myQA iON 2.1 Beam Data Requirements For Proton Site

SITE INFORMATION

Institution Name	
IBA Dosimetry customer number	
Institution address	
Contact person	
Phone	
Email	

To initiate the beam modelling process, please submit both the "Data Requirements" sheet along with all relevant measurement files (scans) associated with all Proton treatment machine commissioned energies to be verified.

TREATMENT DEVICE DATA

Proton Treatment Machine Vendor & Model (please specify the TreatmentMachineName in the DICOM RTPlan)	
CT Scanner Vendor & Model (Please specify the StationName and SeriesDescription in the DICOM CT image)	
Treatment Planning System, Version)	

COMMISSIONING MEASUREMENTS DATA

To generate the beam model for myQA iON, we would need the machine commissioning measurements data (exported .csv format data files from RayStation – RayPhysics module or .txt format files from Eclipse TPS) as below:

☐ Integrated Depth Dose (IDD) profiles of single spot beams for all commissioned energies which are usually measured in water with large ionization chambers (IC), for example, by using, Blue Phantom 2 or Blue Phantom PT with Stingray and Stealth. Please specify the model and the diameter of IC used for measurements.

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dosimetry-info@iba-group.com | www.iba-dosimetry.com | Registration Court: Local Court (Amtsgericht) Nürnberg, HRB 4262
Managing Directors: Olivier Legrain, Jean-Marc Bothy, Soumya Chandramouli | VAT Reg No: DE132815519 | St.-Nr. 241/115/72638
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☐ The 2D fluence map of a single spot beam (the 2D spot profiles in both inline and crossline directions) measured in air for each commissioned energy. This measurement should be repeated at N different distances from isocenter (at least N=3, including the isocenter itself, upstream and downstream) in air by using a fluorescent screen combined with a CCD-camera or flat panels, for example, Lynx or myQA Phoenix.

☐ The absolute dose delivered per MU for each commissioned energy, which are usually measured in water at a given depth in the middle of a uniform field (for example, 10×10 cm^2) by using a small parallel plate ionization chamber (PPIC), for example, the PPC05 within Blue phantom 2 or Blue Phantom PT. Please specify the model and the diameter of the PPIC used for measurements. Please specify also whether the measured dose is physical or biological effective dose (RBE dose), *depth of measurement points for each commissioned energies, depth of isocenter during measurements, field size, spot spacing, SAD and IC correction factor (only for Eclipse)*

☐ Machine Data Summary: The Virtual SAD in both X and Y axis (aka. Focal Length X and Y or Scanning Magnet Position X and Y), Distance from isocenter to nozzle exit, Range Shifter Information (each Range Shifter ID, material, physical thickness and density, and measured Water Equivalent Depth/Thickness)

CT CALIBRATION

To generate the CT calibration (Scanner) for MC calculation with MCsquare in patient anatomy, there will be 2 curves that needs to be generated per scanner (for Eclipse users, Hounsfield Units to Stopping Power Ratios might also be needed). To generate those curves, the detailed CT calibration reports of all CT scanners (for creating all Proton CT simulation Imaging Protocols) using Gammex or CIRS phantom must be provided by the user, including the following raw measurement data with all material inserts:

☐ Gammex Phantom OR ☐ CIRS Phantom

- ☐ Material name of each insert
- ☐ Element composition of each insert
- ☐ Measured Hounsfield Unit number of each insert
- ☐ Mass Density of each insert

Hounsfield Units (HU) to mass density (g/cm^3). Here is an example

```
# ===================
# HU    density g/cm3
# ===================
-2000          0.001
-1000          0.001
-739           0.28
-628           0.4
-97            0.942
-52            0.977
0              1.000
14             1.053
70             1.097
213            1.143
220            1.154
588            1.335
```


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```
1046            1.560
1565            1.825
5000            1.825
```

HU to material. The HU to type of materials conversion model must be defined as a list of pairs of HU values and material ID. Usually we use the material listed in the example below by default.

```
# ===================
# HU    Material label
# ===================

-1050   39              # Schneider_Air
-950    40              # Schneider_Lung
-120    41              # Schneider_AT_AG_SI1
-82     42              # Schneider_AT_AG_SI2
-52     43              # Schneider_AT_AG_SI3
-22     44              # Schneider_AT_AG_SI4
8       45              # Schneider_AT_AG_SI5
19      46              # Schneider_SoftTissus
80      47              # Schneider_ConnectiveTissue
120     48              # Schneider_Marrow_Bone01
200     49              # Schneider_Marrow_Bone02
300     50              # Schneider_Marrow_Bone03
400     51              # Schneider_Marrow_Bone04
500     52              # Schneider_Marrow_Bone05
600     53              # Schneider_Marrow_Bone06
700     54              # Schneider_Marrow_Bone07
800     55              # Schneider_Marrow_Bone08
900     56              # Schneider_Marrow_Bone09
1000    57              # Schneider_Marrow_Bone10
1100    58              # Schneider_Marrow_Bone11
1200    59              # Schneider_Marrow_Bone12
1300    60              # Schneider_Marrow_Bone13
1400    61              # Schneider_Marrow_Bone14
1500    62              # Schneider_Marrow_Bone15
```

Each row defines the beginning of a new material. The same material is thus assigned to all voxels having a HU ranging from its specified HU up to the next row HU. For example, with the example above, HU between -1050 and -951 (included) will be assigned to the ID 39, which corresponds to the Schneider Air material.

If you'd like to add other materials, please provide us the stoichiometric calibration of the CT scanner done by your own to generate new HU-Material conversion with the two-step method provided originally proposed by Schneider et al. in 1996[1], then revisited for Monte Carlo simulation in 2000[2].

[1] Schneider U, Pedroni E, Lomax A, The calibration of CT Hounsfield units for radiotherapy treatmentplanning,Phys. Med. Biol., 1996; 41:111-124.

[2] Schneider W, Bortfeld T, Schlegel W, Correlation between CT numbers and tissue parameters neededfor Monte Carlo simulations of clinical dose distributions,Phys. Med. Biol., 2000; 45:459-478.

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COMMENTS

Please use this space to share any additional information about your measurements with IBA Dosimetry.

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I confirm that the data and measurements are correct to my knowledge.

Customer Signature: ____

Printed Name: ____

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