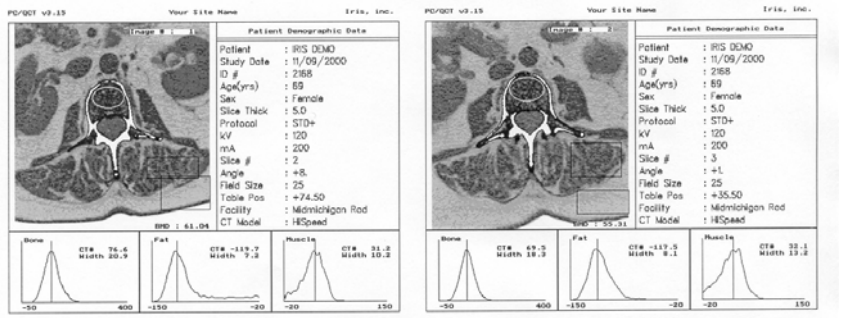
Order online

PC/QCT Bone Mineral Density Software

Model 49-800



Introduction

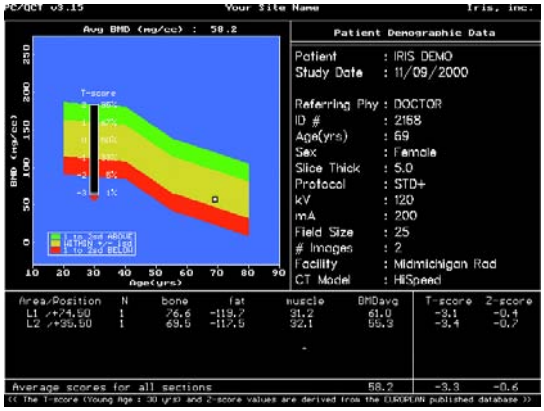
A PC-based QCT software program for the convenient and reliable derivation of the QCT value of trabecular bone.

This QCT technique does not require the use of external calibration phantoms, but uses internal reference tissues instead. Muscle and fat tissue, positioned in proximity to the lumbar vertabrae, are used as reference tissue to calibrate CT numbers of trabecular bone.

Applications

An interactive histogram plotting technique is used to determine the mode CT number of the trabecular bone.

The average BMD value for the lumbar slices is determined and compared to the selected reference population data and the T- and Z-scores are calculated and plotted in color for the final report.



* *Precise Measurement of Vertebral Bone Density Using Computed Tomography Without the Use of an External Reference Phantom.* Journal of Digital Imaging, *Vol. 2, No. 1 (Feb), 1999.*

** *Vertebral Bone Density in Icelandic Women Using Quantitative Computed Tomography Without an External Reference Phantom.* Osteoporosis International *(1993) 3:84-89.*

DI **Diagnostic Imaging**

- Phantomless QCT with PC based software
- Cost effective - provides added value to your existing equipment
- Bone Mineral Density (BMD) Analysis available from your present spine scans without additional procedures
- Trend Analysis performed for patients with follow-up or multiple studies
- Performs analysis retrospectively
- Reported precision better than 1%* for normals
- Reproducibility less than 2%**
- Determination of T-score and Z-score values
- DICOM® 3.0 compatible; DICOM storage class provider (SCP) application license provided

Specifications

Minimum computer requirements Pentium® processor, 3.5 inch HD floppy drive, DICOM supported system with Microsoft® Windows® 95, interfaces for non-DICOM systems available

Available model(s)

49-800 PC/QCT Bone Mineral Density Software

For additional information, please contact Radiation Management Services business of Cardinal Health at 440.248.9300, fax: 440.349.2307, or e-mail: rmsinfo@cardinal.com; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

49-800-ds rev 1 05 aug 03

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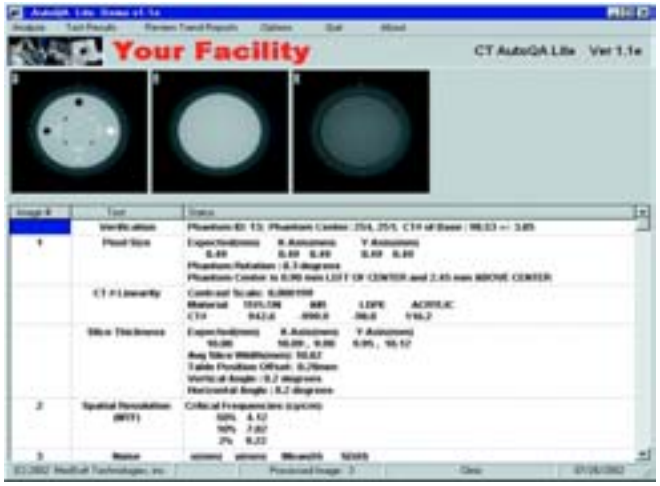
Order online

CT AutoQA Lite™ Software

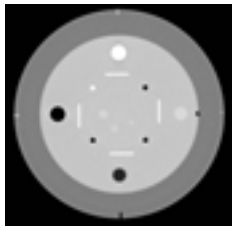
Model 49-802

DI **Diagnostic Imaging**



- Fast automated CT analysis for routine QC or acceptance testing
- Generates easy to read results with hardcopy output
- Comprehensive trend analysis
- Can be configured with various vendor phantoms including the Catphan® Phantom (Models 424, 440, and 500[1,2])
- DICOM® 3.0 compatible; DICOM storage class provider (SCP) application license provided

Processing features

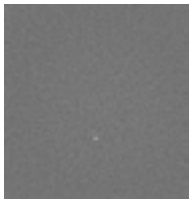


- **Localizer and table incrementation accuracy** – can be evaluated from the slice width section when the ramps are paired at opposing angles. The slice width test outputs a parameter called Table Position Offset, which is an offset in the z-axis relative to the center of the opposing wire (or test section). Verification of the scanner table incrementation accuracy can be checked by incrementing the table by 30 mm and then returning the table to the starting position and scanning the slice width module. The reported table position offset values should be the same.

Verification	Phantom ID: 1; Phantom center: 256, 257; CT# of base: 90.92 ± 2.30				
Pixel size	Expected (mm)	X-axis (mm)	Y-axis (mm)		
	0.47	0.47, 0.47	0.47, 0.47		
	Phantom rotation: 0.0°				
	Phantom center is 0.00 mm Right of Center and 0.47 mm Below Center				
CT # linearity	Contrast scale: 0.000197				
	Material	Teflon®	Air	LDPE	Acrylic
	CT#	975.8	-1011.8	-106.9	119.2
Slice thickness	Expected (mm)	X-axis (mm)	Y-axis (mm)		
	10.00	10.61, 9.10	10.55, 9.14		
	Avg. slice width: 9.85 mm				
	Table position offset: 0.52 mm				
	Vertical angle: 1.5°				
	Horizontal angle: 1.6°				

- **Noise and mean CT number** – is calculated from several regions of interest (ROI) positioned over a water/ uniformity phantom section. The number, size and location of these ROI's are variable, but typically five are defined: one at the phantom center and the other four along the axes at the same radius covering a 15 x 15 pixel area.

Noise	x (mm)	y (mm)	Mean (H)	SD (H)									
	0.00	50.00	5.48	2.50									
	50.00	0.00	4.86	2.51									
	0.00	-50.00	2.44	1.99									
	-50.00	0.00	3.46	2.22									
	0.00	0.00	5.16	2.62									
Uniformity			X-axis	Y-axis									
	Uniformity index		0.79	0.83									
	Std Dev (H): 4.2												
Low contrast	Contrast (%)	0.32	0.24	0.19	0.16	0.14	0.12	0.11	0.10	0.09	0.08	0.07	0.07	0.06
	Detail (mm)	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.0	11.0	12.0	13.0	14.0	15.0



- **Spatial resolution (MTF)** – The modulation transfer function (MTF) is calculated from the discrete Fourier transform of the average vertical and horizontal LSF's of the point spread function from the bead or wire test section. The program reports the 50%, 10%, and 2% MTF cutoff values[3].

Spatial resolution (MTF)	Critical frequencies (cyc/cm)	
	50%	8.15
	10%	10.86
	2%	12.90

- **CT linearity (sensitometry)** – mean CT values are calculated for each reference material in the phantom test section. The measured CT numbers for test materials are fit to the linear attenuation coefficients using a linear least squares for energies from 40 to 100 keV. The variance representing the lowest variance was designated as the scanner's effective energy. The linear attenuation coefficients for this effective energy are used to determine the contrast scale from the calculated linearity slope[4].
- **Pixel size** – test verifies the expected pixel size based on the display field of view and the reconstruction matrix size from the measured set of four calibration pins positioned at a known physical location as specified in the Catphan section CTP401.

Processing features *(continued)*

- **Slice thickness** – is determined from the average full-width at half-maximum (FWHM) of the CT number profile for each wire ramp. The expected slice width is compared with all four measured ramps values. A trigonometric conversion is calculated based on the known ramp angle to yield the slice width. This test provides information on the position of the phantom and the vertical and horizontal tilt values. A rotation of the phantom about an axis perpendicular to the ramps is also computed. Since there are two pairs of ramps orientated along the orthogonal directions, phantom rotations about both the vertical and horizontal axes can be estimated[5].
- **Uniformity** – vertical and horizontal profiles 10 pixels wide are generated and averaged through the phantom's center. The fractional uniformity of the profile is calculated as the percentage of the pixels within an acceptable range determined by ± 2 times the central noise or ± 10 H, whichever is smaller.
- **Contrast detail (low contrast resolution)** – theoretical Contrast-Detail data is calculated based on the measured noise of the water/uniformity test section.

  Note: *Low contrast modules (CTP263 and CTP515) are not used in this measurement. This represents a conservative estimate of the minimum contrast level required such that a cylindrical object of a given diameter should be detected[6].*

Result features

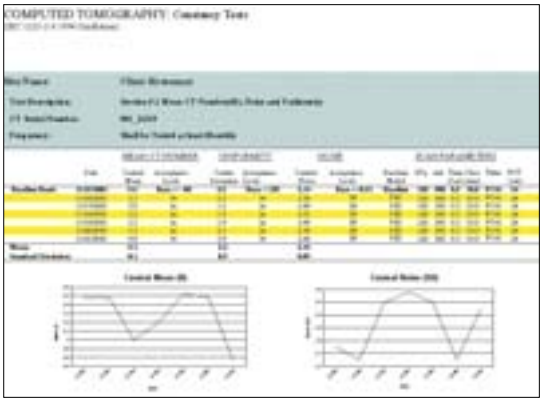
CT AutoQA Lite provides two database options for storage of test results. 'Monitor Database' is the first database option designated for constancy/monitoring and is linked to the Trend Analysis function. The 'Service Database' is the second data base option and is designed for more extensive service and/or acceptance testing data sets. If neither of these two options is appropriate, the user can select the option to not store results but only view results.

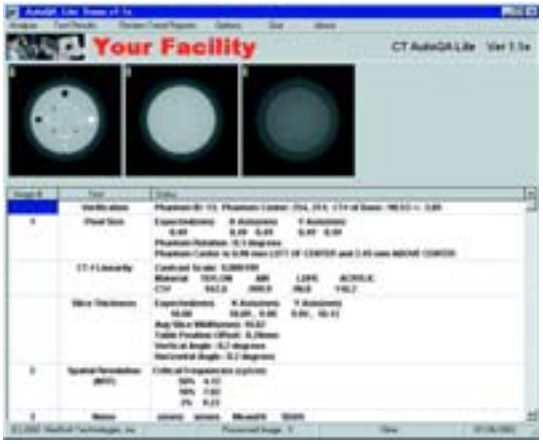
References

1. Goodenough DJ, Weaver KE, Davis DO. Development of a Phantom for Evaluation and Assurance of Image Quality. *Optical Engineering*, 16:52-65, Jan/Feb 1976.
2. Goodenough DJ, Levy JR, Kasales C. Development of phantom for Spiral CT. *Computerized Medical Imaging and Graphics*, 22: 247-255 1998.
3. Rossman K. Point Spread Function, Line Spread Function and Modulation Transfer Function: Tools for the Study of Imaging Systems. *Radiology,* 93:257-72, 1969.
4. Kriz RJ, Strauss KJ, An Investigation of computed tomography (CT) Linearity. *Medical Imaging and Instrumentation*, SPIE Vol. 555, 195-204, 1985.
5. Atkins FB, Goodenough DJ. A New Method to Test CT Scan Plane Angulation and Rotation Relative to a Test Phantom. *Radiology,* Vol. 209 (P), Pg 285, 1998.
6. Cohen G, DiBianca FA. The Use of Contrast-Detail-Dose Evaluation of Image Quality in a Computed Tomographic Scanner. *Journal of Computed Assisted Tomography*, 3(2):189-195, April 1979.

Result features *(continued)*

The basic display of results is provided as a scrolling window, with a print 'Test Results' function button.





The Trend Analysis feature is available for Noise/Mean CT number, slice width, spatial resolution (MTF), and CT linearity measurements. The Trend Analysis function is linked to the monitor database files and follows guidelines for CT constancy testing established by the International Electrotechnical Commission (IEC) 1223-2-6 (Constancy tests - X-ray equipment for computed tomography, First Edition 1994-04).

Specifications

Minimum computer requirements Pentium® processor, Microsoft® Windows® 95/NT®, CD-Rom, network connection using TCP/IP protocol, NIC

Available model(s)

49-802 CT AutoQA Lite Software

For additional information, please contact Radiation Management Services business of Cardinal Health at 440.248.9300, fax: 440.349.2307, or e-mail: rmsinfo@cardinal.com; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

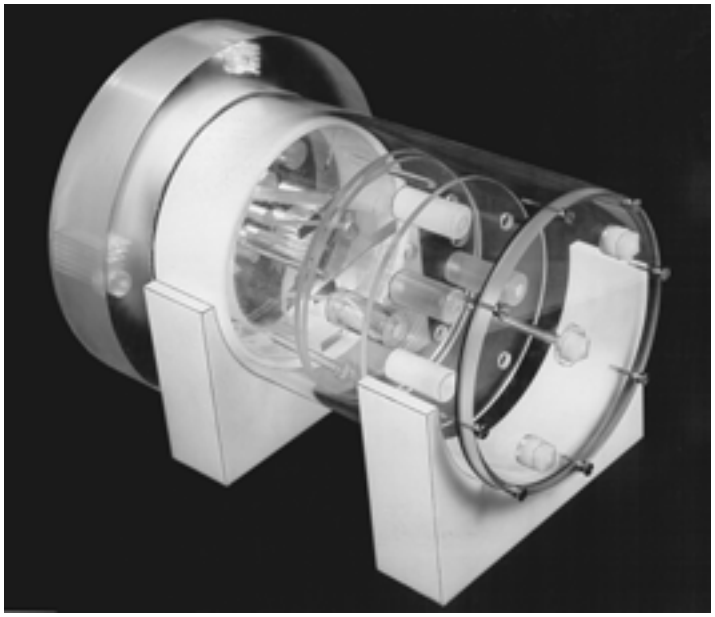
49-802-ds rev 1 26 jun 03

Order online

AAPM CT Performance Phantom

Model 76-410-4130

DI Diagnostic Imaging



- Meets guidelines in AAPM Report #1 for Performance Evaluation and QC of CT Scanners
- Single system measures nine performance parameters

Introduction

The increasing use of computed tomography (CT) as a diagnostic tool creates the need for an efficient means of evaluating the performance of the CT scanners now in use. Recognizing this requirement, the American Association of Physicists in Medicine established the AAPM Task Force on CT Scanner Phantoms. Its goals are to define CT scanner performance and present practical methods of performance testing through the utilization of special phantoms. This phantom design is based on the guidelines presented in Report #1 of the Task Force and approved by the AAPM.

Applications

The modular AAPM CT Performance Phantom offers the CT user a single system with which to measure nine performance parameters. This phantom permits the routine standardization of alignment, beam width, spatial uniformity, linearity/contrast, spatial resolution, linespread, noise, size independence, and absorbed dose. All components of the phantom are housed in a compact, transparent tank which holds the system together in the correct orientation.

The phantom consists of an 8.50 inch diameter acrylic tank containing a beam-width insert, a spatial resolution and linespread block, a high-contrast insert, and a means for inserting alignment pins and/or TLD holders. Additionally, a 0.25 inch thick Teflon® band, positioned at the base of the tank and concentric to the 8 inch internal diameter, simulates human bone. Attached to the base of the tank is a low-contrast section with resealable cavities (from 1 to 0.125 inch diameter) which can be filled with a diluted dextrose or other appropriate solution to provide a low-contrast media. The optional external resolution and noise ring slides snugly over the outside diameter of the tank, allowing whole-body scanner systems to be evaluated.

Features

This ONE phantom evaluates:

- Noise
- Spatial resolution
- Sensitivity (low contrast resolution)
- Absorbed dose
- Size dependence
- Contrast scale
- Slice thickness
- Alignment
- Linearity
- Beamwidth

Specifications

Watertank Made of acrylic, 8.50 inch OD x 8 inch ID x 12.75 inch long. Resealable with fill and drain ports. Low-contrast detectability block is attached to base

Linearity and contrast insert 7.50 inch OD x 2.50 inch long. Contains 1 inch diameter contrast pins of polyethylene, acrylic, polycarbonate, polystyrene and nylon. Density values: polyethylene, 0.95 gm/cc; polystyrene, 1.05 gm/cc; nylon, 1.10 gm/cc; acrylic, 1.19 gm/cc; polycarbonate, 1.20 gm/cc

NOTE: The contrast pins in each AAPM CT Performance Phantom are identical in density to the contrast pins of similar material in every other Nuclear Associates' CT Phantom. For example, the nylon pin in every CT Phantom we manufacture has the same density

This uniform density among all Nuclear Associates' phantoms provides the user with a standard for comparing the performance of different scanners

Resolution insert 7.50 inch OD x 2.50 inch long with 6 inch diameter solid acrylic block. In the Model 76-410-4130, the block has eight sets of five holes: 1.75, 1.5, 1.25, 1.00, .75, 0.61, 0.5, and 0.4 mm round. In the Model 76-410-4132, the block has nine sets of five holes: 1.75, 1.5, 1.25, 1.00, .75, 0.61, 0.5, 0.4, and 0.2 mm round. In both phantom inserts, the holes are spaced longitudinally on 5 mm centers and vertically on centers equal to twice the hole width. All cavities are filled with air. The 6 inch block is sectored 1.25 inch out on radius. The insert contains 0.014 inch stainless steel wire positioned longitudinally to the insert plates. The wire allows simple computation of linespread functions. A sectored 1.25 inch portion of the main 6 inch block permits an edge gradient to be measured

Beam width insert 7.50 inch OD x 3.50 inch long. Contains three 0.020 x 1.00 inch aluminum strips angled at 45°, positioned on the center line and displayed vertically. A simple, direct calculation permits the accurate measurement of beam width. Adjacency is determined merely by a double exposure of two adjacent frames

Low-contrast extension 8.50 inch OD x 2.75 inch long solid acrylic block. Has two each of the following 2.25 inch deep cavities: 1, 0.75, 0.50, 0.375, 0.25, and 0.125 inch diameter, spaced twice the appropriate diameter apart, one row of cavities on each side of the center line. Cavities with screw-locking sealing ports are easily filled with dextrose or sodium chloride solutions of various densities. The user may adjust densities to any value suitable for the scanner. Typically, 2% or 3% differentials in density between cavities are used

Alignment pin 0.25 inch OD x 3 inch long aluminum with tapped hole, allowing pin to be secured to cover plate

TLD insert 0.50 inch OD x 3.50 inch long polystyrene rod drilled 3 inch deep to accept TLD inserts. Resealable cavity. Tapped on other end to allow mounting to cover plate

External (whole-body) resolution and noise ring Annulus 12 inch OD x 8.50 inch ID x 2.50 inch long contains the same hole pattern as the Resolution Insert, at two locations 90° apart. Permits whole-body resolution and noise measurements when positioned on the main tank. Inner and outer resolution values are easily determined

CT-SSP insert The CT-SSP (Slice Sensitivity Profile) Point Response Phantom can be used as a stand-alone phantom or as an insert with the AAPM CT Performance Phantom. The AAPM CT Performance Phantom meets the guidelines in AAPM Report #1 for Performance Evaluation and QC of CT Scanners. The AAPM CT Performance Phantom is described in the report by the AAPM Task Force on CT Scanner Phantoms. The acrylic and closed-cell foam ball bearing size is 0.010 inch, diameter is 7.50 inch, width is 3.50 inch, and weight is 0.825 lb.

Dimensions 8.50 in Ø x 15.50 in (d) (21.59 x 39.37 cm)

Weight 17.25 lb (7.84 kg)

Optional accessories

External (Whole-Body) Resolution and Noise Ring (Model 76-411)

CT-SSP Point Response Phantom (Model 76-412)

Available model(s)

76-410-4130 AAPM CT Performance Phantom, with Resolution Insert (to 0.4 mm)

76-410-4132 AAPM CT Performance Phantom, with Resolution Insert (to 0.2 mm)

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

76-410-4130-ds rev 3 10 mar 03

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CT Dose Phantom Kit for Pediatric/Adult Head and Body

Model 76-419-4150

DI Diagnostic Imaging

- Specifically designed for pediatric or adult computed tomography dose index (CTDI)
- Can be used with new multi-detector (MDCT) units
- Meets requirements of FDA Performance Standards
- All new carrying case with wheels and pull handle

Introduction

These phantoms can be used with any computed tomography (CT) system designed to image both head and body. They can separate dose information for each. When performing dose profile measurements, the dose phantoms allow the user to collect information for the maximum, minimum and mid-range value of the nominal tomographic section thickness.

This essential phantom kit consists of three parts: an adult body phantom, an adult head phantom that doubles as a pediatric body phantom and the new pediatric head phantom. (All are made of solid acrylic, 15 cm thick, with diameters of 32, 16 and 10 cm, respectively.) Each part contains five probe holes, one in the center and four around the perimeter, 90° apart and 1 cm from the edge. The inside diameter of the holes is 1.31 cm. Each part includes five acrylic rods for plugging all the holes in the phantom. A sturdy storage and carrying case that holds all three phantoms is available as an option and includes wheels and a pull handle.

Applications

The CT Dose Phantoms were designed in accordance with the Food and Drug Administration's performance standard for diagnostic x-ray systems, which includes regulations specifically applicable to CT systems (21 CFR 1020.33).

Specifications

Weight

Body phantom 32 lb (14.5 kg)

Head phantom 8 lb (3.6 kg)

Pediatric head phantom 2.85 lb (1.3 kg)

Optional accessories

Carrying Case for CT Pediatric/Adult Head and Body Dose Phantom Kit (Model 89-419)

Carrying Case for CT Adult Head and Body Dose Phantom Kit (Model 89-414)

For ion chamber selection, see next page.

Available model(s)

76-419-4150 CT Dose Phantom Kit for Pediatric/Adult Head and Body, including carrying case

76-414-4150 CT Dose Phantom Kit for Adult Head and Body, including carrying case

76-419 CT Pediatric Head Dose Phantom, with five plugs

76-414 CT Head Dose Phantom, with five plugs

76-415 CT Body Dose Phantom, with five plugs

CardinalHealth

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CT Ion Chambers

Specifications

Detector type Vented air ion chamber

Volume 3.2 cc

Sensitive length 10.0 cm

Chamber material Polystyrene

Chamber inside diameter 6.4 mm

Chamber wall thickness 54 mg/cm^2

Electrode material Aluminum

Sensitivity 10 R. cm/nC (nominal)

Standard calibration 100 kVCP, 5.5 mm Al HVL (NIST Tech. M100)

Energy response ± 5%, 1 mm Al to 10 mm Al HVL

Beam orientation Normal to chamber axis

Phantom adapter OD 1.27 ± 0.04 cm (0.50 ± 0.015 in)

Leakage current (300 V collection potential) Less than 1013 A at 10 min polarization time, less than 1014 A at 2 hr polarization time

Intensity limits Continuous beam: 4.86 kR/min (1% recombination loss)

Pulsed beam 51.5 mR/pulse (1% recombination loss)

Maximum pulse repetition rate 3.3 kHz

Cable length 3 ft (0.9 m)

Weight 1 lb (0.46 kg)

Available model(s)

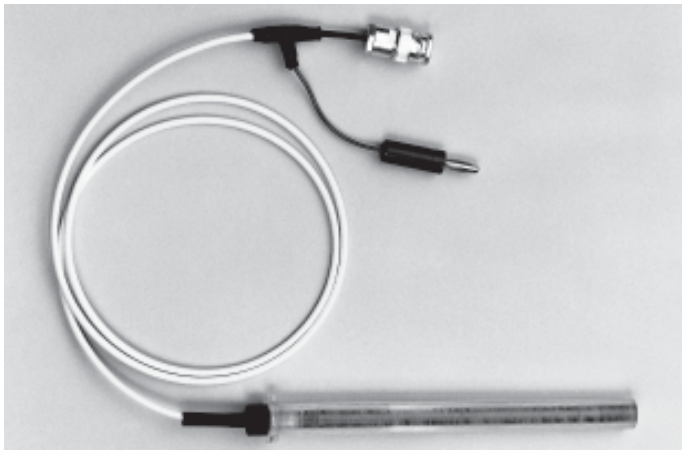
660-6 CT Ion Chamber, 3.2 cm^3, with UHF termination: used with Victoreen® Model 660 Electrometer

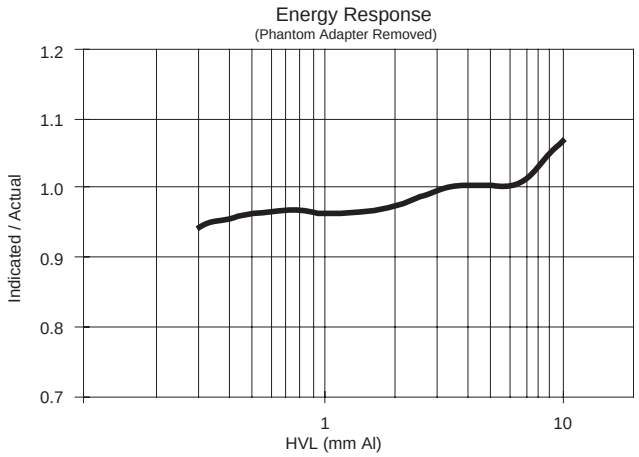
500-100 CT Ion Chamber, 3.2 cm^3: used with Model 35040 (ATD), TRIAD™ and TRIAD TnT

500-200 CT Ion Chamber High Sensitivity, 10 cm^3 for multislice CT: used with Model 35040 (ATD) and other electrometer/dosimeters, including TRIAD and TRIAD TnT

6000-100 CT Ion Chamber, 3.2 cm^3: used with Victoreen Models 4000, 6000, 8000 and RAD-CHECK® PLUS

6000-200 CT Ion Chamber High Sensitivity, 10 cm^3, for multislice CT: used with Victoreen Models 4000, 6000, 8000 and RAD-CHECK PLUS





For additional information, please contact the Radiation Management Services business of Cardinal Health at 440.248.9300, fax 440.349.2307 or e-mail rmsinfo@cardinal.com; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

76-419-4150-ds rev 1 13 may 04

CardinalHealth

www.cardinal.com/rms

Order online

CT Head and Body Dose Phantom

Model 76-414-4150

DI Diagnostic Imaging

Introduction

These phantoms can be used with any computed tomography (CT) system designed to image both head and body. They can separate dose information for each. When performing dose profile measurements, the dose phantoms allow the user to collect information for the maximum, minimum and mid-range value of the nominal tomographic section thickness.

This essential phantom consists of two parts: a body phantom and a head phantom. Both are made of solid acrylic, 15 cm thick, with diameters of 32 cm and 16 cm, respectively. Each part contains five probe holes, one in the center and four around the perimeter, 90° apart and 1 cm from the edge. The inside diameter of the holes is 1.31 cm. Each part includes five acrylic rods for plugging all the holes in the phantom. A storage and carrying case is available as an option.

Applications

The CT Dose Phantoms were designed in accordance with the Food and Drug Administration's performance standard for diagnostic x-ray systems, which includes regulations specifically applicable to CT systems (21 CFR 1020.33).

Allows the user to calculate:

- Computed Tomography Dose Index (CTDI)
- Dose profile
- Meets requirements of FDA Performance Standards

Specifications

Weight Body phantom: 32 lb (14.5 kg); Head phantom: 8 lb (3.6 kg)

Optional accessories

Carrying Case (Model 89-414)

CT Head Dose Phantom, with five plugs (Model 76-414)

CT Body Dose Phantom, with five plugs (Model 76-415)

Available model(s)

76-414-4150 CT Head and Body Dose Phantom

CT Ion Chambers

Specifications

Detector type Vented air ion chamber

Volume 3.2 cc

Sensitive length 10.0 cm

Chamber material Polystyrene

Chamber inside diameter 6.4 mm

Chamber wall thickness 54 mg/cm^2

Electrode material Aluminum

Sensitivity 10 R. cm/nC (nominal)

Standard calibration 100 kVCP, 5.5 mm Al HVL (NIST Tech. M100)

Energy response ± 5%, 1 mm Al to 10 mm Al HVL

Beam orientation Normal to chamber axis

Phantom adapter OD 1.27 ± 0.04 cm (0.50 ± 0.015 in)

Leakage current (300 V collection potential) less than 1013 A at 10 min polarization time, less than 1014 A at 2 hr polarization time

Intensity limits Continuous beam: 4.86 kR/min (1% recombination loss)

Pulsed beam 51.5 mR/pulse (1% recombination loss)

Maximum pulse repetition rate 3.3 kHz

Cable length 3 ft (0.9 m)

Weight 1 lb (0.46 kg)

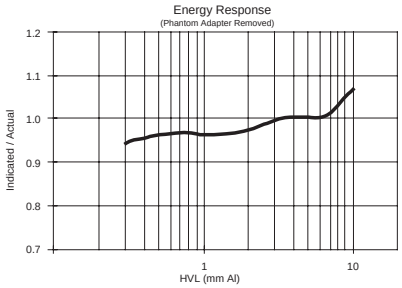
Available model(s)

660-6 CT Ion Chamber, 3.2 cm^3, with UHF termination: used with Victoreen Model 660 Electrometer

500-100 CT Ion Chamber, 3.2 cm^3: used with Model 530 and (ATD) Model 35040 electrometers

500-200 CT Ion Chamber High Sensitivity, 10 cm^3: used with Model 530, (ATD) Model 35040, and other electrometer/dosimeters

6000-100 CT Ion Chamber, 3.2 cm^3: used with Victoreen Models 4000, 6000, 8000, and RAD-CHECK® PLUS



Available model(s) *(continued)*

6000-200 CT Ion Chamber High Sensitivity, 10 cm^3, for multislice CT: used with Victoreen Models 4000, 6000, 8000, and RAD-CHECK PLUS

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

76-414-4150-ds rev 3 10 mar 03

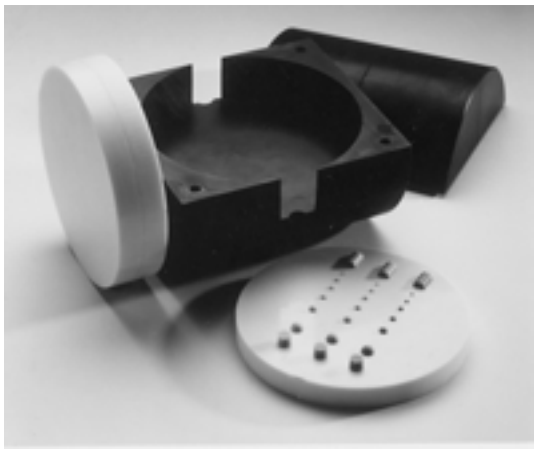
Order online

Diagnostic Imaging DI

Spiral/Helical CT Lesion Detectability Phantom

Model 76-409

- Incorporates clinically-relevant lesion shape (spherical) and size
- Provides clinically-relevant absolute HU values for soft tissue
- Provides a clinically-relevant HU differential (i.e. tumors have a slightly lower HU than backround)



Introduction

The CT Lesion Detectability Phantom is particularly useful to physicians, CT technologists, and medical physicists who design scanning protocols for abdominal, pelvic, and brain CT. It allows users to test various scanning protocols to verify that small low contrast lesions will be detected. This is the only way to be sure that a CT scanner is "seeing" tumors that are known to be present. The use of this phantom removes any doubt as to the limit of low contrast spherical lesion detectability for various scan protocols.

Features

- Designed for use on all conventional and spiral (helical) CT scanners
- Compact, rugged
- Features three cylindrical reference plugs made of the same material as the spherical lesions
- Valid for x-ray energies from 80 to 140 kVp
- Background Hounsfield Units (HU) approximate liver tissue
- Contains clinically-relevant sphere sizes of 2.4, 3.2, 4.0, 4.8, 6.3, and 9.5 mm in diameter
- Spheres are 5, 10, and 20 HU below background HU
- Carrying case is designed for use as a phantom support during scanning procedure

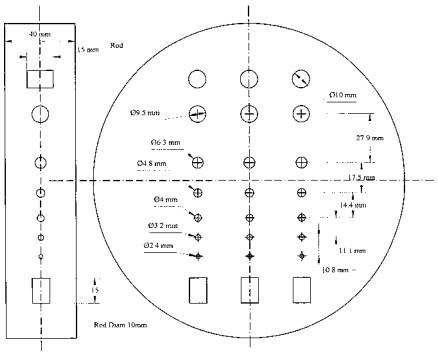
Applications

The phantom is designed to permit complete testing of low contrast lesion detection when various scan or image reconstruction parameters are varied. These include: collimation, pitch, reconstructed field of view, reconstruction algorithm, z-axis (patient's long axis) interpolators, kVp, mA, and rotation time. This lesion detectability testing can be applied to protocols designed for imaging of the liver, spleen, pancreas, kidneys, and adrenal glands. It can also be used for mass detection in the brain.

Specifications

Note: The CT Lesion Detectability Phantom is a tissue-equivalent test object that consists of an 18 cm diameter right circular cylinder with a CT value of 50 HU at 120 kVp. Within the phantom is an 18 cm diameter, 4 cm deep right circular void in which a soft-tissue-equivalent disk (containing low contrast spheres) can be placed. The cylindrical void is in a plane containing the z-axis of the scanner. The soft-tissue-equivalent disk also has a background CT value of 50 HU

Embedded within the disk are three sets of simulated spherical lesions. One set is 5 HU below background, a second set is 10 HU below background, and the last set is 20 HU below background. Each set contains one sphere each of the following diameters: 2.4, 3.2, 4.0, 4.8, 6.3, and 9.5 mm. These diameters were chosen to encompass the full range of clinically significant lesions. The disk can also be placed at the end of the phantom when axial scanning detectability testing is desired



Disk with embedded targets

Low-contrast sphere diameters 2.4, 3.2, 4.0, 4.8, 6.3, and 9.5 mm

Disk dimensions 18 cm Ø x 4 cm thick

Phantom dimensions 20 cm long x 18 cm Ø

Weight 11.9 lb (5.4 kg)

Available model(s)

76-409 Spiral/Helical CT Lesion Detectability Phantom

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

Specifications are subject to change without notice.

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CardinalHealth

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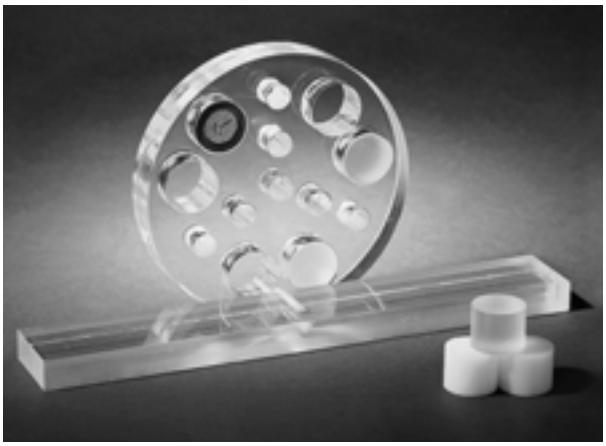
Mini CT QC Phantom

Model 76-430

DI Diagnostic Imaging

Introduction

This highly versatile phantom is designed for routine monitoring of the consistency of all the major parameters of computed tomography (CT) image quality and radiation dose. Its unique, compact design allows for unparalleled portability, easy set up and reliable parameter determinations. It is perfect for use by physicists, technologists and service engineers.



- Lightweight, compact, and extremely portable
- Ideal for field service use
- Used with any CT scanner, for measurement and analysis of all major CT scanner functions and radiation dose
- Makes inhomogeneity corrections in radiation oncology

Accurately evaluates:

- Laser beam alignment
- Slice thickness, spacing, and contiguity
- Table movement
- CT numbers and noise level
- CT number uniformity
- Relative radiation dose
- Video monitor and image processing equipment
- Scout and axial scan correspondence
- High contrast resolution
- Low contrast resolution (with optional insert)

Applications

The disc section consists of a 1 inch thick Lucite® disc with a 6 inch diameter. The six large holes are for the placement of inserts for evaluation of CT number consistency and evaluation of image resolution. The four small holes are for inserting an ion chamber at different locations within the phantom. Lucite inserts are provided to fill the four small holes, when necessary. The disc section is attached to a rectangular acrylic bar containing a thin copper wire embedded along a central groove. This section of the phantom is used to evaluate laser beam alignment and accuracy of slice thickness, slice spacing, slice contiguity, and pilot scan to transverse (longitudinal) scan correspondence. This is achieved by exposing a non-screen film (such as Flex Film Cassettes, listed below) placed underneath the phantom, and making several cuts while the phantom is advanced along the gantry in a pre-programmed manner.

Specifications

Dimensions 6 inch Ø, 1 inch thick, with six 1.125 inch through-holes and four 0.50 inch through-holes

Lucite disk The Lucite disk is attached to the side of the base by two removable nylon, slotted screws

Inserts Phantom is supplied with seven inserts for 1.125 inch holes; 1 each of: Plastic Water®, bone-equivalent, polystyrene, polycarbonate, polyethylene, nylon, and one acrylic high-contrast resolution insert

Lucite base 11.94 inch long x 1.81 inch wide x 0.69 inch thick, with copper wire (approximately 0.020 inch) fixed into a 0.020 inch deep groove centered on the base

Weight 3 lb (1.36 kg)

Optional accessories

Low Contrast Resolution Insert (Model 76-430-1000): designed for determining the CT unit's ability to detect slight differences in contrast. Two materials with very similar CT numbers are incorporated into the low contrast resolution insert to assess the low contrast detection capability of the unit

Optional accessories *(continued)*

Teflon® and Lung Inserts (Models 76-430-2000 and 76-430-3000): these inserts provide the CT number and density that are important when treatment planning parameters are being established for radiation therapy patients

Teflon-Bone Semi-Ring (Model 76-430-4000): this accessory is used as a beam hardening ring for simulating clinical conditions. The ring has been machined to slide easily over the phantom, so that each of the inserts will have the effect of beam hardening

Acrylic Insert with Wire, 0.50 inch (Model 76-430-1212)

Acrylic Insert (Model 76-430-6000)

Fillable Insert (Model 76-430-7000)

Aluminum Insert (Model 76-430-8000)

Carrying Case (Model 89-430)

Flex Film Cassette, 5 x 7 in (Model 07-800-5007)

Flex Film Cassette, 8 x 10 in (Model 07-800-8010)

Optional accessories *(continued)*

Flex Film Cassette, 10 x 12 in (Model 07-800-1012)

Available model(s)

76-430 Mini CT QC Phantom, includes seven inserts

76-430-5555 Mini CT QC Phantom Kit, includes phantom, seven standard inserts, all seven optional inserts, teflon-bone semi-ring, and carrying case

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

Specifications are subject to change without notice.

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Order online

Diagnostic Imaging DI

Interventional Triple-Modality 3-D Abdominal Phantom

Nuclear Associates Model 84-357

- Mimics human tissue for MRI, ultrasound, and CT
- Designed for training, quality control and demonstrating scan techniques

Needle not included

Features

- Improve performance of freehand abdominal biopsies
- Test new equipment
- Validate automated biopsy systems
- Demonstrate CT, ultrasound, and MRI scan techniques
- Optimize imaging protocols

* *US Patent No. 5196343.*

Introduction

This anthropomorphic phantom is made from proprietary materials which accurately mimic human tissues under magnetic resonance imaging (MRI), ultrasound, and computed tomography (CT). It is designed for image-guided interventional procedures.

Applications

The phantom contains simulated lungs, liver, hepatic vessels, ribs, vertebra, kidneys, abdominal aorta, inferior vena cava, muscle fat and interstitial tissues. Embedded within the lung and liver are simulated lesions available in a range of sizes and relative contrasts.

Each phantom is protected by a fat-equivalent urethane membrane and ABS end-caps. These features make the phantom durable enough for extended scanning sessions and enable insertion of various surgical instruments, as needed.

Specifications

Material Zerdine®*, urethane, epoxy, and ABS

Dimensions 28 (w) x 12.5 (d) x 20 cm (h)

Weight 12 lb (5.5 kg)

Available model(s)

84-357 Interventional Triple-Modality 3-D Abdominal Phantom

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA.

Specifications are subject to change without notice.

Zerdine is a registered trademark of Computerized Imaging Reference Systems, Inc.

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CardinalHealth

Order online

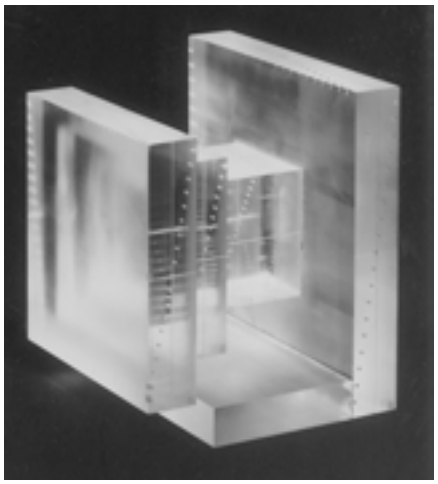
CT Spiral Phantom*

Model 76-432

DI Diagnostic Imaging

Introduction

The accurate indexing capability and exceptional image quality of the computed tomography (CT) scanners not only guarantee the object's location and its size and shape, but also improve the diagnosis accuracy. The index and performance parameters of the CT scanners cannot be confirmed without objects of known specifications. The CT Spiral Phantom from Nuclear Associates provides specific details necessary to confirm the integrity of both conventional and spiral scanning. What makes the phantom unique is that it allows the user to visually evaluate all test results in their image displays.



- A supplemental phantom to the CT Performance Phantom, described in a report by the AAPM task force on CT scanner phantoms
- Quality of axial and spiral scanning can be assured
- Accuracy of clinical diagnosis based on the object's size, shape and location will be improved
- Users can evaluate scanners objectively and independently of CT manufacturers
- No film exposures and no radiation profile measurements are necessary
- All test results can be evaluated visually by the users in their image displays
- Scanner evaluation is more realistic; what you scan, is what you see

Applications

The phantom consists of five Lucite® plates of different sizes, all affixed to a flat rectangular base. Specific hole patterns are drilled on each side of these plates. When imaging, the holes within the x-ray field will appear in the phantom images. By the hole appearance, both index and performance parameters can be confirmed qualitatively and quantitatively.

This versatile phantom can be used by:

End users, to:

- Set up baseline standards for future reference
- Verify scanner performance in the acceptance test
- Assist in routine equipment quality control testing
- Evaluate vendor-supported imaging protocols
- Customize image parameters for special applications

CT manufacturers, to:

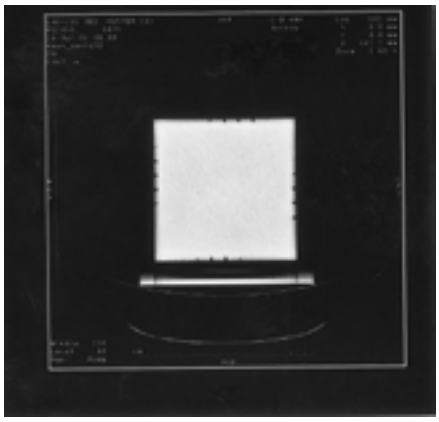
- Evaluate equipment hardware design
- Improve imaging software
- Facilitate equipment installation, calibration, and preventive maintenance

Research laboratories, for:

- Testing image reconstruction algorithms and interpolation approaches

Regulatory agencies, to:

- Set up the standards for CT scanners, and measure their compliance



Typical Spiral CT image of the CT Spiral Phantom shows non-uniform slice geometry, based on the hole appearance on each side of the plate

Specifications

Material Lucite

Plate dimensions 10 x 10 cm, 15 x 15 cm, 20 x 20 cm, 25 x 25 cm

Phantom dimensions 25 (w) x 20 (d) x 25 cm (h)

Weight 7.18 lb (8.2 kg)

Available model(s)

76-432 CT Spiral Phantom, with Bubble Level

Features

Parameters that can be confirmed by the phantom, based on the hole appearance in the phantom images include:

Index parameters

- Light localizer orientation
- Light localizer and image slice congruence
- Slice thickness accuracy
- Gantry inclination
- Couch index accuracy
- Ruler (angle and distance) accuracy

Performance parameters

- Slice geometric uniformity
- Image geometric distortion
- Image slice overlap
- Slice thickness change by pitch factor and image interpolation
- Noise level of imaging protocols

* *Designed by Jung T. Ho, Ph.D., Department of Radiology, LAC+USC Medical Center, Los Angelos, California 90033.*

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