

IROC Head and Neck Phantom

Guidelines for *Planning and Irradiating* the IROC IMRT Phantom.

Revised April 2014

The IROC Houston is requesting that each institution keep the phantom for two weeks. During this time, the institution will image, plan, and treat the phantom and return it to the IROC Houston. Thank you for your cooperation.

This phantom has been designed and constructed by the IROC Houston

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). The guidelines for dose delivery were written by Mike Gillin

If you have any questions, please contact the appropriate person.

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DOSIMETRY INFORMATION TO BE SUBMITTED:

The following information is to be submitted to the IROC (include in the shipping box):

- Original hard-copy isodose distributions in the axial and sagittal planes through the target volume. Please ensure that each plane fills an entire page and that a scale is printed on the page.
 - The axial plane is essentially the central plane and contains the axial film.
 - The film in the sagittal plane is easily seen in the CT scans.
- A completed **IROC Head and Neck Phantom-Institution Information** form.
- A copy of results of all film and ion chamber QA measurements.

The following information is to be submitted to the IROC:

Please follow the login URL:

<https://mdandersonorg.sharefile.com>

and the log in information below to submit the digital treatment planning data in the DICOM format which include all CT slice, 3D composite dose file, structure and plan file.

Username: trangnguyen@mdanderson.org

Password: Phantom8989

- To create a new folder, select the **Add Folder** tab on the top right hand site of the screen. In the **folder name** box, enter your institution name, city and state then click **Create Folder**.
- Select the folder that you have created, then select **Upload Files** tab on the right hand site. Follow the instruction and upload your file.
- Please log out once you finish and inform the RPC by email trangnguyen@mdanderson.org.

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

- 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 2 TLD capsules taped to the ears.
 - Phantom insert
 - Rubber hose (optional)
 - Envelope with background film (hidden from your view; please don't try to find it)
 - Pillbox to accept TLD from phantom ears.
 - Mailing label to return case to RPC at RPC cost.
 - Traditional RPC TLD block and irradiation table. (Please irradiate this at the time you irradiate the phantom.)
- Adjust the head so that the axial film is perpendicular to the table.
- The adjustment screws in the back of the phantom base should make the phantom adaptable to most head holders.

Procedures:

1. Fill with water:
 - 1.1. Remove both PVC plugs from the base of the phantom.
 - 1.2. Thread the rubber hose into one of the filler holes.
 - 1.3. Fill slowly with water (the rubber hose stretches over most faucets). You may need to jiggle the head to release air trapped in the nose etc.
 - 1.4. Remove hose and replace PVC plugs.
2. Allow the phantom to sit with water in it for 20 min. to check for leaks.
3. Look in the insert space and check for water leakage. If you find any water call the RPC. If not, proceed to the next step.
4. This phantom has only one insert. The same insert is used for both imaging and for treatment. To position the insert, unscrew green nuts. NOTE: align the two red arrows. This places the "organ at risk" posterior to the primary target, and the secondary target to the right (phantom #1, 7-15) or left (phantom 2-5) of the primary target.
5. Screw green nuts back; make sure the insert holders hold the insert in place.
6. Make sure that there are two TLD 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.
7. 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.
8. **REMOVE THE TLD CAPSULES FROM THE EARS.** Place in a pillbox labeled "ear TLD".
9. Remove insert from head during planning process. Store insert in a dry place where it will not be irradiated.
10. 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)
11. Plan the treatment as specified in the DOSE PRESCRIPTION above.
12. Perform your customary QA of the IMRT plan prior to irradiating the phantom.
13. Irradiate the RPC TLD block according to the instructions provided.
14. Look in the insert space and check for water leakage. If you find any water call the RPC. If not, load the insert into the head.
15. Treat the phantom with the developed plan as you would an actual patient. Try to avoid positioning the axial film at the abutment of adjacent MLC leaves or adjacent arcs. Abutting fields or leaves on the film may increase the uncertainty of the measurement.
16. Drain the water.
17. Remove the insert and place it in the box.
18. Please verify that there is no water in the insert space. If you find any water call the RPC.
19. Screw in the two water plugs. Leave the plugs loose.
20. Put the empty phantom in the box.
21. Make sure that the "ear TLD" pillbox and the rubber hose are in the box.
22. Include the dosimetry data discussed above. Complete the attached forms. Be sure to include the scale used on the images coming from your TPS. Isodose lines should include at least the following: 6.6, 5.4, 5, 4.5, 4, 3.5 Gy.
23. Return the complete package to the RPC.

IROC Head and Neck Phantom- Institution Information

Please email the IROC , at IROCHouston@mdanderson.org to let us know when you are going to irradiate the phantom. We will irradiate TLD standards to meet your schedule. Please include on the subject: irradiation of IMRT head and neck phantom.

Institution: _____

Address: _____

Person performing irradiation: _____

Physicist to receive report: _____

Oncologist to receive report: _____

Person to call in case of questions: _____

Phone Number: _____ Fax Number: _____

Email address: _____

Treatment Unit:

Manufacturer: _____ Model: _____

In-house specification: _____

Photon Energy Nom _____(MV) IR (TMR 20/TMR 10): _____ %dd(10)_x _____

Intensity Modulation Device:

___ MIMIC ___ Multileaf Collimator ___ Solid Attenuator Modulation

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. FTP the digital treatment plan.

Treatment Planning System:

Manufacturer: _____ Model: _____ Algorithm _____

Software: _____ Version Number: _____

Treatment of Phantom:

Date of Irradiation: _____

Dose specified is to: _____ Muscle _____ Water

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? _____

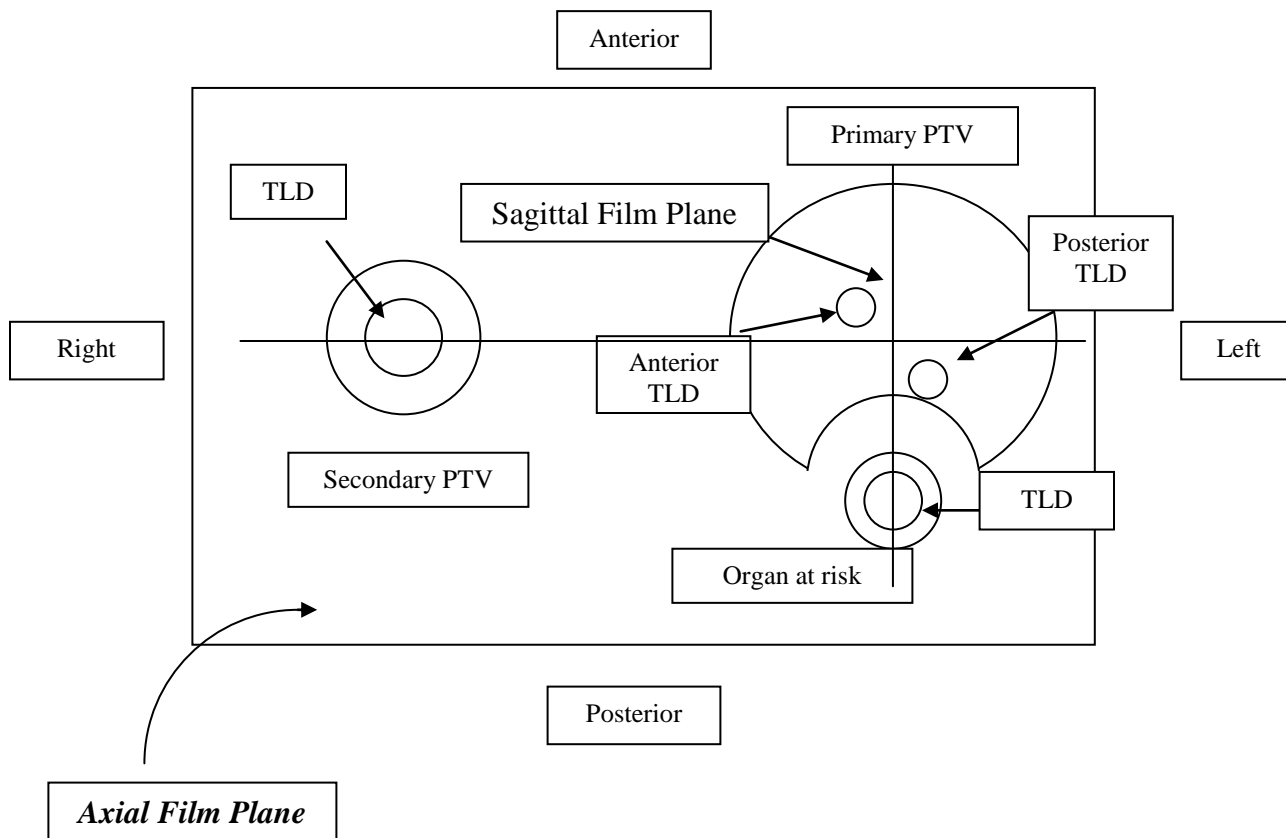
Did you use your record and verify system? _____

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

Comments: _____

For Office Use Only	Batch TLD 11 Film batch 07301301	Phantom ID #	Code	Date Sent	Date Rec'd

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



Note: You need to deliver 6.6 Gy to the 1^oPTV (in 1 or more fraction).

Total dose to the 1^oPTV 6.6 Gy

Thanks

Phantom team @ IROC Houston