

Particle Therapy QA Tools

A complete range of tools for
reference dosimetry, machine QA
and patient plan verification

About Particle Therapy

More and more particle therapy centers, especially proton therapy centers, are being established to optimize radiation treatment for cancer patients.

In contrast to photons and electrons, protons or heavier particles exhibit improved accuracy for absorbed dose deposition due to the physical properties of these particles, such as limited scattering and a sharply defined maximum range. The depth of the target volume can easily be matched by means of the spread-out Bragg peak method, varying the energy of the particle beam.

Although most dosimetry tools used in classical radiotherapy centers can also be used in particle therapy centers, there are some specific requirements that are to be addressed. Modern beam scanning systems come with gantry systems, and as the beam energy is a very crucial quantity, the requested scanning precision may be higher than in classical radiotherapy.

The main standards dealing with particle therapy QA are IAEA's TRS-398 as well as the AAPM's TG-224 report.

Machine QA

Reference Dosimetry

Electrometer UNIDOS Tango

Highlights

- ▶ Premium electrometer exceeding IPEM and IEC 60731 standards
- ▶ New usability features like Intelligent Detector Recognition (IDR) and remote control
- ▶ Measurements with high precision and a resolution of 100 aA
- ▶ High-resolution 5" touchscreen with excellent readability from different angles
- ▶ Intuitive GUI in 9 languages
- ▶ Interface to Track-it via BeamDose
- ▶ Individual and password protected profiles with all device settings and detector parameters

Options

- ▶ MP1 1D Water Phantoms
- ▶ Stationary Water Phantom (T41023)
- ▶ RW3 Slab Phantom (T41023)
- ▶ BeamDose 2.0
- ▶ Track-it QA Data Management Software



Radiation Detectors for Reference Dosimetry



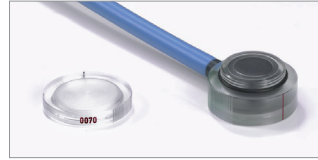
PTW Farmer® (30010*, 30013)
 Volume: 0.6 cm^3
 Field size:
 $(5 \times 5) \text{ cm}^2 \dots (40 \times 40) \text{ cm}^2$
 *non-waterproof



Semiflex 3D Chamber (31021)
 Volume: 0.07 cm^3
 Field size:
 $(2.5 \times 2.5) \text{ cm}^2 \dots (40 \times 40) \text{ cm}^2$



PinPoint 3D® Chamber
 (31022)
 Volume: 0.016 cm^3
 Field size:
 $(2 \times 2) \text{ cm}^2 \dots (40 \times 40) \text{ cm}^2$

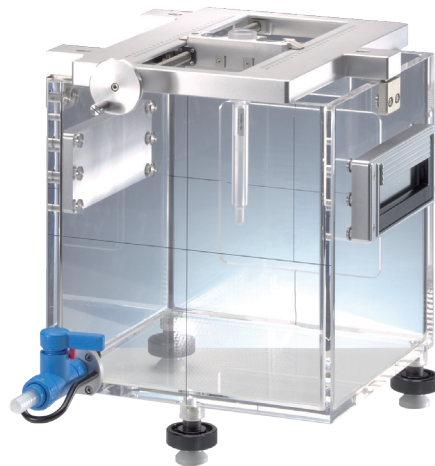


Advanced Markus® Chamber
 (34045)
 Volume: 0.02 cm^3
 Field size:
 $(3 \times 3) \text{ cm}^2 \dots (40 \times 40) \text{ cm}^2$

Available Phantoms



MP1 1D Water Phantoms (T41019/T41025)
 for reference dosimetry and measurement of depth dose curves, motorized or manual



Stationary Water Phantom (T41023)
 for reference dosimetry with horizontal beam incidence



RW3 Slab Phantom (T29672)
 water-equivalent for therapy dosimetry

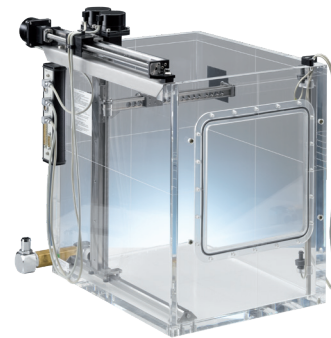
Relative Dosimetry

Water Phantoms

MP3-P and MP3-PL - Hi-Tech 3D Water Phantom Solution for Particle Therapy Treatment Machines

Highlights

- ▶ Versatile, application-specific solution, perfectly adapted to beam commissioning and QA requirements of particle therapy applications
- ▶ Appropriately sized, fully automatic 3D water tanks with parallel walls and a thin exchangeable entrance window for precise horizontal beam measurements. The scanning ranges for the MP3-P and MP3-PL are 380 mm vertically and 350 mm horizontally and 405 mm vertically and 500 mm horizontally respectively.
- ▶ Detector positioning accuracy true to 0.1 mm
- ▶ State-of-the-art TANDEM XDR dual-channel field class electrometer with extended measurement range also suitable for reference dose measurements
- ▶ Full line of accessories, including specially designed water tank, for true one-stop convenience
- ▶ Powerful BeamScan software with intuitive Navigator user interface and customizable multiple-queue drag & drop task lists
- ▶ Available on a SCANLIFT water reservoir and carriage



PEAKFINDER Water Column*

Tool for the very precise measurement of Bragg curves

Highlights

- ▶ Measures position of Bragg peak within (15 ... 350) mm with a spatial resolution of 10 μm
- ▶ Built-in monitor and measuring chambers
- ▶ Gate input for spill-by-spill measurements
- ▶ State-of-the-art TANDEM XDR dual-channel field class electrometer with extended measurement range also suitable for reference dose measurements

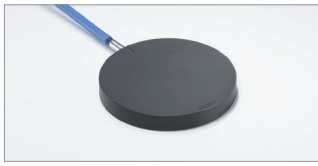


The PEAKFINDER water column is especially designed for highest precision peak detection of proton and heavy ion beams in particle therapy. It is a closed water column for scans up to 35 cm depth with increments of 10 μm . Because of its sealed construction it can be used in any spatial orientation. Windows allow a visible inspection of the column inside.

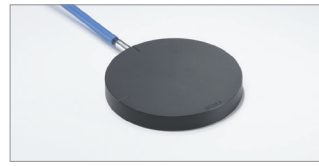
The signals of the built-in thin window Bragg peak chamber T34080 and the monitor chamber T34082 are read out by the TANDEM XDR electrometer. A TCP/IP interface is implemented for software control. The included PeakScan software package allows precise measurements and a detailed Bragg peak analysis.

* The PEAKFINDER Water Column is not available for sale in the USA.

Radiation Detectors for Relative Dosimetry



Bragg Peak Chamber (34070)
Active diameter: 81.5 mm
Field size:
diameter 3 ... 10 mm



Bragg Peak Chamber (34080)
Active diameter: 81.5 mm
Field size:
diameter 3 ... 10 mm



Bragg Peak 150 (34089)
Active diameter: 147 mm
Field size:
diameter 3 ... 10 mm



microDiamond® (60019)
Volume: 0.004 mm³
Field size:
(1 x 1) cm² ... (40 x 40) cm²



PinPoint® 3D Chamber (31022)
Volume: 0.016 cm³
Field size:
(2 x 2) cm² ... (40 x 40) cm²



Semiflex 3D Chamber (31021)
Volume: 0.07 cm³
Field size:
(2.5 x 2.5) cm² ... (40 x 40) cm²

Detector Arrays

OCTAVIUS Detector 1500 XDR and 1600 XDR

- ▶ Suitable for patient plan verification and machine QA of proton and heavy ion beams
- ▶ Outstanding detector and matrix design:
 - 1405 vented cubic ion chambers, uniformly arranged on a 27 x 27 cm² matrix (1500 XDR)
 - 1521 vented cubic ion chambers, arranged on a 15 x 15 cm² matrix (1600 XDR)
- ▶ Detector spacing:
 - 7.1 mm center-to-center, diagonals (1500 XDR)
 - 2.5 mm center-to-center central 6.5 x 6.5 cm² area, 5 mm center-to-center outer 15 x 15 cm² area (1600 XDR)
- ▶ No ageing effects by utilizing gold standard ionization chamber technology
- ▶ Absolute dose calibration in ⁶⁰Co beam
- ▶ Supported by the measurement and evaluation software programs VeriSoft, MultiCheck and BeamAdjust



The OCTAVIUS Detectors 1500 XDR and 1600 XDR are high resolution ion chamber matrix arrays for patient plan verification and quality control in radiation therapy with protons or heavy ions. Utilizing ion chambers avoids radiation defects, the major drawback of solid-state detectors. The vented plane-parallel ion chambers are 4.4 mm x 4.4 mm x 3 mm

(1500 XDR) and 2.5 mm x 2.5 mm x 2 mm (1600 XDR) respectively in size. The square chamber design of the OCTAVIUS Detector 1500 XDR offers 50 % field coverage and the design of the OCTAVIUS Detector 1600 XDR offers unique 100 % field coverage in the central region. Read out cycles of 100 ms provide the basis for real-time analysis of beam profiles.

PQASoft Machine QA Software

Highlights

- ▶ Source independent analysis software. Works with tiff, dicom and mcc image formats
- ▶ Works with PTWs OCTAVIUS Detector 1500 XDR and 1600 XDR ionization chamber arrays for a powerful, complete solution
- ▶ User-defined reference parameters, thresholds and/or tolerances
- ▶ Integrated tracking and trending tool
- ▶ Automatic pdf-format result documentation
- ▶ Export capability, integration with PTW Track-it software



PQASoft is a software to check the consistent performance of pencil beam scanning systems in particle therapy. It has been designed for easy e.g. daily checks of beam properties,

i.e. Beam Positioning, Spot Size and Shape, Field Flatness and Energy Constancy.

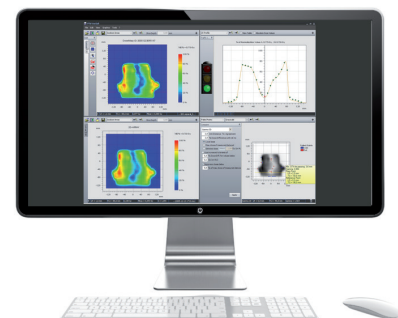
Patient QA

Plan Verification

VeriSoft - Patient Plan Verification Software

Highlights

- ▶ Patient plan verification software with advanced tools for measurement, dose comparison and evaluation
- ▶ Supports the use of all available PTW OCTAVIUS detectors necessary to verify treatment plans, including OCTAVIUS Detector 1500 XDR and OCTAVIUS Detector 1600 XDR
- ▶ Provides powerful 3D dose distribution comparison and evaluation tools to compare a treatment plan with a pre-treatment phantom measurement

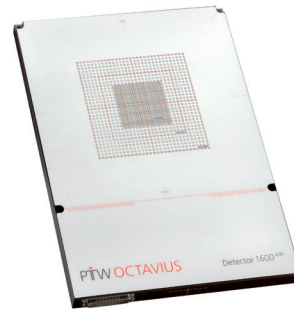


VeriSoft is a patient plan verification software with advanced tools for measurement, dose comparison and evaluation. In addition to all standard comparison tools VeriSoft gives you a

full range of advanced tools for the comparison in axial, sagittal and coronal planes.

Detector Arrays

For details on the ionization chamber arrays see page 5



Accessory

Holder (T40065)

This holder allows the positioning of the OCTAVIUS Arrays with a variable number of RW3 buildup plates so that patient verification measurements can be done for gantry angles 0°, 90°, 180° or 270° in depths adjustable in 1mm steps. The RW3 phantom (T29762) is required.

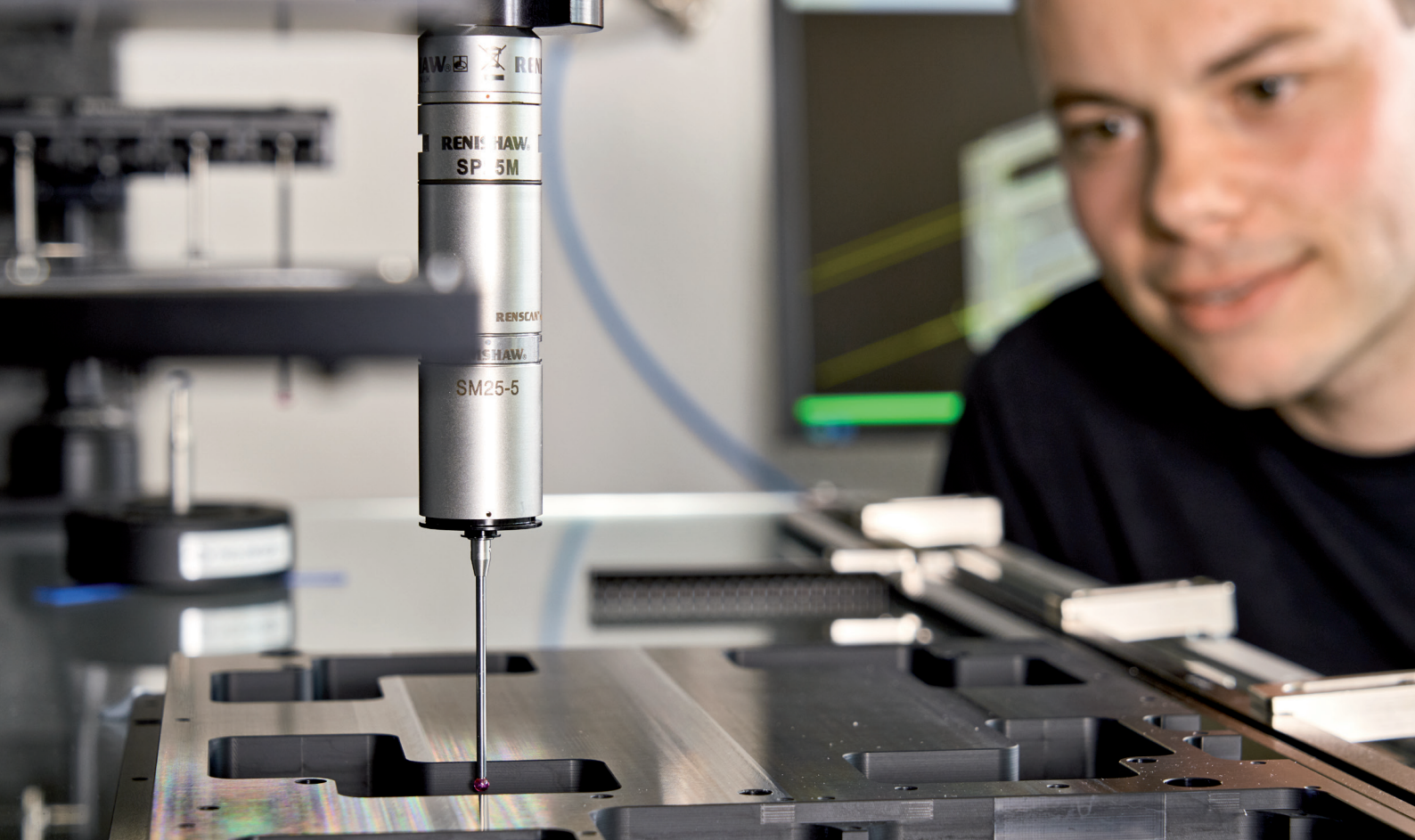


Patient Positioning and End-to-End testing

RUBY Phantom

Perform integrated tests of the entire treatment chain from imaging to treatment planning and verification with one basic phantom. Add and expand QA capabilities when needed. As the new modular phantom platform for radiotherapy QA, RUBY comes with a variety of exchangeable, application-specific inserts that satisfy all test requirements in a modern treatment facility.





Dosimetry Pioneers since 1922.

PTW is a global market leader for dosimetry and quality control solutions in radiation medicine, serving the needs of medical radiation experts in more than 160 countries worldwide. Starting with the famous Hammer dosimeter in 1922, the German manufacturer is the pioneer in medical radiation measurement, known for its unparalleled quality and precision.

For PTW, making medical radiation safer is both a passion and lifetime commitment. The family-run high-tech company operates the oldest and largest accredited calibration laboratory in the field of ionizing radiation and established THE DOSIMETRY SCHOOL to globally promote the exchange of knowledge in clinical dosimetry.

For more information on our products visit
ptwdosimetry.com or contact your local PTW representative:
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