Myocardial perfusion SPECT is a widely-used, non-invasive method for the diagnosis and management of patients with coronary disease. However, non-uniform photon attenuation, Compton scatter, limited and depth-dependent spatial resolution, as well as image noise, limit the ability of SPECT to obtain images that reliably represent the true tracer distribution. The non-uniform attenuation of the thorax is the most significant factor limiting the diagnostic efficacy of myocardial SPECT.

The currently used attenuation, scatter and resolution correction methods are suboptimal, since they do not provide improvement in the 25% false-negative findings in a group of about 100 patients with luminal diameter stenoses of at least 50%. Furthermore, the ability to detect multivessel disease was 70% without and 47% with corrections. This finding implies that myocardial SPECT can seriously underestimate the extent of disease in high risk patients. On the other hand, the false-positive findings in the group with a low probability of coronary disease were reduced from 14% without corrections to 3% with corrections.

Obviously, further improvements in both hardware and software for myocardial SPECT are necessary before this important diagnostic technique can realize its full potential. These improvements must be carefully evaluated on realistic, anthropomorphic phantoms to improve results in clinical practice.
THE HEAD

The Head Phantom is based upon a standard head with a calvarial cut to insert or remove the brain shell easily. The nasal cavity and maxillary sinuses are filled with foam with a mass density of 0.23 g/cc.

ITEM NUMBERS
Striatal Phantom Head with Transparent Brain & Striatum...5220-RS900T

BRAIN SHELL

The brain shell has five compartments which can be filled separately: left and right nucleus caudate, left and right putamen, and the remainder of the brain. This allows different nucleus caudate to putamen ratios as well as different striatal to background ratios to be obtained; this also permits differences between left and right striatal activity to be examined.

ITEM NUMBERS
Transparent Brain Shell with Striatum..........................5220-RS901T

Livermore Organs

<table>
<thead>
<tr>
<th>Organs</th>
<th>Inert, Hole, Matrix</th>
<th>Solid, Active</th>
<th>Inert, Hollow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungs</td>
<td>N/A</td>
<td>5220-RS503A</td>
<td>N/A</td>
</tr>
<tr>
<td>Lymph Nodes(set of 3)</td>
<td>N/A</td>
<td>5220-RS506A</td>
<td>5220-RS506S</td>
</tr>
<tr>
<td>Liver &amp; Liver Envelope</td>
<td>5220-RS507H</td>
<td>5220-RS508A</td>
<td>5220-RS519S</td>
</tr>
<tr>
<td>(Liver only)</td>
<td>(Liver only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdominal Contents*</td>
<td>5220-RS510H</td>
<td>5220-RS511A</td>
<td>N/A</td>
</tr>
<tr>
<td>(*Replaces Liver and Liver Envelope)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fission-Product Organs

<table>
<thead>
<tr>
<th>Organs</th>
<th>Inert, Hole, Matrix</th>
<th>Solid, Active</th>
<th>Inert, Hollow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungs</td>
<td>5220-RS502H</td>
<td>5220-RS503A</td>
<td>N/A</td>
</tr>
<tr>
<td>Lymph Nodes(set of 3)</td>
<td>N/A</td>
<td>5220-RS506A</td>
<td>5220-RS506S</td>
</tr>
<tr>
<td>Thyroid</td>
<td>N/A</td>
<td>5220-RS543A</td>
<td>5220-RS543S</td>
</tr>
<tr>
<td>Liver</td>
<td>5220-RS507H</td>
<td>5220-RS508A</td>
<td>5220-RS519S</td>
</tr>
<tr>
<td>Kidneys (pair)</td>
<td>5220-RS530H</td>
<td>5220-RS531A</td>
<td>5220-RS532S</td>
</tr>
<tr>
<td>Stomach</td>
<td>5220-RS533H</td>
<td>5220-RS534A</td>
<td>5220-RS535S</td>
</tr>
<tr>
<td>Pancreas</td>
<td>5220-RS536H</td>
<td>5220-RS537A</td>
<td>5220-RS538S</td>
</tr>
<tr>
<td>Spleen</td>
<td>5220-RS539H</td>
<td>5220-RS540A</td>
<td>5220-RS541S</td>
</tr>
<tr>
<td>Small Intestine</td>
<td>5220-RS544H</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Large Intestine</td>
<td>5220-RS546H</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Pixy Body Phantoms

<table>
<thead>
<tr>
<th>Organization</th>
<th>Phantom Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparent Whole Body Phantom</td>
<td>0695-0001</td>
<td></td>
</tr>
<tr>
<td>Opaque Whole Body Phantom</td>
<td>0695-0002</td>
<td></td>
</tr>
</tbody>
</table>
HOLLOW SPHERE SETS (6)™

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

ITEM MEASUREMENTS
- 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

ITEM NUMBER
Hollow Sphere Sets (6)™.................................................. 5250-0160

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

<table>
<thead>
<tr>
<th>OD (mm)</th>
<th>ID (mm)</th>
<th>OD (cm)</th>
<th>OD (inches)</th>
<th>Measured volume (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.89</td>
<td>9.89</td>
<td>1.2</td>
<td>.468</td>
<td>0.5 mL</td>
</tr>
<tr>
<td>14.43</td>
<td>12.43</td>
<td>1.4</td>
<td>.568</td>
<td>1.0 mL</td>
</tr>
<tr>
<td>17.69</td>
<td>15.43</td>
<td>1.8</td>
<td>.696</td>
<td>2.0 mL</td>
</tr>
<tr>
<td>21.79</td>
<td>19.79</td>
<td>2.2</td>
<td>.858</td>
<td>4.0 mL</td>
</tr>
<tr>
<td>26.82</td>
<td>24.82</td>
<td>2.7</td>
<td>1.056</td>
<td>8.0 mL</td>
</tr>
<tr>
<td>33.27</td>
<td>31.27</td>
<td>3.3</td>
<td>1.310</td>
<td>16.0 mL</td>
</tr>
</tbody>
</table>

NEMA IEC PET BODY PHANTOM SET™

FEATURES
- The NEMA 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

APPLICATIONS
- Simulation of whole-body imaging especially using PET and camera-based coincidence imaging techniques
- Evaluation of reconstructed image quality in wholebody 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

ITEM MEASUREMENTS
- 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


ITEM NUMBERS
NEMA IEC Body Phantom Set™.............................................. 5250-0161
**NEMA PET SCATTER PHANTOM™**

**FEATURES**
- The NEMA Scatter Phantom™ 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.

**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.

**ITEM MEASUREMENTS**
- **Outside diameter:** 203 cm
- **Length:** 70 cm
- **Hole size:** 6.4 mm
- **Offset distance:** 4.5 cm
- **Line source insert:**
  - **Length:** 80 cm
  - **Inside diameter:** 3.2 mm
  - **Outside diameter:** 5 mm

**NEMA PET SENSITIVITY PHANTOM™**

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

**ITEM MEASUREMENTS**
- 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
  - **Innermost tube** (fillable polyethylene tubing):
    - **Inside Diameter:** 1 mm
    - **Outside Diameter:** 3 mm


**ITEM NUMBER**
- NEMA PET Sensitivity Phantom™ ........................................... 5250-0165

**ITEM NUMBERS**
- NEMA PET Scatter Phantom™ ........................................... 5250-0166
**NEMA SPECT TRIPLE LINE SOURCE PHANTOM™**

**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*
- Material clear is PMMA

**APPLICATIONS**
- Acceptance testing with NEMA standard
- Center-of-rotation error evaluation
- Evaluation of changes of radius-of-rotation on spatial resolution
- Quantitative evaluation of reconstruction filters and scatter compensation methods
- Research

**ITEM MEASUREMENTS**
- Cylinder Outside Diameter: 22.2 cm
- Cylinder Inside Diameter: 20.2 cm
- Cylinder Outside Height: 23.8 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. NU 1, National Electrical Manufacturers Association (NEMA), Washington, D.C., 2007

**ITEM NUMBERS**
NEMA SPECT Triple Line Source Phantom.......................... 5250-0179

---

RSD Phantoms

Turn to Page 134 for More Details
ACR SMALL FLANGELESS SPECT PHANTOM™

FEATURES
• For use with high spatial resolution SPECT systems.

APPLICATIONS
• 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 for small field of view dedicated cardiac SPECT systems (Camera Specific)

CYLINDER MEASUREMENTS
• Overall length: 23.0 cm
• Inside diameter: 14.0 cm
• Outside Diameter: 15.3 cm
• Wall thickness: .64 cm
• Inside length: 15.0 cm
• NEW Cylinder Twist and Lock Lid Design!
• Lid closure mechanism: Bayonet-style with Lock Screw to prevent accidental opening; O-ring seal

INSERT MEASUREMENTS
• Cold Rod diameters: 4.8, 6.4, 7.9, 9.5, 11.1 and 12.7 mm
• Height of cold rods: 4.0 cm

SPHERE MEASUREMENTS
• Solid sphere diameters: 6.4, 9.5, 12.7, 15.9, 19.1, and 25.4 mm
• Height above inside base plate: 7.85 cm
• Sphere circle pattern diameter: 9.7 cm
• Angular Spacing: 60°

ITEM NUMBERS
ACR Small Flangeless SPECT Phantom™.......................... 5250-0172
JASZCZAK STANDARD SPECT PHANTOM™

ECT phantoms with protruding flanged top and 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
- All clear material: PMMA
- Cylinder inside diameter: 21.6 cm
- Cylinder inside height: 18.6 cm
- Cylinder wall thickness: 3.2 mm

SPECIFICATIONS OF INSERT
- All clear material: PMMA
- Rod diameters: Vary with insert
- Height of rods: 8.8 cm
- Solid sphere diameters: Vary with inert
- Height of center of spheres from base plate: 12.7 cm

ITEM NUMBERS

Ultra Deluxe Jaszcak Phantom™ .................................................. 5250-0168
For use with ultra-high spatial resolution SPECT and PET systems.
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

Deluxe Jaszcak Phantom™ .......................................................... 5250-0167
For use with high to very high spatial resolution SPECT and PET systems.
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, 25.4, and 31.8 mm

Standard Jaszcak Phantom™ ..................................................... 5250-0157
For use with medium to high spatial resolution SPECT and PET systems.
Rod diameters: 6.4, 7.9, 9.5, 11.1, 12.7 and 19.1 mm
Solid sphere diameters: 12.7, 15.9, 19.1, 25.4, 31.8, and 38 mm

Follow us on Twitter
@CapintecInc
FLANGELESS DELUXE JASZCZAK SPECT PHANTOM™

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

**SPECIFICATIONS OF INSERT AND SPHERES**
- Rod diameters: 4.8, 6.4, 7.9, 9.5, 11.1 and 12.7 mm
- Height of rods: 8.8 cm
- Solid sphere diameter: 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

**ITEM NUMBERS**
Flangeless Deluxe Jaszczak Phantom™.......................... 5250-0169

MAMMOGRAPHIC ACCREDITATION PHANTOM

This phantom assures optimum imaging performance of your mammographic system by providing a baseline from which you can easily monitor your unit’s performance.

The Accreditation Phantom contains test objects which simulate malignancies and other small structures seen in the breast (microcalcifications, fibrils, and tumor-like masses). All the test objects are contained in a single wax block which is enclosed in an acrylic base.

This phantom is designed to simulate a 4.0 to 4.5 cm compressed breast. Included with each phantom is a 4 mm acrylic disk for making density difference measurements as required by the American College of Radiology (ACR)

**SPECIFICATIONS**
- **Test Objects:**
  - (5) Simulated Microcalcifications
  - (6) Nylon Fibrils
  - (5) Tumor-like Masses
  - (1) 4 mm Acrylic Disk

**ITEM MEASUREMENTS**
- **Dimensions:** 1.75" x 4" x 4.25" (4.5 x 10.2 x 10.8 cm)
- **Weight:** 1.2 lbs. (0.55 kg)

**ITEM NUMBERS**
Mammographic Accreditation Phantom .......................... 0695-0128
CONTRAST-DETAIL PHANTOM (CDRAD 2.0)

Most definitions of image quality in radiology are based on characterizing the psychical properties of the image chain. However, medical diagnosis is not made by the image alone, also the perception by the observer is crucial for the result. A test of the observers perception is possible with so called Contrast-Detail (CD) phantoms. With a CD-phantom it is possible to quantify both, details and contrasts, as observed by the radiologist.

The CDRAD 2.0 phantom can be used within the entire range of diagnostic imaging systems, such as fluoroscopy and digital subtraction angiography.

Construction

The CDRAD phantom consists of a plexiglass tablet with cylindrical holes of exact diameter and depth (tolerances: 0.02 mm).

Together with additional plexiglass tablets, to simulate the dimensions of the patient, the radiographic image of the phantom gives information about the imaging performance of the whole system (refs. 1 and 2).

The image shows 225 squares, 15 rows and 15 columns. In each square either one or two spots are present, being the images of the holes. The first three rows show only one spot, while the other rows have two identical spots, one in the middle and one in a randomly chosen corner (fig. 1).

The optical densities of the spots are higher as compared to the uniform background.

Due to the (exponentially) increasing depth of the holes in horizontal direction, the image shows 15 columns of spots with increasing contrast. In the vertical direction the diameter of the holes increases stepwise and exponentially from 0.3 to 8.0 mm. For the image this means 15 rows of spots with increasing spatial resolution.

Evaluation

For evaluation of the phantom image the observer indicates the location of the second spot in each square. Correct indication proves that a contrast is really seen. At the transition from visible to invisible it is difficult to decide in which corner the second spot is located and the response equals pure chance. The line connecting the central spots with smallest visible diameter and contrast is called the Contrast-Detail (CD) curve.

For comparison of the imaging performance of different systems, phantom images are made under identical conditions and evaluated by the same observer and at the same time. The better system will produce an image in which smaller contrasts and details are visible. This results in a shift of the CD-curve to the lower left part of the image (see fig. 2).

Comparison of the performance of several observers is also possible. The better performing observer produces a CD-curve more to the lower left part of the image.

After some experience one tends to memorize the positions of the corner spots. Therefore, to avoid this, four versions are available upon request.

ITEM NUMBERS

Contrast-Detail Phantom (CDRAD 2.0) ........................................ 0695-0118

References

Most definitions of image quality in radiology are based on characterizing the psychical properties of the image chain. However, medical diagnosis is not made by the image alone, also the perception by the observer is crucial for the result. A test of the observers perception is possible with so called Contrast-Detail (CD) phantoms. With a CD-phantom it is possible to quantify both, details and contrasts, as observed by the radiologist.

The CD DISC 2.0 phantom is especially designed for the evaluation of fluoroscopes.

**Construction**

The CD DISC phantom consists of a plexiglass tablet with cylindrical holes of exact diameter and depth (tolerances: 0.02 mm).

Together with additional plexiglass tablets, to simulate the dimensions of the patient, the radiographic image of the phantom gives information about the imaging performance of the whole system (refs. 1 and 2).

The image shows 240 curved segments. These segments are formed by 16 concentric rings divided by 15 rays from the center of the rings. In each segment one spot is present, in a randomly chosen corner, being the images of the hole (fig. 1).

The optical densities of the spots are higher as compared to the uniform background.

Due to the (exponentially) increasing depth of the holes in clockwise direction, (from 0.3 to 8.0 mm) the image shows 15 disc-segments of spots with increasing contrast. From the center towards the edge the diameter of the holes increases stepwise and exponentially from 0.3 to 8.0 mm. For the image this means 16 rings of spots with increasing spatial resolution.

**Evaluation**

For evaluation of the phantom image the observer indicates the location of the spot in each square. Correct indication proves that a contrast is really seen. At the transition from visible to invisible it is difficult to decide at which position the spot is located and the response equals pure chance. The line connecting the spots with smallest visible diameter and contrast is called the Contrast-Detail (CD) curve.

For comparison of the imaging performance of different systems, phantom images are made under identical conditions and evaluated by the same observer and at the same time. The better system will produce an image in which smaller contrasts and details are visible. This results in a shift of the CD-curve to the lower left part of the diagram / graph (see fig. 2).

Comparison of the performance of several observers is also possible. The better performing observer produces a CD-curve more to the lower left part of the diagram.

**ITEM NUMBERS**

Contrast-Detail Phantom (CD DISC 2.0) ........................................... 0695-0119

**References**

ANTHROPOMORPHIC PHANTOMS

Anthropomorphic Phantoms... Ideal Substitute Patients for Teaching/Training Radiologic Technologists

- Permit unlimited repetitions of most views...patients cannot be used for this...
- Demonstrate effects of changing technical factors...
- Provide valid feedback to evaluate trainee performance...
- Because the same phantom can be used year after year, performance norms can be derived to guide training procedures...

Human Skeletal Architecture Is Duplicated More Realistically with Capintec Skeletons Than With Cadaveric Skeletons

Soft-tissue molds and skeleton molds are matched for anatomic fidelity.

The skeletons meet radiation interaction properties of both cortical bone and spongiosa as standardized by the International Commission on Radiation Units and Measurements. Many cadaveric human skeletons do not...especially when dried out for their preparation.

PIXY THE ANTHROPOMORPHIC TRAINING/TEACHING PHANTOM

- An anatomically and radiologically correct female
- Small size and low weight simplify positioning
- Permits evaluation of student performance
- Organs accept contrast media
- Opaque or transparent

PIXY was designed specifically for training radiologic technologists. PIXY is 5 ft. 1 in. (156cm) tall and weighs 105 lbs (48kg). She is repeatable, virtually indestructible, and a convenient substitute for patients.

PIXY is made of tissue-equivalent materials and has life-like articulations. Students have no difficulty in maneuvering PIXY into most desired positions.

PIXY is used to demonstrate anatomy and evaluate positioning and imaging techniques, including kVp, mAs, contrast, optical density, OFD and TFD. Radiographs of PIXY are optically equivalent in density and contrast to human patients.

PIXY permits unlimited exposures and tolerates trainee errors.

Pixy... Opaque Phantom
**PIXY Anatomy**

PIXY shoulders have ball and socket joints, elbows and knees flex 90° to 100°. Hips flex 130° with 30° hyperextension.

A “frog position” is made possible by lateral flexion at the hips. The right hand is molded with fingers positioned for an AP view, while the left hand is in an oblique-lateral position. The left foot is in full plantarflexion, the right foot is in a neutral position.

C1, C2, C6 and C7 were converted to mechanical nylon joints because educators in the field prefer full positioning capabilities for the head. The design permits the remaining neck vertebrae to be fixed in a normal position, while assuring a full range of head motion.

PIXY contains abdominal and pelvic organs: stomach, gall bladder, urinary bladder, kidneys, rectum and sigmoid flexure. These are air-filled, but accept water or contrast media and can be easily flushed after use. Custom fractures and custom pathologies are optional.

**PIXY Materials**

**Skeletons**- Skeletons are in continuous production, so prompt shipments are routine. Nevertheless, human skeletons are available for users who desire them. There is a surcharge to cover the high cost of scarce natural skeletons and for added labor needed to rework them to fit PIXY molds.

The matching of skeletons and soft-tissues permits external and bony landmarks to coincide. The position of bones within the soft tissues is anatomically correct.

The detail cast into skeletons is considered a triumph of the sculptural moldmaker’s craft. The skull, for example, has frontal and sphenoidal sinuses, ethmoidal and mastoid air cells and the auditory ossicles. Bone sutures are radiographically visible.

**Soft Tissues**- PIXY is available in opaque or transparent tissue-equivalent materials. The transparent PIXY has visible organs and skeleton except at the hips, knees and elbows, which are opaque because, as on the opaque PIXY, latex coverings are needed to retain tissue-equivalent gels for soft-tissue continuity at these articulations. Two-ply coverings protect against gel leakage.

**Lungs**- Standard PIXY lungs are molded of tissue-equivalent foam with the mass density of inflated human lungs (0.30 g/cc). They are connected to the oro-nasal cavity by the stem bronchi and trachea. The oro-nasal pharynx is filled with a nearly air-equivalent foam.

Optional animal lungs, which duplicate the intricate detail of the vascular trees, are available. These lungs are fixed in the inflated state and molded to confirm to the pleural cavities of the phantom. The pulmonary arteries are injected with a blood-equivalent plastic. In addition, low, medium or high contrast material may be selected by the user.

**Refurbishment**- Capintec offers a PIXY refurbishment service which, after wear and tear from usage over an extended period of time, restores PIXY to its original condition. This service includes repair of minor bone fractures of hands and feet. Quotes are furnished upon request for more extensive damage.

**ITEM NUMBERS**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIXY</td>
<td>0695-0001</td>
</tr>
<tr>
<td>PIXY- Transparent</td>
<td>0695-0002</td>
</tr>
<tr>
<td>Actual Lungs</td>
<td>0695-0003</td>
</tr>
<tr>
<td>Custom Fractures &amp; Pathologies</td>
<td>0695-0004</td>
</tr>
<tr>
<td>Standard Pixy Refurb</td>
<td>0695-0005</td>
</tr>
</tbody>
</table>
SECTIONAL PHANTOMS

Anthropomorphic Body Sections With Applications Throughout The Field of Radiography

Sectional phantoms, with the anatomic and radiofidelity of PIXI, are used widely in teaching/training, with many other applications. They represent an average male 5 ft. 9 in. tall (175cm) with a weight of 162 lbs (74kg). They are rugged, easily transported and shatter-proof.

Sectional phantoms do not replace simple geometric phantoms that are used to evaluate individual characteristics of an imaging system. They provide comprehensive evaluation of the imaging system and imaging techniques under realistic conditions. Typical applications are the same as PIXI.

---

ITEM NUMBERS

<table>
<thead>
<tr>
<th>Organs</th>
<th>Opaque</th>
<th>Transparent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head with Complete Cervical Spine</td>
<td>0695-0006</td>
<td>0695-0007</td>
</tr>
<tr>
<td>Head without Cervical Spine</td>
<td>0695-0008</td>
<td>0695-0009</td>
</tr>
<tr>
<td>Head w/o Cervical Spine + a 5 Stepwedge and Test Pattern</td>
<td>0695-0010</td>
<td>0695-0011</td>
</tr>
<tr>
<td>Thorax</td>
<td>0695-0012</td>
<td>0695-0013</td>
</tr>
<tr>
<td>Pelvis</td>
<td>0695-0014</td>
<td>0695-0015</td>
</tr>
<tr>
<td>Hand/Wrist; natural position</td>
<td>0695-0016</td>
<td>0695-0017</td>
</tr>
<tr>
<td>Hand/Wrist; oblique position</td>
<td>0695-0018</td>
<td>0695-0019</td>
</tr>
<tr>
<td>Foot/Ankle; natural position</td>
<td>0695-0020</td>
<td>0695-0021</td>
</tr>
<tr>
<td>Foot/Ankle; oblique position</td>
<td>0695-0022</td>
<td>0695-0023</td>
</tr>
<tr>
<td>Knee; natural position</td>
<td>0695-0024</td>
<td>0695-0025</td>
</tr>
<tr>
<td>Knee (90 flexion)</td>
<td>0695-0026</td>
<td>0695-0027</td>
</tr>
<tr>
<td>Elbow; natural position</td>
<td>0695-0028</td>
<td>0695-0029</td>
</tr>
<tr>
<td>Elbow; 90 flexion</td>
<td>0695-0030</td>
<td>0695-0031</td>
</tr>
<tr>
<td>Complete Arm/Shoulder; natural position</td>
<td>0695-0032</td>
<td>0695-0033</td>
</tr>
<tr>
<td>Complete Leg/Hip; natural position</td>
<td>0695-0034</td>
<td>0695-0035</td>
</tr>
</tbody>
</table>
IB-10 KYOTO
BRAIN PHANTOM
Additional Geometric Test Objects

Identical to the IB-20 brain phantom, the IB-10 offers additional geometric test objects: six isolated compartments, and resolution test objects of 6, 8, 10, 12, 14, 16 mm diameter.

ITEM NUMBERS
IB-10 Brain Phantom........5230-0052

PH-24
MYOCARDIAL PHANTOM

This is the cardiac muscle phantom for PECT in Nuclear Medicine. This provides the experiment how the high integrated IR in the liver effects the SPECT image of the cardiac muscle. The cold defect can be set in the left cardiac muscle. This structure allows the phantom to create the background in each the lung field, the mediastinum and the cardiac right ventricle.

SPECIFICATIONS
• Material: Acrylic

ITEM MEASUREMENTS
• Dimensions: 11.8" x 7.8" x 8.2" (h) (300 x 200 x 210 mm)

ITEM NUMBERS
PH-24 Myocardial Phantom.................................5230-0147

IB-20 KYOTO
BRAIN PHANTOM
Simulates Cerebral Blood Flow

Made of high-quality acrylic, the IB-20 brain phantom simulates regional cerebral perfusion studies, with correct representation of gray and white matter. The IB-20 may be used to verify integrity of both SPECT and PET systems. Useful for both QC and teaching.

SPECIFICATIONS
• Brain activity distribution: 1.97" (5 cm) thick

ITEM DIMENSIONS
• Dimensions: Skull container: 3.94" h x 8.07" w x 6.10" d (10 x 20.5 x 15.5 cm)

ITEM NUMBERS
IB-20 Brain Phantom......................................................5230-0051

CAPTUS NECK PHANTOM
FOR THYROID UPTAKES

The CAPTUS neck phantom is made of clear Lucite designed to represent a patient's neck. The phantom has a two part insert that allows counting in a bottle or vial, as well as capsule counting. The unit is etched to show where the caliper of the thyroid probe should be placed for proper alignment. The phantom allows for placement in a vertical or horizontal position. This phantom meets all suggested requirements for use in counting a thyroid uptake standard source.

ITEM NUMBERS
CAPTUS Neck Phantom..................................................5230-0038

Digital Catalog and Literature Downloads
CD PHANTOM FOR MAMMOGRAPHY
(CDMAM 3.4)

In mammography it’s essential that objects with very small contrast and diameter can be distinguished. Therefore the quality of the technical aspects of the mammography equipment should be monitored at regular time-intervals. Usually this is performed by measurement of the physical parameters of the X-ray equipment, screen-film combination, developing process and observation conditions. The main item in quality control however should be the assurance of information transfer from the tissue under examination to the radiologist. Therefore the information content of an image should be monitored.

The CDMAM 3.4 is specially developed to facilitate the evaluation of mammography systems, i.e. detecting very low contrast and very small details.

With the phantom the "threshold contrast" as a function of the object diameter can be determined and plotted in a Contrast-Detail curve.

Construction

The CDMAM phantom consists of an aluminum base with gold discs of various thickness and diameter. The aluminum base is attached to a plexiglass (PMMA) cover. Under normal mammography-radiation conditions (Mo anode, 30 mm Mo filter, 28 kV) the aluminum base and plexiglass cover together has a equivalent plexiglass thickness of 10 mm. The phantom is delivered with 4 PMMA plates of each 10 mm thickness. Every plate has an engraved marker with lead inlet for identification.

The gold discs are arranged in a matrix of 16 rows by 16 columns. Within a row the disc diameter is constant, with (partly) logarithmic increasing thickness (see specifications) and within a column the thickness of the discs is constant and the diameter increases logarithmic.

Each square contains two identical discs (same thickness, same diameter), one in the center and one in a randomly chosen corner. Easily recognizable patterns have been avoided.

The total matrix is rotated by 45 degrees and the corners of the matrix are skipped. This is done for 2 reasons, getting a better focus on the interesting part (low contrast, small diameter) and making the recognition of the patterns more difficult.

Measurements

To make an X-ray image, the CDMAM phantom (in combination with one or more plexiglass plates) should be positioned on the bucky with the smallest disc diameters at the thorax side.

After the film has been processed, the density of the film should be checked. In a series of CD-images, all the images should have approximately the same densities in a reference position on the film.

After this preprocessing, the following measurements are possible:

• Comparison of image quality with various film-screen combinations
• Optimization of digital mammography systems
• Determination of the optimum background density, by variation of this density
• Determination of the optimum exposure technique, e.g. by variation of the tube potential
• Comparison of image quality at various thickness, by
variation of the amount of plexiglass at a fixed density

**SPECIFICATIONS**

- **Base:**
  - Material: Aluminum (99.5%)
  - Thickness: 0.5 mm
  - Size: 180 x 240 mm (mammography film size)

- **Gold discs:**
  - Material: Gold (99.9999%)
  - Thickness: 0.03 .. 2.00 mm (16 exponential steps) contrast range 0.5 - 30% under standard conditions*
  - Diameter: 0.06 .. 2.0 mm (16 exponential steps)

- **Cover:**
  - Material: PMMA
  - Thickness: together with base, under standard conditions 10 mm plexiglass equivalent
  - Size: 180 x 240 mm
  - Grid: silkscreen printed with X-ray contrasting paint.

- **Plexiglas plates (4):**
  - Material: PMMA
  - Thickness: 10 mm
  - Size: 180 x 240 mm
  - Markers: identification markers with lead inlet

- **Every phantom is delivered with a reference photo, made under the following standard conditions*:**
  - Tube: Mo anode with 30 mm Mo filter
  - Potential: 28 kV
  - Focal spot: large (IEC-grade 0.3)
  - Grid: present
  - Exposure time: resulting in D ~1.2 O.D. + base and fog
  - Compression plate: present

**ITEM NUMBERS**

CD Phantom for Mammography (CDMAM 3.4) ......................... 0695-0120

The CDMAM 3.4 phantom is a result of the project: "Quality Assurance in Mammography, Department of Radiology, University Medical Centre Nijmegen, (St. Radboud), the Netherlands."


---

**DIGITAL MAMMOGRAPHIC PHANTOM**

The Digital Mammography Phantom is a small version of the Mammographic Accreditation Phantom. The Phantom is used for monitoring digital mammography systems currently used for stereotactic biopsy and localization.

The wax insert of the phantom is 5 x 5 cm and contains simulated microcalcifications, nylon fibrils and tumor-like masses. These are identical to the test objects in the Mammographic Accreditation Phantom, except the two largest fibers, microcalcification groups and masses are omitted. The largest simulated microcalcification and tumor-like masses are the image requirement for Screen Film accreditation. The second nylon fibril is the accreditation requirement.

An 8x8 cm acrylic adapter with a cutout for placement of the 5x5 cm wax insert allows users to use the standard base (supplied with the phantom).

**SPECIFICATIONS**

- **Test Objects:**
  - (3) Simulated Microcalcifications
  - (4) Nylon Fibrils
  - (3) Tumor-like Masses

**ITEM MEASUREMENTS**

- **Dimensions:** 1.75” x 4” x 4.25” (4.5 x 10.2 x 10.8 cm)
- **Weight:** 1.2 lbs. (0.55 kg)

Digital Mammography Phantom ........................................ 0695-0129
DIAGNOSTIC X-RAY PHANTOMS

JCAHO requires that x-ray exposure measurements be determined for commonly used projections in all radiographic suites. In order to provide this information when using Automatic Exposure Control (AEC) or Automatic Brightness Control (ABC) systems, specially designed phantoms must be used. Attenuating material must be used between the source and AEC or ABC detectors. Since these detectors are energy dependent, measurement of skin entrance exposure requires the use of patient-equivalent phantoms for meaningful results.

AAPM Report #31 recommends the use of four special phantoms for use in diagnostic x-rays. These acrylic and aluminum phantoms are patient equivalent, and are specifically designed to conform to the AAPM recommendations.

• Patient-equivalent acrylic and aluminum phantoms provide the necessary attenuation between the source and AEC or ABC detectors
• Helps you comply with JCAHO requirements for radiographic exposure measurements
• Easy-to-use

CHEST X-RAY PHANTOM

The Chest Phantom consists of four sheets of 25cm x 25cm x 2.54cm clear acrylic. One sheet of 25cm x 25cm x 1 mm and one sheet of 25cm x 25cm x 2mm type 1100 high-purity aluminum and spacers to provide a 5.08 cm air gap. Clinical testing of the phantom has shown it to be equivalent to a 23 cm patient for the PA chest projection.

ITEM MEASUREMENTS
• Weight: 17.5 lbs (8 kg)

ITEM NUMBERS
Chest X-Ray Phantom ................................................................. 0695-0180

ABDOMEN/LUMBAR SPINE PHANTOM

The Phantom consists of five sheets of 25cm x 25cm x 2.54 cm and one sheet of 25 cm x 25 cm x 5.08 clear acrylic to achieve a 17.78 cm thick phantom. In order to provide additional attenuation in the spinal region, a 7cm x 25cm x 4.5cm thick piece of high-purity aluminum is included.

ITEM MEASUREMENTS
• Weight: 37 lbs (17 kg)

ITEM NUMBERS
Abdomen/Lumbar Spine Phantom ............................................. 0695-0181

Phantoms conform to AAPM recommendations contained in Report #31, “Standardized Methods for Measuring Diagnostic X-Ray Exposure.”

These Phantoms are recommended in AAPM Report #60, "Instrumentation Requirements of Diagnostic Radiological Physicists."
SKULL X-RAY PHANTOM

The Skull Phantom has the same configuration as the Chest Phantom, but without the air gap. It consists of four sheets of 25cm x 25cm x 2.54 clear acrylic, one sheet of 25cm x 25cm x 1 mm and one sheet of 25cm x 25cm x 2mm high-purity alloy aluminum and a center sheet of 25cm x 25cm x 5.08 clear acrylic.

ITEM MEASUREMENTS
• Weight: 26.5 lbs (12 kg)

ITEM NUMBERS
Skull X-Ray Phantom........................................................................... 0695-0182

EXTREMITY X-RAY PHANTOM

The extremity Phantom consists of one 25cm x 25cm x 2 cm piece of high-purity alloy aluminum sandwiched between two sheets of 25cm x 25cm x 2.54 cm clear acrylic.

ITEM MEASUREMENTS
• Weight: 10 lbs (4.5 kg)

ITEM NUMBERS
Extremity X-Ray Phantom................................................................. 0695-0183

CT HEAD AND BODY DOSE PHANTOMS

Allows the user to calculate:
• Computed Tomography Dose Index (CTDI).
• Dose profile.

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

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

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

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

MEETS FDA PERFORMANCE STANDARDS!
• Component Weights: Body Phantom, 32 lbs, head phantom, 8 lbs
• CT Head Dose Phantom, with Five Plugs
• CT Body Dose Phantom, with five Plugs
• Storage and Carrying Case (Only available if head and body are purchased)

ITEM NUMBERS
CT Head Dose Phantom................................................................. 0695-0113
CT Body Dose Phantom................................................................. 0695-0114
CT PERFORMANCE PHANTOM

Meets guidelines in AAPM Report #1 for performance and quality assurance of CT scanners

This ONE phantom evaluates

- Noise
- Size dependence
- Spatial resolution
- Contrast scale
- Sensitivity (low contrast)

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

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

The phantom consists of an 8 1/2” diameter acrylic tank containing a beam-width insert, a spatial resolution and linespread block, a high-contrast insert and a means for inserting alignment pins and/or TLD holders. Additionally, a 1/4” thick Teflon band, positioned at the base of the tank and concentric to the 8” internal diameter, simulates human bone. Attached to the base of the tank is a low-contrast section with resealable cavities (from 1” to 1/8” diam.) which can be filled with a diluted dextrose or other appropriate solution to provide a low-contrast media. The optional External Resolution and Noise Ring slides snugly over the outside diameter of the tank, allowing whole-body scanner systems to be evaluated.

SPECIFICATIONS

- **Water Tank:** Made of acrylic 8 1/2 “ O.D x 8” I.D x 12 3/4” long. Resealable with fill and drain ports. Low-contrast detectability block is attached to base.
- **Linearity and Contrast Insert:** 7 1/2” O.D. x 2 1/2” long. Contains 1” diameter contrast pins of polyethylene, acrylic, polycarbonate, polystyrene, and nylon. Density values: polyethylene, 0.95 gm/cc, polystyrene, 1.05 gm/cc, nylon 1.10 gm/cc, acrylic 1.19 gm/cc, polycarbonate 1.20 gm/cc.
- **Beam Width Insert:** 7 1/2” O.D. x 3 1/2” long solid acrylic block. Has two each of the following: 2 1/4” deep cavities: 1”, 3/4”, 1/2”, 3/8”, 1/4”, 1/8” diameter spaced twice the appropriate diameter apart, one row of cavities on each side of the center line. Cavities with screw-locking sealing ports are easily filled with dextrose or sodium chloride solutions of various densities. The user may adjust densities to any value suitable for the scanner. Typically, 2% or 3% differentials in density between cavities are used.
- **Alignment Pin:** 0.25 O.D. x 3” long aluminum with tapped hold, allowing pin to be secured to cover plate.
- **TLD Insert:** 1/2” O.D. x 3 1/2” long polystyrene rod drilled 3” deep to accept TLD inserts. Resealable cavity. Tapped on other end to allow mounting to cover plate.
- **External (Whole-Body) Resolution and Noise Ring:** Annulus 12” O.D. x 8 1/2” I.D. x 2 1/2” long contains the same hole pattern as the Resolution Insert, at two locations 90° apart. Permits whole-body resolution and noise measurements when positioned on the main tank. Inner and outer resolution values are easily determined.

ITEM MEASUREMENTS

- **Dimensions:** 15 1/2” long x 6 1/2” diameter
- **Weight:** 17.25 lbs.

ITEM NUMBERS

CT Performance Phantom with Resolution Insert (to .4mm)............. 0695-0105
External (Whole-Body) Resolution & Noise Ring.......................... 0695-0107