## Model Numbers

| Model No. | Product Description |
|---|---|
| RS-800T | Heart/Thorax Phantom |
| RS-801 | Thoracic Cavity with the bottom plate |
| RS-802 | Perfusable Lungs with Styrofoam beads (pair) |
| RS-804 | Heart with two hollow defects in myocardial wall – standard size or to fit |
| RS-805 | Liver Shell ONLY |
| RS-806 | Chest Overlay |
| RS-807 | Removable Breast with set of tumors |

## Materials *See page 30 for more information.*

| RSD Soft Tissue | RSD Cortical Bone | RSD Trabecular Bone |
|---|---|---|
| • | • | • |

## Specifications

| Packing Size | Packing Weight |
|---|---|
| 86W x 79D x 48H cm | 32 kg |
| 34W x 31D x 19H in | 70 lb. |

**Publication References:** 1) Gallivanone F, Carne I, Interlenghi M, et al. A Method for Manufacturing Oncological Phantoms for the Quantification of 18F-FDG PET and DW-MRI Studies. Contrast Media Mol Imaging. 2017;2017:3461684. Published 2017 Sep 7. DOI: https://doi.org/10.1155/2017/3461684. 2) Heikkinen JO, Kuikka JT, Rautio PJ. Interdepartmental audit with an anatomically realistic lung phantom. Journal of Nuclear Medicine Technology. 2006 Mar;34(1):34-42. PMID: https://pubmed.ncbi.nlm.nih.gov/16517967. 3) Doshi N, Basic M, Cherry S. Evaluation of the Detectability of Breast Cancer Lesions Using a Modified Anthropomorphic Phantom. Journal of Nuclear Medicine, 39, 1951-7. 1998. PMID: https://pubmed.ncbi.nlm.nih.gov/9829588.

## Applications

Myocardial perfusion SPECT image quality evaluation

Attenuation corrections

Evaluating patient doses

Training for SPECT/PET imaging

Quantitative phantom for SUV validation

## Modalities

SPECT/PET

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# Thyroid Phantom

## Applications

I-131 therapy training

Thyroid uptake and scan quality assurance

SUV quantification and validation

## Modalities

SPECT/PET

## THYROID UPTAKE & IMAGE QUALITY ASSURANCE

The Thyroid Phantom is an integral part of the Fission-Product Phantom, but it can also be supplied separately (with or without a head). This phantom has the same contours as in the full Fission-Product Phantom and contains a neck with corresponding "Superhuman Skeleton" vertebrae, a hollow-shell thyroid with filling and flushing ports, and a front cover of tissue-equivalent phantom material. This assembly has been designed for rapid removal of the cover plate and thyroid, a quick fill with an isotope solution and an equally rapid reassembly. This permits work with iodines of very short half-lives. A portion of the clavicles and sternum are included to further enhance the realism of the phantom.

**Publication Reference:** Kramer GH, Olender G, Vlahovich S, Hauck BM, Meyerhof DP. Comparison of the ANSI, RSD, KKH, and BRMD thyroid-neck phantoms for $^{125}$I thyroid monitoring. Health Phys. 1996 Mar;70(3):425-9. DOI: https://doi.org/10.1097/00004032-199603000-00014. PMID: 8609037.

## Model Numbers

| Model No. | Product Description |
|---|---|
| RS-542 | Without Head |
| RS-545 | With Head and Cervical Spine |

## RSD Materials *See page 30 for more information.*

| RSD Soft Tissue | RSD Cortical Bone | RSD Trabecular Bone |
|---|---|---|
| • | • | • |

## Specifications

| Packing Size | Packing Weight |
|---|---|
| 36W x 36D x 36H cm | 5 kg |
| 14W x 14D x 14H in | 12 lb. |

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# RSD Materials

Soft Tissues: There are unlimited, small variations in density and absorption throughout the human body. Phantom soft tissue is closely controlled to have the average density of these tissues.

Skeletons: RSD skeletons are highly detailed polymer moldings which reproduce the shape, mass density and attenuation coefficients of cortical bone and spongiosa. RSD's proprietary moldings allow for continuous production, eliminate the restrictions of human skeleton bones (including limited availability, unethical collection of human bone specimen, variable size, and uncertain chemical composition), and avoid the loss of marrows in dried natural skeletons thereby making RSD skeletons superior to "real bone."

Molds: Molds for the RSD cortical bone and spongiosa were made from human skeletons consistent with the sizes of the soft tissue molds.

ICRU 44: RSD skeletons conform closely to the standards established by the International Commission on Radiation Units and Measurements (ICRU Report No. 44); mass density is reduced slightly to take into account a small decrease in calcium content for older patients.

## LINEAR ATTENUATION DATA

1. Monte Carlo simulation was used to calculate linear attenuation coefficients as a function of beam.
2. Monte Carlo results were validated with linear attenuation coefficients derived from Hounsfield Unit measurements at discreet energy levels.
3. RSD Phantom material linear attenuation data was compared to NIST data using ICRU Report 44 compositions of human tissues.
4. NIST data was interpolated when necessary.

| MATERIALS | DENSITY (g/cc) |
|---|---|
| RSD Soft Tissue (Opaque) | 1.08 |
| RSD Soft Tissue (Transparent) | 1.10 |
| RSD Cortical Bone | **1.83** |
| RSD Trabecular Bone | **1.17** |

| RSD SOFT TISSUE | | | | | |
|---|---|---|---|---|---|
| Energy (MeV) | Mean (HU) | Calculated (M) | μ (ICRU 44) | % Difference | Ratio |
| 00.08 | 60.30 | 0.1948 | 0.1932 | 0.0080 | 0.9921 |
| 00.10 | 52.88 | 0.1797 | 0.1795 | 0.0015 | 0.9985 |
| 00.12 | 57.10 | 0.1717 | 0.1709 | 0.0044 | 0.9956 |
| 00.14 | 52.95 | 0.1623 | 0.1624 | 0.0007 | 1.0007 |
| 00.20 | -- | 0.1477 | 0.1439 | 0.0261 | 0.9746 |
| 00.30 | -- | 0.1245 | 0.1246 | 0.0004 | 1.0004 |
| 00.60 | -- | 0.0950 | 0.0941 | 0.0101 | 0.9900 |
| 00.80 | -- | 0.0825 | 0.0826 | 0.0013 | 1.0013 |
| 01.00 | -- | 0.0744 | 0.0743 | 0.0018 | 0.9982 |
| 02.00 | -- | 0.0520 | 0.0519 | 0.0018 | 0.9982 |
| 03.00 | -- | 0.0351 | 0.0357 | 0.0171 | 1.0174 |
| 06.00 | -- | 0.0288 | 0.0291 | 0.0088 | 1.0088 |
| 08.00 | -- | 0.0252 | 0.0255 | 0.0098 | 1.0099 |
| 10.00 | -- | 0.0229 | 0.0232 | 0.0149 | 1.0151 |
| 15.00 | -- | 0.0203 | 0.0203 | 0.0015 | 0.9985 |
| 20.00 | -- | 0.0189 | 0.0189 | 0.0017 | 1.0017 |

| RSD CORTICAL BONE | | | | | |
|---|---|---|---|---|---|
| Energy (MeV) | Mean (HU) | Calculated (M) | μ (ICRU 44) | % Difference | Ratio |
| 00.08 | 1365 | 0.4345 | 0.4280 | 0.0151 | 0.9851 |
| 00.10 | 1048 | 0.3496 | 0.3562 | 0.0184 | 1.0188 |
| 00.12 | 0977 | 0.3211 | 0.3274 | 0.0191 | 1.0195 |
| 00.14 | 0902 | 0.2932 | 0.2986 | 0.0180 | 1.0184 |
| 00.20 | -- | 0.2511 | 0.2513 | 0.0009 | 1.0009 |
| 00.30 | -- | 0.2155 | 0.2137 | 0.0084 | 0.9916 |
| 00.60 | -- | 0.1596 | 0.1598 | 0.0011 | 1.0011 |
| 00.80 | -- | 0.1403 | 0.1402 | 0.0010 | 0.9990 |
| 01.00 | -- | 0.1274 | 0.1261 | 0.0106 | 0.9895 |
| 02.00 | -- | 0.0883 | 0.0885 | 0.0017 | 1.0017 |
| 03.00 | -- | 0.0611 | 0.0625 | 0.0229 | 1.0235 |
| 06.00 | -- | 0.0512 | 0.0525 | 0.0246 | 1.0253 |
| 08.00 | -- | 0.0468 | 0.0474 | 0.0120 | 1.0121 |
| 10.00 | -- | 0.0446 | 0.0444 | 0.0039 | 0.9962 |
| 15.00 | -- | 0.0410 | 0.0409 | 0.0016 | 0.9984 |
| 20.00 | -- | 0.0393 | 0.0397 | 0.0102 | 1.0103 |

| RSD TRABECULAR BONE (SPONGIOSA) | | | | | |
|---|---|---|---|---|---|
| Energy (MeV) | Mean (HU) | Calculated (M) | μ (ICRU 44) | % Difference | Ratio |
| 00.08 | 551 | 0.2849 | -- | -- | -- |
| 00.10 | 515 | 0.2586 | -- | -- | -- |
| 00.12 | 439 | 0.2337 | -- | -- | -- |
| 00.14 | 318 | 0.1541 | -- | -- | -- |