

# Delta<sup>4PT</sup>

Plastic Water<sup>®</sup> version



## Delta<sup>4PT</sup> Plastic Water version offers:

- Consistent water equivalent QA from calibration to plan verification
- Immediate plan verification
- Highest accuracy in dose determination
- Water equivalence in diagnostic and therapeutic energies

# Water equivalent QA

Pre-treatment verification using phantoms with non-water equivalent material is widely used in clinical practice. However, some dose calculation algorithms require extra attention when using these materials. Special consideration must be taken into account regarding:

- Density scaling artifacts <sup>[1]</sup>
- Non-appropriate scatter from material with density  $>1 \text{ g/cm}^3$  <sup>[2,3]</sup>
- Absence of phantom material as a separate entry in the HU-electron density conversion table <sup>[4]</sup>

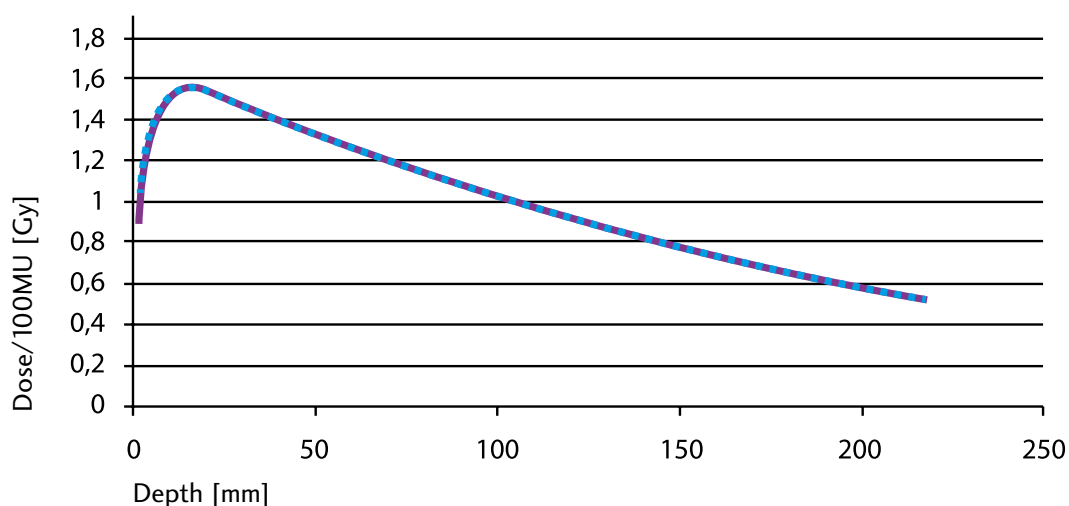
These factors may contribute to reduced accuracy in the dose determination in the phantom. Using a water equivalent phantom material eliminates these uncertainties and also provides consistency maintained in QA from calibration to patient QA.

The Delta<sup>4PT</sup> phantom is available with Plastic Water<sup>®</sup> DT material. The material has been chosen because of its capability to simulate water within a wide energy range <sup>[5]</sup>.

For clinics who base all dosimetry on water and want to stay consistent, the Delta<sup>4PT</sup> Plastic Water version is the system of choice <sup>[6]</sup>.



- Data based on Delta<sup>4PT</sup> Plastic Water unit
- Data based on HU=0 (water)



## Reference

- <sup>1</sup> Dickof P. Density scaling artifact in dosimetry calculations. *Journal of Applied Clinical Medical Physics*, vol 6, No. 3, summer 2005
- <sup>2</sup> Bedford J L, Hansen V N, Lee Y K, Warrington A P. Accurate verification of IMRT and VMAT in PMMA diode array phantom. *Radiotherapy Oncology Vol 96 Suppl 1 (ESTR 2010)*, 1321 poster 447
- <sup>3</sup> Bedford J L, Childs P J, Hansen V N, Moseleh-Shirazi M A, Verhaegen F, Warrington A P. Commissioning and quality assurance of the Pinnacle3 radiotherapy treatment planning system for external beam photons. *The British Journal of Radiology* 76 (2003), 163-176
- <sup>4</sup> Appendix "Validation of Oncentra Photon Dose using PMMA Phantoms". D192.739ENG-04 Oncentra MasterPlan – Physics and Algorithms
- <sup>5</sup> Heaton R et al. Dosimetric Evaluation of Plastic Water-Diagnostic Therapy. Poster PO-T-97, AAPM (2003)
- <sup>6</sup> Matzen T, Isacsson U, Medin J. Plastic Water as phantom material during pre-treatment verification. *Radiotherapy and Oncol*, 99 no 1 (suppl.) (2011) p. 5-5.

# Technical specification

Cylindrical phantom material                      Plastic Water® DT

Calibration phantom material                      Plastic Water® DT, Back- and sidescatter in PMMA

## Detectors:

|  |                                     |
|--|-------------------------------------|
| Type   | p-Si                                |
| Total number   | 1069                                |
| Maximum deviation of detection point relative to markings on the phantom | 0.5 mm                              |
| Detection area per plane   | 20 x 20 cm                          |
| Distance between detectors   |                                     |
| Central area (6x6cm)   | 5 mm                                |
| Outer area (20x20cm)   | 10 mm                               |
| Size (radial x axial)  | 1 x 0.05 mm (0.04 mm <sup>3</sup> ) |
| Shape  | Disc                                |
| Dose range   | 1mGy to unlimited                   |
| Dose resolution  | 50 nGy                              |
| Sensitivity decrease (6MV beam)  | 0.8% per kGy                        |
| SVWT (Temp. dependency)  | 0.27% /degree                       |

## Size and weight Delta<sup>4PT</sup> unit:

|                   |       |
|-------------------|-------|
| Cylinder diameter | 22 cm |
| Cylinder length   | 40 cm |
| Total length      | 72 cm |
| Total weight      | 24 kg |

## Ordering Information:

| Part no.   | Description   |
|------------|---|
| SDOS102-00 | Delta <sup>4PT</sup> basic system Plastic Water® DT version including: <ul style="list-style-type: none"><li>• 3D detector arrays embedded in Plastic Water</li><li>• Plastic Water Measuring phantom</li><li>• Plastic Water Calibration phantom</li><li>• Delta<sup>4</sup> basic software for acquisition of data and analysis</li></ul> |
| SDOS102-14 | Ion chamber slab for Farmer type chamber 2571, Plastic Water  |
| SDOS102-15 | Ion chamber slab for Semiflex 0.3 ccm, Plastic Water  |
| SDOS102-16 | Ion chamber slab for A1SL, Plastic Water  |
| SDOS102-17 | Ion chamber slab for A12, Plastic Water   |
| SDOS120-95 | Upgrade to Plastic Water  |
| SDOS101-01 | Delta <sup>4VMAT</sup> option   |
| SDOS101-03 | Delta <sup>4DVH</sup> software option   |
| SDOS101-06 | Delta <sup>4DVH</sup> Professional software option  |
| SDOS101-08 | Delta <sup>4DVH</sup> Anatomy software option   |
| SDOS101-04 | Delta <sup>4Tomo</sup> option   |
| SDOS101-05 | Delta <sup>4MachineQA</sup> software option   |
| SDOS102-01 | Delta <sup>4PT</sup> Trolley  |
| SDOS102-02 | Delta <sup>4PT</sup> Extra cable set  |
| SDOS102-03 | Delta <sup>4PT</sup> Sagittal-Coronal support   |

*"We feel confident with Delta<sup>4PT</sup> Plastic Water since the dose planning process is straight forward: All calculations and measurements are performed as if the phantom was true water. In addition we can even CT-scan the Delta<sup>4PT</sup> Plastic Water phantom and thereby extend the verification process to the acquisition of CT data."*

Ulf Isacsson, PhD,  
Chief physicist, therapy section,  
Uppsala University Hospital



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## Headquarter

**ScandiDos AB**  
Uppsala Science Park,  
SE-751 83 Uppsala, Sweden  
**Tel** +46 (0)18-472 30 30  
**E-mail** Info@ScandiDos.com

## US Office

**ScandiDos Inc**  
2693 Research Park Drive, Ste. 202  
Madison, WI 53711, USA  
**Tel** +1 877 535 69 72  
**E-mail** Sales-US@ScandiDos.com

**Web** [www.ScandiDos.com](http://www.ScandiDos.com)