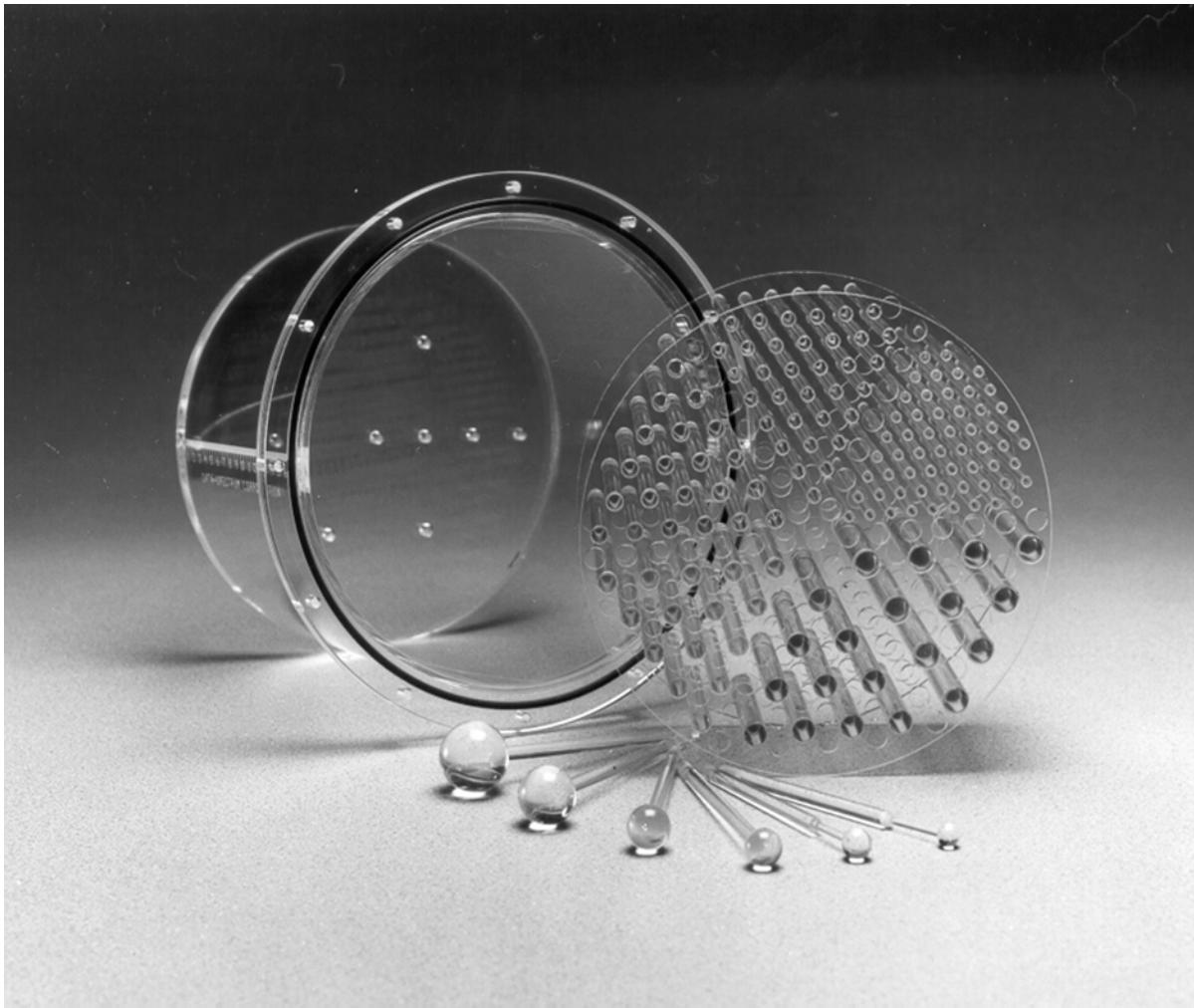


Data Spectrum Corporation



Emission Computed Tomography (ECT) Phantoms
Year 2001 Product Catalogue

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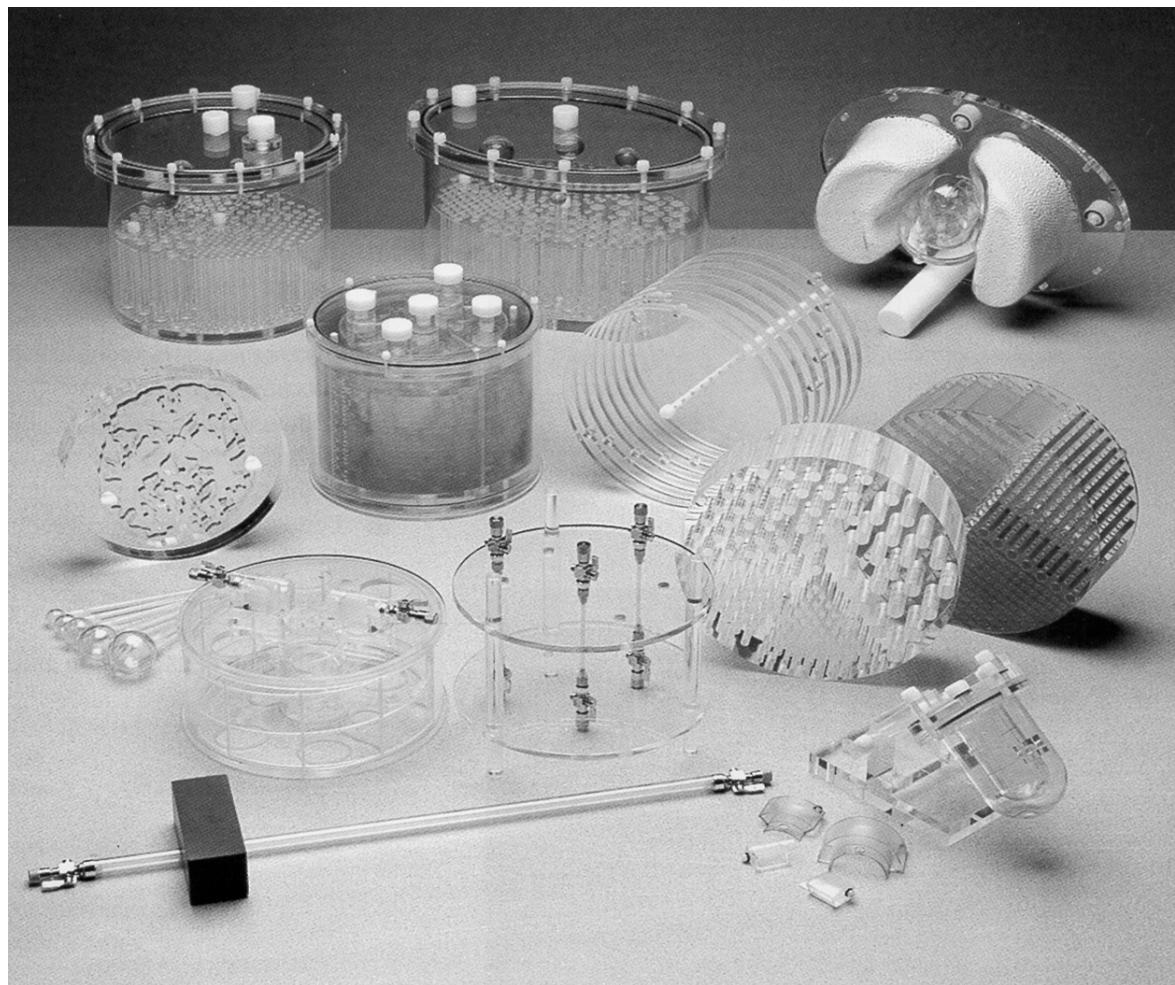
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High Quality MRI Phantoms	37
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*New Products

Specifications listed in brochure are subject to change without notice.
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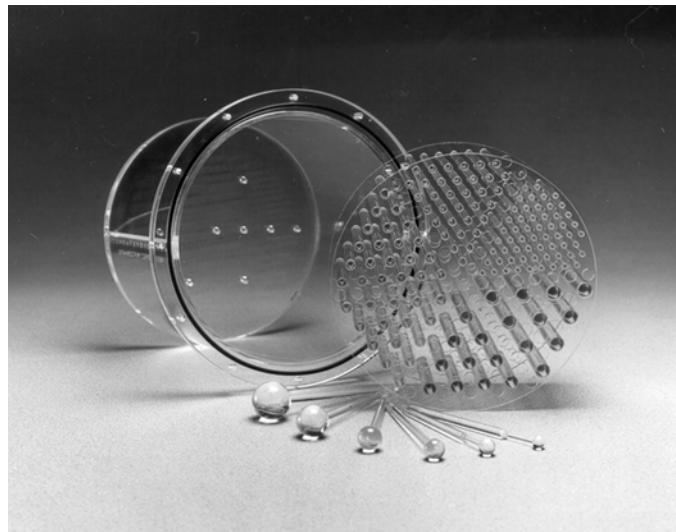
ECT Phantoms



SPECT / PET

- Quality Assurance
- Acceptance Testing
- Research Studies

Flanged Phantoms



Components of Deluxe ECT Phantom™



Components of Deluxe ECT Phantom™

Flanged ECT Phantom

(See page 3 for available models)

Main Features:

- ECT phantoms with protruding flanged top and with 3.2 mm cylinder wall thickness

Main Applications:

- For use with SPECT and PET systems
- System performance evaluation (collimator, artifacts, calibration, reconstruction parameters)
- Acceptance testing
- Routine quality, assurance and control
- Evaluation of center-of-rotation error
- Evaluation of non-uniformity artifact
- Evaluation of changes of radius-of-rotation on spatial resolution
- Evaluation of reconstruction filters on spatial resolution
- Evaluation of attenuation and scatter compensation
- Research

Specifications of Cylinder:

Cylinder inside diameter: 21.6 cm

Cylinder inside height: 18.6 cm

Cylinder wall thickness: 3.2 mm

Volume of empty cylinder: ~ 5.68 liter

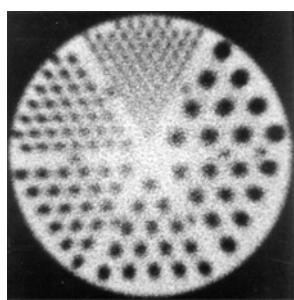
Specifications of Insert:

Rod diameters: Vary with insert, see page 3

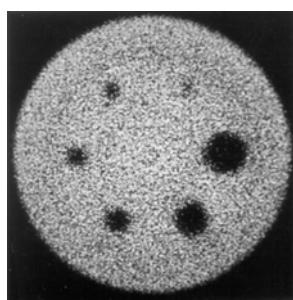
Height of rods: 8.8 cm

Solid sphere diameters: Vary with insert, see page 3

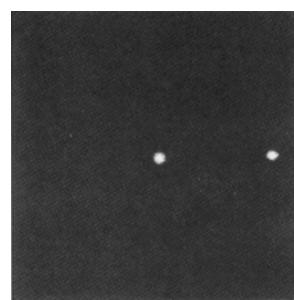
Height of center of spheres from base plate: 12.7 cm



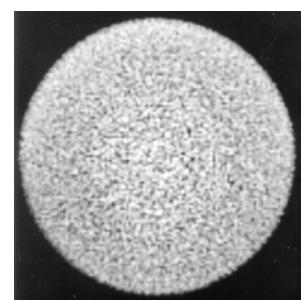
Cold Rods



Cold Spheres



Line Sources



Uniform

(The images were obtained with the Deluxe Phantom™ Model ECT/DLX/P)

- ❖ Glass capillary tubes (user supplied) with 12 cm length may be positioned without removing top cover plate as a result of a unique design of filter caps, one on axis, one 8.6 cm from axis-of-rotation

Flanged ECT Phantom Models

Ultra Deluxe Phantom™

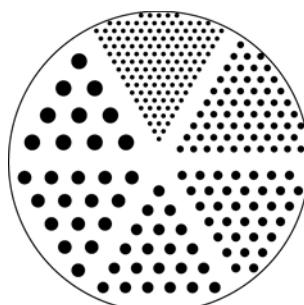
Model ECT/U-DLX/P

- For use with ultra-high spatial resolution SPECT and PET systems.

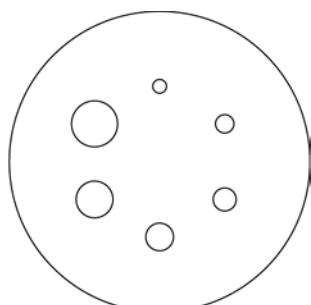
Specifications:

Rod diameters: 3.2, 4.8, 6.4, 7.9, 9.5 and 11.1 mm
Solid sphere diameters: 9.5, 12.7, 15.9, 19.1, 25.4, and 31.8 mm

Cold Rods



Cold Spheres



Ultra Deluxe

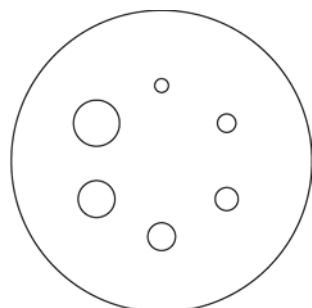
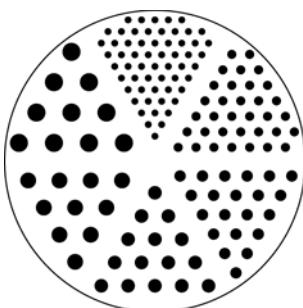
Deluxe Phantom™

Model ECT/DLX/P

- For use with high to very high spatial resolution SPECT and PET systems.

Specifications:

Rod diameters: 4.8, 6.4, 7.9, 9.5, 11.1 and 12.7 mm
Solid sphere diameters: 9.5, 12.7, 15.9, 19.1, 25.4, and 31.8 mm



Deluxe

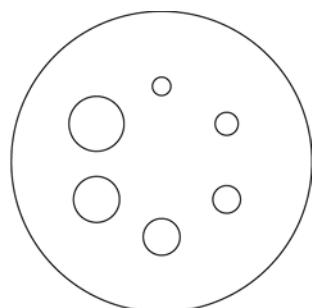
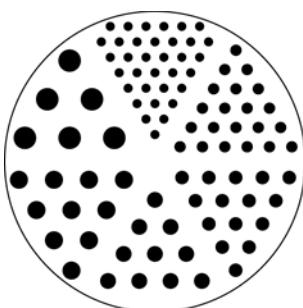
Standard Phantom™

Model ECT/STD/P

- For use with medium to high spatial resolution SPECT and PET systems.

Specifications:

Rod diameters: 6.4, 7.9, 9.5, 11.1, 12.7 and 16.0 mm
Solid sphere diameters: 12.7, 15.9, 19.1, 25.4, 31.8, and 38 mm



Standard

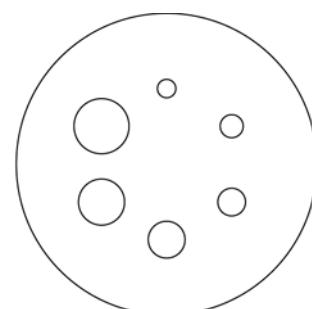
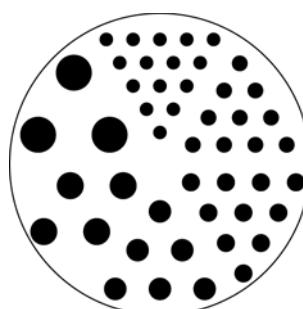
Benchmark Phantom™

Model ECT/BEN/P

- For use with ECT systems with poorer spatial resolution, larger radius-of-rotation, low cut-off reconstruction filters and count densities mimicking clinical scans.

Specifications:

Rod diameters: 9.5, 11.1, 12.7, 15.9, 19.1 and 25.4 mm
Solid sphere diameters: 12.7, 15.9, 19.1, 25.4, 31.8 and 38 mm



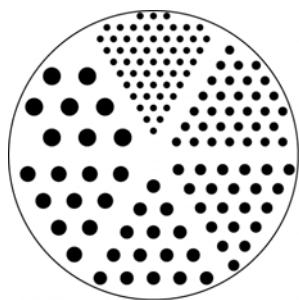
Benchmark

Flangeless Deluxe ECT Phantom™



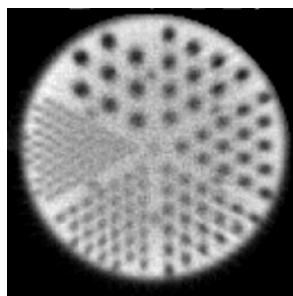
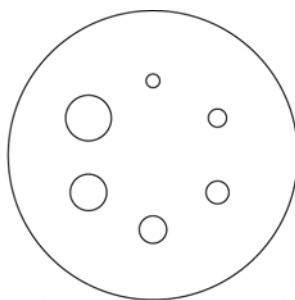
Flangeless Deluxe ECT Phantom™

Cold Rods

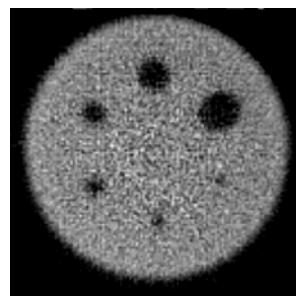


Flangeless Deluxe

Cold Spheres



Cold Rods



Cold Spheres

Flangeless Deluxe ECT Phantom™

Model ECT/FL-DLX/P

Main Features:

- Deluxe ECT phantom without protruding flange

Main Applications:

- For use with high spatial resolution SPECT and PET systems
- System performance evaluation (collimator, artifacts, calibration, reconstruction parameters)
- Acceptance testing
- Routine quality assurance and control
- Evaluation of center-of-rotation error
- Evaluation of non-uniformity artifact
- Evaluation of changes of radius-of-rotation on spatial resolution
- Evaluation of reconstruction filters on spatial resolution
- Evaluation of attenuation and scatter compensation
- Research
- ACR recommended phantom

Specifications of Cylinder:

Cylinder inside diameter: 20.4 cm

Cylinder inside height: 18.6 cm

Cylinder wall thickness: 6.4 mm

Volume of empty cylinder: ~ 5.72 liter

Specifications of Cylinder:

Rod diameters: 4.8, 6.4, 7.9, 9.5, 11.1 and 12.7 mm

Height of rods: 8.8 cm

Solid sphere diameters: 9.5, 12.7, 15.9, 19.1, 25.4 and 31.8 mm

Height of center of spheres from base plate: 12.7 cm

The images were obtained with the Flangeless Deluxe Phantom™

Elliptical ECT Phantom™

Elliptical ECT Phantom™

Model ECT/ELP/P

Main Features:

- Deluxe ECT phantom with elliptical body shape

Main Applications:

- For use with *high spatial resolution* SPECT and PET systems
- Evaluation of data acquisition using non-circular orbit
- System performance evaluation over larger field-of-view (collimator, artifacts, calibration reconstruction parameters)
- Study of the effects of regional variation in intrinsic system response using uniform portion of the elliptical cylinder
- Evaluation of the accuracy of body contour and attenuation compensation algorithms
- Study of spatial resolution variation within the field-of-view using portion of insert containing variable sized rods
- Evaluation of lesion detectability using portion of inserts containing multi-sized spheres
- Study of the effects of finite spatial resolution & Compton scatter on image quality
- Acceptance testing
- Routine quality, assurance and control
- Research

Specifications:

Rod diameters: 6.4, 7.9, 9.5, 11.1, 12.7 and 16.0 mm

Height of rods: 8.8 cm

Solid sphere diameters: 12.7, 15.9, 19.1, 25.4, 31.8 and 38 mm

Height of center of spheres from base plate: 12.7 cm

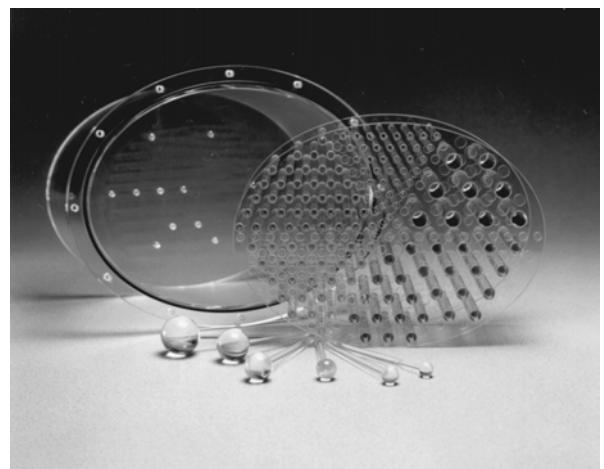
Cylinder inside diameter along major axis: 30.5 cm

Cylinder inside diameter along minor axis: 22.1 cm

Cylinder inside height: 18.6 cm

Cylinder wall thickness: 6.4 mm

Volume of empty cylinder: ~ 9.5 liter

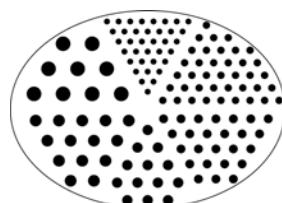


Components of Elliptical ECT Phantom™

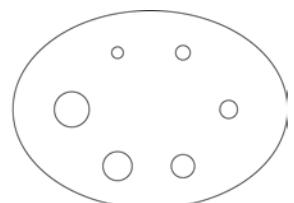


Elliptical ECT Phantom™

Cold Rods

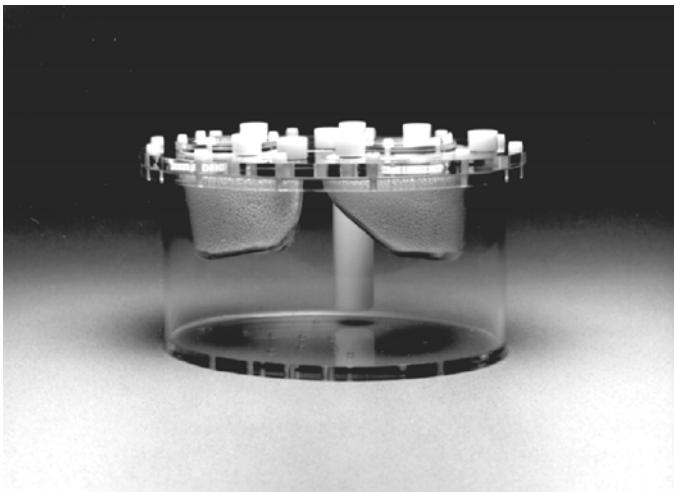


Cold Spheres

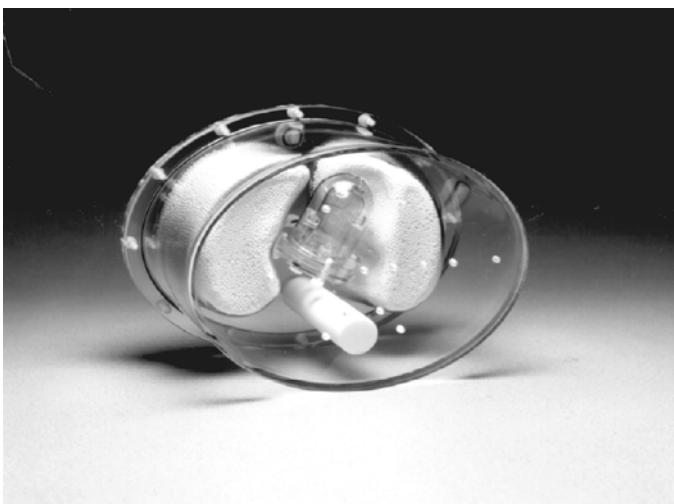


Elliptical

Elliptical Lung-Spine Body Phantom™



Elliptical Lung-Spine Body Phantom™



Shown with optional Cardiac Insert™

Elliptical Lung-Spine Body Phantom™

Model ECT/LUNG/P

Main Features:

- Includes spine and fillable lung inserts
- Lung inserts can be filled with Styrofoam® beads and water to simulate lung tissue density
- Optional Cardiac Insert™ (Model ECT/CAR/I) may be purchased separately
- Simulates anatomical structures and radioactivity distributions in upper torso of human
- Optional body contour rings may be purchased separately. When used with the body contour rings, the upper torso of a small (~ 30 x 22 cm) patient is simulated
- Optional Fillable Spine Insert available, see page 29

Main Applications:

- Evaluation of acquisition and reconstruction methods for cardiac and lung ECT studies
- Evaluation of non-uniform attenuation and scatter compensation methods
- Research

Specifications:

Cylinder inside diameter: 21.6 cm

Cylinder inside diameter along major axis: 30.5 cm

Cylinder inside diameter along minor axis: 22.1 cm

Cylinder inside height: 18.6 cm

Cylinder wall thickness: 6.4 mm

Volume of empty cylinder: ~ 9.5 liter

Volumes:

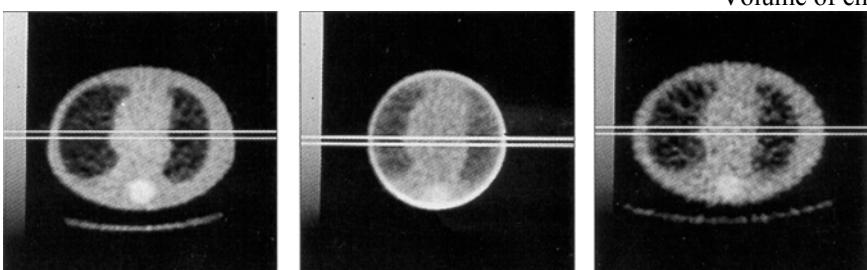
Empty cylinder: ~ 9.4 liter
Left lung (w/o Styrofoam® beads): ~ 0.9 liter

Right lung (w/o Styrofoam® beads): ~ 1.1 liter
Left lung (w/ Styrofoam® beads): ~ 0.36 liter

Right lung (w/ Styrofoam® beads): ~ 0.44 liter

Volume of cylinder with Lungs: ~ 7.4 liter

Transmission CT



Fan Beam ($f_L=110$)cm

Fan Beam ($f_L=63$)cm

Parallel Beam

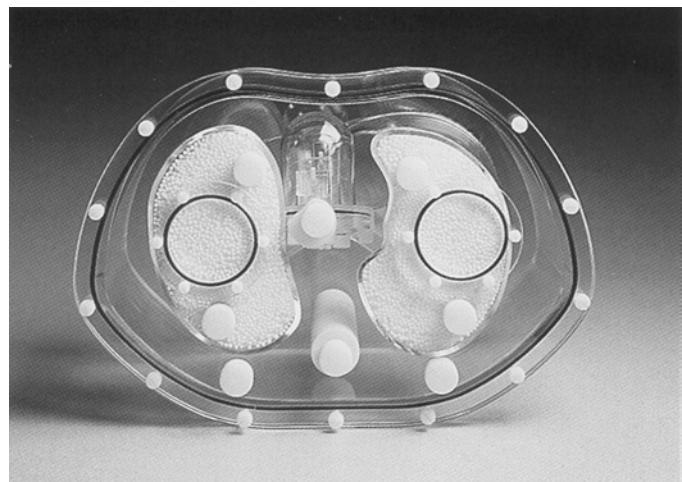
Anthropomorphic Torso Phantom™

Anthropomorphic Torso Phantom™

Model ECT/TOR/P

Main Features:

- Includes large, body-shaped cylinder lung, liver and spine inserts
- Lung inserts can be filled with Styrofoam® beads and water to simulate lung tissue density
- Optional Cardiac Insert™ (Model ECT/CAR/I) may be purchased separately
- Simulates upper torso of average to large male/female patients (38 x 26 cm)
- Simulates anatomical structures and radioactivity distributions
- Optional Fillable Spine Insert available, see page 29



Top view - Shown with optional Cardiac Insert™

Main Applications:

- Evaluation of cardiac ECT data acquisition and reconstruction methods
- Evaluation of non-uniform attenuation and scatter compensation methods
- Research

Specifications:

Lateral outside dimension: 38 cm

Lateral inside dimension: 36 cm

Anterior-posterior outside dimension: 26 cm

Anterior-posterior inside dimension: 24 cm

Wall thickness: 9.5 mm

Volumes:

Left lung (w/o Styrofoam® beads): ~ 0.9 liter

Right lung (w/o Styrofoam® beads): ~ 1.1 liter

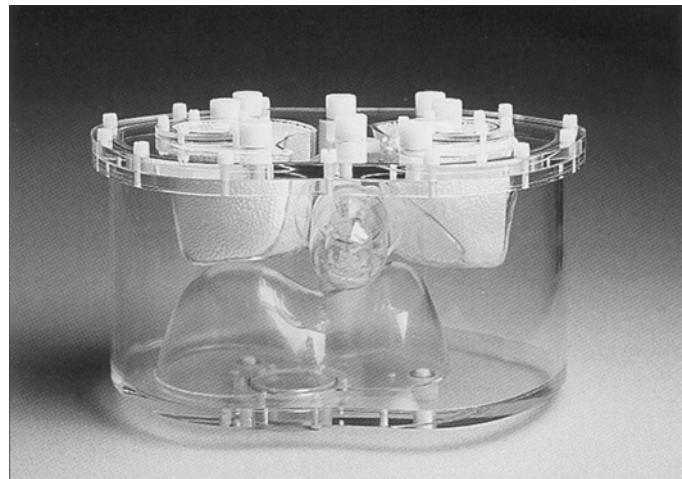
Left lung (w/ Styrofoam® beads): ~ 0.36 liter

Right lung (w/ Styrofoam® beads): ~ 0.44 liter

Liver: ~ 1.2 liters

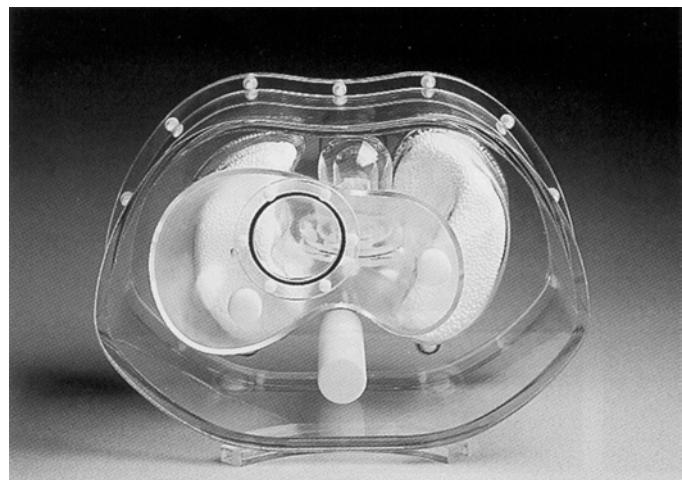
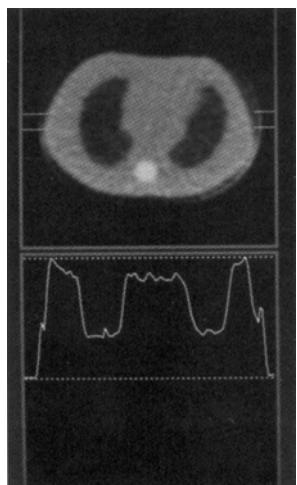
Background: ~ 10.3 liters

Cylinder with lung-spine insert: ~ 7.4 liter



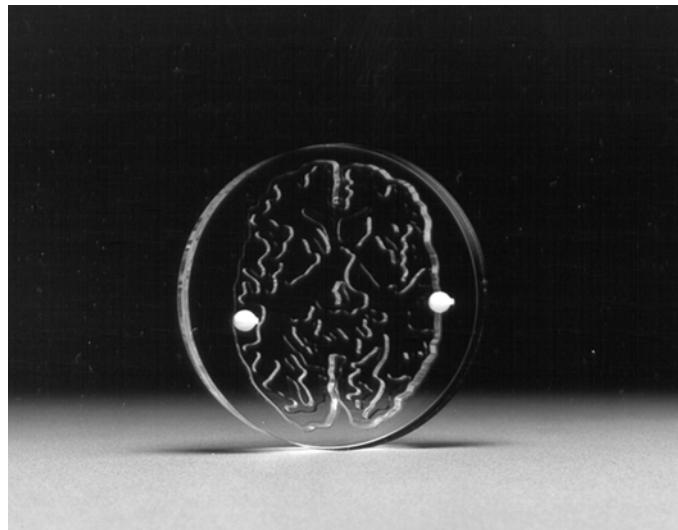
Frontal view - Shown with optional Cardiac Insert™

Transmission CT



Bottom view - Shown with optional Cardiac Insert™

Hoffman 2-D Brain Phantom™



Hoffman 2-D Brain Phantom™

Hoffman 2-D Brain Phantom™

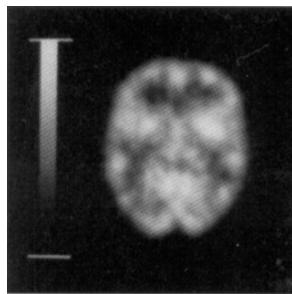
Model BR/2D/P

Main Features:

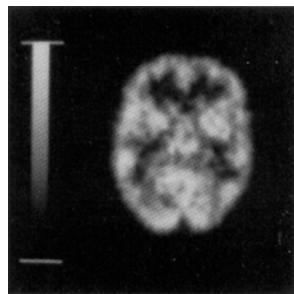
- Thickness differences between ventricle, gray and white matter simulate the radioactivity distribution in a single slice of a brain ECT study
- Normal gray-matter:white-matter:ventricle radioactivity ratio is 4:1:0 (simulated by partial volume effect)

Main Applications:

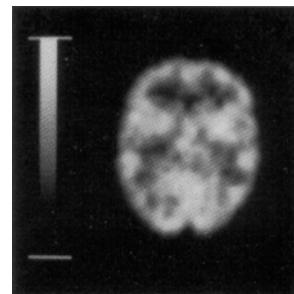
- Evaluation of acquisition and reconstruction methods for brain PET and SPECT studies
- Research



*Low Energy All Purpose
Collimation*



*Fan Beam
Collimation*



*High Resolution
Collimation*

Equivalent Scan Time
 I^{-123}

Hoffman Multi-Compartment 2-D Brain Phantom™

Hoffman Multi-Compartment 2-D Brain Phantom™ Model BR/2D-M/P

Main Features:

- Anatomically correct - varying isotope uptake ratios - simulation of the activity distribution in a flow or metabolic image of normal and abnormal human brain*
- Seven (7) gray-matter compartments that may be separately filled with varying amounts of radiotracer to simulate a variety of "hot" and "cold" abnormalities
- Normal gray-matter:white-matter:ventricle activity, ratio is 4:1:0 (simulated by partial volume effect)
- Abnormal-gray-matter:normal-gray-matter activity, ratios can be varied from 0.25:1 to greater than 100:1

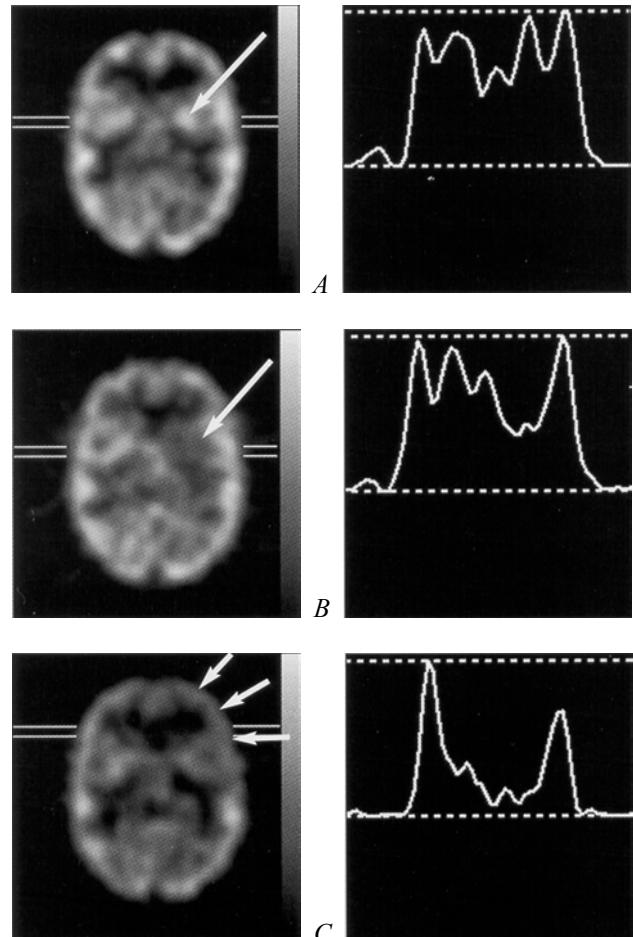
Main Applications:

- SPECT and PET applications include research, system performance measurements, optimization of imaging protocols, image interpretation, and training



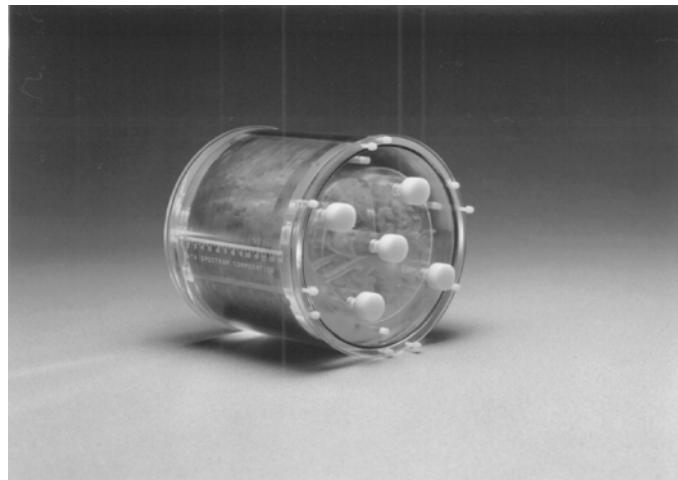
Hoffman Multi-Compartment 2-D Brain Phantom™

- (A) SPECT image and profile of Hoffman 2-D Multi-Compartment Brain Phantom™ with a compartment (arrow) filled with increased activity to simulate a 67% increase in perfusion during an intraictal phase.
- (B) SPECT image and profile of Hoffman 2-D Multi-Compartment Brain Phantom™ with a compartment (arrow) filled with decreased activity to simulate a 67% reduction in perfusion during an interictal phase.
- (C) SPECT image and profile of Hoffman 2-D Multi-Compartment Brain Phantom™ with a compartment (arrows) filled with decreased activity to simulate a 33% reduction in perfusion in the left frontal lobe.



* Hoffman EJ, Ricci AR, van der Stee LMAM, Phelps ME. ECAT -- Basic Design Considerations, IEEE Trans Nucl Sci, NS-30:729-733, 1983.

Hoffman 3-D Brain Phantom™



Hoffman 3-D Brain Phantom™

Hoffman 3-D Brain Phantom™

Model BR/3D/P

Main Features:

- Anatomically accurate simulation of radioactivity distribution for brain SPECT and brain PET studies* and distribution of proton density and relaxation parameters for brain MRI studies
- Simulates 4:1 uptake ratio (by partial volume effect) seen for normal gray and white matter in flow and metabolic studies
- Single fillable chamber eliminates the necessity of preparing different concentrations of radioactivity
- Fillable and solid defects for basil ganglia region available

Main Applications:

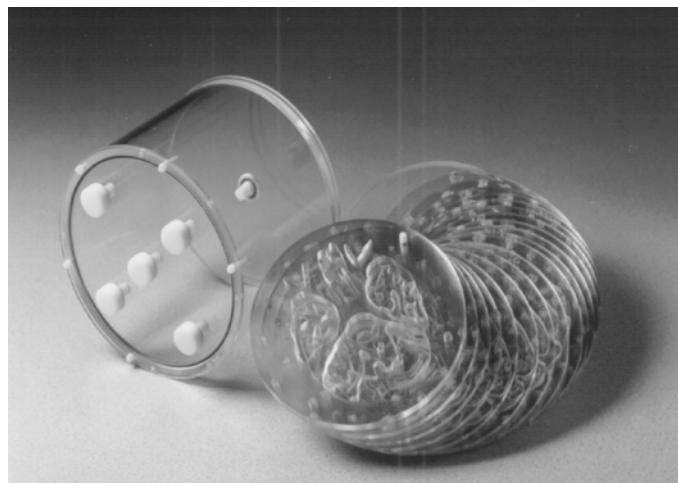
- Evaluation of acquisition and reconstruction methods for brain ECT studies
- Evaluation of 3-D reconstruction methods
- Evaluation of 3-D attenuation and scatter compensation methods
- Evaluation of 3-D SPECT, PET and MRI registration techniques
- Research

Specifications:

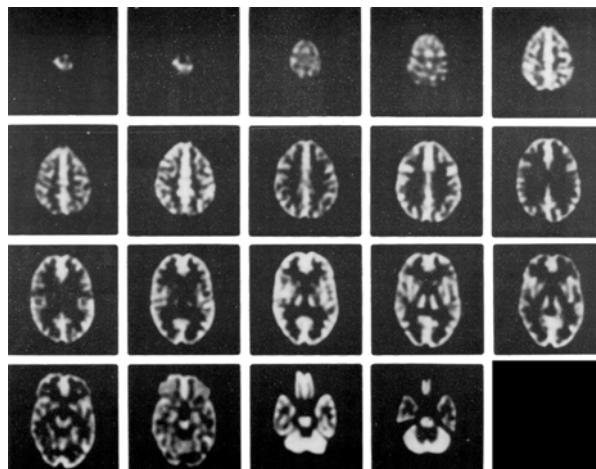
Cylinder inside diameter: 20.8 cm

Cylinder inside height: 17.5 cm

Fillable volume: ~ 1.2 liter



Cylinder and 3-D Brain Insert™



SPECT Images

Fillable/Solid Defects Set

Model BR/3D/DEF

- Hot and cold defects can be located in the basil ganglia region
- Allows user to determine image shape of the defect

* Hoffman EJ, Cutler PD, Digby WM and Mazziotta JC. 3-D phantom to simulate cerebral blood flow and metabolic images for PET, IEEE Trans Nucl Sci 37:616-620, 1990. Mini and Micro Deffrise Phantom™

Mini Defrise Phantom™

Mini Defrise Phantom™

Model ECT/DEF/MP

Main Applications:

- Small animal system evaluation (with field-of-view greater than 77 mm)
- Evaluation of ultra-high resolution ECT systems (less than or equal to 3 mm FWHM)
- Evaluation of slice profile uniformity along longitudinal axis of an ECT system
- Evaluation of ultra-high resolution, fan-beam, cone-beam and pinhole collimation
- Research

Specifications:

Cylinder outer diameter: 8.3 cm

Cylinder inside diameter: 7.6 cm

Cylinder inner height: 5 cm

Disk diameter: 7.5 cm

Disk thickness: 4.3 mm

Gap thickness: 4.3 mm



Mini Defrise Phantom™

Micro Defrise Phantom™

Model ECT/DEF/MMP

Main Applications:

- Very small animal system evaluation (with field-of-view greater than 45 mm)
- Evaluation of ultra-high resolution ECT systems (less than or equal to 3 mm FWHM)
- Evaluation of slice profile uniformity, along longitudinal axis of an ECT system
- Evaluation of ultra-high resolution, fan-beam, cone-beam and pinhole collimation
- Research

Specifications:

Cylinder outer diameter: 5 cm

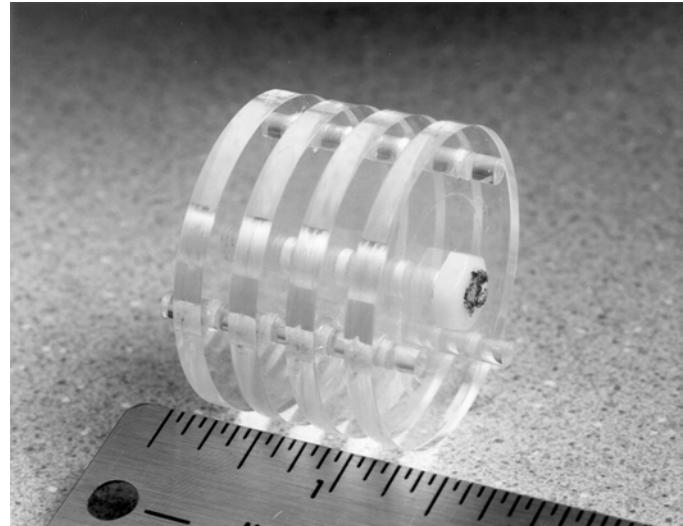
Cylinder inside diameter: 4.5 cm

Cylinder inner height*: 3.7 cm

Disk diameter: 4.3 cm

Disk thickness: 4.3 mm

Gap thickness: 4.3 mm



Shown Micro Defrise Insert™

Mini and Micro Deluxe Phantom™



Components of Mini Deluxe Phantom™

Mini Deluxe Phantom™

Model ECT/DLX/MP

Main Applications:

- Small animal system evaluation (with field-of-view greater than 77 mm)
- Evaluation of ultra-high resolution ECT systems (less than or equal to 3 mm FWHM)
- Spatial resolution measurements
- Evaluation of center-of-rotation error
- Research

Specifications:

Rod diameters: 1.2, 1.6, 2.4, 3.2, 4.0 and 4.8 mm
Height of rods: 3.4 cm
Insert diameter: 7.5 cm
Cylinder outside diameter: 8.3 cm
Cylinder inside diameter: 7.6 cm
Cylinder inside height: 5 cm

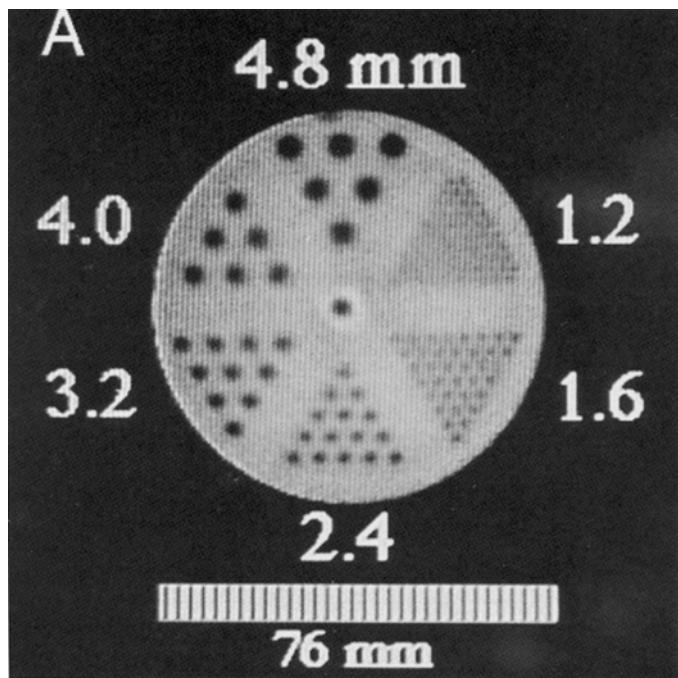


Image of Mini Deluxe SPECT Cold Rod Phantom™

Micro Deluxe Phantom™

Model ECT/DLX/MMP

Main Applications:

- Small animal system evaluation (with field-of-view greater than 45 mm)
- Evaluation of ultra-high resolution ECT systems (less than or equal to 3 mm FWHM)
- Spatial resolution measurements
- Evaluation of center-of-rotation error
- Research

Specifications:

Rod diameters: 1.2, 1.6, 2.4, 3.2, 4.0 and 4.8 mm
Height of rods: 3.4 cm
Insert diameter: 4.4 cm
Cylinder outside diameter: 5 cm
Cylinder inside diameter: 4.5 cm
Cylinder inside height: 3.7 cm

NOTE:

See page 23 for Hot Spot Insert for both the Mini and the Micro Phantom's

NEMA PET Phantom™

NEMA PET Phantom™

Model ECT/NEM1/P

Main Features:

- The NEMA PET Phantom™ is designed in accordance with the recommendations by the National Electrical manufacturers Association (NEMA) to standardize the measurement of performance of PET*

Main Applications:

- PET acceptance testing with NEMA standard
- Evaluation of count rate, uniformity, scatter fraction, attenuation compensation, and scatter compensation of ECT systems
- Research

Specifications:

Cylinder outside diameter: 20.3 cm

Cylinder insider diameter: 19.7 cm

Wall thickness: 3 mm

Delrin Insert diameter: 5 cm

Fillable Insert inside diameter: 4.3cm

Fillable Insert height: 18.3 cm

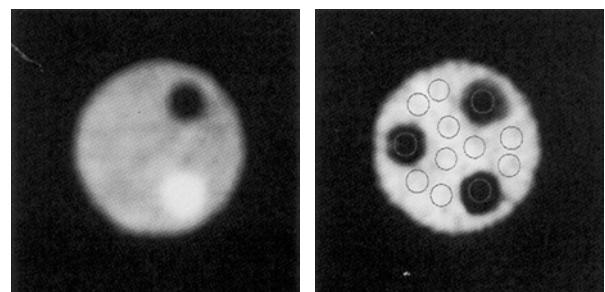
Fillable Insert volume: ~ 260 mL

Line Source diameter: ~ 1 mm

Line Source height: 1.4 cm



NEMA PET Phantom™

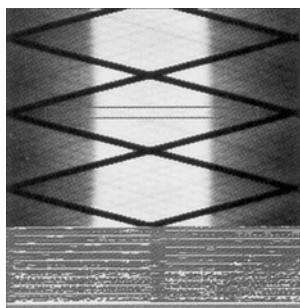


Attenuation Correction Test

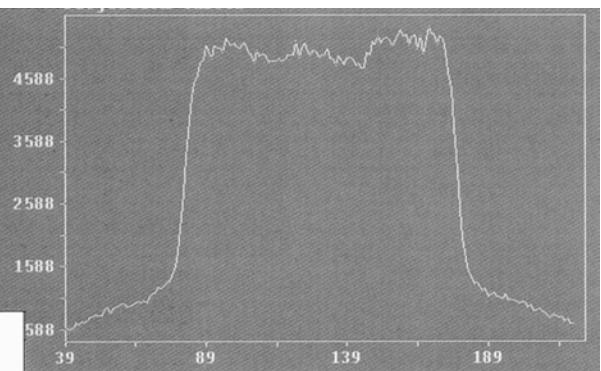
Shown are attenuation image (left) with three inserts and emission image (right) after attenuation correction (with region-of-interest shown for data analysis).

* Karp JS, Daube-Witherspoon ME, Hoffman EJ et al. Performance standards in positron emission tomography, J Nucl Med, 32:2342-2350.

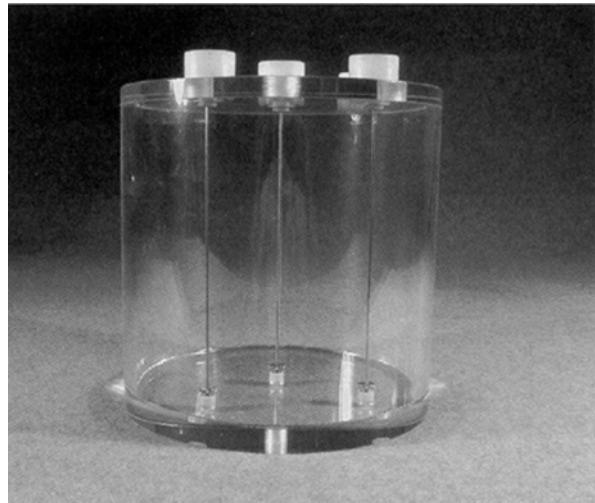
* *Performance Measurements of Positron Emission Tomographs*, NEMA Standards Publication NU2, National Electrical Manufacturers Association (NEMA), Washington, D.C., 1994.



Count Rate Test Using Sinogram



NEMA SPECT Triple Line Source Phantom™



NEMA SPECT Triple Line Source Phantom™

NEMA Triple Line Source Phantom™ Model ECT/NEM-3L/P

Main Features:

- The NEMA SPECT Triple Line Source Phantom™ is designed in accordance with the recommendations by the National Electrical manufacturers Association (NEMA) to standardize the measurement of reconstructed spatial resolution of SPECT*

Main Applications:

- Acceptance testing with NEMA standard
- Center-of-rotation error evaluation
- Evaluation of changes of radius-of-rotation on spatial resolution
- Spatial resolution measurement in air and in water if mounted in cylinder
- Quantitative evaluation of reconstruction filters and scatter compensation methods
- Research

Specifications:

Cylinder outside diameter: 22.2 cm
Cylinder inside diameter: 20.2 cm
Cylinder outside height: 23.4 cm
Cylinder inside height: 20.0 cm
Diameter of line sources: ~ 1 mm
Spacing of Line Sources: 7.5 cm
Useful Height of Line Sources: 18.4 cm

* *Performance Measurements of Scintillation Cameras*, NEMA Standards Publication No. NU1, National Electrical Manufacturers Association (NEMA), Washington, D.C., 1994.

NEMA Scatter Phantom Set™

NEMA Sensitivity Phantom™

NEMA Scatter Phantom SET™

Model ECT/NEM-SC/P

Main Features:

- The NEMA Scatter Phantom Set™ is designed in accordance with the recommendations by the National Electrical manufacturers Association (NEMA) to standardize the measurement of count rate performance of a scintillation camera in the presence of scatter*
- Is a solid right circular high density polyethylene cylinder
- Has a fillable line source holder parallel to the center axis of the cylinder and offset a distance O.D. 4.5 cm
- The cylinder is made of four sections for ease of carrying/storage

Main Applications:

- Acceptance testing with NEMA standard
- Determine the imaging systems relative sensitivity to scatter radiation
- Measure the effects of dead-time and the effects of random events generated at different levels of activity of the line source



NEMA Scatter Phantom™

Specifications:

Outside diameter: 203 cm
Length: 70 cm
Hole size: 6.4 mm
Offset distance: 4.5 cm

Line source insert:

Length: 80 cm
I.D.: 3.2 mm
C.D.: 5 mm

NEMA Sensitivity Phantom™

Model ECT/NEM-SEN/P

- 6 Concentric aluminum tubes used to detect camera sensitivity in PET

Specifications:

5 internally stacked aluminum tubes all 700 mm in length
1st Tube inside diameter 3.9 mm, outside diameter 6.4 mm
2nd Tube inside diameter 7.0 mm, outside diameter 9.5 mm
3rd Tube inside diameter 10.2 mm, outside diameter 12.7
4th Tube inside diameter 13.4 mm, outside diameter 15.9
5th Tube inside diameter 16.6 mm, outside diameter 19.1
The innermost tube, a fillable polyethylene tubing has an inside diameter of 1 mm, outside diameter 3 mm



Close up end of NEMA Sensitivity Phantom™



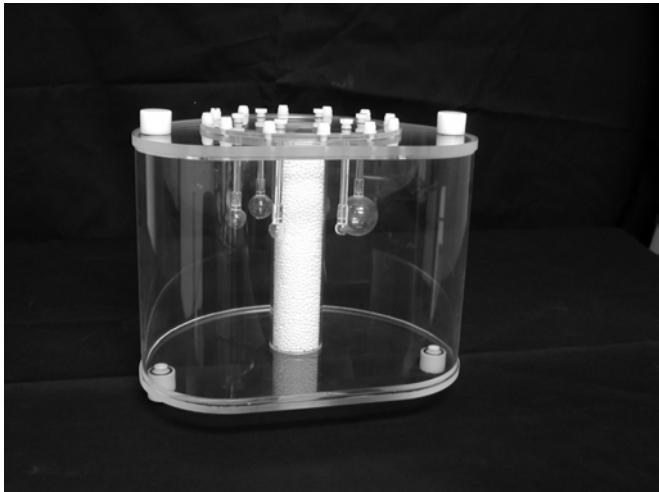
Set of aluminum tubes used in NEMA Sensitivity Phantom™



NEMA Sensitivity Phantom™

* *Performance Measurements of Scintillation Cameras*, NEMA Standards Publication No. NU2, National Electrical Manufacturers Association (NEMA), Washington, D.C., 2000

NEMA IEC Body Phantom Set™



CAD sketch of IEC Body Phantom Torso Section

NEMA IEC Body Phantom Set™ Model ECT/IEC-BODY/P

Main Features:

- The IEC Body Phantom Set™ consists of a body phantom, a lung insert and an insert with six spheres with various sizes
- It is designed in accordance with the recommendations by the International Electrotechnical Commission (IEC) and modified by the National Electrical manufacturers Association (NEMA)
- It is recommended for use in the evaluation of reconstructed image quality in whole body PET imaging

Main Applications:

- Simulation of whole-body imaging especially using PET and camera-based coincidence imaging techniques
- Evaluation of reconstructed image quality in whole-body PET and camera-based coincidence imaging
- Determination of the coincidence count rate characteristics in brain and cardiac imaging
- Evaluation of the relationship between true coincidence count rate and radioactivity
- Determination of the address errors caused by address pile up
- Evaluation of the count loss correction scheme
- Research

Specifications:

Interior length of phantom: 180 mm
Fillable spheres (6) inner diameter: 10 mm, 13 mm, 17 mm, 22 mm, 28 mm, and 37 mm.

Distance from sphere plane to inside wall: 70 mm
Volume of empty cylinder: 9.7 liters

Cylindrical insert dimension:

Outside diameter: 51 mm
Length: 180 mm

* *International Standard: Radionuclide imaging devices – Characteristics and test conditions – Part 1: Positron emission tomographs*, International Electrotechnical Commission (IEC), 61675-1, Geneva, Switzerland, 1998.

* *Performance Measurements of Scintillation Cameras*, NEMA Standards Publication No. NU2, National Electrical Manufacturers Association (NEMA), Washington, D.C., 2000.

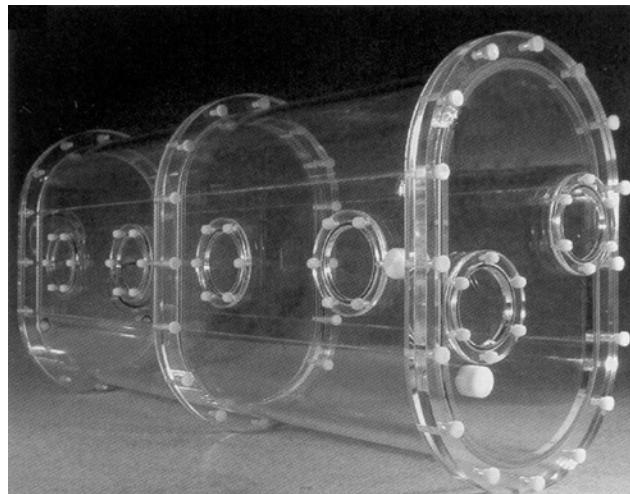
Extended Oval PET Phantom Set™ (Turkington Phantom)

Extended Oval PET Phantom Set™

Model ECT/EX-OV/P

Main Features:

- The Extended Oval PET Phantom Set™ is designed to simulate the distribution of radioactivity throughout the long body torso*
- It consists of a set of two 40 cm long cylinder sections with oval shape cross section to simulate the long body torso
- A single 40 cm section fills the axial FOV of a large camera
- The phantom will allow placement of optional internal containers to simulate radioactivity distribution in various organs, i.e., lung, liver, heart, bladder and tumors
- The optional internal containers will be connected via tubing through an end cap for easy filling†



Extended Oval PET Phantom Set™

Main Applications:

- Evaluation of cancer imaging using camera-based and dedicated PET systems
- Measurements of contrast, signal-to-noise ratio using hot inserts
- Evaluation of the effects of out-of field-of-view activities
- Evaluation of attenuation and scatter correction
- Research

Specifications:

Outside lateral dimensional of cylinder: 36 cm
Inside lateral dimension of cylinder: 34 cm
Outside anterior-posterior dimension of cylinder: 21 cm
Inside anterior-posterior dimension of cylinder: 19 cm
Wall thickness: 1 cm
Height of each cylinder section: 40 cm
Total cylinder height: 80 cm

Extended Oval PET Inserts Set™

Available Late Fall 2001

Model ECT/EX-OV/I-P

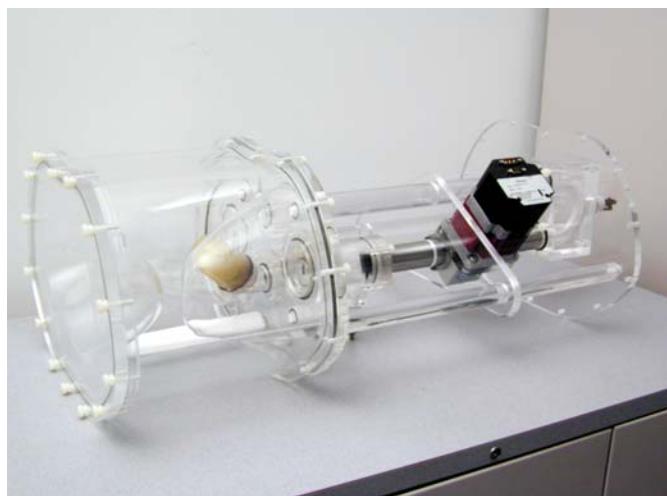
To Include:

Tumor set, fillable lungs, geometrical liver, Indexable bladder, and holder for cardiac phantom

* Turkington TG, Williams NE, Hamblen SM and Coleman RE. Regional FDG uptake, attenuation, and geometry measurements for whole body phantom design. J Nucl Med 40:281P, 1999.

† Internal organ containers are not currently available.

Dynamic Cardiac Phantom™



Dynamic Cardiac Phantom™

Dynamic Cardiac Phantom™

ECT/D-CAR/P

Main Features:

- External filling capability of myocardium and blood volumes
- Full size torso of cardiac region including upper liver and lower lung region
- Movable cardiac position
- Computer controlled

Main Applications:

- Gated cardiac imaging
- Validation of ejection fraction calculation of imaging system
- Uniformity of myocardial walls
- Research

Specifications:

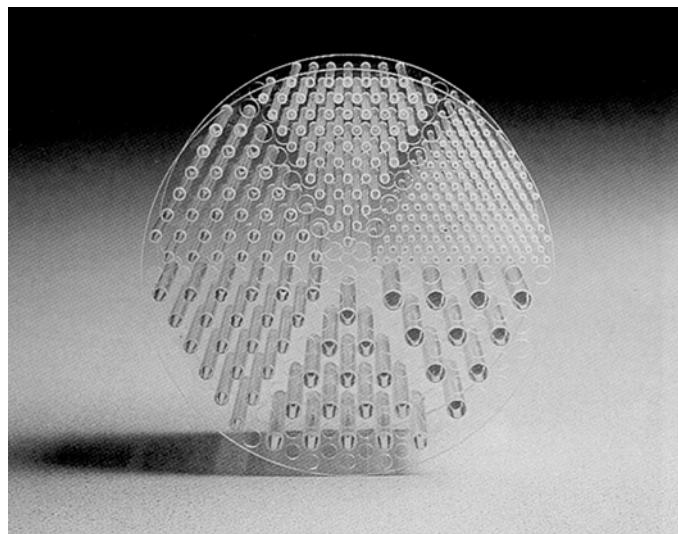
Heart rate range 0-120 beats per minute

Ejection volume range up to 100 mL

Cardiac ejection curves are fully programmable

Inserts & Accessories

Cold Rod Inserts



Ultra Deluxe Cold Rod Insert™

Ultra Deluxe Cold Rod Insert™

Model ECT/U-DLX/I

Main Features:

- Designed for use with the 21.6 cm inside diameter flanged phantoms

Main Applications:

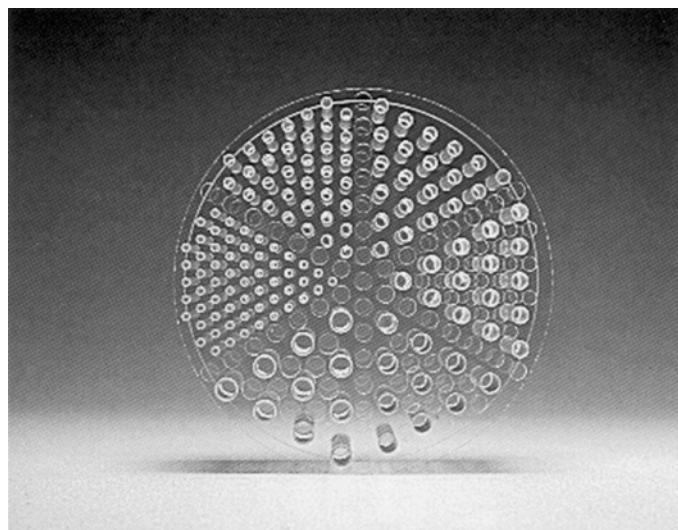
- For use with ultra-high spatial resolution SPECT and PET Systems
- System resolution test for lower contrast structures
- Acceptance testing
- Routine quality, assurance and control
- System performance evaluation
- Research

Specifications:

Insert diameter: 21.3 cm

Rod diameters: 3.2, 4.8, 6.4, 7.9, 9.5 and 11.1 mm

Height of rods: 8.8 cm



Deluxe Cold Rod Insert™

Deluxe Cold Rod Insert™

Model ECT/DLX/I

Main Features:

- Designed for use with the 21.6 cm inside diameter flanged phantoms

Main Applications:

- For use with high and very high spatial resolution SPECT and PET Systems
- System resolution test for lower contrast structures
- Acceptance testing
- Routine quality, assurance and control
- System performance evaluation
- Research

Specifications:

Insert diameter: 21.3 cm

Rod diameters: 4.8, 6.4, 7.9, 9.5, 11.1 and 12.7 mm

Height of rods: 8.8 cm

Cold Rod Inserts

Standard Cold Rod Insert™ Model ECT/STD/I and Model ECT/ELP/I

Main Features:

- Model ECT/STD/I is designed for use with the 21.6 cm inside diameter flanged phantoms
- Model ECT/ELP/I is designed for use with the Elliptical ECT Phantom™ (Model ECT/ELP/P)

Main Applications:

- For use with medium to high spatial resolution SPECT and PET Systems
- System resolution test for lower contrast structures
- Acceptance testing
- Routine quality, assurance and control
- System performance evaluation
- Research

Specifications:

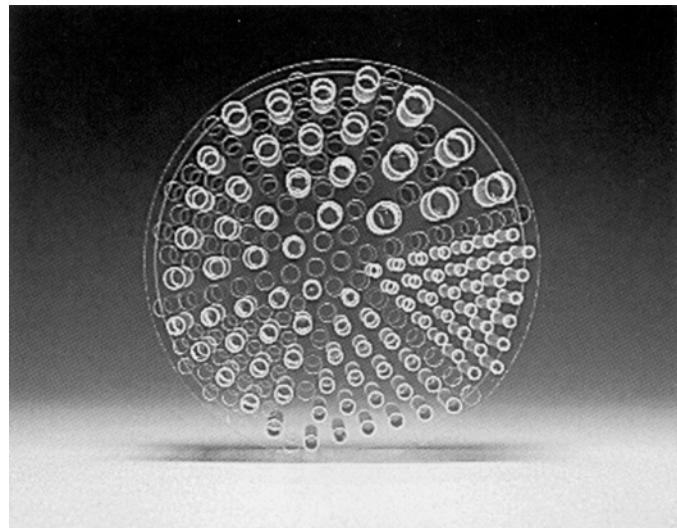
Insert diameter:

Model ECT/STD/I: 21.3 cm

Model ECT/ELP/I: 30.2 cm along major axis
21.8 cm along minor axis

Rod diameters: 6.4, 7.9, 9.5, 11.1 12.7 and 16 mm

Height of rods: 8.8 cm



Standard Cold Rod Insert™

Benchmark Cold Rod Insert™

Model ECT/BEN/I

Main Features:

- Designed for use with the 21.6 cm inside diameter flanged phantoms

Main Applications:

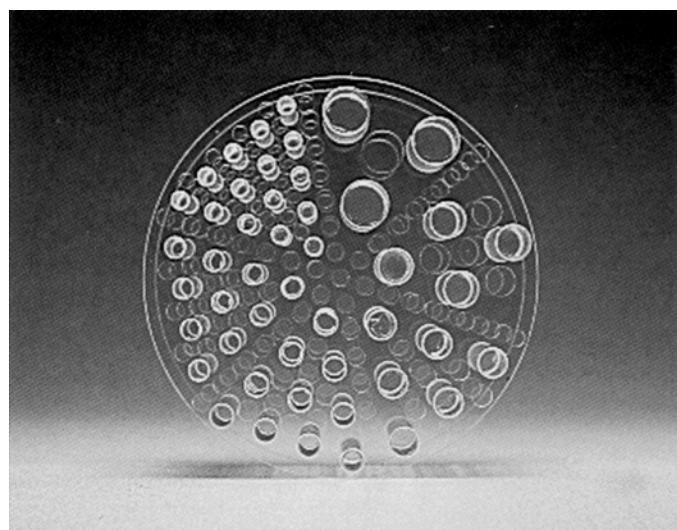
- For use with ECT systems with poorer spatial resolution, larger radius-of-rotation, cut-off reconstruction filters and count densities mimicking clinical scans
- System resolution test for lower contrast structures
- Acceptance testing
- Routine quality, assurance and control
- System performance evaluation
- Research

Specifications:

Insert diameter: 21.3 cm

Rod diameters: 9.5, 11.1, 12.7, 15.9, 19, and 25.4 mm

Height of rods: 8.8 cm



Benchmark Cold Rod Insert™

Plate Insert™

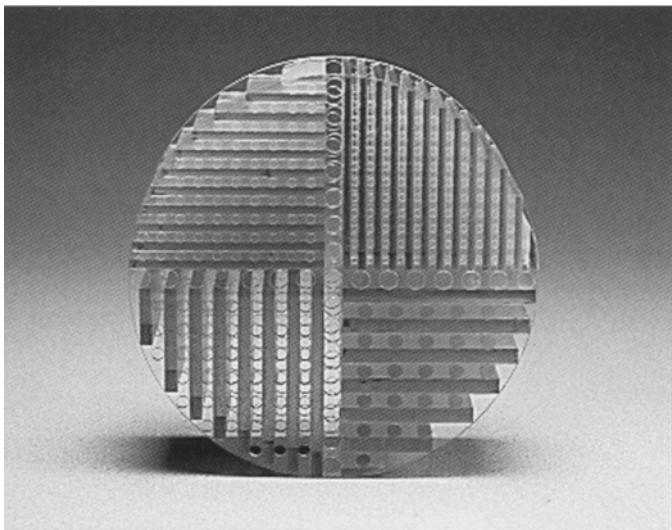
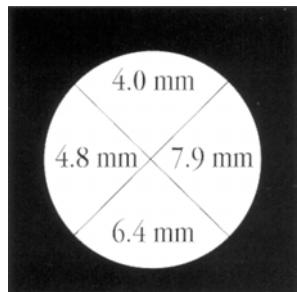
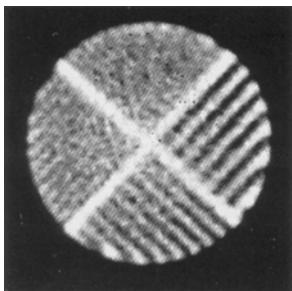


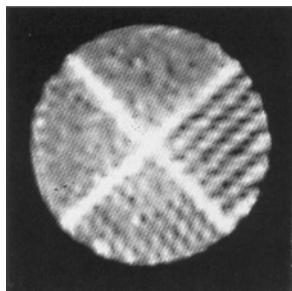
Plate Insert™



*Spacing between Plates in
Different Quadrants of Plate Insert™*



*Image of Plate Insert™
Obtained with
Linear Sampling 3.2 mm
Angular Sampling 2 deg.*



*Image of Plate Insert™
Obtained with
Linear Sampling 6.4 mm
Angular Sampling 4 deg.*

Plate Insert™ Model ECT/PLA/I

Main Features:

- Designed for use with the 21.6 cm inside diameter flanged phantoms
- May be mounted in the cylinder in 3 alternative ways:
 - by itself
 - supplied with the SPECT phantom
 - simultaneously with the optional Hot Spot Insert™

Main Applications:

- For use with high to very high spatial resolution SPECT and PET Systems with reconstructed spatial resolution of better than 12 mm FWHM
- Evaluation of linear and angular sampling on ECT system performance
- Evaluation of spatial resolution of ECT systems
- Evaluation of errors in centering axis-of rotation and aliasing artifacts
- Research

Specifications:

Plate insert diameter: 21.4 cm

Insert height: ~ 8.3 cm

Thickness of plate arrays: 4.0, 4.8, 6.4, and 7.9 mm

Spacing between adjacent plates: Equal to the plate thickness

Hot Spot Insert™

Hot Spot Insert™

Model ECT/HOT/I

Model ECT/HOT-FL/I

Model ECT/HOT-MP/I

Model ECT/HOT-MMP/I

Main Features:

- Model ECT/HOT/I is designed for use with the 21.6 cm inside diameter flanged cylinder
- Model ECT/HOT-FL/I is designed for use with the 20.4 cm inside diameter flangeless cylinder
- Model ECT/HOT-MP/I is designed for use with 7.6 cm inside diameter mini cylinder
- Model ECT/HOT-MMP/I is designed for use with the 4.4 micro cylinder
- May be mounted in the cylinder in 3 alternative ways:
 - by itself
 - simultaneously with the spheres that is supplied with the SPECT phantom
 - simultaneously with the Cold Rod Insert™ that is supplied with the SPECT Phantom

Main Applications:

- For use with high spatial resolution SPECT and PET Systems
- System resolution test for high contrast structures
- Acceptance testing
- Routine quality, assurance and control
- System performance evaluation
- Research

Specifications:

ECT/HOT/I & ECT/HOT-FL/I:

Diameter of insert:

Model ECT/HOT/I: 21.4 cm

Model ECT/HOT-FL/I: 20.3cm

Inside height: 6.6 cm

Diameters of hollow channels: 4.8, 6.4, 7.9, 9.5, 11.1 and 12.7mm

Center-to center spacing of channels: Two times the diameter

ECT/HOT-MP/I & ECT/HOT-MMP/I:

Diameter of insert:

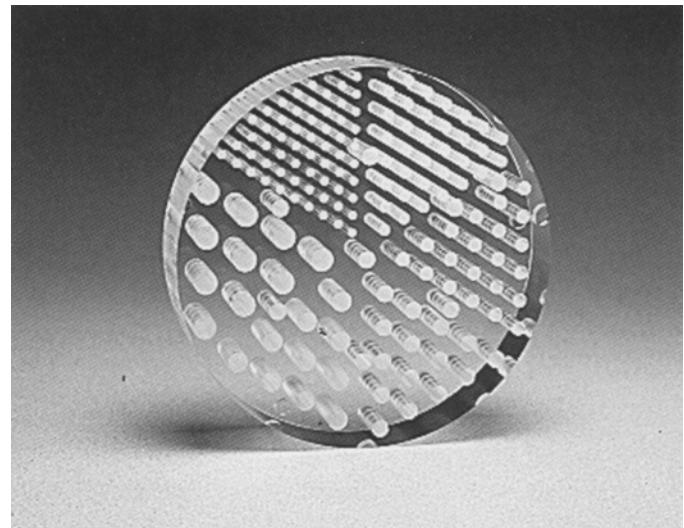
Model ECT/HOT-MP/I: 7.5 cm

Model ECT/HOT-MMP/I: 4.3 cm

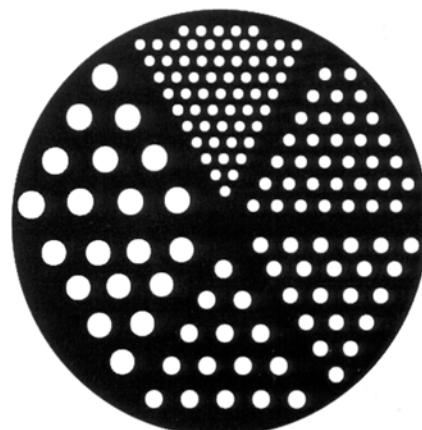
Inside height: 4.3 cm

Diameters of hollow channels: 1.2, 1.6, 2.4, 3.2, 4.0, and 4.8mm

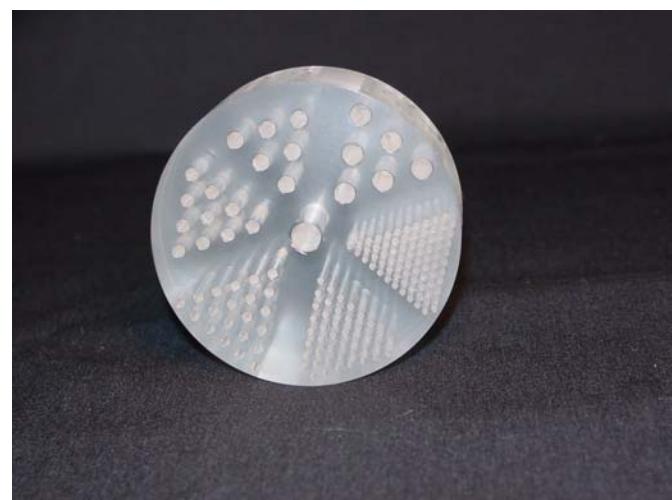
Center-to center spacing of channels: Two times the diameter



Hot Spot Insert™

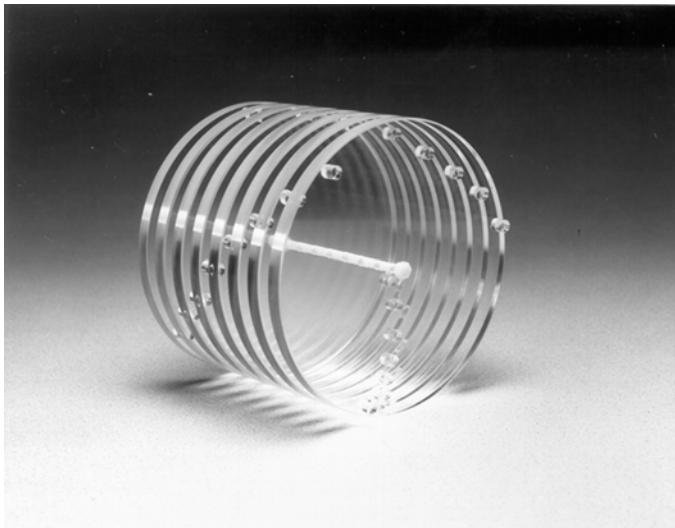


Model ECT/HOT/I™



Mini Hot Spot Insert™

Defrise Insert™



Defrise Insert™

Defrise Insert™

Model ECT/DEF/I

Main Features:

- Designed to be used with the 21.6 cm inside diameter flanged phantoms

Main Applications:

- Evaluation of slice profile uniformity along longitudinal axis of an ECT system
- Evaluation of converging-hole collimators (e.g., fan-beam, cone-beam, pinhole, astigmatic and vari-focal collimators)
- Research

Specifications:

Number of disks: 9

Diameter of disks: 20.9 cm

Thickness of disks: 12 mm

Center-to center spacing between adjacent disks:
20 cm

Slice Thickness Insert™

Slice Thickness Insert™

Model ECT/SLI/I

Main Features:

- Designed to be used with the 21.6 cm inside diameter flanged and the 20.4 cm inside diameter flangeless phantoms
- Consists of a series of calibration points and a double helices of fine bore clear vinyl tubing with one helix located near the central axis while the other helix secured to the outer cylinder.
- The angular extent of the transaxial images of the tubes (filled with a radioactive tracer) accurately determines the true axial resolution at two distances from the central axis of the insert
- Each interval between two adjacent calibration points corresponds to a known thickness interval
- May be used in three alternative ways:
 - by itself (unmounted) for measurements in air
 - as an insert and mounted inside a Data Spectrum cylinder
 - simultaneously with the Solid Sphere Set™ that is supplied with the SPECT phantom

Main Applications:

- Practical and reliable measurement of true axial resolution (i.e., actual slice thickness) as opposed to pixel slice thickness (i.e., digital sampling) of a PET or a SPECT system
- Evaluation of 2 D filtering on axial resolution
- Research

Specifications:

Insert diameter: 19.6 cm

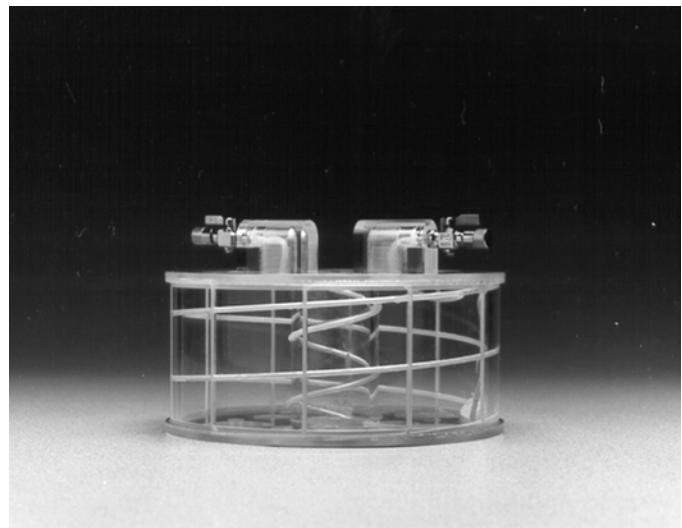
Insert height: 8.9 cm

Distance of inner tubing to central axis: 2.5 cm

Distance of outer tubing to central axis: 8.9 cm

Line pitch of helical tubing: 36 mm/revolution

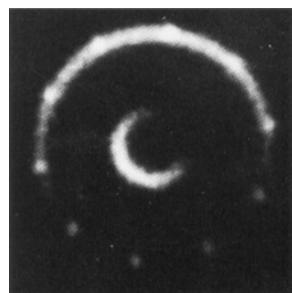
Spacing of adjacent dots: 3.6 mm



Slice Thickness Insert™

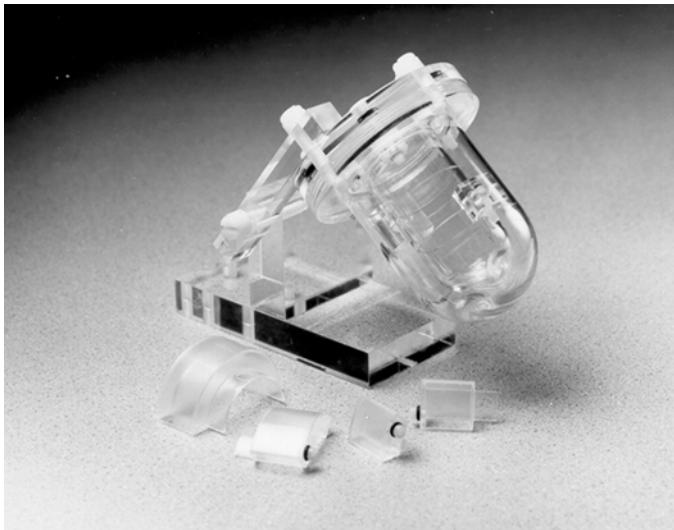


Shown mounted inside Flanged Circular ECT Cylinder™



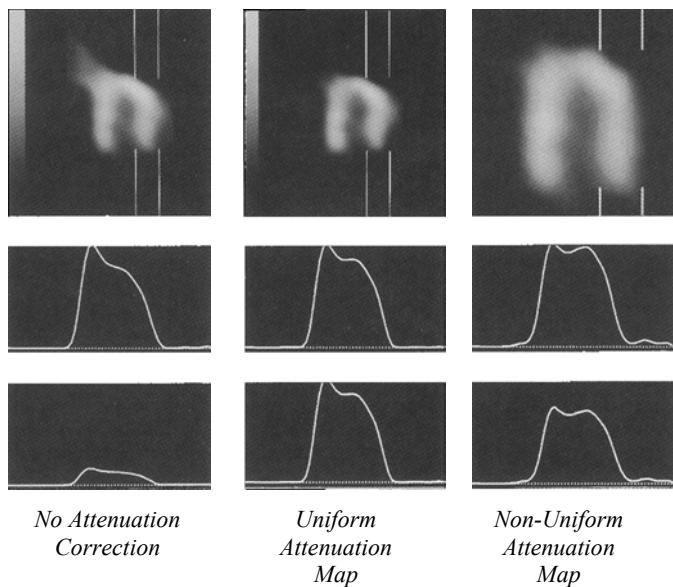
18 mm FWHM

Cardiac Insert™



Cardiac Insert™ with Fillable Defects Set™

SPECT scans with Cardiac Insert™



Cardiac Insert™ with Solid/Fillable Defect Set™ Model ECT/CAR/I

Main Features:

- Designed to be used with the various Data Spectrum circular and elliptical cylinders, the Elliptical Lung-Spine Body Phantom™ and the Anthropomorphic Torso Phantom™
- Simulates normal and abnormal myocardial uptake and radioactivity in left ventricular chamber
- Solid inserts simulate transmural and non-transmural cold abnormalities
- Fillable inserts can be used to simulate transmural and non-transmural cold or hot abnormalities

Main Applications:

- Evaluation of cardiac ECT data acquisition and reconstruction methods
- Quantitative evaluation of non-uniform attenuation and scatter compensation methods
- Research

Specifications:

Cardiac Insert

“Ventricle” overall length: 9.3 cm

“Ventricle” overall diameter: 6.1 cm

“Myocardium” thickness: 1.0 cm

“Myocardium” volume: ~ 110 mL

“Ventricle” volume: ~ 60 mL

Solid Defect Set

1. 60° x 2 cm

2. 45° x 1.5 cm

3. 60° x 2 cm, with 5 mm wall thickness
(non-transmural defect)

Fillable Defect Set

1. 180° x 2 cm ~ 13 mL

2. 90° x 2 cm ~ 5.4 mL

3. 45° x 2 cm ~ 3.8 mL

4. 45° x 2 cm, with 5 mm thick chamber* ... ~ 1.4 mL

* Only the outer half of the 4th defect (non-transmural) is fillable. Each insert can be installed individually.

Fillable Cardiac Defect Set™

Fillable Cardiac Defect Set™

Model ECT/FIL/I

Main Features:

- Designed to be used with the Cardiac Insert™ (Model ECT/CAR/I)

Main Applications:

- Simulate transmural and non-transmural cold or hot abnormalities
- Evaluation of cardiac ECT data acquisitions and reconstruction methods
- Quantitative evaluation of non-uniform attenuation and scatter compensation methods
- Research

Specifications:

Volumes of defects:

1. 180° x 2 cm ~ 13 mL
2. 90° x 2 cm ~ 5.4 mL
3. 45° x 2 cm ~ 3.8 mL
4. 45° x 2 cm, with 5 mm thick chamber* ~ 1.4 mL



Fillable Cardiac Defect Set™

* Only the outer half of the 4th defect (non-transmural) is fillable. Each insert can be installed individually

Body Contour Rings™

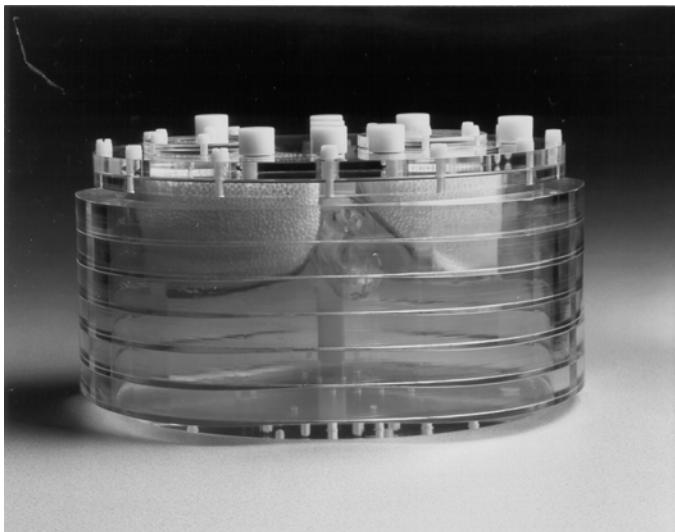


Body Contour Rings™

Body Contour Rings™ (Set of 3 Rings) Model ECT/BCR/ST

Main Features:

- The outer contour of the Body Contour Rings™ has the same shape as the outer contour of the Anthropomorphic Torso Phantom™ (Model ECT/TOR/P)
- Realistically mimics average to large chest size (38 x 26 cm) and shape when fitted over the Elliptical ECT Phantom™ (Model ECT/ELP/P or the Elliptical Lung-Spine Body Phantom™ (Model ECT/LUNG/P)
- May be used with the Elliptical Lung-Spine Body Phantom™
- Allows use of the Solid Breast Accessory Sets™ (Models ECT/SOL-BR/M and ECT/SOL-BR/L) or the Fillable Breast Accessory Set™ (Model ECT/FL-BR/A)



*2 sets of Body Contour Rings™ (6)
fitted over an Elliptical Lung-Spine Body Phantom™
with optional Cardiac Insert™*

Main Applications:

- Evaluation of cardiac ECT data acquisition and reconstruction methods
- Evaluation of non-uniform attenuation and scatter compensation methods
- Research

Specifications:

Lateral outside dimension: 38 cm
Anterior-posterior outside dimension: 26 cm
Thickness: 25 mm

Lung Spine Phantom Lid™

Lung-Spine Phantom Lid™

Model ECT/LUNG/I

Main Features:

- Designed to be used exclusively with the Elliptical ECT Phantom™ (Model ECT/ELP/P)
- Consists of two lung chambers that can be packed with Styrofoam® beads and when filled with a radioactive solution simulate lung tissue with density of ~ 0.3 gm/cm³ and any desirable radioactivity concentration
- A Teflon® rod is used to simulate the spine
- Optional Cardiac Insert™ (Model ECT/CAR/I) can be purchased separately to be used with the Lung Spine Phantom Lid™
- Optional Fillable Spine Insert, see below

Main Applications:

- Evaluation of cardiac ECT data acquisition and reconstruction methods
- Quantitative evaluation of non-uniform attenuation and scatter compensation methods
- Research

Specifications:

Diameter of Teflon® rod (spine): 38 mm

Length of Teflon® rod (spine): 17.8 cm

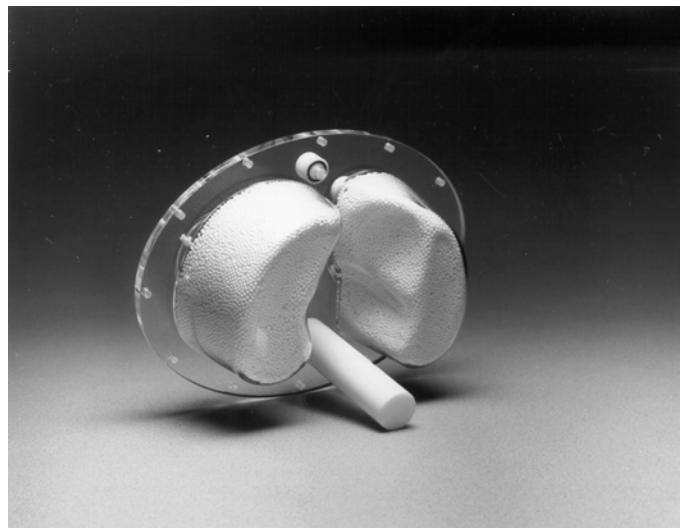
Volumes

Left lung (w/o Styrofoam® beads): ~ 0.9 liter

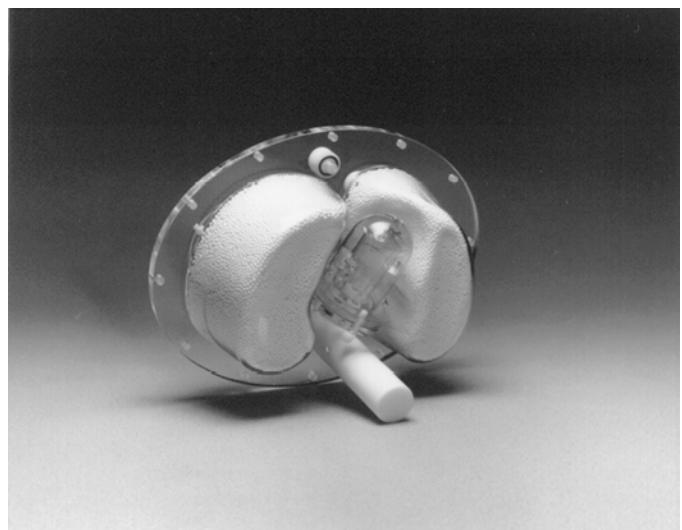
Right lung (w/o Styrofoam® beads): ~ 1.1 liter

Left lung (w/ Styrofoam® beads): ~ 0.36 liter

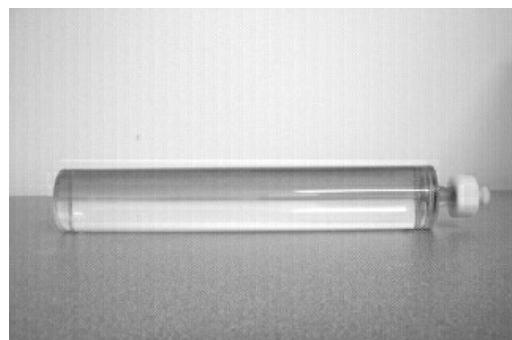
Right lung (w/ Styrofoam® beads): ~ 0.44 liter



Lung-Spine Phantom Lid™



Shown with optional Cardiac Insert™



Fillable Spine Insert™

Fillable Spine Insert™

Available 10/1/01

Model ECT/FL-SPINE/I

DOUG TO CALL BILL OR BEN

Main Features:

- Designed to be used with either the Lung-Spine Phantom™ (Model ECT/LUNG/P) or the Anthropomorphic Torso Phantom™ (Model ECT/TOR/P)

Main Applications:

- Improved spine attenuation characteristic over Teflon® rod

Specifications:

Outside height: 17.0 cm

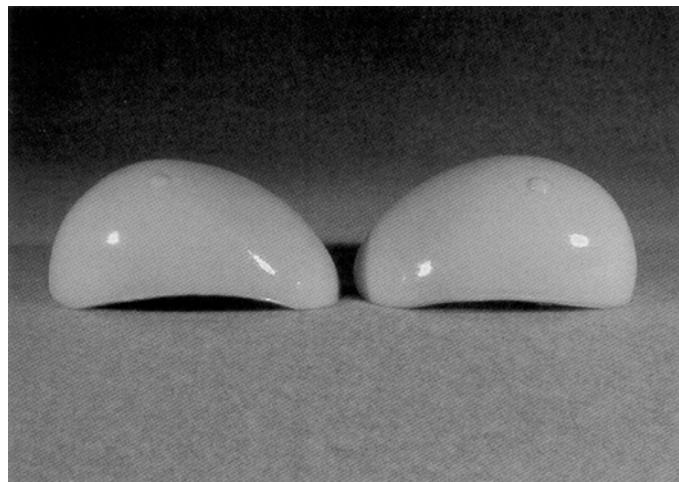
Inside height: 15.5 cm

Outside diameter: 3.8 cm

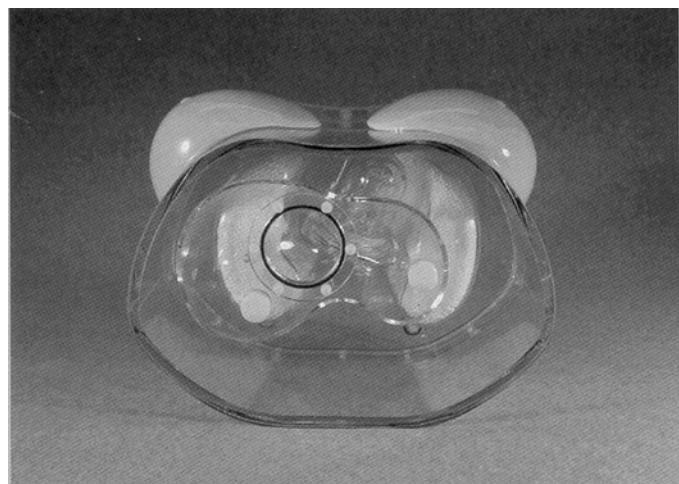
Inside diameter: 6 cm

Volume: 110 cc

Solid Breast Accessory Sets™



Medium Solid Breast Accessory Set™



*Medium Solid Breast Accessory Set™
Shown with Anthropomorphic Torso Phantom™*

Solid Breast Accessory Sets™

Large Solid Breast Accessory Set™

Model ECT/SOL-BR/M

Large Solid Breast Accessory Set™

Model ECT/SOL-BR/L

Main Features:

- Made on a solid tissue equivalent material
- Represents female patient in supine position
- Can be attached to the Anthropomorphic Torso Phantom Large Solid Breast Accessory Set™ (Model ECT/TOR/P)
- Can be attached to the Elliptical Lung-Spine Phantom Large Solid Breast Accessory Set™ (Model ECT/LUNG/P) or the Elliptical ECT Phantom Large Solid Breast Accessory Set™ (Model ECT/ELP/P) if Body Contour Rings Large Solid Breast Accessory Set™ (Model ECT/RING-3/A) are used

Main Applications:

- Assist in the development of myocardial SPECT and PET protocols
- Emission tomography (SPECT and PET) research
- Evaluate effects of breast attenuation and scatter on myocardial SPECT and PET images
- New system development and evaluation
- Investigate emerging transmission data acquisition techniques
- Assess attenuation and scatter compensation methods
- Assist in image interpretation and training

Specifications:

Volume of pair of medium size breasts: ~ 1.31 liter

Volume of pair of large size breasts: ~ 2.64 liter

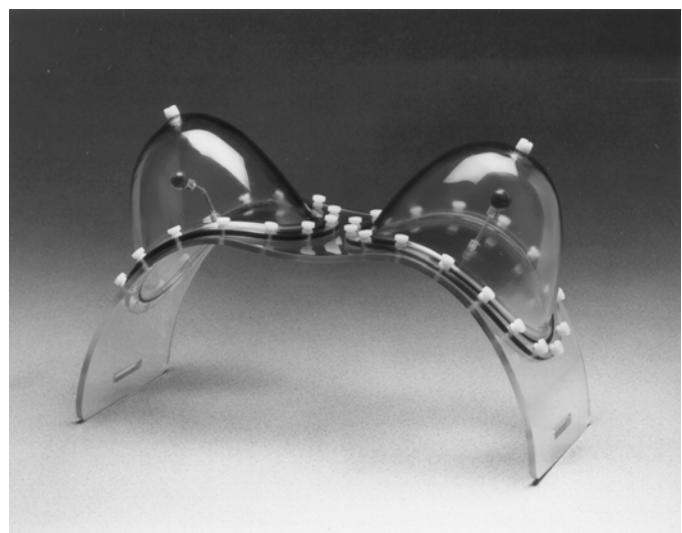
Fillable Breast Accessory Set™

Fillable Breast Accessory Set™

Model ECT/FL-BR/A

Main Features:

- Designed to simulate breast activity, and attenuation
- Represents female patient in prone position
- Supplied with two fillable spheres to simulate breast lesions* with one straight and one inflected rod support
- Can be attached to the Anthropomorphic Torso Phantom™ (Model ECT/TOR/P)
- Can be attached to the Elliptical Lung-Spine Phantom™ Model ECT/LUNG/P) or the Elliptical ECT Phantom™ (Model ECT/ELP/P) if Body Contour Rings™ (Model ECT/RING-3/A) are used



Fillable Breast Accessory™

Main Applications:

- Planar scintimammography
- Emission tomography (SPECT and PET) research
- Protocol development and evaluation
- New imaging system development and evaluation
- Evaluate breast attenuation and scatter on lesion detection
- Assist in image interpretation and training

Specifications:

Volume of breast: ~ 890 mL

Volume of fillable spherical lesions: ~ 1.0 and 2.0 mL



*Fillable Breast Accessory™
Shown with Anthropomorphic*

* Other selected lesions sizes are optionally available see page 33 and the sizes in the hollow sphere sets

Hollow Sphere and Shells™



Hollow Sphere - 60 mm™

Hollow Sphere – 60 mm™

Model ECT/HS-60/A

Main Features:

- Simulates large hot or cold spherical “lesion” (~ 60 mm diameter and ~ 90 mL volume)
- Designed for use in all Data Spectrum circular and elliptical ECT phantoms

Main Applications:

- Quantitative evaluation of attenuation and scatter effects
- Evaluation of quantitative ECT reconstruction methods
- Research



Large Spherical Shell™

Spherical Shells

Large Spherical Shell™

Model ECT/SPS-LG/A

Small Spherical Shell™

Model ECT/SPS-SM/A

Main Features:

- Model ECT/SS-LG/A simulates solid tumors and tumors with necrotic core (~ 20 and ~ 70 mL volume in core and outer shell)
- Model ECT/SS-SM/A simulates solid tumors and tumors with necrotic core (~ 5.5 and ~ 12 mL volume in core and outer shell)
- Available in custom sizes

Main Applications:

- Quantification of size, width, wall thickness and mass of tumor
- Research

Hollow Sphere Sets™

Hollow Sphere Set™

Model ECT/HS/ST

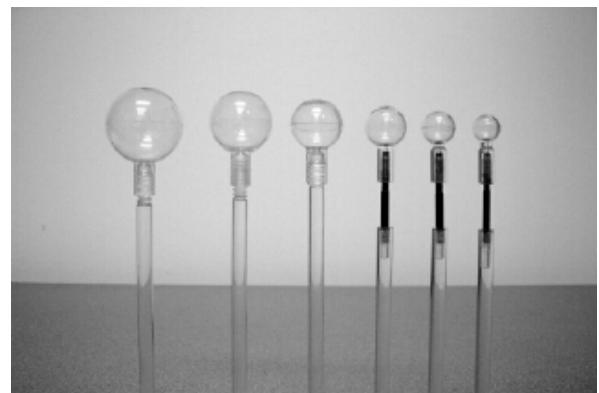
Main Applications:

- Designed for use in all circular and elliptical ECT cylinders
- Simulates hot or cold spherical “lesions”
- Quantitative evaluation of spatial resolution/object size, attenuation and scatter effects
- Evaluation of quantitative ECT reconstruction methods
- Research

Specifications:

Outer diameter: ~ 11.89 mm, ~ 14.43 mm, ~ 17.69 mm,
~ 21.79 mm, ~ 26.82 mm, ~ 33.27 mm

Volume of Spheres: ~ 0.5 mL, ~ 1.0 mL, ~ 2.0 mL,
~ 4.0 mL, ~ 8.0 mL, and ~ 16.0 mL



Hollow Sphere Set™

Micro Hollow Sphere Set™

Model ECT/MI-HS/ST

Main Applications:

- Simulates small hot or cold spherical “lesions”
- Quantitative evaluation of spatial resolution/ small object size effects
- Evaluation of quantitative ECT reconstruction methods
- Research

Specifications:

Outer diameter: ~ 5.94 mm, ~ 6.95 mm, ~ 8.23 mm,
~ 9.86 mm

Volume of Spheres: ~ 0.031 mL, ~ 0.063 mL, ~ 0.125 mL,
and ~ 0.25 mL



Micro Hollow Sphere Set™

HOLLOW SPHERE OUTER DIAMETERS (OD) AND VOLUMES (APPROX.)

OD (mm)	ID (mm)	OD (cm)	OD (inches)	Measured volume (mL)
11.89	9.89	1.9	.468	0.5 mL
14.43	12.43	1.4	.568	1.0 mL
17.69	15.43	1.8	.696	2.0 mL
21.79	19.79	2.2	.858	4.0 mL
26.82	24.82	2.7	1.056	8.0 mL
33.27	31.27	3.3	1.310	16.0 mL

MICRO-VOLUME HOLLOW SPHERE OD'S AND VOLUMES

OD (mm)	ID (mm)	OD (cm)	OD (inches)	Measured volume (mL)
5.95	3.95	.6	.234	0.031 mL
6.95	4.95	.7	.274	0.063 mL
8.23	6.23	.8	.324	0.125 mL
9.86	7.86	1.0	.388	0.25 mL

Height of spheres above base plate: 12.7 cm.

Solid Sphere Set™



Solid Sphere Set™

Solid Sphere Set™

Model ECT/SS/A

Main Features:

- Designed for use in all Data Spectrum circular and elliptical ECT phantoms

Main Applications:

- Simulates cold spherical “lesions”
- Quantitative evaluation of spatial resolution/object size, attenuation and scatter effects
- Evaluation of quantitative ECT reconstruction methods
- Research

Specifications:

Diameters of solid spheres: 9.5, 12.7, 15.9, 19.1, 25. and 31.8 mm

Capillary Line Fixture™

Capillary Line Fixture™

Model ECT/CLF/A

Main Features:

- Center-of-rotation (COR) error measurement for systems that have axially dependent COR correction
- Evaluation of changes of radius-of-rotation on spatial resolution
- Planar and SPECT spatial resolution measurements in air
- Quantitative evaluation of reconstruction filters
- Research

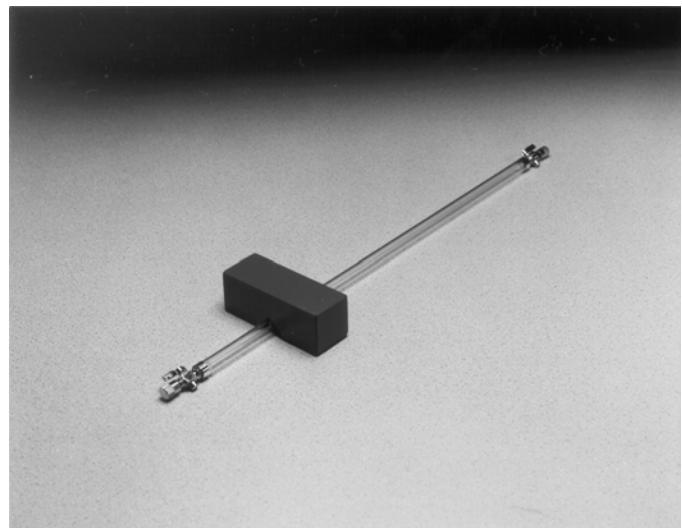
Specifications:

Overall length of line fixture 55.9 cm

Usable length 43.2 cm

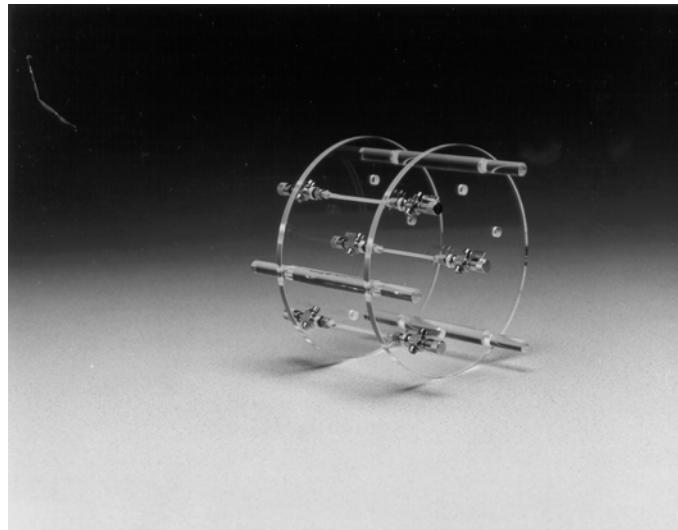
Outer support tubing: Polycarbonate

Inner diameter of tubing: 1.2 mm



Capillary Line Fixture™

Triple Line Insert™



Triple Line Insert™

Triple Line Insert™

Model ECT/TRI/I

Main Features:

- Designed for use with nearly all of the cylinders supplied with Data Spectrum phantoms

Main Applications:

- Center-of Rotation error evaluation
- Evaluation of changes of radius-of rotation on spatial resolution
- Spatial Resolution measurement in air and in water if mounted in cylinder
- Quantitative evaluation of reconstruction filters and scatter compensation methods
- Research

Specifications:

Diameter of insert: 18.6 cm

Diameter of line sources: ~ 1 mm

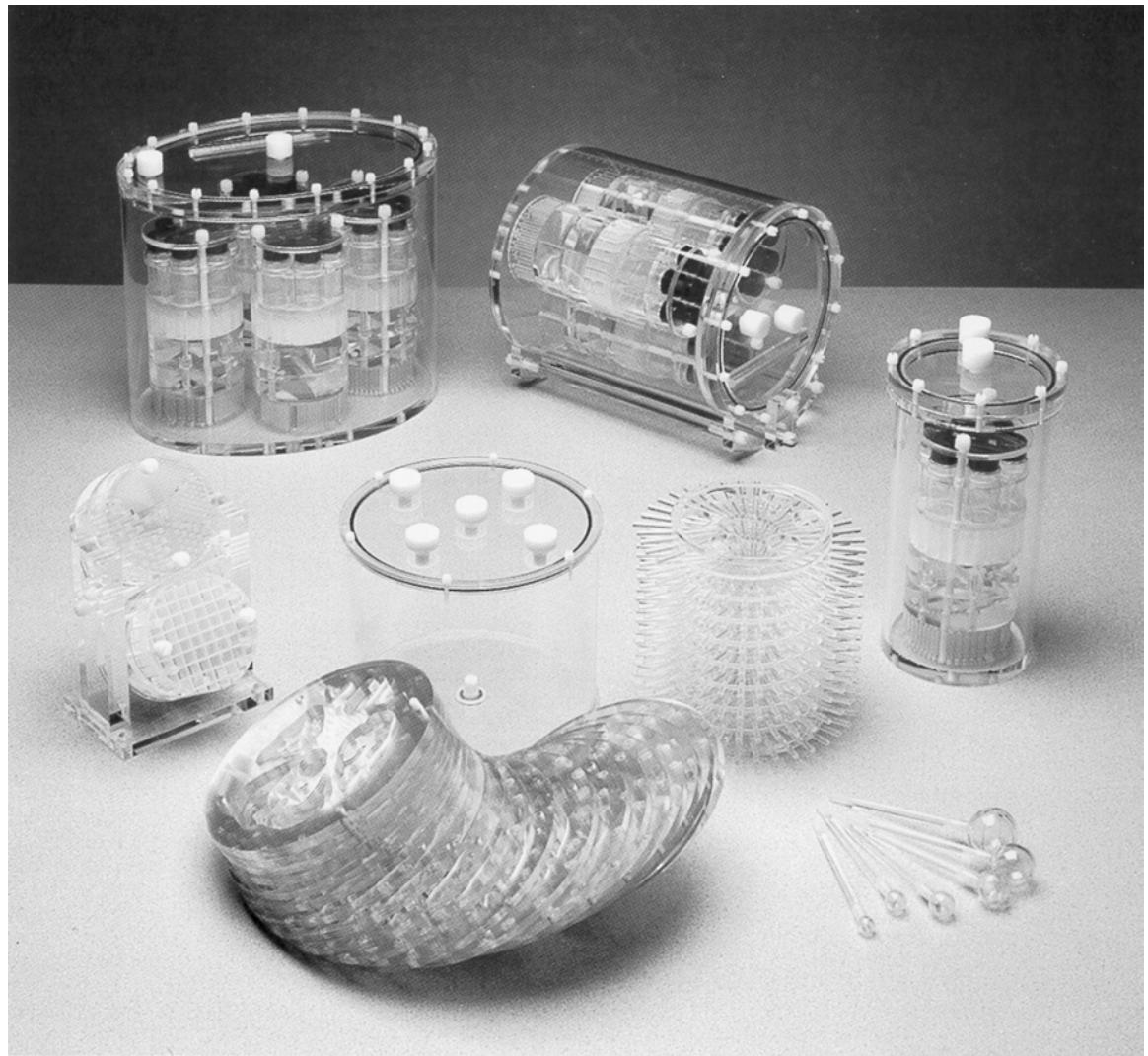
Spacing of line sources: 7.5 cm

Useful height of line sources: 7 cm



Triple Line Insert™ shown mounted
inside Flanged Circular ECT Cylinder™

Also Available



High Quality MRI Phantoms

- **Quality Assurance**
- **Acceptance Testing**
- **Research Studies**



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