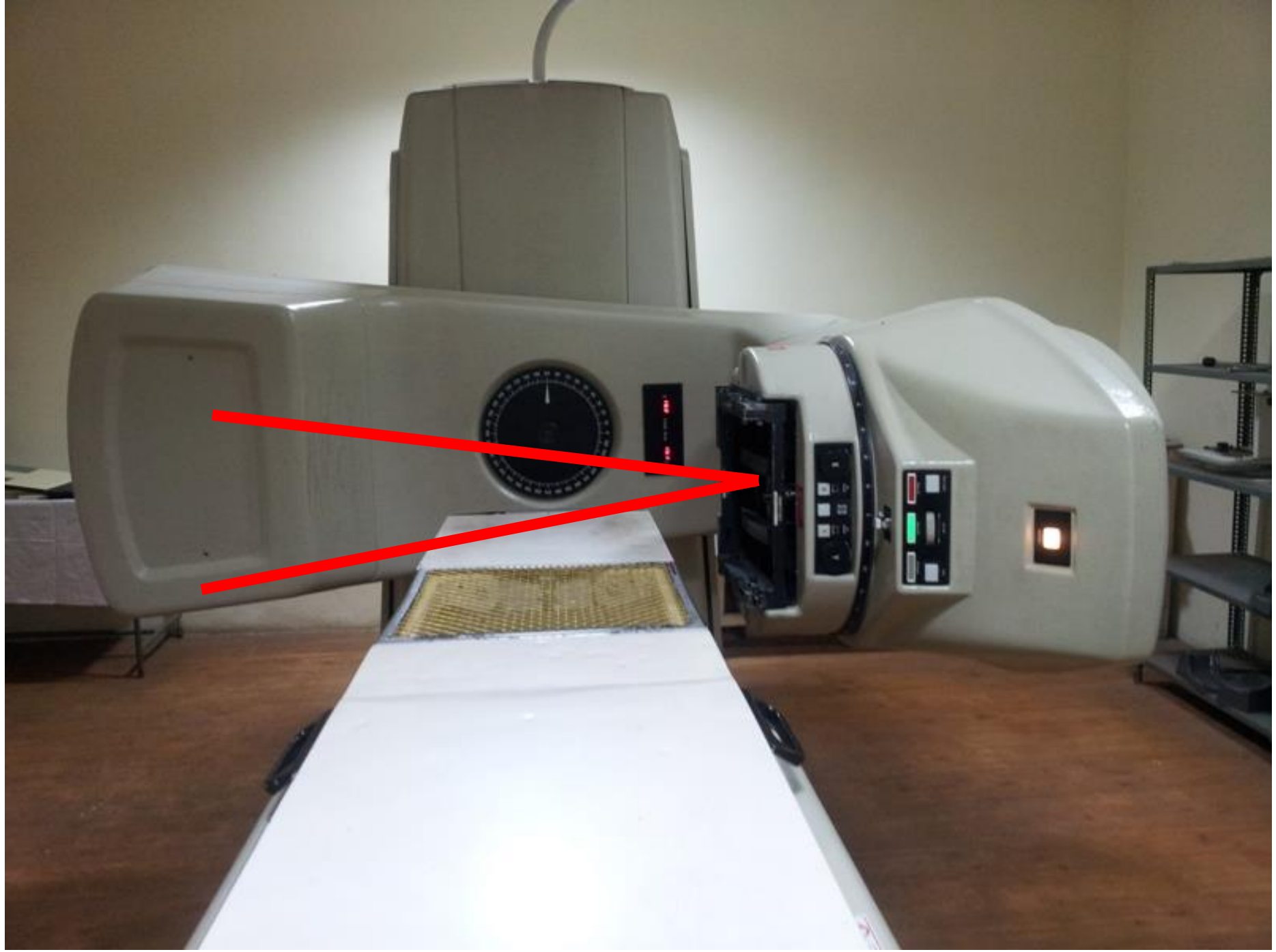
# Solution 3

## By Rotating gantry head upward

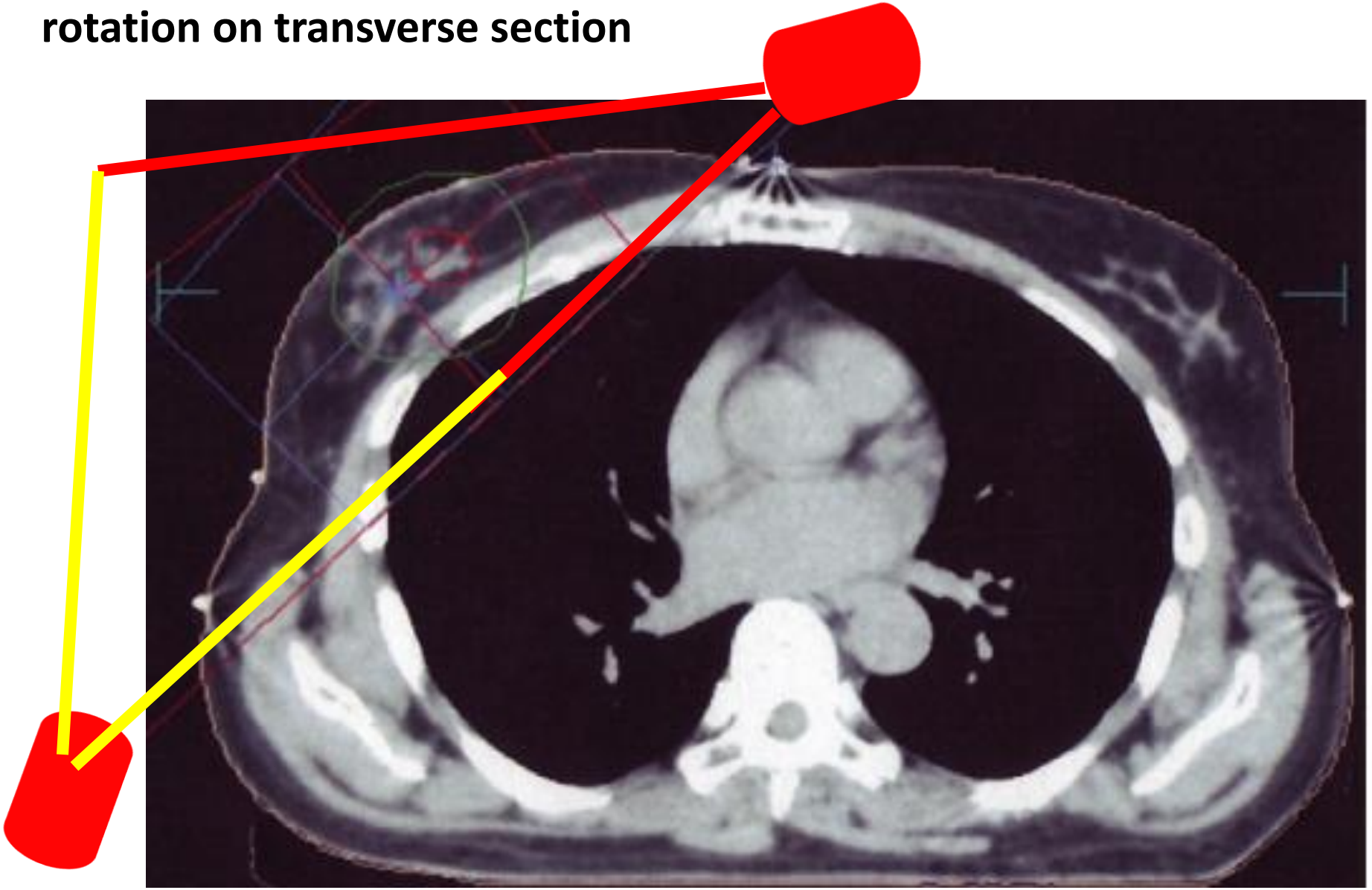
**Calculate the angle of divergence by**

$$\text{Tan}\emptyset = \frac{\text{Half field width}}{\text{SSD}}$$





**Posterior edge of the beam becomes co-planer after gantry rotation on transverse section**

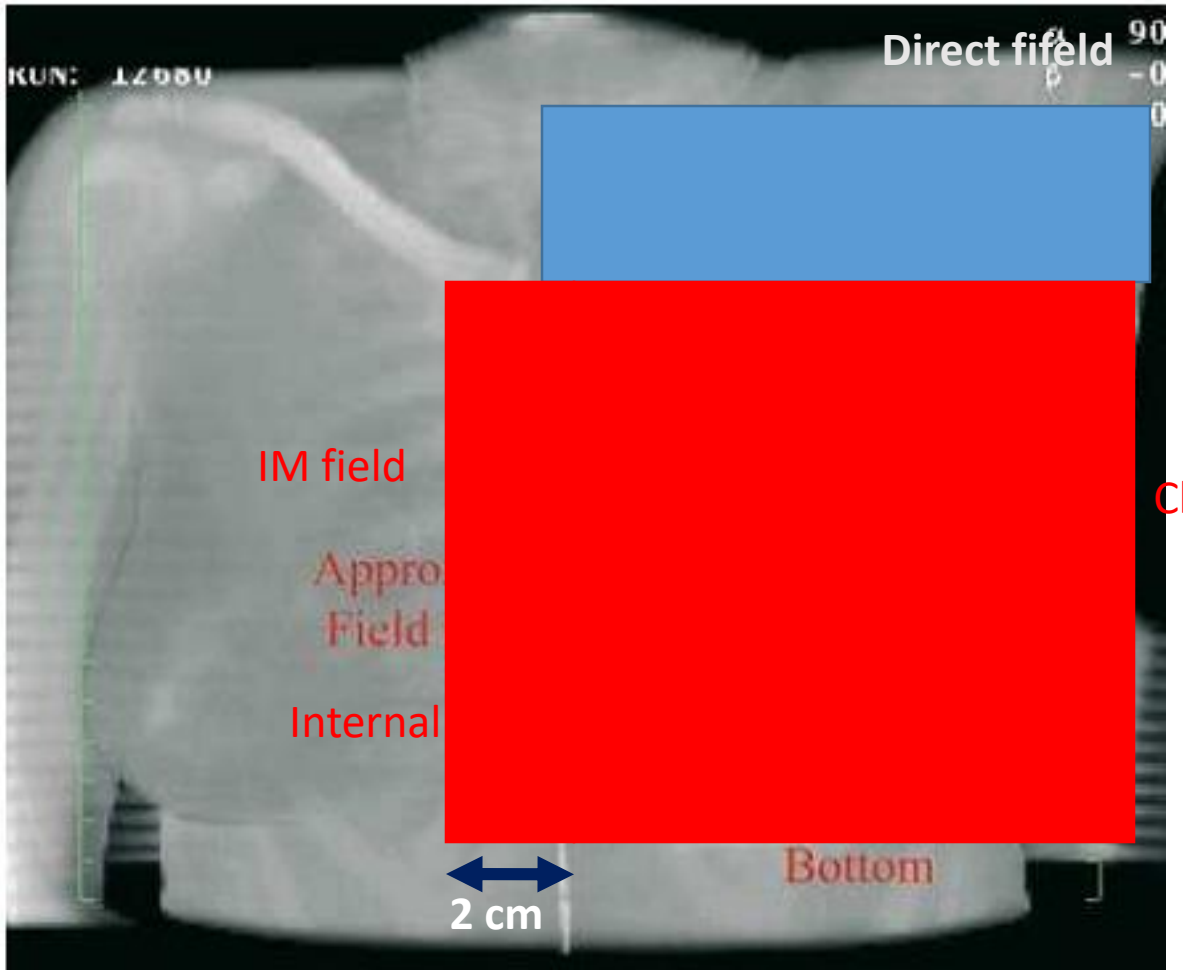


# Number of fields

- **If treating chest wall and all regional nodes then there are two techniques**
  - **Two fields Techniques**
  - **Three fields Techniques**

# Two Field Technique

1. S/C and Axilla by single direct field
2. Internal mammary and chest wall together by tang field



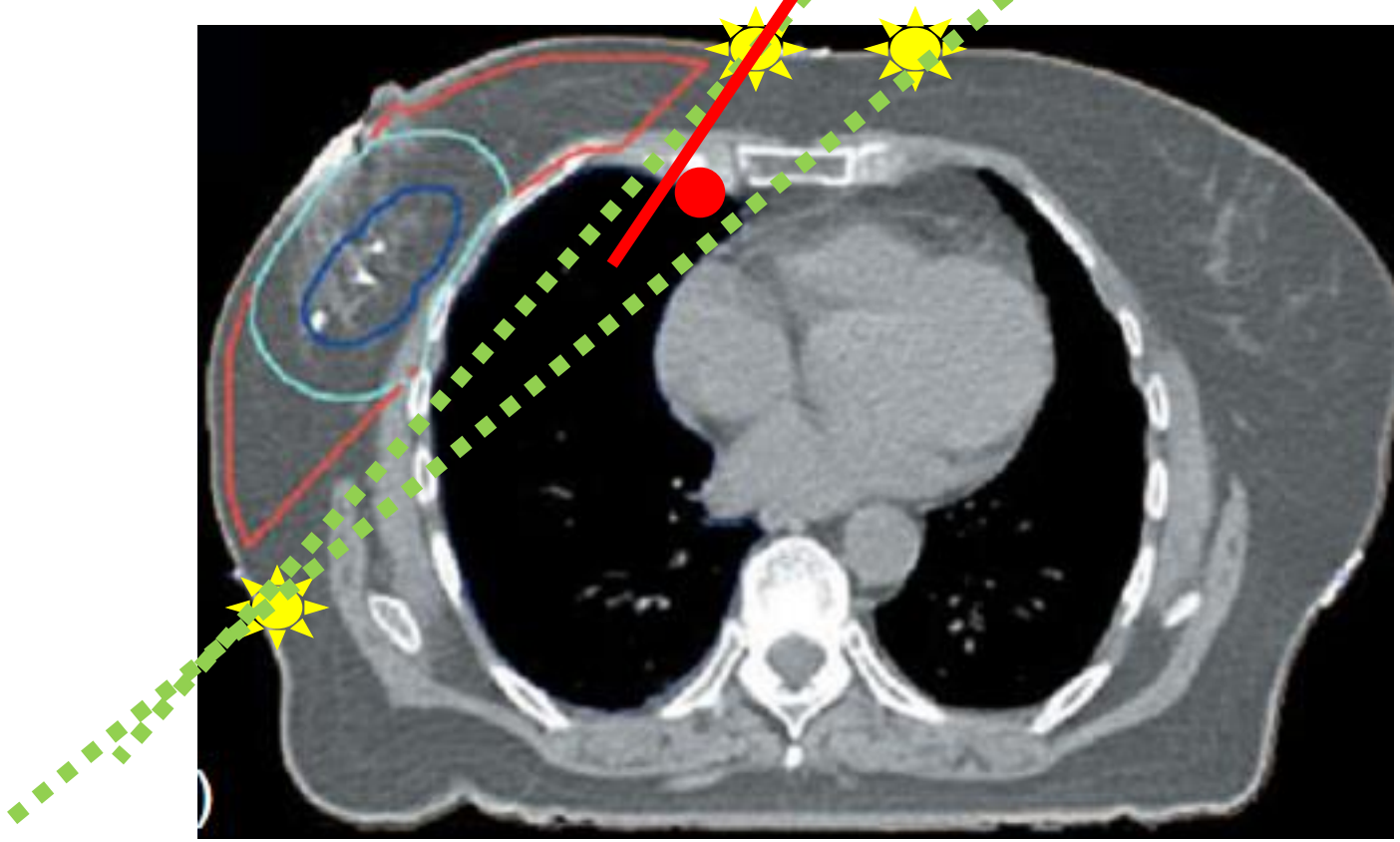

S/C + Axilla

Chest wall Tangential

# Two Field Techniques

## Drawbacks

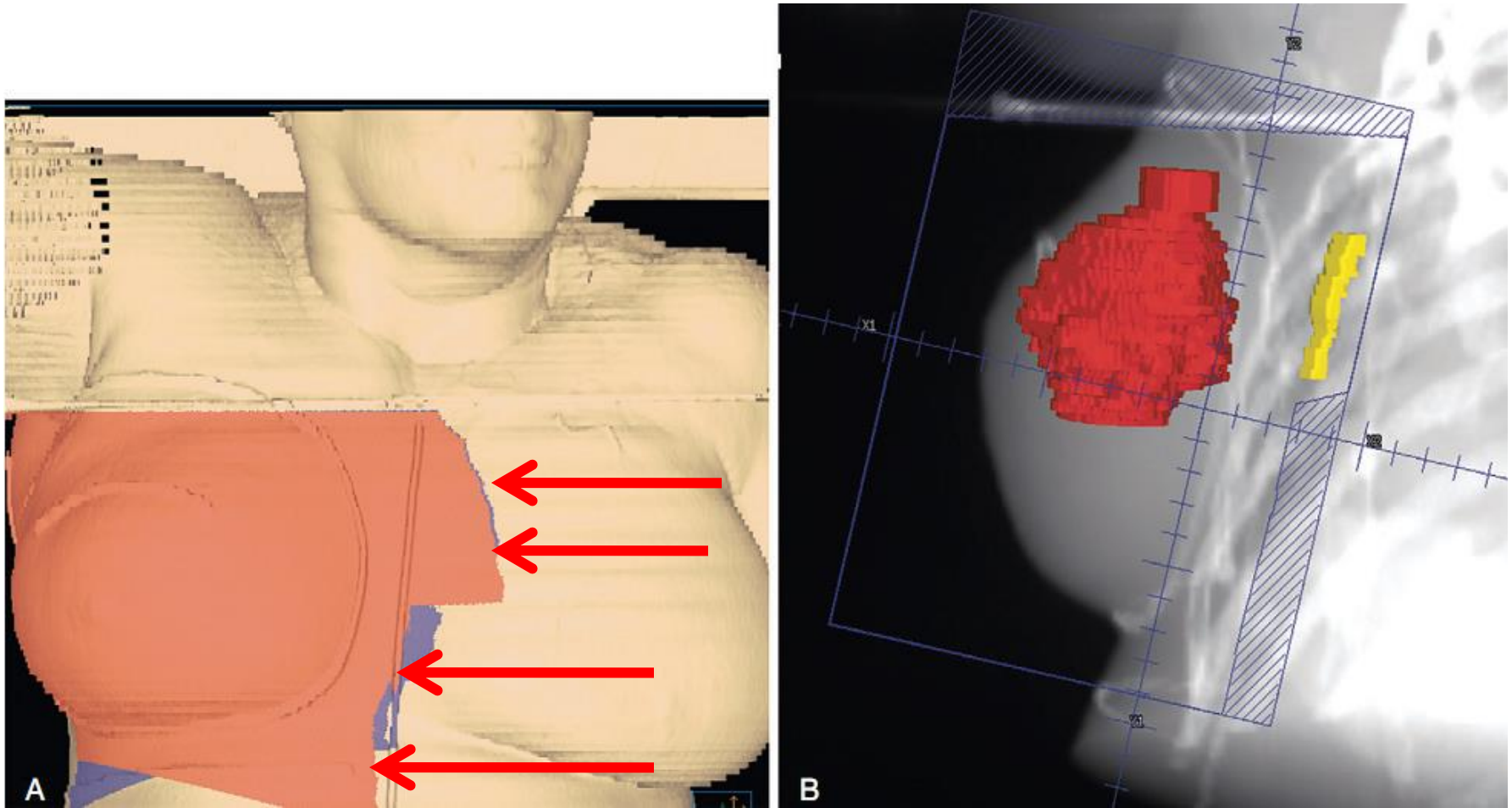
- More lung will be irradiated
- Opposite breast receive higher dose of radiation
- Portion of the heart will also be irradiated



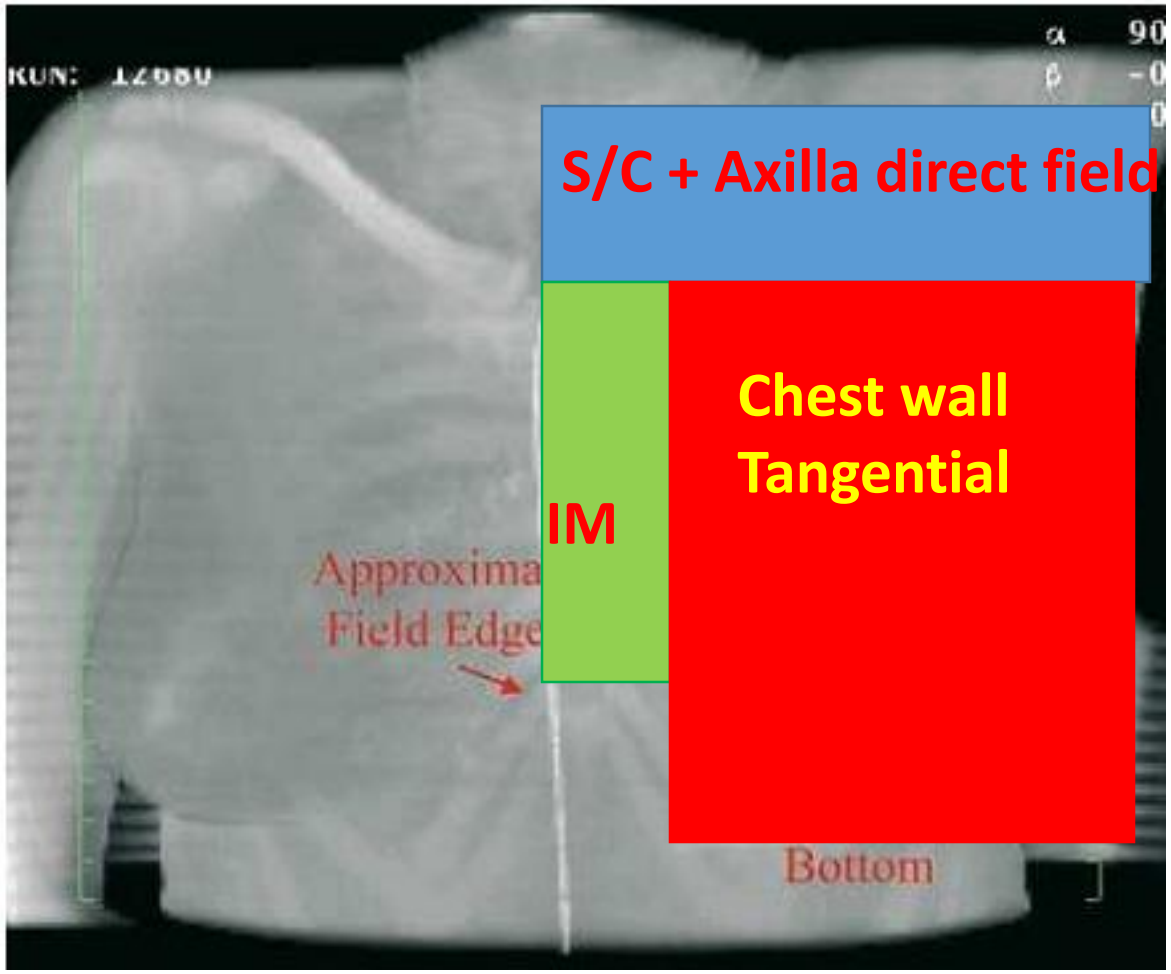
# Deep Tangential or Extended Partial Tangential field

- Only LN of upper 3 intercostal space are involved

- The upper part of chest tangential field is extended medially to cover the internal mammary nodes of upper three intercostal space.



# Three Fields Technique

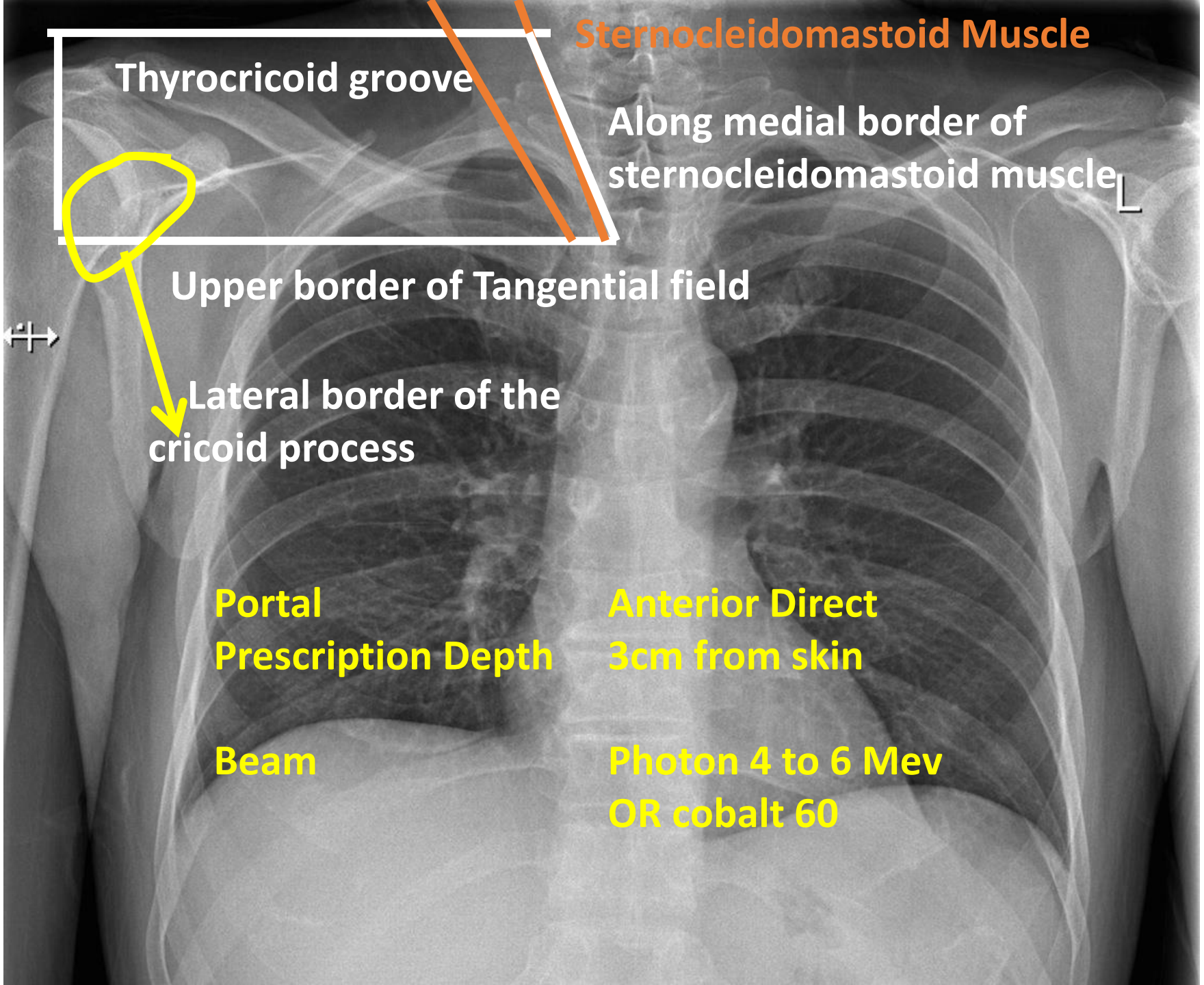



1. S/C + Axilla by direct field
2. IM by direct field
3. Chest wall by Tangential field

# Field Boundaries

# Supraclavicular RT

- **Indication:-**
  - **4 or > 4 axillary nodes positive**
  - **T3 or T4 tumors**
  - **Inadequate axillary dissection**
  - **No axillary dissection**

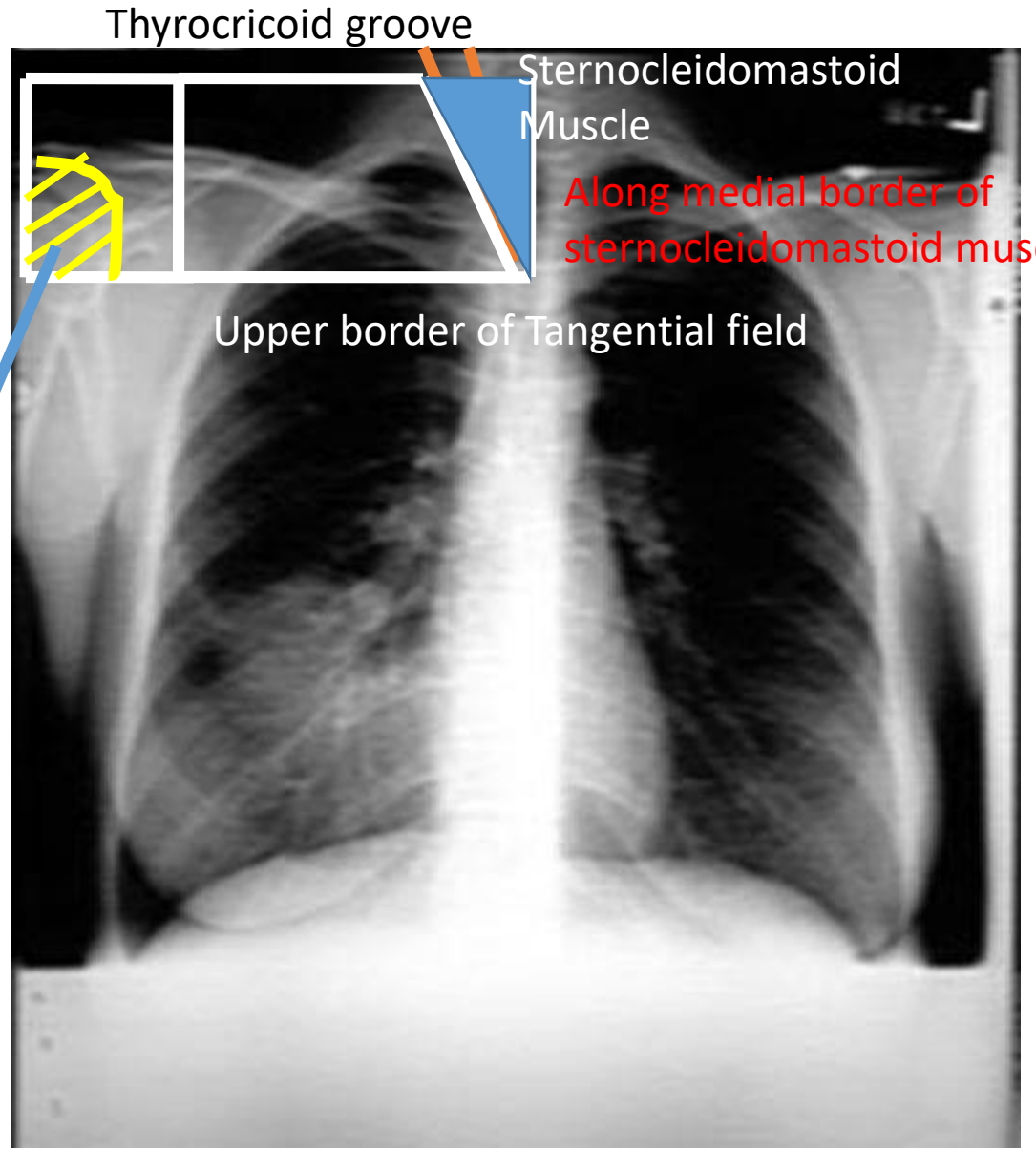

Sternocleidomastoid Muscle
Thyrocricoid groove
Along medial border of sternocleidomastoid muscle
Upper border of Tangential field
Lateral border of the cricoid process
Portal
Prescription Depth
Anterior Direct
3cm from skin
Beam
Photon 4 to 6 Mev
OR cobalt 60

# RT to Axilla

- **Indication**
  - **Inadequate Axillary Dissection ( < 10 )**
  - **No axillary dissection in presence of positive sentinel node.**
  - **Extensive extra capsular extension**
  - **More than 75% nodes are positive ( eg 15/20)**

# Field Bounderies

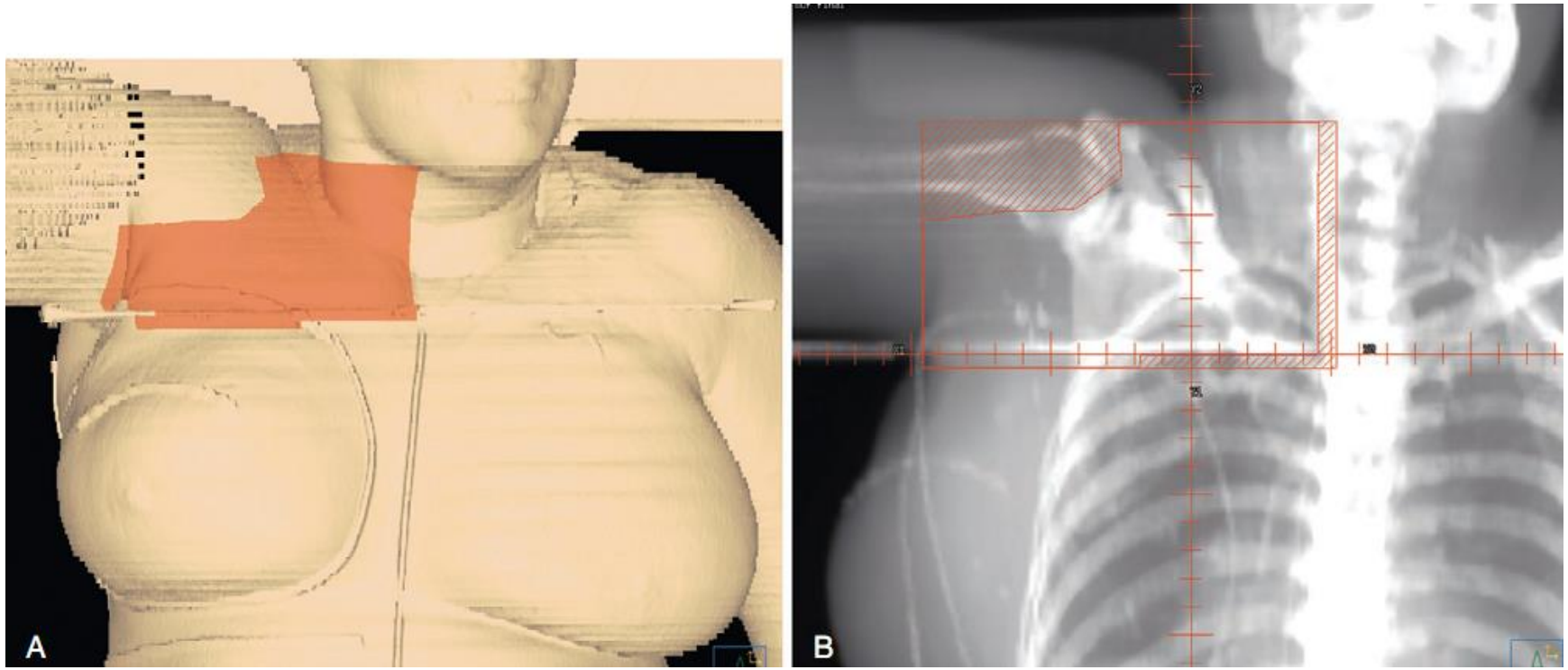
**Lateral border is extended more laterally to include the axilla .**



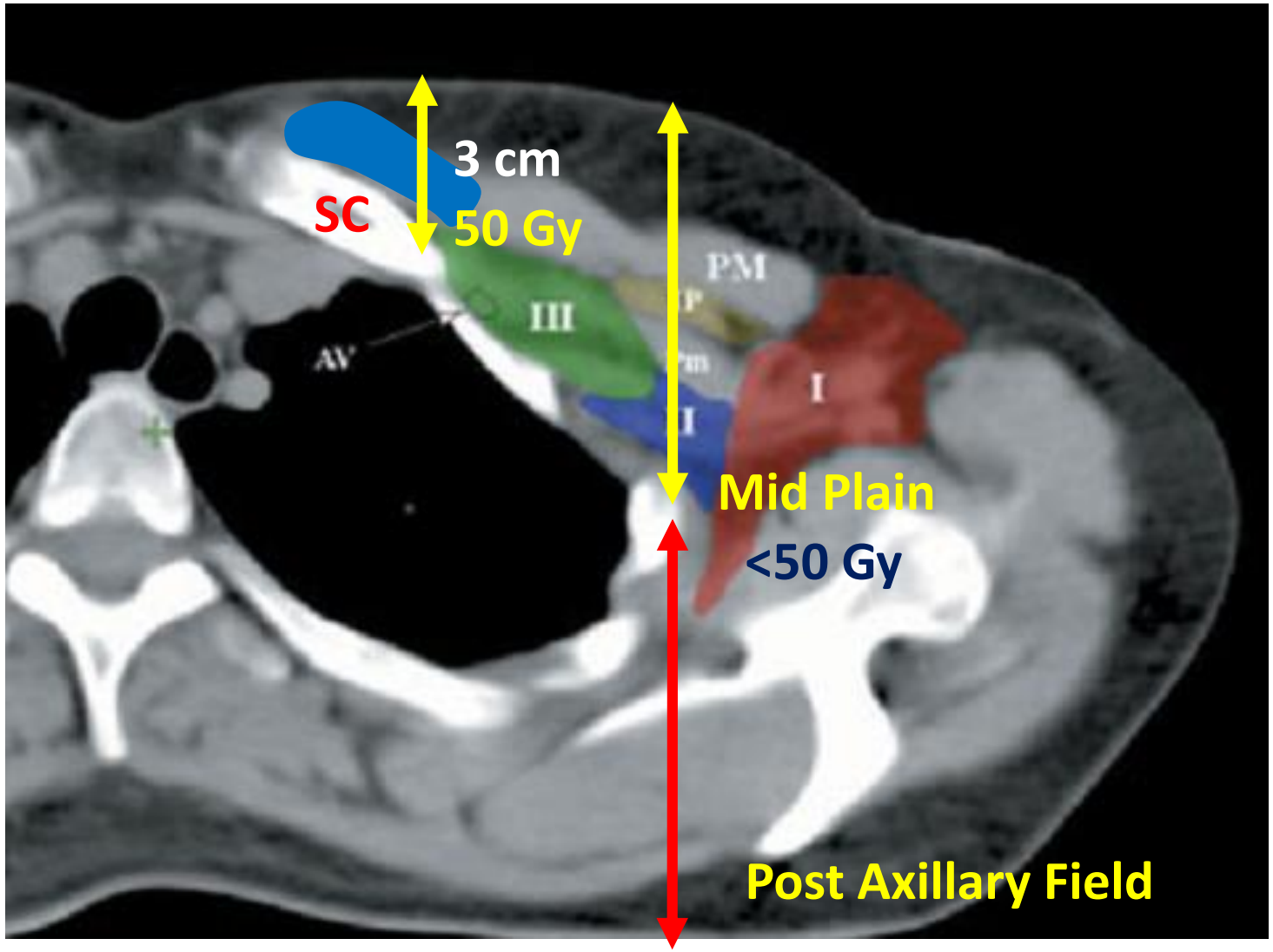

**humeral head is shielded**

# Supraclavicular and Axilla

## Beams eye view and projected field over skin

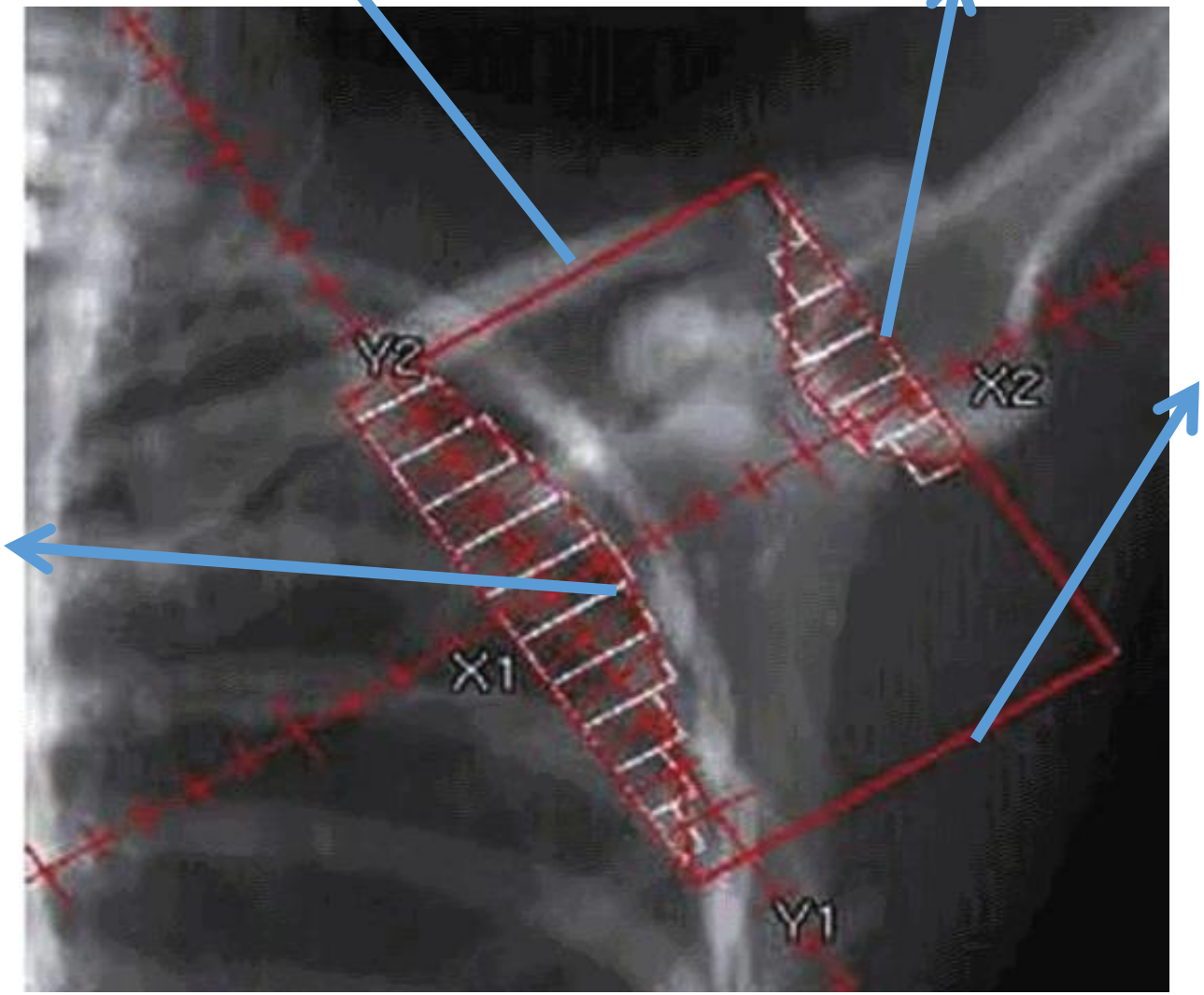


# Posterior Axillary field



Upper Border along the spine of the scapula

Lateral border should match with lat border of ant axillary field with shielding of humeral head




Medial border along the convex lateral wall of the bony thorax cage with 1 to 1.5 cm of lung

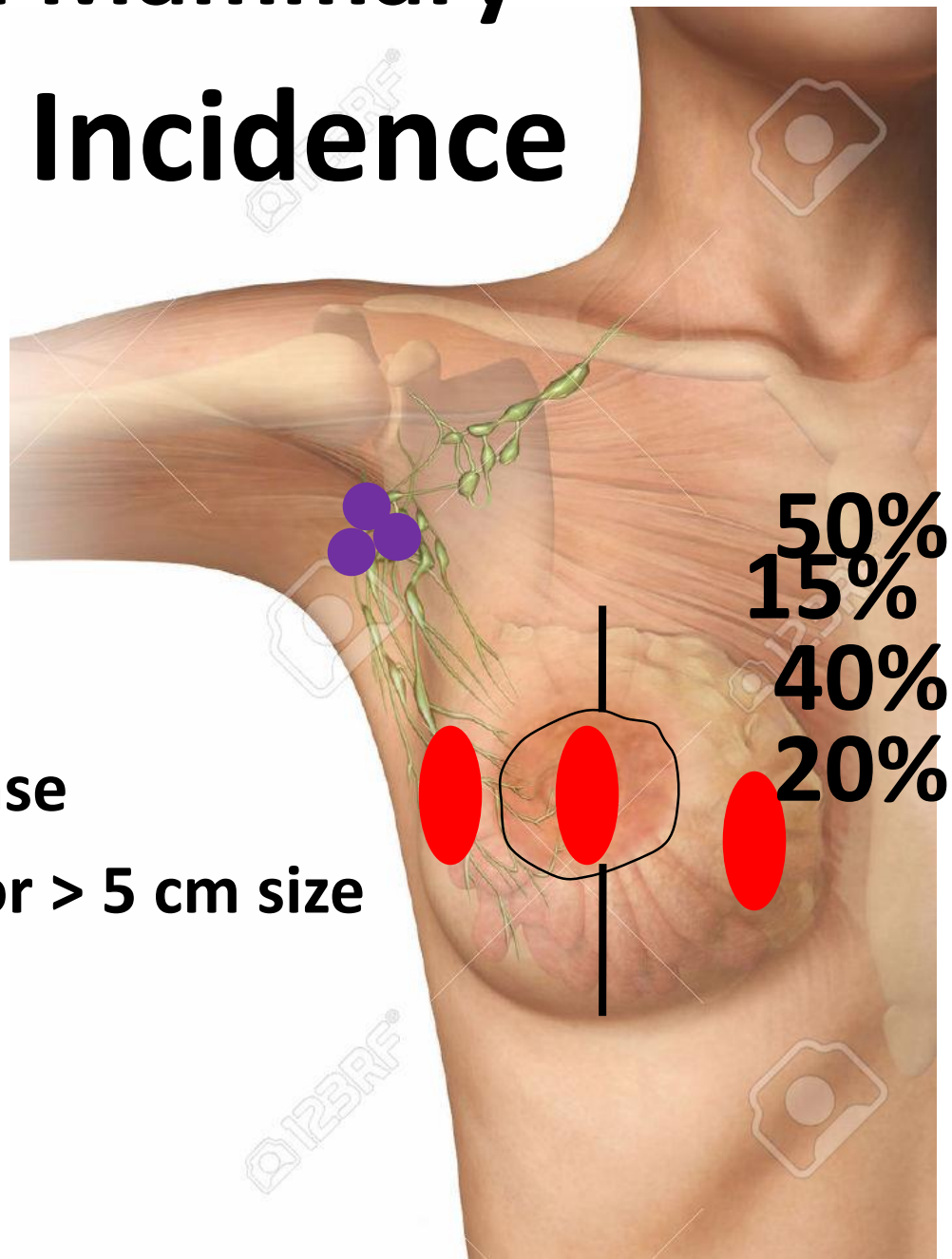
Inferior border should match the lower border of Ant axillary field

# Dose from Posterior field

- **Calculate the contribution at mid plane by ant axillary + S/C fields**
- **Rest of the dose to be given from post field to make total dose 50Gy**
- **For example if the contribution from ant field is 35 Gy, give 15 Gy from post field.**

# Internal Mammary

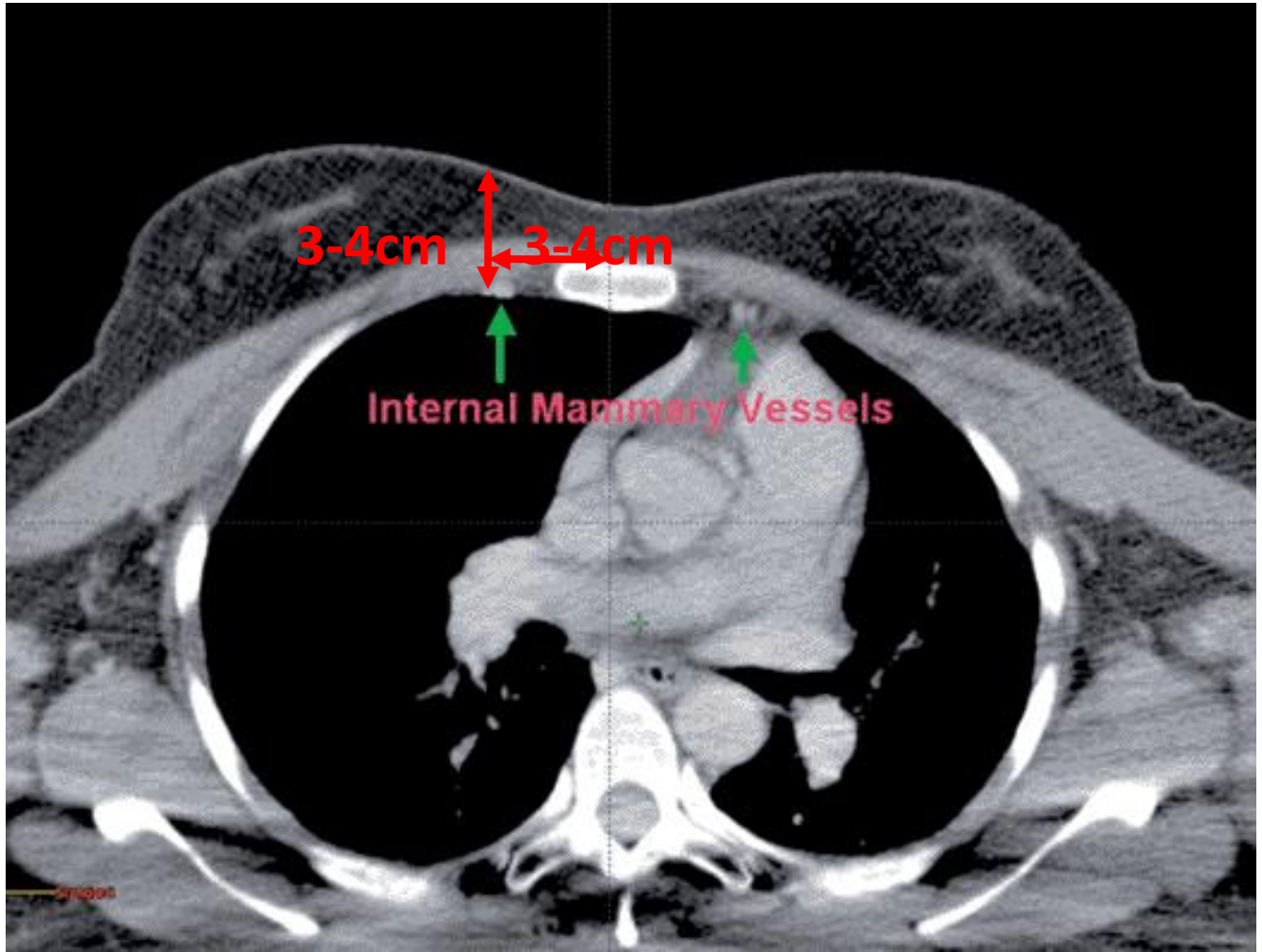
## Incidence



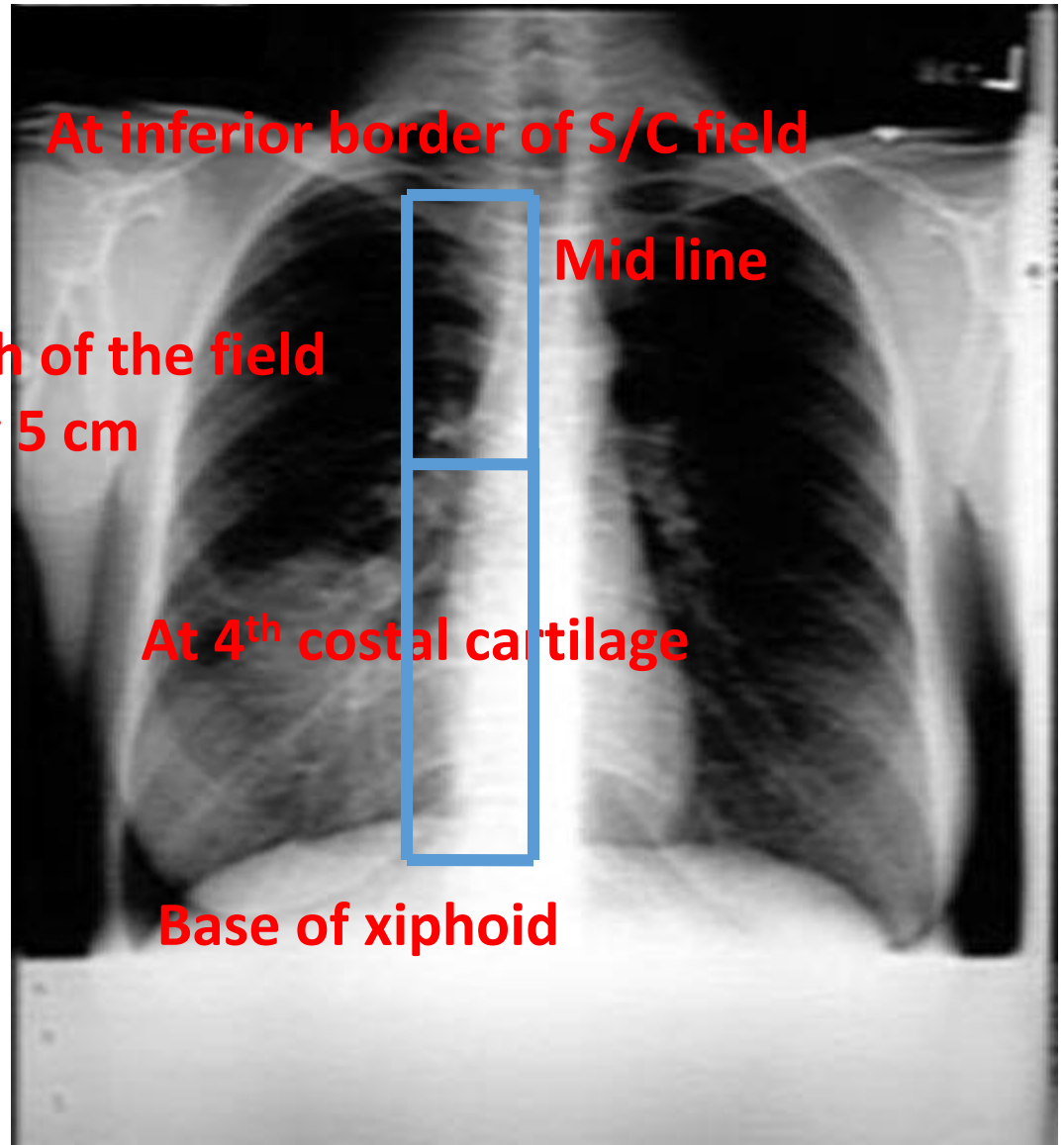

- **Indications:-**
  - **Extensive axillary disease**
  - **Central or medial tumor > 5 cm size**

# Internal Mammary Nodes

**Internal mammary nodes are in close proximity to the internal mammary vessels which are located approximately 3-4 cm lateral to mid line and 3-4 cm deep to the surface.**



# Field Bounderies




**Prescription Depth**

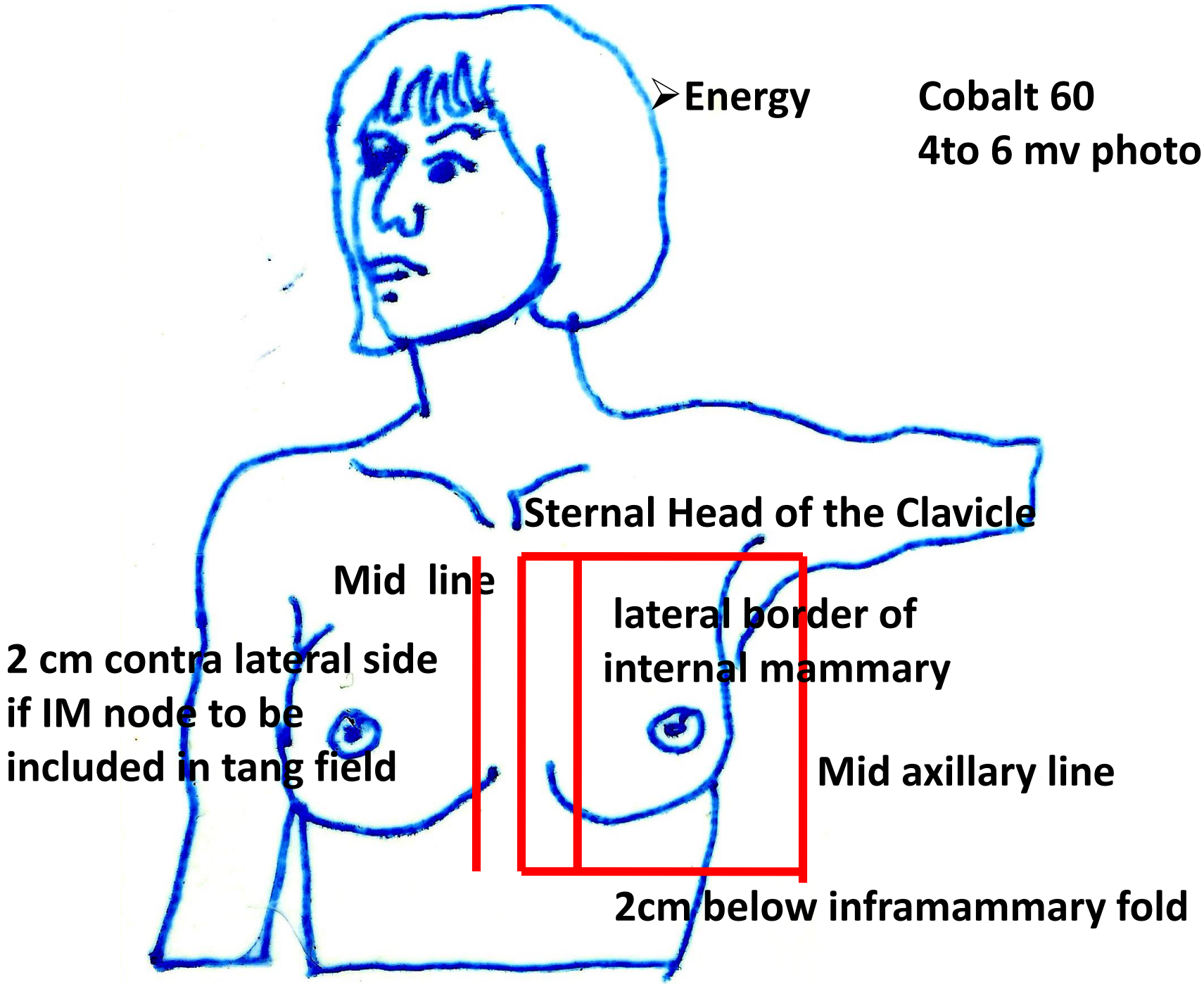
**4 Cm**

**Radiation**

**Photon**
**OR**
**Electron**

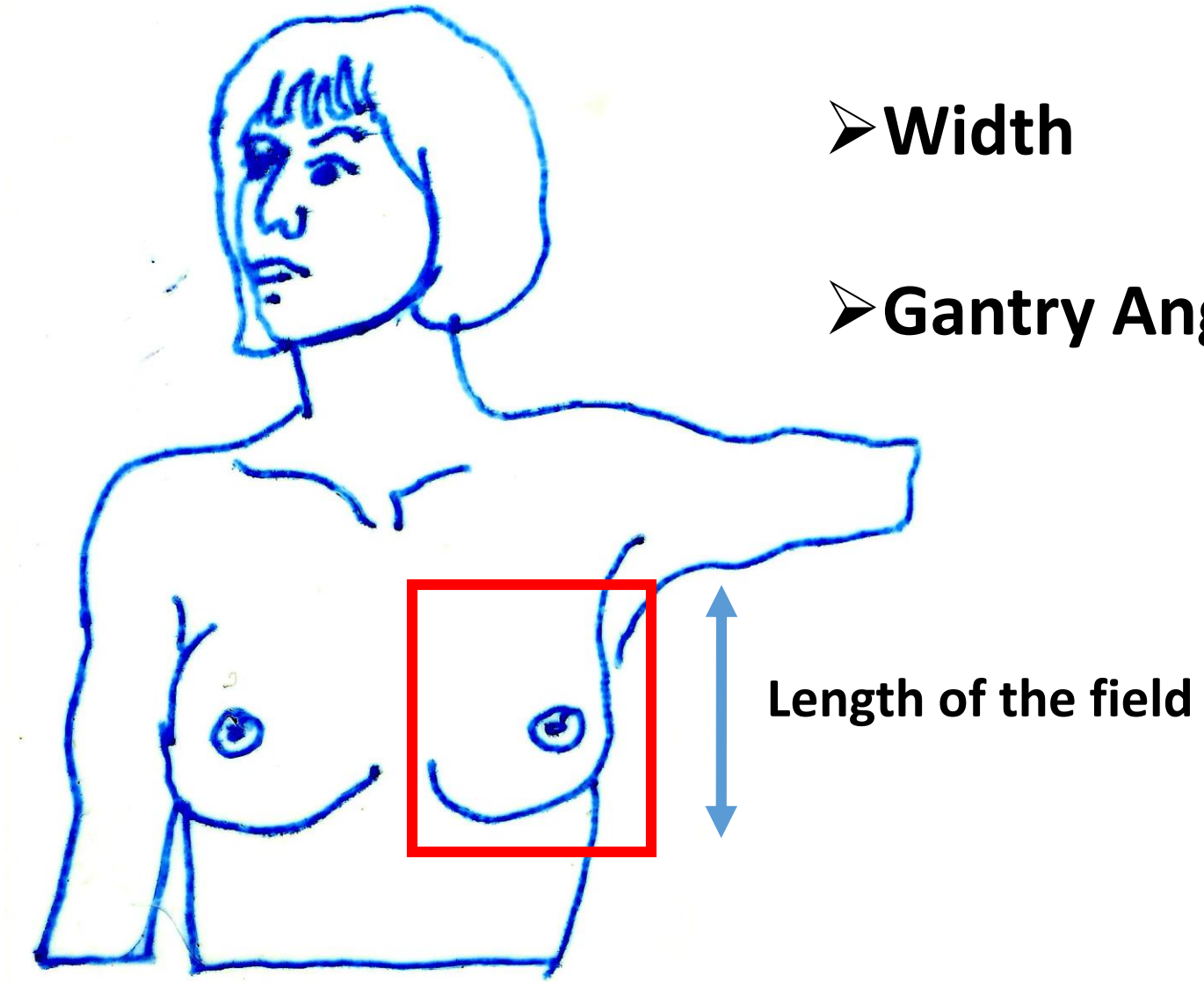
# Chest wall Irradiation

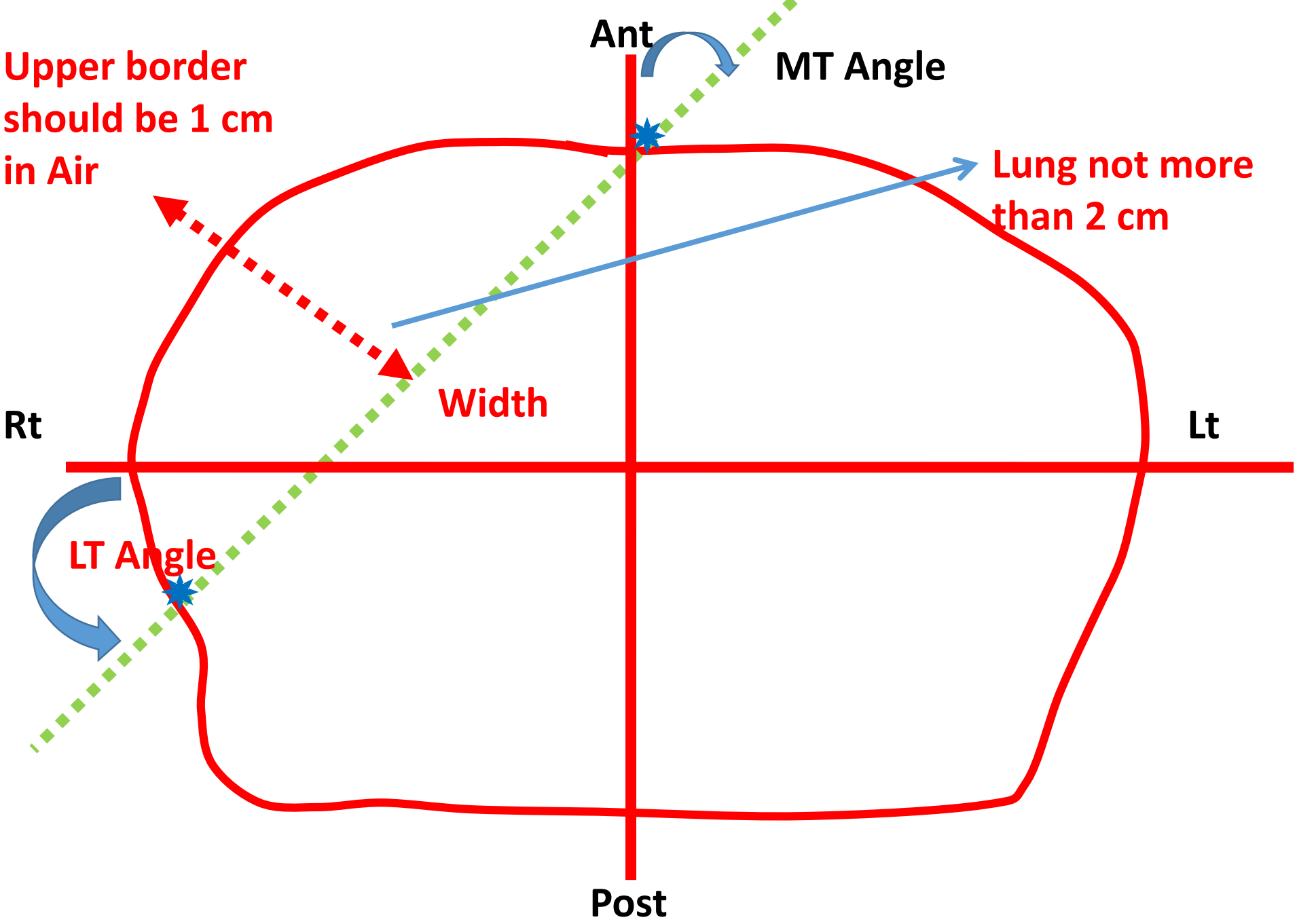
- **By two tangential fields**
  - **Medial Tangential**
  - **Lateral Tangential**


Energy
Cobalt 60
4to 6 mv photon
Sternal Head of the Clavicle
Mid line
lateral border of
internal mammary
2 cm contra lateral side
if IM node to be
included in tang field
Mid axillary line
2cm below inframammary fold

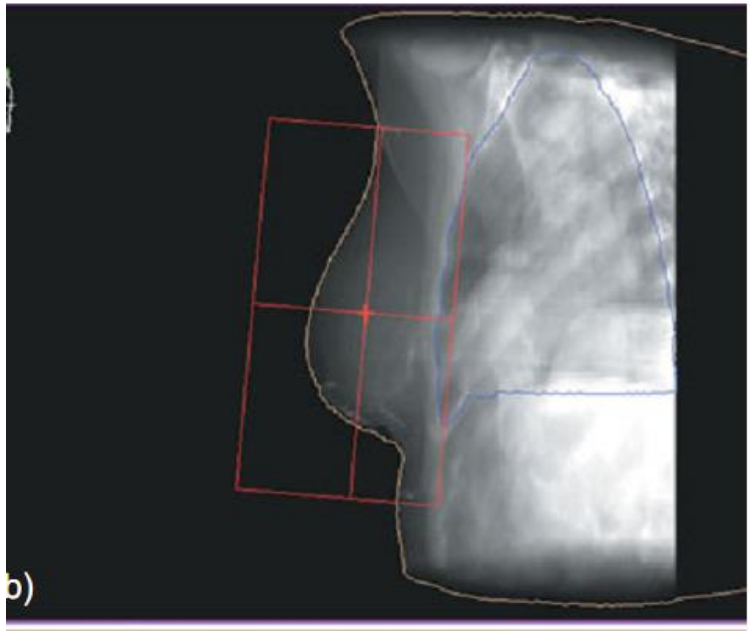
# Parameter for Tangent Fields

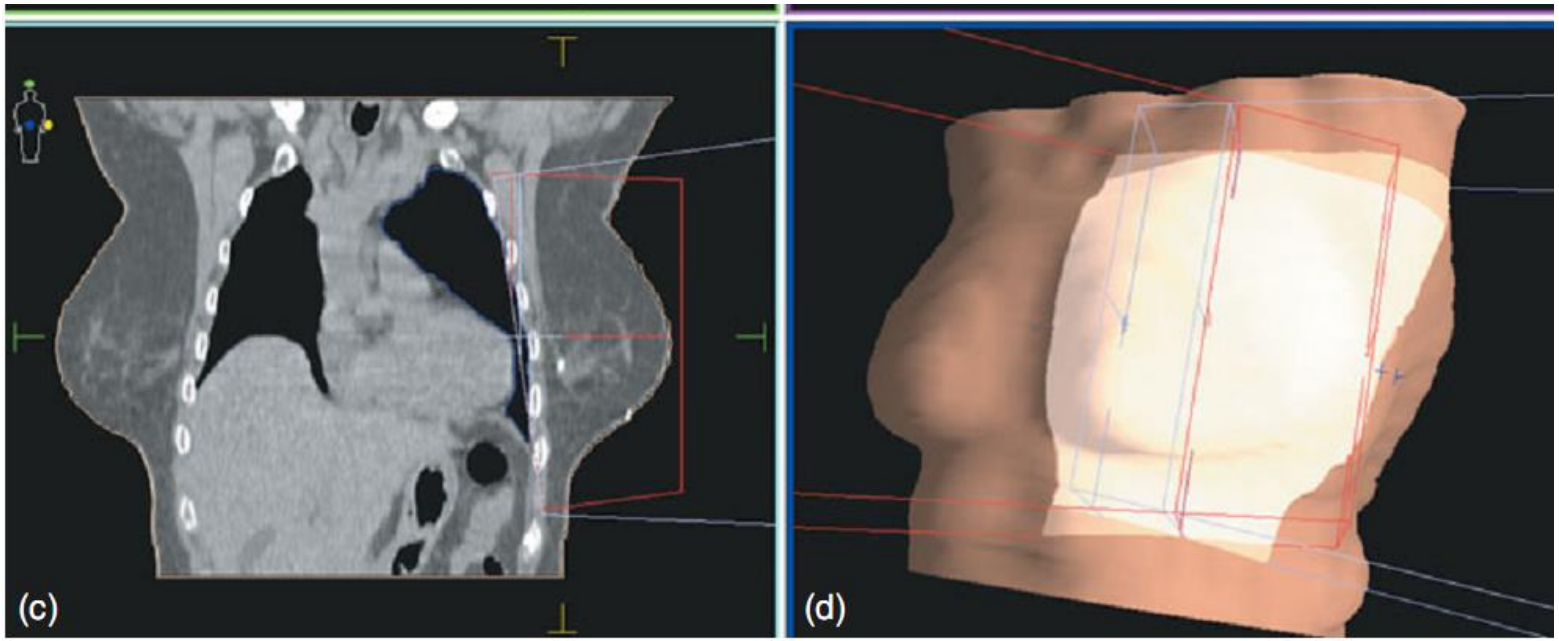
- Length
- Width
- Gantry Angle




Ant
MT Angle
Upper border
should be 1 cm
in Air
Lung not more
than 2 cm
Width
Rt
Lt
LT Angle
Post

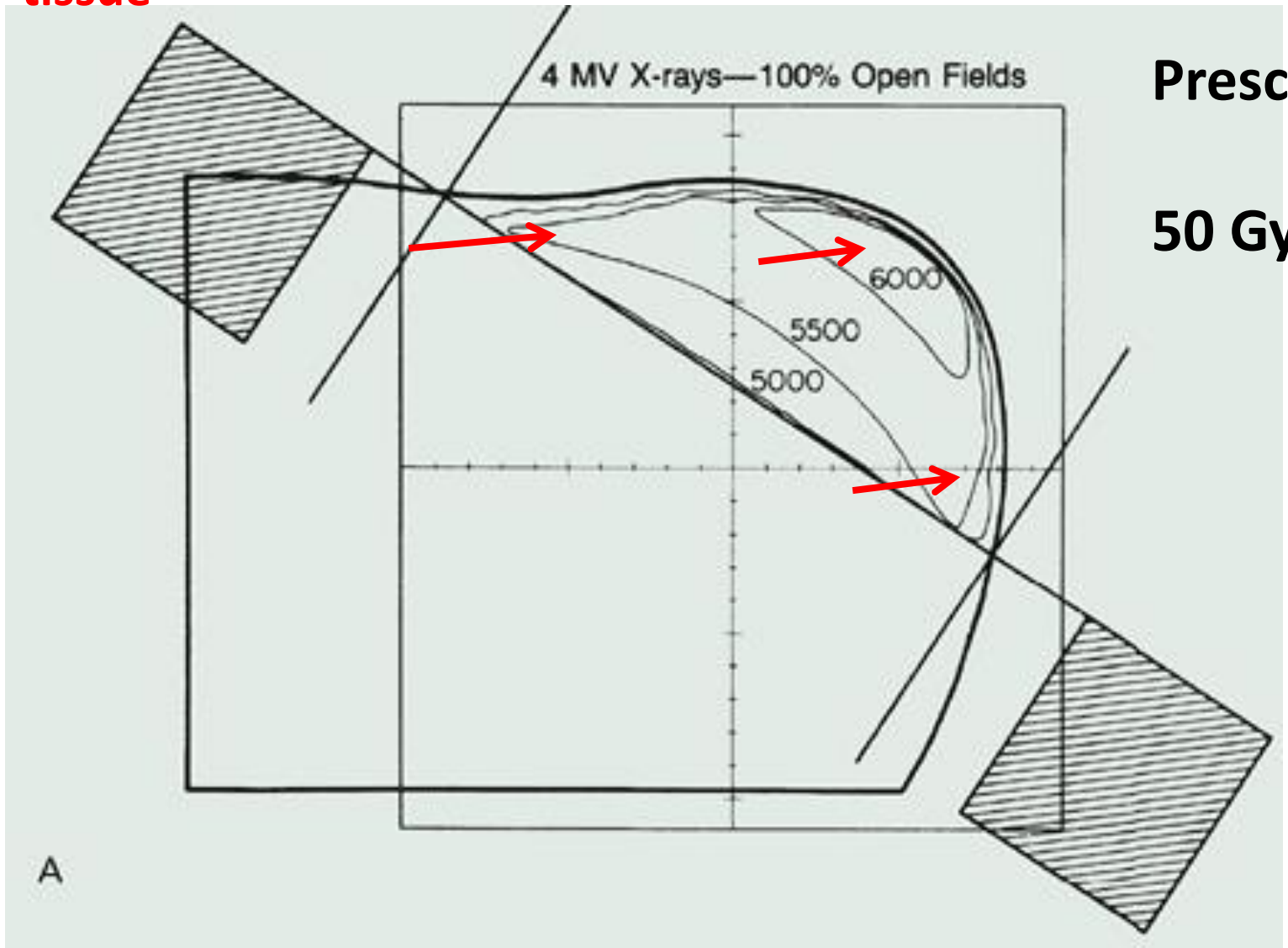
# Tangent Portals



# Dose distribution with two tangential fields

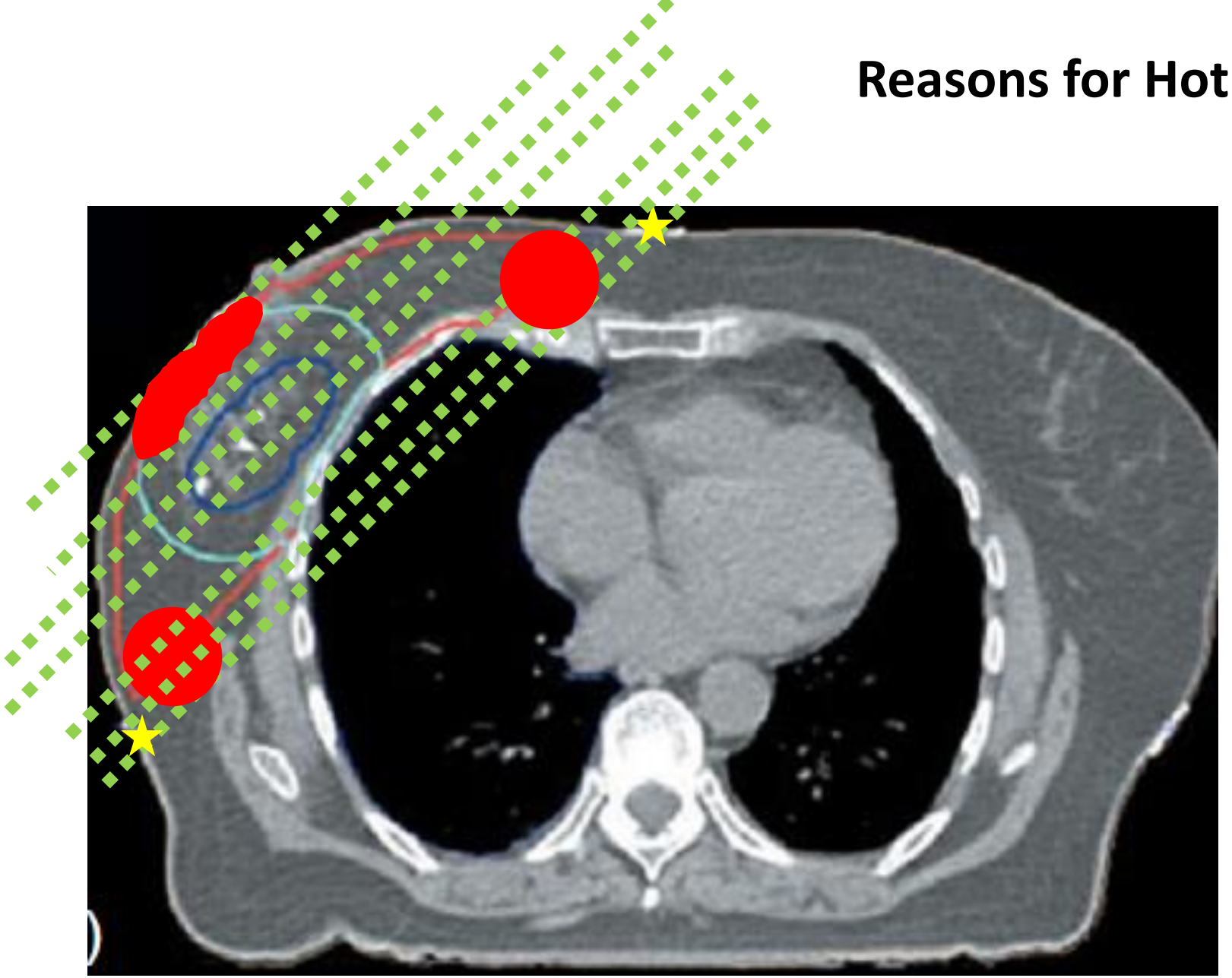
**Note the higher doses at surface and medial and lateral deep breast tissue**




**Prescription**

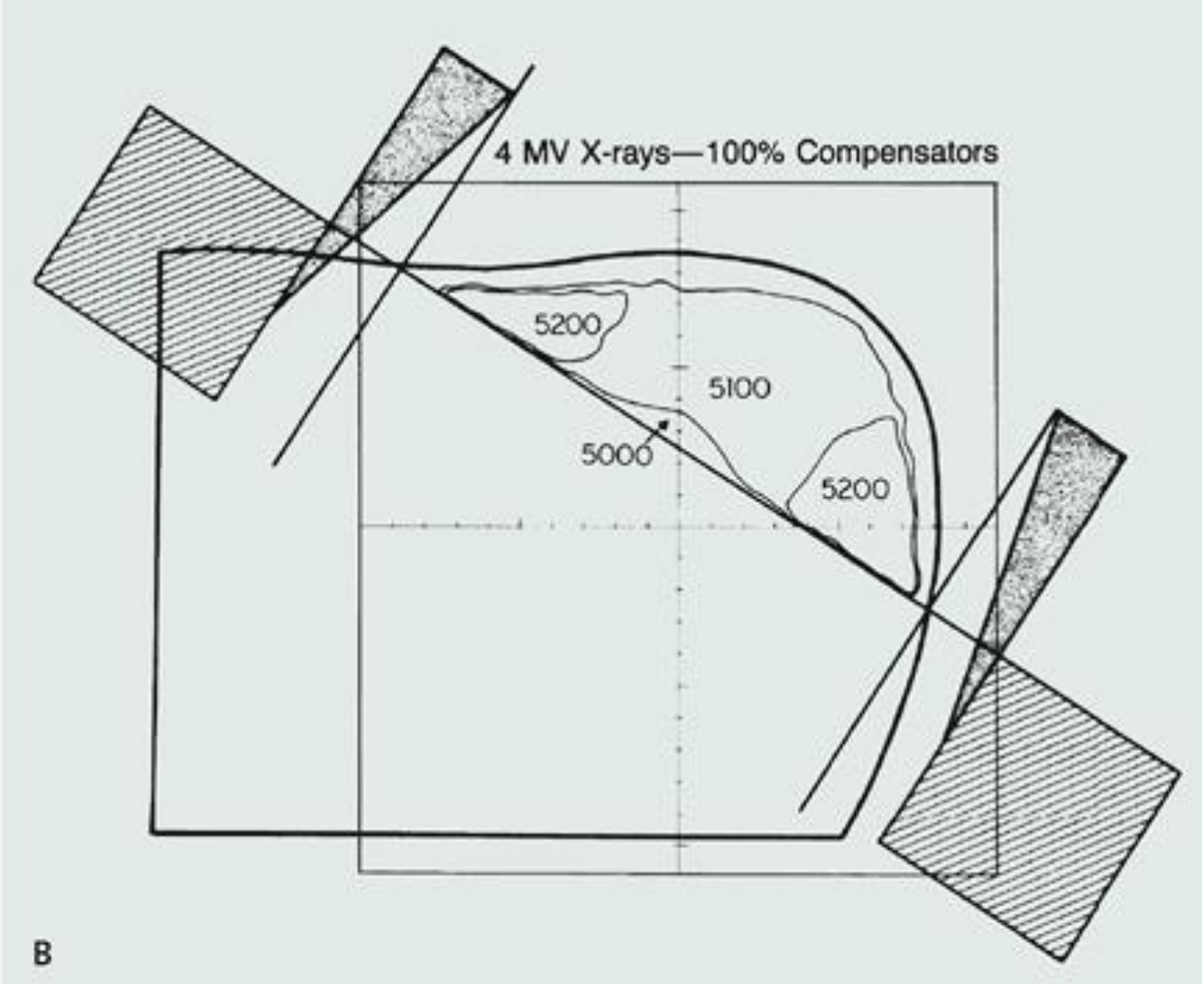
**50 Gy/25 F/5W**

# Reasons for Hot spots



# Solution:-

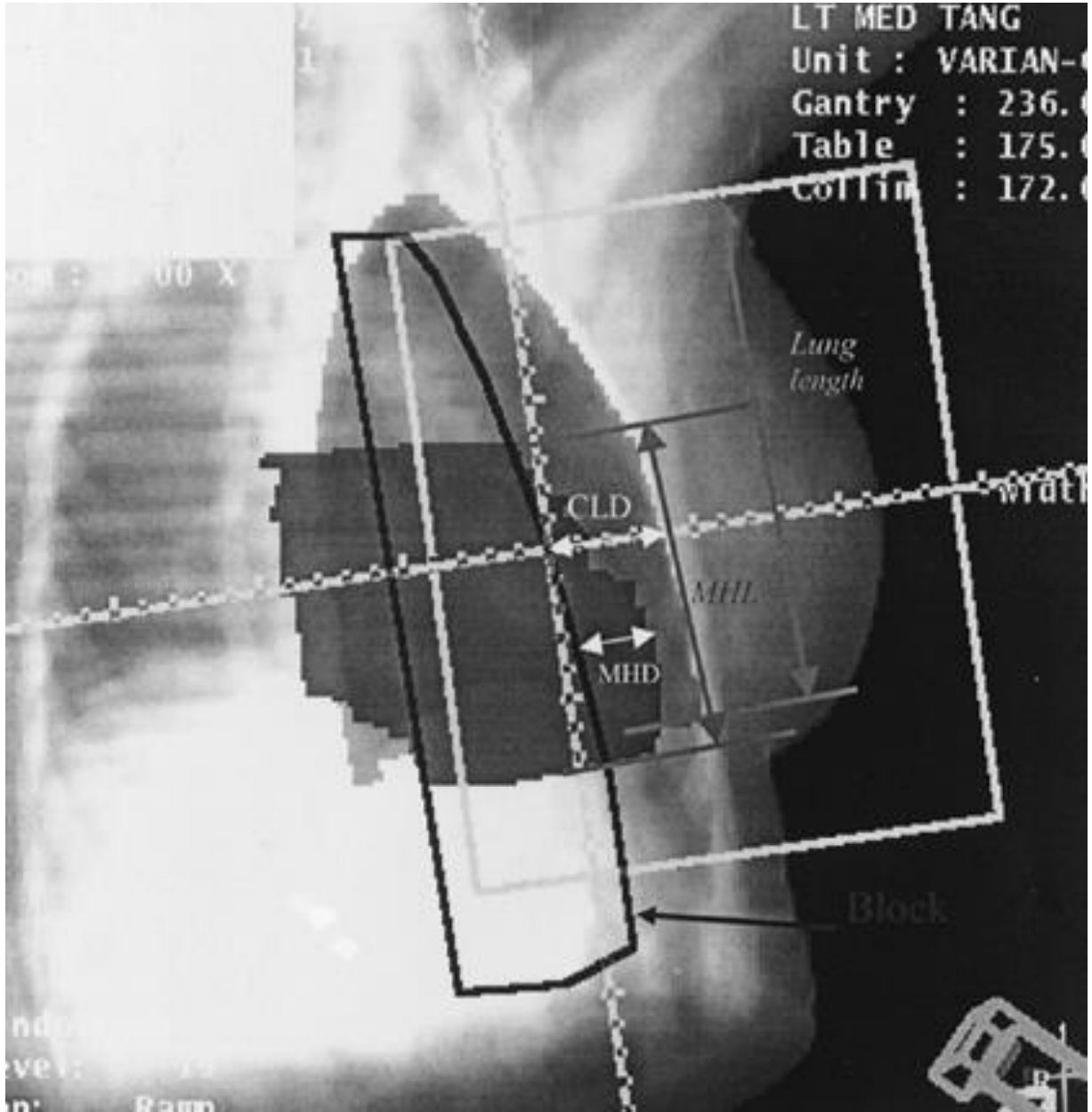
**Use Wedge with thick end upward which act as compensator for missing tissues**




**It removes hot spots anteriorly.**

**The medial and lateral hot spots will still remain**

# Radiographic Parameter on Virtual simulation




**Central Lung Distance(CLD)** :- **width of the lung at central axis**

**Lung Length:-** **Vertical lung distance included in the radiation portal.**

**Maximum Heart Distance (MHD):-**
**maximum width of the heart in the tangent field.**

**Maximum Heart Length (MHL):-**
**Maximum length of the heart in the tangent field.**

# Radiotherapy Techniques in Ca Breast

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