



Proton Therapy Questionnaire

This questionnaire requests data specific to the beam lines and conditions you will use for patients on NCI sponsored clinical trials. Do not try to be comprehensive for your entire facility; replies should be pertinent to patients on pediatric and adult clinical trial group protocols sponsored by the NCI. Recognizing the rapid development of proton techniques, this questionnaire shall be completed each year concurrent with the TLD irradiations from the RPC.

(Please number attachments that are needed to clarify specific procedures.)

Institution: _____

Address: _____

RTF No. (from TLD report): _____

Person completing this questionnaire (please provide your contact information)

Name: _____ Phone _____
email _____

Radiation Oncologist (Please provide the information for one key contact person)

Name: _____ Phone _____
email _____

Physicist (Please provide the information for one key contact person)

Name: _____ Phone _____
email _____

Dosimetrist (Please provide the information for one key contact person)

Name: _____ Phone _____
email _____

Maintenance (Please provide the information for one key contact person)

Name: _____ Phone _____
email _____

Date Completed: _____

A. Experience

A1. For the following sites, approximately how many adult patients have you treated in the last 12 months?

Brain _____ Head and Neck _____ Abdomen _____
Thorax _____ Pelvis _____

A2. Do you treat pediatric cases with protons? yes, no
If yes, how many have you treated in the last 12 months? _____

A3. If you treat pediatric cases, are you capable of providing anesthesia? yes, no
If yes, what percentage of your pediatric caseload is treated under anesthesia? _____ %

B. Calibration and Dose Verification:

B1. What calibration protocol is followed for proton beam calibrations?
 TRS-398, ICRU-59, ICRU-78, other (describe) _____

B2. Dose is specified in: water, other (describe) _____

B3. What devices are used for the absolute dose calibrations? (specify make, model and serial number)

Device	Manufacturer	Model	Serial Number
Ion Chamber			
Electrometer			
Thermometer			
Barometer			

NOTE: Attach a copy of the most recent ADCL calibration report for the chamber and electrometer.

B4. What is the date of your most recent TLD report from the RPC? _____

B5. For what percentage of patient proton treatment fields is the dose per monitor unit checked by physically measuring dose in the beam? _____

B6. When the dose per monitor unit is checked with a physical measurement is:
a) the patient aperture used? _____ always _____ sometimes _____ never
b) a standard aperture used? _____ always _____ sometimes _____ never
c) no aperture used? _____ always _____ sometimes _____ never
d) the patient bolus used? _____ always _____ sometimes _____ never

- e) a substitute flat bolus used? _____ always _____ sometimes _____ never
 f) no bolus used? _____ always _____ sometimes _____ never
 g) additional explanations _____

B7. For what percentage of patient proton treatment fields are the depth dose or lateral profile distributions physically measured in the beam? _____

B8. When the depth dose and/or lateral dose profiles are checked with a physical measurement is:

- a) the patient aperture used? _____ always _____ sometimes _____ never
 b) a standard aperture used? _____ always _____ sometimes _____ never
 c) no aperture used? _____ always _____ sometimes _____ never
 d) the patient bolus used? _____ always _____ sometimes _____ never
 e) a substitute flat bolus used? _____ always _____ sometimes _____ never
 f) no bolus used? _____ always _____ sometimes _____ never
 g) additional explanations _____

B9. Describe how the dose per monitor unit is validated when measurements are not performed in the beam.

B10. What dose parameter is used for patient treatments?
 Dose to water (Gy), Dose multiplied by RBE (Gy*RBE)

B11. If dose*RBE is used, what value for RBE is applied?
 1.1 other (specify) _____

B11. What nomenclature is used to record the dose in the chart?
 Gy, Co-Gy-Eq, CGE, Gy_{RBE}, other (specify) _____

C. Proton Accelerator:

C1. Is your proton accelerator a: cyclotron, synchrotron, synchrocyclotron, other?

C2. Manufacturer: _____

Model: _____

C3. Proton nominal maximum energy (entering radiation head): _____ MeV

C4. How many beam lines in clinical operation could be used for treating patients entered on NCI clinical trials? _____ For each please complete below.

Item	examples	beamline 1	beamline 2	beamline 3	beamline 4
What is your facility's name for this beam line	<i>A3 Green Room</i>				
From what orientations can the beam be directed?	<i>360° gantry horizontal only</i>				
How are fields spread laterally? (If scanning beam, please describe available spot sizes.)	<i>passive scattering active scattering uniform scanning modulated scanning</i>				
For the maximum nominal energy, what is the maximum field size at the nominal isocenter for 10 cm modulation	<i>25 x 25 cm</i>				
For the maximum nominal energy, what is the maximum depth in water that can be treated with a 10 cm x 10 cm field with 10 cm modulation?	<i>27.5 cm</i>				
For the maximum nominal energy, what is the doserate for a 10 x 10 cm field with 10 cm modulation?	<i>1.2 cGy/min</i>				
What parameter is called 100% dose?	<i>average dose in SOBP dose at center of SOBP</i>				
What method of range modulation is used?	<i>Enter one or more codes from note below</i>				
How is the modulation width defined?	<i>proximal 95%</i>				
	<i>distal 90%</i>				
Are there cases where a ripple filter is used?	<i>yes/no</i>				
For the 10 x 10 cm field above, what is the lateral dose	<i>+/- 3 %</i>				

uniformity (with respect to 100%?)					
Are range compensators used to vary penetration of beam across the field?	<i>Yes/no</i>				
If so, what material is used?	<i>Acrylic wax</i>				
What kind of patient specific beam collimation is used?	<i>apertures MLC none</i>				
Is this beam line capable of modulated scanning?	<i>Yes/no</i>				
If yes, is modulated scanning used for patients on NCI supported clinical trials?	<i>Yes/no</i>				
If modulated scanning is used, how long does it take to irradiate a 10 cm x 10 cmmm x 10 cm target volume that has a distal depth of 20 cm of water to 1 Gy	<i>minutes</i>				

Note: Use these codes to describe methods of range modulation that might be used for protocol patients:

1. rotating stepped rangeshifter (modulator wheel or propeller)
2. beam current modulation
3. ridge filter
4. energy stacking
5. spot scanning
6. upstream rangeshifter
7. Other (describe) _____

C5. What method of specifying dose uniformity within the modulated region is used? (e.g. relative to nominal center of modulation, relative to measured center of modulation, relative to average dose within modulated region, etc.)

C6. Please provide a clear description of the QA procedures used for patient specific collimation devices including the acceptability criteria.

C7. Please provide a clear description of the QA procedures used for patient specific range compensator devices including the acceptability criteria.

C6. For each beam applicator (cone) available, please supply the shape (circle, square, other), maximum field size supported, maximum range, and typical clinical dose rate at maximum field size and maximum range for 6.0 cm of range modulation.

Beam Applicator ID	Shape	Max Field Size [mm]	Max Range [mm water]	Dose Rate [Gy/min]

D. Treatment Planning:

D1. What planning system/software and version is used for proton treatment planning?
 manufacturer: _____ model: _____ version: _____

D2. If patients receive both proton and photon beams as part of their treatment, is the photon planning done on the same system as the proton planning? yes, no
 If no, how are the dose distributions summed?

If yes, are the proton and photon portals part of the same plan? yes no

D3. In what format can your proton planning system digitally export CT images, structures, and dose matrix?
 DICOM RT format RTOG format

D4. Can your planning system export a composite plan of photons and protons?
 yes in DICOM RT format yes in RTOG format no

D5. What CT scanner(s) is(are) used for proton therapy patients? For each, complete the table:

Scanner name		
Imaging protocol name		
Helical? (y or n)		
kVp		

D6. Does your planning system allow CT number scaling for different CT scanners or patients?
 yes, no If no, what procedures are used to account for CT number dependencies on patient size, shape, etc.? _____

D7. How are CT numbers used for penetration calculations?
_____ direct from CT# to RLSP (user input)
_____ CT# to mass density (user input), then mass density to RLSP (pre-programmed)
_____ CT# to tissue group and mass density (user input), then to RLSP (e.g. Monte Carlo)
_____ other (describe) _____

D8. How was the conversion of CT data to proton range verified? _____

D9. Does your planning system allow different conversion of CT data to relative stopping power for different CT scanners or scanning techniques?
 yes, no

D10. What is the method and frequency of verification of your CT scanner(s) number reproducibility?

D11. Is 4D CT available for your proton patients? yes, no
If yes, for which sites is 4D CT used? _____

Describe how it is used (e.g. respiratory gating using RPM)

D12. For the following sites, what margin in the directions perpendicular to the beam axis do you usually use:
Brain _____ mm Head and neck _____ mm
Abdomen _____ mm Thorax _____ mm
Pelvis _____ mm

D13. Describe the method(s) you use to account for the uncertainties in the required penetration of the proton beam, i.e. how do you create the treatment margin in the direction of the beam?

D14. How are isodose plans normalized (What dose or point is assigned 100%)?

D16. To what isodose surface are proton treatments usually prescribed for the following sites?

brain _____%	abdomen _____%
head and neck _____%	pelvis _____%
thorax _____%	extremities _____%

E. Immobilization

Please provide a clear description of your immobilization techniques for treatments in the:

E1. Head and neck

Is a rigidly attached bite block routinely used? yes, no

E2. Thorax

E3. Pelvis

E4. What are your procedures for immobilization of pediatric cases.

F. Patient Positioning

F1. Describe your imaging system(s).

F2. How is the patient's anatomy localized with respect to the treatment field?

orthogonal kV x-ray images compared to DRRs

kV x-ray BEV portals compared to DRRs

kV cone-beam CT images compared to planning CT

other (please be specific) _____

F3. Is the alignment verified after the localization and repositioning of the patient?

Adults yes, no

Pediatrics yes, no

F4. Do you use implanted fiducial markers for patient alignment? yes, no

If yes, for which sites? _____

Of what material are the markers made? _____

What size are the markers? _____

F5. Is the correlation of agreement between the verification imaging and image information from the planning CT handled as a computerized process that generates shifts of the patient support system? yes, no

If yes, what software? _____

F6. What are your setup tolerances? That is, what are the acceptable disagreements between the verification imaging and the planning imaging before treating?

brain _____ abdomen _____

head and neck _____ pelvis _____

thorax _____ extremities _____

F7. How frequently is position verification performed?

before every treatment

first treatment and then weekly

other, please describe _____

G. QA Procedures

G1. Describe the equipment used for daily beam output checks.

Equipment: _____

What is the acceptable variation? \pm _____ %.

G2. Describe the equipment and frequency used for physicist(in addition to daily) beam output checks.

Frequency: weekly, monthly, annually, other (describe)

Equipment: _____

What is the acceptable variation? \pm ____ %.

G3. Describe the frequency and equipment used to verify transverse beam profiles.

Equipment: _____

Frequency: daily, weekly, monthly, annually, other (describe)

What is the acceptable variation within the uniform dose region? \pm ____ %.

G4. Describe the frequency and equipment used to verify the transverse beam penumbra width.

Equipment: _____

Frequency: daily, weekly, monthly, annually, other (describe)

What penumbra definition is used for QA? ____ % to ____ %.

What is the acceptable deviation from the standard penumbra width? ____ mm.

G5. Describe the frequency and equipment used to verify beam depth dose profiles.

Equipment: _____

Frequency: daily, weekly, monthly, annually, other (describe)

G6. For the definition of modulation width in C4 above, what is the acceptable variation in proximal peak position? ____ mm.

In distal peak position? ____ mm.

What distal penumbra definition is used for QA? ____ % to ____ %.

What is the acceptable deviation from the standard distal penumbra width? ____ mm.

Return completed questionnaire to:

Physics Division
QARC
Suite 201
640 George Washington Highway
Lincoln, RI 02865-4207
Phone: (401) 753-7600
FAX: (401) 753-7601
Email: Physics@QARC.org