The World Leader in Tissue Simulation Technology

Computerized Imaging Reference Systems, Incorporated is recognized world wide for its tissue simulation technology and is a leader in the manufacture of phantoms and simulators for quantitative densitometry, calibration, quality control and research in the field of medical imaging and radiotherapy.

For over 15 years CIRS has been accurately simulating a wide variety of tissues by skillfully blending epoxy resins, urethanes, water based polymers and other proprietary materials based on computer model calculations which consider tissue to be mimicked, modality/energy level to be used and raw materials. If you have specific requirements regarding physical density, x-ray linear attenuation coefficients, MRI response, ultrasonic attenuation and backscatter, speed of sound, electrical impedance, hardness, elasticity etc., CIRS can help. Most materials can be manufactured in just about any size or shape including anthropomorphic requirements.

If you have a special phantom or reference device you would like to have manufactured, please contact customer service for assistance (800) 617-1177. We look forward to discussing preliminary data on the item you envision.

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Tissue Simulation Technology
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Warranty and Ordering Information

Order and Shipping Policies
When ordering, please specify the model or catalog number and describe the item in detail. Make sure quantities are listed as well as your purchase order number. Shipping and billing addresses (if different) must be included on the order.

Quotes
All written quotes are dated and provide specified expiration time frames.

Product Development and Improvement
Items shown in this catalog are subject to modification and improvement. The customer is assured that the item delivered will equal or exceed the item described in the catalog in all respects or the item may be refused and money refunded.

Pricing
Prices and specifications are subject to change without notice. Orders will be invoiced at prices current on the date of shipment. If an item price increase exceeds $50.00 or 10% of the catalog price (whichever is greater) we will contact you to confirm acceptance of the new price before shipment.

Payment Terms
CIRS requires a minimum order of $150.00. Most items ship via traceable ground carrier, unless specified otherwise. All prices are Ex Works per INCO shipping terms. Shipping and handling quoted at time of order. All orders received from customers shall be deemed to be an acceptance by the customer of our standard order/shipping policies and its conditions. All custom manufactured orders and orders from outside the USA require payment prior to shipment. Please forward check, VISA/Mastercard number and expiration date or pay by wire. Domestic custom orders may ship COD.

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Conditions of Sale
All orders received from customers shall be deemed to be an acceptance by the customer of our standard order/shipping policies and its conditions.

Warranty
All items are sold with a written warranty. We guarantee satisfaction or your money back.

Contents 2003 Catalog

DIAGNOSTIC X-RAY AND RADIATION THERAPY

continued next page

MAMMOGRAPHY

ULTRASOUND

MULTI-MODALITIES

CT Simulator For Bone Mineral Analysis

A simple and effective method for accurate and reliable bone mineral measurements.

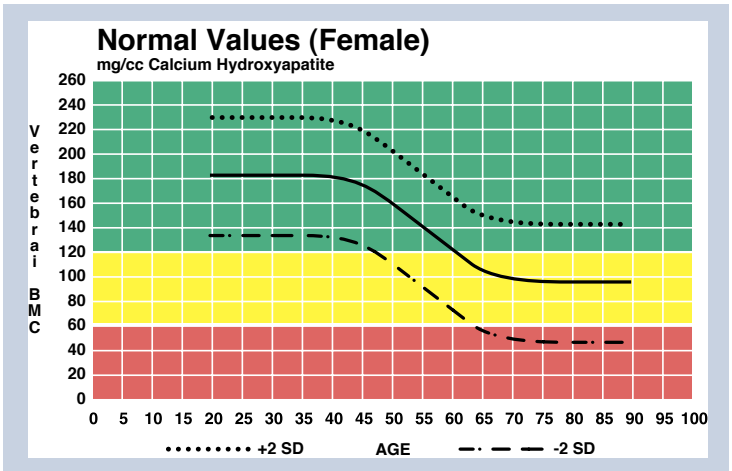
Change in trabecular bone mineral content is an early indicator of change in metabolic function. CT, with its superior contrast discrimination, is a major tool in the evaluation of trabecular bone in the central skeleton. All CT scanners require a standard of reference to properly perform quantitative tissue analysis.

The Model 004 takes into account all known variability factors that can adversely affect the use of CT for bone densitometry. The CIRS anthropomorphic phantom design minimizes beam hardening effects and variances associated with scan field position.

The Model 004 is the CT densitometry system to provide a solid epoxy matrix with true calcium hydroxyapatite references. The system provides extremely stable density references and does not require special extrapolations or complex calculations.

The reporting software runs on a PC or Macintosh platform and does not require CT scanner time. The Model 004 system is designed to be used immediately on any whole body CT scanner and does not require special setups or software configurations.

Model 004



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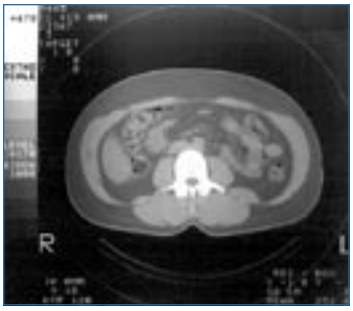

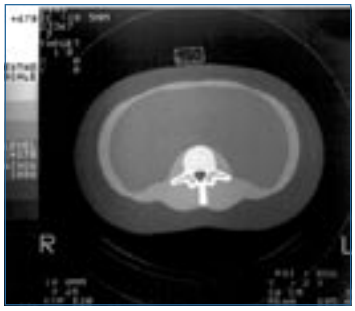

Phantom Benefits:

- Accurately simulates the size, shape and CT density of human tissue
- Includes standard vertebral inserts of varying density to permit accurate correlation for quantitative studies
- Provides the age-related variable corrections for marrow fat and mineral content
- Provides direct measure of calcium hydroxyapatite content avoiding the need for special extrapolations
- Requires no special scanner software
- Ideal for monitoring effects of therapy on trabecular structure
- Includes PC based report software
- Can be used immediately on all whole body CT scanners

User Friendly Report Software:

MODEL 004 computer PC software produces detailed graphic reports on your stationary.

MODEL 004 Includes:

- Tissue Equivalent lumbar section
- Medium and large attenuator rings
- Tissue Equivalent vertebral inserts 50, 100, 150 mg/cc calcium hydroxyapatite
- Slice thickness gauge
- Acrylic support board and base stand
- Technical manual
- Graphic report software (DOS or Windows)
- Manual work sheets and report forms (optional)
- Custom foam lined carrying case Dimensions: 22 1/4 x 14 1/2 x 17
- Instructional videotape
- Informative patient literature
- Technical hotline

References:

(1) Levi C, Gray JE, McCullough EC, Hatery RR, The unreliability of CT numbers as absolute values. AJR 1982:139:443-447

(2) Lampmann LEH, Duursma SA, Ruys JHJ, CT densitometry in osteoporosis 1984: Martinus Nijhoff]

(3) Cann CE, Genant HK: Precise measurement of vertebral mineral content using computed tomography. J Comput Assist Tomography 4: 493,1980

NEMA SCA&I
Cardiovascular Fluoroscopic Benchmark Phantom
For voluntary compliance with NEMA XR 21

The CIRS Model 901 NEMA-SCA&I phantom was designed to evaluate and standardize catheterization image quality. It is the result of collaborative efforts between the Society for Cardiac Angiography and Interventions and the National Electric Manufacturers Association. The phantom specifically enables voluntary compliance with the recently published performance standard NEMA XR 21.

The Model 901 is manufactured from PMMA with x-ray absorption properties similar to soft tissue at diagnostic energies. It contains a variety of static and dynamic test targets for objective assessment of resolution, motion unsharpness and radiation exposure. The sectional design allows for configuration in a wide range of thicknesses from 5 cm to 30 cm simulating PA thicknesses from infants to large adult patients.

The phantom is ideal for routine assessment of the entire imaging system.

Model 901

Features:

- Designed for voluntary compliance with NEMA XR 21
- Simulates coronary arteries for infant through large adult
- Evaluate spatial resolution, motion unsharpness and exposure for the entire imaging system

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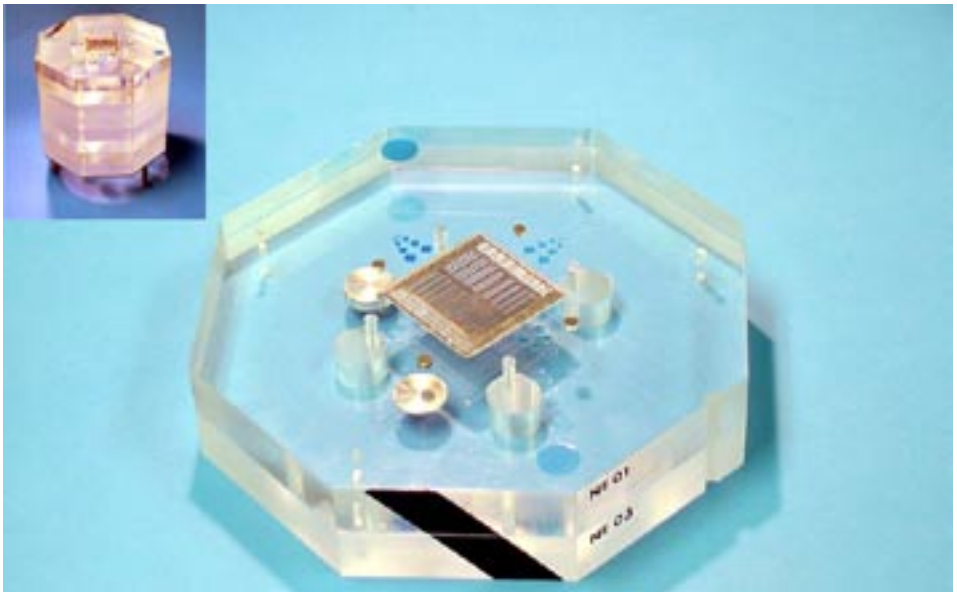
Model 901 Parts List:

Quantity	Plate Number	Description
1	01	Central Target Assembly
1	02	Working Thickness Range (WTR) Plate A
1	03	WTR Plate B
1	04	WTR Plate C
3	5	WTR Plate D
1	06	WTR Plate E
4	07	Blank Plate with alignment parts
1	08/08A (1ea)	Field Size Plate
1	09	Alignment Target for test stand
1	10	Alignment Cross for test stand
1	11	Alignment Target for small base
1	12	Alignment Cross for small base
1	13	Rotating Target Assembly
1	14	Test Stand
1	15	Small Base
1	16	3 mm thick lead plate with laminate
1	17	2 mm thick copper plate with laminate
35		Alignment pins
Optional		Dosimeter alignment adapter
Optional		Carrying Case



Model 901 Plate 01 & 03 Shown

Refer to NEMA publication NEMA XR 21 Characteristic of and Test Procedures for A Phantom to Benchmark Cardiac Fluoroscopic and Fluorographic Performance

ACR Radiography Fluoroscopy Accreditation Phantom

The CIRS Model 903 ACR Radiography / Fluoroscopy Phantom is designed to be an integral part of the American College of Radiology (ACR) Radiography / Fluoroscopy Accreditation Program. This voluntary program provides physicians with an opportunity for a comprehensive peer review of their Radiography / Fluoroscopy facility, personnel qualifications, image quality and quality assurance programs.

The ACR Radiography / Fluoroscopy Accreditation Phantom can be used for initial QA assessment and routine monthly QA testing to help ensure patients are receiving the best possible x-ray examinations.

The CIRS Model 903 is manufactured from PMMA equivalent epoxy that offers the same x-ray attenuation properties as acrylic with significantly greater durability.

Model 903

The overall phantom measures 25 cm wide x 25 cm long x 20.7 cm high and consists of three attenuation plates, one test object plate and a detachable stand for easy, reproducible set-up. Test objects include high-resolution copper mesh targets from 12 – 80 lines per inch, two separate contrast-detail test objects.

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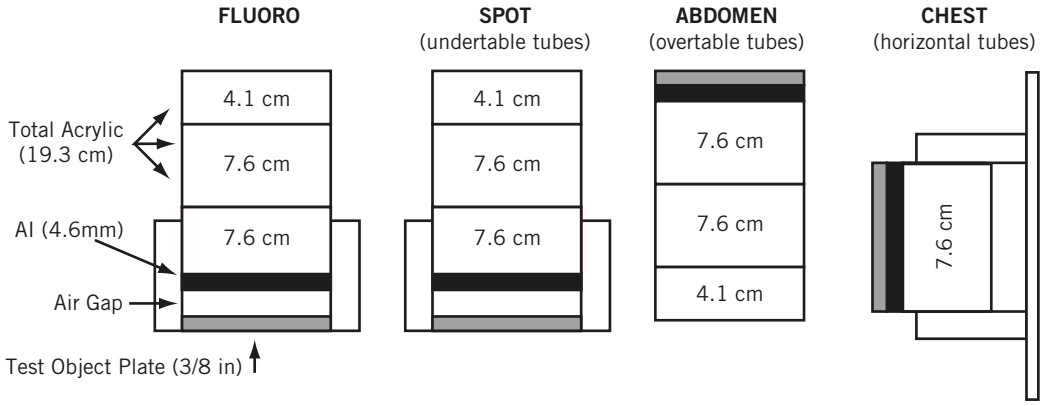
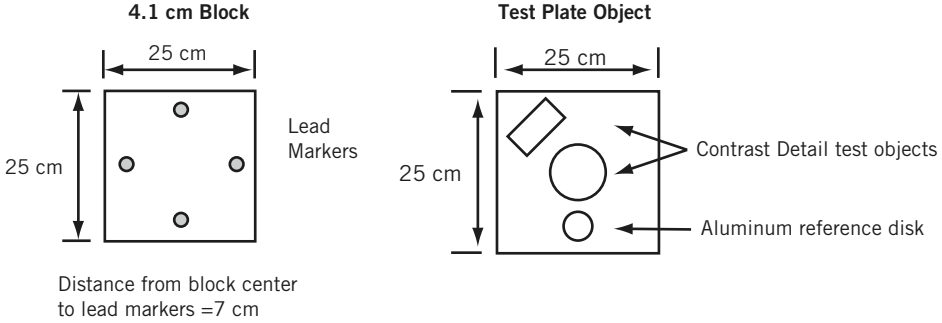
Model 903 Specifications:

Radiography/Fluoroscopy Accreditation Phantom

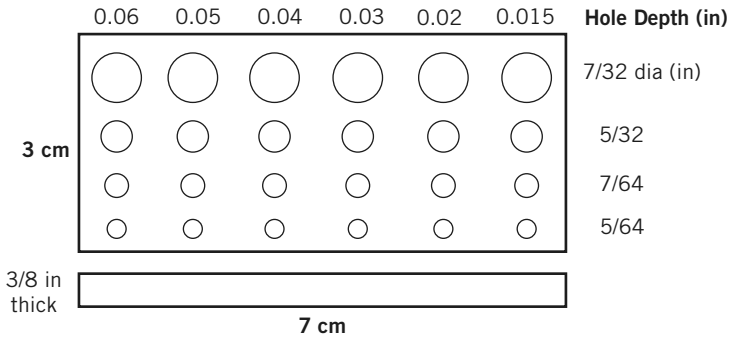
SIDE VIEW



TOP VIEW



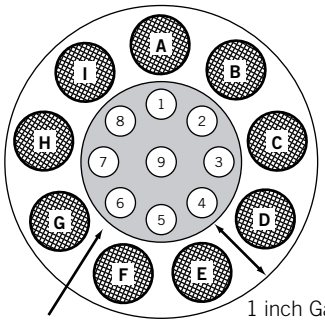
CONTRAST-DETAIL TEST OBJECT



HIGH CONTRAST MESH
LINES PER INCH

A-80
B-12
C-16
D-20
E-24
F-30
G-40
H-50
I-60

Meshes arranged in
incremental order
Lines angled at 45°



LOW CONTRAST HOLES
IN ALUMINUM DISK

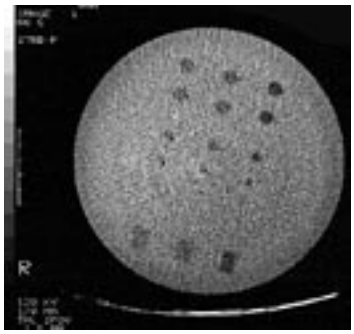
HOLE DEPTHS

1 - 0.068
2 - 0.049
3 - 0.035
4 - 0.025
5 - 0.018
6 - 0.0126
7 - 0.0091
8 - 0.0063
9 - 0.0040

Hole Diameter = 0.375"

Spiral/Helical CT Phantom

Optimize collimation and table speed (pitch) to ensure detection of small lesions in the abdominal cavity



The CIRS Helical CT Phantom is designed to test scanning protocols to verify that small low contrast lesions will be detected. The phantom permits complete testing of low contrast lesion detection when scan parameters are varied. These parameters include collimation, pitch, reconstructed field of view, reconstruction algorithms, z-axis interpolators, kVp, mA and rotation time. Testing can be applied to protocols designed for head and abdomen.

Contains clinically-relevant spherical targets that are 5, 10 and 20 HU below the liver equivalent background matrix.

Model 061

Features:

- Usable on all standard and helical scanners
- Background = liver
- Spheres = 5, 10, 20 ctu below background
- 3 reference plugs for each material used as spheres
- Valid contrast at all energy settings
- Compact

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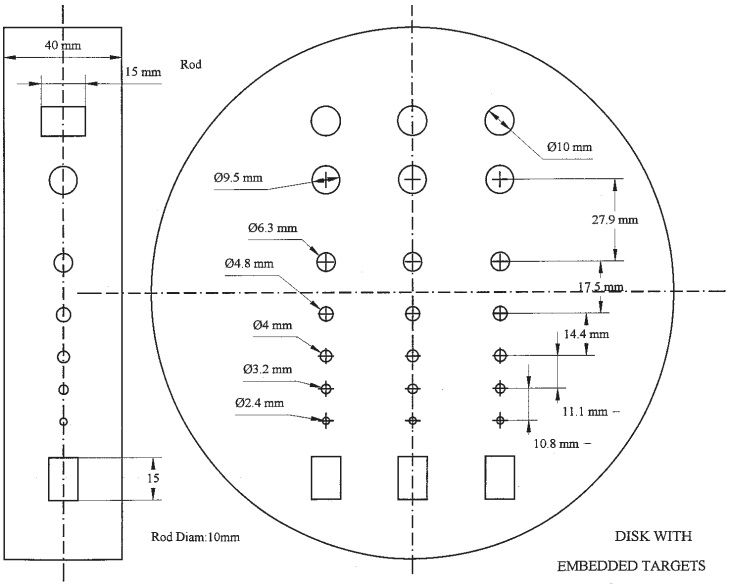
Model 061 Includes:

- Phantom Body
- Low contrast insert (See dimensions below)
- Carrying case which can be used as a phantom support during scanning procedure.
- Instruction manual.



CT Dose Phantom

Designed for FDA performance standard

The CIRS CT Dose Phantom is manufactured to comply with the Food and Drug Administration's performance standard for diagnostic x-ray systems, which includes Computed Tomography Systems (21CFR 1023.33).

Each phantom consists of two 14 cm thick solid PMMA disks measuring 16 cm (head) and 32 cm (body) in diameter.

The disks have five through-holes with an inside diameter of 1.31 cm to accommodate standard CT dose probes and five acrylic rods to plug the holes not in use. One hole is at center and four are around the perimeter, 90° apart and 1 cm from hole center to the outside edge of the phantom.

The head and body phantoms along with the ten acrylic rod plugs are packaged in an extremely rugged foam lined carrying case.

Model 007

Features:

- Usable on all CT scanners
- Head and abdominal configurations included
- Made from acrylic with a density of 1.19 grams/cc
- Includes 10 PMMA plugs
- 1.31 cm inside hole diameter sized for standard CT Dose probes
- Rugged foam lined carrying case included

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Tissue Equivalent Abdominal CT Dose

Accurate dose measurements for infants to large adults

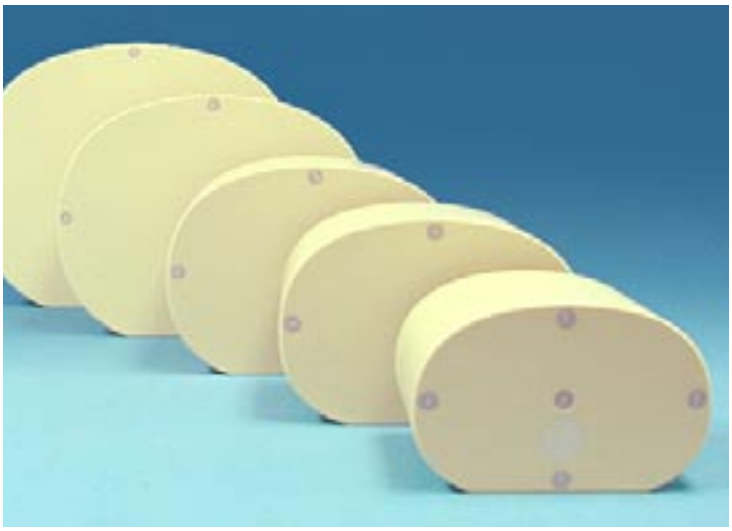
The CIRS Tissue Equivalent CT Dose Phantoms are designed to more accurately simulate the range of patient sizes from small infants to large adult patients rendering more accurate and reliable CT dose data.

The phantoms are made from proprietary epoxy formulations that faithfully mimic the x-ray absorption and scatter properties of soft tissue or water within 1% in the diagnostic energy range.

The set consists of six phantoms with PA thicknesses from 9 cm to 31 cm.

Each phantom includes an embedded vertebral bone equivalent rod that is specifically formulated to mimic the appropriate density for patient size/age.

Phantoms have five through-holes with an inside diameter of 1.30 cm to accommodate standard CT dose probes and five tissue equivalent rods to plug the holes not in use. One hole is at center hole and four are around the perimeter, 90° apart and 1 cm from center to the outside edge of the phantom.



Model 007-TE

Features:

- Usable on all CT scanners
- Simulates infant to large adult patients
- Made from tissue equivalent epoxy
- 1.30 cm inside hole diameter sized for standard CT Dose probes
- Rugged foam lined carrying case included

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Model 007-TE Size Specifications:

Age Group	PA Thickness	Circumference
Newborn	9.0 cm	32 cm
1 year old	11.5 cm	42 cm
5 year old	4 cm	53 cm
10 year old	16 cm	61 cm
15 year old	18.5 cm	71 cm
Small Adult	22 cm	86 cm
Medium Adult	5 cm	96 cm
Large Adult	31 cm	116 cm

3D Sectional Torso Phantom

Includes 12 internal organ tissues

The CIRS Model 600 Anthropomorphic Torso Phantom is designed to provide an accurate simulation of an average male torso (22 cm PA thickness) for medical imaging and dosimetry applications. The epoxy materials used to fabricate the phantom provide optimal tissue simulation between the Diagnostic and Therapy energy range (40 keV to 20 MeV).

Unlike other cross-sectional dosimetry phantoms, the Model 600 includes internal organ structures such as the heart, liver, kidneys, and pancreas. All simulated organs match the tissue density of actual organs and can be clearly visualized.

Model 600

The lower portion of the phantom contains a soft bolus material simulating a mix of 50 percent adipose and 50 percent muscle tissue. Muscle simulating material layers the rib cage and vertebral column. The exterior envelope simulates a mix of 36 percent adipose and 64 percent muscle tissue.

Benefits:

- Includes internal organ structures
- Ideal for calibration, QA and training purposes when specific internal organs are of interest
- Can be configured to accommodate a multitude of dose measurement media
- Usable on any x-ray imaging or treatment device

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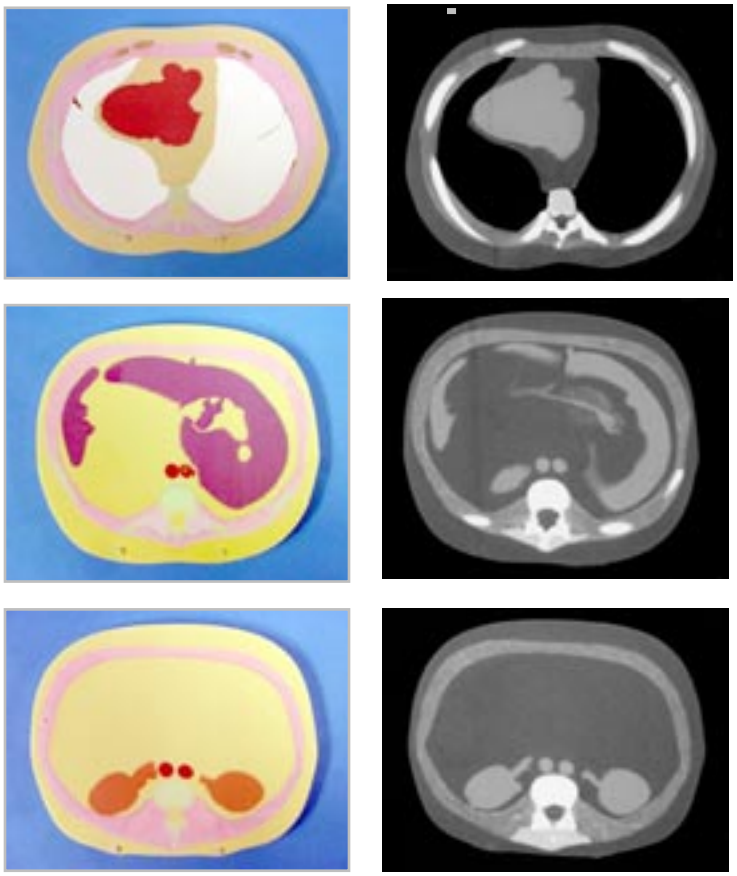
3D Torso Phantom Includes:

- Tissue equivalent torso cavity with skeletal structure
- Tissue equivalent lungs, heart, liver, pancreas, gall bladder and kidneys
- Foam lined carrying case
- Technical manual



CHEMICAL COMPOSITION OF THE TISSUE (illustrative example)
C: 0.3394 **O:** 05232 **H:** 0.002223 **N:** 0.0 **Ca:** 0.0000 **P:** 0.0013 **Al:** 0.0000
Cl: 0.0010 **Na:** 0.0010 **Mg:** 0.0000 **S:** 0.0023 **K:** 0.0025 **Bi:** 0.0000 **Br:** 0.0000
Density: 1.002

keV	Mass Attenuation	Linear Attenuation
10	4.3889	4.39768
15	1.41007	1.41289
20	0.70358	1.41289
30	0.34521	0.3459
40	0.25527	0.25578
50	0.21985	0.22029
60	0.20138	0.20179
80	0.18124	0.1816
100	0.16908	0.16941

CHEMICAL COMPOSITION OF THE SUBSTITUTE
C: 0.7004 **O:** 0.1726 **H:** 0.0881 **N:** 0.0219 **Ca:** 0.0145 **P:** 0.0000 **Al:** 0.0000
Cl: 0.0010 **Na:** 0.0000 **Mg:** 0.0000 **S:** 0.0000 **K:** 0.0000 **Bi:** 0.0000 **Br:** 0.0000
Density: 1.002

keV	Mass Attenuation	Linear Attenuation
10	4.12538	4.2087
15	1.36511	1.39269
20	0.69103	0.070499
30	0.34141	0.34831
40	0.25206	0.25715
50	0.2166	0.22097
60	0.19808	0.20209
80	0.17801	0.1816
100	0.16595	0.16931

3 Dimensional Torso Phantom

Complete with removable organs

The CIRS Anthropomorphic Torso Phantom is designed to provide an accurate simulation of an average male torso for medical imaging applications. The removable organs enable flexibility in the placement of TLD's, contrast agents, etc.. The epoxy materials used to fabricate the phantom provide optimal tissue simulation in the diagnostic energy range (40 keV to 20 MeV).

The phantom will accurately simulate the physical density and linear attenuation of actual tissue to within 2 percent in the diagnostic energy range. As an example, Table 1 gives the results of the simulation for a generic tissue comprising of 36 percent adipose /64 percent muscle.

Each phantom contains lung, heart, liver, pancreas, kidney, and gallbladder organs which are removable. The lower portion of the phantom contains a removable soft bolus material simulating a mix of 50 percent adipose and 50 percent muscle tissue.

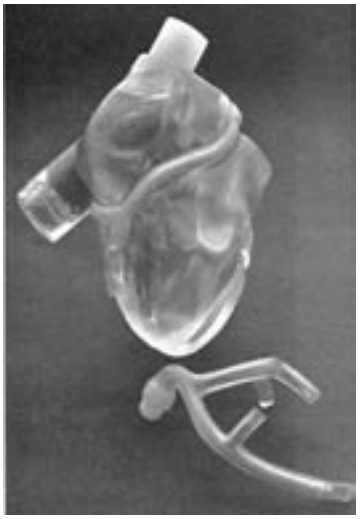
Model 602

This insert is used to maintain the position of the organs when the phantom is placed upright. For ease of removal, the bolus is enveloped in a screen-bag. Muscle simulating material layers the rib cage and vertebral column.

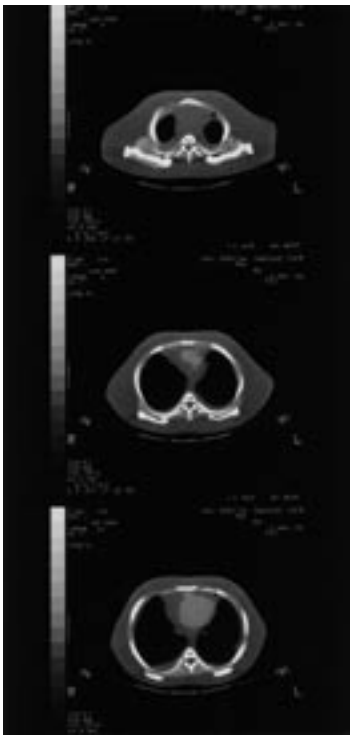
The exterior envelope simulates a mix of 36 percent adipose and 64 percent muscle tissue. The phantom is sealed at the bottom by an acrylic plate. Water or blood mimicking fluid can be used to fill all the interstitial voids.

3D Torso Phantom Includes:

- Tissue equivalent torso cavity with skeletal structure
- Removable lungs, heart, liver, pancreas, gall bladder and kidneys
- Tubing, couplers, vacuum pump and hardware.
- Foam lined carrying case.
- Optional heart with ventricle and auricle cavities and hollow coronary arteries available
- Technical manual



Optional heart and hollow coronary arteries.



CHEMICAL COMPOSITION OF THE TISSUE (illustrative example)
C: 0.3394 **O:** 05232 **H:** 0.002223 **N:** 0.0 **Ca:** 0.0000 **P:** 0.0013 **Al:** 0.0000
Cl: 0.0010 **Na:** 0.0010 **Mg:** 0.0000 **S:** 0.0023 **K:** 0.0025 **Bi:** 0.0000 **Br:** 0.0000
Density: 1.002

keV	Mass Attenuation	Linear Attenuation
10	4.3889	4.39768
15	1.41007	1.41289
20	0.70358	1.41289
30	0.34521	0.3459
40	0.25527	0.25578
50	0.21985	0.22029
60	0.20138	0.20179
80	0.18124	0.1816
100	0.16908	0.16941

CHEMICAL COMPOSITION OF THE SUBSTITUTE
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Cl: 0.0010 **Na:** 0.0000 **Mg:** 0.0000 **S:** 0.0000 **K:** 0.0000 **Bi:** 0.0000 **Br:** 0.0000
Density: 1.002

keV	Mass Attenuation	Linear Attenuation
10	4.12538	4.2087
15	1.36511	1.39269
20	0.69103	0.070499
30	0.34141	0.34831
40	0.25206	0.25715
50	0.2166	0.22097
60	0.19808	0.20209
80	0.17801	0.1816
100	0.16595	0.16931

Forearm Phantoms

For QA and research in CT, pQCT and DXA

The CIRS Forearm phantoms are available in three standard mineral densities of 400, 600 and 800 mg/cc calcium hydroxyapatite equivalence and are sold as a set. The simulated radius and ulna are embedded in a muscle equivalent epoxy matrix.

Each phantom simulates an average female's right arm from wrist to elbow in the palm down position most commonly used in peripheral bone mineral examinations. Other positions and mineral densities are available upon request.

Model 604

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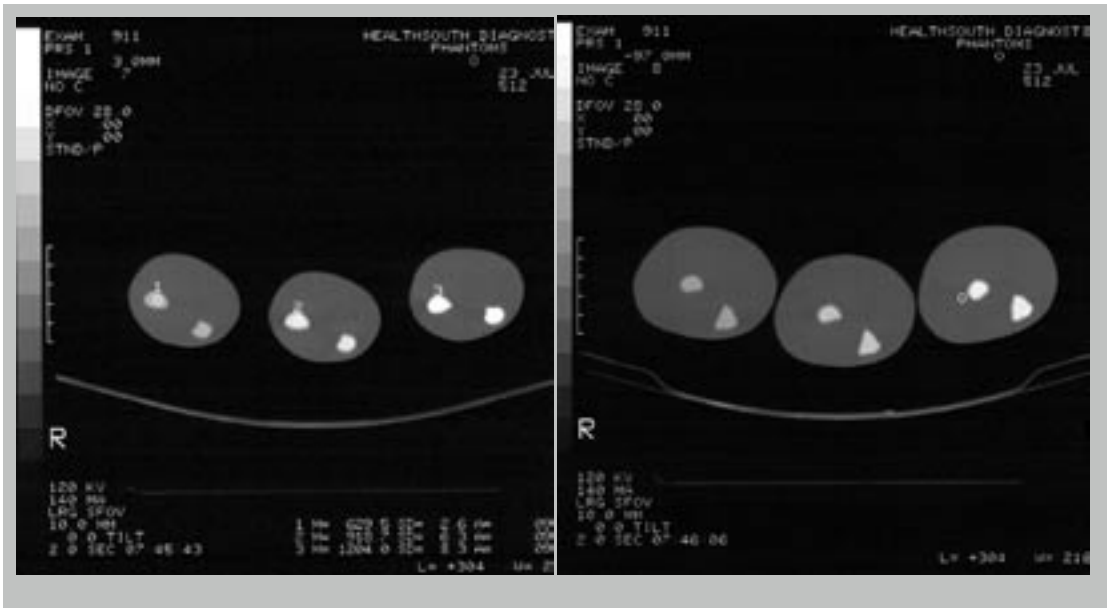
Model 604 Specifications:

MATERIAL:	Epoxy Resin
SOFT TISSUE:	Mimics muscle
BONE:	Each phantom has a different mineral density 400 mg/cc 600 mg/cc 800 mg/cc



3D Heel Phantom For DXA Scanners

Tissue Equivalent, Variable Calcaneal Densities

The Model 027 includes 10 calcaneal inserts of varying mineral densities which permit examination of the calcaneus.

The foot itself is made of epoxy resin to simulate muscle soft-tissue.

Phantom is tissue equivalent at diagnostic x-ray energies.

Model 027

Features:

- Foot with soft tissue which simulates muscle
- 5 calcaneal inserts which simulate H_2O
- 5 calcaneal inserts which simulate 200 mg/cm^3 density in H_2O matrix

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Model 027 Specifications:

MATERIAL: Epoxy Resin
AREA OF INSERT SIDE PROJECTION: 9.35± .1 cm^2
THICKNESS OF EACH INSERT: 5mm
BONE INSERT DENSITY: 200 mg/cm^3

THE PHANTOM CAN ACCOMODATE 5 INSERTS

NUMBER OF INSERTS			
BONE	H_2O		BMD mg/cm^2
0	5	=	0
1	4	=	100
2	3	=	200
3	2	=	300
4	1	=	400
5	0	=	500

Orthopedic Calibration Phantom for CT

CT scanners are used to generate cross-sectional images of peripheral skeletons. Dimensional data are used to size 3D bone models and custom implants.

Errors in CT measurement of bone dimensions have been documented. A sizing reference phantom, placed adjacent to patient anatomy during scanning permits correction of sizing extracted from images.

Approximate CTU at 120 keV :

Bone	1200
Marrow	65
Muscle	50
Fat	85

Model 006

Features:

- Tissue equivalent
- Fat
- Muscle
- Cortical Bone (800 mg/cc)
- Cortical dimensions controlled to 2 decimals

Designed by Douglas Robertson MD, Ph.D.
US Patent # 4,873,707.

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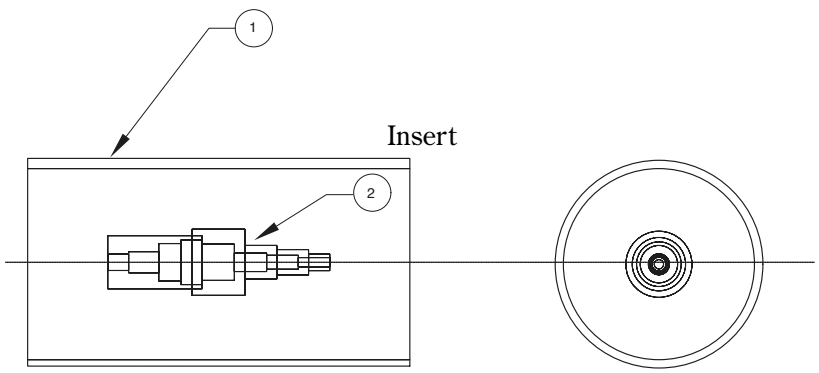
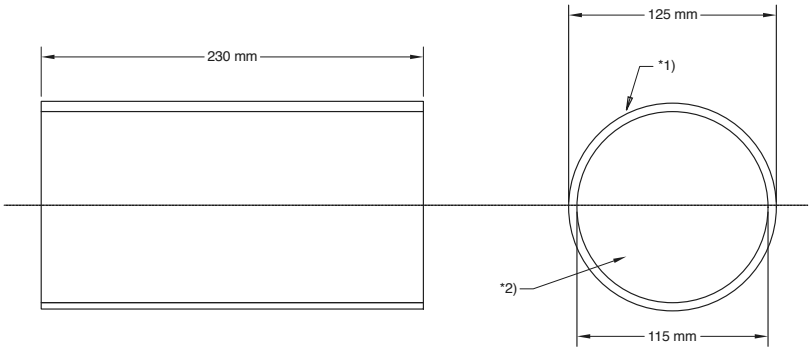
Model 006 Specifications:

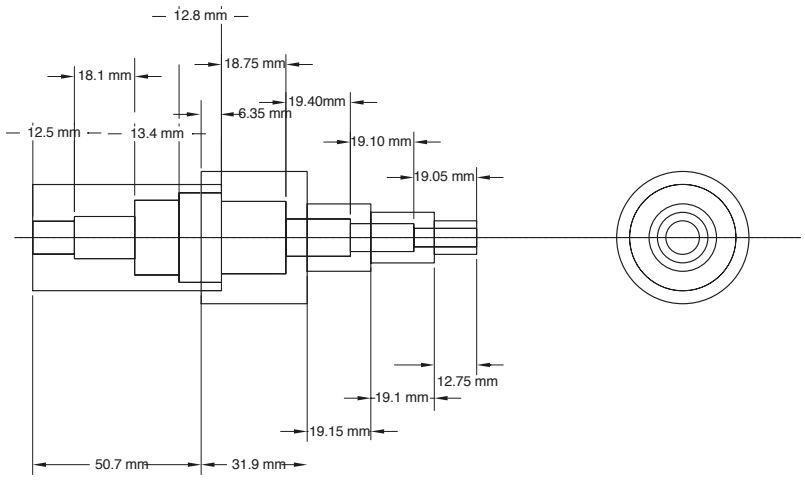
Assembly



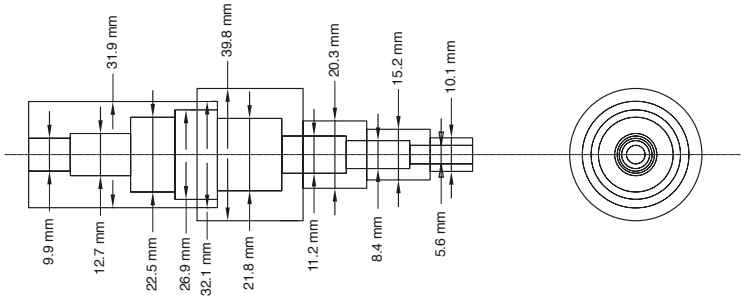
Outer Dimension of Phantom



Insert Length



Cortical and Marrow Diameters



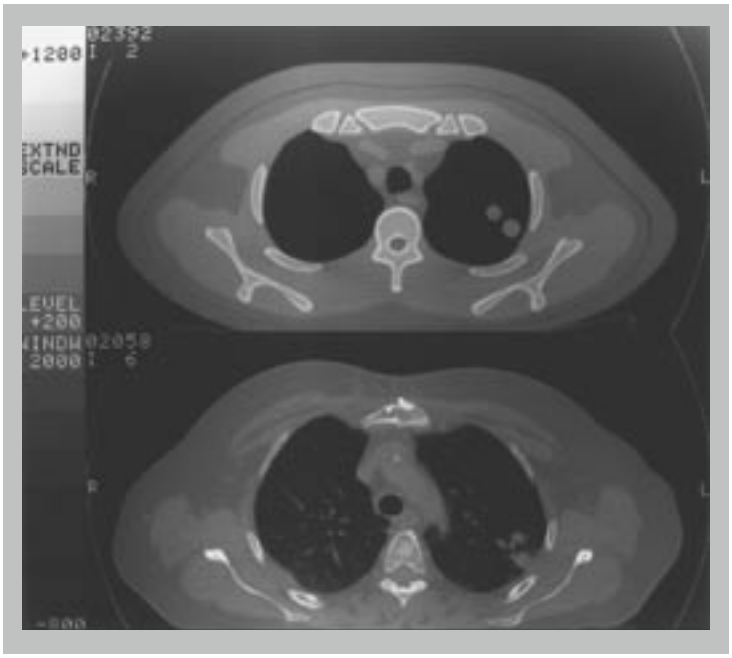
Lung Nodule Simulator for Quantitative CT

The most effective imaging technique for pulmonary nodules

The CIRS series of CT Lung Nodule simulators is fabricated from specially formulated tissue-equivalent materials and each part is individually tested before being molded in a 70 step, controlled process.

The reference nodules, derived from clinical experience, are submitted to stringent quality control procedures because they serve as the standard density above which calcification is considered to be present. Extensive certification procedures are followed for each phantom and for each of the fifteen reference nodules.

The diagnostic methodology that uses these phantoms was developed as a result of the pioneering research by Dr. Stanley Siegelman, Dr. Elias Zerhouni and their colleagues. The phantoms, themselves, were developed by CIRS in consultation with Dr. Zerhouni.



Model 003

Benefits:

- Higher diagnostic reliability
- Rapid answers to referring physicians and patients
- Extremely cost efficient
- Expanded utilization of existing CT capability
- No additional equipment required
- More efficient patient work-up
- Timely decision tool should surgery be indicated
- Most accurate, non-invasive method of evaluating pulmonary nodules

US Patent # 4,646,334

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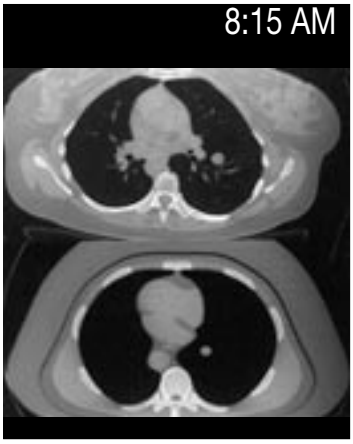
Model 003 Includes:

- 3 tissue equivalent transaxial sections
- Two sizing rings for each section
- One set of 15 reference nodules Liver spleen and diaphragm inserts
- CT slice thickness gauge
- Rolling cart and custom cabinet
- Detailed technical manuals
- Instructional video tape (VHS or PAL)

The technologist performs the scanning operation on the patient to obtain thin CT sections of the nodule.

The technologist sets up the appropriate phantom and reference nodule and scans them using the same technique as the patient.



The radiologist then simply compares the nodule densities of the patient and the phantom by manipulating the display window.

References:

1. Siegelman SS Zerhouni EA Leo FP, Khouri NF. Stitik FP CT of the solitary pulmonary nodule. AJR 135:1-13.1980.
2. Sagel SS. Lung pleura, pericardium and chest wall. In: Computed Body Tomography, ed. by JKT Lee. SS Sagel, RJ. Stanley, New York, Raven Press, 1983, pp 99-101.
3. Proto A.V.: CT Analysis of the pulmonary nodule presented at RSNA meeting—Chicago Nov. 14,1983.
4. Zerhouni EA, Spivey JF, Morgan RH, Leo FP, Stitik FP, Siegelman SS. Factors influencing quantitative CT measurements of solitary pulmonary nodules. J Comput Assist Tomogr 6:1075-1087,1982.
5. McCullough EC, Morin RL: CT number variability in thoracic geometry. AJR 141:135-140,1983.
6. Zerhouni EA, Boukadoum M, Siddiky MA, et al: A standard phantom for quantitative analysis of pulmonary nodules by Radiology 149: 767-773,1983.

080803

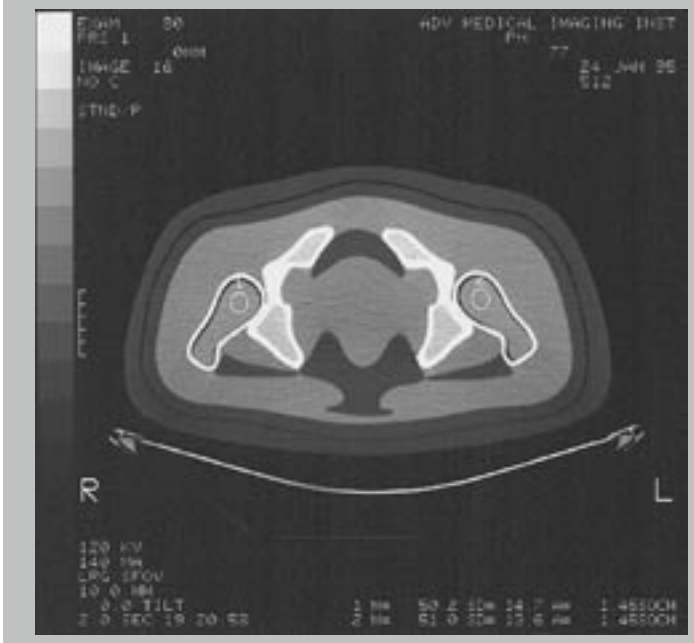
CT Simulator for Bone Mineral Analysis of the Femoral Neck

For research studies of the femoral neck

Change in trabecular bone mineral content is an early indicator of change in metabolic function. CT, with its superior contrast discrimination, is a major tool in the evaluation of trabecular bone in the central skeleton. All CT scanners require a standard of reference to properly perform quantitative tissue analysis.

The Model 005 takes into account all known variability factors that can adversely affect the use of CT for bone densitometry. The CIRS anthropomorphic phantom design minimizes beam hardening effects and variances associated with scan field position.

The Model 005 is the CT densitometry system to provide a solid epoxy matrix with true calcium hydroxyapatite references. The system provides extremely stable density references and does not require special extrapolations or complex calculations.



Model 005

Benefits:

- Accurately simulates the size, shape and CT density of human tissue
- Includes standard femoral neck inserts of varying density to permit accurate correlation for quantitative studies
- Provides direct measure of calcium hydroxyapatite content avoiding the need for extrapolations
- Requires no special software
- Can be used immediately on all whole body CT scanners
- Easy step by step reporting methods
- Technical hot line

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Model 005 Includes:

- Tissue Equivalent Femoral section
- Medium and large attenuator rings
- Tissue Equivalent inserts 50, 100, 150 mg/cc calcium hydroxyapatite
- Slice thickness gauge
- Acrylic support board and base stand
- Technical manual
- Manual work sheets and report forms (optional)
- Custom foam lined carrying case Dimensions: 22 1/4 x 14 1.2 x 17

Model 005

References:

(1) Levi C, Gray JE, McCullough EC, Hatery RR, The unreliability of CT numbers as absolute values. AJR 1982:139:443-447

(2) Cummings SR, Black D: Should Perimenopaulsal Women Be Screened for Osteoporosis? Jun 86 Annals of Int. Med. vol 104 number 6, page 817

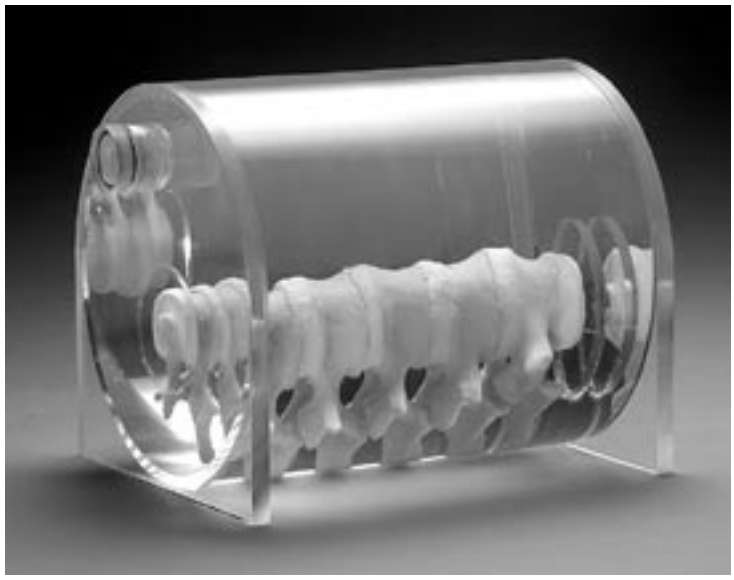
(3) Cann CE, Journal of Computer Assisted Tomography volume 9, 3 1985 page 639

3D Spine Phantom

Ideal for correlation studies between different bone density measurement systems

The Model 025 contains five anthropomorphic vertebral bodies, each having separate cortical and trabecular densities.

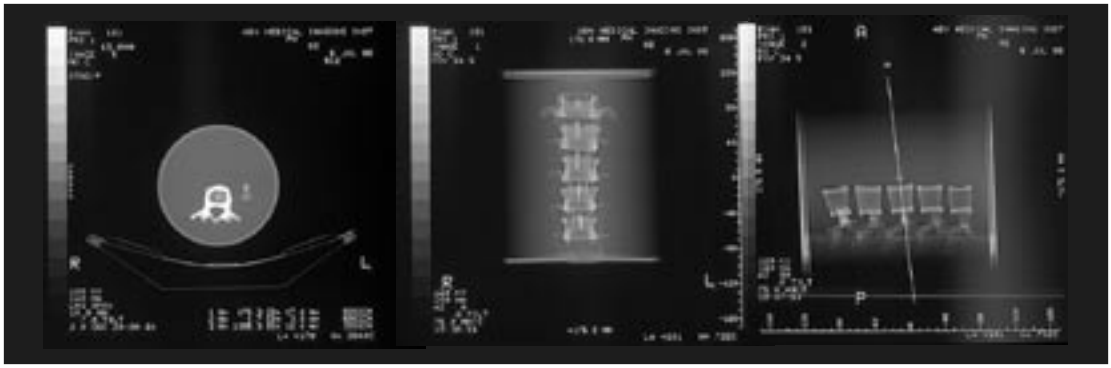
The acrylic "tank" design permits variation of the background matrix such as distilled water, glycol, or mineral oil. When not in use the tank can be quickly emptied, making the phantom light weight and easy to transport. The Model 025 comes with a heavy duty, foam lined carrying case for safe storage.



Model 025

Features:

- 5 Vertebral bodies
- Separate cortical and vertebral densities
- Variable background capability
- Carrying case



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Model 025 Specifications:

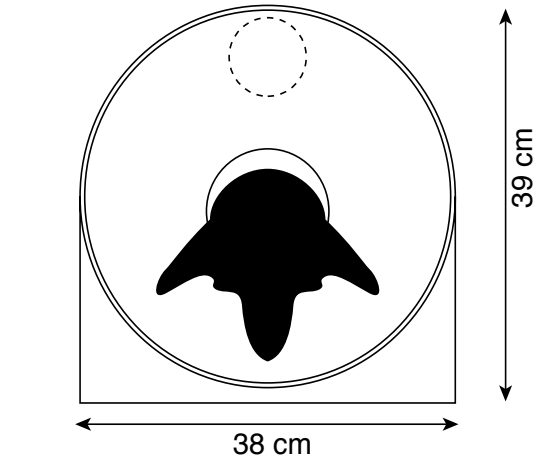
MATERIAL:
Bone - epoxy resin
Case - PMMA

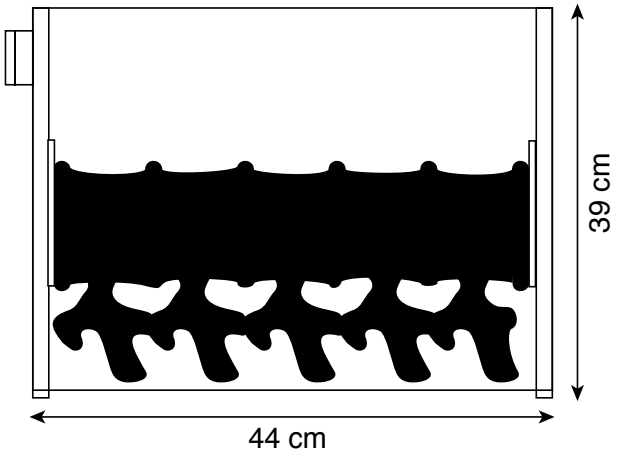
CORTICAL BONE DENSITY:
Equivalent to 1200 mg/cc in a soft tissue matrix.

TRABECULAR BONE DENSITY:
50 mg/cc to 250 mg/cc of calcium hydroxyapatite in a marrow equivalent matrix.

TANK DIMENSIONS:
38 cm DIA x 44 cm L

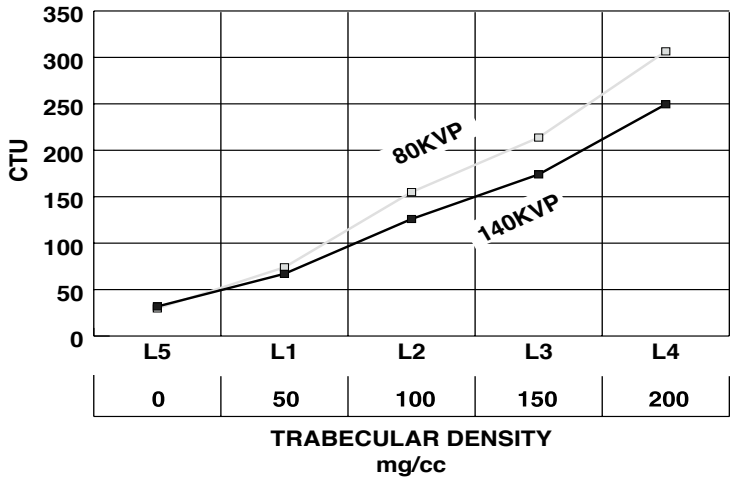
Shipping weight 45 lbs.





Phantom Response Example

GE 9800 Q Scanner - phantom filled with water



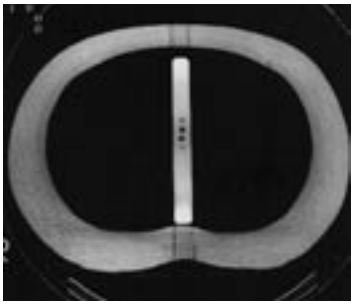
Slice Thickness Gauge

Slice thickness accuracy is one element in the quality control program for any CT scanner. It is a very important element and one which takes added emphasis when the scanner is used for quantitative applications such as bone densitometry, lung nodule analysis or other tissue comparative diagnostic techniques.

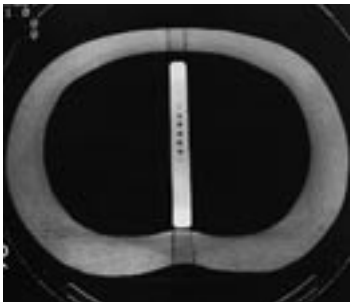
The gauge is constructed of 13 impact resistant acrylic sheets, each 1 mm thick and having one small hole drilled in each sheet. The 13 sheets are laminated with the 13 holes offset in a continuing (step) fashion.

The CIRS slice thickness gauge is designed for easy use by the CT technologist at any time there is a need for quick direct reading evaluation of slice thickness.

Model 030



3 mm Example



6 mm Example

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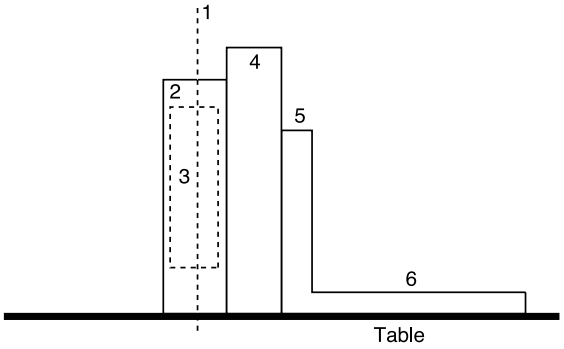
Slice Thickness Calibration



1. Laser Light
2. Attenuator Ring
3 Slice Gauge
4. Support Board
5. Support Base
6. Sandbag/Lead Apron

1. Place large attenuator ring on support board. Place slice thickness calibration gauge on Velcro™ support board so that gauge is perpendicular to foot of support board. (See figure above) The attenuator ring is provided to simulate a patient in the gantry as many scanners will not actively scan if an empty gantry is sensed.

2. Position Simulator on table so that laser light line is centered directly over the gauge. Be sure that support board and gauge are exactly perpendicular to the table. If necessary, use a sandbag on foot of support board to achieve this perpendicularity.

3. Set machine for 5 mm slice thickness (or whatever thickness setting you wish to check).

4. Scan the gauge using a normal abdominal technique such as 120 kv/140 mA/2 sec

5. Bring the image to the monitor. Use window level approximating 300 H and width of 1400 to 2000 H for ease of interpretation. You will see a certain number of distinct black circles. Each distinct black circle represents a 1 mm slice thickness. You may also see a lighter circle at the top or bottom - or perhaps, at both top and bottom. These lighter circles represent partial mm slice thicknesses. Thus, four distinct black circles and one lighter circle would represent a 4 1/2 mm slice thickness. Four distinct black circles and two lighter circles would represent a 5 mm slice thickness.

6. If the gauge's measurement of actual slice thickness is not within 1 mm of the setting you have made on your machine, have your machine serviced for slice thickness accuracy.

7. If the #1 or #13 hole show a black dot, you should reposition the gauge (or move the table) and rescan to insure the total slice thickness is recorded. If you wish to check other slice thicknesses, simply rescan the gauge with the different slice thickness.

REMEMBER
Quantitative CT analysis is heavily dependent on accuracy of slice thickness.

Dosimetry Verification Phantoms

ATOM®

ATOM® Phantoms were previously manufactured in Riga, Latvia and sold worldwide. Since the late eighties, these phantoms have been used extensively in Australia, Western Europe and the Republics of the former Soviet Union.

The complete line of ATOM® phantoms are now being manufactured exclusively by CIRS. Standard phantoms include bone, lung and soft tissue compositions formulated for accurate simulation for diagnostic and therapy energies. Photon attenuation values between 30 keV and 20 MeV are within 1% for bone and soft tissue substitutes and within 3% for lung substitute.

The skeleton is made from an average composition of normal cortical and trabecular bone and includes vertebral disks and spinal cord.

Standard phantoms consist of 25 mm thick contiguous sections. Each section contains 5 mm diameter through holes and tissue equivalent plugs for TLD placement. Hole locations are optimized for precise dosimetry in 19 internal organs (detailed list available upon request). Ion chamber cavities, other grid patterns and hole diameters are available upon request.

Standard phantom includes head, torso, upper femur and genitalia. Legs and arms are included with the newborn and 1 year pediatric phantoms. Legs and arms can be manufactured for other phantoms upon special request.

All phantoms include detailed technical manual, positioning system and storage case. Attenuation coefficients for all materials is available.

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Specifications:

Based on ICRP 23, ICRU 48 and available anatomical reference data

Model	Description	Height	Weight	Thorax Dimensions
701	Adult Male	173 cm	73 kg	23 cm x 32 cm
702	Adult Female	160	55	20 x 25 *
703	Pediatric Newborn	51	3.5	9 x 10.5
704	Pediatric 1 year	75	10	12 x 14
705	Pediatric 5 years	110	19	14 x 17
706	Pediatric 10 years	140	32	17 X 20
707	Pediatric 15 years	165	54	18 x 24

* measurement does not include breasts

Tissue Equivalent Substitutes Basic Data

	Average Soft Tissue		Average Bone (Adult)*		Lung (Inhale)**		Spinal Cord		Cartilage (vertebral disks)	
	Refer[1].	CIRS	Refer[1].	CIRS	Refer[2].	CIRS	Refer[1].	CIRS	Refer[2].	CIRS
Density, cm^{-3}	1.03	1.055	1.58	1.6	0.2	0.21	1.038	1.07	1.1	1.155
Z_{eff}	7.23	7.15	11.5	11.5	7.51	7.1	7.41	7.38	7.9	7.87
El.Density, $*10^{23}$ cm^{-3}	3.42	3.43	5.03	5.03	0.663	0.681	3.45	3.45	3.69	3.7
Basic Elements										
H	10.5	8.47	6.39	4.86	10.3	8.32	10.68	7.36	9.6	6.71
N	2.5	1.65	3.39	0.86	3.1	3.15	1.53	2.17	2.2	1.88
O+C	86.2	82.03	69.57	71.9	85.4	83.82	86.89	80.86	84.3	76.96
Ca			13.8	14.67						

* Average Bone material for Pediatric Phantoms is being used in Models 703, 704, and 705.

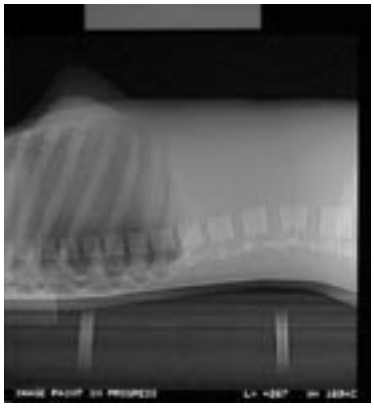
** Average (density - 0.26 - 0.30 gcm^{-3}) and Exhale Lung material (density - 0.45 - 0.50 gcm^{-3}) available.

Attenuation coefficients for all materials available upon request.

REFERENCE

1. ICRP 23, Reference Man, 1975.

2. ICRU 44, 1989.



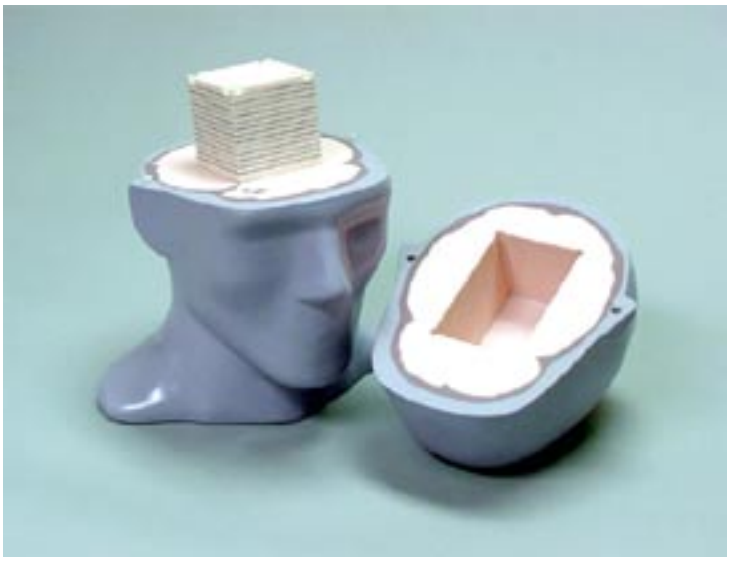
Radiosurgery Head Phantom

For Evaluation of Treatment Accuracy

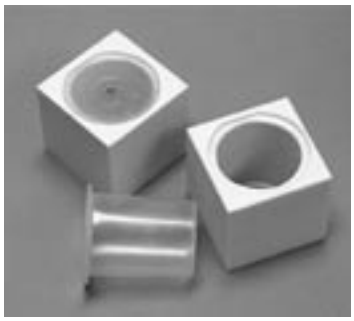
The CIRS Radiosurgery Head Phantom was designed to improve the accuracy of treatment plan verification in radiosurgery. It allows for 3D dose verification in a large cranial volume.

The Phantom contains average brain, bone spinal cord, vertebral disks and soft tissues mimicked with 1% accuracy for both CT and Therapy energy ranges (50 keV - 25 MeV).

The 2.5"x2.5"x2.5" Film Cassette contains 13 levels of X-Ray or Gafchromic® Film to increase accuracy of 3D dose reconstruction. It can be interchanged with an equivalent Gel Dosimetry Cassette or TLD holder. Two brain-equivalent spacers allow the user to locate the cassette in one of four different positions without breaking the consistency of the intracranial anatomy.



Model 605



BANG™ gel cassette

BANG is a registered trademark of MGS Research Inc.

Phantom Benefits:

- Verification of intracranial dose distribution
- 3D isodose verification
- Commissioning and comparison of Treatment Planning Systems
- Verification of individual patient treatment plan
- Teaching tool for Gamma Knife and Radiosurgery

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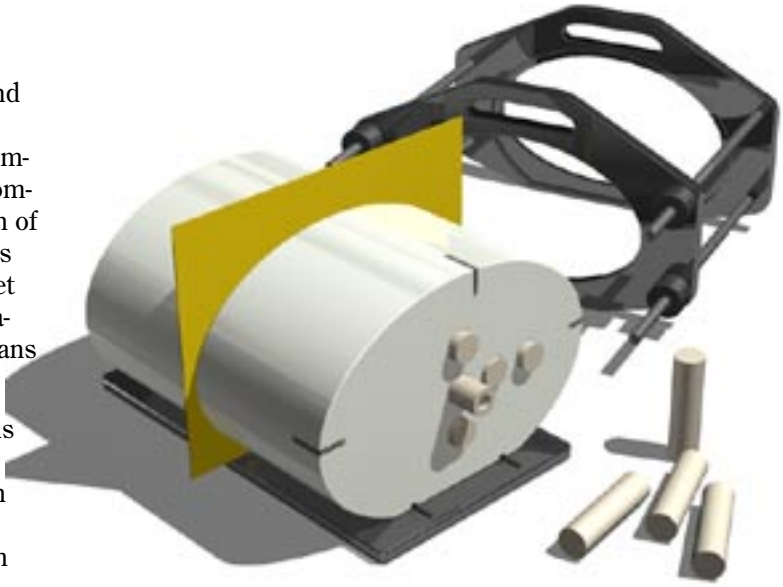
IMRT Homogeneous Phantom

Complete QA from CT imaging to dose verification



The CIRS Model 002H5 IMRT Phantom for Film and Ion chamber Dosimetry is designed to address the complex issues surrounding commissioning and comparison of treatment planning systems while providing a simple yet reliable method for verification of individual patient plans and delivery.

The 002H5 is homogeneous and elliptical in shape. It properly represents human anatomy in size and proportion. It measures 30 cm long x 30 cm wide x 20 cm thick (PA). The phantom is manufactured from a unique proprietary material that faithfully mimics water within 1% from 50 keV to 25 MeV.

Water equivalent interchangeable rod inserts accommodate ionization chambers allowing for point dose measurements in multiple planes within the phantom. The phantom also supports radiographic or GafChromic® film at mid-plane in the phantom for analysis of dose distributions. Optional inserts are available to support a variety of other detectors including TLD's, MOSFET, and diodes.

Handling, assembly and proper orientation of the phantom is made easy with the use of a unique alignment base and holding device. The surfaces of the phantom are etched for ease of laser alignment, and CT markers ensure accurate film to plan registration.

IMRT Solutions

Phantom Benefits:

- Check 2D dose distributions (3D distributions optional)
- Point dose measurements in multiple planes
- Calibrate film with ion chamber quickly verify individual patient treatment plans
- Correlate CTU to electron density

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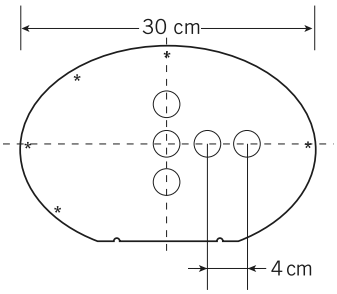
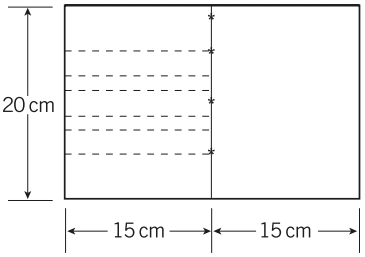
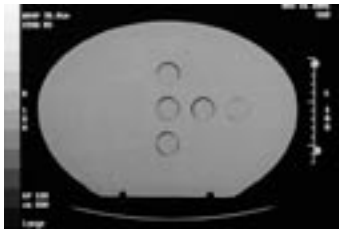
IMRT Phantom Specifications:
Model 002H5

Front View



Side View





* fiducials (markers) locations

Model 002H5 Includes

Qty	Model	Description
2		Tissue equivalent sections, one drilled to accommodate solid rod inserts
5	**002CTF**	CT to film fiducial markers
5		Water equivalent rod inserts
1	**002RW15**	Water equivalent rod insert with ion chamber cavity
1		Alignment base
1		Holding device

Optional Accessories

002BR	Single breast attachment
002FC	Film stack for small volume 3D image reconstruction
002GC	Gel dosimetry cassette
002HCV	Homogeneous section that accommodates 002FC or 002GC cassettes
002CTF	CT to film fiducial markers
002RW15	Water equivalent rod insert with ion chamber cavity
002RB15	Bone equivalent insert with ion chamber cavity
002RL15	Lung equivalent insert with ion chamber cavity
002LCV	Thorax region section that accommodates 002FC or 002GC cassettes
002SPH	Tissue equivalent rods for TLD's (set of 5)
002ED	Electron density reference plugs (set of 4) (lung, bone, muscle, adipose)
002CS	Foam lined carrying case

IMRT Verification System

CIRS IMRT phantoms are manufactured from tissue equivalent materials that mimic within 1% from 50 keV to 25 MeV for accurate simulation from CT planning to treatment delivery. An interchangeable rod design allows the phantom to accommodate a multitude of dose measurement devices such as ion chambers, TLD, diodes and MOSFET's in the same location within the phantom. Phantom cross sections accommodate GafChromic® or standard ready-pack films.[1]

Electron Density Reference Insert

	Density	Electron Density per cc x 10^23	Electron Density Relative to H_2O
H_2O	1.00	3.34	1.000
Lung	0.21	0.69	0.207
Bone	1.60	5.03	1.506
Muscle	1.06	3.48	1.042
Adipose	0.96	3.17	0.949
Plastic Water-Diagnostic/ Therapy Range	1.04	3.35	1.003

Ratios of IMRT Phantom Material[2][3]

linear attenuation coefficients to reference tissues.

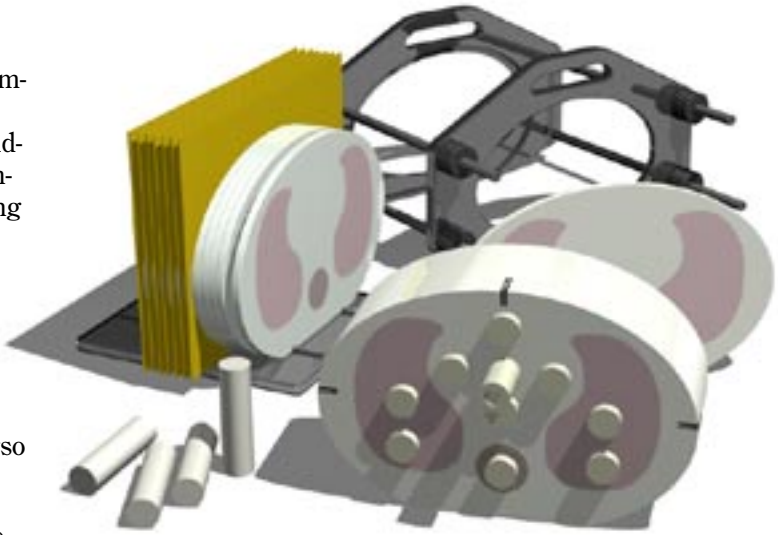
	Plastic Water-DT to H_2O	Average Bone to Ref[1]	Lung (inhale) to Ref[2]
En, MeV	**Ratio, %**	**Ratio, %**	**Ratio, %**
0.05	100.8	100.00	100.3
0.06	100.5	99.96	101.1
0.08	100.3	99.91	101.9
0.10	100.2	99.88	102.2
0.15	100.1	99.86	102.5
0.20	100.1	99.84	102.5
0.40	100.1	99.84	102.7
0.60	100.1	99.83	102.6
0.80	100.1	99.84	102.7
1.00	100.1	99.83	102.7
1.50	100.1	99.84	102.7
2.00	100.1	99.84	102.6
4.00	100.0	99.87	102.1
6.00	99.8	99.93	101.6
8.00	99.7	99.95	101.2
10.0	99.6	100.03	100.7
15.0	99.2	100.06	100.0
20.0	99.1	100.13	102.7
El. density	100.1	99.83	102.7
Density	1.039 g/cm^3	1.60 g/cm^3	0.21 g/cm^3

1. The CIRS line of IMRT phantoms is compatible with the RIT 113 Software for film to plan analysis.
2. ICRP 23, Report of the Task Group on Reference Man (1975).
3. Woodard, H.Q., White, D.R., The Composition of Body Tissues, The British Journal of Radiology (1986) 59: 1209-1219

IMRT Thorax Phantom

Complete QA from CT imaging to dose verification

The CIRS Model 002LFC IMRT Thorax Phantom for Film and Ion chamber Dosimetry is designed to address the complex issues surrounding commissioning and comparison of treatment planning systems while providing a simple yet reliable method for verification of individual patient plans and delivery.



The 002LFC is elliptical in shape and properly represents an average human torso in proportion, density and two-dimensional structure. It measures 30 cm long x 30 cm wide x 20 cm thick. The phantom is manufactured from unique proprietary materials that faithfully mimic water, bone and lung within 1% from 50 keV to 25 MeV.

Tissue equivalent interchangeable rod inserts accommodate ionization chambers allowing for point dose measurements in multiple planes within the phantom. Hole placement allows verification in the most critical areas of the chest. One half of the phantom is divided into 12 sections, each 1 cm thick, to support radiographic or GafChromic® film. Optional inserts are available to support a variety of other detectors including TLD's, MOSFET, and diodes.

Handling, assembly and proper orientation of the phantom is made easy with the use of a unique alignment base and holding device. The surfaces of the phantom are marked for ease of laser alignment. Optional CT markers are available to ensure accurate film to plan registration.

Phantom Benefits

- Verify heterogeneity corrections
- Correlate CTU to electron density
- Check dose distributions in sensitive areas
- Check depth doses and absolute dose
- 2D and 3D isodoses
- Calibrate film with ion chamber
- Verify individual patient treatment plans

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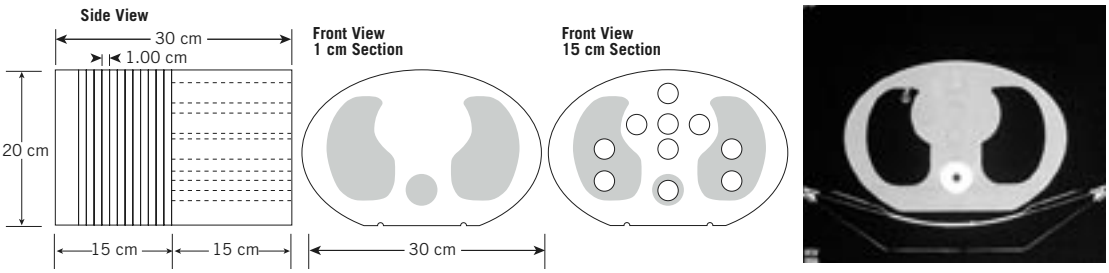
IMRT Phantom Specifications:
Model 002LFC



Model 002LFC Includes

Qty	Model	Description
1		Thorax section drilled to accomodate rod inserts
12		1 cm thorax sections
1		3 cm end section
1		Alignment base
1		Holding device
1	**002RW15**	Water equivalent insert with ion chamber cavity
1	**002RB15**	Bone equivalent insert with ion chamber cavity
1	**002RL15**	Lung equivalent insert with ion chamber cavity
5		Water equivalent solid rod inserts
1		Bone equivalent solid rod inserts
4		Lung equivalent solid rod inserts

Optional Accessories

002BR	Single breast attachment
002FC	Film Stack for small volume 3D image reconstruction
002GC	Gel dosimetry cassette
002HCV	Homogeneous section that accommodates 002FC or 002GC cassettes
002LCV	Thorax region section that accommodates 002FC or 002GC cassettes
002SPH	Tissue equivalent rods for TLD's (set of 5)
002CTF	CT to film fiducial markers
002ED	Electron density reference plugs (set of 4) (lung, bone, muscle adipose)
002RW15	Water equivalent rod inserts with ion chamber cavity
002RB15	Bone equivalent insert with ion chamber cavity
002RL15	Lung equivalent insert with ion chamber cavity
002CS	Foam lined carrying case

IMRT Verification System

CIRS IMRT phantoms are manufactured from tissue equivalent materials that mimic within 1% from 50 keV to 25 MeV for accurate simulation from CT planning to treatment delivery. An interchangeable rod design allows the phantom to accommodate a multitude of dose measurement devices such as ion chambers, TLD, diodes and MOSFET's in the same location within the phantom. Phantom cross sections accommodate GafChromic® or standard ready-pack films.[1]

Electron Density Reference Insert

	Density	Electron Density per cc x 10^23	Electron Density Relative to H_2O
H_2O	1.00	3.34	1.000
Lung	0.21	0.69	0.207
Bone	1.60	5.03	1.506
Muscle	1.06	3.48	1.042
Adipose	0.96	3.17	0.949
Plastic Water-Diagnostic/ Therapy Range	1.04	3.35	1.003

1. The CIRS line of IMRT phantoms is compatible with the RIT 113 Software for film to plan analysis.
2. ICRP 23, Report of the Task Group on Reference Man (1975).
3. Woodard, H.Q., White, D.R., The Composition of Body Tissues, The British Journal of Radiology (1986) 59: 1209-1219

Ratios of IMRT Phantom Material[2][3]

linear attenuation coefficients to reference tissues.

	Plastic Water®-DT to H_2O	Average Bone to Ref[1]	Lung (inhale) to Ref[2]
En, MeV	**Ratio, %**	**Ratio, %**	**Ratio, %**
0.05	100.8	100.00	100.3
0.06	100.5	99.96	101.1
0.08	100.3	99.91	101.9
0.10	100.2	99.88	102.2
0.15	100.1	99.86	102.5
0.20	100.1	99.84	102.5
0.40	100.1	99.84	102.7
0.60	100.1	99.83	102.6
0.80	100.1	99.84	102.7
1.00	100.1	99.83	102.7
1.50	100.1	99.84	102.7
2.00	100.1	99.84	102.6
4.00	100.0	99.87	102.1
6.00	99.8	99.93	101.6
8.00	99.7	99.95	101.2
10.0	99.6	100.03	100.7
15.0	99.2	100.06	100.0
20.0	99.1	100.13	102.7
El. density	100.1	99.83	102.7
Density	1.039 g/cm^3	1.60 g/cm^3	0.21 g/cm^3

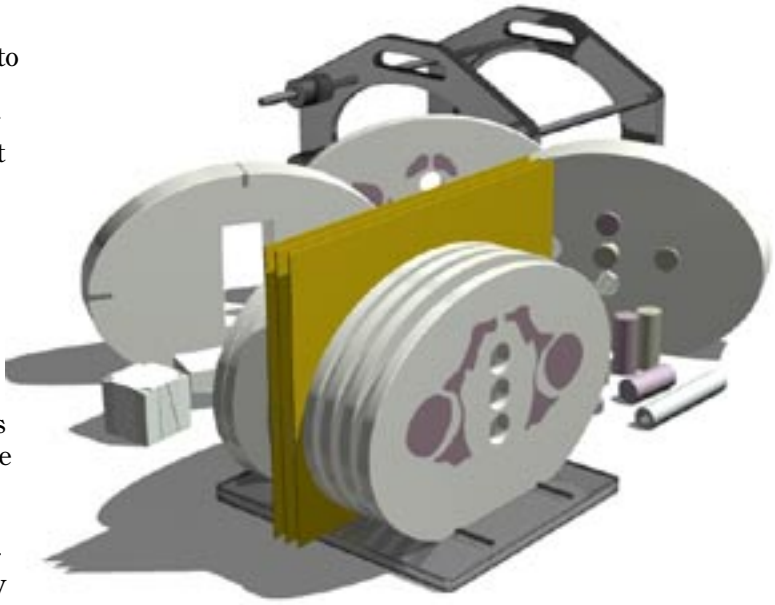
IMRT Pelvic 3D Phantom

Complete QA from CT imaging to dose verification

The CIRS Model 002PRA IMRT phantom is designed to address the complex issues surrounding commissioning and comparison of treatment planning systems and verification of individual patient plans and delivery.

The CIRS 002PRA phantom properly represents human pelvic anatomy in shape, proportion and structure as well as density. This enables thorough analysis of both the imaging and dosimetry system. The phantom is manufactured from unique proprietary materials that faithfully mimic bone and water within 1% from 50 keV to 25 MeV.

The phantom is elliptical in shape, approximates the size of an average patient, and has a tissue equivalent, three dimensional skeleton. Tissue equivalent interchangeable rod inserts for ionization chambers allow for point dose measurements in multiple planes in the phantom and



film calibration. The phantom also supports film dosimetry with not only standard radiographic films but also GafChromic® media. Optional inserts are available to support a variety of other detectors including TLD's, MOSFET, and diodes.

The Model 002PRA includes four different Electron Density reference plugs which can be interchanged in five separate locations within the phantom. The surface of the phantom is etched with grooves to ensure proper orientation of the CT slices and accurate film to plan registration.

Phantom Benefits

- Verify heterogeneity corrections
- Correlate CTU to electron density
- Check dose distributions in sensitive areas
- Check depth doses and absolute dose
- 2D and 3D isodoses
- Verify individual patient treatment plans
- Calibrate film with ion chamber

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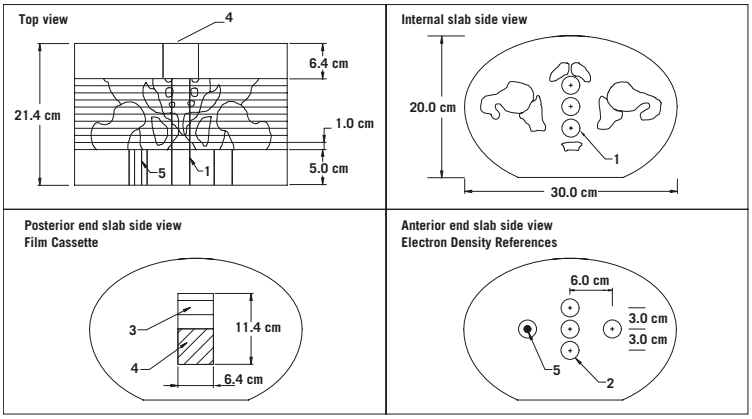
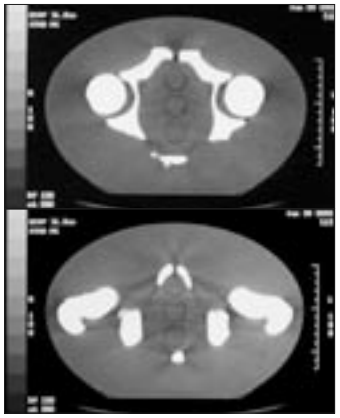
IMRT Phantom Specifications:
Model 002PRA





1 - Holes plugged with rods (ø 2.5 cm)
2 - Holes for electron density inserts
3 - Spacers
4 - Film stack (cube 2.5 inches)
5 - Bone core (diam. 1 cm in water background)

Model 002PRA Includes

Qty	Model	Description
1		5 cm tissue equivalent electron density reference section with interchangeable inserts
10		1 cm thick contiguous 3D pelvic sections each drilled to accommodate rod inserts
1	**002HCV**	Homogeneous section that accommodates 002FC or 002GC cassettes
1	**002RW15**	Water equivalent rod insert with ion chamber cavity
3		Water equivalent rod inserts
2		Bone equivalent rod inserts
1		Alignment base
1		Holding device
4		Electron density reference plugs (set of 4 lung, bone, muscle, adipose, water)
1		5 cm section for ED plugs
1		Water equivalent insert with ion chamber cacity
1		Bone equivalent insert with ion chamber cacity
1	002FC	Film stack for 3D reconstruction

IMRT Verification System

CIRS IMRT phantoms are manufactured from tissue equivalent materials that mimic within 1% from 50 keV to 25 MeV for accurate simulation from CT planning to treatment delivery. An interchangeable rod design allows the phantom to accommodate a multitude of dose measurement devices such as ion chambers, TLD, diodes and MOSFET's in the same location within the phantom. Phantom cross sections accommodate GafChromic® or standard ready-pack films.[1]

Electron Density Reference Insert

	Density	Electron Density per cc x 10^23	Electron Density Relative to H_2O
H_2O	1.00	3.34	1.000
Lung	0.21	0.69	0.207
Bone	1.60	5.03	1.506
Muscle	1.06	3.48	1.042
Adipose	0.96	3.17	0.949
Plastic Water-Diagnostic/ Therapy Range	1.04	3.35	1.003

1. The CIRS line of IMRT phantoms is compatible with the RIT 113 Software for film to plan analysis.
2. ICRP 23, Report of the Task Group on Reference Man (1975).
3. Woodard, H.Q., White, D.R., The Composition of Body Tissues, The British Journal of Radiology (1986) 59: 1209-1219

Ratios of IMRT Phantom Material[2][3]

linear attenuation coefficients to reference tissues.

	Plastic Water-DT to H_2O	Average Bone to Ref[1]	Lung (inhale) to Ref[2]
En, MeV	**Ratio, %**	**Ratio, %**	**Ratio, %**
0.05	100.8	100.00	100.3
0.06	100.5	99.96	101.1
0.08	100.3	99.91	101.9
0.10	100.2	99.88	102.2
0.15	100.1	99.86	102.5
0.20	100.1	99.84	102.5
0.40	100.1	99.84	102.7
0.60	100.1	99.83	102.6
0.80	100.1	99.84	102.7
1.00	100.1	99.83	102.7
1.50	100.1	99.84	102.7
2.00	100.1	99.84	102.6
4.00	100.0	99.87	102.1
6.00	99.8	99.93	101.6
8.00	99.7	99.95	101.2
10.0	99.6	100.03	100.7
15.0	99.2	100.06	100.0
20.0	99.1	100.13	102.7
El. density	100.1	99.83	102.7
Density	1.039 g/cm^3	1.60 g/cm^3	0.21 g/cm^3

IMRT Head and Neck Phantom

Complete QA from CT imaging to dose verification

The CIRS Model 002HN IMRT phantom is designed to address the complex issues surrounding commissioning and comparison of treatment planning systems and verification of individual patient plans and delivery.

The CIRS 002HN phantom properly represents human head and neck anatomy in shape, proportion and structure as well as density. This enables thorough analysis of both the treatment planning and delivery systems. The phantom is manufactured from unique proprietary materials that faithfully mimic bone and water within 1% from 50 keV to 25 MeV.

The phantom is circlular in shape, approximates the size of an average patient. Tissue equivalent interchangeable rod inserts for ionization chambers allow for point dose measurements in multiple planes in the phantom and film calibration. The phantom also supports film dosimetry with not only standard radiographic films but also Gaf-Chromic® media. Optional inserts are available to support a variety of other detectors including TLD's, MOSFET, and diodes.

The Model 002HN accommodates one Ready Pack™ 10" x 12" films in transverse orientation, two radiochromic or radiographic 10 x 10 cm films in transverse orientation and a stack of thirteen radiochromic films pre-cut to 63.5 x 63.5 mm in three different orientations.

The Model 002HN has an optional four Electron Density reference plugs which can be interchanged in five separate locations within the phantom. The surface of the phantom is etched with grooves to ensure proper orientation of the CT slices and accurate film to plan registration. An optional cranial bone ring is also available.

Phantom Benefits

- Verify heterogeneity corrections
- Correlate CTU to electron density
- Check dose distributions in sensitive areas
- Check depth doses and absolute dose
- 2D and 3D isodoses
- Verify individual patient treatment plans
- Calibrate film with ion chamber

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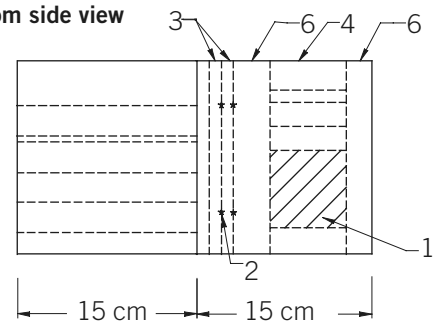
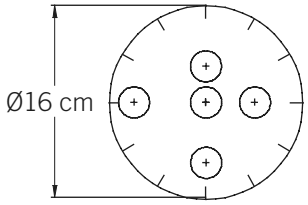
IMRT Phantom Specifications:
Model 002HN

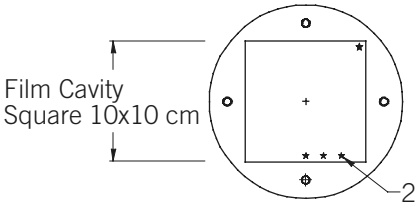
Phantom side view



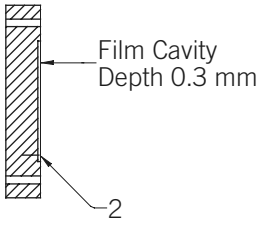
Phantom front view



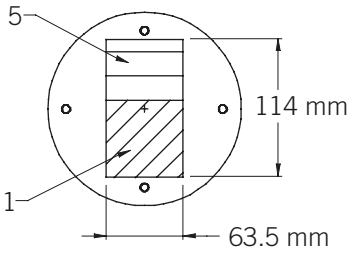
Film dosimetry slab front view



Side view



Cavity slab front view



1 - Film Stack 002FC or Gel Cassette 002GC
2 - Fiducials Markers
3 - two 1 cm slabs for film dosimetry slabs
4 - Cavity Slab
5 - 1 cm and 2 cm spacers for Film Stack positioning
6 - 2 cm and 1 cm spacer slabs

Optional Accessories

Qty	Model	Description
1	002GC	Gel dosimetry cassette
1	002SPH	Water equivalent rod inserts (5 cm) for TLD's (set of 5)
1	002ED	Electron density reference plug (set of 4) (lung, bone, muscle, adipose)

Electron Density Reference Insert

	Density	Electron Density per cc x 10^23	Electron Density Relative to H_2O
H_2O	1.00	3.34	1.000
Lung	0.21	0.69	0.207
Bone	1.60	5.03	1.506
Muscle	1.06	3.48	1.042
Adipose	0.96	3.17	0.949
Plastic Water-Diagnostic/ Therapy Range	1.04	3.35	1.003

Model 002HN Includes

Qty	Model	Description
1		Water equivalent homogeneous section drilled to accommodate rod inserts
2		Film slabs, 1 cm, film cavity 10x10 cm
2	002CTF	CT to Film Fiducial Markers in Film slabs
1		Cavity slab, 6.4 cm, to accommodate Film Stack or Gel Cassette
1	002FC	Film Stack for small volume 3D image reconstruction
2		Spacer slabs, 1 cm
1		Spacer slab, 2 cm
2		End slabs
1	002RW15	Water equivalent rod insert with ion chamber cavity
1	002RB15	Bone equivalent rod insert with ion chamber cavity
5		Water equivalent rod inserts
1		Bone equivalent rod insert
1		Alignment base
1		Holding device

Specifications subject to change without notice.
GafChromic® is a registered trademark of International Specialty Products, Wayne, NJ

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IMRT Head & Torso Freepoint Phantom

Complete QA from CT imaging to dose verification

CIRS offers a variety of IMRT phantoms to match the most common IMRT treatment areas such as prostate, head and neck, breast and lung.

All CIRS IMRT Phantoms are manufactured from proprietary materials that faithfully mimic water, bone and lung within 1% from 50 keV to 25 MeV. These unique materials eliminate the need for correction factors, thus improving accuracy and saving time. The phantoms simulate the patient through the entire process from CT data acquisition and planning to delivery and dose verification.

The new Model H9K was designed in collaboration with David D. Loshek PhD. With the H9K, choose any point dose location within a circular area with diameter of 11.2 cm by simply adjusting the two rotating cylinders. Lung and bone equivalent rods can be positioned at any location within the circular area for assessment of heterogeneity correction. Remove the center cylinder from the phantom body to simulate head and neck set-ups.

Model 002H9K

Features:

- Ionization chambers, TLD, MOSFET and Diodes easily positioned using interchangeable rods
- Choose any point dose location by rotating the cylinders
- Use radiographic film dosimetry[1] - Ready Pack® and/or GafChromic® film
- Close placement of detectors to film improves film calibration
- CT - film markers ensure accurate film to plan registration
- Surfaces are etched with indices for precise alignment
- Configure with or without heterogeneities

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IMRT Phantom Specifications:
Model 002H9K

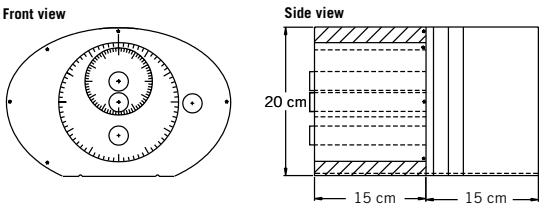
Model 002H9K Includes

Qty	Model	Description
1		Water equivalent homogeneous torso section
1		Water equivalent homogeneous torso section with cylinderical inserts
2		Spacer slabs, 2 cm
1		Spacer slab, 1 cm
1		Spacer slab, 10 cm
1	002RW15	Water equivalent rod insert with ion chamber cavity
1	002RB15	Bone equivalent rod insert with ion chamber cavity
4		Solid water equivalent rod inserts
1		Bone equivalent rod insert
1	002CTF	Set of 5 CT to film fiducial markers
1		Alignment base
1		Holding device

Optional Accessories

Model	Description
02BR	Single breast attachment
002FC	Film Stack for small volume 3D image reconstruction
002GC	Gel dosimetry cassette
002HCV	Homogeneous section that accommodates 002FC or 002GC cassettes
002LCV	Thorax region section thataccommodates 002FC or 002GC cassettes
002SPH	Tissue equivalent rods for TLD's (set of 5)
002CTF	CT to film fiducial markers
002ED	Electron density reference plugs (set of 4) (lung, bone, muscle adipose)
002SPH	Tissue equivalent rods for TLD's (set of 5)
002RW15	Water equivalent rod inserts with ion chamber cavity
002RB15	Bone equivalent insert with ion chamber cavity
002RL15	Lung equivalent insert with ion chamber cavity
002CS	Foam lined carrying case

Body with the Head part for Chamber Dosimetry



Ratios of IMRT Phantom Material[2][3]

linear attenuation coefficients to reference tissues.

	Plastic Water-DT to H_2O	Average Bone to Ref[2]	Lung (inhale) to Ref[3]
En, MeV	**Ratio, %**	**Ratio, %**	**Ratio, %**
0.05	100.8	100.00	100.3
0.06	100.5	99.96	101.1
0.08	100.3	99.91	101.9
0.10	100.2	99.88	102.2
0.15	100.1	99.86	102.5
0.20	100.1	99.84	102.5
0.40	100.1	99.84	102.7
0.60	100.1	99.83	102.6
0.80	100.1	99.84	102.7
1.00	100.1	99.83	102.7
1.50	100.1	99.84	102.7
2.00	100.1	99.84	102.6
4.00	100.0	99.87	102.1
6.00	99.8	99.93	101.6
8.00	99.7	99.95	101.2
10.0	99.6	100.03	100.7
15.0	99.2	100.06	100.0
20.0	99.1	100.13	102.7
El. density	100.1	99.83	102.7
Density	1.039 g/cm^3	1.60 g/cm^3	0.21 g/cm^3

Electron Density Reference Insert

	Density	Electron Density per cc x 10^23	Electron Density Relative to H_2O
H_2O	1.00	3.34	1.000
Lung	0.21	0.69	0.207
Bone	1.60	5.03	1.506
Muscle	1.06	3.48	1.042
Adipose	0.96	3.17	0.949
Plastic Water-Diagnostic/ Therapy Range	1.04	3.35	1.003

1. The CIRS line of IMRT phantoms is compatible with the RIT 113 software for film to plan analysis
2. ICRP 23, Report of the Task Group on Reference Man (1975).
3. Woodard, H.Q., White, D.R., The Composition of Body Tissues, The British Journal of Radiology (1986) 59: 1209-1219

Water Equivalent Mini Phantom

Permits precise evaluation of scatter

The Water Equivalent Mini Phantom for Radiotherapy eliminates scatter radiation and X-Ray beam electron contamination during the ion chamber measurements at a reference depth of 10 cm. Phantom material is Plastic Water® and precise machining improves the dosimetric accuracy and reliability of LINAC beam MU calibrations.

The Phantom satisfies the requirements of ESTRO Booklet 3 “Monitor unit calculation for high energy photon beams” for Output, Volume-Scatter and Scatter-Primary Ratio measurements.

The Model 670 provides an excellent tissue simulation and opportunity of true dose comparison with the 30 x 30 cm Plastic Water® slab phantom. By positioning the ion chamber at a reference depth of 10 cm, the Mini Phantom allows the physicist to isolate and investigate the influence of scatter radiation on a reference dose measured in a slab phantom.

Model 670

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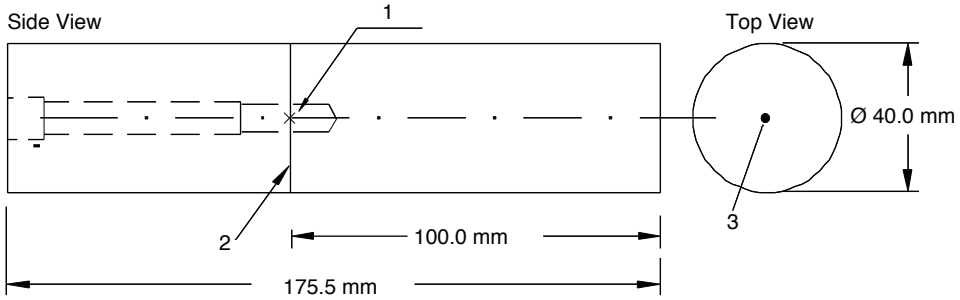
Mini Phantom Specifications:

Characteristics:	Water-Equivalent for photon beams 150 keV - 100 MeV
Composition:	Plastic Water®
Shape:	Cylindrical
Dimensions:	as per drawing
Standard Cavity:	Farmer Ion Chamber
Optional Cavities:	by request
Optional Stand:	CNMC Stand Model AL-CSS-MP, accommodates vertical and horizontal positioning



Notes:

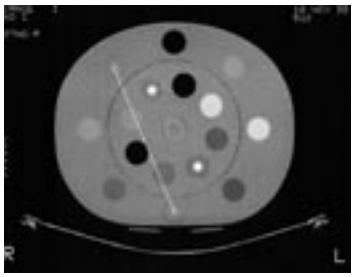
1. ISO center of cavity.
2. Alignment groove scribe line centered with ISO center
3. Alignment point

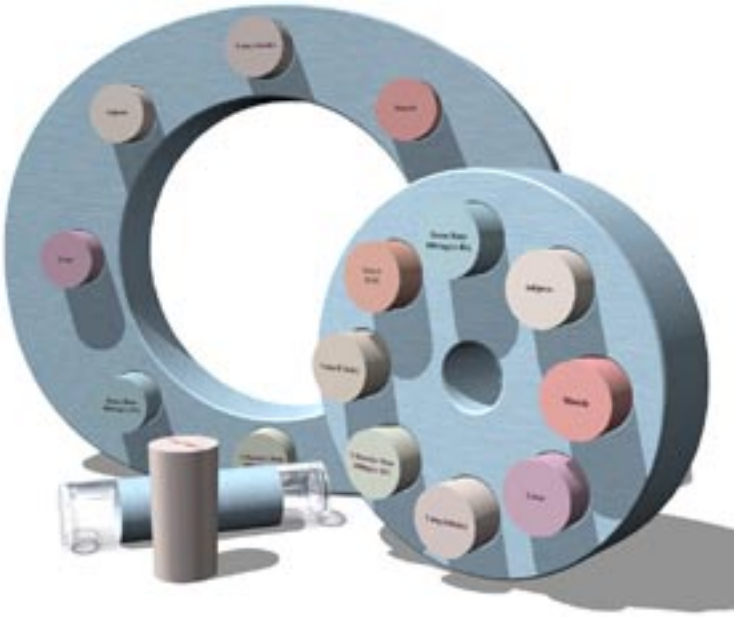
Electron Density Phantom

For use in CT Treatment Planning

The accuracy of Radiation Oncology Treatment planning systems is heavily dependent upon precise CT analysis of the patient anatomy which is to be irradiated.

Physicists performing Treatment planning need accurate tools to evaluate CT scan data, correct for inhomogeneities, and to document the relationship between CT number and tissue electron density. The CIRS Model 062 was designed and developed specifically to meet this requirement.





Model 062

Features:

- Can be configured to simulate head or abdomen
- Manufactured from durable epoxy
- Tissue equivalent plugs can be positioned at 17 different locations within the scan field
- Special marker plugs enable quick assessment of distance registration
- All materials accurately simulate indicated tissue within the diagnostic energy range
- Carrying case for ease of transport

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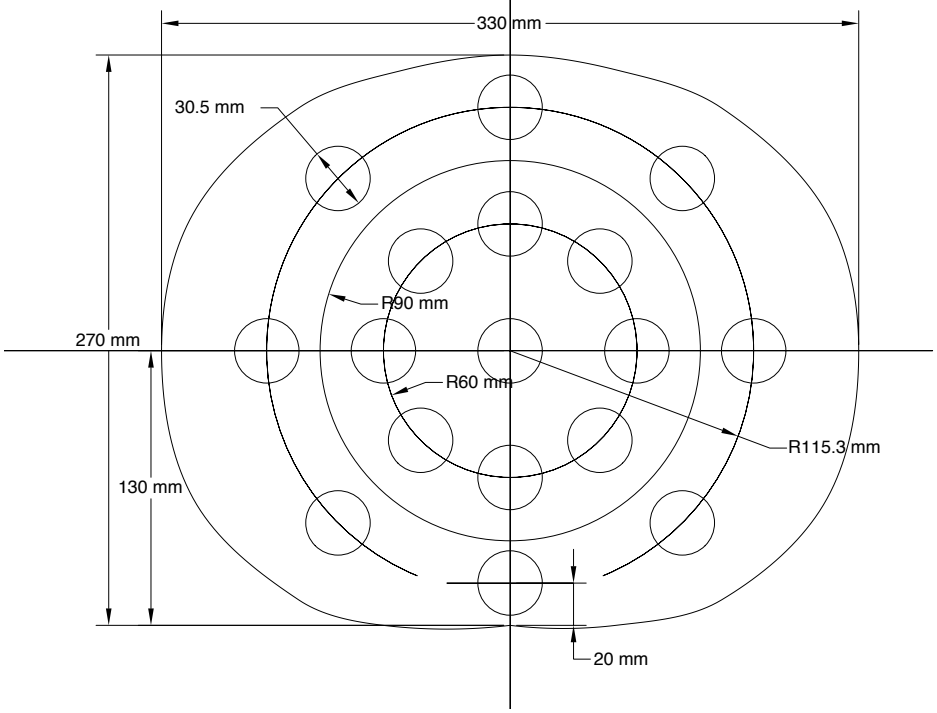
080803

Model 062 Specifications:

MATERIAL: Proprietary epoxy resin

	062 ELECTRON DENSITY PHANTOM COMPONENTS	062-01 HEAD INSERT COMPONENTS	PHYSICAL DENSITY	ELECTRON DENSITY Per cc X 10^{23}	ELECTRON DENSITY RELATIVE TO H_2O
PHANTOM HEAD PHANTOM BODY (water equivalent)	1 1	1 0	-	-	-
INSERTS					
SYRINGE H_2O	1	1	1.000	3.340	1.000
Lung (Inhale)	2	1	0.195	0.634	0.190
Lung (Exhale)	2	1	0.495	1.632	0.489
Breast (50/50)	2	1	0.991	3.261	0.976
Dense Bone 800mg/cc HA H_2O with 10 mm dia rod	2	1	1.609	5.052	1.512
Trabecular Bone	2	1	1.161	3.730	1.117
Liver	2	1	1.071	3.516	1.052
Muscle	2	1	1.062	3.483	1.043
Adipose	2	1	0.967	3.180	0.952
Distance Marker	2	2	1.007	-	-
Titanium	Optional	Optional	4.507	12.475	3.735

Plugs to accommodate chambers, TLD's and film available upon special request.



CT Therapy Planning Board

The CIRS Model 064 CT Therapy planning board uses a hollow core, "torsion box" design to achieve a light-weight yet incredibly strong bed. Each bed measures 195 cm x 45 cm x 7 cm and will not flex, bend or warp with extended use. Rubber bumpers run the length of the board at sixteen degree angles for maximum surface contact with most CT bed curvatures. Simply remove the foam pad from the CT bed and rest the board on top. If positioned properly, the board will not rock, slip or move during use.

The planning board has two 1 mm diameter steel wires which run the length of the bed and are positioned exactly 10 cm apart horizontally and approximately 2 cm below the patient. They provide artifact free markers for quick and easy measurement of magnification on any image.

The top surface of the board is made from 1 cm thick foam board with a thin polystyrene laminate. The surface is durable, can be easily disinfected and the low CT density foam enables easy autocontouring of the patient. The surface can also be drilled to accommodate most immobilization frames.

Model 064

Features:

- Flattened patient contours for accurate CT planning
- Low density surface for easy autocontouring
- Distance markers for measurement of magnification factor
- Polystyrene laminate for durability and easy cleaning
- Can be retrofitted with standard immobilization frames
- Designed to fit most CT beds without hardware
- Optional built-in density reference plugs available in lung, water and bone equivalent material

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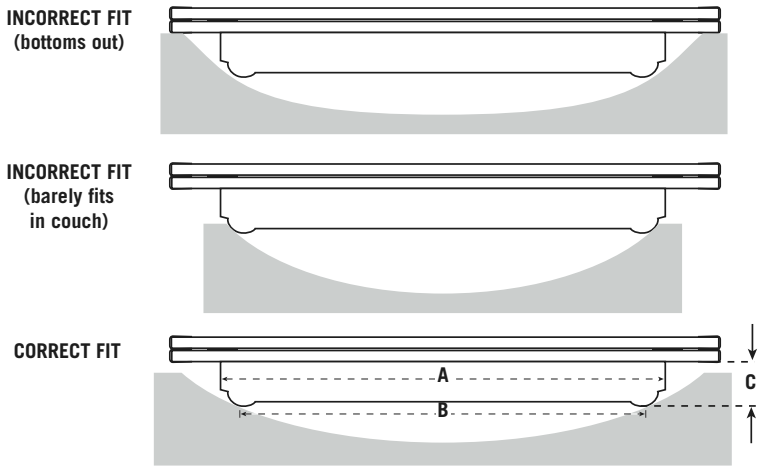
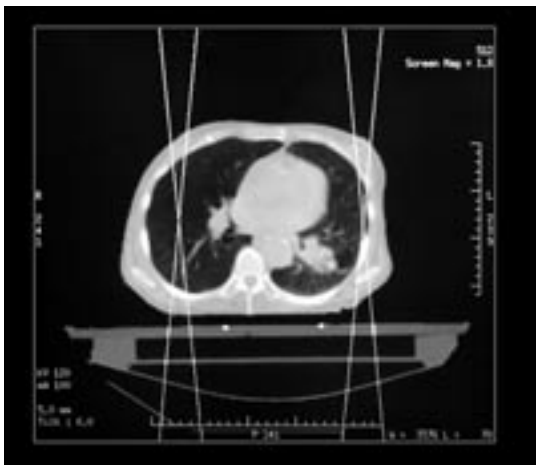
Model 064 Specifications:

Overall Dimensions: 195 cm Long x 45 cm Wide x 7 cm Thick
(See Below for model differences)



MODEL	A	B	C
64-03	33 cm	30 cm	4 cm
64-04	37.3 cm	34.3 cm	4 cm



Plastic Water®

Calibrate photon and electron beams within 0.5% of true water dose

Unlike other water equivalent plastics on the market, Plastic Water® is flexible and will not break under impact. Plastic Water® is the only calibration material available in 1 mm thicknesses. Plastic Water® is the only material which agrees with true water within 0.5% above 7 MeV.

Custom cavities are available to accommodate any ion chamber on the market (simply provide detailed drawings when ordering).

CIRS can simulate any tissue found in the human body and many phantoms contain multiple tissue substitutes. Water, however, is the most important reference material in Medical Physics. To accurately simulate water over all energy from 10 keV to 100 MeV with a singular solid materials is one of the more challenging tasks in the field of Tissue Simulation. CIRS water equivalent materials are formulated to mimic within 1% or better for specific energy ranges.

Features:

- Available in 1 mm thickness
- Easy to machine
- Un-breakable
- Five year written warranty
- Film Dosimetry Cassettes are available.

Plastic Water® LR - 15 keV - 8 MeV
Use for such things as dose evaluation for low energy brachytherapy sources or CT dose verification.

Plastic Water® DT - 50 keV - 25 MeV
Use for special applications requiring exposures to both diagnostic and therapeutic energies such as radiation therapy planning and dose verification in IMRT.

Plastic Water® - The Original - 150 keV - 100 MeV
Permits calibration of photon and electron beams within 0.5% of true water dose. Ideal for routine beam constancy checks.

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Plastic Water® Specifications:

Standard Sizes :

L x W (cm)	Thicknesses:
20 x 20°	0.1, 0.2, 0.5,1.0, 2.0, 3.0, 4.0, 5.0, 6.0 and 7.0 cm.
30 x 30	
40 x 40	

Chamber Cavities and Plugs

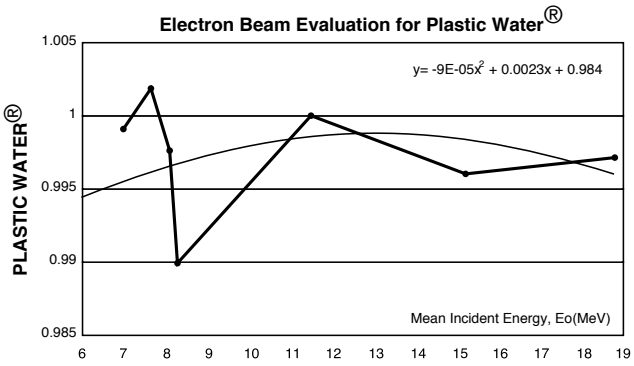
Plastic Water® can be manufactured to accommodate any chamber on the market today. CIRS maintains the following models as standard 30x30x2cm phantoms. When ordering, specify CIRS Model Number and Chamber Description. Cavities and plugs for additional chambers can be provided. Contact our customer service representative to find out how!

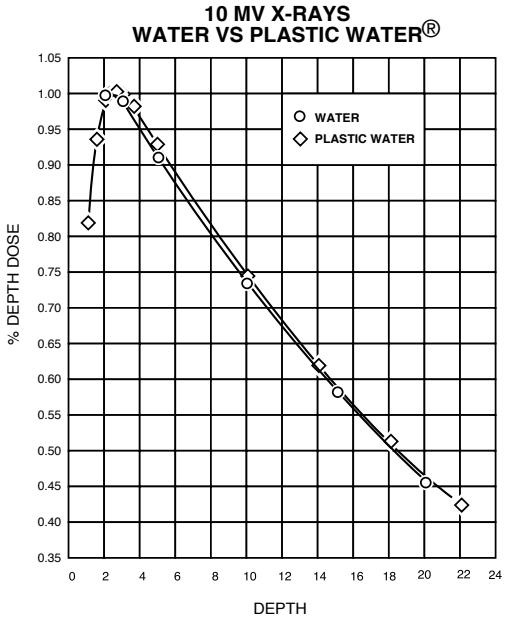
Plug Model	Cavity Model	Accommodates
PL501	CV501	0.6 cc Farmer-type chambers without build-up cap, PTW, Nuclear Enterprise (NE)
PL502	CV502	0.6 cc Farmer-type chambers with build-up cap, PTW, Nuclear Enterprise (NE)
PL503	CV503	PTW Markus, Applied Engineering C134, Wellhofer PPC05
PL504	CV504	PTW Roos 0.35 cm^3 parallel plate chamber
PL506	CV506	Capintec PR-06G with build-up cap
PL507	CV507	Capintec PR-06C without build-up cap
PL508	CV508	Capintec PS-033 parallel plate chamber
PL511A	CV511A	Nuclear Enterprise (NE) 2533 without build-up cap
PL511B	CV511B	PTW N31003 0.3cc wihtout build-up cap
PL511C	CV511C	0.125 cc without build-up cap, PTW 31002, 31005, Multidata 233643
PL511D	CV511D	PTW 23323
PL512	CV512	Exradin Model 11
PL512A	CV512A	Exradin Model 11 (12/7/01)
PL513	CV513	Exradin Model 12
PL516	CV516	Attix 449
PL517	CV517	0.2 cc Farmer Chamber without Build-up Cap, NE 2515-3A, 2577
PL518	CV518	PTW 31006 without Build-up Cap
PL519	CV519	PTW 23342
PL520	CV520	PTW 23331 without Build-up Cap
PL521	CV521	Wellhofer IC3
PL522	CV522	NE 2611A without Build-up Cap
PL523	CV523	Victoreen X-10
PL524	CV524	Victoreen 550-6A T Ion Chamber without build-up cap
PL525	CV525	Wellhofer IC15 Ion Chamber without build-up cap
PL526	CV526	Capintec PR-06G without build-up cap
PL527	CV527	Wellhofer* IC70 with build-up cap FC65
PL528	CV528	Exradin Model 14SL
PL529	CV529	Exradin Model 10 with water-proof cap
PL530	CV530	Wellhofer PPC40, Roos-Type Chamber *PS-31
PL531	CV531	Exradin Model 1SL
PL532	CV532	Wellhofer CC13, IC10
PL533	CV533	Wellhofer CC01
PL534	CV534	Exradin Model 10
PL535	CV535	Capintec PR05, PR05P
PL536	CV536	Wellhofer Model 4
PL537	CV537	Phillips 60003 Diamond Detector Type
PL538	PL538	MOSFET
PL539	PL539	Exradin Model 2
PL540	CV540	Exradin Model 16
PL541	CV541	Phantom Lab Mosfet Casting
PL599	CV599	Scanditronix NACP parallel plate chambers

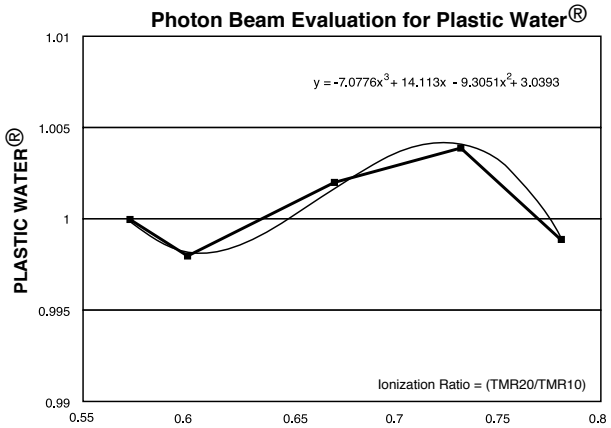
Film Dosimetry Cassettes

PCST310 - CNMC/CIRS Film Dosimetry cassette for 30 x 30 cm Plastic Water 10x12'

PCST410 - CNMC/CIRS Film dosimetry cassette for 40 x 40 cm Plastic Water 10"x12







Detailed publications available from CIRS upon request.

Ion Chamber Positioning Cassette

Off-axis measurements - - easy, accurate and reproducible

Model 650 Ion Chamber Positioning Phantom is designed to provide an easy, accurate and reproducible method of making off-axis dose verification and calibration measurements. Its unique design offers the ability to smoothly slide the ion chamber positioning assembly within a solid phantom material in two dimensions for a measurement anywhere within the 25 x 30 cm area.

Model 650 is constructed of Plastic Water® that faithfully mimics water within 1% from 0.5 MeV to 100 MeV or the new DT type Plastic Water® developed specifically for IMRT applications that mimics water within 1% from 0.05 MeV to 25 MeV. It is suitable for use in both, photon and electron therapy. Minimum chamber depth is 3 cm, minimum scatter is 5 cm. Pegs are provided to accurately locate additional 30x30 cm buildup and scatter material. With the top plate removed, chamber depth can be as little as 1 cm.

Model 650

Ready-Pack radiographic film up to 10x12" may be placed within 10mm of the ion chamber plane for simultaneous dose distribution measurements.

One ion chamber holder machined to accommodate a specified ion chamber is included. Additional ion chamber holders machined for any ion chamber are available at extra cost.

Features:

- Position ion chamber anywhere in 25 x 30 cm field
- Simple Set-up
- Accommodates any ion chamber
- Can be used with Ready Pack™ Radiographic Film

**Shown with optional 5 cm Plastic Water® slab.*

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Ion Chamber Positioning Cassette Specifications:

Model 650

Material: Model 650: Plastic Water® (+\-1% from 0.5 MeV to 100 MeV)

Model 650-DT: DT Plastic Water® (+\-1% from 0.05 MeV to 25 MeV)

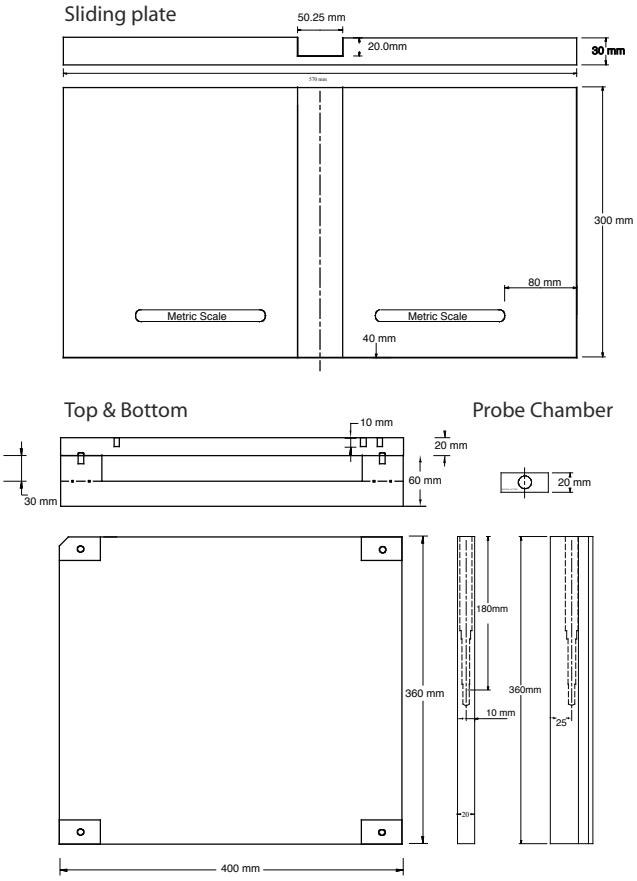
Position range: x axis: +/- 12.5 cm
y axis: +/- 15 cm

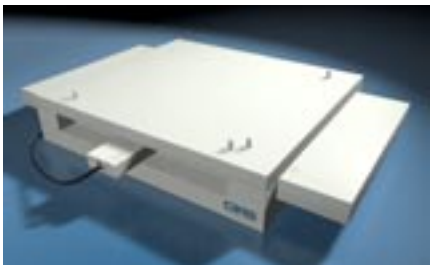
Scanning Field: 25 cm x 30 cm

Scales: cm and mm graduations

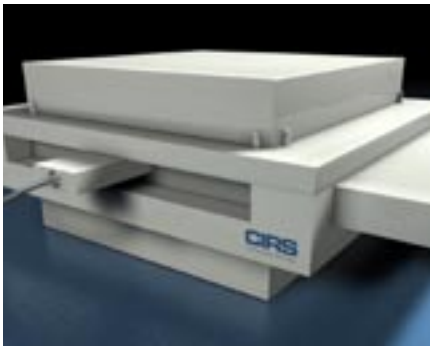
Dimensions: 36x57x8 cm overall

Weight: 13kg (28.5 lbs)

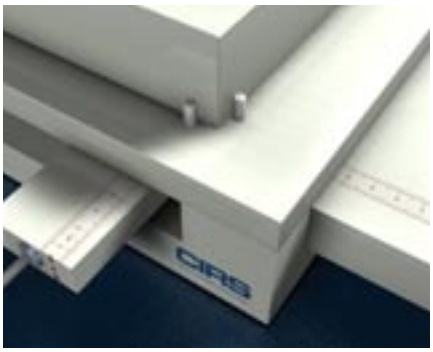




Model 650 Ion Chamber Positioning Cassette

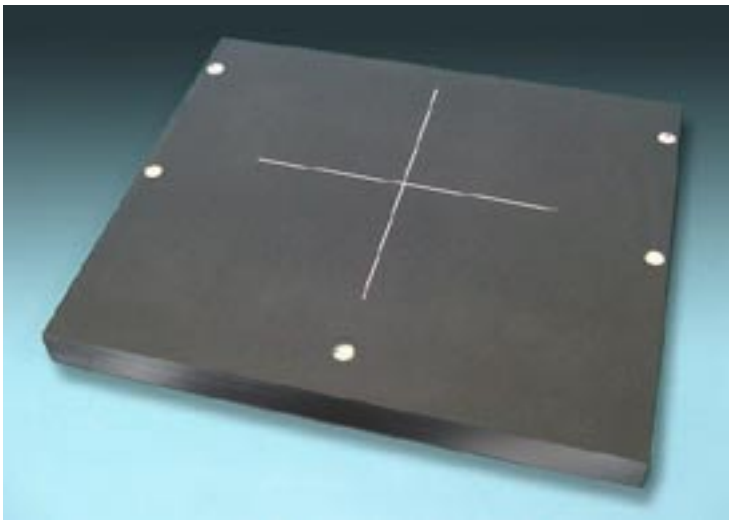


Cassette permits for slab alignment both above and below the chamber.



Ion chamber x, y coordinates are easily read with a unique embedded scale system.

Plastic Water® Film Dosimetry Cassette



The Plastic Water® Dosimetry Film Cassette is uniquely designed to allow convenient and easy positioning of film with one edge flush with the edge of the cassette. The tongue and groove surrounding the film provides a light-tight seal on three sides, and black vinyl tape seals the unprotected edge after the film has been compressed by tightening the five screws less than one turn. The film orientation is automatically indexed by ambient light through six small holes forming a letter "L". The scribes locate the central axis and the 20 cm field limit.

It is not necessary to disassemble the cassette to insert and remove the film; simply loosening the screws allows the cassette halves to separate enough so the film can be inserted or "poured" out. To assure film alignment with the edge, the phantom can be turned upside down so both the film and the phantom edges rest against a flat surface while tightening the screws. The design allows for the use of loose film or ready-pack film if removed from the pack. They are made to accommodate 10"x12" film size.

Benefits:

- Allows film positioning flush with edge for electrons
- Excellent film compression
- Accommodates 10"x12" films
- Automatic film orientation mark
- Central axis and 20x20 cm field scribe
- Economically priced

Developed in conjunction with

CNMC Company, Nashville, TN

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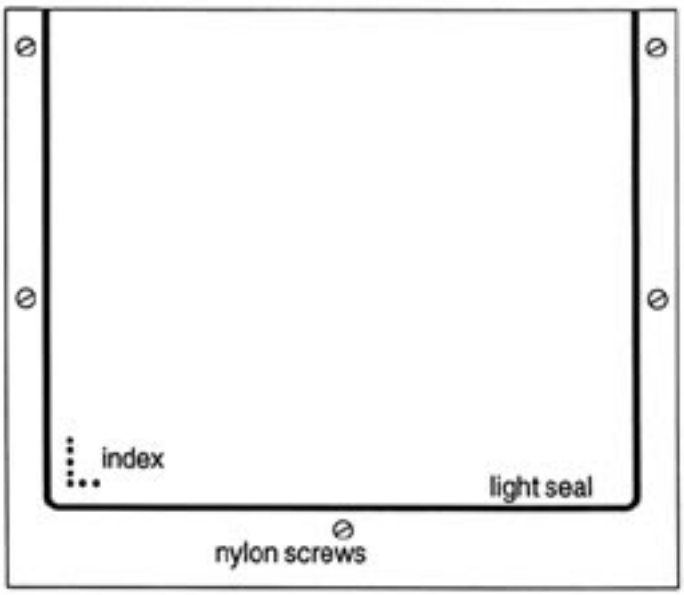
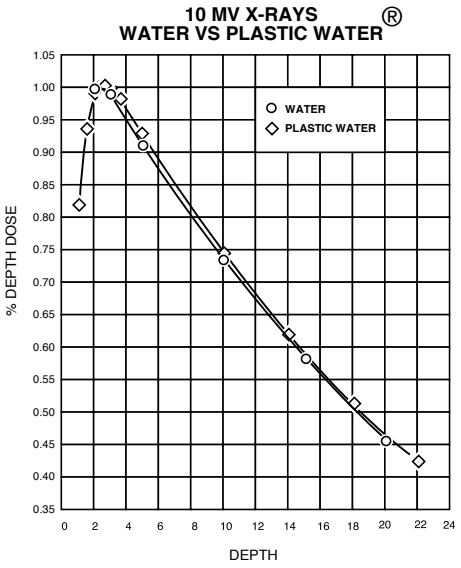
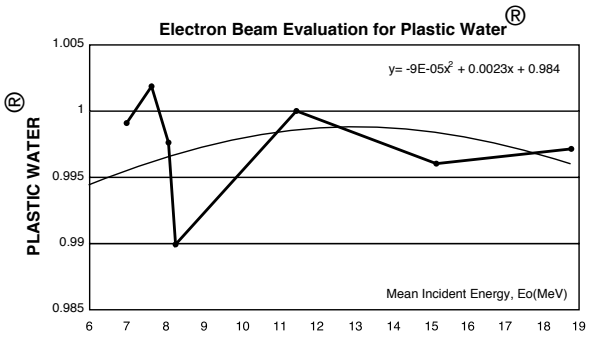
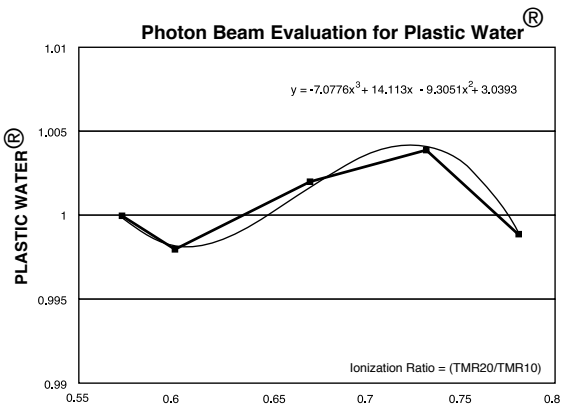
Plastic Water® Cassette Specifications:

MODEL	DIMENSIONS	FILM SIZE	WEIGHT
PCST310	30X35X2.5 CM	10 X 12 "	2.62 kg
PCST410	40X40X2.5 CM	10 X 12 "	4 kg









Detailed publications available from CIRS upon request.

NEMA PET Scatter Phantom

Designed specifically for NEMA Standard NU2-2001

The CIRS Model 800 PET Scatter Phantom is a solid right circular polyethylene cylinder with a specific gravity of 0.96 +/- 0.01. A 6.4 +/- 0.2 mm hole is drilled parallel to the central axis of the cylinder, at a radial distance of 45 +/- 1 mm.

For ease of handling the cylinder consists of three segments that are assembled during testing.

The test phantom line source insert is a clear polyethylene plastic tube of 800 mm in length, with an inside diameter of 3.2 +/- 0.2 mm and outside diameter of 4.8 +/- 0.2 mm. The central tube can be filled with a known quantity of activity and threaded through the 6.4 mm hole in the test phantom.

Model 800

Benefits:

- Designed to test scatter fraction, count losses and random measurements in accordance with NEMA-NU2-2001
- Three piece construction for easier handling

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Model 800 Specifications:

Total Length (3 pieces) : 700 mm
Diameter : 203 mm
Phantom Weight with case : 35 kg
Phantom Weight : 21 kg
Material : polyethelene
Density : .96 grams/cc

Hard sided, foam lined carrying case and copy of NEMA standard included with purchase.

Tissue-Equivalent Phantom for Mammography

A Refined Quality Assurance Tool for Today's Advanced Imaging Systems

Proven simulation technology enables the use of tissue-equivalent, realistically-shaped phantoms for mammographic quality assurance.

CIRS resin material mimics the photon attenuation coefficients of a range of breast tissues. Average elemental composition of the human breast being mimicked is based on the individual elemental composition of adipose and glandular tissue reported by Hammerstein.

Attenuation coefficients are calculated by using the "mixture rule" and the Photon Mass Attenuation and Energy Absorption Coefficient Table of J.H. Hubbell.

The CIRS Model 011A Breast Phantom contains targets that are engineered to test the threshold of the new generation of mammography machines. Model 011A is 4.5 cm thick and simulates an average glandular tissue composition.

Model 011A

The Model 011A was designed to test the performance of any mammographic system. Objects within the phantom simulate calcifications, fibrous calcifications in ducts and tumor masses. Test objects within the phantom range in size from those that should be visible on any system to objects that will be difficult to resolve on the best mammographic systems.

CIRS mammography phantoms are also manufactured in 4 cm, 5 cm and 6 cm thicknesses with various glandular equivalencies.

The methodology and design of these phantoms was developed by Dr. Panos Fatouros and his associates at the Medical College of Virginia.

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Model 011A Specifications:

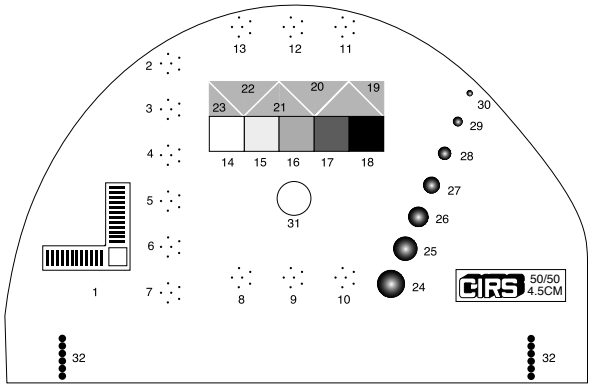
- **Line pair target**
  1. 20 lp/mm

- **Ca CO_3 specs**
  grain size (mm)
  2. .130
  3. .165
  4. .196
  5. .230
  6. .275
  7. .400
  8. .230
  9. .196
  10. .165
  11. .230
  12. .196
  13. .165

- **Step Wedge**
  1 cm thick
  14. 100% gland
  15. 70% gland
  16. 50% gland
  17. 30% gland
  18. 100% adipose

- **Nylon Fibers**
  diameter size (mm)
  19. 1.25
  20. 0.83
  21. 0.71
  22. 0.53
  23. 0.30

- **Hemispheric Masses**
  75% glandular/ 25% adipose, thickness (mm)
  24. 4.76
  25. 3.16
  26. 2.38
  27. 1.98
  28. 1.59
  29. 1.19
  30. 0.90



- **Optical Density**
  31. reference zone

- **Edge of Beam**
  32. localization target

- **Phantom Body**

Length	12.5 cm
Width	18.5 cm
Height	4.5 cm
Material	Epoxy

- **Also Included**
  30x handheld microscope

Mammography QA documents for recording image evaluations and scores

Technical manual

Carrying case sold separately.

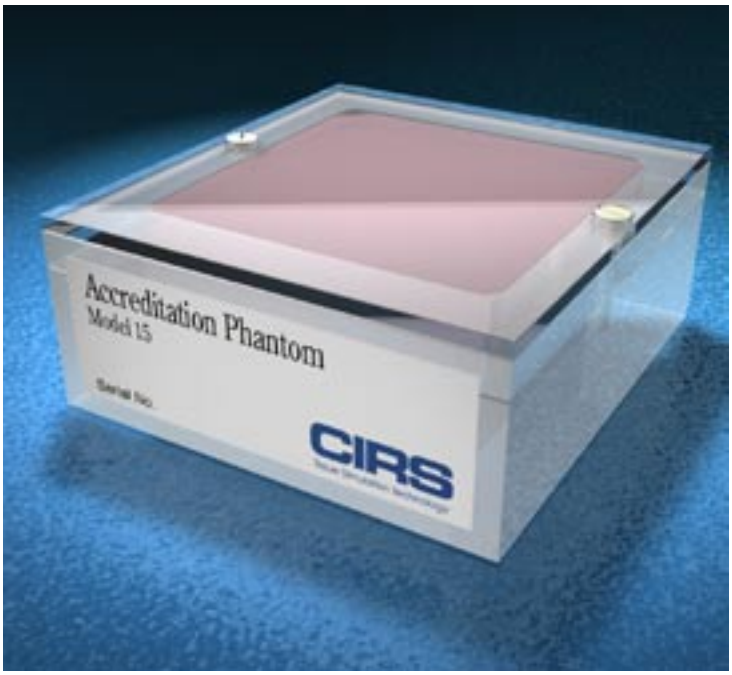
References:

1. Skubic S.E., Fatouros PP. Abosorbed Breast Dose: Dependence on Radiographic Modality and Technique, and Breast Thickness. RADIOLOGY,1986, 161:263-270.
2. Fatouros PP, Skubic S.E., Goodman H. The Development and Use of Realistically Shaped, Tissue- equivalent Phantoms for Assessing the Mammographic Process . RADIOLOGY, 1985 157(p):32.

MQSA Item

Mammographic Accreditation Phantom

The required standard for image quality evaluations



Model 015

Meets MQSA requirements. The Mammographic Accreditation Phantom was designed to test the performance of a mammographic system by a quantitative evaluation of the system's ability to image small structures similar to those found clinically. Objects within the phantom simulate calcifications, fibrous calcifications in ducts, and tumor masses. The Phantom is designed to determine if your mammographic system can detect small structures that are important in the early detection of breast cancer. Test objects within the phantom range in size from those that should be visible on any system to objects that will be difficult to see even on the best mammographic systems.

The 4.4 cm thick Mam–mograhpic Phantom is made of a 7 mm wax block insert containing 16 sets of test objects, a 3.4 cm (approx. 1-3/8") thick acrylic base, and a 3 mm (1/8") thick cover. All of this together approximates a 4.2 cm compressed breast of average glandular /adipose composition. Included in the wax insert are aluminum oxide (Al_2O_3) specks to simulate micro-calcifications. Six different size nylon fibers simulate fibrous structures and five different size lens shaped masses simulate tumors.

Phantom includes a 4 mm acrylic step wedge, operating instructions, faxitron x-ray image and magnifying lens.

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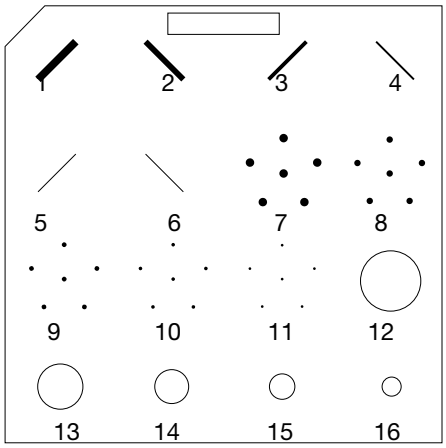
Model 015 Specifications:

WAX INSERT

FIBERS

1. 1.56 mm nylon fiber
2. 1.12 mm nylon fiber
3. 0.89 mm nylon fiber
4. 0.75 mm nylon fiber
5. 0.54 mm nylon fiber
6. 0.40 mm nylon fiber



SPECKS

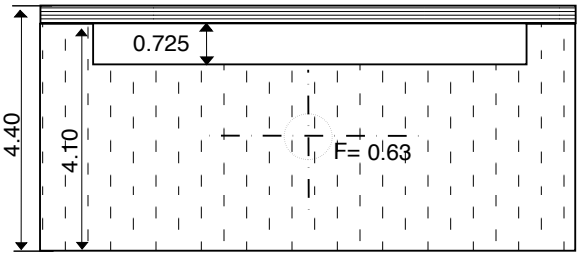
7. 0.54 mm Al_2O_3 speck
8. 0.40 mm Al_2O_3 speck
9. 0.32 mm Al_2O_3 speck
10. 0.24 mm Al_2O_3 speck
11. 0.16 mm Al_2O_3 speck

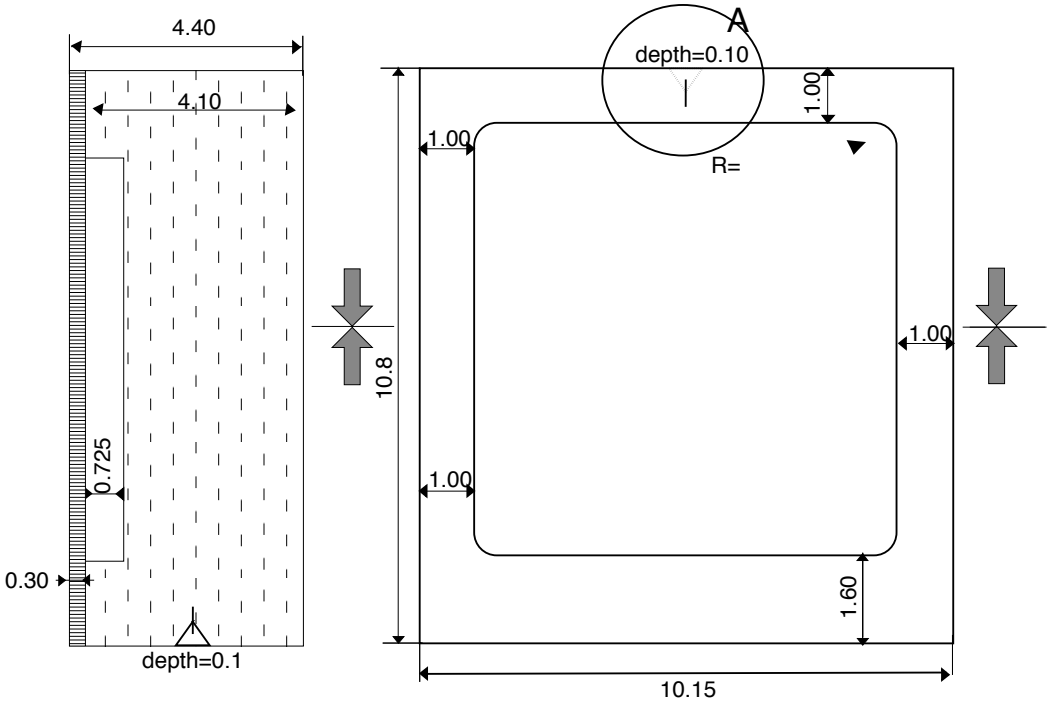
MASSES

12. 2.00 mm (thickness) mass
13. 1.00 mm (thickness) mass
14. 0.75 mm (thickness) mass
15. 0.50 mm (thickness) mass
16. 0.25 mm (thickness) mass

PHANTOM BODY

MATERIAL: ACRYLIC
LENGTH: 10.8 CM
WIDTH: 10.15 CM
DEPTH: 4.4 CM





Mammography Research Set

Designed to encompass the full range of size, glandularity and thickness encountered in clinical mammography.

The CIRS mammography research set includes tissue equivalent phantoms 4, 5 and 6 cm thick. Each phantom contains identical embedded details (see map 011A). The glandular content of each phantom is 50%, 30%, and 20% respectively. Also included are phototimer compensation plates enabling a range of thickness from 0.5 cm to 7 cm with a glandular content of 30%, 50% and 70%.

One compensation plate contains embedded details for evaluation of image quality. A 30 power hand held microscope and heavy duty foam lined carrying case are included.

CIRS resin material mimics the photon attenuation coefficients of a range of breast tissues. Average elemental composition of the human breast being mimicked is based in the individual elemental composition of adipose and glandular tissue reported by Hammerstein.

Attenuation coefficients are calculated by using the "mixture rule" and the Photon Mass Attenuation and Energy Absorption Coefficient Table of J.H. Hubbell.

The methodology and design of these phantoms was developed by Dr. Panos Fatouros and his associates at the Medical College of Virginia.

Model 012A

Benefits:

- Enable evaluation of image quality under varying degrees of thickness and glandularity
- Provides accurate reliable test for radiation dose
- Assures consistent production of diagnostically useful images

REFERENCES:
1. Skubic S.E., Fatouros PP. Absorbed Breast Dose: Dependence on Radiographic Modality and Technique, and Breast Thickness. RADIOLOGY,1986, 161:263-270.
2. Fatouros PP, Skubic S.E., Goodman H. The Development and Use of Realistically Shaped, Tissue- equivalent Phantoms for Assessing the Mammographic Process . RADIOLOGY, 1985 157(p):32.

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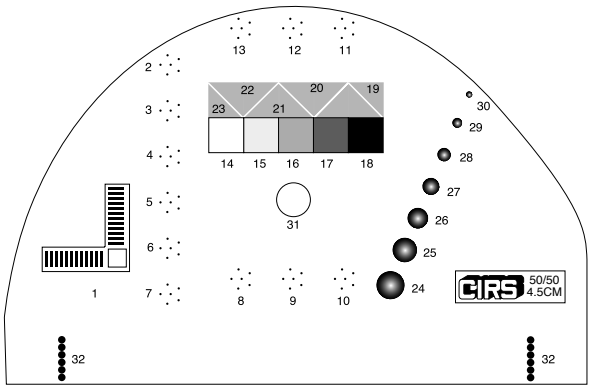
Phantom Details



- **Line pair target**
  1. 20 lp/mm

- **Specs** Calcium carbonate grain size (mm)
  2. .130
  3. .165
  4. .196
  5. .230
  6. .275
  7. .400
  8. .230
  9. .196
  10. .165
  11. .230
  12. .196
  13. .165

- **Step Wedge** 1 cm thick
  14. 100% gland
  15. 70% gland
  16. 50% gland
  17. 30% gland
  18. 100% adipose

- **Fibers** Nylon in wax inset diameter size (mm)
  19. 1.25
  20. 0.83
  21. 0.71
  22. 0.53
  23. 0.30

- **Hemispheric Masses** 75% glandular/25% adipose, thickness (mm)
  24. 4.76
  25. 3.16
  26. 2.38
  27. 1.98
  28. 1.59
  29. 1.19
  30. 0.90

- **Optical Density**
  31. reference zone

- **Edge of Beam**
  32. localization target

Embedded Detail For Phototimer Compensation Plate

- **Contrast Stepwedge** (5 mm thickness)
  1) Adipose tissue
  2) Glandular tissue

- **Hemispheric Masses** 75% Glandular Tissue Thickness (mm)
  3) 3.16
  4) 2.38
  5) 1.98
  6) 1.59
  7) 1.19
  8) 0.90

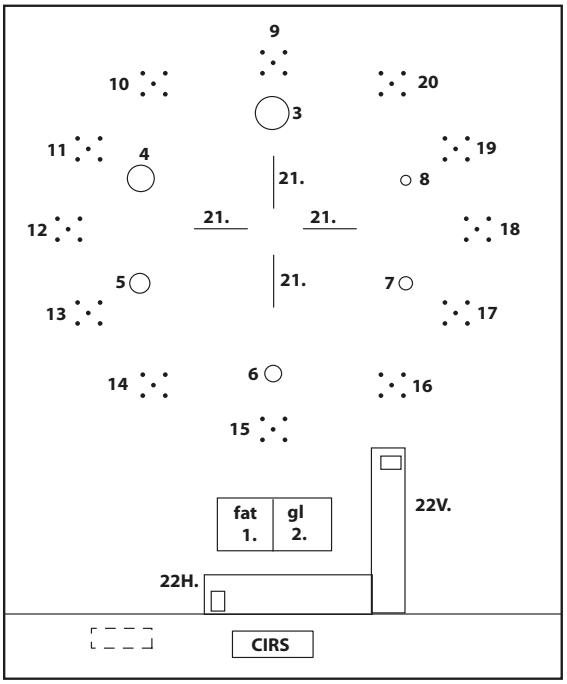
- **Line pair test target** 20 lp/mm

- **Specs** Calcium Carbonate (mm)
  9) .39
  10) .27
  11) .23
  12) .20
  13) .16
  14) .13

Alumina (mm)
  15) .39
  16) .27
  17) .23
  18) .20
  19) .16
  20) .13

- **Fibril**
  21) Diameter=25 Microns High Contrast

  22) **Line pair test target** 20 lp/mm



Mammography Phototimer Consistency Testings Slabs

Better than PMMA for AEC calibration

CIRS Phototimer Consistency Testing Slabs are designed for precise assessment of AEC system performance in accordance with American College of Radiology and MQSA recommendations. BR-12 (47% water/ 53% adipose) is most commonly used but other glandular equivalencies are available. Unlike acrylic, these testing slabs are manufactured with very tight thickness tolerances and more accurately simulate real breast tissue over the range of energies used in mammography.

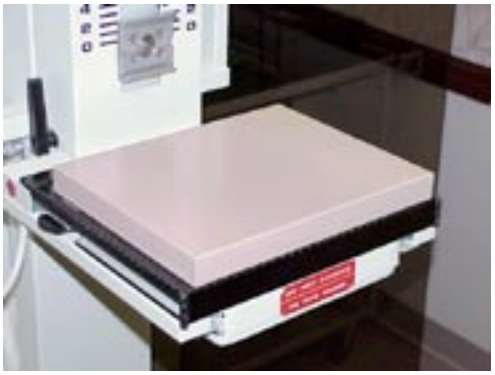
Model 014A

Mammography Artifact Evaluation Phantom

The American College of Radiology and MQSA recommend a uniform 4 cm thick "high grade" cassette sized phantom for evaluation of mammography artifacts as it is often difficult to identify artifacts based on clinical or standard phantom images.

CIRS has designed two phantoms to meet these recommendations. The small phantom measures 18 x 24 x 4 cm thick and the large phantom measures 24 x 30 x 4 cm thick.

Both are made from tissue equivalent BR-12 with a thickness tolerance of .01 mm and all phantoms are image tested and carefully screened for homogeneity and impurities. Other glandular equivalencies are available upon request.



Model 014E

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Model 014 Specifications:

Illustrative example

Chemical Composition of CIRS BR12[1] Formula

C: 0.7037 O: 0.1693 H: 0.0961 N: 0.0194 Ca: 0.0086 Cl: 0.0020

Density = 0.98

Calculated Attenuation Values[2] :

KEV= 10	MU= 3.550
KEV= 15	MU= 1.183
KEV= 20	MU= 0.610
KEV= 30	MU= 0.315
KEV= 40	MU= 0.240
KEV= 50	MU= 0.209
KEV= 60	MU= 0.193
KEV= 80	MU= 0.174
KEV=100	MU= 0.163

Specify Glandular Equivalency when ordering other than standard

% Gland	% Adipose
0/100	
30/70	
(BR12) 47/53	
50/50	
70/30	
100/0	

Standard Dimensions - Standard

Glandularity	Model	Quantity	Length	Width	Thickness
BR12	014A	3	12.5 cm	10 cm	2 cm
		2	12.5 cm	10 cm	1 cm
		1	12.5 cm	10 cm	0.5 cm
BR 50/50	014AD	2	12.5 cm	10 cm	2 cm
		1	12.5 cm	10 cm	2 cm (with embedded detail plate)
		2	12.5 cm	10 cm	1 cm
		1	12.5 cm	10 cm	0.5 cm
BR 12	014B	4	12.5 cm	10 cm	2 cm
BR 12	014C	2	18 cm	24 cm	2 cm
BR 12	014E	1	30 cm	24 cm	4 cm
BR 50/50	014F	1	12.5 cm	10 cm	2 cm (with embedded detail plate)

Optional glandularities - any combination ranging from pure glandular to pure adipose are available on request.
Other thicknesses available 0.1, 0.2, 0.5, 1, 2, 3, 4, 5 and 6 cm can be manufactured upon customer's request.

1. White, D.R., R.J. Martin, and R. Darlison, Epoxy resin based tissue substitutes, British Journal of Radiology, 5, 814-821, 1977.

2. Materials are formulated to maximize simulation properties at 20 keV for the mammographic range, 80 keV for the diagnostic range and .5 MeV and above for the therapeutic range.

Single Exposure High Contrast Resolution Phantom

MQSA Item

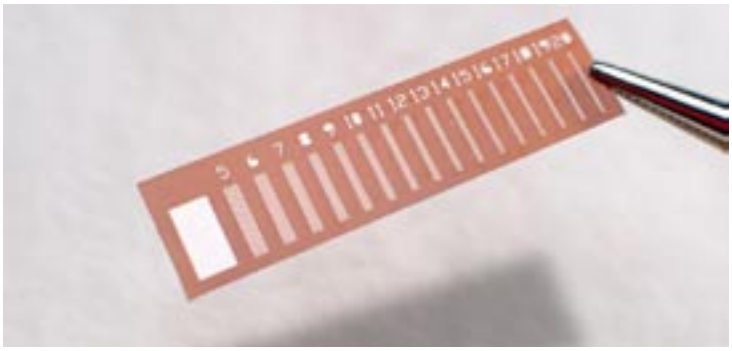
Perform QC inspections of mammography system resolution with just one exposure!

The CIRS Model 016A incorporates two 17.5 micron thick gold-nickel alloy bar patterns. These bar patterns are positioned at 90 degrees to allow assessment of resolution perpendicular and parallel to anode-cathode axis in just one exposure! The targets have 17 segments from 5 lp to 20 lp/mm and are equivalent to 25 microns of lead or 2.6 mm of aluminum at 20 keV.

The patterns are permanently embedded in a thin acrylic wafer to protect them from wear or damage.

The phantom body is available in BR12 or BR50/50. It enables consistent, reproducible positioning at 4.5 cm above the breast support plate and 1cm from the chest wall, centered laterally (as recommended by the American College of Radiology).

The Model 016A includes a 30x hand held microscope and handling instructions.



Model 016A

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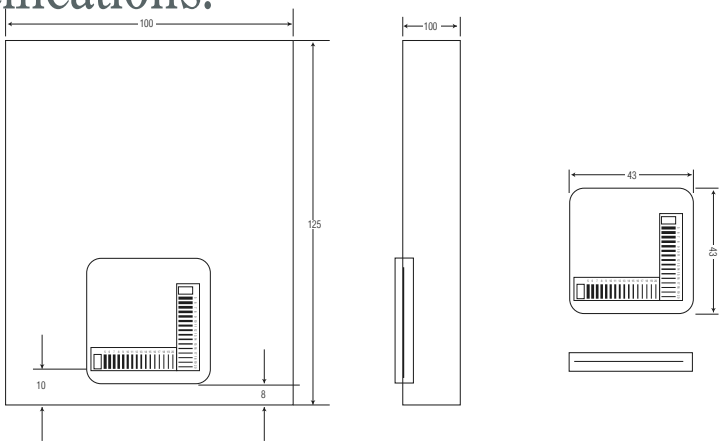
Model 016A Specifications:



BODY

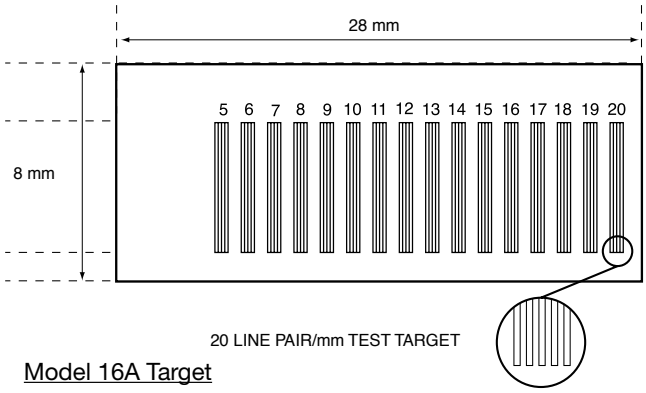
Material:	BR12 or BR50/50
Length:	125 mm
Width:	100 mm
Height:	20 mm

TARGET

Material: Gold/nickel con struction (equivalent to 25 microns lead or 2.6 mm aluminum) embedded in acrylic.

SET

Consists of:
(1)acrylic target
(2) 12.5 x 10 x 2 cm slabs
(1) 12.5 x 10 x 0.5 cm slab
(1) 12.5 x 10 x 2 with LP location



Model 16A Target

Special High Contrast Resolution Phantom

MQSA Item

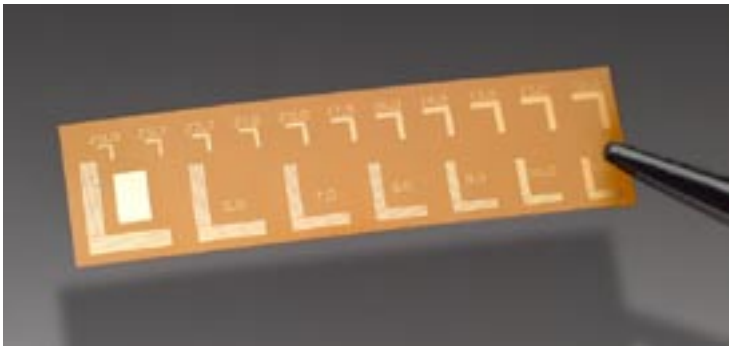
For greater accuracy challenge and efficiency

The CIRS Model 016B incorporates a 17.5 micron thick gold-nickel alloy bar pattern. Each bar pattern is positioned at 90 degrees to allow assessment of resolution perpendicular and parallel to anode-cathode axis in just one exposure! The 016B high resolution target has 18 segments from 5 lp to 28 lp/mm. The target is equivalent to 25 microns of lead or 2.6 mm of aluminum at 20 keV.

The bar pattern is permanently embedded in a thin acrylic wafer to protect it from wear or damage.

The phantom body is available in BR12 or BR50/50. It enables consistent, reproducible positioning of the bar pattern at 4.5 cm above the breast support plate and 1 cm from the chest wall, centered laterally (as recommended by the American College of Radiology).

The Model 016B includes a 30x hand held microscope and handling instructions.



Model 016B

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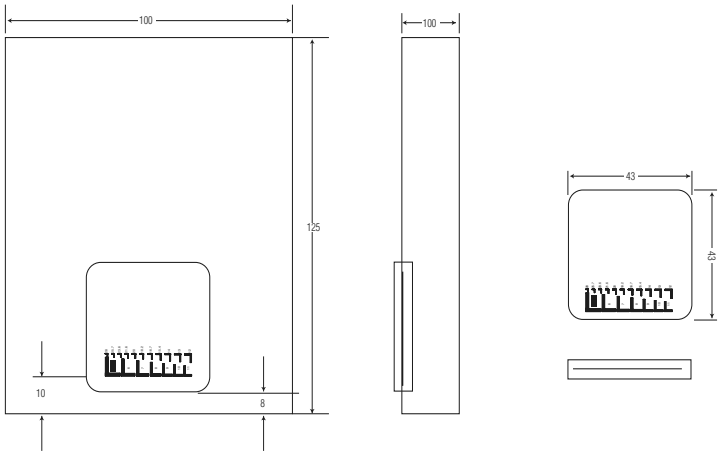
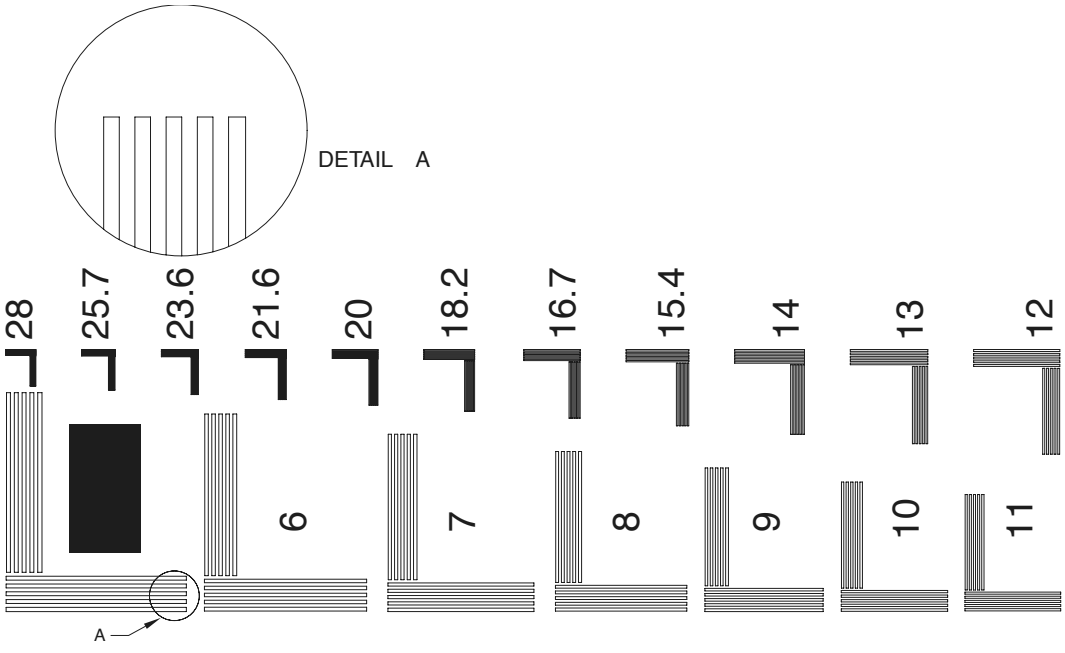
Model 016B Specifications:

BODY
Material: BR12 or BR50/50
Length: 125 mm
Width: 100 mm
Height: 20 mm

TARGET
Material: Gold/nickel construction (equivalent to 25 microns lead or 2.6 mm aluminum) embedded in acrylic.

SET
Consists of:
(1) acrylic target
(2) 12.5 x 10 x 2 cm slabs
(1) 12.5 x 10 x 0.5 cm slab
(1) 12.5 x 10 x 2 with LP location





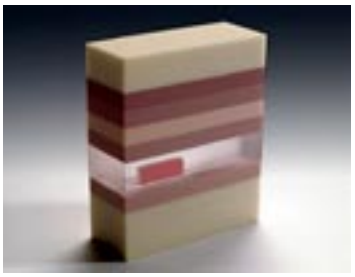
The selection of sizes is designed for a consistent "step-down" progression from target to target.

Mammographic Step Wedges

Ideal for evaluating system performance under varying exposure parameters

CIRS step-wedges can be used with standard densitometers to monitor system performance under changing exposure parameters.

Wedges are manufactured from tissue simulating materials which have been specially formulated to maximize simulation properties in the Mammographic Energy Range.



Model 017

Model 018

Model 017 Features

- Constant thickness, variable densities/glandular equivalencies. All material optimized for use in mammographic energy range
- Use with densitometer to monitor system performance quantitatively
- Overall measurement 10 cm x 12 cm x 4 cm
- Wedge Includes:
  Water equivalent bolus on each end
  100% glandular equivalent material (pure gland)
  70% " " "
  64% " " " acrylic (PMMA) with wax insert
  50% " " "
  45% " " " (BR 12)
  30% " " "
  0% " " " (pure adipose)

Model 018 Features

- Overall measurement 10 cm x 12 cm
- 4 cm initial thickness decrimented in 10 steps, each step .25 cm
- Standard materials composition is 50% Glandular/ 50% Adipose Tissue

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Full Field Digital Phantoms

Specifically designed for assessment of digital system resolution and verification of CCD stitching

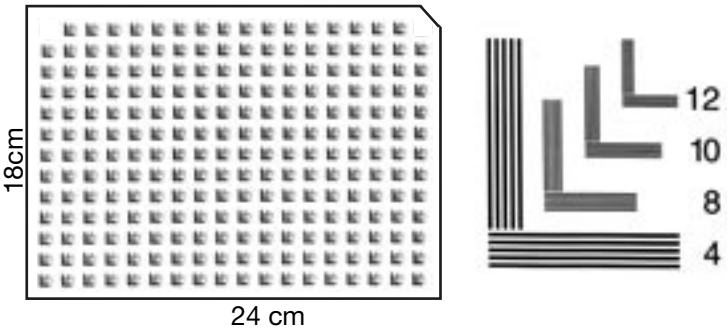
Full Field Digital Mammography systems which utilize CCD technology require test tools to monitor the continuity of "stitching" software.

The CIRS Model 085 phantom provides a series of L-shaped line pair targets from 4 to 12 line pair per mm. These targets are contiguously positioned to cover an 18 cm x 24 cm area at midplane in a 1 cm thick tissue equivalent slab.

Visual inspection of the resulting image permits quick and definitive assessment of stitching continuity and system resolution.

Additional slabs of tissue equivalent material are available for varying thickness and attenuation values.

Model 085



Phantom Body

Material:	BR 50/50
Length:	240 mm
Width:	180 mm
Height:	10 mm

Target

- Tin/Lead construction on Kapton substrate
- Bar length is five times width of the line grouping
- Target pattern embedded mid-plane of phantom

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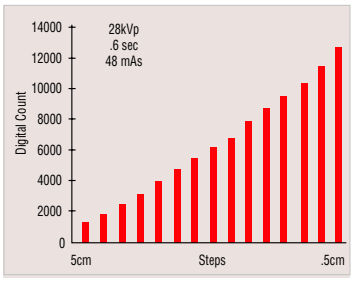
Digital Mammography Phantoms

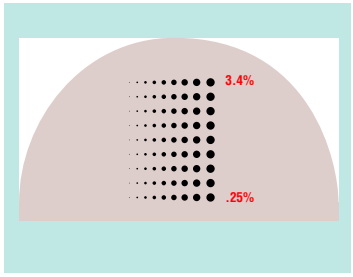
Tissue equivalent test tools

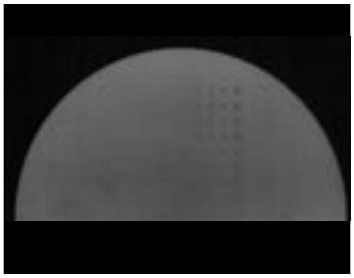


Model 081

Digital Step Wedge

- Test linearity of digital image
- Test dynamic range

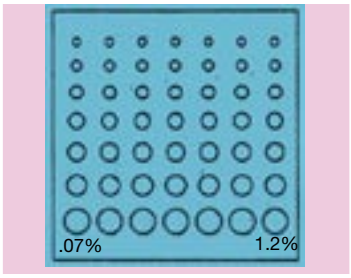


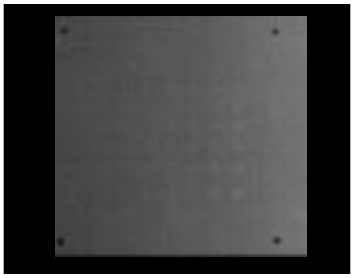


Model 082

Full Field Low Contrast Phantom

- Variable thickness
- Variable composition
- Contrast = air/background
- For FFD and film screen



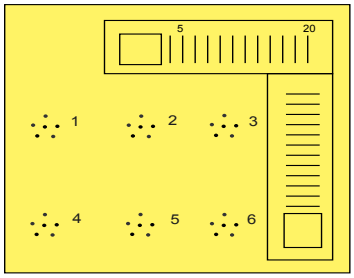


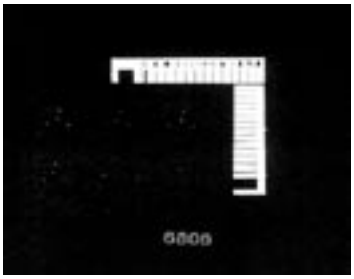
Model 083

Small Field Low Contrast Phantom

Standard contrast object is 10% glandularity above background (other contrasts available)

DIA. 4.5, 4.0, 3.5, 3.0, 2.5, 2.0, 1.5 mm
THK. .25, .40, .80, 1.2, 2.0, 3.0, 4.5 mm





Model 084

High Contrast Test Target Phantom

L-shaped line pair test target for evaluating line pair resolution

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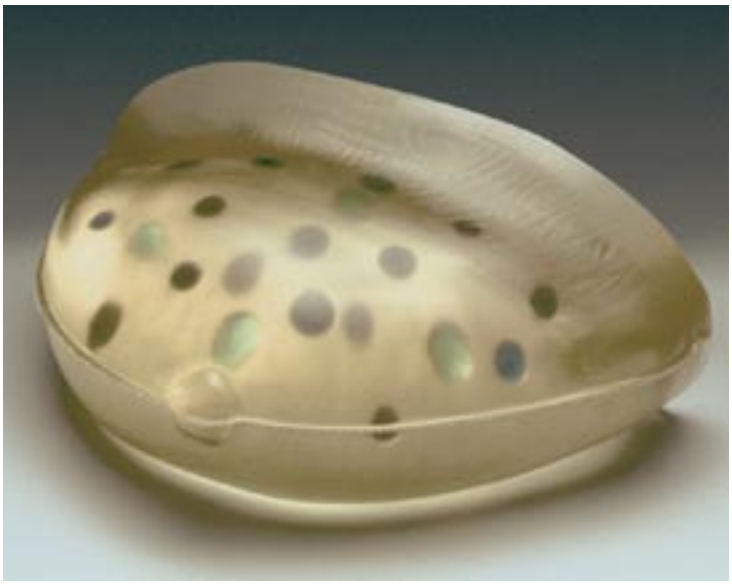
Stereotactic Needle Biopsy Training Phantom

A tissue equivalent, compressible biopsy training phantom, that wont leak

This phantom closely mimics properties of the human breast. It is an ideal teaching tool and practice medium for mammographic needle biopsy procedures. Model 013 also serves as an excellent quality assurance testing device for stereotactic systems and should be used whenever a new system is installed or repaired to insure accurate needle placement.

Each solid mass can be biopsied multiple times. The phantom is constructed from a solid material so it will not leak when punctured.

Model 013 is an excellent research and development or demonstration tool for manufacturers of mammography equipment.



Model 013

Features:

- Compressible
- Proprietary gel simulates the physical density and mass attenuation of "BR 12"
- A physical consistency similar to human tissue combined with an elastic, skin-like membrane enables palpation of embedded structures and accurately simulates needle resistance
- Anthropomorphic shape for accurate simulation of breast compression
- Gel will not dry out after initial needle punctures thus extending storage life
- Contains dense masses and calcifications

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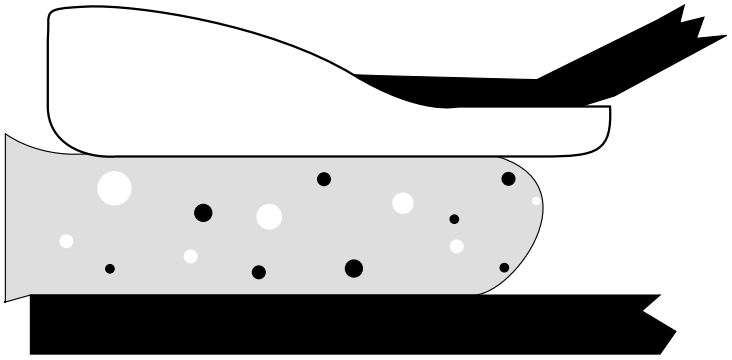
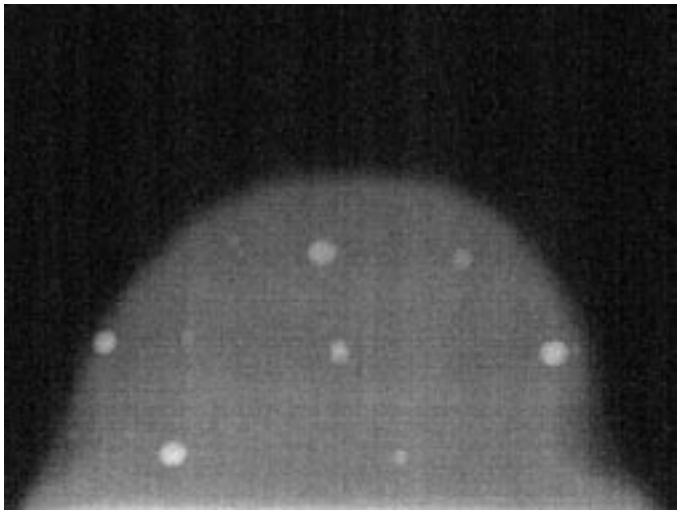
Model 013 Specifications:

PHANTOM
Size: 1500 cc
Length: 10 cm
Height: 5 cm



Targets

	COLOR	SIZE	QUANTITY	POSITION
DENSE MASSES	black	3–6 mm	11	random
MICROCALCIFICATIONS	orange on white mass	0.3–0.35 mm	2 clusters	mid-plane on right and left sides



Specimen Imaging and Transport Container

An efficient system for imaging, transporting and identifying breast biopsies and multiple core specimens

GRIDVIEW®

GRIDVIEW® was developed specifically to address inadequacies which exist with regards to the post operative handling of surgical breast biopsy specimens and multiple core biopsy specimens. It's unique design and radio-opaque grid provide an efficient system for imaging, transporting and identifying breast biopsies.

Benefits:

- Reduces surgery time through improved imaging turnaround
- Improves communication between surgery, radiology and pathology
- Eliminates physical handling of specimens in radiology
- Eliminates the need for needles or wires
- Reduces risk of exposure to blood-borne pathogens

US PATENT # 5383472

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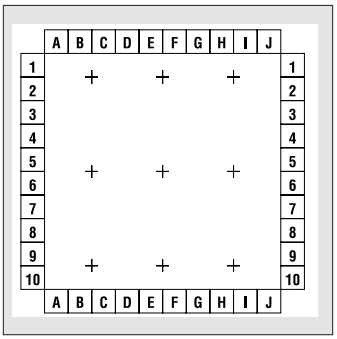
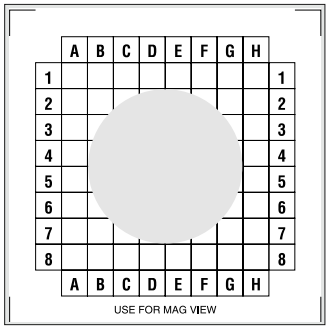
Optional Grids



A



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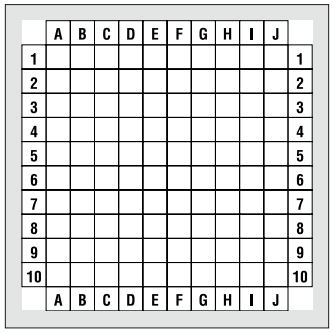

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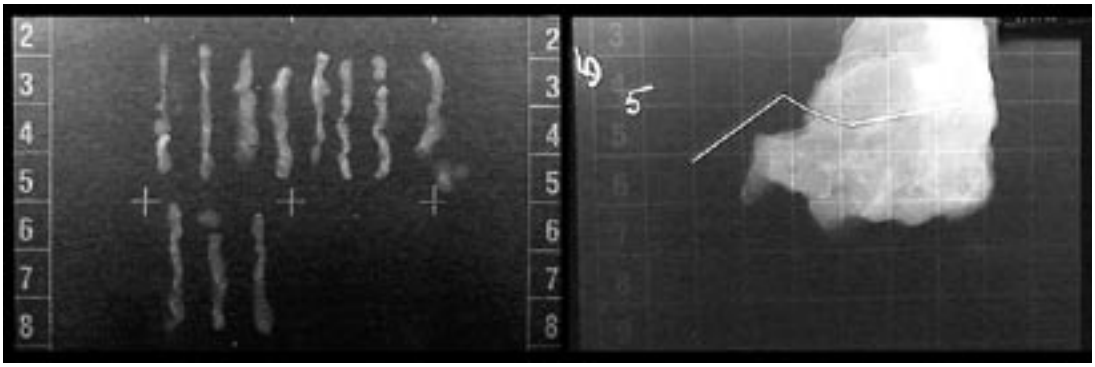


Multiple Core Specimens

Surgical Specimen

Clam shell design compresses larger specimens for improved image contrast and contains specimen fluids.

Unique design accommodates the largest surgical specimens without compromising performance or convenience.

Example:

1. Biopsy Tissue is placed in GRID-VIEW® container.
2. GRID-VIEW® container is delivered to Radiology for confirmation image.
3. GRID-VIEW® container with biopsy is delivered undisturbed to pathology with the x-ray image.
4. Specimen is compared with x- ray image by pathologist for isolation of suspect tissue or calcifications.

Mammoview Markers

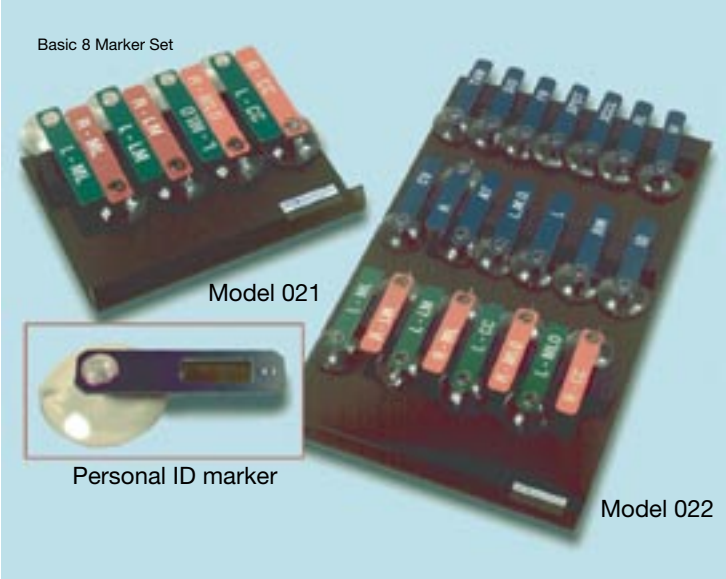
Simple to use and compatible with any mammography x-ray system

These radio-opaque markers are designed to provide a clear indication of position, which can be read directly from x-ray film. They are manufactured in accordance with abbreviations recommended by the ACR.

Each marker is manufactured to be clearly visible on x-ray film only in the mammographic energy range.

Each set of markers comes with an acrylic holding device designed to be mounted near the x-ray unit for easy access.

The CIRS Mammoview Markers are quick and easy to use. Simply mount the acrylic holder near the mammography unit in close proximity to the buckey. Firm pressure applied to the suction cup will hold the marker in place on any smooth surface. Mammoview Markers are usable on any mammography system.



Benefits:

- Fast and simple to use
- Meets all requirements for standardized terminology set forth by the American College of Radiology
- For all mammography systems
- Custom, personalized ID markers also available

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Marker Set Configurations

Standard Set
(8 Markers)

R-CC	L-CC
R-MLO	L-MLO
R-ML	L-ML
R-LM	L-LM

Full Service set
(Standard Set +14 Additional Markers)

R	L
SPOT	M
CV	AT
ID	TAN
SIO	LMO
FB	RL
RM	XCCL

Personal ID markers are also available individually.

LATERALITY	LABELING CODE	PURPOSE
Right	R	
Left	L	
PROJECTION POSITION		
Mediolateral Oblique	MLO	Standard View
Craniocaudal	CC	Standard View
90° LATERAL		
Mediolateral	ML	Localize, Define
Lateromedial	LM	Localize, Define
Spot Compression	SPOT	Define
Magnification	M*	Define
Exaggerated Craniocaudal	XCCL	Localize
Cleavage	CV	Localize
Axillary Tail	AT	Localize, Define
Tangential	TAN	Localize, Define
Rolled Lateral	RL*	Localize, Define
Rolled Medial	RM**	Define
Caudocranial (From Below)	FB	Define
Lateromedial Oblique	LMO	Define
Superolateral to Infermedial Oblique	SIO	Define
Implant Displaced	ID	Augmented Breast

* Use a prefix before the projection. For example, RMMLO equals Right Magnification Mediolateral Oblique.

** Used as a suffix after the projection. For example, LCCRL equals Left Craniocaudal Upper Breast Tissue Rolled Laterally.

Excerpts taken from THE AMERICAN COLLEGE OF RADIOLOGY MAMMOGRAPHY QUALITY CONTROL MANUAL, 1994 Edition

General Purpose Multi-Tissue Ultrasound Phantom

The standard for ultrasound quality assurance
Two Phantoms in one case

The CIRS series of ultrasound phantoms, unlike human subjects or random scannable materials, offers a reliable medium which contains specific, known test objects for repeatable qualitative assessment of ultrasound scanner performance over time.

This phantom is constructed from the patented solid elastic material, Zerdine® [1]. Zerdine®, unlike other phantom materials on the market, is not affected by changes in temperature. It can be subjected to boiling or freezing conditions without sustaining significant damage. Zerdine® is also more elastic than other materials and allows more pressure to be applied to the scanning surface without subsequent damage to the material. At normal or room temperatures the Zerdine® material found in the Model 040 will accurately simulate the ultrasound characteristics found in human liver tissue.

Model 040

Complies with AIUM Standard for Quality Assurance.

The Model 040 was designed to allow for assessment of uniformity, axial and lateral resolution, depth calibration, dead zone measurement, and registration within two different backgrounds of 0.5 and 0.7 dB/cm/MHz.

[1] US PATENT# 5196343

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Model 040 Specifications:

MATERIAL: Zerdine®(1), solid elastic water-based polymer
Freezing Point: 0° C
Melting Point: Above 100° C

ATTENUATION COEFFICIENT:
0.5 dB/cm/MHz
0.7 dB/cm/MHz

SPEED OF SOUND:
1540 m/s

SCANNING WELL:
1 cm deep

SCANNING MEMBRANE:
Saran

TARGETS:
Material: Nylon Monofilament
Wire Diameter: 0.1 mm

VERTICAL PLANE TARGETS
Number of Groups: 1
Number of Targets Per Group: 16
Depth Range: 18 cm
Spacing: 1 cm

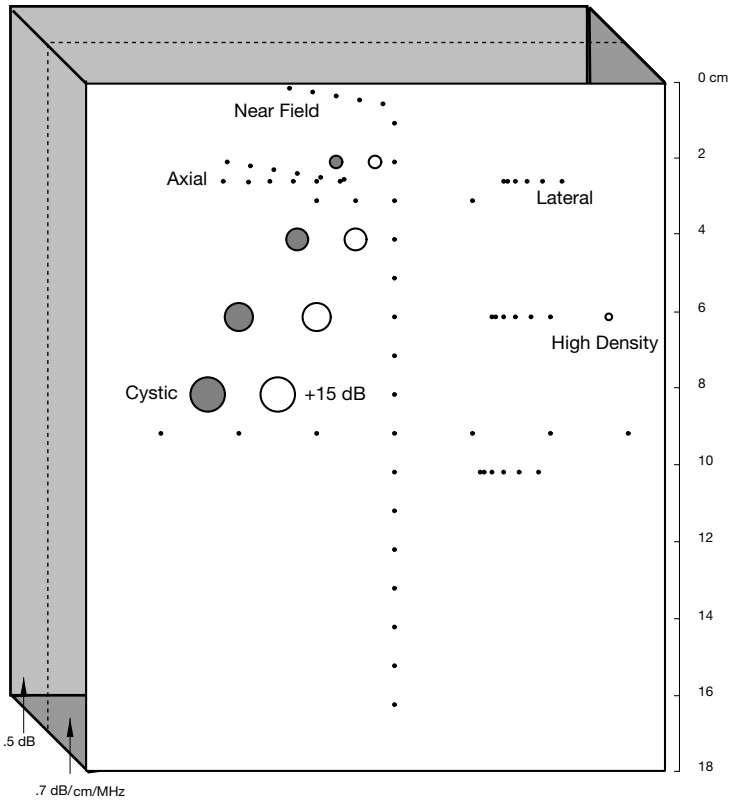
HORIZONTAL PLANE TARGETS
Number of Groups: 2
Number of Targets: 4 and 7
Depth Range: 3 cm and 9 cm
Spacing: 1 cm and 2 cm

RESOLUTION TARGETS:
Number of Arrays: 4
Depths: 2.5 cm, 6 cm and 10 cm
Axial Intervals: 0.5, 1 , 2, 3, 4, and 5 mm
Horizontal Intervals: 1, 2, 3, 4, and 5 mm

CYSTIC TARGETS:
Number of Targets: 4
Diameter of Targets: 2, 4, 6 and 8 mm
Depth of Targets: 2, 4, 6, and 8 cm
Attenuation: <0.07dB/cm/MHz
Speed: 1540 m/s
Contrast: anechoic

HIGH CONTRAST TARGETS:
Number of Targets: 4
Diameter of Targets: 2, 4, 6 and 8 mm
Depth of Targets 2, 4, 6, and 8 cm
Attenuation: 1.0 dB/cm/MHz
Speed: 1540 m/s
Contrast: +15 dB v.s. background

HIGH DENSITY TARGET:
Material: PMMA
Diameter: 1/16"
Depth: 6 cm

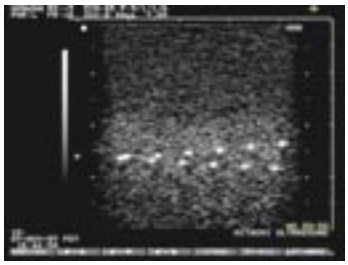


Phantom comes with detachable scanning wells to accommodate large sector probes and small endocavity probes. It is packaged in a hermetically sealed, air tight, rugged carrying case.

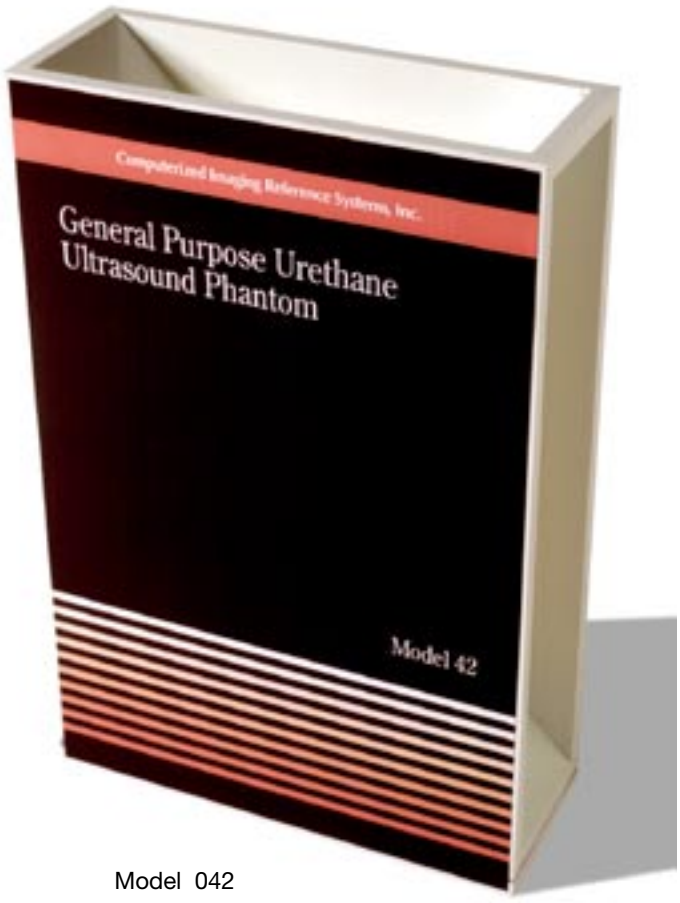
General Purpose Urethane Ultrasound Phantom

Three scan-surfaces

The CIRS series of ultrasound phantoms, unlike human subjects or random scannable materials, offers a reliable medium which contains specific, known test objects. The CIRS line of ultrasound phantoms enables repeatable, qualitative assessment of ultrasound scanner performance over time.



The Model 042 Axial Resolution Target is constructed from a proprietary urethane matrix, housed within a rigid PVC container with three separate scanning windows. It allows for depth of penetration, uniformity, distance calibration, resolution and lesion delectability assessment.



Model 042

The Model 042 is sold with a three year warranty. All CIRS Ultrasound QA phantoms, including the Model 042, are sold with an in-house certification traceable to NIST standards, user manual, ultrasound physics textbook and a carrying case.

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Model 042 Specifications:

MATERIAL: Proprietary Urethane Matrix

ATTENUATION COEFFICIENT: 0.50 dB/cm/MHz ± 0.05 dB/cm/MHz at 5.0 MHz

SPEED OF SOUND:
1430 m/s ± 10 m/s at 20°C

SCANNING SURFACES:
Number: 3
Depth of scanning wells: 2 cm

HOUSING:
Material: White PVC
Outer Dimensions:
17 cm X 25.5 cm X 7 cm

VERTICAL PLANE TARGETS:
Number of Groups: 1
Number of Targets per Group: 10
Depth of Visualization: 1 cm - 19 cm

Visualized Spacing:
20.0 mm ± 0.38 mm

Material: 0.10 mm diameter, Nylon monofilament

HORIZONTAL PLANE TARGETS:
Number of Groups: 1
Number of Targets per Group: 10

Depth of Visualization:
3 cm and 10 cm

Visualized Spacing:
18.56 mm ± 0.38 mm

Material: 0.10 mm diameter, Nylon monofilament

Note: This target group is also the Vertical Plane Target group

AXIAL RESOLUTION TARGETS:
Number of Groups: 2
Number of Targets per Group: 12

Depth of Visualization:
2, 5, 8 & 11 cm

Axial Resolution Test Range:
0.50 mm, 1.00 mm - 5.00 mm in 1.00 mm increments

Material: 0.1 mm diameter, Nylon monofilament

LATERAL RESOLUTION TARGETS:
Number of Groups: 2
Number of Targets per Group: 6

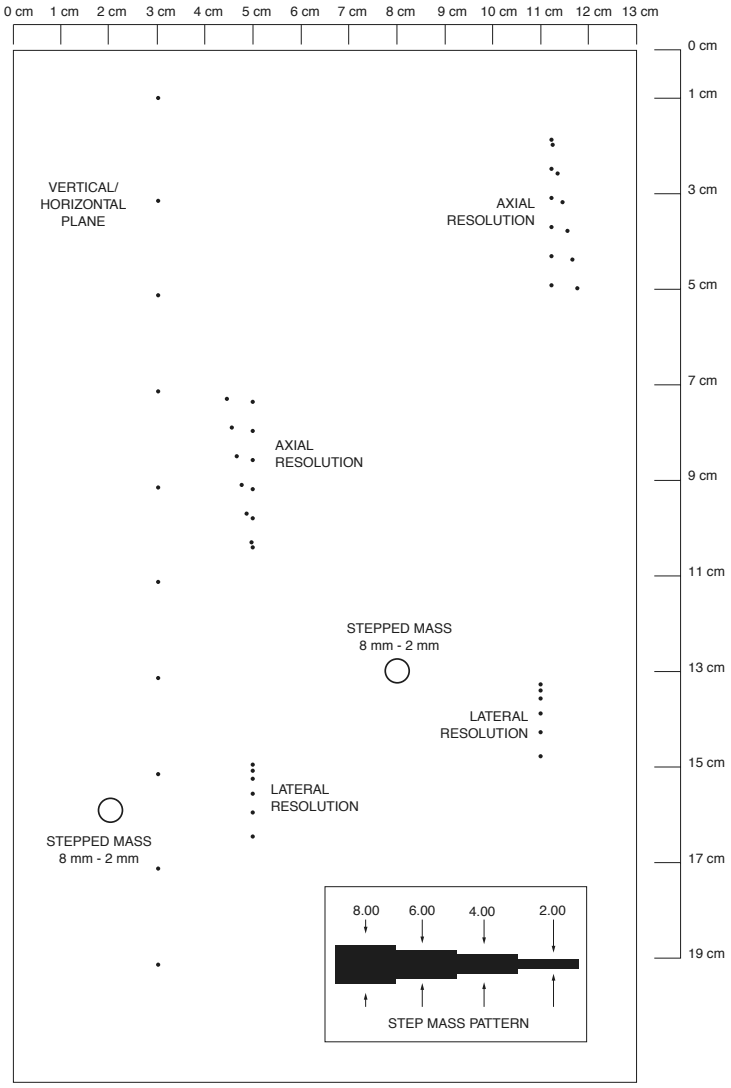
Depths of Visualization:
2, 5, 8 & 11 cm

Lateral Resolution Test Range:
1.00 mm - 5.00 mm in 1.00 mm increments
Material: 0.1 mm diameter, Nylon monofilament

ANECHOIC TARGETS:
Number of Targets: 2

Diameter:
8 mm - 2 mm in 2 mm increments

Depths of Visualization:
2, 5, 8, 11, 13 and 16 cm.



Breast Ultrasound Needle Biopsy Phantom

The perfect training device for ultrasound guided needle biopsy procedures

The Model 052 accurately mimics the ultrasonic characteristics of tissues found in an average human breast. The size and shape of the phantom simulates that of an average patient in the supine position.

A special holding tray facilitates proper hand position during the training procedures.

Protected by a membrane, the phantoms flesh-like consistency, (Zerdine®)[1] simulates needle resistance. Each cystic mass may be aspirated once while each solid mass may be biopsied multiple times. Cyst material is stained green and solid masses are black for easy identification.

The Model 052 Ultrasound Needle Biopsy Phantom was developed by those skilled in the art of ultrasound guided needle biopsy procedures and is the ideal training device.

Model 052

Benefits:

- Improve hand-eye coordination
- Build confidence and reduce patient anxiety
- Test new equipment
- Experiment with new techniques
- Instruct others
- Contains cysts which can be aspirated
- Contains solids which can be biopsied

[1]US PATENT# 5196343

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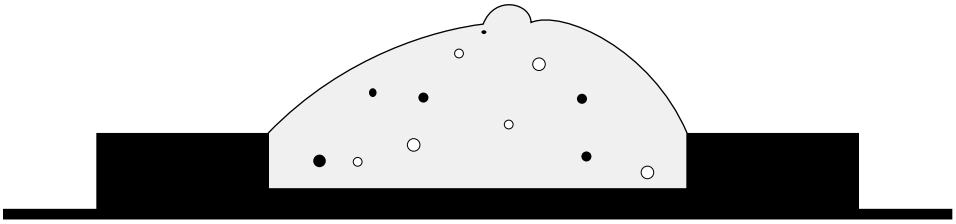
Model 052 Specifications:

Phantom

SIZE	600 cc	**LENGTH**	15 cm
WIDTH	12 cm	**HEIGHT**	7 cm
MATERIAL	Zerdine®		



Targets

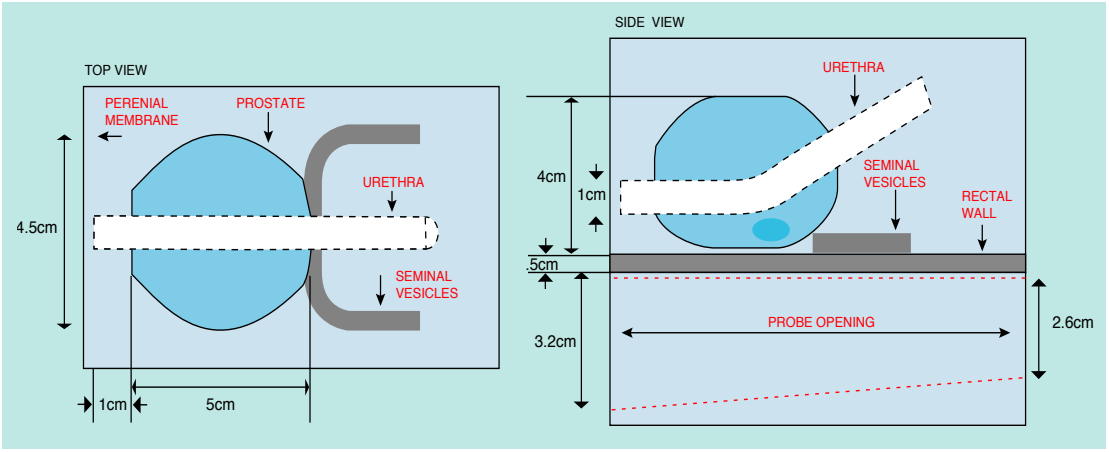
	COLOR	SIZE	QUANTITY	POSITION
CYSTIC MASSES	green	8-15 mm	6	random
DENSE MASSES	black	6-12 mm	6	random
BACKGROUND	white			

Tissue Equivalent Ultrasound Prostate

The ideal training device for ultrasound guided procedures

The CIRS Model 053 Ultrasound Prostate Training Phantom is a disposable phantom developed for practicing procedures which involve scanning the prostate with a rectal probe.
The prostate along with structures simulating the rectal wall, seminal vesicles and urethra is contained within an 11.5 cm X 7.0 cm X 9.5 cm clear acrylic container. A 3 mm simulated perineal membrane enables various probes and surgical tools to be inserted into the prostate. This phantom is an ideal training device for ultrasound guided cryosurgery, radioactive seed implantation, and needle biopsy.

Model 053 (option A shown)



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Model 053 Specifications:

CONTAINER:
Material: Clear acrylic
Dimensions: 11.5 cm X 7.0 cm X 9.5 cm
Front probe opening:
3.2 cm diameter
Rear probe opening:
2.6 cm diameter

PERINEAL MEMBRANE:
4.5 cm diameter
3 mm thick urethane

BACKGROUND GEL:
Similar to water with very little backscatter attenuation
≤ 0.07 db/cm/MHz

URETHRA:
Dimensions: 0.7 cm diameter
Material: Zerdine® [1], low scatter

SEMINAL VESICLES:
Dimensions: 7 mm diameter X 10 cm long
Material: Zerdine® [1]
Properties: Speed=1540 m/s
Attenuation= 0.5 dB/cm/MHz
Backscatter similar to liver tissue

PROSTATE:
Dimensions: 5 cm X 4.5 cm X 4.0 cm
Material: Blue Zerdine® [1], high scatter
Volume: approximately 53 cc

RECTAL WALL:
Dimensions: 6 cm X 11 cm X 0.5 cm
Material: Zerdine® [1]
Properties: Speed=1540 m/s
Attenuation= 0.5 dB/cm/MHz
Backscatter similar to liver tissue

OPTIONS:
A. Embedded lesion 0.5cc +/- hypoechoic unless otherwise specified. (Ideal for needle biopsy)

B. Urethane version- see data sheet for Model 058

C. Clear rectal area for visualization of probe orientation.

D. Semi-clear prostate allows visualization of seed placement.

E. Pubic arch simulation.

F. Hollow urethra for catheter insertion.

G. Oil based prostate gel for minimal needle tracks.

H. Small rectal opening version

I. Seed implant version-see data sheet for Model 053-I


MODEL 053


MODEL 053A-Lesion Shown

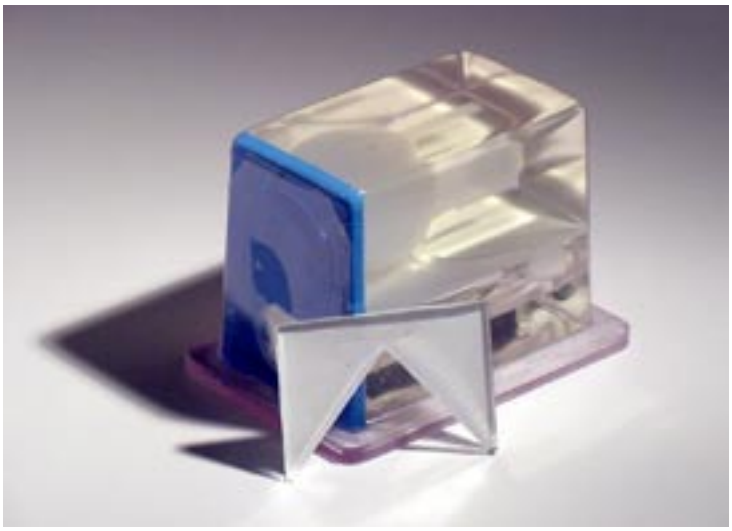
[1] US Patent # 5196343

Ultrasound Prostate Training Phantom

The ideal training device for permanent seed implantation procedures

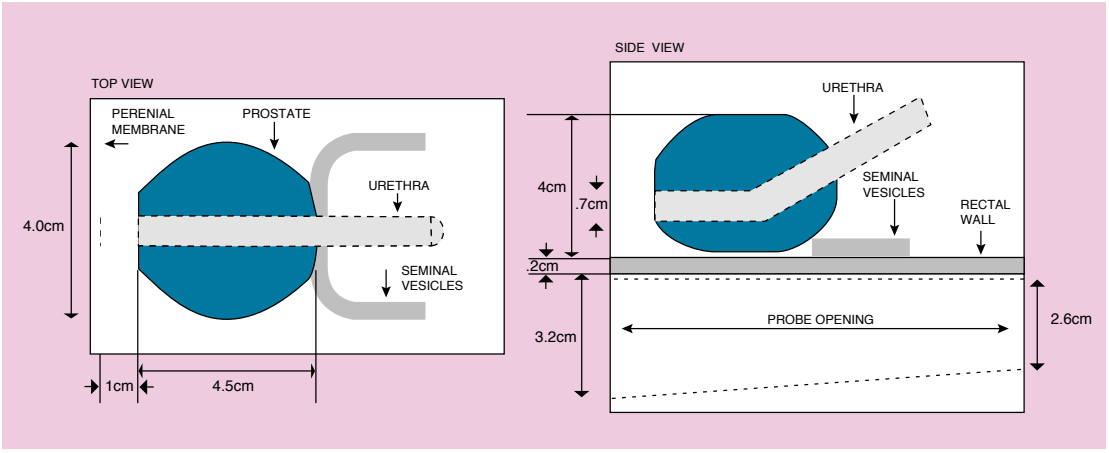
The CIRS Model 053-I Ultrasound Prostate Training Phantom is a disposable phantom developed for practicing permanent seed implantation procedures. It contains several unique features to assist the teaching and learning process.

The simulated perineal membrane permits needle insertion with realistic resistance. In addition, the area below the rectal wall is a clear gel to permit visualization of probe orientation. The prostate is transparent to allow visual verification of seed placement. The phantom also includes a removable pubic arch simulation.



Model 053-I

This modification to the CIRS Model 053 phantom was developed with Dr. Peter Grimm and his associates at the Seattle Prostate Institute.



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Model 053-I Specifications:

CONTAINER:
Material: Clear acrylic
Dimensions: 11.5 cm X
7.0 cm X 9.5 cm
Front probe opening:
3.2 cm diameter
Rear probe opening:
2.6 cm diameter

PERINEAL MEMBRANE:
3 mm thick urethane

BACKGROUND GEL:
Similar to water with very little backscatter attenuation
≤ 0.07 dB/cm/MHz

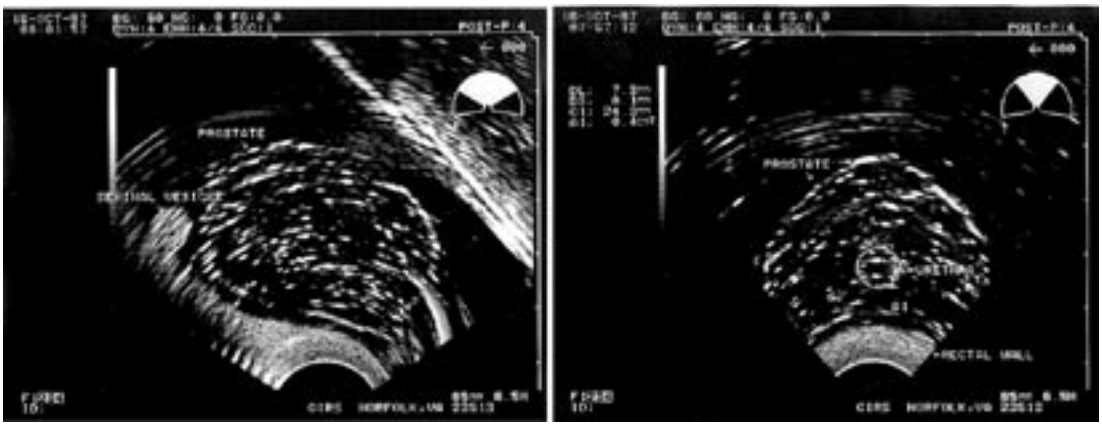
URETHRA:
Dimensions: 0.7 cm diameter
Material: Zerdine® [1], low scatter

SEMINAL VESICLES:
Dimensions: 7 mm diameter X
10 cm long
Material: Zerdine® [1]
Properties: Speed=1540 m/s
Attenuation= 0.5 dB/cm/MHz
Backscatter similar to liver tissue

PROSTATE:
Dimensions: 4 cm X 4.5 cm
X 4.0 cm
Material: Zerdine® [1], low scatter

RECTAL WALL:
Dimensions: 6 cm X 11 cm
X 0.2 cm
Material: Zerdine® [1]
Properties: Speed=1540 m/s
Attenuation= 0.5 dB/cm/MHz
Backscatter similar to liver tissue

OTHER FEATURES:
Removable pubic arch



Note: This phantom not intended to ultrasonically mimic the human prostate.

[1] US Patent # 5196343

Advanced General Purpose Ultrasound Phantom

Designed for evaluating system resolution

The CIRS series of ultrasound phantoms, unlike human subjects or random scannable materials, offers a reliable medium which contains specific, known test objects for repeatable qualitative assessment of ultrasound scanner performance over time.

This phantom is constructed from the patented solid elastic material, Zerdine®(1). Zerdine®(1), unlike other phantom material on the market, is not affected by changes in temperature. It can be subjected to boiling or freezing conditions without sustaining significant damage. Zerdine®(1) is also more elastic than other materials and allows more pressure to be applied to the scanning surface without subsequent damage to the material. At normal room temperature, the Zerdine®(1) material found in the Model 044 will accurately simulate the ultrasound characteristics found in human liver tissue.

The Model 044 consists of two planes of short cylinders. One plane has an attenuation coefficient of 0.5 dB/cm/MHz while the other is 0.7 dB/cm/MHz. Each plane has two groups of targets. The 12 mm diameter test objects have three contrasts with respect to the background enabling low contrast resolution assessment at many depths. All other targets have a -15 dB contrast. To facilitate proper probe alignment, the Model 044 contains a series of nylon targets. The phantom includes a sturdy carrying case and certification sheet. The Model 044 is ideal for simultaneous assessment of axial, lateral, and elevational resolution.

Model 044

(1) US PATENT# 5196343

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Model 044 Specifications:

MATERIAL: Zerdine®(1), solid-elastic, water-based polymer
Freezing Point: 0°C
Melting Point: Above 100°C

ATTENUATION COEFFICIENT:
0.50 dB/cm/MHz ± 0.05 dB/cm/MHz
0.70 dB/cm/MHz ± 0.07 dB/cm/MHz

SPEED OF SOUND:
1540 m/s ± 6 m/s

SCANNING MEMBRANE:
Saran based

TARGETS:
Number of Groups: 4

Number of Targets per Group:
35, 45, 45 & 15

Type of Target: short cylinders

Diameter of Targets: 1.5 mm, 3 mm, 3 mm & 12 mm

Length Targets: 2.4 mm, 3 mm, 6 mm & 18 mm

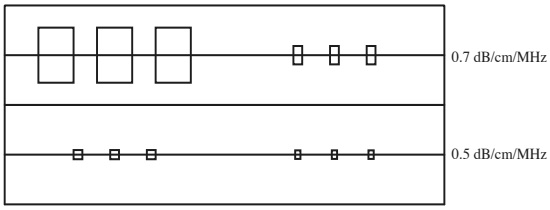
Placement: see diagram

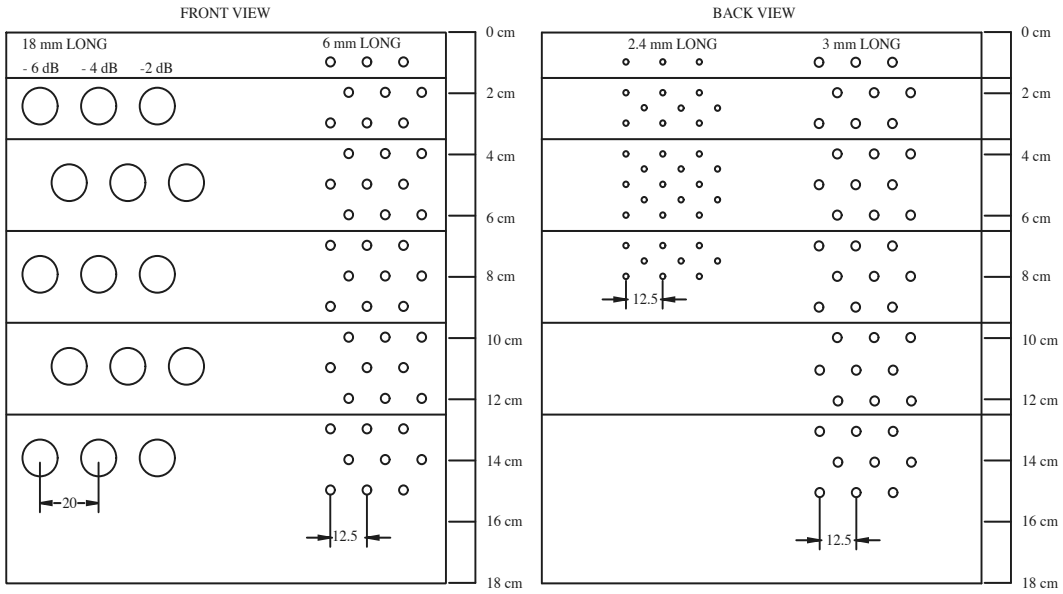
Contrast:
12 mm: - 2 dB, - 4 dB & - 6 dB
all others: - 15 dB ± 2 dB wrt background

ALIGNMENT TARGETS:

Material: Nylon Monofilament
Diameter: 0.1 mm

Depths: 1.5 cm, 3.5 cm, 6.5 cm, 9.5 cm & 12 cm





Gray Scale Ultrasound Phantom

For evaluating resolving power as a function of depth, size, and contrast.

Introducing a new design using proven, patented materials to permit rapid visualization of gray scale resolution power at continuous depths from 1 to 12 cm.

Model 047 is a single simple tool to assess resolution of masses varying in size, depth and contrast.

The Model 047 is usable on all diagnostic ultrasound machines thus allowing user evaluation of gray scale sensitivity with a wide range of transducer frequencies. This phantom is an ideal training tool for learning optimum system setup and evaluating system performance.

Masses may be viewed with either a circular or elliptical cross-section. The mass diameters were selected so the volume imaged would double as the diameter increased. The gray-scale levels were selected to achieve a doubling in signal intensity as you move from mass to mass. The anechoic masses comply with the ACR accreditation program.

Model 047

Features:

- 21 Testing objects:
  Diameters: 2.4, 4, & 6.4 mm
  Contrast: Anechoic, -9, -6, -3, +3, +6, +9 dB
- Depth of test object varies continuously as phantom is scanned laterally
- Scatter controlled independently from attenuation
- Carry case included

(1) US Patent # 5196343

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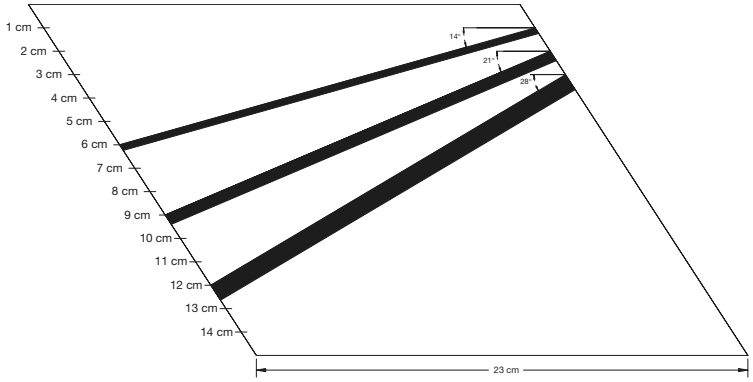
Model 047 Specifications:

DIMENSIONS

35 cm x 13 cm x 17 cm
WEIGHT: 23 lbs.
SCANNING WELL: 1 cm deep

MATERIAL

Zerdine®(1), solid elastic water-based polymer
Freezing Point: 0^0 C, Melting Point: Above 100^0 C
SCANNING MEMBRANE:
Saran-based laminate



BACKGROUND:

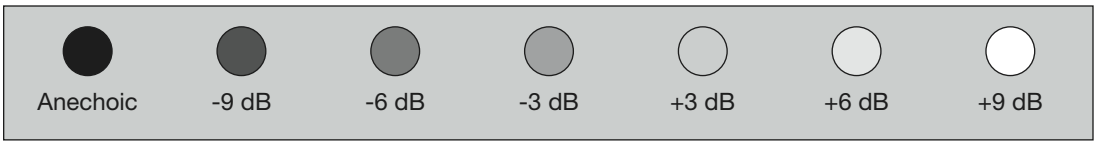
ATTENUATION COEFFICIENT:
0.50 dB/cm/MHz± 0.05 dB/cm/MHz
SPEED OF SOUND: 1540 m/s ± 6 m/s
CONTRAST: 0 dB

TARGETS

ATTENUATION COEFFICIENT:
0.50 dB/cm/MHz±0.05 dB/cm/MHz
SPEED OF SOUND:
1540 m/s
CONTRAST:
anechoic, -9, -6, -3, +3, +6, +9 dB
DIAMETERS:
2.4, 4, and 6.4 mm
DEPTH RANGE:
3 mm: 1 cm - 6 cm
4 mm: 2 cm - 9 cm
6 mm: 3 cm - 12 cm

Gray Scale Phantom Procedure

For each probe combination scan laterally to detect maximum frequency of visualization. Freeze image, measure depth from scan surface to top of target of last visualization.



Test objects have same speed and attenuation as background

Masses are angled for continuous assessment over a range of depth.

Near Field Ultrasound Phantom

QA standard for high frequency probes

The CIRS series of ultrasound phantoms, unlike human subjects or random scannable materials, offers a reliable medium which contains specific, known test objects for repeatable qualitative assessment of ultrasound scanner performance over time.

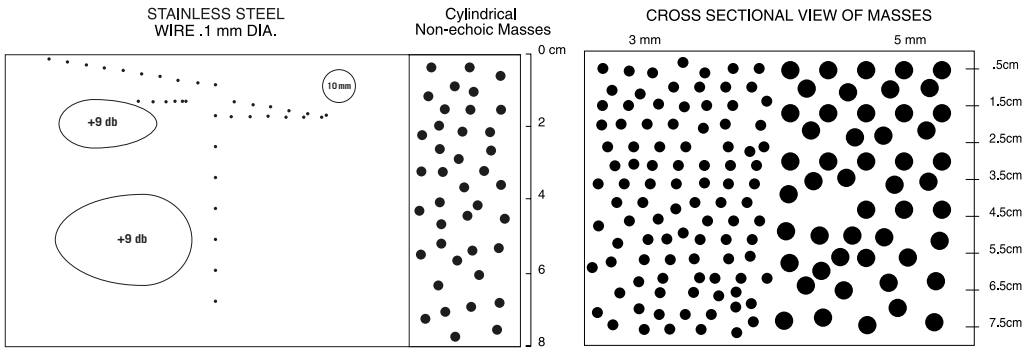
At normal or room temperatures the Zerdine® [1] material found in the Near Field phantom will accurately simulate the ultrasound characteristics found in human tissue.

The Model 050 has a series of wire targets that will appear as bright dots or lines on the ultrasound image. These targets are made from stainless steel with a diameter of 0.10 mm and a positional accuracy of± 0.2 mm. There are also two known volumes a 10 mm anechoic/+15 dB mass and anechoic focal lesions embedded within the phantom. These "masses" are made from Zerdine® that has a different contrast and attenuation relative to the background material.

Model 050

Complies with AIUM Standard for Quality Assurance.

The Model 050 was designed to allow for assessment of uniformity, dead zone, depth of penetration, beam profile/ focal zone/lateral response width, vertical distance measurement accuracy, axial resolution, lateral resolution, anechoic masses, high contrast masses, volumetric measurement accuracy, and focal lesion detectability.



[1] US PATENT# 5196343

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Model 050 Specifications:

MATERIAL: Zerdine®(1), solid elastic water-based polymer
Freezing Point: 0^0 C
Melting Point: Above 100^0 C

ATTENUATION COEFFICIENT:
0.5 dB/cm/MHz

SPEED OF SOUND:
1540 m/s

SCANNING WELL:
165 mm X 100 mm X 1.5 cm

SCANNING MEMBRANE:
Saran-based laminate

TARGETS:
Material: Stainless Steel Wire
Diameter: 0.1 mm

VERTICAL PLANE TARGETS:
Depth Range: 8 cm
Spacing: 1 cm

RESOLUTION TARGETS:
Number of Arrays: 2
Depths: 1.5 cm and 2 cm
Axial Intervals: 0.5, 1 , 2, 3, 4, and 5 mm
Horizontal Intervals: 1, 2, 3, 4, and 5 mm

RING DOWN TARGET:
1 mm to 10 mm

VOLUMETRIC TEST OBJECT:
Calibrated asymmetric shape
7 cc and 21 cc

SPHERICAL CYSTS:
Diameter: 5 mm, 3 mm
Random Distribution.

HIGH CONTRAST/CYSTIC:
Cylinder: Diameter 10 mm
Depth: 1.0 cm
Contrat: HSdB/anechoic

Phantom includes detachable scanning wells and air tight case.

General Purpose Ultrasound Phantom

The basic standard for ultrasound quality assurance.

The CIRS series of ultrasound phantoms, unlike human subjects or random scannable materials, offers a reliable medium which contains specific, known test objects for repeatable qualitative assessment of ultrasound scanner performance over time.

This phantom is constructed from the patented solid elastic material Zerdine®(1). Zerdine®(1), unlike other phantom materials on the market, is not affected by changes in temperature. It can be subjected to boiling or freezing conditions without sustaining significant damage. Zerdine®(1) is also more elastic than other materials and allows more pressure to be applied to the scanning surface without subsequent damage to the material. At normal or room temperatures, the Zerdine®(1) material found in the Model 054 will accurately simulate the ultrasound characteristics found in human liver tissue.

Model 054

Complies with AIUM Standard for Quality Assurance.

The Model 054 was designed to allow for axial resolution, lateral response width, uniformity, dead zone measurements, depth of visualization, high and low contrast mass imaging, and distance calibration.

(1) US PATENT# 5196343

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Model 054 Specifications:

MATERIAL: Zerdine®(1), solid elastic water-based polymer
Freezing Point: 0^0 C
Melting Point: Above 100^0 C

ATTENUATION COEFFICIENT:
0.5 dB/cm/MHz
0.7 dB/cm/MHz available upon request

SPEED OF SOUND:
1540 m/s

SCANNING WELL:
1 cm Deep

SCANNING MEMBRANE:
Saran

VERTICAL PLANE TARGETS:
Number of Groups: 1
Number of Targets Per Group: 9
Depth Range: 18 cm
Spacing: 2 cm
Material: 0.1 mm Nylon monofilament

HORIZONTAL PLANE TARGETS:
Number of Groups: 1
Number of Targets Per Group: 7
Depth Range: 9 cm
Spacing: 2 cm
Material: .1 mm Nylon monofilament

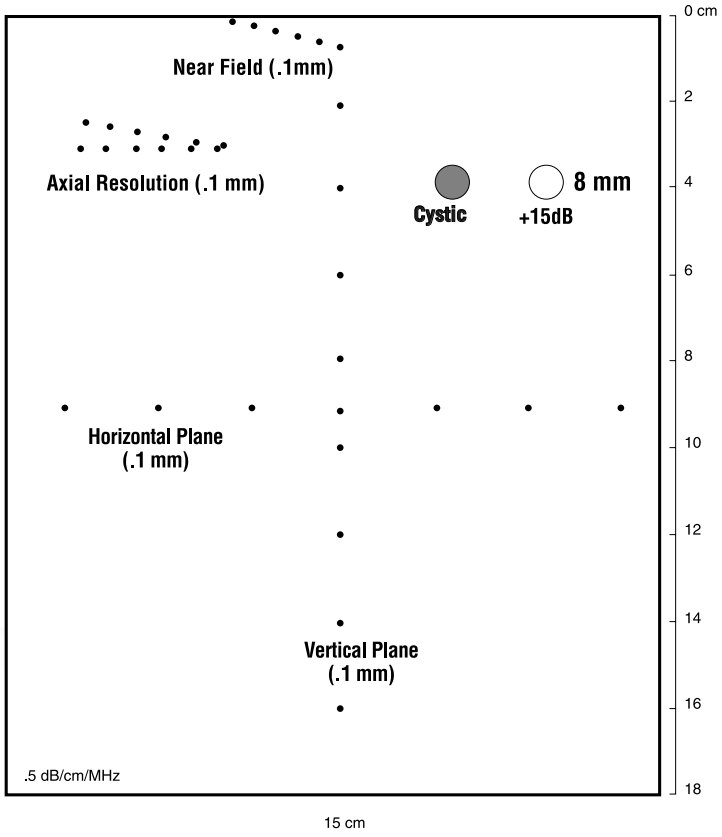
Phantom includes detachable scanning wells and air tight case.

NEAR FIELD TARGETS:
Number of Groups: 1
Number of Targets Per Group: 6
Depth of Targets: 1 mm, 2 mm, 3 mm, 4 mm, 5 mm, and 6 mm.
Material: 0.1 mm Nylon wire

AXIAL RESOLUTION TARGETS:
Number of Groups: 1
Number of Targets
Per Group: 12
Depth: 3 mm
Spacing: .5 mm, 1 mm, 2 mm, 3 mm, 4 mm, and 5 mm
Material: 0.1 mm Nylon wire

ANECHOIC TARGET:
Number of Targets: 1
Diameter of Target: 8 mm
Depth of Target: 4 cm
Contrast: -15dB to Background Material

HIGH CONTRAST TARGET:
Number of Targets: 1
Diameter of Target: 8 mm
Depth of Target: 4 cm
Contrast: +15dB to Background Material



(1) US Patent # 5196343

Three Dimensional Ultrasound Calibration Phantom

The perfect tool for assessment of volumetric measurement accuracy

The Model 055 was designed to allow for assessment of volumetric measurement accuracy and 3D imaging.

The background is calibrated to mimic the ultrasound characteristics of human liver tissue. The phantom contains two calibrated volumetric test objects. The test objects and background material are made from Zerdine® a patented, solid elastic material. Unlike other phantom materials Zerdine® is not damaged by changes in temperature.

The Model 055 is completely encased within a rugged ABS container which minimizes desiccation and facilitates scanning on two sides enabling 3D scanning.

There are two embedded test objects – a small egg and a large egg. The targets are off centered within the background material. Depending upon what side is scanned, the test objects are located at distances ranging from 2 cm to 6 cm from the scanning surface.

Model 055

The backscatter within the test objects is 9 dB ± 3 dB less than the background material. The speed of sound within both the background and the test objects is 1540 m/s ± 6 m/s.

The attenuation coefficient in both the background and test objects is 0.50 dB/cm/MHz ± 0.05 dB/cm/MHz. The volume of each test object is recorded on a certification sheet which accompanies each phantom.

The Model 055 3D Calibration Phantom is the tool for routine quality assurance of three dimensional ultrasound systems, software development, and research.

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Model 055 Specifications:

MATERIAL:
Zerdine®(1), solid elastic water-based polymer
Freezing Point: 0°C
Melting Point: above 100°C

ATTENUATION COEFFICIENT:
0.50 dB/cm/MHz ± .05 dB/cm/MHz

SPEED OF SOUND:
1540 m/s ± 6 m/s

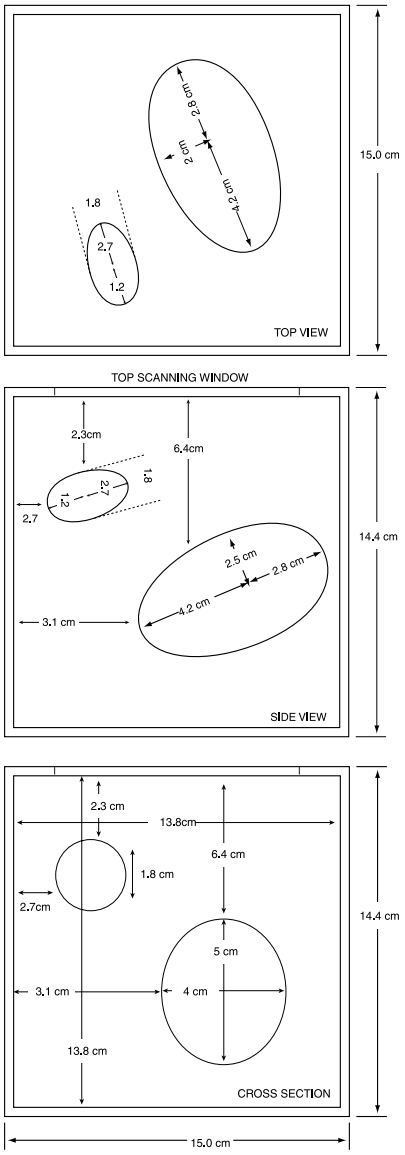
CONTRAST:
Targets 9 dB ± 3 dB lower than background

DEPTH OF TARGETS:
2 cm to 6 cm from scanning surface

VOLUME OF TARGETS:
Small Egg: 6.7cc
Large Egg: 65.0cc

SCANNING MEMBRANE:
Saran-based

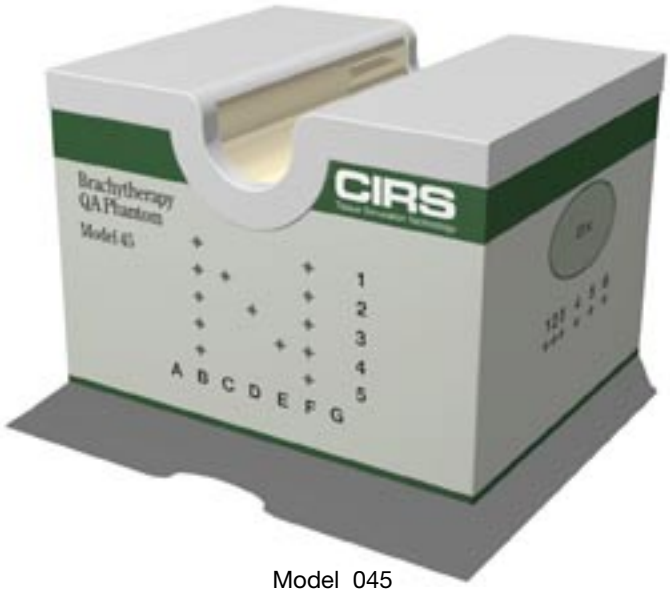
PHANTOM DIMENSIONS:
(nominal)
15 cm L x 15 cm W x 14.7 cm H



Note: All dimensions are nominal.

Brachytherapy QA Phantom

Perform QA on sidefire transrectal probes



Model 045

The CIRS series of ultrasound phantoms, unlike human subjects or random scannable materials, offer a reliable medium which contains specific, known test objects for repeatable qualitative assessment of ultrasound scanner performance over time.

The Model 45 was designed for transrectal ultrasound QA and calibration of brachytherapy systems. It contains targets to assess volume measurements, internal grid accuracy, and probe retraction accuracy. When scanning towards the top of the phantom, a partial grid of wires appears. These wires should line up with the grid that appears on your screen thus ensuring correct vertical and horizontal distance measurements.

Five cross wires are embedded within the phantom to determine if the probe is being retracted the specified distance. Turn the probe 60° to the right or left to visualize and measure the volume of three different calibrated objects, one of which is non-spherical.

Benefits:

- Internal grid assessment
- Probe retraction step assessment
- Volume verification

[1] US PATENT #5196343

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Model 045 Specifications:

MATERIAL: Zerdine ®(1)

ATTENUATION COEFFICIENT:
0.50 ± 0.05 dB/cm/MHz

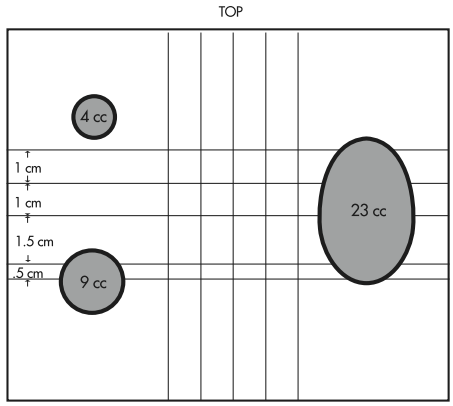
SPEED OF SOUND:
1540 m/s ± 6 m/s

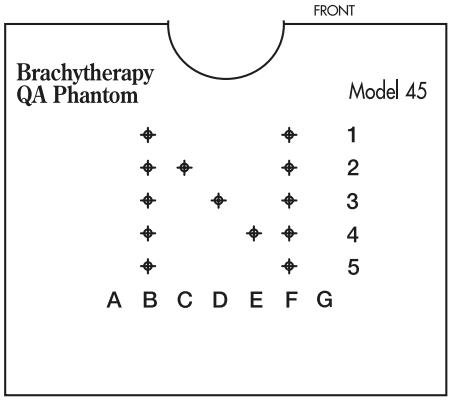
TARGETS:

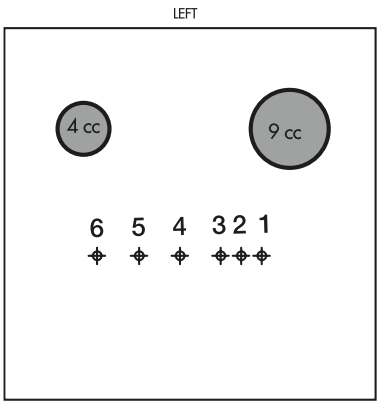
Internal Grid Assessment:
Material: Nylon Monofilament
Diameter: 0.5 mm
Number of Targets: 13
Position: B1 - B5, C4, D3, F1 - F5

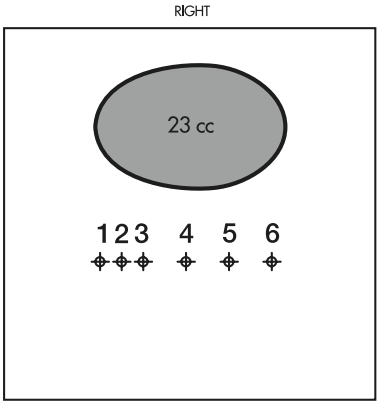
Probe Retraction Assessment:
Material: Nylon Monofilament
Diameter: 0.5 mm
Number of Targets: 5
Spacing: 0.1 cm, 1 cm, 1.5 cm and 0.5 cm
Position: along row 4

Volumes:
Material: Zerdine®(1)
Sizes: approximately 4 cc,(S) 9 cc,(M) and 23 cc(L). Exact volumes provided on certification sheet.









Ultrasound Pathfinder

Interactive training for FNA and core biopsy of the breast

The Ultrasound Pathfinder System combines phantom technology with interactive multimedia. A concise CD-ROM presentation by Peter J. Dempsey M.D., demonstrates proper techniques and safety for Ultrasound Guided Fine Needle Aspiration and Core Biopsy of the breast. The interactive presentation includes narration, 3D animation, live action video and ultrasound footage. This Pathfinder program is Windows and Macintosh compatible. Pathfinder includes a tissue equivalent biopsy phantom with cystic and solid lesions to enable practice in a non-stressful situation. The size and shape of the phantom simulates an average patient in the supine position. A special holding tray facilitates proper hand position during the training procedures.

Pathfinder qualifies for category II credit under ACCME guidelines. All appropriate documentation is included.

• User-friendly and concise CD-ROM presentation

• Practice on a tissue-equivalent phantom

• Learn techniques from an expert

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DR. DEMPSEY is the Director of Outpatient Radiology at the Kirklin Clinic, University of Alabama, at Birmingham. He is the Medical Director of UAB's Interdisciplinary Breast Clinic, and Chief of the Breast Imaging Section.

He devotes the majority of his clinical and academic time to mammography, breast sonography, and interventional breast procedures.

THE ULTRASOUND BREAST PHANTOM is made from a patented gel called Zerdine®. The phantom mimics the ultrasonic characteristics of tissues found in an average human breast. The size and shape of the phantom simulates that of an average patient in the supine position.

A special holding tray facilitates proper hand position during the training procedures.

Each phantom contains six simulated cystic and six simulated solid lesions which vary in diameter from as large as 15mm to as small as 5mm.

	COLOR	SIZE	QUANTITY	POSITION
CYSTIC MASSES	green	8 - 15mm	6	random
DENSE MASSES	black	6 - 12mm	6	random
BACKGROUND	white			

ULTRASOUND PATHFINDER PROGRAM OUTLINE

DISK CONTENTS
- ¥ Ultrasound Pathfinder Program
- ¥ QuickTime 3.0/installer

Windows System Requirements:
- ¥ A Pentium CPU
- ¥ Microsoft Windows95
- ¥ 32 MB of RAM
- ¥ A quad CD-ROM drive

Mac OS System Requirements:
- ¥ Power PC processor
- ¥ 32MB RAM
- ¥ A quad CD-ROM drive

MACINTOSH® WINDOWS COMPATIBLE

MADE WITH macromedia®

Quantitative Ultrasound Phantom

Tissue Equivalent, Calibration Standard

The Model 63 QUS Phantom provides a linear response of Broadband Ultrasonic Attenuation (BUA) in the diagnostic frequency range for assessment of bone quality.

Model 063

Features:

- Linear response in the diagnostic frequency range
- Can be molded into any shape (custom manufacturing)
- Mimics calcaneus bone
- Proven construction methodology
- Known material properties permit phantom to be used as a calibration tool with various QUS systems

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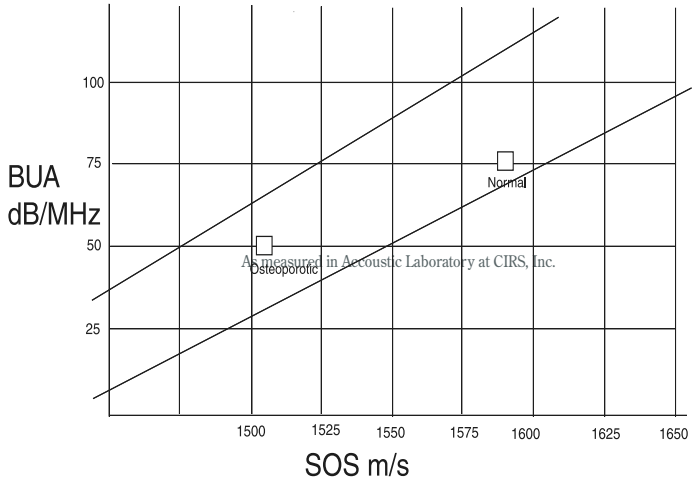
Model 063 Specifications:

MATERIAL:
Proprietary Urethane

THICKNESS: 36 mm

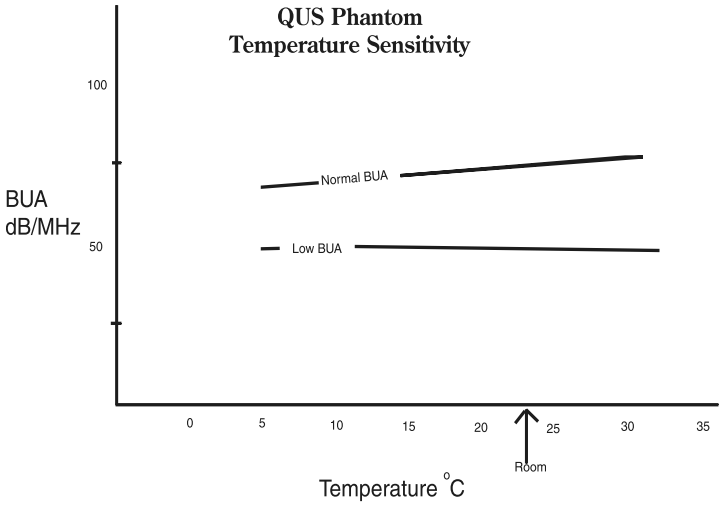
SPEED OF SOUND RANGE:
1500-1600 m/s at room temperature

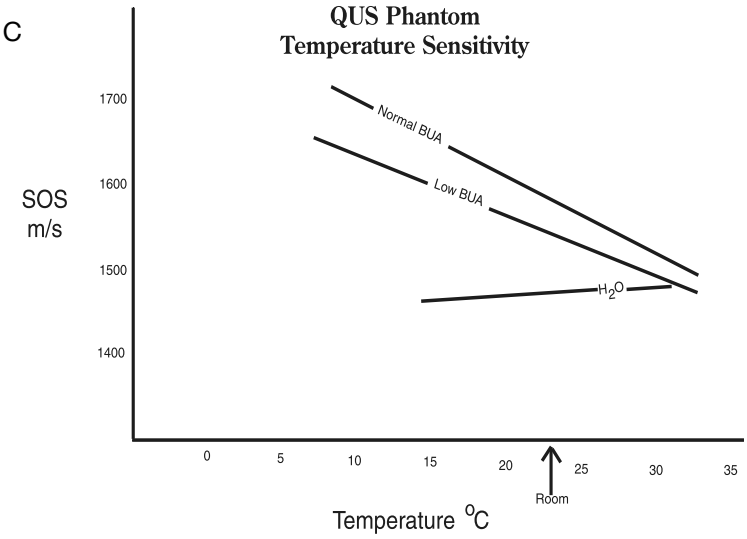
BUA VS SOS



Test Conditions in CIRS Accoustic Laboratory:

- Water bath
- Transducer center frequency = 0.5 MHz
- Sampling frequency = 20 million samples/sec.
- Frequency range for BUA evaluation = 0.25 - 0.55 MHz
- Temperature = 21.3 degrees C





Prostate Demonstration Phantom

Non-disposable urethane phantom for prostate imaging

The Model 058 is a derivative of the Model 053 Ultrasound Prostate Training Phantom. The Model 058 is durable and appropriate for repetitive demonstration scanning.

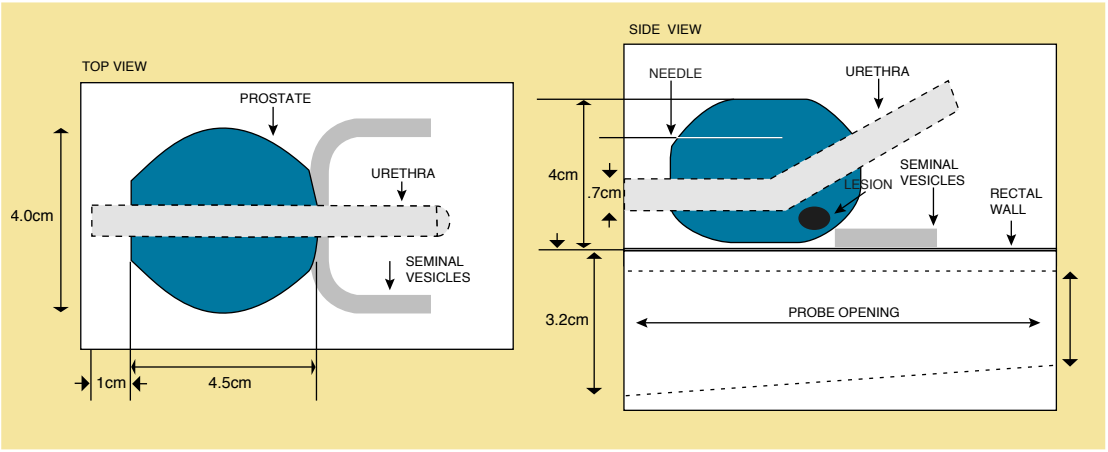
The prostate along with structures simulating the rectal wall, seminal vesicles and urethra is contained within an 11.5 cm X 7.0 cm X 9.5 cm clear container.

A needle is embedded within the prostate to demonstrate needle localization.

Model 058

The phantom also contains a simulated lesion and calcification cluster.

This phantom is an ideal demonstration device for rectal scanning.



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Model 058 Specifications:

CONTAINER:
Material: Clear PETG

Dimensions:
11.5 cm X 7.0 cm X 9.5 cm

Front probe opening:
3.2 cm diameter

Rear probe opening:
2.6 cm diameter

BACKGROUND GEL:
Similar to water with very little backscatter attenuation
≤ 0.20 db/cm/MHz

URETHRA:
Dimensions: 0.7 cm diameter
Material: urethane, low scatter

SEMINAL VESICLES:
Dimensions:
7 mm diameter X 10 cm long

Material: urethane

PROSTATE:
Dimensions:
5 cm X 4.5 cm X 4.0 cm

Material: Blue urethane, high scatter
Volume: approximately 53cc

RECTAL WALL:
Dimensions: 6 cm X 11 cm X .5 cm
Material: Urethane, Backscatter similar to liver tissue

Blood Flow Simulator for Ultrasound

Ideal for demonstrations or basic Doppler function check

The CIRS Model 070 Self contained blood flow simulator was designed as a cost effective alternative to calibrated Doppler phantoms, when only basic Doppler inspections are required.

The Model 070 offers a singular peak flow velocity of approximately 100 cm/sec. It contains one straight vessel oriented at 35 degrees relative to the scanning surface within a tissue equivalent polyurethane material. Vessel diameter is 6.3 mm and depth from the scanning surface ranges from 2 to 5 cm. The pump, internal thermometer, and electrical components are self-contained within the phantom housing. Simplicity of design makes the Model 070 rugged and very easy to use.

Neutrally buoyant, non-degradable blood mimicking solution, user's guide, and phantom inspection certificate included. Extra blood mimicking fluid and carrying case also sold separately.

Model 070

Features:

- Check sample gate location
- Verify relative accuracy of scanner velocity readout
- Compare B-mode vs. color flow position
- Confirm system's ability to discriminate flow direction
- Compact, self contained and easy to use

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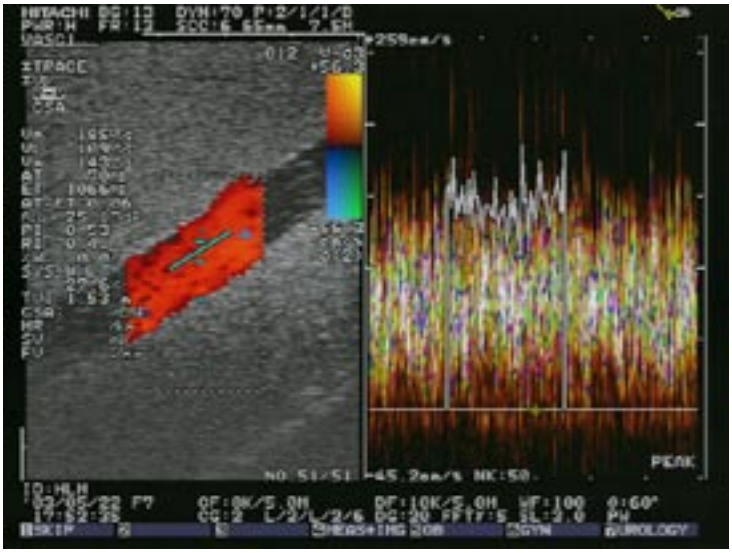
Model 070 Specifications:

Housing Material:	ABS Plastic
Dimensions:	20.5 cm long x 14.5 cm wide x 13 cm high
Scanning Material:	Tissue Equivalent Polyurethane
Speed of Sound:	1430 m/sec +- 10 m/s
Attenuation:	0.50 dB/cm/MHz ± 0.05 dB/cm/MHz
Usable Scanning Area:	6.5 cm x 6.5 cm
Blood Mimicking Fluid:	proprietary
Speed of Sound:	1530 m/s ± 10m/s
Viscosity:	4 mPa s ± 0.4 mPa s
Density:	1.03 g/cc ± 0.03
Attenuation:	<0.1 dB/cm/MHz
Scatterer Size:	5 micron
Fluid Reservoir Capacity:	1.9L
Average velocity:	115 cm/sec
Peak velocity:	145 cm/sec
Flow Velocity: 1	00 cm/sec approximate
Vessel Angle:	35 degrees
Vessel Internal Diameter:	6.3mm
Vessel Depth:	2 to 5 cm
Power Requirements:	110VAC



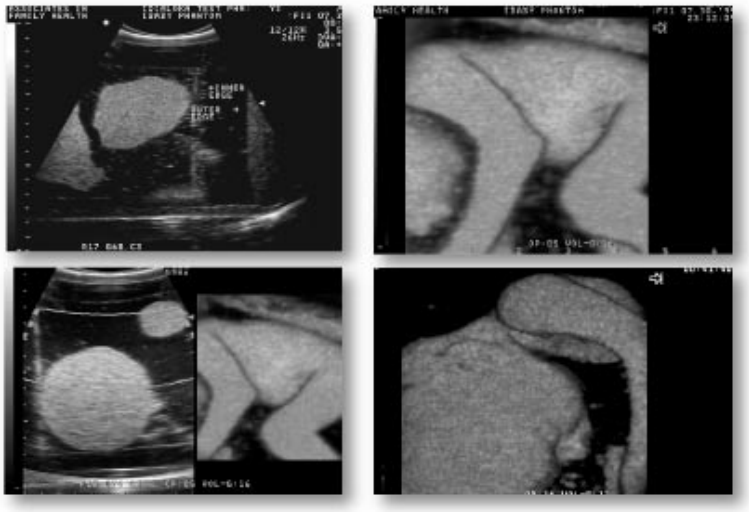
Fetal Ultrasound Training Phantom

The CIRS fetal phantoms can be used for ultrasound scanning demonstrations, 3D reconstructions, surface rendering and a variety of other applications. The phantoms are made from a tissue equivalent polyurethane material for durability.

Models include full fetus or head only for 20 weeks or 36 weeks gestational age.

Contact CIRS for more information.

Model 065-36



Fetal Model for 36 week old.

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Model 065 Specifications:

Material: Proprietary Polyurethane

Background

Attenuation: 0.050 dB/cm/MHz

Speed of sound: 1430 m/sec +/- 10

Backscatter: anechoic

Fetus

Attenuation: 0.050 dB/cm/MHz

Speed of sound: 1430 m/sec +/- 10

Backscatter: similar to liver tissue

Dimensions:

Model 065-20 Full Fetal 20 weeks
13 cm X 25 cm X 20 cm
6000 grams

Model 065-36 Full Fetal 36 weeks
17 cm X 31 cm X 20 cm 9800 grams

Model 066-20 Fetal Head 20 weeks
10 cm x 15 cm x 14 cm
2000 grams

Model 066-36 Fetal Head 36 weeks
16 cm x 16 cm x 16 cm
3200 grams

Note: Phantom does not contain internal organs or structures.

Doppler String Phantom

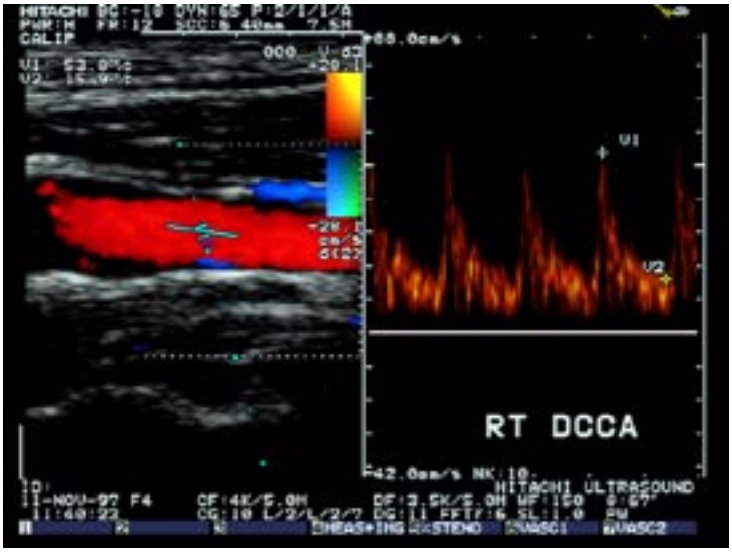
Accurately simulates 16 physiological and test waveforms

The CIRS Model 043 "Mark 4" Doppler Phantom is an essential tool for people who work with Doppler Ultrasound. The crystal controlled motor accurately generates sixteen pre-programmed waveforms using advanced string target technology. Since the speed is adjusted 1000 times every second, you know it's precise and repeatable.

The Model 043 can be set for use with water or velocity-corrected fluid. If you're using water, it adjusts the string speed accordingly so the different speed of sound in water won't affect your tests. And unlike fluid-flow phantoms, the target never changes; you know what your test results should be every time.

All CIRS Ultrasound phantoms, including the Model 043, are sold with an in-house certification, user's manual, ultrasound physics text book and a rugged carrying case. Additional options include a large tank with adjustable target angle, and custom programming of special waveforms.

Model 043



Typical Doppler image of carotid blood flow in human.

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Model 043 Specifications:

Digital Display:	Waveform readout, string speed, help statements and instructions, and computer host information.
Flow Simulation Speeds:	10 to 200 centimeters per second, bi-directional.
Speed Drift:	Crystal-locked to 20 parts per million (0.002%).
Accuracy:	+/- 1% of stated speed.
Pulsatile Waveforms:	16 pre-programmed and optional customer specified.
Waveforms Included:	Adult common carotid, stenotic carotid, femoral, aortic. Fetal middle cerebral artery, renal artery, umbilical artery. Pediatric descending thoracic artery, patent ductus arteriosus. Test waveforms: Sinewaves with peak speeds of 100, 150, and 200 cm/second. Triangle waves with peak speeds of 100, 150, and 200 cm/second. Stepped ramp wave with stops at 0, 20, 40, 60, 80, and 100 cm/sec.
Waveform Resolution:	Each waveform simulation contains 1000 points of resolution, or speed adjustments, enabling extremely complex simulation.
Computer Interface:	Industry standard RS-232 interface built-in for future enhancements and remote control. Very useful for automated quality control in a manufacturing environment.
Fluids Used in Tank:	Plain tap water (velocity 1480 meters per second at 20 degrees C) or velocity corrected water/glycol solution giving 1540 meters per second at 20 degrees C. Phantom adjusts itself for either fluid.
Physical Specifications:	120 Volts AC, 50 Watts. Total weight in travel case: 22 lbs. (10Kg). Travel case dimensions: 17" x 17" 10" (43 x 43 x 25 cm).
Tank dimensions:	10" x 12" x 9" deep (25 cm x 30 cm x 23 cm).

3D Anthropomorphic Skull Phantom

For Rapid Assessment of Image Displacement in Gamma Knife and Other Treatment Planning Systems

The CIRS skull phantom is made from materials which can be imaged using x-ray, CT and MR. The skull is manufactured from an epoxy based tissue substitute. The interstitial and surrounding soft tissues are made from a proprietary water based polymer. The gel can be formulated to accommodate specific requirements such as x-ray attenuation, contrast, and MR response. The entire phantom is encased in a vac- uum formed plastic shell for ease of use and durability.

Available options include:

- Wire or point targets in various locations
- Simulated tumors

Skull phantoms are made to order. Contact CIRS if you have a unique requirement.

Model 603

Features:

- Images well on T1, T2 and 3DT OF MRI acquisitions
- Images well on CT scans
- Stereotactic frame can be applied to special reinforced pads
- Images can be imported into stereotactic localization program
- CT scans can be used to assess MRI accuracy

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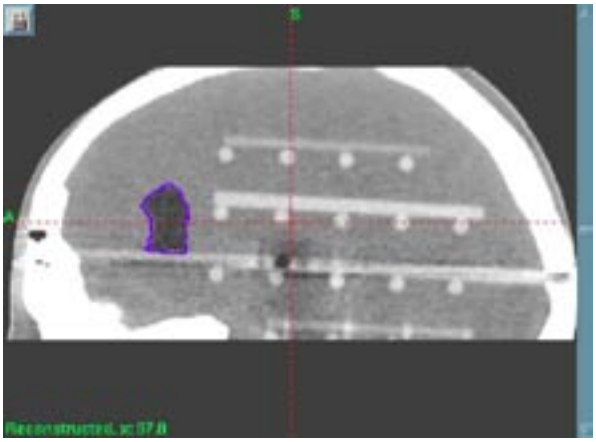
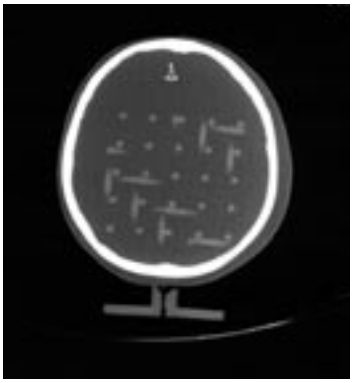
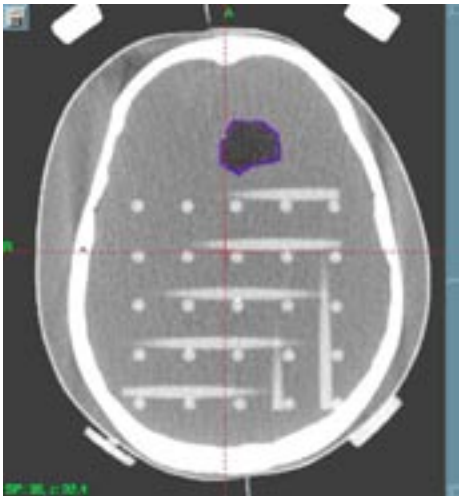
3D Skull Phantom Specifications:





- Three dimensional orthogonal acrylic rod matrix through cranial volume enables assessment of mage distortions



- Optional lesion also available

Interventional 3D Abdominal Phantom

Multi-modality (CT, MRI, US)

The Model 057 is an anthropomorphic abdominal phantom made from proprietary materials which accurately mimic human tissues under MRI, ultrasound and CT.

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 making it durable enough for extended scanning sessions yet enabling insertion of various surgical instruments as needed.

Model 057

Benefits:

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

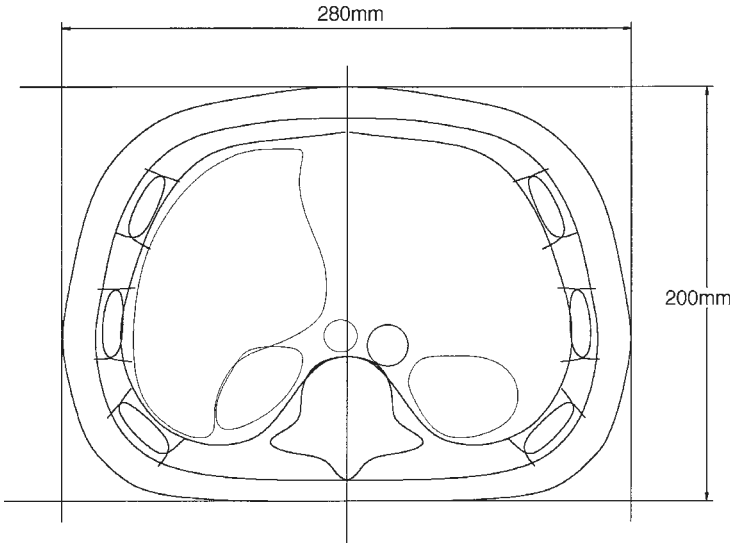
CIRS
Tissue Simulation Technology
2428 Almeda Avenue • Suite 212 • Norfolk, Virginia 23513 • USA
(800) 617-1177 • (757) 855-2765 • FAX (757) 857-0523
www.cirsinc.com • admin@cirsinc.com

Model 057 Specifications:

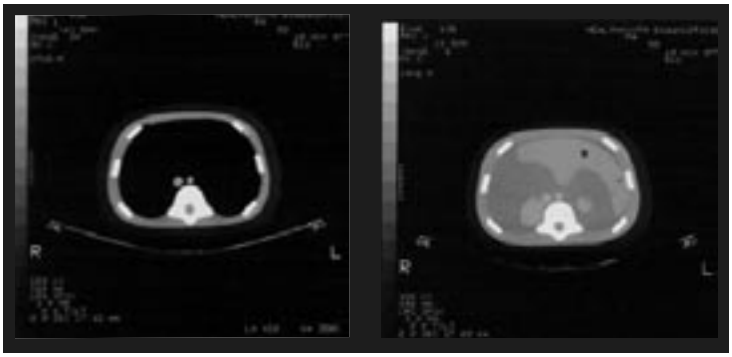
Length: 125mm
Width: 280mm
Height: 200mm
Weight: 5500grams

Materials: Zerdine®
Urethane
Epoxy
ABS

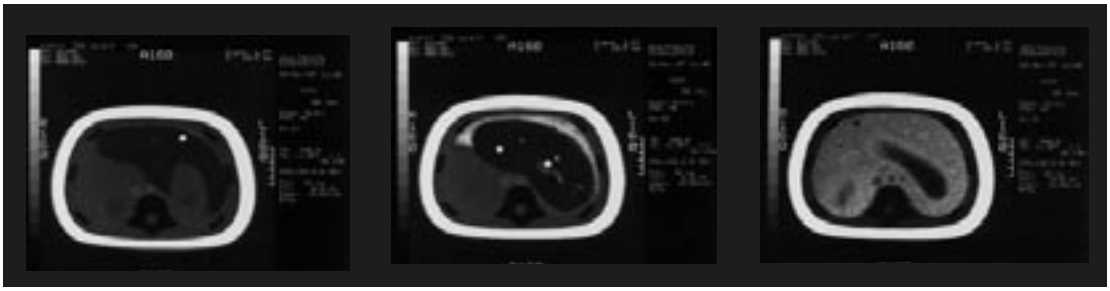
US PATENT#5196343



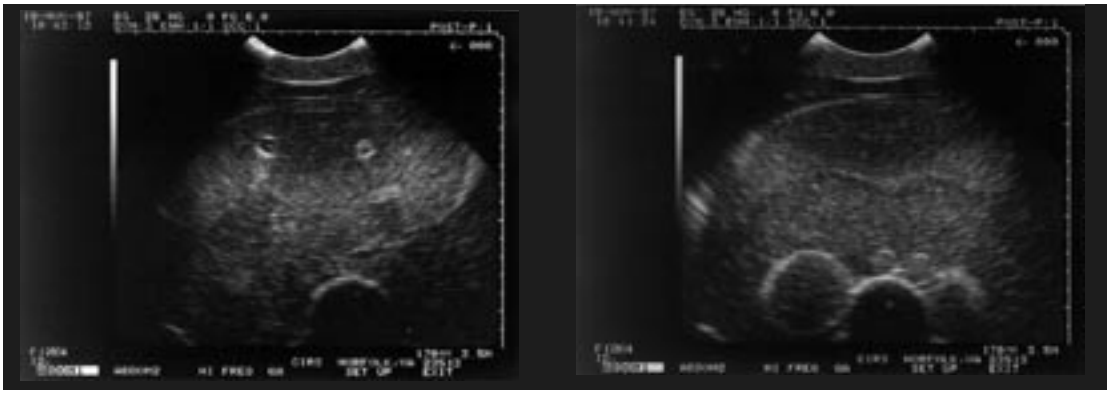
CT



MRI



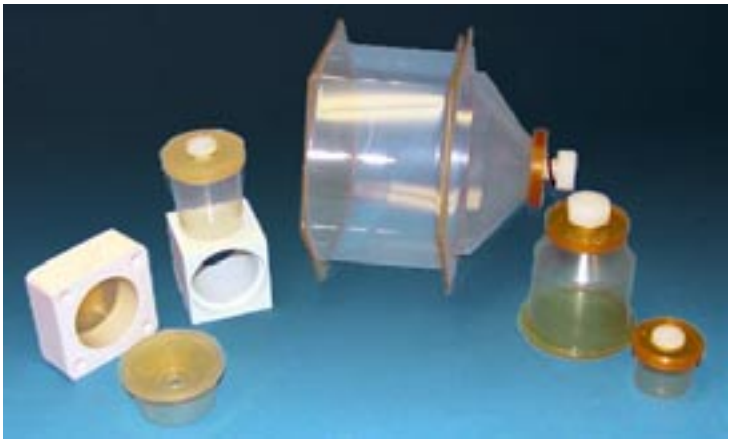
ULTRASOUND



Barex™ Gel Containers

Barex™ is a Copolymer Resin with specific oxygen barrier properties. Dosimetric Gel containers manufactured from Barex™ allow a wide range of scanning options in addition to permitting visual inspection of the irradiated gel.

Barex™ Containers may be scanned in CT, MRI, and optical scanners. Barex™ Containers are often used with Bang™ Gels.



Features:

- Thermoformed Containers for use with all Dosimetric Gel Media.
- Oxygen Resistant Barex™ is transparent to allow visual assessment of dose distributions.
- Custom shapes and sizes available to accommodate various phantoms. Send drawings/ dimensions for quotations.
- Supports accurate readings in various confirmation configurations.

NOTES:

(1) Wall thickness is less than 1 mm, with deeper Thermoforming draw being thinner.
(2) Refractive index of Barex™ approximates 1.5.
(3) Barex™ properties are available at www.barex.com

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Barex Specifications:

Container Model	Height (CM)	Diameter (CM)	Comments
B-1	4	4.2	Brain/Radiosurgery
B-2	17	18	IMRT Head Phantom for CT/MRI or Laser Scanners
B-3	22	18	Same as B-2 with special insert base for homogenity testing on CT scanners.
B-4 **B-4 Cassette**	3.5	5.6	Fits Sandstrom “Lucy” phantom
B-5	11	8	“Coffee cup” phantom
B-6 **B-6 Cassette**	7	5	CIRS Radiosurgery Head/IMRT Phantom compatible

Triple Modality Biopsy Training Phantom

Suspect lesions discovered in x-ray mammography must often be evaluated under ultrasound to aid diagnosis and in some cases, use of MRI may be indicated. This phantom is an ideal training device because it can be imaged under three modalities and was designed specifically for needle biopsy.

Each cystic mass may be aspirated once while each solid mass may be biopsied multiple times.

Model 051

Benefits:

- Compressible
- Physical density and attenuation characteristics accurately simulate that of an average 50% glandular breast (BR-12 equivalent) under x-ray, ultrasound, and MRI
- Phantom's flesh-like consistency simulates needle resistance found in human tissue
- Anthropomorphic shape is suitable for compression mammography or ultrasound examinations

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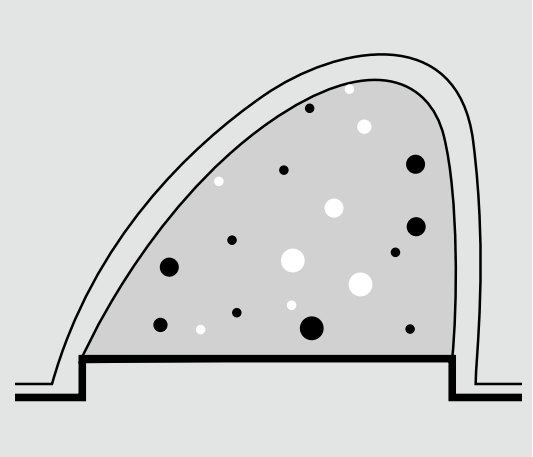
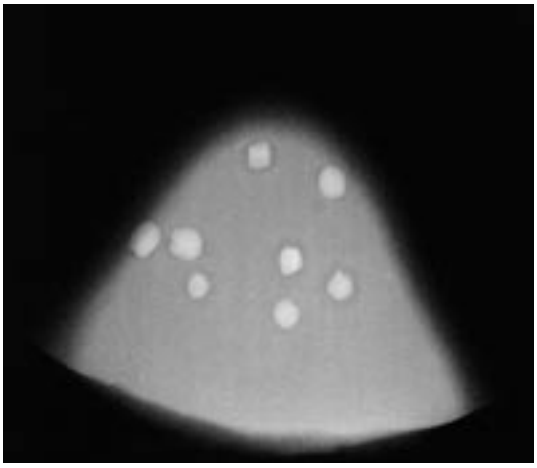
Model 051 Specifications:

SIZE:	500 cc
LENGTH:	12 cm
WIDTH:	10 cm
HEIGHT:	9 cm
MATERIAL:	Zerdine®

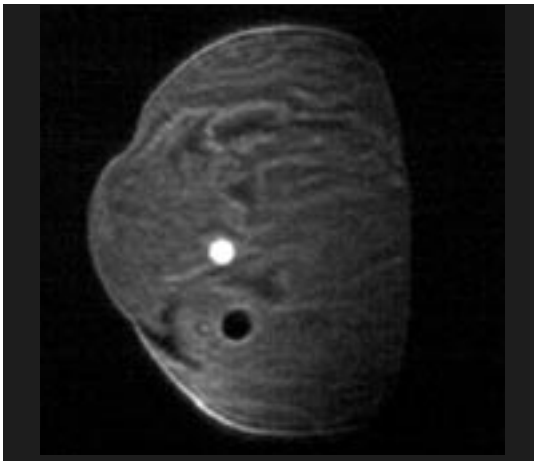
Dense masses
2 to 8 mm in diameter for core biopsy.

Cystic Masses
3 to 10 mm in diameter for needle aspiration.

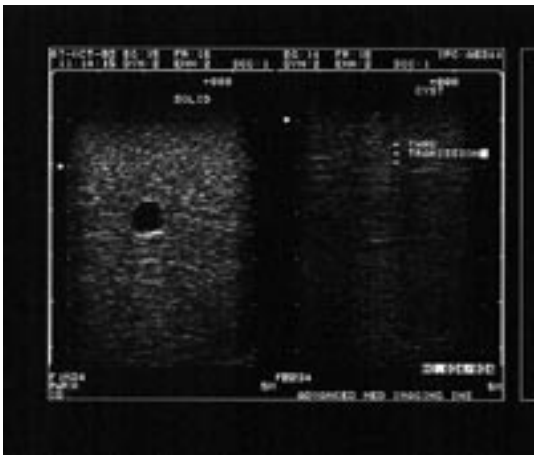




X-ray mammography



MRI



Ultrasound