

Plastic Water®

Model 74-6 Series



Radiation Oncology



Plastic Water is a unique, solid phantom material that will change the way you perform high-energy calibration in both electron and photon radiation oncology. With Plastic Water, you'll achieve the results you want without spending extra time, effort or money. Why? Because Plastic Water is virtually identical to water in dosimetric properties, but easier to use.

With plastic water, you'll be able to calibrate photon and electron beams within 0.5% of true water dose, and do it quickly, easily and cost-effectively.

High-energy calibration in radiation oncology doesn't have to be difficult, time-consuming or costly. With Plastic Water, you'll never be bothered with cumbersome water tanks or charge storage problems again.



- Agrees with true water within 0.5% \pm 0.04% above 7 MeV
- Won't break or crack, even under impact
- Provides the closest dosimetry characteristics to natural water, over the entire oncology energy range
- Allows for easy and accurate calibration and energy checks
- Needs no correction factors, making it fast, easy and convenient to use
- Is available in a wide range of thicknesses, starting as low as 0.1 cm, to meet all of your calibration needs
- Is compatible with a variety of chambers, making it the most versatile solid phantom material available. (Custom cavities are available to accommodate any ion chamber on the market; simply provide detailed drawings when ordering)

Specifications

Material Epoxy

Thickness tolerances ± 0.01 cm

Density 1.02 gm/cc

Individual slab thicknesses, model numbers, and sizes

Thickness (cm)	20 x 20 cm Model	25 x 25 cm Model	30 x 30 cm Model	40 x 40 cm Model
0.1	74-600-2020	74-600-2525	74-600	74-600-4040
0.2	74-601-2020	74-601-2525	74-601	74-601-4040
0.5	74-602-2020	74-602-2525	74-602	74-602-4040
1.0	74-603-2020	74-603-2525	74-603	74-603-4040
2.0	74-604-2020	74-604-2525	74-604	74-604-4040
3.0	74-605-2020	74-605-2525	74-605	74-605-4040
4.0	74-606-2020	74-606-2525	74-606	74-606-4040
5.0	74-609-2020	74-609-2525	74-609	74-609-4040
6.0	74-610-2020	74-610-2525	74-610	74-610-4040
7.0	74-611-2020	74-611-2525	74-611	74-611-4040

Plastic water can be drilled to accommodate the following chambers

Model	Description
30-751, 30-752, 30-753	Wellhöfer Farmer-type Ionization Chambers
30-716, 30-744	Wellhöfer Thimble Ionization Chambers
30-749, 30-750, 30-728	Wellhöfer Roos-type Parallel Plate Ionization Chamber
2507	Nuclear Enterprises (NE) Chamber
2507/3A	Nuclear Enterprises (NE) 0.6 cm ³ Farmer Chamber with 0.25-2 mV cap
2505, 2571	Nuclear Enterprises (NE) 0.6 cm ³ Farmer Chamber without buildup cap
2581	Nuclear Enterprises (NE) 0.6 cm ³ Robust Ion Chamber
30-316, 30-317	PTW 0.3 cm ³ Ion Chamber (beam plotting)
30-349	PTW Transit Chamber
30-351, 30-352	PTW 0.6 cm ³ Farmer-type Chamber without buildup cap
30-329	PTW Markus Electron Beam Chamber
550-6	Victoreen Orthovoltage Diagnostic Chamber
580-006-WP	Victoreen 0.6 cm ³ Farmer-type Chamber without buildup cap
PR-05	Capintec Wide Range Diagnostic Chamber
PR-06C	Capintec Farmer Replacement Chamber
PR-06G	Capintec Farmer-type Chamber with fully-guarded stem
Exradin	T1 Chamber

Specifications *(continued)*

Plastic Water pre-drilled for standard cylindrical chambers, others on request

Model	Description
74-608	2.0 x 30 x 30 cm
74-608-2020	2.0 x 20 x 20 cm
74-608-2525	2.0 x 25 x 25 cm
74-608-4040	2.0 x 40 x 40 cm
74-608-3290	Drilled for 30-329 PTW Markus Electron Beam Checker
74-608-3510	Drilled for 30-351 PTW 0.6 cm ³ Farmer-type Chamber with cap
74-619	Any cavity drilled in plastic water
74-619-1000	Plug for any cavity drilled in plastic water
<i>(Please provide specifications when ordering)</i>	

Film dosimetry cassettes

Model	Description
74-607	Plastic Water Film Cassette, 8 x 10 inch
74-607-1012	Plastic Water Film Cassette, 10 x 12 inch

Plastic Water Sets

Plastic Water Set #1

(Model 74-613)

- 5.5 MeV electron calibrations, and higher
- 30 x 30 cm
- Weight of set: 10 lb (4.5 kg)

Qty.	Thickness (cm)	Qty.	Thickness (cm)
1	0.1	1	0.5
2	0.2	1	1.0
		1*	2.0
* Drilled for chamber			

Plastic Water Set #2

(Model 74-614)

- 5.5 MeV electron and photon calibration, and higher
- 30 x 30 cm
- Weight of set: 40.3 lb (18.3 kg)

Qty.	Thickness (cm)	Qty.	Thickness (cm)
1	0.1	2	2.0
2	0.2	1	2.0
1	0.5	1	4.0
1	1.0	1	6.0

Plastic Water Set #3

(Model 74-615)

- 5.5 MeV electron and photon calibrations, and photon beam energy checks
- 30 x 30 cm
- Weight of set: 47 lb (21.4 kg)

Qty.	Thickness (cm)	Qty.	Thickness (cm)
1	0.1	2	2.0
2	0.2	1	4.0
1	0.5	1	3.0
1	1.0	1	6.0
1*	2.0		
* Drilled for chamber			

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

Specifications are subject to change without notice.

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74-6-ds rev 1 25 mar 03

SCRAD Calibration Phantom Kits

Model 74-379-3888 & 74-379-3999

- In polystyrene or acrylic
- All sections are 25 cm²

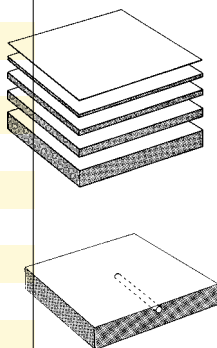
These phantom sections provide an easy means of assembling your own calibration phantom. They are available in a wide range of thicknesses to suit a variety of application needs. Available in polystyrene or acrylic.



Phantom sections

Section Thickness	Polystyrene Model	Acrylic Model
0.5 mm	74-389	---
0.03 in (0.79 mm)	74-380	74-390
0.06 in (1.58 mm)	74-381	74-391
0.13 in (3.17 mm)	74-382	74-392
0.25 in (6.35 mm)	74-383	74-393
0.50 in (12.7 mm)	74-384	74-394
1 in (25.4 mm)	74-385	74-395
2 in (50.8 mm)	74-386	74-396
1 in (25.4 mm)	74-388†	74-398†

† Ion chamber section has opening to accept chamber, center axis of hole is exactly 10 mm from the nearest surface. Specify model number of chamber.



Polystyrene SCRAD Calibration Phantom Kit

Model 74-379-3888

(Drilled for 0.6 cm³ Ion Chamber Model 30-351)

Qty.	Description	Model
1	0.03 in (0.79 mm)	74-380
1	0.06 in (1.58 mm)	74-381
1	0.13 in (3.17 mm)	74-382
1	0.25 in (6.35 mm)	74-383
1	0.50 in (12.7 mm)	74-384
7	1 in (25.4 mm)	74-385
1	1 in (25.4 mm)	74-388

Weight of set 34.5 lb (15.7 kg)

Options

Model	Description
74-318	Additional cavity for chamber
74-387	Therapy Dosimetry Film Cassette, for electron and photon beam film dosimetry, 8 (w) x 10 (l) x 0.56 in (d)
74-387-1012	Therapy Dosimetry Film Cassette, for electron and photon beam film dosimetry, 10 (w) x 12 (l) x 0.56 in (d)

Acrylic SCRAD Calibration Phantom Kit

Model 74-379-3999

(Drilled for 0.6 cm³ Ion Chamber Model 30-351)

Qty.	Description	Model
1	0.03 in (0.79 mm)	74-390
1	0.06 in (1.58 mm)	74-391
1	0.13 in (3.17 mm)	74-392
1	0.25 in (6.35 mm)	74-393
1	0.50 in (12.7 mm)	74-394
7	1 in (25.4 mm)	74-395
1	1 in (25.4 mm)	74-398

Weight of set 34.5 lb (15.7 kg)

Options

Model	Description
74-319	Additional cavity for chamber
74-397	Therapy Dosimetry Film Cassette, for electron and photon beam film dosimetry, 8 (w) x 10 (l) x 0.56 in (d)
74-397-1012	Therapy Dosimetry Film Cassette, for electron and photon beam film dosimetry, 10 (w) x 12 (l) x 0.56 in (d)

For additional information, please contact Cardinal Health, Radiation Management Services customer service at 440.248.9300, 800.850.4608, or fax: 440.349.2307; located at 6045 Cochran Road, Cleveland, Ohio 44139-3303, USA. Specifications are subject to change without notice.
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74-379-ds rev 1 11 mar 03

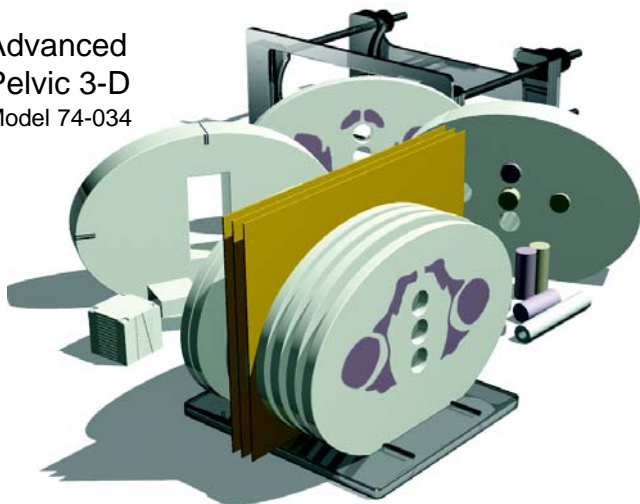
CIRS IMRT Phantoms

Nuclear Associates Models

74-007, 74-008, 74-034

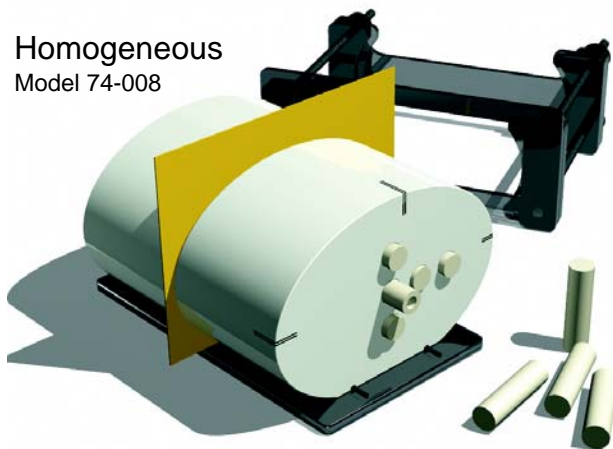


Advanced
Pelvic 3-D
Model 74-034

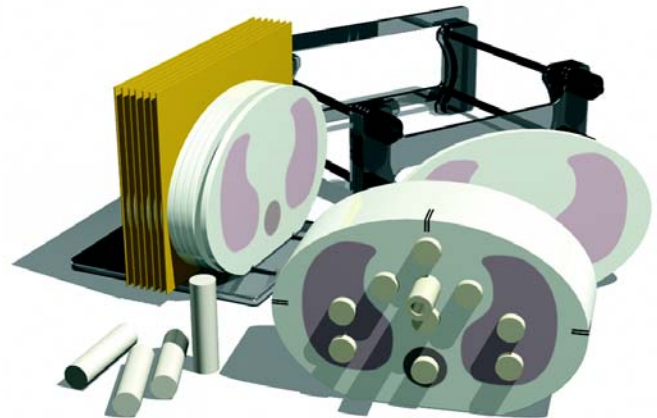


- Check 2-D dose distributions (3-D distributions optional)
- Point dose measurements in multiple planes
- Calibrate film with ion chamber
- Quickly verify individual patient treatment plans
- Correlate CTU to electron density

Homogeneous
Model 74-008



Thorax
Model 74-007



Complete QA from CT imaging to dose verification

Introduction

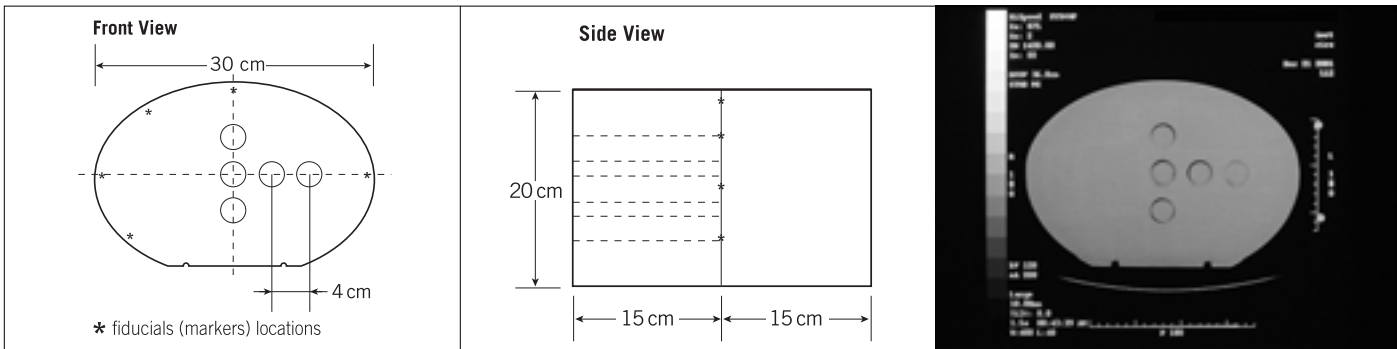
The IMRT (Intensity-Modulated Radiotherapy) Phantom for Film and Ion Chamber Dosimetry is designed to address the complex issues surrounding commissioning and comparison of treatment planning systems while providing a simple yet reliable method for verification of individual patient plans and delivery.

The phantoms are elliptical in shape. They properly represent human anatomy in size and proportion. The phantoms are manufactured from a unique proprietary material that faithfully mimics water within 1% from 50 keV to 25 MeV.

The phantoms also support 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.

The surfaces of the phantoms are etched for ease of laser alignment, and CT markers ensure accurate film to plan registration.

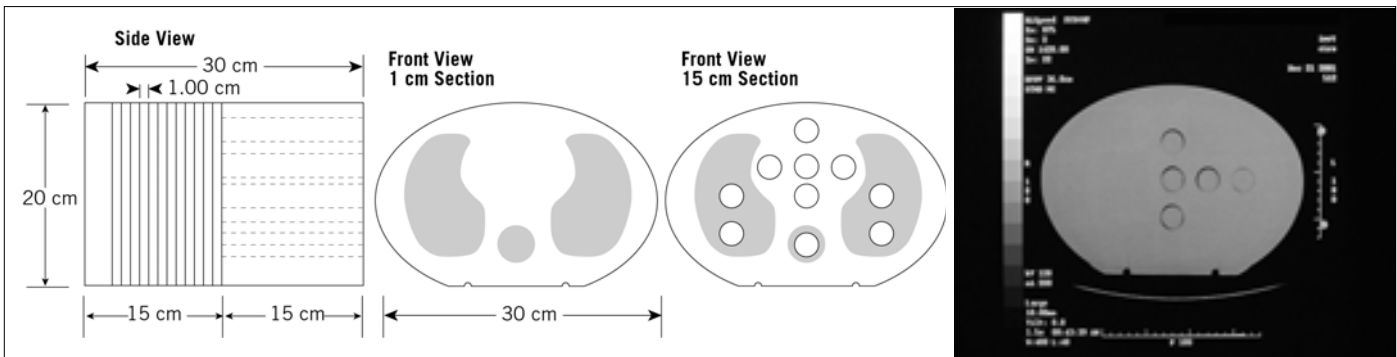
Specifications Homogeneous (Model 74-008)



Homogeneous includes

Qty	Model	Description	Qty	Model	Description
2		Tissue Equivalent Sections, one drilled to accommodate rod inserts, 15 cm thick	1	74-024	Water Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long
5	74-015	CT to Film Fiducial Markers	1	74-010	Alignment Device
5		Water Equivalent Rod Inserts, 15 cm long	1	74-016	Holding Device

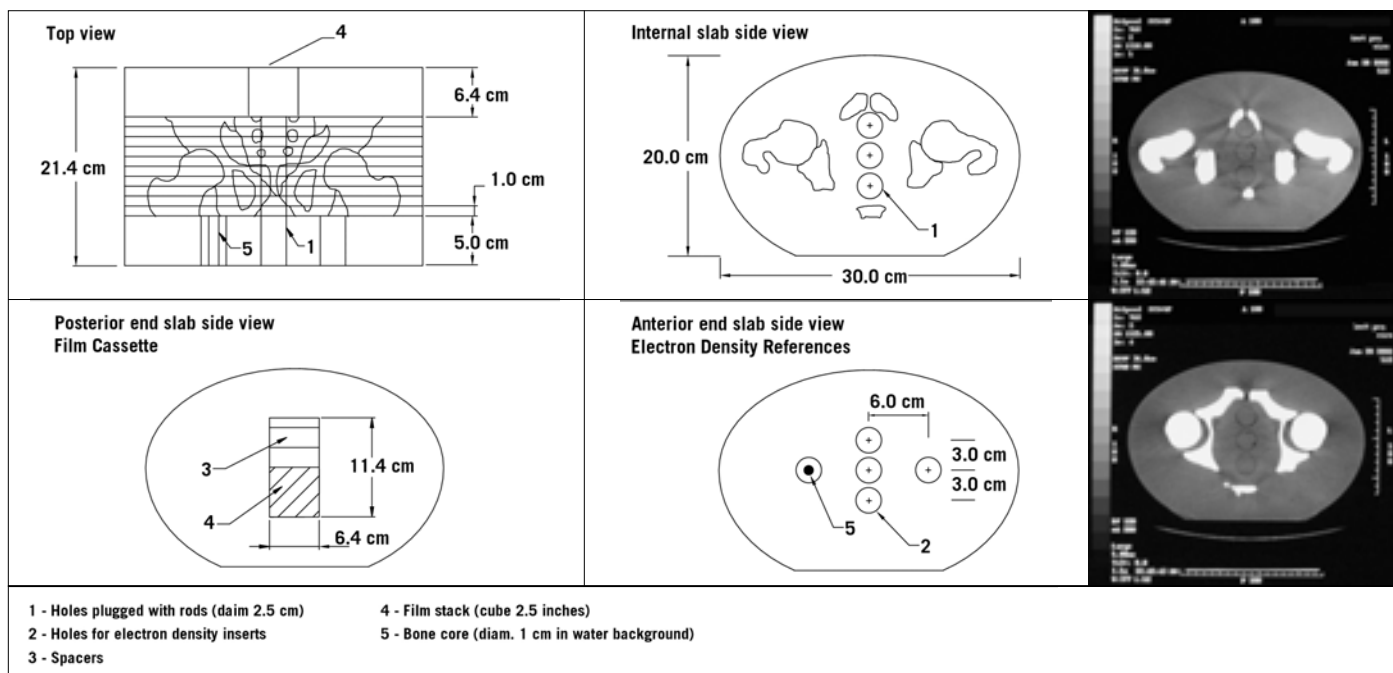
Specifications Thorax (Model 74-007)



Thorax includes

Qty	Model	Description	Qty	Model	Description
1		Thorax Region Section drilled to accommodate rod inserts, 15 cm thick	1	74-020	Bone Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long
12		Thorax Region Sections, 1 cm thick	1	74-022	Lung Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long
1		End Section, 3 cm thick	5		Water Equivalent Rod Inserts, 15 cm long
1	74-024	Water Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long	1		Bone Equivalent Rod Insert, 15 cm long
1	74-010	Alignment Device	4		Lung Equivalent Rod Inserts, 15 cm long
1	74-016	Holding Device			

Specifications Advanced Pelvic 3-D (Model 74-034)



Advanced Pelvic 3-D includes

Qty	Model	Description	Qty	Model	Description
1		Tissue Equivalent Electron Density Reference Section with interchangeable inserts, 5 cm thick	1	74-010	Alignment Device
10		Contiguous 3-D Pelvic Sections each drilled to accommodate rod inserts, 1 cm thick	1	74-016	Holding Device
1	74-017	Homogeneous Section that accommodates models 74-013 or 74-014 cassettes	5		Electron Density Reference Plugs (set of 5: lung, bone, muscle, adipose, water)
1	74-024	Water Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long	1		Section for Electron Density Reference plugs, 5 cm thick
5+		Water Equivalent Rod Inserts, 15 cm long			

Electron Density Reference Inserts for IMRT Phantoms: Models 74-008, 74-007, & 74-034

	Density	Electron density per cc x 10 ²³	Electron density relative to H ₂ O
H ₂ O	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

Specifications (continued)

Available model(s)

Model	Description
74-008	IMRT Phantom - Homogeneous
74-007	IMRT Phantom - Thorax
74-034	IMRT Phantom - Advanced Pelvic 3-D

Optional accessories

Model	Description
74-012	Single Breast Attachment
89-002	Foam Lined Carrying Case
74-015	CT to Film Fiducial Markers
74-028	Electron Density Reference Plugs (set of 4: lung, bone, muscle, adipose)
74-013	Film Stack for Small Volume 3-D Image Reconstruction
74-014	Gel Dosimetry Cassette
74-017	Homogeneous Section that accommodates Models 74-013 or 74-014 cassettes
74-018	Thorax Region Section that accommodates Models 74-013 or 74-014 cassettes
74-019	Pelvic Region Section that accommodates Models 74-013 or 74-014 cassettes
74-020	Bone Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long
74-022	Lung Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long
74-024	Water Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long
74-011	Water Equivalent Rod Inserts (5 cm) for TLD's (set of 5)
74-016	Holding Device
74-010	Alignment Device

Custom accessories are available for diodes, MOSFET, and other detectors. Contact Cardinal Health, Radiation Management Services customer service for more information.

Rod with ion chamber cavities

Rods with chamber cavities are included with each phantom. See specific phantom description for details. The rods are 1 inch in diameter and are 15 cm long. They are available in water, bone, or lung equivalent material. Should your chamber not be listed below, contact Syncor Radiation Management Customer Service for assistance.

When ordering, specify part number and cavity code.

Example: 74-024-501

Cavity code	Accommodates
501	0.6 cm ³ Farmer-type Chambers without buildup cap, PTW, Nuclear Enterprise (NE), Victoreen 580-006-WP
502	0.6 cm ³ Farmer-type chambers with buildup cap, PTW, Nuclear Enterprise (NE)
506	Capintec PR-06G with buildup cap
507	Capintec PR-06C without buildup cap
511A	Nuclear Enterprise (NE) 2533 without buildup cap
511B	PTW N31003 0.3 cm ³ without buildup cap
511C	PTW N31002 0.125 cm ³ without buildup cap
513	Exradin A-12
515	Exradin T-14 Microchamber
517	0.2 cm ³ Farmer-type Chamber without buildup cap
518	PTW 31006 without buildup cap
520	PTW 23331 without buildup cap
521	Wellhöfer IC3
522	Nuclear Enterprise (NE) 2611A without buildup cap
523	Victoreen 550-6A Ion Chamber with buildup cap (X-10)
524	Victoreen 550-6A Ion Chamber without buildup cap
525	Wellhöfer IC15 Ion Chamber without buildup cap
526	Capintec PR-06G without buildup cap
527	Wellhöfer IC70 with buildup cap
528	Exradin 14SL
531	Exradin 1SL
532	Wellhöfer CC13/IC10
533	Wellhöfer CC01

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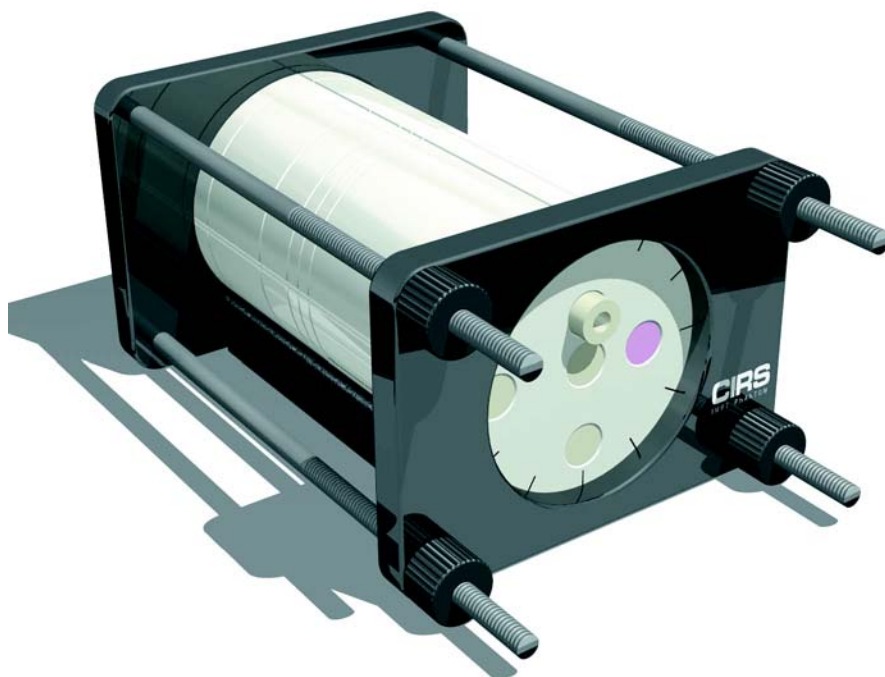
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74-007-ds rev 2 11 mar 03

CIRS IMRT Phantom Head and Neck Nuclear Associates Model 74-001



Radiation Oncology



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

Complete QA from CT imaging to dose verification

Introduction

The Model 74-001 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 phantom is circular in shape, approximates the size of an average patient, and is manufactured from unique proprietary materials that faithfully mimic bone and water within 1% from 50 keV to 25 MeV. This enables thorough analysis of both the treatment planning and delivery systems.

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.

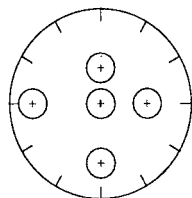
The Model 74-001 accommodates one Ready Pack™ 10 x 12 inch film in transverse orientation, two radiochromic or radiographic 10 x 10 cm films in transverse orientation and/or a stack of thirteen radiochromic films pre-cut to 63.5 x 63.5 mm* in three different orientations.

The Model 74-001 includes five different Electron Density reference plugs that 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.

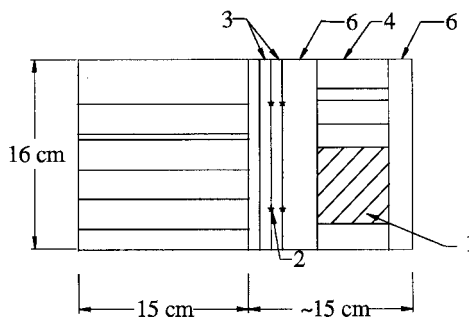
* GAFCHROMIC MD-22 Therapy Dosimetry Media (Model 37-041-2525), package of twenty 2.5 x 2.5 inch octagonal shaped sheets.

Specifications Head and Neck (Model 74-001)

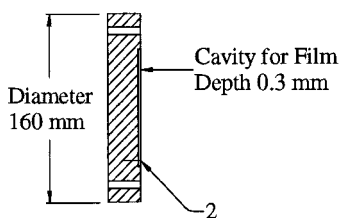
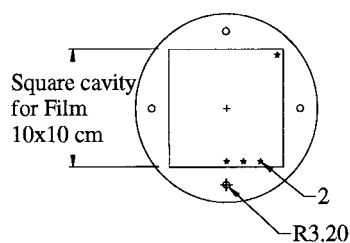
Phantom front view



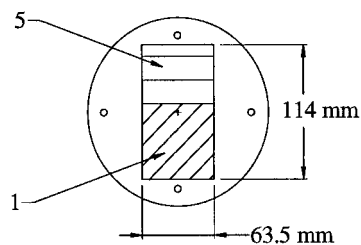
Phantom side view



Film dosimetry slab front view Side view



Cavity slab front view



- 1 - Film stack or gel cassette
- 2 - Fiducial markers
- 3 - Two 1 cm slabs for film dosimetry

- 4 - Cavity slab
- 5 - 1 and 2 cm spacers for film stack positioning
- 6 - 2 and 3 cm spacer slabs

Head and Neck includes

Qty	Model	Description	Qty	Model	Description
1		Water Equivalent Homogeneous Section drilled to accommodate rod inserts, 15 cm thick	1	74-020	Bone Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long
1		Cavity Slab to accommodate Film Stack or Gel Cassette, 6.4 cm	1	74-024	Water Equivalent Rod Insert with Ion Chamber Cavity, 15 cm long
2		Film Slabs, 1 cm, Film Cavity 10 x 10 cm	2		End Slabs
1	74-013	Film Stack for Small Volume 3-D Image Reconstruction	5		Water Equivalent Rod Inserts, 15 cm long
2	74-015	CT to Film Fiducial Markers in Film Slabs	1		Bone Equivalent Rod Insert, 15 cm long
2		Spacer Slabs, 1 cm	1	74-010	Alignment Device
1		Spacer Slab, s cm	1	74-016	Holding Device

Specifications (continued)

Available model(s)

Model	Description
74-001	IMRT Phantom - Head and Neck

Optional accessories

Model	Description
74-011	Water Equivalent Rod Inserts (5 cm) for TLD's (set of 5)
74-014	Gel Dosimetry Cassette
74-028	Electron Density Reference Plugs (set of 4: lung, bone, muscle, adipose)

Electron density reference inserts

	Density	Electron density per cc x 10 ²³	Electron density relative to H ₂ O
H ₂ O	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

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

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Rod with ion chamber cavities

Rods with chamber cavities are included with each phantom. See specific phantom description for details. The rods are 1 inch in diameter and are 15 cm long. They are available in water, bone, or lung equivalent material. Should your chamber not be listed below, contact Syncor Radiation Management Customer Service for assistance.

When ordering, specify part number and cavity code.

Example: 74-024-501

Cavity code	Accommodates
501	0.6 cm ³ Farmer-type Chambers without buildup cap, PTW, Nuclear Enterprise (NE), Victoreen 580-006-WP
502	0.6 cm ³ Farmer-type chambers with buildup cap, PTW, Nuclear Enterprise (NE)
506	Capintec PR-06G with buildup cap
507	Capintec PR-06C without buildup cap
511A	Nuclear Enterprise (NE) 2533 without buildup cap
511B	PTW N31003 0.3 cm ³ without buildup cap
511C	PTW N31002 0.125 cm ³ without buildup cap
513	Exradin A-12
515	Exradin T-14 Microchamber
517	0.2 cm ³ Farmer-type Chamber without buildup cap
518	PTW 31006 without buildup cap
520	PTW 23331 without buildup cap
521	Wellhöfer IC3
522	Nuclear Enterprise (NE) 2611A without buildup cap
523	Victoreen 550-6A Ion Chamber with buildup cap (X-10)
524	Victoreen 550-6A Ion Chamber without buildup cap
525	Wellhöfer IC15 Ion Chamber without buildup cap
526	Capintec PR-06G without buildup cap
527	Wellhöfer IC70 with buildup cap
528	Exradin 14SL
531	Exradin 1SL
532	Wellhöfer CC13/IC10
533	Wellhöfer CC01

CIRS Electron Density Phantom

Nuclear Associates Model 76-462

- 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 material accurately simulate indicated tissue within the diagnostic energy range
- Includes a rugged carrying case



Introduction

The Electron Density Phantom (Model 76-462) is used in CT (computed tomography) 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 Electron Density Phantom is designed to meet this requirement.

Specifications

	Physical density	Electron density per cc x 1023	Electron density relative to H ₂ O
Phantom body (water equivalent)	1.018	-----	-----
Inserts			
Water in syringe	1.000	3.340	1.000
Lung (inhale)	0.217	0.709	0.212
Lung (exhale)	0.508	1.673	0.500
Breast (50/50)	0.99	3.267	0.977
Dense bone, 800 mg/cc HA	1.575	4.894	1.464
Trabecular bone, 200 mg/cc HA	1.159	3.725	1.115
Liver	1.0709	3.514	1.052
Muscle	1.061	3.480	1.041
Adipose	0.967	3.180	0.951

Material Epoxy resin

Weight 15 lb (6.8 kg)

Available model(s)

76-462 Electron Density Phantom

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

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76-462-ds rev 1 11 mar 03

CT Simulation Phantom

Nuclear Associates Model 76-417



Radiation Oncology

Introduction

A CT simulator consists of a dedicated, fast CT scanner (often a spiral scanner), a virtual simulator (a set of computer software), and a laser marking device to mark the center of target volume. Therefore, methods of designing and implementing quality control procedures must include quality control on each segment of the process. Accuracy of table movements and lasers should also be checked to be within 1 millimeter accuracy. Quality control of a virtual simulator is a very complex issue and difficult to verify, due to the nature of software quality. Since geometrical planning is the core of CT simulation, periodic quality control is essential for maintaining optimum image quality and patient care. Hence, the quality control of a virtual simulator consists of testing every segment of the software for possible flaws. A detailed description of such a process can be found in "A Practical Guide to CT Simulation."^{1,2} The basic features which must be checked are reconstruction registration error (RRE), and geometrical accuracy in gantry, collimator and table simulations. The test should also include imaging parameters such as low contrast resolution and high contrast detectability of a DRR.



The CT Simulation Phantom tests all quality control parameters that can affect patient treatment, including RRE, magnification, image quality, and more

Applications

Digitally reconstructed radiographs produced from a commercial CT simulator have been evaluated using this phantom which consists of a 15 cm high-density polystyrene cubic block. Polystyrene was chosen due to the similarities in electron and physical densities between it and water, while its dimensions were chosen as a compromise between the need to design a compact and portable phantom and the desire to represent a typical anatomical scan volume. In this instance, the anatomical volume most representative of the phantom can be considered as the head, the neck and the brain.

The phantom contains four test patterns engraved into three of its six faces. The four patterns are designed to measure low and high contrast resolution, modulation transfer function, ray line divergence accuracy, and spatial linearity of the digitally reconstructed radiograph.

Various 3-D treatment planning systems can also generate DRR. Hence, the quality control of DRR generation needs to be addressed. This versatile phantom provides essential quality control tools for geometrical 3-D treatment planning systems and imaging tools for CT-simulation as well, which are capable of generating DRR for portal design.

Specifications

Material Acrylic

Dimensions 5.906 x 5.906 in (15 x 15 cm)

Weight 9.24 lb (4.19 kg)

Available model(s)

76-417 CT Simulation Phantom

References

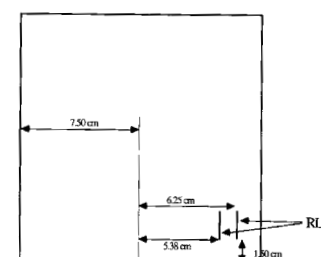
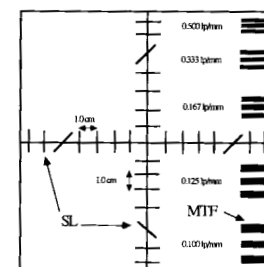
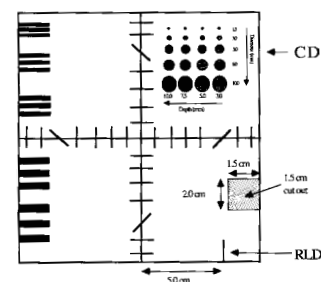
1. K.P., McGee, I.J. Das, "Commissioning Acceptance Testing and Quality Assurance of a CT Simulator," in *A Practical Guide to CT Simulation*, L.R. Coia, T.E. Schultheiss, and G.E. Hanks, eds. (Madison, WI: Advanced Medical Publishing, 1995), 39-50.
2. K.P., McGee, I.J. Das, C. Sims, "Evaluation of Digitally Reconstructed Radiographs (DRRs) Used for Clinical Radiotherapy: A Phantom Study," *Medical Physics*, 22 (1995), 1815-1827. **Request Reprint No. 638B.**

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

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- For quality control of CT simulators and treatment planning systems capable of generating digitally reconstructed radiographs
- Designed for use with spiral CT scanners and may be used with conventional scanners
- Simplifies quality control for the radiology physicist and radiation oncology physicist
- Verifies the accuracy of the digitally reconstructed radiograph (DRR) reconstruction for 3-D treatment planning systems



Schematic representation of the phantom developed to evaluate DRRs: (a) Top face of the DRR phantom showing the contrast-detail, MTF, ray line divergence (RLD), and spatial linearity (SL) test patterns. (b) Side face of the phantom showing the MTF and SL test pattern. (c) shows the third face of the phantom containing the RLD pattern. The two lines represent the rods embedded at distances of 5.38 and 6.25 cm from the central axis of the phantom

LUCY® 3-D Plus

Precision 3-D QA Phantom

Model 76-311

- Multi-tasking radiographic and dosimetric QA phantom specifically developed for radiation therapy, radiology, and stereotactic radiosurgery
- Verify imaging errors, compare localization measurements of different imaging modalities, including CT, angiography, portal imaging, and MRI
- Test image distortion and slice thickness
- Verify target volume calculations and CT / MRI fusion
- Verify accuracy of treatment planning software algorithms
- For hardware verification, linear accelerator gantry isocentricity, table positioning, laser alignment, and collimators
- Verify planned vs. delivered dose distribution using radiochromic film, ion chambers, MOSFETs, TLDS, and gel
- Adapts to any stereotactic frame to verify material or geometry effects
- A commissioning tool for hardware and software
- A useful teaching aid



LUCY 3-D Plus sphere shown on standard alignment base

Introduction

LUCY 3-D Plus is a spherical, acrylic phantom precision-machined to simulate a patient's head. It contains known markers and spatial relationships which are detectable by CT, angiography, and MRI imaging modalities, as well as various therapeutic equipment. The LUCY 3-D Plus Phantom was developed to simulate clinical situations, verify hardware and software components, and detect system errors.

Applications

LUCY supports all 3-D stereotactic radiotherapy and small field IMRT Systems, for localization and treatment verification using major commercially available treatment planning and delivery systems.

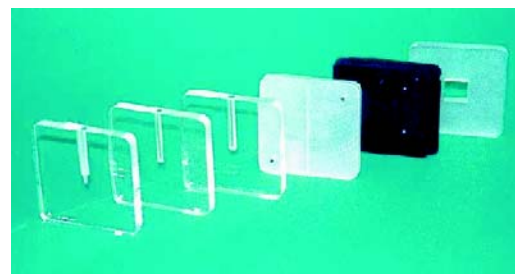
Use of the LUCY Phantom permits quantitative assessment and calibration of parameters described in established quality assurance protocols and the commissioning of new equipment and procedures, such as fusion and IMRT.



Detector in open LUCY sphere



Film cassette



Multiple detector cassettes

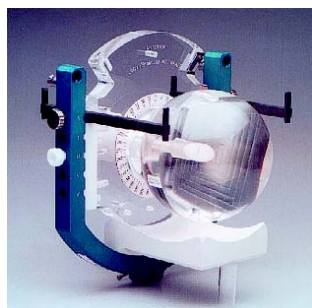
Specifications

- The LUCY phantom sphere is constructed of acrylic, a standard radiation calibration material recommended by the AAPM Task Group 21
- All screws and plugs are made of white plastic material
- A 360° rotation scale is located on the vertical support, around the sphere axis for sagittal or coronal mounting
- The LUCY sphere is 140 mm in diameter
- Upper Hemisphere Cavity: 81 x 81 x 35 mm, for insertion of an MRI signal generator or other 3-D volumes, e.g. stacked film or gel container
- Lower Hemisphere: has four cylindrical chambers 10 mm Ø x 25 mm deep, for placement of radiological markers
- A second cavity of 85 x 85 x 10 mm is located at the center of the sphere, for placement of accessories and cassettes. An accessory port of 8 mm in diameter allows for insertion of dosimetry sensors to the center of the sphere, in the transverse mount
- Weight: 11.8 lb (5.3 kg)

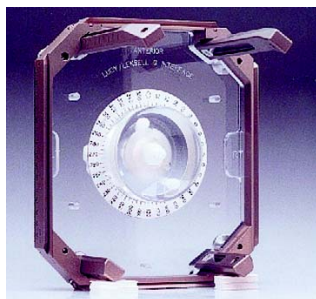
LUCY interfaced with stereotactic systems



LUCY/Brainlab Interface



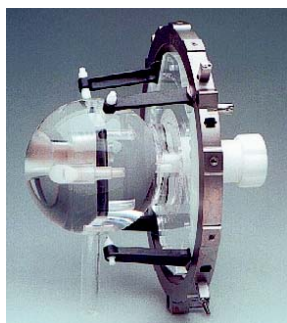
LUCY/Brainlab Interface Mask System



LUCY/Leksell Interface



LUCY/Leibinger Interface



LUCY/Radionics BRW Interface



LUCY/Sandstrom Interface

References

1. R. Ramani, M.G.Ketko, P.F. O'Brien, M.L. Schwartz, "A QA Phantom for Dynamic Stereotactic Radiosurgery: Quantitative Measurements," *Medical Physics*, 22 (8), (1995) 1343-1346.
2. R. Ramani, A.W. Lightstone, D.L.D. Mason, P.F. O'Brien, "The Use of Radiochromic Film in Treatment Verification of Dynamic Stereotactic Radiosurgery," *Medical Physics*, 21 (3), (1994) 389-392.

Available model(s)

Model	Description
76-311	LUCY 3-D Plus Precision 3-D QA Phantom, includes one phantom sphere and one tool kit set

Alignment bases, including MRI and stereotactic frame interfaces

Model	Description
76-311-4000	Standard Base and Clamp
76-311-4001	GE MRI Head Coil Base
76-311-4002	Stereoadapter® Frame Supports
76-311-4003	Load-Bearing Stereoadapter Base
76-311-4004	Brainlab Frame Interface
76-311-4005	Optional Brainlab Mask System Adapters
76-311-4006	Leksell/Gamma Knife Interface
76-311-4007	Leibinger Frame Interface
76-311-4008	Radionics BRW Frame Interface
76-311-4009	Optional Radionics GTC Frame Adapters
76-311-4010	Optional Radionics MRI Frame Adapters

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Radiological accessories

Model	Description
76-311-3006	CT Marker Cylinders, set of four
76-311-3007	Angiography Marker Cylinders, set of four
76-311-3008	MRI Marker Cylinders, set of four
76-311-3009	CT/Angio Grid Plate
76-311-3011	CT 3-Volume Chamber
76-311-3012	MRI 3-Volume Chamber
76-311-3013	Target/Treatment Verification Chamber
76-311-3021	3-D Volume Chamber with lid (supplied empty)
76-311-3022	MRI Signal Generator

Radiotherapy / dosimetry accessories

Model	Description
76-311-3013	Target/Treatment Verification Chamber
76-311-3014	Radiation/Optics Alignment Pointer
76-311-3030	PTW Cassette for Pin Point 0.015 cm ³ (Model TN31006)
76-311-3031	IBA-Scanditronix Cassette for Chamber (Model DEB050)
76-311-3032	Exradin Cassette for chamber (Model IC-A1SL-1)
76-311-3033	IBA-Wellhofer Cassette for chamber (Model CC01) (10 mm)
76-311-3040	Radiochromic Stacked Film Assembly (85 x 85 x 10 mm) 4 x 2.25 mm Dividers suitable for 3 x 3 inch film
76-311-3041	Radiochromic Stacked Film Assembly (85 x 85 x 10 mm) 4 x 2.25 mm Dividers suitable for 2.5 x 2.5 inch film
76-311-3042	Radiochromic Stacked Film Assembly (81 x 81 x 35 mm) 14 x 2.25 mm Dividers suitable for 2.5 x 2.5 inch film
76-311-3045	MOSFET Array Cassette suitable for TLD's
76-311-3051	B-4 Cassette for Polymer Gel Container (81 x 81 x 35 mm)
76-311-3052	B-4 Polymer Gel Container - disposable

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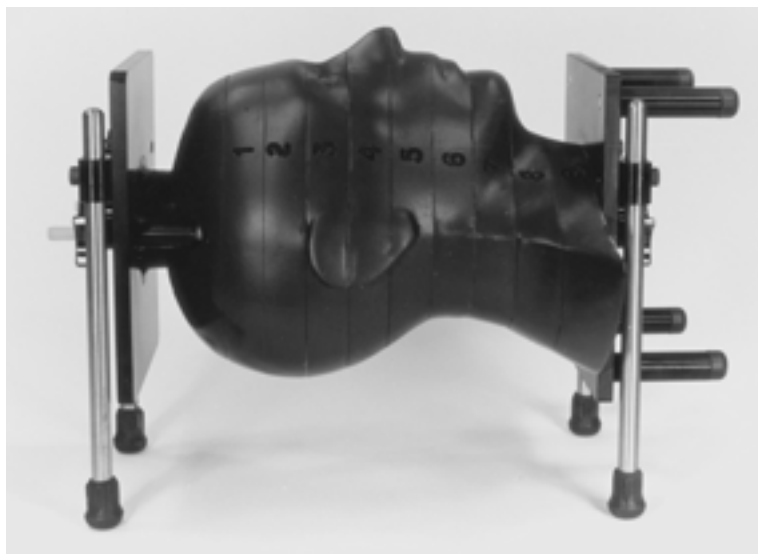
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ART Phantoms

Models 75-1 & 75-2 Series

- The worldwide standard for quality assurance for radiation therapy
- Approximately 2,000 are in use worldwide
- Designed within highly sophisticated technological constraints and follow ICRU Report No. 44 standards



Introduction

The Alderson Therapy Phantom (ART) has been in use for more than 30 years. These phantoms are indispensable quality assurance tools...approximately 2,000 are in use worldwide. ART Phantoms provide integrated tests of the entire chain of treatment planning and delivery of radiation dose.

ART Phantoms are molded of tissue-equivalent material; they are designed within highly sophisticated technological constraints and follow ICRU Report No. 44 standards. They are also designed for accuracy and ease of use.

Anatomy

The Male ART Phantom represents a 175 cm (5 ft 9 in) tall, 73.5 kg (162 lb) male, and the Female ART Phantom represents a 155 cm (5 ft 1 in) tall, 50 kg (110 lb) female.

The ART Phantom is transected horizontally Each slice has holes which are plugged with bone-equivalent, soft-tissue-equivalent and lung-tissue-equivalent pins which can be replaced by TLD holders.

Dosimetry holes These holes are drilled in grids 3 x 3 cm or 1.5 x 1.5 cm in 5, 6, and 7 mm diameters. These afford detailed measurements of dose distributions.

Soft-tissue-equivalent coatings These coatings give each slice a 2.5 thickness with glass-smooth interfaces. Also, they are cut away over the air spaces of the oronasal pharynxes, trachea and stem bronchi.

Breasts are available in various sizes They can be drilled in the AP direction for TLD dosimetry or sliced in frontal planes (drilled or un-drilled) for film dosimetry. Breasts of Male and Female ART Phantoms are contoured to blend realistically to the sides of the thorax. Breasts are mounted with nylon screws. The male chest, with breasts attached, serves as a large female.

Materials

Soft Tissue Soft-tissue composition, a variable in every radiation therapy plan, can never be realistically standardized among patients, yet is consistent in the ART Phantom. ART soft-tissue material is matched to soft-tissue in mass density and attenuation characteristics.

Skeletons These highly-detailed polymer skeletons reproduce the shape, mass density and attenuation coefficients of cortical bone and spongiosa. They allow continuous production of phantoms instead of sporadic production required by limited availability, variable size and uncertain chemical composition of human skeletons.

Molds for cortical bone and spongiosa were made from selected human skeletons consistent with the size of soft-tissue molds. This eliminates the need to vary the lengths of human bones and their spacing, which must be done so that variable human skeletons can be fitted into sized molds.

The skeletons used in ART Phantoms conform closely to the ICRU Report No. 44 standards, but density is reduced slightly to take into account a small decline in calcium content. By contrast, natural human skeletons have unknown calcium loss approaching osteoporosis in some cases, and they may be contaminated by bleaches or other chemical agents are used in their preparation.

Lungs Lungs are molded from syntactic foam, with a mass density of 0.30 g/cc.

Assembly

The ART Phantom's slices are held between aluminum plates by nylon tie-rods. Knobs at the ends of the rods clamp the slices tightly, evenly and in proper alignment. Plates can accommodate both internal and external rods and can hold any number of slices.

Nylon rods for internal assembly pass through registration holes, maintaining alignment of the slices.

Both internal and external assembly devices are included. The external assembly facilitates film dosimetry, while the internal assembly is generally used with TLDs or ion-chamber dosimetry.

The aluminum plates are larger than the slices, allowing the rods to remain external to the larger phantom contours. Although these rods can assemble the entire phantom, usually smaller assemblies (head and neck, thorax, and pelvis) are used.

Female ART Phantoms

Female ART Phantom (Sections 0 - 32) without hole grid

Includes internal and external assembly systems and storage case

Model 75-110-2000

Female ART Phantom (Sections 0 - 32) with 3 x 3 cm hole grid spacings

Includes lung and tissue-equivalent plugs, internal and external assembly systems, and storage case. Available in:

Model 75-110-2050 5 mm hole Ø

Model 75-110-2060 6 mm hole Ø

Model 75-110-2070 7 mm hole Ø

Female ART Phantom (Sections 0 - 32) with 1.5 x 1.5 cm hole grid spacings

Includes lung and tissue-equivalent plugs, internal and external assembly systems, and storage case. Available in:

Model 75-110-2250 5 mm hole Ø

Model 75-110-2260 6 mm hole Ø

Model 75-110-2270 7 mm hole Ø

Female ART Phantom, Head and Neck (Sections 0 - 9) without hole grid

Includes internal and external assembly systems

Model 75-112-2000

Female ART Phantom, Head and Neck (Sections 0 - 9) with 3 x 3 cm hole grid spacings

Includes tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-112-2050 5 mm hole Ø

Model 75-112-2060 6 mm hole Ø

Model 75-112-2070 7 mm hole Ø

Female ART Phantom, Head and Neck (Sections 0 - 9) with 1.5 x 1.5 cm hole grid spacings

Includes tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-112-2250 5 mm hole Ø

Model 75-112-2260 6 mm hole Ø

Model 75-112-2270 7 mm hole Ø

Female ART Phantom, Chest (Sections 10 - 23) without hole grid

Includes internal and external assembly systems

Model 75-113-2000

Female ART Phantom, Chest (Sections 10 - 23) with 3 x 3 cm hole grid spacings

Includes lung and tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-113-2050 5 mm hole Ø

Model 75-113-2060 6 mm hole Ø

Model 75-113-2070 7 mm hole Ø

Female ART Phantom, Chest (Sections 10 - 23) with 1.5 x 1.5 cm hole grid spacings

Includes lung and tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-113-2250 5 mm hole Ø

Model 75-113-2260 6 mm hole Ø

Model 75-113-2270 7 mm hole Ø

Female ART Phantom, Pelvis (Sections 24 - 32) without hole grid

Includes internal and external assembly system

Model 75-114-2000

Female ART Phantom, Pelvis (Sections 24 - 32) with 3 x 3 cm hole grid spacings

Includes tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-114-2050 5 mm hole Ø

Model 75-114-2060 6 mm hole Ø

Model 75-114-2070 7 mm hole Ø

Female ART Phantom, Pelvis (Sections 24 - 32) with 1.5 x 1.5 cm hole grid spacings

Includes tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-114-2250 5 mm hole Ø

Model 75-114-2260 6 mm hole Ø

Model 75-114-2270 7 mm hole Ø

Female Breast Attachment with 3 x 2.5 cm hole grid spacings

Sold as single units. Available in:

Model 75-140-2105 200 ml, 5 mm hole Ø

Model 75-140-2106 200 ml, 6 mm hole Ø

Model 75-140-2107 200 ml, 7 mm hole Ø

Model 75-140-2205 300 ml, 5 mm hole Ø

Model 75-140-2206 300 ml, 6 mm hole Ø

Model 75-140-2207 300 ml, 7 mm hole Ø

Model 75-140-2305 400 ml, 5 mm hole Ø

Model 75-140-2306 400 ml, 6 mm hole Ø

Model 75-140-2307 400 ml, 7 mm hole Ø

Model 75-140-2405 500 ml, 5 mm hole Ø

Model 75-140-2406 500 ml, 6 mm hole Ø

Model 75-140-2407 500 ml, 7 mm hole Ø

Model 75-140-2505 600 ml, 5 mm hole Ø

Model 75-140-2506 600 ml, 6 mm hole Ø

Model 75-140-2507 600 ml, 7 mm hole Ø

Female Breast Attachment with 1.5 x 2.5 cm hole grid spacings

Sold as single units. Available in:

Model 75-140-2125 200 ml, 5 mm hole Ø

Model 75-140-2126 200 ml, 6 mm hole Ø

Model 75-140-2127 200 ml, 7 mm hole Ø

Model 75-140-2225 300 ml, 5 mm hole Ø

Model 75-140-2226 300 ml, 6 mm hole Ø

Model 75-140-2227 300 ml, 7 mm hole Ø

Model 75-140-2325 400 ml, 5 mm hole Ø

Model 75-140-2326 400 ml, 6 mm hole Ø

Model 75-140-2327 400 ml, 7 mm hole Ø

Model 75-140-2425 500 ml, 5 mm hole Ø

Model 75-140-2426 500 ml, 6 mm hole Ø

Model 75-140-2427 500 ml, 7 mm hole Ø

Model 75-140-2525 600 ml, 5 mm hole Ø

Model 75-140-2526 600 ml, 6 mm hole Ø

Model 75-140-2527 600 ml, 7 mm hole Ø



Male ART Phantoms

Male ART Phantom (Sections 0 - 35) without hole grid Includes internal and external assembly systems and storage case

Model 75-100-2000

Male ART Phantom (Sections 0 - 35) with 3 x 3 cm hole grid spacings Includes lung and tissue-equivalent plugs, internal and external assembly systems, and storage case. Available in:

Model 75-100-2050 5 mm hole Ø

Model 75-100-2060 6 mm hole Ø

Model 75-100-2070 7 mm hole Ø

Male ART Phantom (Sections 0 - 35) with 1.5 x 1.5 cm hole grid spacings Includes lung and tissue-equivalent plugs, internal and external assembly systems, and storage case. Available in:

Model 75-100-2250 5 mm hole Ø

Model 75-100-2260 6 mm hole Ø

Model 75-100-2270 7 mm hole Ø

Male ART Phantom, Head and Neck (Sections 0 - 9) without hole grid Includes internal and external assembly systems

Model 75-102-2000

Male ART Phantom, Head and Neck (Sections 0 - 9) with 3 x 3 cm hole grid spacings Includes tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-102-2050 5 mm hole Ø

Model 75-102-2060 6 mm hole Ø

Model 75-102-2070 7 mm hole Ø

Male ART Phantom, Head and Neck (Sections 0 - 9) with 1.5 x 1.5 cm hole grid spacings Includes tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-102-2250 5 mm hole Ø

Model 75-102-2260 6 mm hole Ø

Model 75-102-2270 7 mm hole Ø

Male ART Phantom, Chest (Sections 10 - 25) without hole grid Includes internal and external assembly systems

Model 75-103-2000

Male ART Phantom, Chest (Sections 10 - 25) with 3 x 3 cm hole grid spacings Includes lung and tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-103-2050 5 mm hole Ø

Model 75-103-2060 6 mm hole Ø

Model 75-103-2070 7 mm hole Ø

Male ART Phantom, Chest (Sections 10 - 25) with 1.5 x 1.5 cm hole grid spacings Includes lung and tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-103-2250 5 mm hole Ø

Model 75-103-2260 6 mm hole Ø

Model 75-103-2270 7 mm hole Ø

Male ART Phantom, Pelvis (Sections 26 - 35) without hole grid Includes internal and external assembly system

Model 75-104-2000

Male ART Phantom, Pelvis (Sections 26 - 35) with 3 x 3 cm hole grid spacings Includes tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-104-2050 5 mm hole Ø

Model 75-104-2060 6 mm hole Ø

Model 75-104-2070 7 mm hole Ø

Male ART Phantom, Pelvis (Sections 26 - 35) with 1.5 x 1.5 cm hole grid spacings

Includes tissue-equivalent plugs, and internal and external assembly systems. Available in:

Model 75-104-2250 5 mm hole Ø

Model 75-104-2260 6 mm hole Ø

Model 75-104-2270 7 mm hole Ø

Male Breast Attachment with 3 x 2.5 cm hole grid spacings

Sold as single units. Available in:

Model 75-140-1105 250 ml, 5 mm hole Ø

Model 75-140-1106 250 ml, 6 mm hole Ø

Model 75-140-1107 250 ml, 7 mm hole Ø

Model 75-140-1205 500 ml, 5 mm hole Ø

Model 75-140-1206 500 ml, 6 mm hole Ø

Model 75-140-1207 500 ml, 7 mm hole Ø

Model 75-140-1305 750 ml, 5 mm hole Ø

Model 75-140-1306 750 ml, 6 mm hole Ø

Model 75-140-1307 750 ml, 7 mm hole Ø

Model 75-140-1405 1000 ml, 5 mm hole Ø

Model 75-140-1406 1000 ml, 6 mm hole Ø

Model 75-140-1407 1000 ml, 7 mm hole Ø

Model 75-140-1505 1250 ml, 5 mm hole Ø

Model 75-140-1506 1250 ml, 6 mm hole Ø

Model 75-140-1507 1250 ml, 7 mm hole Ø

Male Breast Attachment with 1.5 x 2.5 cm hole grid spacings

Sold as single units. Available in:

Model 75-140-1125 250 ml, 5 mm hole Ø

Model 75-140-1126 250 ml, 6 mm hole Ø

Model 75-140-1127 250 ml, 7 mm hole Ø

Model 75-140-1225 500 ml, 5 mm hole Ø

Model 75-140-1226 500 ml, 6 mm hole Ø

Model 75-140-1227 500 ml, 7 mm hole Ø

Model 75-140-1325 750 ml, 5 mm hole Ø

Model 75-140-1326 750 ml, 6 mm hole Ø

Model 75-140-1327 750 ml, 7 mm hole Ø

Model 75-140-1425 1000 ml, 5 mm hole Ø

Model 75-140-1426 1000 ml, 6 mm hole Ø

Model 75-140-1427 1000 ml, 7 mm hole Ø

Model 75-140-1525 1250 ml, 5 mm hole Ø

Model 75-140-1526 1250 ml, 6 mm hole Ø

Model 75-140-1527 1250 ml, 7 mm hole Ø



Options for Male and Female ART Phantoms

Solid Pin 2.5 cm long, choice of material, package of 50. Available in:

Model 75-235-7000 Mixed, 5 mm hole Ø

Model 75-236-7000 Mixed, 6 mm hole Ø

Model 75-237-7000 Mixed, 7 mm hole Ø

Model 75-235-7001 Lung-Equivalent, 5 mm hole Ø

Model 75-236-7001 Lung-Equivalent, 6 mm hole Ø

Model 75-237-7001 Lung-Equivalent, 7 mm hole Ø

Model 75-235-7002 Tissue-Equivalent, 5 mm hole Ø

Model 75-236-7002 Tissue-Equivalent, 6 mm hole Ø

Model 75-237-7002 Tissue-Equivalent, 7 mm hole Ø

Rod Holder, 1 mm inside diameter 2.5 cm long, choice of material, package of 50. Available in:

Model 75-240-7100 Mixed, 5 mm hole Ø

Model 75-243-7100 Mixed, 6 mm hole Ø

Model 75-244-7100 Mixed, 7 mm hole Ø

Model 75-240-7101 Lung-Equivalent, 5 mm hole Ø

Model 75-243-7101 Lung-Equivalent, 6 mm hole Ø

Model 75-244-7101 Lung-Equivalent, 7 mm hole Ø

Model 75-240-7102 Tissue-Equivalent, 5 mm hole Ø

Model 75-243-7102 Tissue-Equivalent, 6 mm hole Ø

Model 75-244-7102 Tissue-Equivalent, 7 mm hole Ø

Rod Holder, 2 mm inside diameter 2.5 cm long, choice of material, package of 50. Available in:

Model 75-240-7200 Mixed, 5 mm hole Ø

Model 75-243-7200 Mixed, 6 mm hole Ø

Model 75-244-7200 Mixed, 7 mm hole Ø

Model 75-240-7201 Lung-Equivalent, 5 mm hole Ø

Model 75-243-7201 Lung-Equivalent, 6 mm hole Ø

Model 75-244-7201 Lung-Equivalent, 7 mm hole Ø

Model 75-240-7202 Tissue-Equivalent, 5 mm hole Ø

Model 75-243-7202 Tissue-Equivalent, 6 mm hole Ø

Model 75-244-7202 Tissue-Equivalent, 7 mm hole Ø

Chip Holder 0.32 cm² x 0.08 cm Cross-Section Depth, 2.5 cm long, choice of material, package of 50. Available in:

Model 75-242-7000 Mixed, 5 mm hole Ø

Model 75-246-7000 Mixed, 6 mm hole Ø

Model 75-247-7000 Mixed, 7 mm hole Ø

Model 75-242-7001 Lung-Equivalent, 5 mm hole Ø

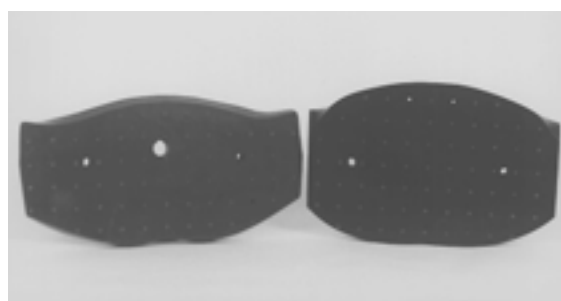
Model 75-246-7001 Lung-Equivalent, 6 mm hole Ø

Model 75-247-7001 Lung-Equivalent, 7 mm hole Ø

Model 75-242-7002 Tissue-Equivalent, 5 mm hole Ø

Model 75-246-7002 Tissue-Equivalent, 6 mm hole Ø

Model 75-247-7002 Tissue-Equivalent, 7 mm hole Ø



Sectional hole grid

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

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