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Model 76-414-4150NAD

CT Head and Body Dose Phantom



Diagnostic X-ray

76-414-4150NAD



Allows the user to calculate:

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

INTRODUCTION

These Nuclear Associates' 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).

FEATURES

The CTDI can be measured:

- At the axis of rotation of the phantom
- Along a line parallel to the axis of rotation and 1.0 cm interior to the surface of the phantom
- For each selectable CT condition of operation that varies either the rate or duration of X-ray exposure
- At the location coincidence with the maximum CTDI at 1 cm interior to the surface of the dosimetry phantom for each selectable peak tube potential

INOVISION

SPECIFICATIONS

Weight Body Phantom 32 lb; Head Phantom 8 lb

Options **Model 76-414-4150NAD** CT Head and Body Dose Phantom Kit

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

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

Model 89-414NAD Storage and Carrying Case

Specifications are subject to change without notice.

Manufactured for Nuclear Associates.

764144150NAD-ds rev 2 02 jun 01



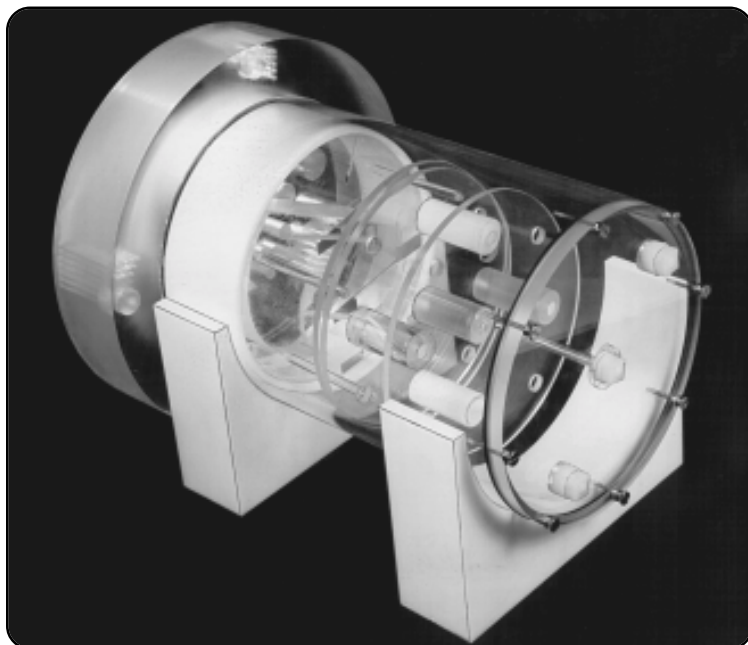
Model 76-410-4130NAD

CT Performance Phantom



Diagnostic X-ray

76-410-4130NAD



- Meets guidelines in AAPM Report #1 for performance evaluation and quality assurance 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 CT Performance Phantom offers the CT user a single system with which to measure nine performance parameters. **ONE PHANTOM DOES IT ALL!** 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 1/2 in 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 1/4 in thick Teflon® band, positioned at the base of the tank and concentric to the 8 in internal diameter, simulates human bone. Attached to the base of the tank is a low-contrast section with resealable cavities (from 1 in to 1/8 in 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

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SPECIFICATIONS

Water Tank

Made of acrylic, 8 1/2 in outside diameter x 8 in inside diameter x 12 3/4 in long. Resealable with fill and drain ports. Low-contrast detectability block is attached to base

Linearity and Contrast Insert

7 1/2 in outside diameter x 2 1/2 in long. Contains 1 in 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 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 1/2 in outside diameter x 2 1/2 in long with 6 in diameter solid acrylic block. In the Model 76-410-4130NAD, 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 76-410-4132NAD, 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 in block is sectored 1 1/4 in out on radius. Insert contains 0.014 in stainless steel wire positioned longitudinally to the insert plates. The wire allows simple computation of linespread functions. A sectored 1 1/4 in portion of the main 6 in block permits an edge gradient to be measured

Beam Width Insert

7 1/2 in outside diameter x 3 1/2 in long. Contains three 0.020 in x 1.00 in 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 1/2 in outside diameter x 2 3/4 in long solid acrylic block. Has two each of the following 2 1/4 in deep cavities; 1 in, 3/4 in, 1/2 in, 3/8 in, 1/4 in, and 1/8 in 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 in outside diameter x 3 in long aluminum with tapped hole, allowing pin to be secured to cover plate

TLD Insert 1/2 in outside diameter x 3 1/2 in long polystyrene rod drilled 3 in 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 in outside diameter x 8 1/2 in inside diameter x 2 1/2 in 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

Dimensions 8 1/2 in Ø x 15 1/2 in (d)

Weight 17.25 lb

Options **Model 76-410-4130NAD** CT Performance Phantom, with Resolution Insert (to 0.4 mm)
Model 76-410-4132NAD CT Performance Phantom, with Resolution Insert (to 0.2 mm)
Model 76-411NAD External (Whole-Body) Resolution and Noise Ring

Specifications are subject to change without notice.

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Manufactured for Nuclear Associates.

764104130NAD-ds rev 2 02 Jun 01

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Model 76-430NAD

Mini CT QC Phantom



Diagnostic X-ray

76-430NAD



- 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

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.

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 Nuclear Associates' Flex Film Cassettes, listed below) placed underneath the phantom, and making several cuts while the phantom is advanced along the gantry in a preprogrammed manner.

FEATURES

The Mini CT QC Phantom 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)

INOVISION

SPECIFICATIONS

Dimensions

6 in diameter, 1 in thick, with six 1 1/8 in through-holes and four 1/2 in 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 1/8 in holes; 1 each of: Plastic Water, bone-equivalent, polystyrene, polycarbonate, polyethylene, nylon, and one acrylic high-contrast resolution insert

Lucite base

11 15/16 in long x 1 13/16 in wide x 11/16 in thick, with copper wire (approximately .020 in) fixed into a .020 in deep groove centered on the base

Weight

3 lb

Options

Low Contrast Resolution Insert. 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

Teflon Insert and optional Lung Insert. 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. 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.

Model 76-430NAD Mini CT QC Phantom; Including Seven Inserts

Model 76-430-1000NAD Optional Low-Contrast Resolution Insert

Model 76-430-1212NAD Optional 1/2 in Acrylic Insert with Wire

Model 76-430-2000NAD Optional Teflon Insert

Model 76-430-3000NAD Optional Lung Insert

Model 76-430-4000NAD Optional Teflon-Bone Semi-Ring (270°) for Evaluation of Beam Hardening Correction Software

Model 76-430-5555NAD Mini CT QC Phantom Kit, Includes Phantom, Seven Standard Inserts, All Seven Optional Inserts, Teflon-Bone Semi-Ring and Carrying/Storage Case

Model 76-430-6000NAD Optional Acrylic Insert

Model 76-430-7000NAD Optional Fillable Insert

Model 76-430-8000NAD Optional Aluminum Insert

Model 89-430NAD Carrying Case

Model 07-800-5007NAD Flex Film Cassette; 5 in x 7 in

Model 07-800-8010NAD Flex Film Cassette; 8 in x 10 in

Model 07-800-1012NAD Flex Film Cassette; 10 in x 12 in

Specifications are subject to change without notice.

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76-430NAD-DS Rev. 1 20 NOV 00

The logo for INOVISION, featuring the word "INOVISION" in a bold, blue, sans-serif font. The letters "I" and "V" are stylized with horizontal lines passing through them.

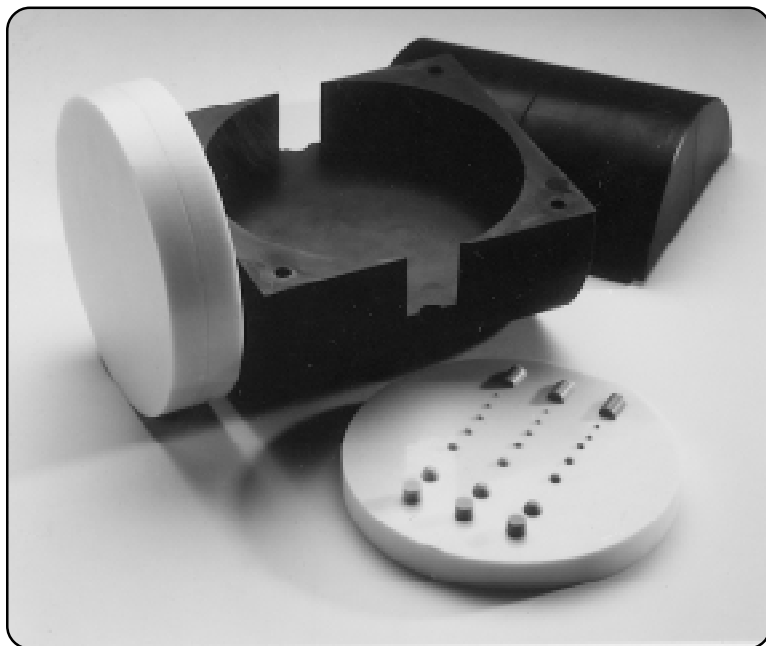
Model 76-409NAD

Spiral/Helical CT Lesion Detectability Phantom



Diagnostic X-ray

76-409NAD



The Spiral/Helical CT Lesion Detectability Phantom is Unique Because it:

- 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 background)

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.

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.

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 kVp 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

INOVISION

SPECIFICATIONS

NOTE: The CT Lesion Detectability Phantom from Nuclear Associates 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 mm, 3.2 mm, 4.0 mm, 4.8 mm, 6.3 mm, 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

Low-Contrast Sphere Diameters (mm)

2.4, 3.2, 4.0, 4.8, 6.3, 9.5

Disk Dimensions

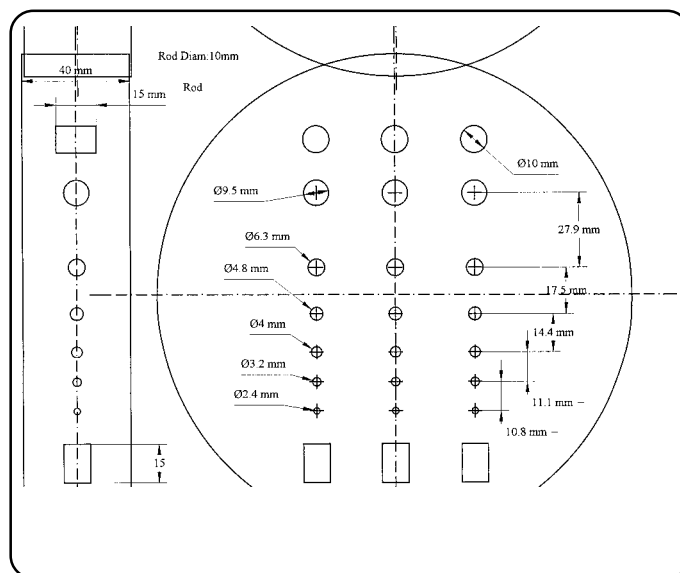
18 cm diameter x 4 cm thick

Phantom Dimensions

20 cm long x 18 cm Diameter

Weight 11.9 lb (5.4 kg)

Options **Model 76-409NAD** Spiral/Helical CT Lesion Detectability Phantom



Disk with embedded targets

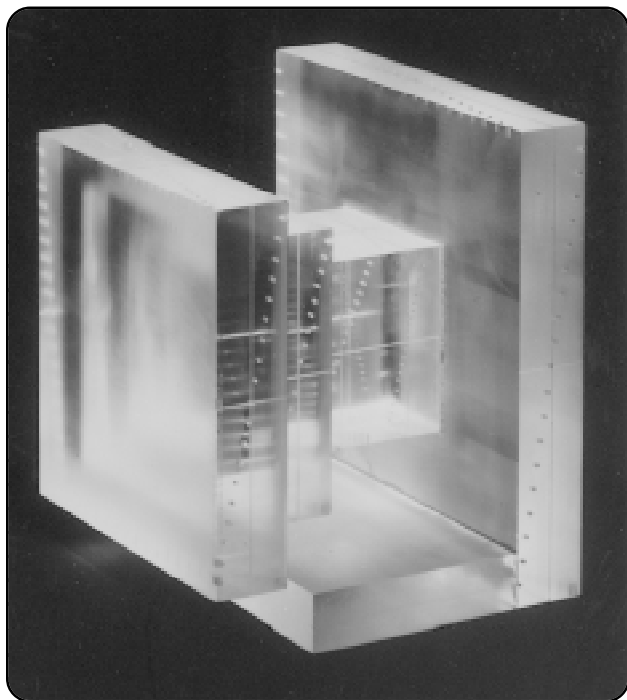
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76-409NAD-DS Rev. 1 07 NOV 00

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Model 76-432NAD CT Spiral Phantom*



Diagnostic X-ray

76-432NAD

With the CT Spiral Phantom:

- 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
- Maximum performance...Low cost... Easy to use

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 new 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.

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.

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

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

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SPECIFICATIONS

Material Lucite

Plate Dimensions

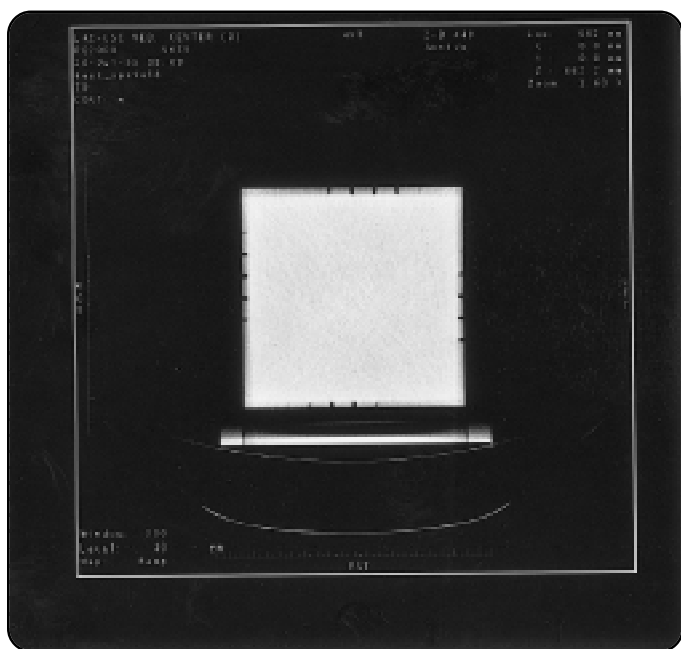
10 x 10 cm, 15 x 15 cm, 20 x 20 cm, 25 x 25 cm

Phantom Dimensions

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

Weight 7.18 lb (8.2 kg)

Options **Model 76-432NAD** CT Spiral Phantom, with Bubble Level



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

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

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76-432NAD-DS Rev. 1 20 NOV 00

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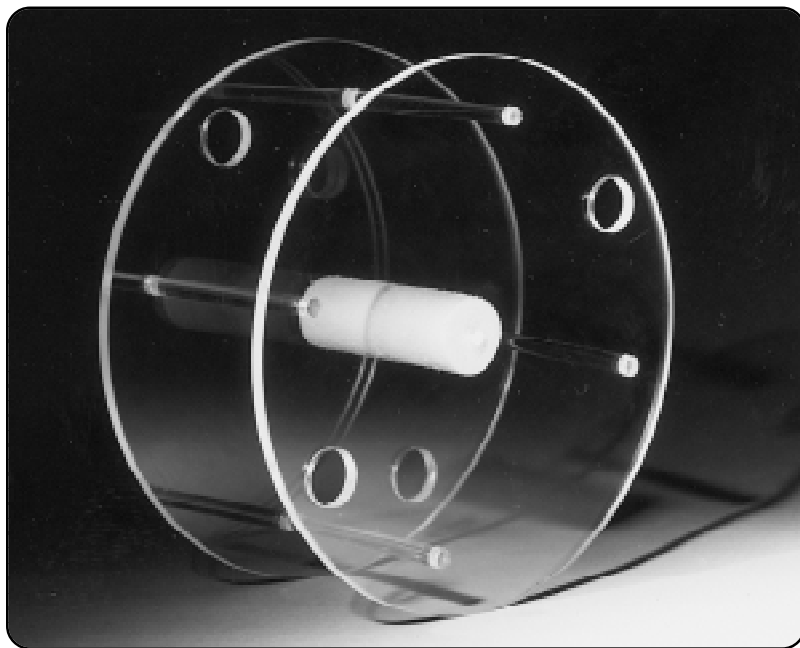
Model 76-412NAD

CT-SSP (Slice Sensitivity Profile) Point Response Phantom



Diagnostic X-ray

76-412NAD



Ideal for:

- Acceptance testing for slice thickness
- Routine QC for slice thickness
- Comparing slice sensitivity profiles for combinations of collimation, pitch and table speed

INTRODUCTION

Nuclear Associates' CT-SSP Phantom allows slice sensitivity profiles (section thickness) to be quickly and easily evaluated for spiral and conventional computed tomography (CT). By using this single test object, setup time is greatly reduced; something that cannot be accomplished using the 45° tilted aluminum ramps.

APPLICATIONS

This point response phantom consists of stainless steel ball bearings embedded in a block of closed-cell foam, allowing it to remain insensitive to setup constraints and positioning errors within the scanner. Unlike ramp or disk-type quality control devices, the CT-SSP Phantom will provide accurate determinations even if it isn't parallel to the imaging plane.

The CT-SSP Phantom can be used as a stand-alone phantom or as an insert with the CT Performance Phantom. The CT Performance Phantom (Models 76-410-4130NAD and 76-410-4132NAD) meets the guidelines in AAPM Report #1 for Performance Evaluation and QC of CT Scanners. The CT Performance Phantom is described in the report by the AAPM Task Force on CT Scanner Phantoms.

FEATURES

The CT-SSP Phantom:

- Complies with guidelines in NCRP (National Council on Radiation Protection and Measurements) Report No. 99 for testing sensitivity profile (slice width or section thickness)
- Determines the optimal combination of parameters to reduce partial volume averaging without compromising z-axis (patient) coverage
- Makes data easy to collect, analyze and display
- Is perfect for hospital-based QC physicists, CT researchers, independent QC consultants and manufacturers of CT equipment
- Is supplied with a base unit that enables it to be used as a stand-alone phantom

INOVISION

SPECIFICATIONS

Acrylic and closed-cell foam ball bearing size

.010 in

Dimensions 7 1/2 in Ø x 3 1/2 in (w)

Weight 13.2 oz

Options **Model 76-412NAD** CT-SSP (Slice Sensitivity Profile) Point Response Phantom

Model 76-410-4130NAD CT Performance Phantom, Without External (Whole Body) Resolution and Noise Ring

Model 76-410-4132NAD CT Performance Phantom, With Resolution Insert (to 0.2 mm)

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

FREE STUDY REPRINT AVAILABLE

"Determination of Spiral CT Slice Sensitivity Profiles Using a Point Response Phantom,"
Journal of Computer Assisted Tomography, 19:5
(Sept.-Oct. 1995), 838-843. **Request reprint #543B**

Specifications are subject to change without notice.

Manufactured for Nuclear Associates.

76-412NAD-DS Rev. 1 24 NOV 00



Model 84-357NAD

Interventional Triple-Modality 3-D Abdominal Phantom



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

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.

FEATURES

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

SPECIFICATIONS

Material Zerdine, urethane, epoxy, and ABS

Dimensions

280 mm (w) x 125 mm (d) x 200 mm (h)

Weight 12 lb (5500 g)

Options **Model 84-357NAD** Interventional Triple-Modality 3-D Abdominal Phantom

Specifications are subject to change without notice.

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Manufactured for Nuclear Associates.

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