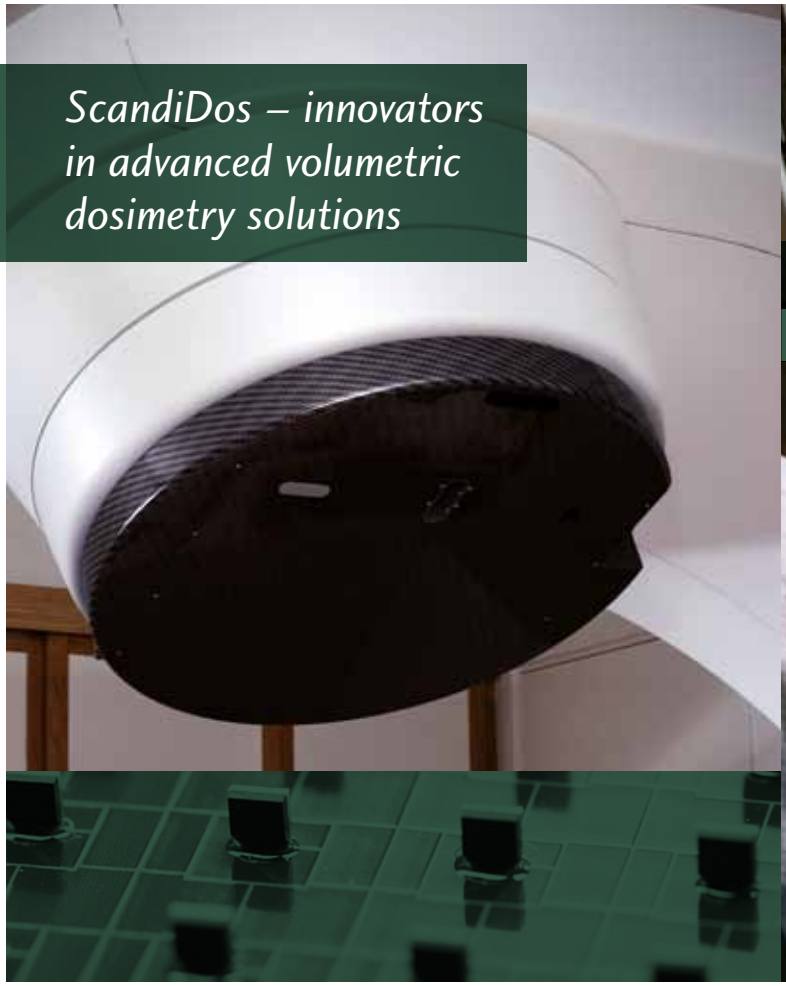
Delta^4 Family

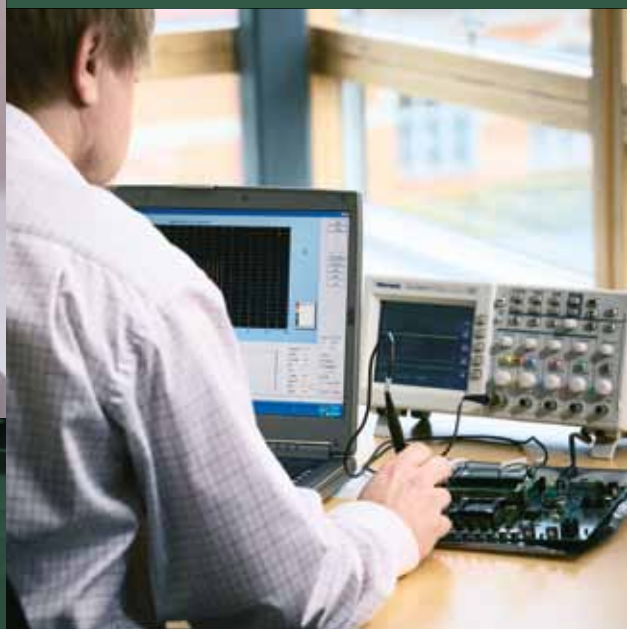
QA FROM PLAN TO THE LAST FRACTION

CONFIDENCE BASED ON REAL MEASUREMENTS

ScandiDos



ScandiDos – innovators in advanced volumetric dosimetry solutions



ScandiDos

ScandiDos is the world´s leader in Dosimetry which has introduced the innovative 3D and 4D volumetric dosimetry system Delta^4.
The company grew out of a recognized need and a vision to develop a new QA and dosimetry standard for the new dynamic radiation therapy technologies. New unique solutions have been developed without compromise to adapt to the QA requirements for dynamic treatment modalities.
In 2006, ScandiDos was the first to introduce a volumetric QA system, fully compatible with IMRT and VMAT, Rapid Arc® and TomoTherapy®.

QA from Plan to the last Fraction

The Delta^{4PT} Pre Treatment system is today recognized world-wide as the Gold Standard for QA of treatment techniques such as IMRT, Varian's RapidArc®, Elekta's VMAT, and Philips' SmartArc. With the introduction of Delta^{4AT} for patient-specific At Treatment QA, the Delta^4 family now covers the QA requirements from treatment plan to the last delivered fraction.
The Delta^4 concept is developed to be compatible with today´s and tomorrow´s advanced radiation therapy modalities.

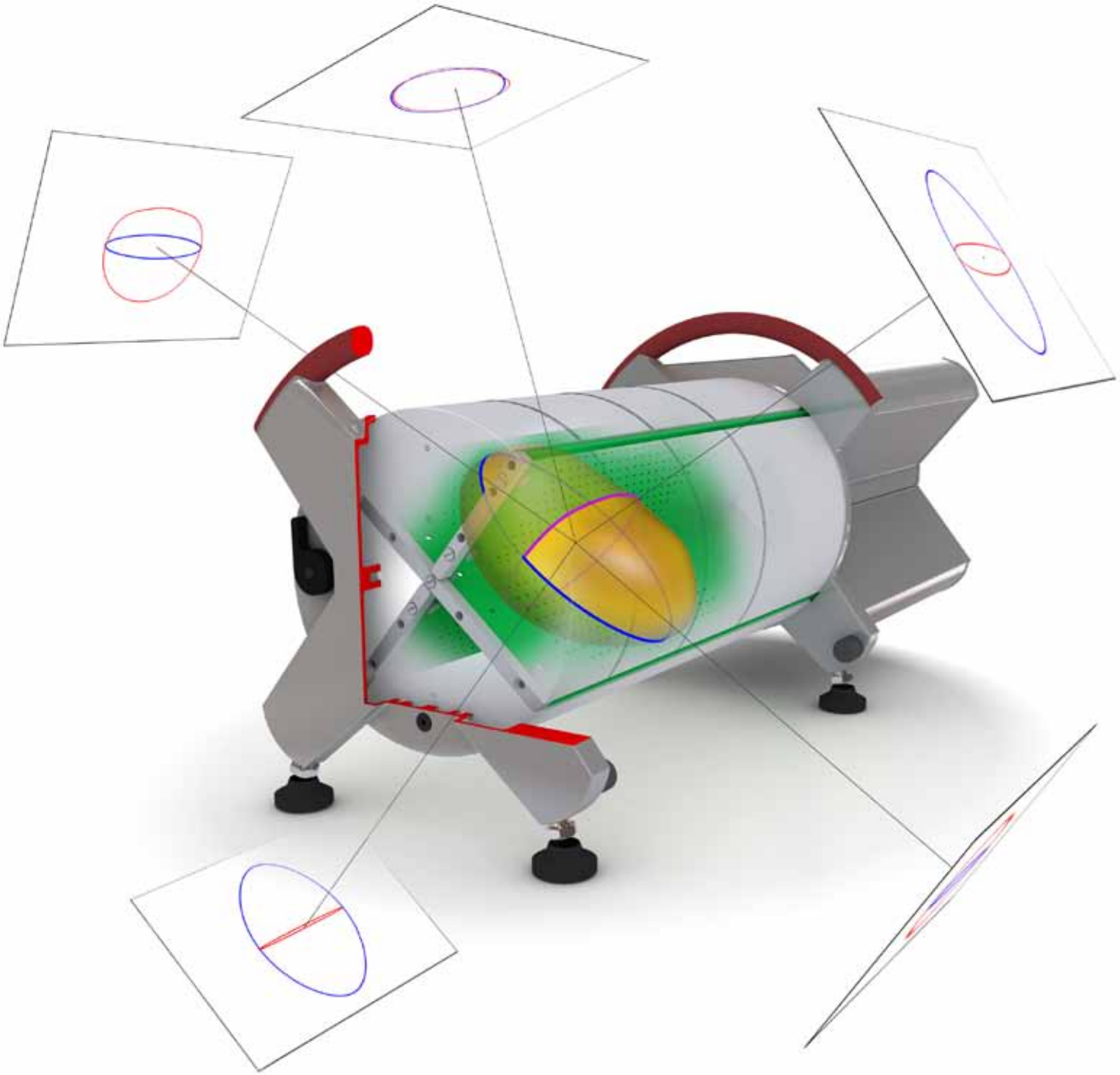
Accuracy and Quality

Modern radiation therapy technologies such as IMRT, VMAT and TomoTherapy create complex composite dose distributions that are specific for each patient. To verify that the planned dose is delivered correctly, the QA system must measure the dose with much higher accuracy than the calculation accuracy in the planning system. This can only be achieved by actually measuring the dose - both the direct and the indirect contribution from all beams in each fixed position - with high spatial resolution and high resolution in dose.

Confidence based on real measurements

- **Real measurements** - The dose is measured with the highest accuracy in the tumor and in high gradient region
- **Instantly analyze and approve plans** - Direct measurements eliminate additional processing of data
- **Clinical significance of deviations** - Use 3D tools to find out **where** deviations are
- **Quick and powerful analysis** - Use 4D tools to find **when** in the delivery sequence deviations occur
- **Accuracy and clinical relevance** - 4D Volumetric dosimetry, both in the phantom and in the patient Anatomy

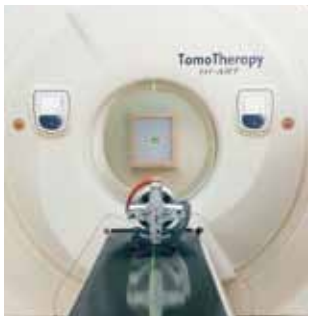
Delta^{4PT} Pre Treatment Verification



- *True measurements in the target volume*
- *Highest spatial resolution*
- *Isotropic response*
- *Material: Plastic Water® DT or PMMA*

Delta^{4PT} – The Gold Standard for pre-treatment QA in IMRT, VMAT/Rapid Arc, TomoTherapy, IGRT and SBRT





Pre Treatment Verification of calculated dose from a Planning System requires that the verification is done with higher accuracy than the TPS calculation. The Delta^{4PT} system uniquely measures the dose directly in 3D in the target volume. In contrast, other systems measure far from the central region, adding significant uncertainties to the verification!

The Delta^{4PT} system is optimized for volumetric verification of dynamic treatment modalities. It has been used for the validation of Elekta VMAT, RapidArc® and Philips SmartArc, and it is the Gold Standard for Pre Treatment verification. Due to its unique and patented design with a cylindrical, water equivalent, phantom and a high number of detectors in fixed positions in the isocentric tumor and high gradient region, it can directly verify the delivered dose and compare with the plan without any additional processing software.

- Real and absolute dosimetry in a 3D solid phantom in accordance with accepted dosimetry protocols.
- User-friendly software and fast set-up and alignment.
- Instant Pass/Fail analysis based on both measurements and clinical significance.
- Pulse-by-pulse measurement provides unsurpassed 50 nGy dose resolution from fraction to control point.
- Highest spatial resolution and long-term stable p-Si detector technology.
- Ideal for FFF dosimetry with no recombination effect.

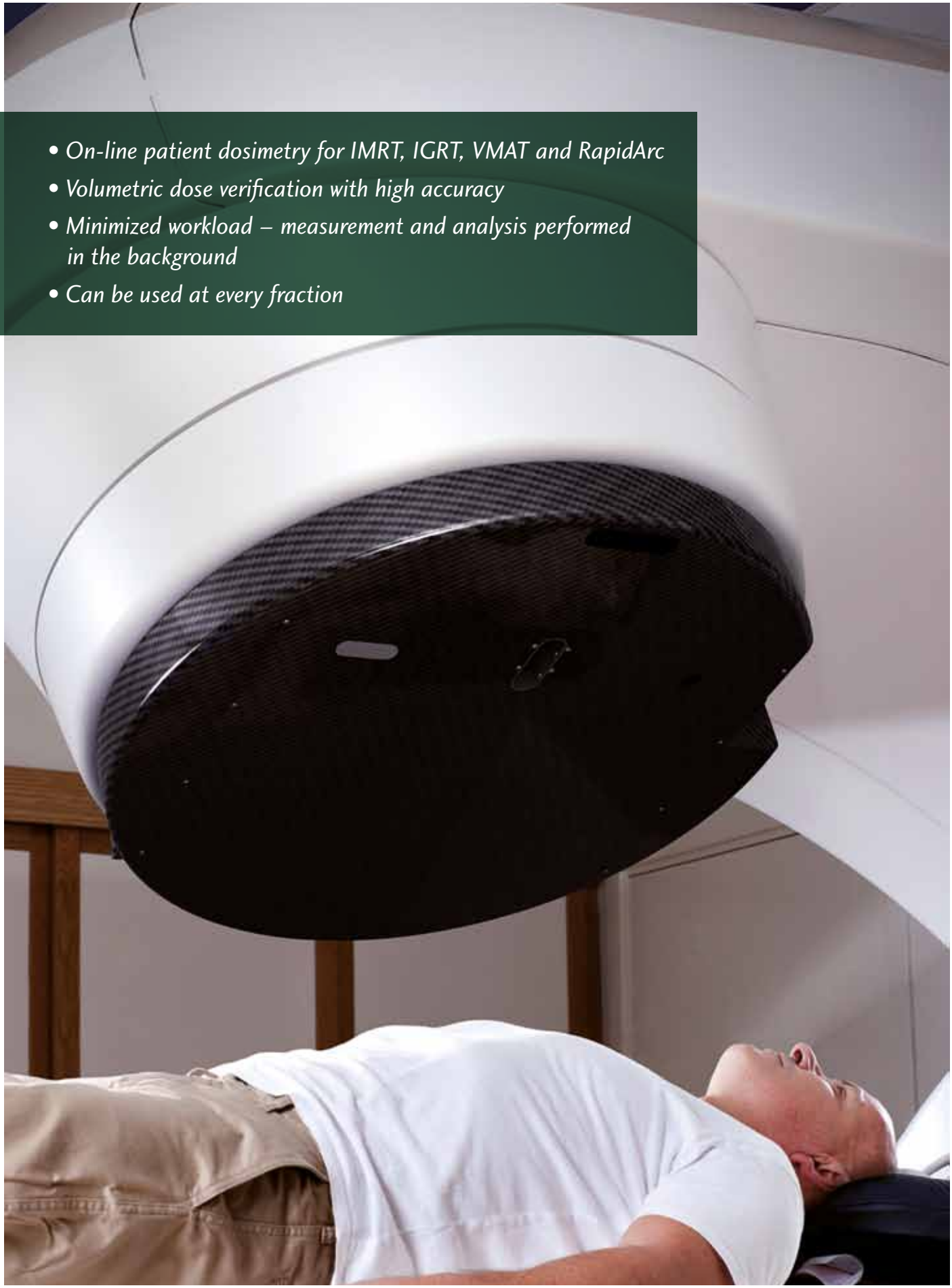
Sagittal-Coronal Support

The Sagittal-Coronal support allows measurements to be performed directly in the sagittal and coronal planes, thus increasing the beam coverage and adding flexibility.

Trolley

The Delta^{4PT} Trolley provides a quick, easy and ergonomic solution for transferring the Delta^{4PT} phantom to the couch without any need to lift the phantom.

Delta^{4AT} - At Treatment



- *On-line patient dosimetry for IMRT, IGRT, VMAT and RapidArc*
- *Volumetric dose verification with high accuracy*
- *Minimized workload – measurement and analysis performed in the background*
- *Can be used at every fraction*

Confidence at all times

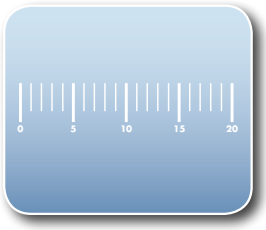
Complete QA must include verification of the dose that is delivered to the patient also during treatment. *In-vivo* dose verification with single detectors placed on the patient skin has been used for many years in conventional radiation therapy. In advanced modulated treatments, such as IMRT and VMAT, a system that measures the whole irradiated area and verifies the delivered dose in 3D is required. The Delta^{4AT} system is a highly sophisticated system that provides an on-line dosimetric verification with very high accuracy. Delta^{4AT} consists of a thin detector that monitors the actually delivered dose during the treatment. It has minimal effect on attenuation and skin dose and can therefore be used during all fractions.

• *In-vivo Dosimetry showing the dose in the Patient Anatomy*

The D^{4DVH} Anatomy software option allows that the measurement is readily converted to dose in both the patient anatomy and in phantom. Pass/fail criteria can be pre-defined with templates for different types of treatments.

• *Simplicity – works in the background during calibration and treatment*

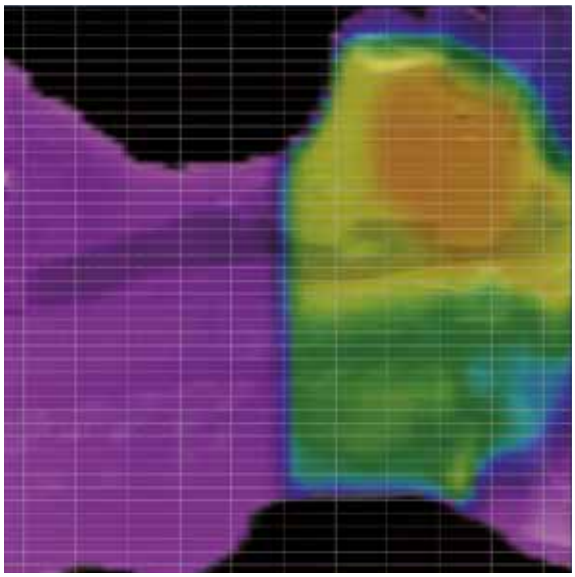
The system is always ready to measure. The calibration is done in the background during ordinary Pre Treatment verification and is then automatically applied during treatment with no manual detector handling.

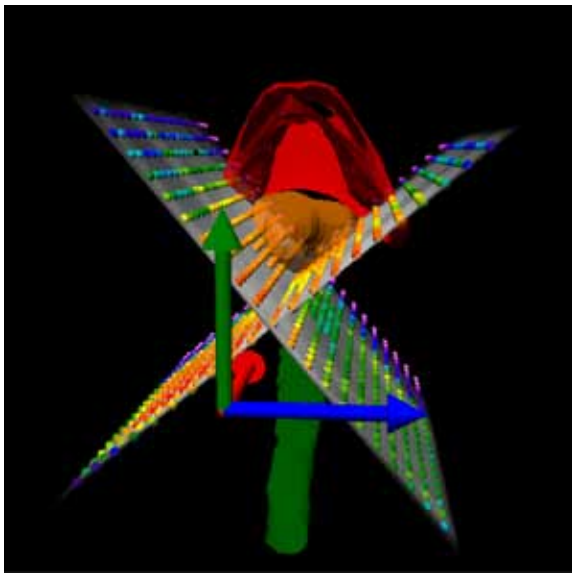


• *Highest accuracy due to patented per plan calibration*

Delta^{4AT} uses a proven and patented concept to calibrate each patient plan to achieve the highest dose determination At Treatment.

Delta^{4DVH} Clinical Significance

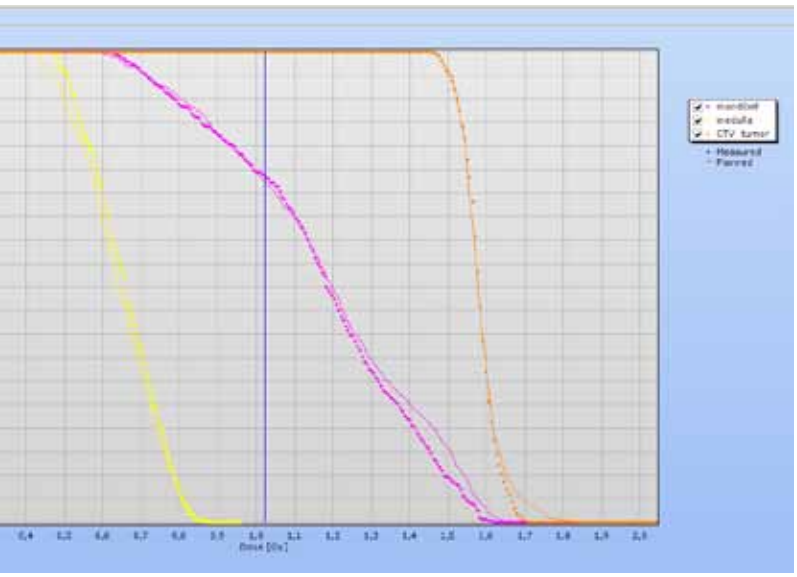




Accuracy, efficiency and clinical relevance - at the same time

With the introduction of the Delta^{4DVH} software option in 2007 ScandiDos presented a new concept of QA based on clinical relevance by analyzing the delivered dose to each structure individually. Delta^{4PT} combines accurate dose measurements in the target and high gradient regions with full volumetric dose reconstruction. The Delta^{4DVH} suite gives 3D analysis capability from phantom to the patient anatomy.

Function	Delta^{4DVH}	Delta^{4DVH} Professional	Delta^{4DVH} Anatomy
3D Dose	✓	✓	✓
DVH	✓	✓	✓
Manual analysis	✓	✓	✓
Templates		✓	✓
Structure specific analysis		✓	✓
Quantification per structure		✓	✓
Automatic Pass/Fail of selected structures		✓	✓
Delivered dose in patient			✓
CT image overlay			✓
Planned vs. Delivered dose in patient			✓



Delta^{4DVH} Anatomy

Delta^{4DVH} Anatomy allows an immediate comparison in the patient anatomy of the planned and the delivered patient dose. The patient inhomogeneities are taken into account and the real dose deviation in each organ is evaluated. You can immediately determine if the dose in the target volume is enough to achieve tumor control or if the dose to an organ at risk (OAR) is too high. This feature also allows custom setting of Pass/Fail criteria for a structure based on serial or a parallel OAR specification Delta^{4DVH} Anatomy includes all functions available in Delta^{4DVH} and Delta^{4DVH} Professional.

Delta^{4DVH} Professional

Delta^{4DVH} Professional automates 3D and structure specific analysis. Each structure can be grouped by its type – Target or OAR – depending on type of treatment. Quantification of deviations is done automatically and each type of structure uses its own set of Pass/Fail criteria. With the use of templates, each plan can easily be assigned the appropriate set of organs and criteria to include. The automated analysis immediately shows if a plan has passed. Delta^{4DVH} Professional also includes all functions available in Delta^{4DVH}.

Delta^{4DVH}

With Delta^{4DVH} a plan can be effectively analysed with respect to each structure's clinical relevance. With the introduction of DVH a full volumetric analysis can be made for the clinically relevant volumes. You can verify that targets are fully covered and that the dose is correct and that the OARs do not get excessive dose. The Delta^{4DVH} allows the most accurate comparison between the planned and the delivered dose.

HexaMotion

QA today your next treatment technique

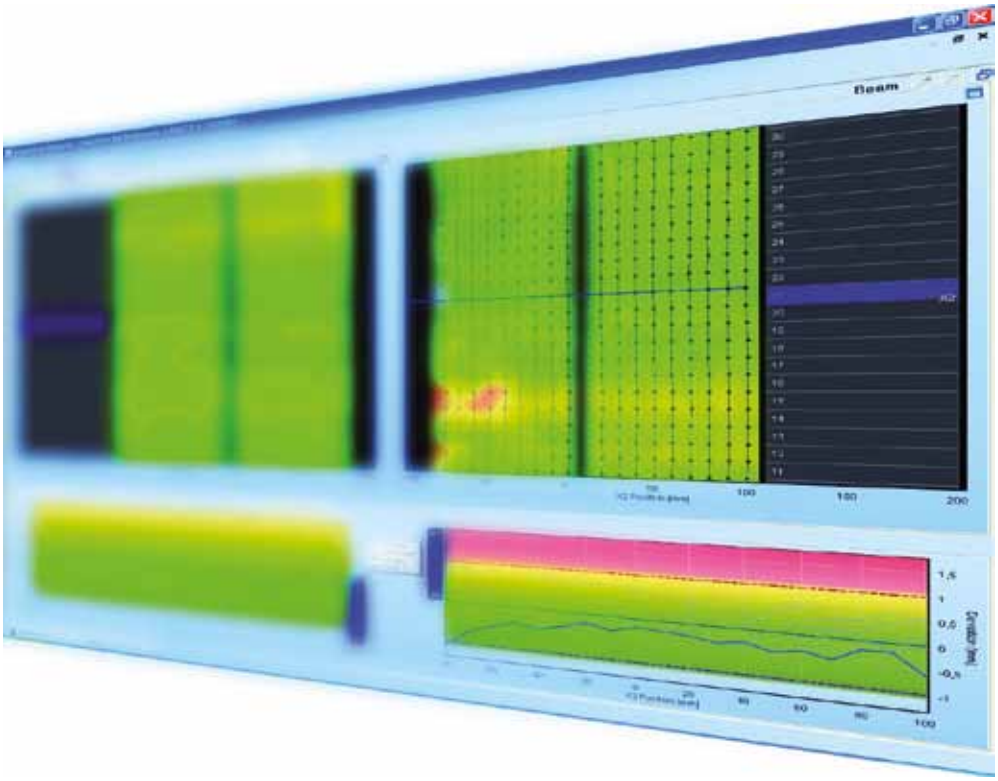
6D Motion management QA

When reduced margins are introduced also for treatment sites where the target or other organs are moving, motion management such as gating or tumor tracking is used to insure that only the target is irradiated. HexaMotion is a fast and accurate system that simulates the patient specific tumor motion pattern in 6 dimensions and the dosimetric effects on the dose delivery. Precision motors provide fast and precise movement of the phantom. The target area is free from disturbing materials in all beam directions allowing 360^0 rotation of the gantry mimicking exactly the treatment situation.

- *Verify the dose in moving targets*
- *Detect latencies in the delivery systems*
- *Time resolved analysis of the delivery*
- *Fast positioning within sub-millimeter accuracy*

Machine QA

Advanced treatment techniques like IMRT, VMAT and IGRT with dynamic shaping of the beams are sensitive to small errors in MLC, beam profiles and depth doses. To insure that plans are delivered correctly a more stringent machine QA is required. The Delta$^{4\ \text{Machine QA}}$ option can be used for periodic QA to check start-up behavior, beam constancy, stability, flatness and MLC. When a plan QA fails it is important to know if the error is due to the plan or if the delivery system is failing. With the Delta$^{4\ \text{Machine QA}}$ option this can be verified immediately with the same Delta^{4PT} phantom.



- *Advanced machine QA in a few minutes*
- *Stability check with high accuracy and detailed analysis*
- *Beam Constancy at various gantry angles*
- *MLC performance check at various gantry angles*
- *Dosimetric leaf gap*
- *Film-free picket fence test*
- *Flatness and symmetry checks*
- *Trending*

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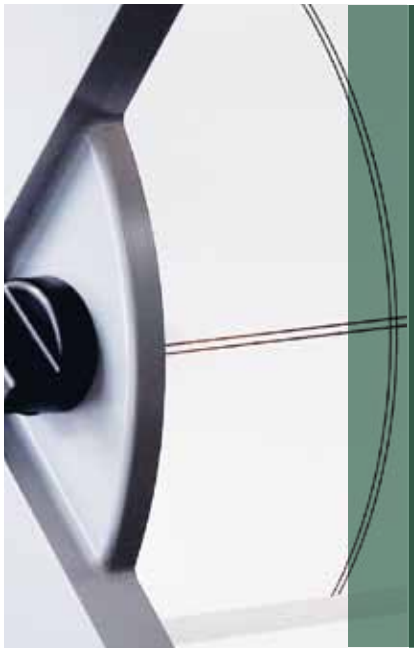

ScandiDos is an innovative, cutting edge maker of quality assurance solutions and a world leader in dosimetry for radiation therapy. By developing tools for efficient QA, we help to make new and improved treatment techniques available. ScandiDos strives to be at the forefront of technology development to enable the rapid clinical adoption of the latest treatment modalities.

Contact us today, or visit www.scandidos.com for more information.

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