Penta-Guide

QUASAR

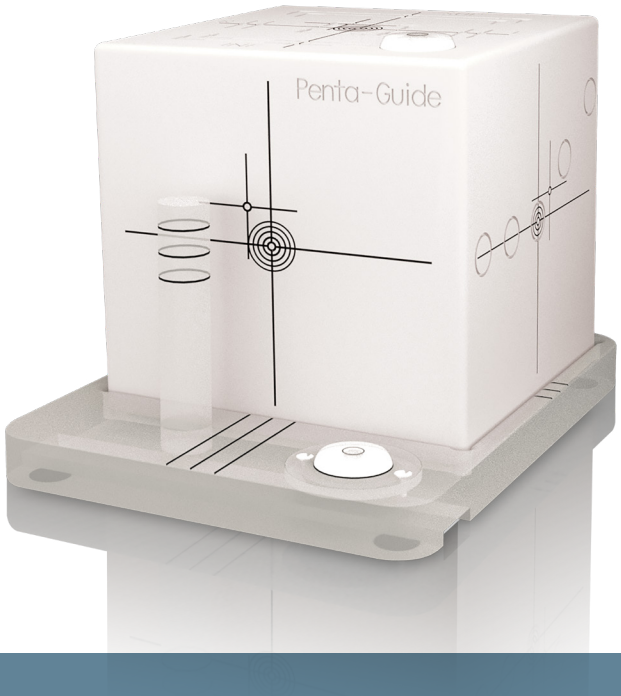
BY MODUS QA

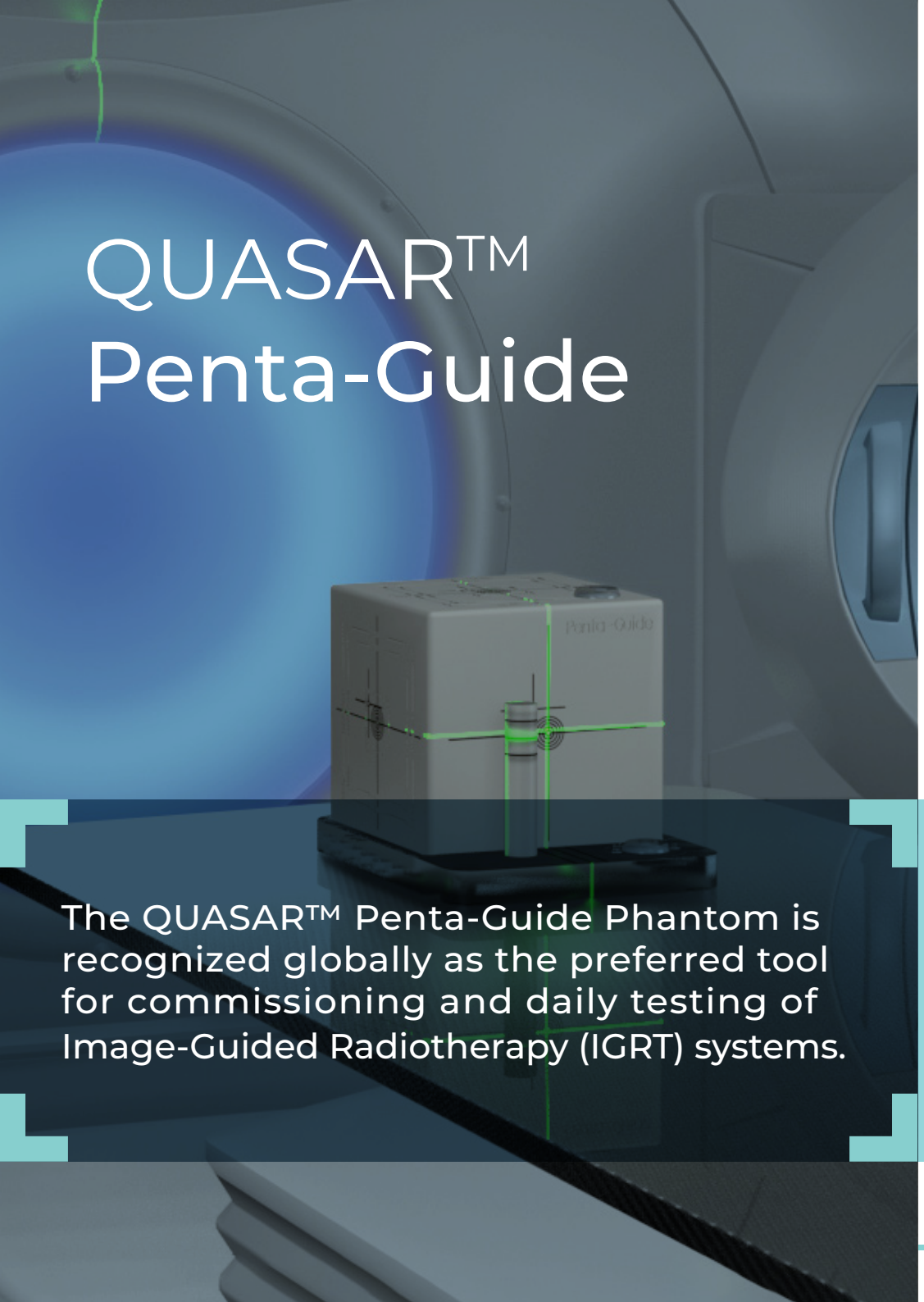
PENTA-GUIDE

Daily QA

Phantom & Software System

IGRT Alignment, Image Quality,
and Machine Targeting





QUASAR™ Penta-Guide

The QUASAR™ Penta-Guide Phantom is recognized globally as the preferred tool for commissioning and daily testing of Image-Guided Radiotherapy (IGRT) systems.

Penta-Guide
QUASAR
BY MODUS QA

The QUASAR™ Penta-Guide Phantom ensures the accuracy of LINAC-mounted On-Board Imaging (OBI) guidance systems, including KV, MV, and X-ray Volumetric Imaging (XVI) using Cone Beam CT (CBCT).

Its simple and innovative design facilitates intuitive verification of spatial alignment and isocenter coincidence on IGRT and SGRT systems. The addition of an optional Penta-Guide Tilt Plate provides intuitive verification of 6DoF couch adjustments. Combined with our included analysis software, Penta-Guide provides detailed image quality metrics that evaluate the performance of your CBCT imaging systems.

QUASAR™ Penta-Guide in Numbers

4K
phantoms sold

100
countries with active users

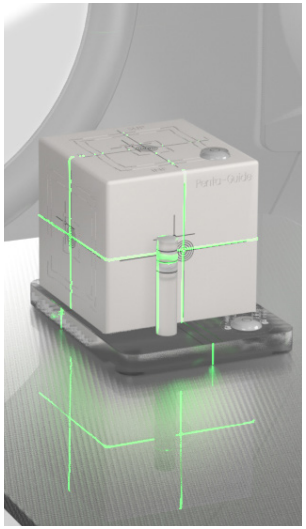
14
years serving medical physicists

DAILY QA WORKFLOW EFFICIENCY:
Saving physicists **time** and **money**

Integrate the QUASAR™ Penta-Guide IGRT phantom into your daily QA routine to perform geometric accuracy tests. Confirm room laser and IGRT targeting accuracy while simultaneously acquiring valuable CBCT image quality data to monitor On Board Imaging performance.

By following the recommended workflow process, key metrics of your treatment unit's performance can be obtained in under 15 minutes. Acquiring imaging quality metrics on a daily basis during morning QA eliminates the need for additional image quality phantom scanning. Save valuable time by removing the need for additional QA after hours!

integrate into daily routine



verify alignment accuracy

perform image quality analysis

1 Machine Targeting QA

Use the Penta-Guide as your **key device for efficient morning QA** IGRT verification:

Testing abilities:

- laser to isocenter coincidence
- light field to beam isocenter coincidence
- field geometry and collimator accuracy
- ODI accuracy
- gantry and collimator accuracy
- KV/KV, KV/MV, DRR and CBCT isocenter coincidence
- correlation between CTSIM imaging and LINAC imaging systems
- LINAC remote couch adjustment accuracy during image matching and patient positioning
- 6DoF remote couch adjustment with use of optional Penta-Guide Tilt Plate
- isocenter coincidence with 3rd party SGRT systems (accessories may be required)

2 Import CBCT

Merge dataset into Penta-Guide 2.0 Software to analyze Imaging Quality metrics including Spatial Resolution, Geometric Distortion, HU Constancy, Noise, Linearity and Uniformity.

3 Trend Results

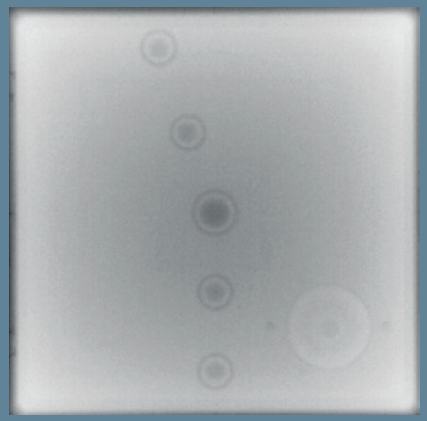
Monitor the performance of your IGRT system over time with the automated trending and analysis tools included in Penta-Guide 2.0. Gradual deterioration of an imaging system can be detected using consistent datasets and eliminate the need of scanning additional image quality phantoms. Data can be trended against an ideal CBCT dataset or an original planning CT dataset.

INTUITIVE DESIGN

QUASAR™ Penta-Guide's simple design promotes efficient daily testing to ensure on-board imaging alignment accuracy. The phantom contains a unique system of low-density rings and hollow spheres, enabling intuitive quality assurance while eliminating high-density imaging artifacts.

Pass/Fail Criteria

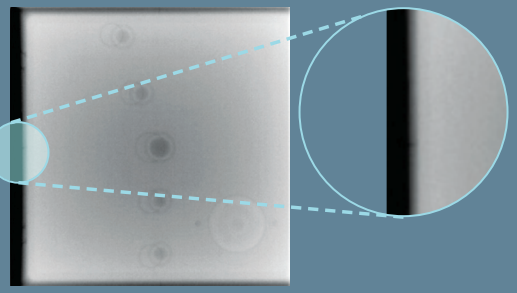
The QUASAR™ Penta-Guide phantom incorporates simple pass/fail aids designed to promote efficient analysis. The surface of the phantom contains targets indicating tolerance levels as well as 1mm & 2mm "out-of- tolerance" distance indicators on the field light verification outlines. A typical tolerance of +/- 2 mm in x, y, and z directions is recommended.



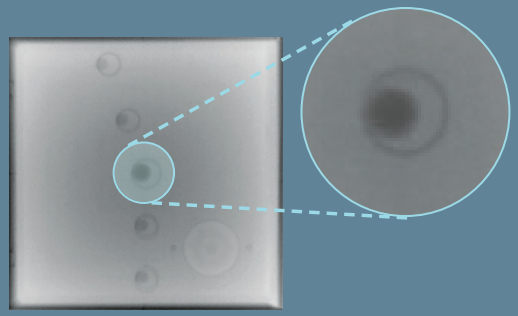
Phantom centered in field of view

The low-density ring and sphere system provides you with intuitive alignment verification, in accordance with accepted radiotherapy tolerances, using 2D and 3D image-matching.

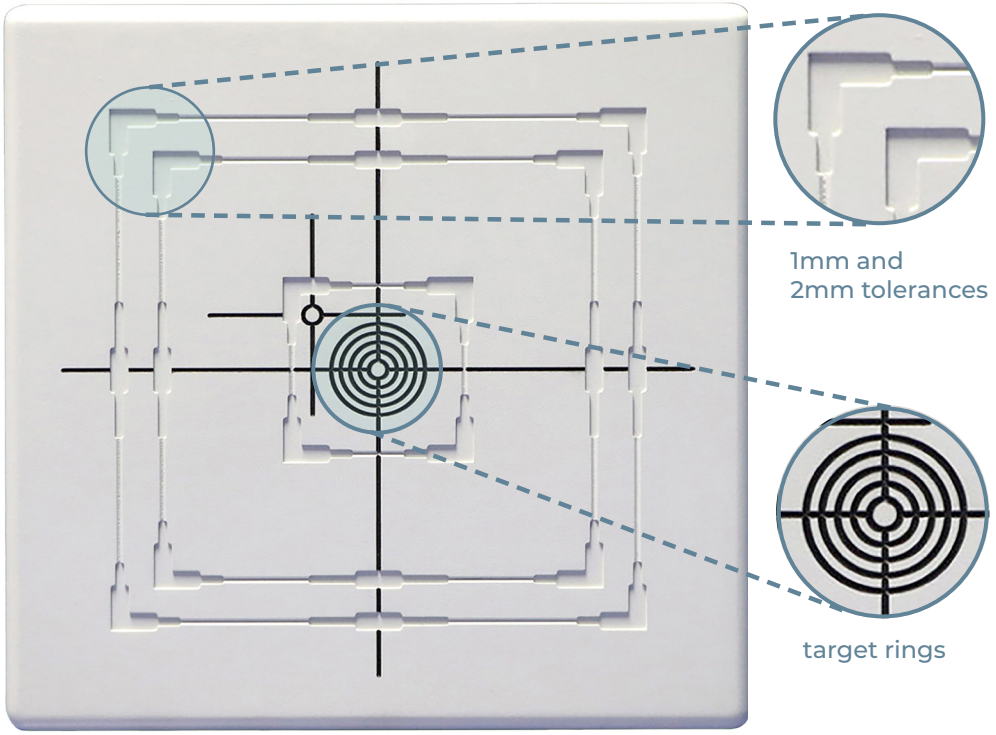
*All images 6MV AP



Example of
translational misalignment



Example of
rotational misalignment



(Above) Intuitive Visual Tolerance Indicators

PRECISION

Manufactured to provide 0.25 mm accuracy – guaranteeing a high-caliber tool for your daily QA processes. Perform multiple isocenter coincidence and alignment tests with reliable repeatability and confidence. Used globally with confidence on high-precision systems that deliver SRS and SBRT.

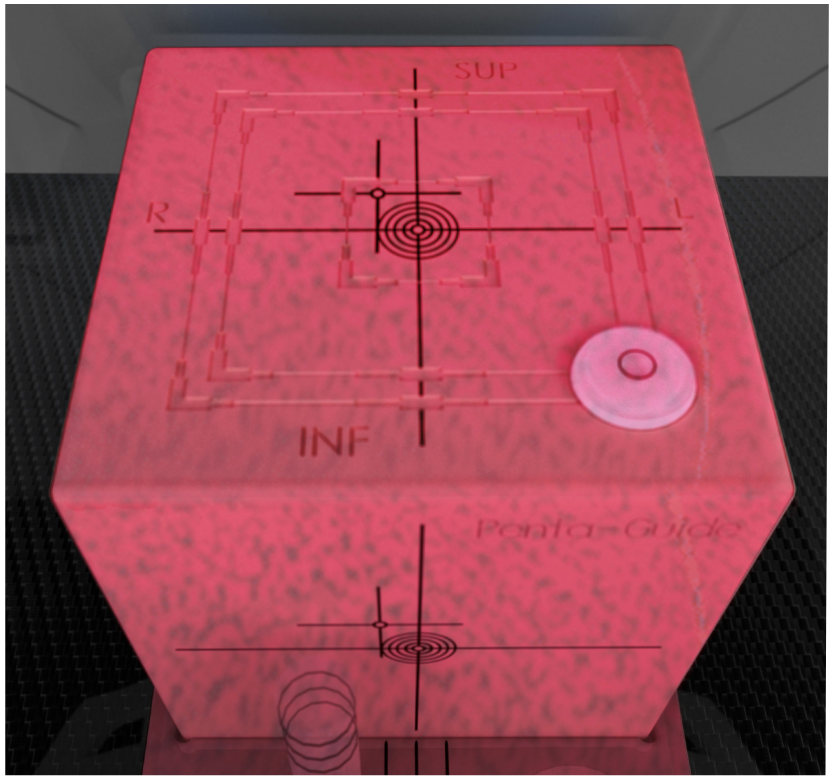
6 DEGREE OF FREEDOM COUCH QA (6DoF)

The addition of a QUASAR™ Penta-Guide Tilt Plate (500-3503) allows easy and efficient verification of 6 DoF treatment couch adjustments. The Tilt Plate positions the QUASAR™ Penta-Guide Phantom at known rotation angles and displacements relative to the isocenter. With this device, users test rotation corrections and combined translation and rotation corrections on a 6DoF couch.

Embedded tilt angles of 0.75°, 1.25° and 1.0° rotate the Penta-Guide phantom, and guide-lines etched on the Tilt Plate's surface provide displacements from the isocenter. The flexibility of being able to rotate the Tilt Plate allows you to verify shift corrections in multiple directions.

SURFACE-GUIDED RADIATION THERAPY QA (SGRT)

The 16x16x16 cm surface of the Penta-Guide phantom provides an ideal surface for optical SGRT system detection. Used in conjunction with the Penta-Guide Tilt Plate or on its own, the Penta-Guide phantom can be imaged with the SGRT system to verify the SGRT alignment with the mechanical isocenter of the treatment unit. After the positional correction is performed by the SGRT system, the alignment is verified using the On-Board-Imaging (OBI) system with 2D or CBCT verification.



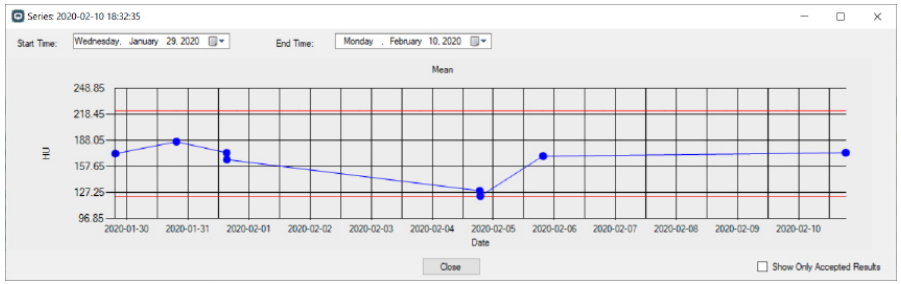
(Above) SGRT System Detection of Penta-Guide Phantom

Penta-Guide 2.0
AUTOMATED SOFTWARE

Modus QA has developed software features to unlock new testing capabilities of our Penta-Guide phantom. The Penta-Guide is used worldwide as the leading beam geometry and imaging alignment phantom. Modus QA introduces a method to monitor imaging system performance during regular QA procedures by analyzing image quality metric trends with our new automated software. By analyzing daily/weekly CBCT images of the Penta-Guide phantom used in geometric alignment, ongoing analysis of the LINAC EPID system performance can be completed.

DATA TRENDING

All automated metric calculations have the ability to be tracked over any given timeframe. Parameters can be compared and monitored over time to a desired Baseline Dataset. This Baseline Dataset can be an Ideal CBCT dataset or the original planning CT Dataset.



3D VISUALIZATION

Visualize the acquired Penta-Guide data in 3D with an increased ability to analyze pixel data using line profile generation. Select a region of interest to further evaluate the uniformity within the 3D volume.

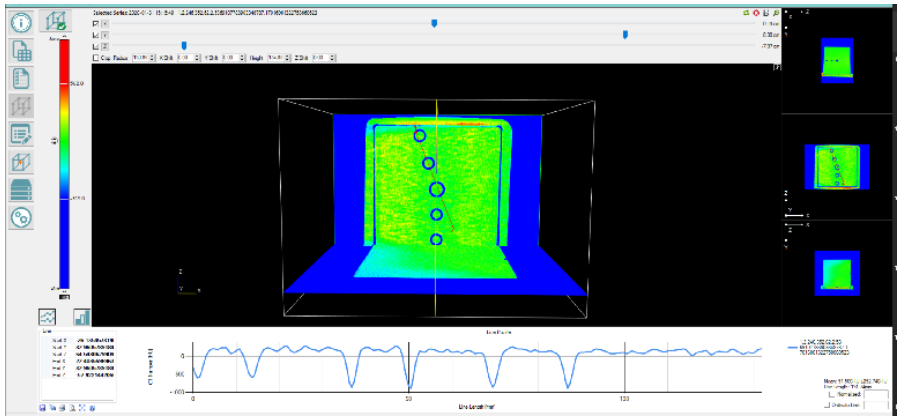


IMAGE QUALITY

Geometric Distortion

Software uses algorithms to compare CBCT imaged internal geometry to the known positions providing data on distortion in X, Y, Z dimensions.

a) Provides data on shifts in sphere positions, size and phi angles
b) Data on scaling and voxel/pixel sizes

Hounsfield Unit Constancy

Data provided on Air and Acrylic density values enabling confirmation that values coincide with the established baseline curve.

Uniformity

Mean Pixel Values determined near the center of the phantom and compared to multiple locations at the periphery of the phantom provide details on image uniformity.

Spatial Resolution

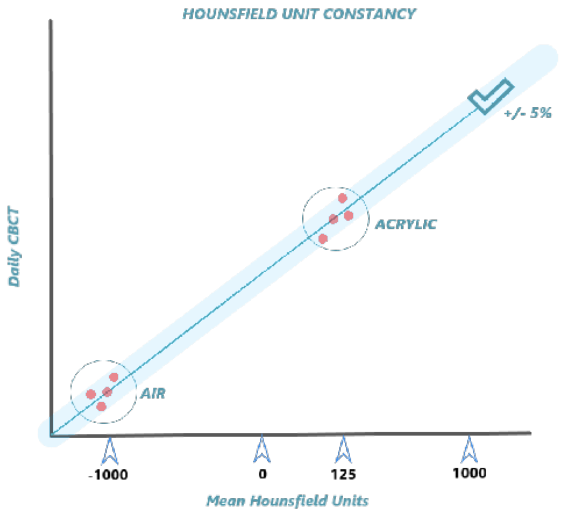
Modulation Transfer Function (MTF) and Point/Line/Surface Spread Function (PSF/LSF/SSF), provide contrast resolution data.

Linearity

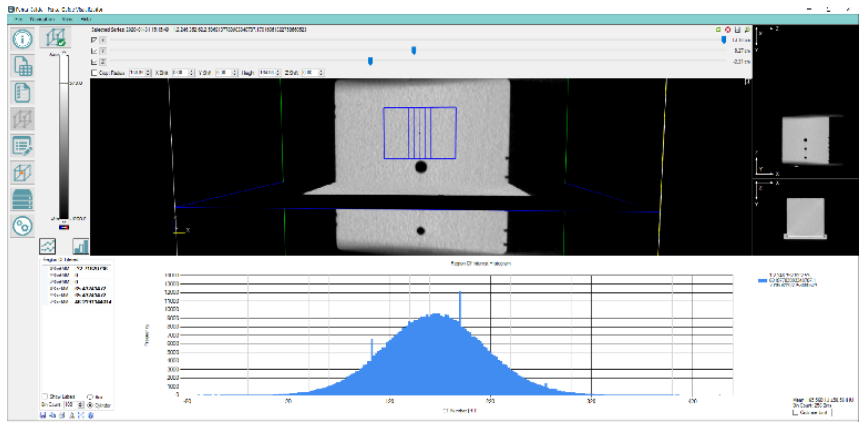
Reports on differences in linearity between superior and inferior spheres.

Noise

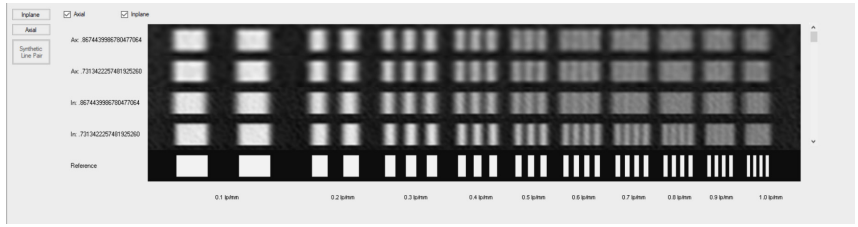
Noise to contrast values determine noise levels contained within the system.



(Left)
Hounsfield Unit Constancy



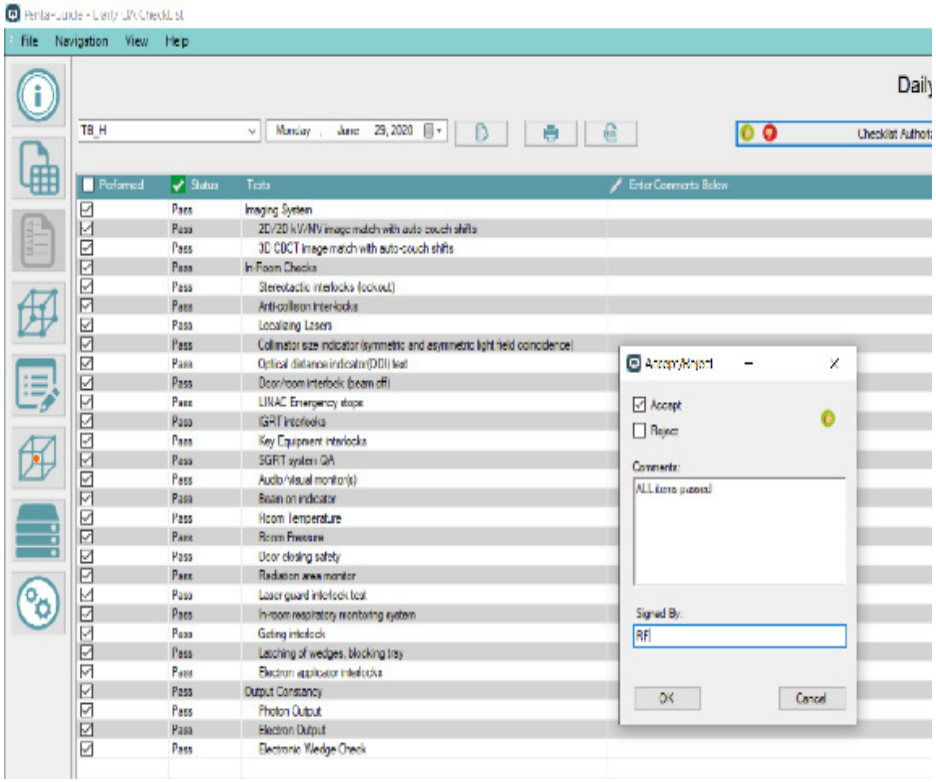
(Above) Image Uniformity



(Above) Synthetic Line Pairs for MTF Visualization

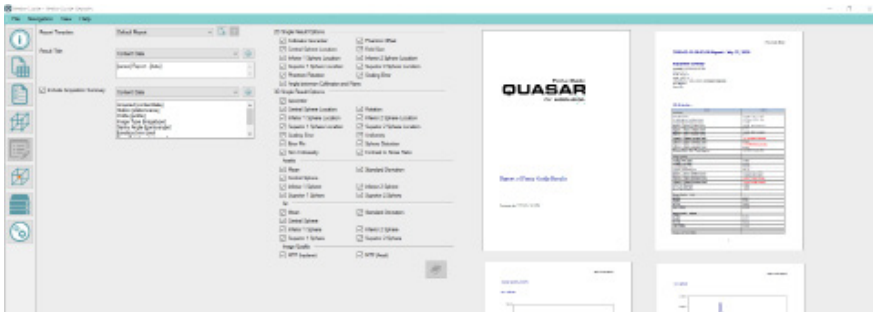
DAILY QA CHECKLIST

Penta-Guide 2.0 Software includes a fully customizable daily QA checklist designed to keep track of morning QA procedures and log any errors for communication to the physics team. The included tests can be chosen based on your clinic's routine and unique tests can be easily added. Authorization levels can be set per user based on the requirements for your clinic. Incorporate the daily QA checklist as part of your QA process to improve workflow and documentation, without the need to use an Excel® spreadsheet or QA journal.



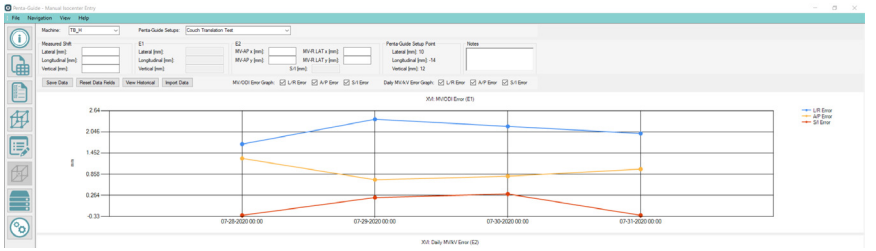
CUSTOMIZABLE REPORTS

Present Penta-Guide results with customizable PDF reports as part of your documentation routine or to communicate results with other members of your QA team. The report generator presents all selected content within a concise document, with statistical and graphical displays. Report templates can be created to provide custom documents tailored for the intended user group.

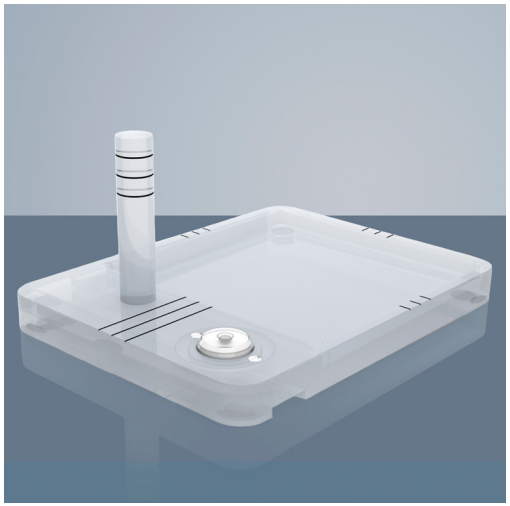


MANUAL ISOCENTER ENTRY

Penta-Guide 2.0 contains a database where users can store historical shifts within the software and not require a secondary software solution. The manual isocenter entry allows users to input the obtained daily shift on a particular unit and monitor the positional trend over time. This process allows the observation of couch translations over time, triggering the need for maintenance investigation if the values begin to drift from the baseline values. This feature was included to replace the excel spreadsheet currently used by Penta-Guide customers.



PENTA-GUIDE TILT PLATE



The Penta-Guide Tilt Plate adds 6DoF couch adjustment verification to your daily QA routine. Its simplicity of design promotes intuitive confirmation that the 6DoF adjustments are performing to specification.

As an accessory to the Penta-Guide phantom, the QUASAR™ Tilt Plate is also compatible with Penta-Guide 2.0 software. The 6DoF CBCT is automatically detected and categorized into a 6DoF Couch Rotation and Translation profile.

Workflow Efficiency

Integrate the QUASAR™ Tilt Plate and Penta-Guide phantom into your daily QA routine to confirm geometric targeting accuracy. Confirm 6DoF couch corrections and SGRT ISO alignment using an intuitive, simplified workflow. Complete TG 142 requirements and simultaneously obtain valuable image quality data in under 15 minutes.

Intuitive Design

The QUASAR™ Tilt Plate's simple design promotes efficient daily testing to ensure 6DoF couch correction accuracy. Embedded into the light-weight accessory are known tilt angles as well as translation marks. The device can be quickly indexed and levelled on the 6DoF couch, to be ready for imaging within seconds.

Testing Versatility

Not only does the QUASAR™ Tilt Plate and Penta-Guide Phantom confirm 6DoF couch corrections, it is also a trusted tool to verify SGRT-IGRT-MV isocenter agreement. The 16cm³ surface is easily detected by optical SGRT systems and the internal structures provide users intuitive isocenter coincidence verification.

SPECIFICATIONS

- 16 cm acrylic cube – 5 kg
- Light Field alignment (cm) 4x4, 10x10, 12x12
- 0.25 mm accuracy

ORDERING INFORMATION

100-1009

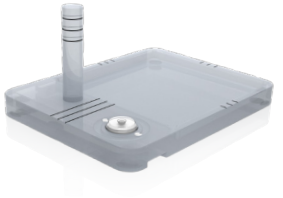
QUASAR™
Penta-Guide Phantom

- **1** Phantom
- **1** Software
- User's Guide
- Workflow Guide

OPTIONAL ACCESSORIES

500-3503

QUASAR™ Penta-Guide Tilt Plate



500-3501

QUASAR™ Hood for Frameless Array

MODUS QA
TRUSTED ACCURACY

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