Filmless QA for VMAT, RapidArc™ and TomoTherapy®

IMRT QA for VMAT, RapidArc™ and TomoTherapy®?
Do it the smart way. Use the validated* system that works:
OCTAVIUS


Filmless Patient Plan QA with seven29 and OCTAVIUS
► Use of the world's best ion chamber array for IMAT and TomoTherapy
► Response behavior independent of the beam direction
► Complete pre-treatment patient plan verification with one measurement
► Multifaceted and simple to use thanks to the special design
► Avoid the angular dependence of semiconductors by using ion chambers
1 Introduction

Pre-treatment patient plan verification is usually standard for IMRT treatment. No adequate solution has been available for new dynamic techniques such as Intensity Modulated Arc Therapy (IMAT) and Tomotherapy till now. Point measurements with ionization chambers are usually insufficient. Film dosimetry requires a lot of work if you want to achieve good results.

Using the new OCTAVIUS phantom, the ionization chamber array 2D-ARRAY seven29, which has been tried and tested many times, can also be used for dynamic applications.

The OCTAVIUS set is composed of two phantoms, a CT phantom and a LINAC phantom. The LINAC phantom has a cavity in the lower area of the phantom to compensate for the reduced response behavior of the 2D-ARRAY seven29 when irradiated from the back.

2 Workflow

A patient plan is transferred to the CT scan of the CT phantom. The dose distribution in the phantom is recalculated without changing any dosimetrically relevant treatment parameters. The newly calculated patient plan is irradiated on the LINAC phantom. The measurement values are recorded in the phantom using the 2D-ARRAY seven29 and VeriSoft software and compared directly with the data calculated by the treatment planning system. The verification time is reduced to that for the phantom setup and plan irradiation.

3 Explanation of the Phantom

3.1 OCTAVIUS LINAC Phantom

Because the irradiation direction changes in IMAT and Tomotherapy, the measurement means must work independent of the irradiation direction.

Thanks to its innovative ionization chamber design, the 2D-ARRAY seven29 has a very homogenous response behavior across a large angle area.

When irradiation is from the back, the 2D-ARRAY seven29 has a slightly reduced response behavior. This is compensated by a semicircular cavity built into the phantom.
3.2 OCTAVIUS CT Phantom

The CT phantom is required for the CT scan to record the geometry of the phantom for the planning system. The phantom can also be used for measurements with single chambers. Up to nine ionization chambers (PTW 0.125 cm³ semiflex 31010) can be inserted simultaneously into the phantom. Additional uses such as inhomogeneity slabs for CT checks and adapter plates for TLDs and films are under development.

If a separate CT phantom is not desired a CT scan of the phantom can be provided upon request.

4 Application samples

4.1 IMAT

Thyroid plan, Varian Clinac® 21EX, 6 MV

The red points are measurement data of the 2D-ARRAY seven29, and the blue lines display profiles in left - right (above) and target - gun (below) direction.

Result after comparison

Gamma Index, 3 mm distance to agreement (DTA), 3% dose difference. Red points fell short of the criterion. Green points fulfilled the criterion. All red measurement points are in the low dose range.
4.2 Tomotherapy

Head&Neck Plan, Tomotherapy Hi-Art®

The red points are measurement data of the 2D-ARRAY seven29, and the blue lines display profiles in left - right (above) and target - gun (below) direction.

Result after comparison

Gamma Index, 3 mm distance to agreement (DTA), 3% dose difference. Red points fell short of the criterion. Green points fulfilled the criterion.

5 Use with "Normal" IMRT

OCTAVIUS can also be used for verifying normal IMRT patient plans. The complete patient plan is irradiated on the phantom. All influences of irradiation are considered when this is done.

The results of the measurement depend on the dose calculation algorithm of the planning system used. Good results have been achieved with Monte Carlo-based planning systems, e.g., Varian Eclipse®, Collapsed Cone (AAA algorithm) and Tomotherapy Hi-Art®. Other planning systems are currently being checked.

Specifications:

<table>
<thead>
<tr>
<th>Material</th>
<th>Polystyrene, density 1.04 g/cm³</th>
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<tr>
<td>Size</td>
<td>Octagon, diameter 320 mm, length 320 mm</td>
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<tr>
<td>Weight</td>
<td>Approx. 24 kg (LINAC Phantom); approx. 26 kg (CT-Phantom)</td>
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Ordering Information:
- L981809 IMAT Set seven29 includes two OCTAVIUS phantoms (LINAC phantom and CT phantom), chamber plate, 2D-ARRAY seven29 and VeriSoft software
- L991037 OCTAVIUS Set, includes two phantoms (LINAC phantom and CT phantom) and chamber plate
- T40042 OCTAVIUS LINAC phantom
- T40043 OCTAVIUS CT phantom
- T40042.1.010 OCTAVIUS chamber plate

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