A collection of various medical test objects, including cylindrical phantoms, rectangular blocks with internal structures, and circular discs, arranged on a white surface.

TEST *objects*

QUALITY CONTROL PHANTOMS
FOR RADIOTHERAPY AND MEDICAL IMAGING

QualiFormeD[®] Phantoms

A selection of test objects facilitating regulatory quality controls in radiation therapy and medical imaging

Practical, comprehensive, accurate, clever and unique tools!

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Test objects for use with radiotherapy treatment machines

Test Object OTP-EPID

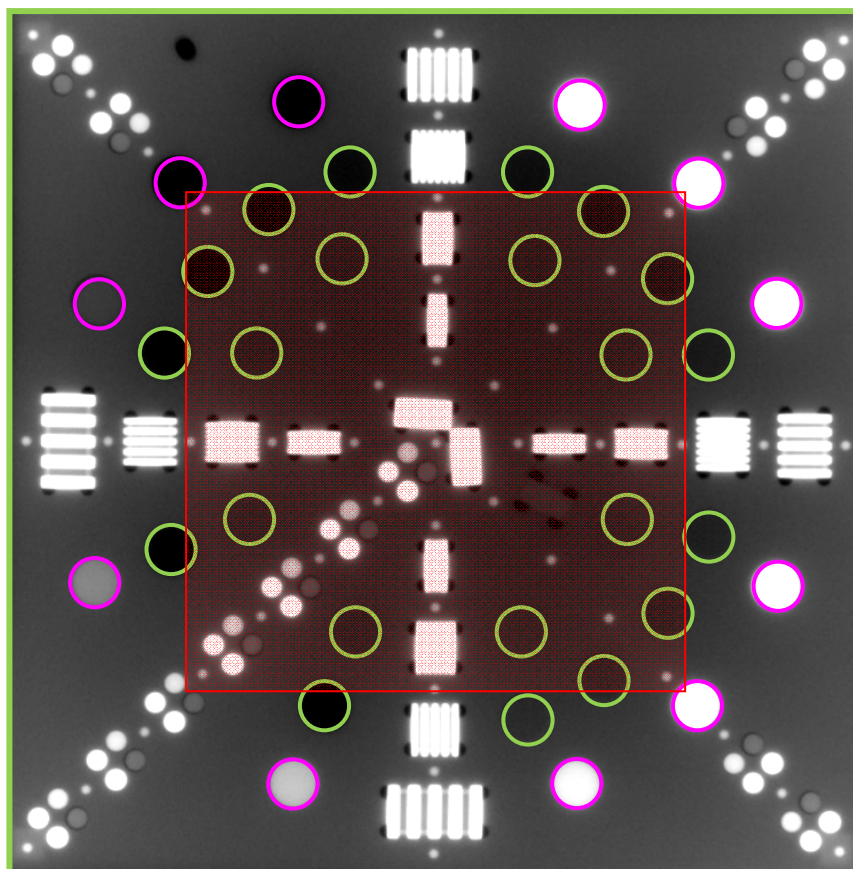
Quality Control of a high energy portal imager used in 2D-MV mode

► QUALIFORMED's OTP-EPID phantom has been designed to accurately measure in a single acquisition all the main parameters which characterize the performance of high-energy "portal" imagers operating with high energy X photons (4 - 25 MV) used in radiotherapy to determine patient position vis-à-vis radiation beam limits.

► Analysis of the images of the OTP-EPID test object is optimal (precise, automatic, quick) when used in conjunction with the QUALIMAGIQ software platform, complemented by the MOD-EPID analysis module (→ see www.qualiformed.com). "Manual" analysis of the images remains of course possible.



Specifications of the OTP-EPID test object



Linearity of the imager response

Measured by 11 copper disks of increasing thickness set along a circular ring centered around the centre of the beam to be free of influence of any lack of homogeneity of captor response.

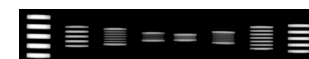
Geometric distortions

49 tungsten balls distributed over a large surface to enable mapping of distortion.

Spatial Resolution - ESF method

OTP-EPID is the only test object available for applying ISO standard 12233:2000, referred to as the « Edge Spread Function », in order to accurately measure the imager's FTM.

Spatial Resolution - Pairs of lines pattern

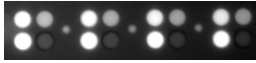


16 horizontal and vertical patterns made up of regularly spaced line pairs, alternately radio-opaque and radio-transparent, allow you to evaluate spatial resolution visually.

Contrast


22 targets of increasing thickness distributed equi-distant from the beam's center. The width of the discs prevents the measurements from being distorted by noise.

Uniformity of the response linearity of the imager



52 copper disks situated in 13 zones distributed evenly over the entire surface of the test object.

Advantages of the OTP-EPID test object

- ▶ The essential measurements (spatial resolution, contrast and geometric distortions) may all be taken within a small radiation field ( 12x12 cm² at 100 cm from the source),
- ▶ Measurement of the spatial resolution with a modern and accurate standardised method (ESF),
- ▶ The contrast is evaluated by large targets and constant diameters to avoid tainting the measurement with distortions by noise or/and the non-homogeneity of the signal,
- ▶ All of the targets contained in OTP-EPID are kept within a matrix, which ensures that their orientation follows the divergence of the radiation beam, thereby providing objects whose contours remain distinct in the images,
- ▶ The exterior surface of the test object is black and the alignment grooves are white, thereby facilitating alignment with the laser positioning system.

Regulations

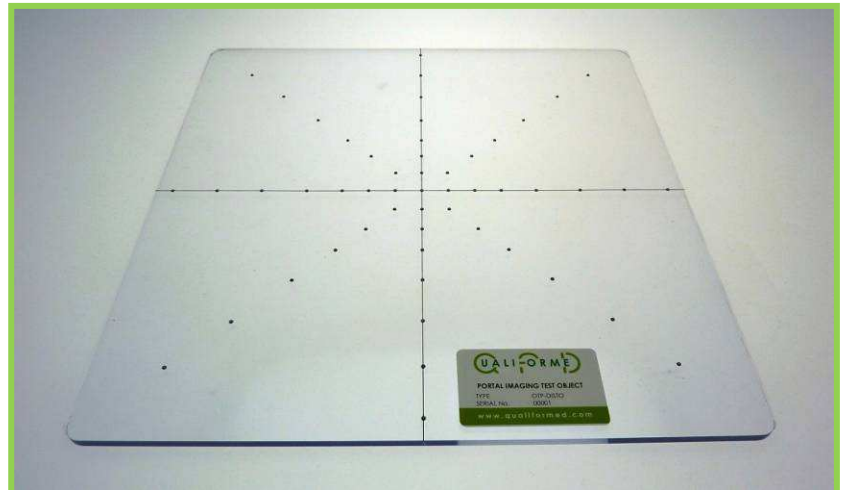
The OTP-EPID phantom enables you to optimally fulfill all requirements of the French AFSSAPS decision dated 27/07/07 regulating Internal quality control of external radiation therapy installations: points 5.9.6 and 5.9.10 of the annex.

Test Object OTP-DISTO

Advanced testing of geometrical distortions stemming from a high energy (MV) or low energy (KV) « portal » imager used in 2D mode

- ▶ The **OTP-DISTO** phantom from **QUALIFORMED** enables you to obtain the complete 2D cartography of the geometrical distortions of the « portal » imager with just one click.

The OTP-DISTO test object is made up of a network of 53 tungsten balls 2 mm in diameter, evenly distributed throughout a transparent acrylic plate 5 mm thick which measures 300 mm x 300 mm. This plate also bears a crosshair engraved in black.



- ▶ Analysis of the images of the OTP-DISTO test object is optimal (precise, automatic, quick) when used in conjunction with the QUALIMAGIQ software platform, complemented by the MOD-EPID+ analysis module for a high energy imager and MOD-18FG analysis module for a low energy imager (→ see www.qualiformed.com). Most particularly QUALIMAGIQ yields a 2D cartography of all geometrical distortions stemming from the tested « portal » imager in less than 5 seconds with just 3 mouse clicks.

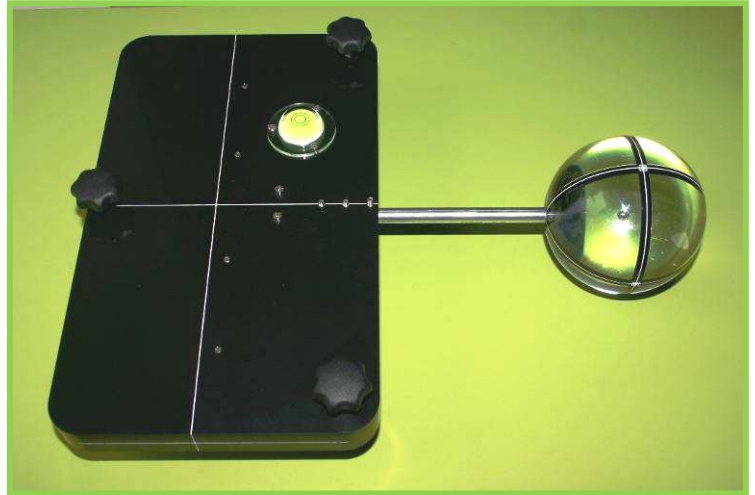
Regulations

The OTP-DISTO phantom enables you to optimally fulfill all requirements of the French AFSSAPS decision dated 27/07/07 regulating Internal quality control of external radiation therapy installations: point 5.9.10 of the annex.

Test Objects **OTP-ISO+** and **OTP-CROSS**

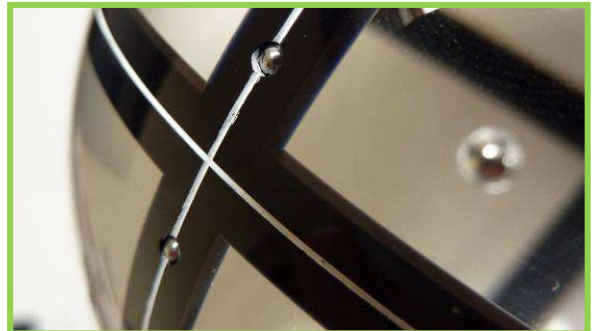
Control the size and position of the radiological isocentres, and the angles of the gantry, the collimator and the couch of a radiotherapy treatment device

► **The OTP-ISO phantom, patented by QUALIFORMED**, enables you to accurately perform the test proposed by Winston & Lutz [Int J Radiat Oncol Biol Phys (1988), 14(2):373-81]. The spatial position of the 3 rotation axes of the installation (gantry, collimator and table) in the treatment room is determined with optimal precision. The position is defined by a radio-opaque ball aligned along the positioning lasers. Accuracy is ensured by the 3 perfectly orthogonal white equatorial grooves engraved on the surface of an acrylic sphere 100 mm in diameter, whose center corresponds to the center of the radio-opaque ball. The unit is suspended from an aluminum rod connecting it to a counterweight which includes a bull's eye spirit level, 3 adjustable screws for levelling the base and pre-alignment etchings.

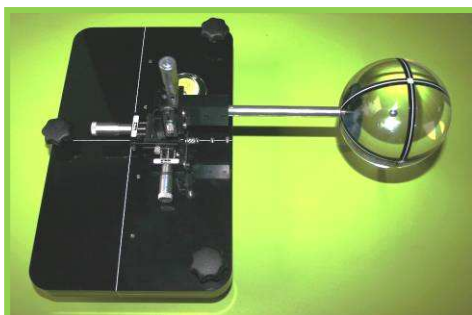
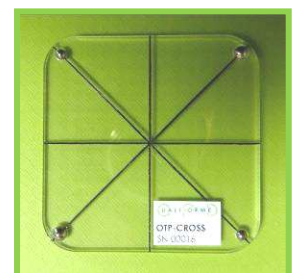


The acrylic sphere provides a zoom effect to better align the test object along the positioning lasers. The orthogonal white equatorial grooves set into the black background further facilitate alignment. The "2 to 2" coincidence, level and orthogonality of the laser planes may all be verified before carrying out the Winston & Lutz test.

A set of 3 pairs of peripheral balls, used to determine the gantry's rotation angle, complete the test object. The aluminum holding rod enables the treatment table's rotation angle to be measured.



► **The OTP-CROSS test object** is affixed to the treatment machine's collimator outlet. It detects a fixed point in the images with regard to the radiation source, essential for carrying out the Winston-Lutz test. This fixed point is generally the centre of a small radiation field, however by using OTP-CROSS test results are not impacted by sagging of the jaws due to the gantry rotation angle. The collimator angle may also be measured from the orientation of the OTP-CROSS on the images.



A high-precision version of the OTP-ISO test object is equipped with 3 micrometric screws. The sphere and then the positioning lasers can be positioned within 1/10 of a millimeter of the treatment machine's real isocenter by adjusting the screws.

The test is carried out on high energy (MV) «portal» images in order to determine the treatment isocenter for the corresponding energy. By repeating this test on a low energy (kV) imager the alignment of the onboard imager onto the treatment isocenter can be verified.

► Analysis of the images of the OTP-ISO+ and OTP-CROSS test objects is optimal (precise, automatic, quick) when used in conjunction with the QUALIMAGIQ software platform, complemented by the MOD-ISO, MOD-ISO+, MOD-ISO-KV and MOD-ISO-KV+ analysis modules (→ see www.qualiformed.com).

Regulations

The OTP-ISO+ and OTP-CROSS test objects enable you to optimally fulfill all requirements of the French AFSSAPS decision dated 27/07/07 regulating Internal quality control of external radiation therapy installations: points 5.2.3, 5.2.8, 5.7.2 and 5.8 of the annex.

Test Objects OTP-FIELD and OTP-FIELD28

Control of the congruence between the light fields and the irradiated fields for both symmetrical and asymmetrical rectangular fields produced by a radiotherapy treatment machine



► The OTP-FIELD test objects from QUALIFORMED enable you to control the positions of the light field limits of the 4 jaws of a simple collimator, using a high energy portal imager.

Since it is easier and more objective to align the test object along the light beam rather than the contrary, OTP-FIELD is composed of a set of 20 rules of varying lengths, to accommodate all configurations of rectangular fields.



Each of the 20 rules contains:

- 2 radio-opaque balls,
- a longitudinal engraving etched 8 mm from the pair of radio-opaque balls,
- a perpendicular engraving bisecting the rule.

The rules are made from a plastic chosen for the high degree of rigidity it offers at such a low thickness, a necessary criterion to avoid impairing the detection of the radiated field limits.

The OTP-FIELD test objects come equipped with:

- a customized aluminum storage case,
- double-sided, repositionable adhesive tape to temporarily secure the rules to the imager's cover when the gantry is set at another angle than 0°.



► Analysis of the images of the OTP-FIELD test objects is optimal (precise, automatic and quick) when used in conjunction with the QUALIMAGIQ software platform complemented by the MOD-FIELD analysis module (→ see www.qualiformed.com). Note that by using QUALIMAGIQ, in less than 10 seconds and with just 3 mouse clicks you can determine all tested light and irradiated field sizes without using X-ray film.

► Remark: the OTP-FIELD28 test object is a set consisting of only the 2 longest rulers of the 20 rulers making up the complete set of the OTP-FIELD test object.

Regulations

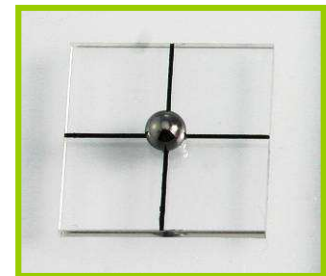
The OTP-FIELD phantoms enable you to optimally fulfill all requirements of the French AFSSAPS decision dated 27/07/07 regulating Internal quality control of external radiation therapy installations: points 5.2.6 and 5.3.10 of the annex.

Test Objects OTP-ALIGN and OTP-BALL

Mechanical and geometrical tests of a radiotherapy treatment machine



► The OTP-ALIGN and OTP-BALL test objects designed by QUALIFORMED enable you to carry out several mechanical and geometrical analyses on radiotherapy treatment machines used in conjunction with high (MV) and low (KV) energy « portal » imagers.



OTP-ALIGN is made of a transparent acrylic plate 5 mm thick which contains:

- a square tungsten frame, 150 mm x 150 mm
- 5 tungsten balls, each 2 mm in diameter
- a crosshair engraved in black

OTP-BALL is made of a transparent acrylic plate 2 mm thick on which a crosshair is engraved in black. The base contains a tungsten ball 4 mm in diameter.

The OTP-ALIGN test object is especially used together with « portal » imagers to determine the position of the mechanical rotation center of the treatment machine's crosshair, the mechanical vertical play, pixel size and the source – imager distance of associated « portal » imagers ...

The OTP-BALL test object is especially used together with « portal » imagers to determine the position of the mechanical rotation center of the treatment machine's collimator, the mechanical play in relation to the gantry rotation of the associated « portal » imagers, sagging of the leaf banks of multi-leaf collimators ...

► Analysis of the images of the OTP-ALIGN and OTP-BALL test objects is optimal (precise, automatic, quick) when used in conjunction with the QUALIMAGIQ software platform, complemented by the MOD-EPID+, MOD-FIELD and MOD-MLC-stat analysis modules (→ see www.qualiformed.com).

Regulations

The OTP-ALIGN and OTP-BALL test objects enable you to optimally fulfill all requirements of the French AFSSAPS decision dated 27/07/07 regulating Internal quality control of external radiation therapy installations : points 5.2.1, 5.2.2, 5.9.2, 5.9.3 and 5.9.4 of the annex.

Test objects for use with external patient positioning lasers on CT-scanner installations dedicated to radiotherapy

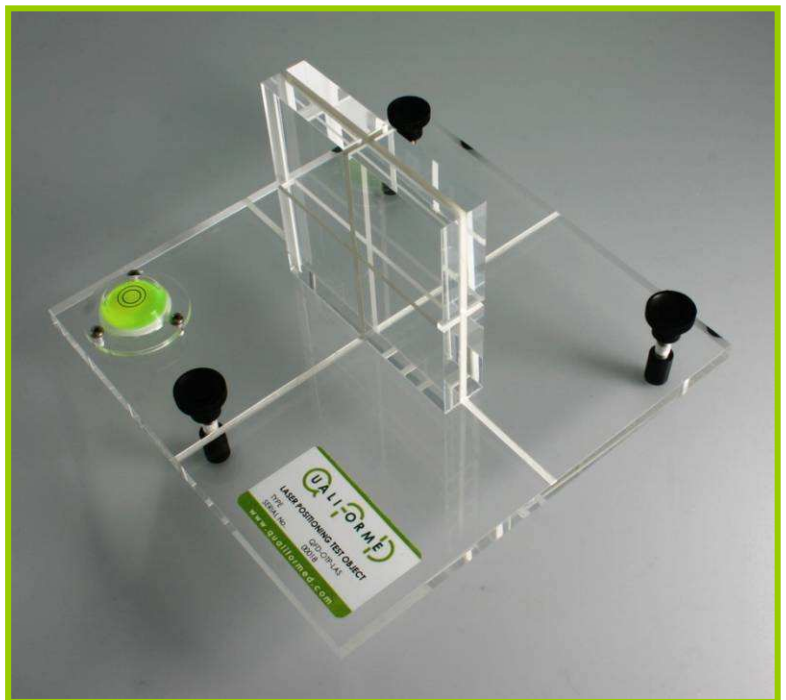
Test Object OTP-LAS

Control the alignment of the laser positioning system's isocenter onto the CT-scanner isocenter

► The OTP-LAS phantom from QUALIFORMED enables you to verify the alignment of the origin of the positions of the laser positioning system with the anatomical origin of the CT-scanner, through a single acquisition of a dozen of CT-scanner slices.

► Advantages of the OTP-LAS phantom :

- OTP-LAS is robust and easy to align. This makes it particularly suitable for daily set-up of the routine control of the position of the isocenter of the laser in relation to the isocenter of the scanner.
- OTP-LAS is made entirely of transparent acrylic. The alignment engravings are white, which allows them to light up without dispersion when the lasers are aligned along them with the same intensity as for red or green lasers.



► Analysis of the images of the OTP-LAS test object is optimal (precise, automatic, quick) when used in conjunction with the QUALIMAGIQ software platform, complemented by the MOD-LAS or MOD-LAS+ analysis module (→ see www.qualiformed.com). Most particularly QUALIMAGIQ supplies in less than 2 seconds with just 3 mouse clicks, the shifts between the laser positioning system and the CT-scanner: translations in the 3 directions of space.

Regulations

The OTP-LAS test object enables you to optimally fulfill point 8.6 of the annex of the French AFSSAPS decision dated 22/11/07 regulating Quality Control (QC) of the CT-scanners.

Test Object OTP-PLAN

Comprehensive control of the laser positioning system's alignment to the CT-scanner

Verification of longitudinal positioning accuracy (Head/Feet axis), horizontality of patient support, respect of the distances in images produced by a CT-scanner dedicated to radiation therapy applications

► **The OTP-PLAN phantom from QUALIFORMED** verifies all of the following in just 3 CT-scanner acquisitions:

- the accuracy of patient positioning along the Head/Feet axis,
- flatness and horizontality of the patient support on the transverse plane,
- respect of the distances on the transverse plane by the CT-scanner,
- alignment of the lasers positioning system along the 3 main CT-scanner axes and
- congruence between the isocenter of the CT-scanner and that of the laser positioning system.



Advantages of the OTP-PLAN test object

- The adjustable leveling screws of the OTP-PLAN can be fully retracted so that the test object comes into perfect contact with the patient support during testing. The screws protrude to enable adjustment when testing positioning lasers.
- The OTP-PLAN test object is composed entirely of black acrylic plastic with alignment engravings etched in white. The white engravings thereby light up without dispersion when the lasers are aligned along them, equally so for both red and green lasers.
- The « inserts » are air-filled hollows, 0.5 mm in diameter, within the acrylic cubes. Detection of the position of the inserts in all spatial directions is as precise as possible, the limiting factor being the quality of the scanner images. In addition, the inserts provide strong contrast, registering a difference of 1100 Hounsfield Units.
- Analysis of the images of the OTP-PLAN test object is optimal (precise, automatic, quick) when used in conjunction with the QUALIMAGIQ software platform, complemented by the MOD-PLAN or the MOD-LAS+ analysis modules (→ see www.qualiformed.com). QUALIMAGIQ's performance is particularly noteworthy - in less than 10 seconds with just 3 mouse clicks it determines the shifts between the positioning lasers and the scanner: translations in the 3 directions of space, and 3 rotations around these 3 directions.



Regulations

The OTP-PLAN test object enables you to optimally fulfill points 8.6 and 8.8 of the annex of the French AFSSAPS decision dated 22/11/07 regulating Quality Control (QC) of the CT-scanners.



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