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Delta⁴[®]

Dosimetry for TomoTherapy[®]



Delta⁴ makes it easy to:

- Verify the dose delivery without compromises - in 3D
- Instantly analyze and approve plans
- Analyze the clinical significance of deviations
- Find the causes of deviations



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Dosimetry for TomoTherapy®

Verify the dose delivery without compromises in 3D

The TomoTherapy Hi-Art® treatment approach is a very sophisticated treatment technique wherein it is insufficient to make dose verification at only one point, profile, or in a single plane. Complete verification must be volumetric in 3D; including total coverage of the cross-section of the beam at all beam angles. Instant analysis and approval require integrated dose in fixed geometric points during the complete delivery. Thereby, the composite dose from all gantry angles is directly measured in each point.

Dose verification, especially in high gradient fields, requires real measurements with high spatial resolution in the region of interest, while dose reconstruction, calculated from measurements from outside of the region, can be used as complementary information.

Delta⁴ measures the dose with a dense grid of detectors, particularly in the region close to the isocenter or the reference point. Two orthogonal detector planes, with spacing as close as 5 mm between the detectors in the central parts of the beam, insures that the dose is measured accurately and directly in the region of interest. Delta⁴ measures the dose distribution directly in the sagittal and coronal planes. The data is uniquely acquired in one single measurement, which guarantees that the two planes are exactly matched geometrically.

Delta⁴ has an isotropic response, which is essential for TomoTherapy dose measurements. Delta⁴'s unique volumetric dosimetry system is the only system that measures 3D distribution in 360° gantry rotation and not simply one single plane.



Instantly analyze and approve plans

Delta⁴ is placed on the couch in order to measure the same geometric points throughout the delivery. The complete delivery sequence is acquired with only one measurement and is immediately available for analysis. The measured dose is directly compared with the calculated data from the TPS.

With customizable acceptance criteria, you immediately see if the verification of the delivery has passed or failed.

You can also export the simultaneously measured sagittal and coronal dose to the Hi-Art treatment planning system.

Analyze the clinical significance of deviations

Pass and fail criteria must not be defined only by the portion of those measured points with a gamma index exceeding 1. Rather it must also take into account whether the deviating points are located within a critical structure.

Delta⁴ uniquely overlays the structures graphically with the measured dose distribution, thus showing if deviations are of clinical significance.

Find the causes of deviations

When significant deviations are found, it is important to have the right tools to find the cause of the deviations in order to achieve the best result possible with a given treatment technique.

Delta⁴'s unique 4D analysis tools include dose deviations, distance to agreement (DTA), Gamma index and the reproducibility of the delivery sequence. DTA and Gamma analysis is performed in 3D and even the whole dose distribution can be shifted in 3 dimensions.



Process flow in Tomo Therapy QA

1 min

Import plan from TPS

PlanID	Patient Name	Plan Name	Date	Planned
0000000	LC_00000	1.00000	2008-05-08 12:51:56	Factor
0000000	LC_00000	1.00000	2008-05-08 14:59:35	Factor
0000000	LC_00000	1.00000	2008-05-08 15:11:15	Factor

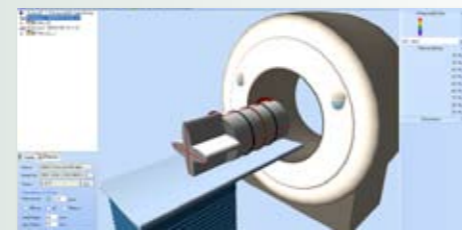
DICOM RT Plan
Structure of the treatment

DICOM RT Dose
3D dose distribution per fraction

DICOM RT Structure
Outline of the patient structures, when refined analysis is required

5 min

Set-up and alignment



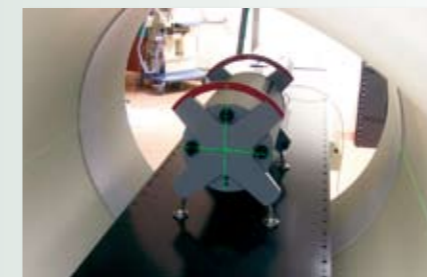
Delta⁴ Trolley eliminates heavy lifting
Leveling adjustments on Delta⁴ phantom for easy leveling.
Alignment lasers and couch motion for easy alignment

Isocenter or reference point

Select the position most suitable for the location of the target volume or OAR

Normal treatment time

Run complete treatment

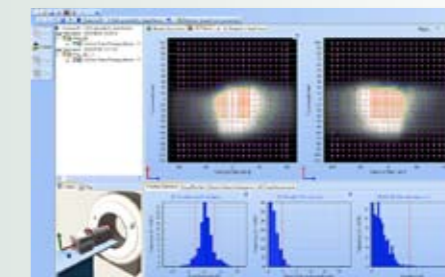


Automatic synchronization with the delivery system

Measure simultaneously the dose in Sagittal – Coronal plane or 50/40 degrees angle.

instant

Pass or fail?



Pre set-up criteria for pass and fail using Dose deviation and/or Distance to agreement and/ or Gamma index

Green beam icon
Pass criteria is fulfilled

Red beam icon
Refine the analysis using the same measurement data; No new measurements are necessary.

