

## Head and Neck Phantom

### Guidelines for *Planning and Irradiating* the Head and Neck Phantom. Revised September 2024

#### GENERAL INFORMATION:

Each institution may keep the phantom for a period of time no more than 2 weeks. During this two-week period, the institution will image, plan, and treat the phantom and return. Thank you for your cooperation.

The phantom has one insert. The phantom contains TLD at 8 locations and perpendicular sheets of film. Four TLD are located in the primary PTV, and two each in the secondary PTV and in the organ at risk (spinal cord).

If you have any questions, please contact the Radiation Quality Laboratory:

Phone: (713) 745-8989

Email: [RQALab@mdanderson.org](mailto:RQALab@mdanderson.org)

#### DOSIMETRY INFORMATION TO BE SUBMITTED:

The following information is to be submitted when returning the phantom:

- Original hard copy isodose distribution in axial and sagittal planes through target center.
- Treatment plan report or summary.
- Screen shots showing the contour of the TLD (similar to the figure below).
- **Data to be upload to OneDrive** - A folder has been created with your institution name on OneDrive and it will be shared with you via email. Please upload the digital treatment planning data in the DICOM format which include all CT slices with 3D composite Dose, RTStructure and RTPlan. **Please compress the file before upload to avoid the file corrupt during the process.**
- Please inform phantom team by email, [RQALab@mdanderson.org](mailto:RQALab@mdanderson.org), when you finished the upload.

**Please note, if unable to do the above please send a CD with all the requested data with the phantom.**

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**The Phantom should be imaged, planned, and irradiated as if it were an actual protocol patient, incorporating all of your customary quality assurance checks.**

#### DOSE PRESCRIPTION:

The doses to be delivered to the phantom are a factor of 10 less than the protocol dose specifications, namely:

- Primary PTV.
  - 6.6 Gy to at least 95% of the PTV and
  - < 1% of the PTV receives < 93% of the prescribed dose.
- Secondary PTV (Node or Salivary gland):
  - 5.4 Gy to at least 95% of the PTV and
  - < 1% of the PTV receives < 93% of the prescribed dose.
- Organ at risk:
  - < 4.5 Gy, maximum dose.
- Normal tissue:
  - ≤ 110% of the prescribed dose (6.6 Gy).

## IRRADIATING THE PHANTOM

- Material included in box:
  - Head Phantom, with 1 or 2 TLD capsules taped to each ear.
  - Phantom insert (already place on head phantom)
  - Envelope with background film (hidden from your view; please don't try to find it)
  - Pillbox to accept TLD from phantom ears.
  - FedEx prepaid return label
  - TLD block and irradiation table. (Please irradiate this at the time you irradiate the phantom.)
- The adjustment screws in the back of the phantom base should make the phantom adaptable to most head holders.

### Procedures:

1. This phantom has only one insert. The same insert is used for both imaging and for treatment.
2. Make sure that there is 2TLD capsules taped into each ear. If they have come out, please tape them back in. They will remain in for the imaging process, then be removed so as to determine background for the Therapy TLD in the insert.
3. CT scan the phantom as you would a patient. You may wish to scan with 1.5 mm slices especially near the center to better identify the TLD capsules. Rotate the adjustment screws to support and position the phantom.
4. **REMOVE THE TLD CAPSULES FROM THE EARS.** Place in a pillbox labeled "ear TLD".
5. Segment the phantom images contouring the skin, primary and secondary planning target volumes (PTVs) and the organ at risk (OAR) analog (posterior to the primary target volume crescent) and all 8 TLD volumes. TLD are in the locations shown in the diagram superior and inferior to the axial film.

Please use the following names for your contours:

PTV\_66 for the 1° PTV

PTV\_54 for the 2° PTV

CORD for the OAR

66\_Sant\_TLD and 66\_Iant\_TLD for the superior and inferior anterior TLDs in the 1° PTV

66\_Spost\_TLD and 66\_Ipost\_TLD for the superior and inferior posterior TLDs in the 1° PTV

SCORD\_TLD and ICORD\_TLD for the superior and inferior TLDs in the OAR

S54\_TLD and I54\_TLD for the superior and inferior TLDs in the 2° PTV

- The dimensions of the TLD volume are approximately 10 mm long by 2 mm diameter
  - The outside dimensions of the TLD capsules are 15 mm long by 4 mm diameter, the TLD axis lies in a sagittal plane. (Both the capsules and the TLD should be visible on CT image)
6. Plan the treatment as specified in the DOSE PRESCRIPTION above.
  7. Perform your customary QA of the IMRT plan prior to irradiating the phantom.
  8. Irradiate TLD block according to the instructions provided. Not applicable for Tomotherapy machines.
  9. Treat the phantom with the developed plan as you would an actual patient. .
  10. Make sure that the "ear TLD" pillbox is on the box.
  11. Include the dosimetry data discussed above. Complete the attached forms. Isodose lines should include at least the following: 6.6, 5.4, 5, 4.5, 4, 3.5 Gy.
  12. Return the complete package using FedEx prepaid label provided in the case.

## Head and Neck Phantom - Institution Information

Institution: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Person performing irradiation: \_\_\_\_\_

Physicist to receive report: \_\_\_\_\_

Email address: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Person to call in case of questions: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Email address: \_\_\_\_\_

### **Treatment Unit used for irradiation:**

Manufacturer: \_\_\_\_\_ Model (Head model if Elekta): \_\_\_\_\_

In-house specification: \_\_\_\_\_ Serial number: \_\_\_\_\_

Photon Energy Nom \_\_\_\_\_ (MV) FFF beam \_\_\_\_\_ SRS beam \_\_\_\_\_

### **Intensity Modulation Device:**

\_\_\_ Multileaf Collimator: Model: \_\_\_\_\_

\_\_\_ Other: \_\_\_\_\_

### **IMRT Technique:**

\_\_\_ Segmental (step and shoot) MLC      \_\_\_ Dynamic MLC      \_\_\_ Tomotherapy

\_\_\_ VMAT      \_\_\_ Rapid Arc      Other: \_\_\_\_\_

**Please enclose original copies of your treatment plans. Include the slices where the films are and scaling factors.**

**Treatment Planning System:**

Manufacturer: \_\_\_\_\_ Model: \_\_\_\_\_ Algorithm \_\_\_\_\_

Software: \_\_\_\_\_ TPS Version: \_\_\_\_\_

**Treatment of Phantom:**

Date of Irradiation: \_\_\_\_\_

Indicate the dose delivered to the TLD as determined by your treatment planning computer

TLD	Mean Dose(Gy)	Min Dose(Gy)	Max Dose(Gy)
Ant 1° PTV superior(66 Sant)			
Ant 1° PTV inferior (66 I ant)			
Post 1° PTV superior (66 S post)			
Post 1° PTV inferior (66 I post)			
2° PTV superior (S54)			
2° PTV inferior (I54)			
Organ at risk superior (S cord)			
Organ at risk inferior (I cord)			

Results of IMRT QA (please attach copies of measurement data): \_\_\_\_\_

Did you adjust the MU based on these results? \_\_\_\_\_ If so, how much? \_\_\_\_\_

Did you irradiate the phantom in service or clinical mode? \_\_\_\_\_

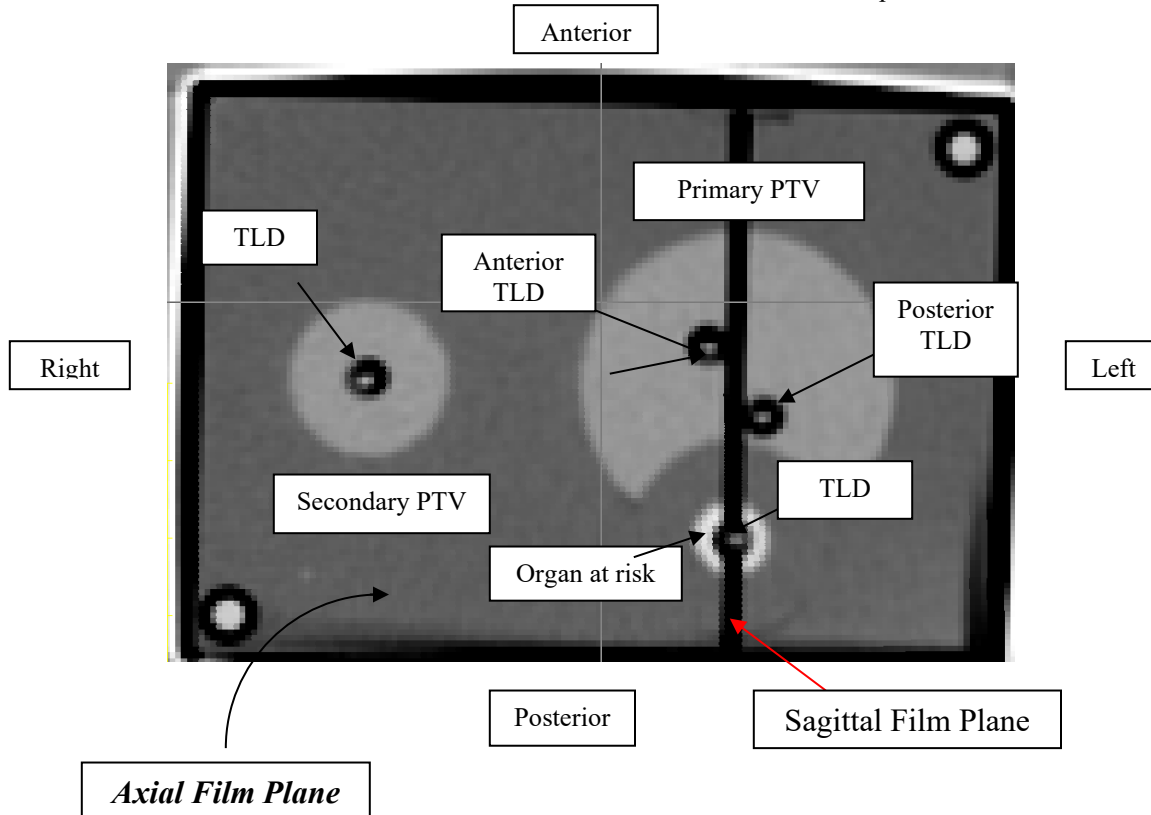
Did you use your record and verify system? \_\_\_\_\_

Attach copies of the treatment plan including a plan in the axial and sagittal film planes

Comments: \_\_\_\_\_

For Office Use Only	Batch TLD EBT3 LOT #	Phantom ID # H&N	Code Inst#	Date Sent	Date Rec'd

This is a cross sectional view of the insert. The TLD are located superior and inferior to the axial film.



### Notes:

- For H&N # 2 and #4 The Primary PTV is on the right side
- You need to deliver 6.6 Gy to the 1<sup>o</sup>PTV (in 1 or more fraction). Total dose to the 1<sup>o</sup>PTV 6.6 Gy.
- Please do not write on the phantom, you are welcome to use masking tape to aid on the localization, make sure to remove the tape after irradiation.
- There is 4 TLDs on the ears, 2 on each ear, please don't forget to remove all of them.

*Thanks  
Phantom team*