

# Body Section Phantoms

## SPECIALLY DESIGNED TEACHING & TRAINING AID FOR RADIOLOGICAL TECHNOLOGISTS

RSD's Body Section Phantoms provide a comprehensive evaluation of the imaging system and imaging techniques under realistic conditions. They are rugged, easily transported, and shatter-proof.

Available in opaque or transparent, RSD's Body Section Phantoms allow for tremendous flexibility with teaching and training. Each Body Section Phantom represents an average male 5 ft. 9 inc. tall (175 cm), with a weight of 162 lb. (74 kg).

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

### ARM & SHOULDER PHANTOM



#### Model Numbers

Model No.	Product Description
RS-122	Opaque
RS-122T	Transparent

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

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

RSD Soft Tissue	RSD Cortical Bone	RSD Trabecular Bone
•	•	•

#### Specifications

Packing Size	Packing Weight
91W x 30D x 41H cm	11 kg
36W x 12D x 16H in	25 lb.

### ELBOW PHANTOM



#### Model Numbers

Model No.	Product Description
RS-120	Opaque in Natural Position
RS-120T	Transparent in Natural Position
RS-121	Opaque with 90° Flexion
RS-121T	Transparent with 90° Flexion

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

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

RSD Soft Tissue	RSD Cortical Bone	RSD Trabecular Bone
•	•	•

#### Specifications

Packing Size	Packing Weight
25W x 25D x 25H cm	2 kg
10W x 10D x 10H in	5 lb.

## FOOT & ANKLE PHANTOM



### Model Numbers

Model No.	Product Description
RS-116	Opaque in Natural Position
RS-116T	Transparent in Natural Position
RS-117	Opaque in Plantar Flexion
RS-117T	Transparent in Plantar Flexion

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

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

RSD Soft Tissue	RSD Cortical Bone	RSD Trabecular Bone
•	•	•

### Specifications

Packing Size	Packing Weight
25W x 25D x 25H cm	1 kg
10W x 10D x 10H in	3 lb.

**Publication Reference:** Ichikawa K, Hara T, Urikura A, Takata T, Ohashi K. Assessment of Temporal Resolution of Multi-Detector Row Computed Tomography in Helical Acquisition Mode Using the Impulse Method. Original Paper, Vol. 31, Iss. 4, P374-381. 2015 Mar. DOI: <https://doi.org/10.1016/j.ejomp.2015.02.012>.

## HAND & WRIST PHANTOM



### Model Numbers

Model No.	Product Description
RS-114	Opaque in Natural Position
RS-114T	Transparent in Natural Position
RS-115	Opaque in Oblique Flexion
RS-115T	Transparent in Oblique Flexion

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

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

RSD Soft Tissue	RSD Cortical Bone	RSD Trabecular Bone
•	•	•

### Specifications

Packing Size	Packing Weight
25W x 25D x 25H cm	1 kg
10W x 10D x 10H in	3 lb.

## KNEE PHANTOM



### Model Numbers

Model No.	Product Description
RS-118	Opaque in Natural Position
RS-118T	Transparent in Natural Position
RS-119	Opaque with 90° Flexion
RS-119T	Transparent with 90° Flexion

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

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

RSD Soft Tissue	RSD Cortical Bone	RSD Trabecular Bone
•	•	•

### Specifications

Packing Size	Packing Weight
30W x 30D x 30H cm	5 kg
12W x 12D x 12H in	10 lb.

## LEG & HIP PHANTOM



### Model Numbers

Model No.	Product Description
RS-123	Opaque
RS-123T	Transparent

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

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

RSD Soft Tissue	RSD Cortical Bone	RSD Trabecular Bone
•	•	•

### Specifications

Packing Size	Packing Weight
112W x 30D x 30H cm	21 kg
44W x 12D x 12H in	47 lb.

## LUNG & CHEST PHANTOM

Developed in conjunction with the University of California, Irvine's Department of Radiological Sciences, RSD's Lung & Chest Phantom is specialized at providing a high degree of realism in chest radiography.

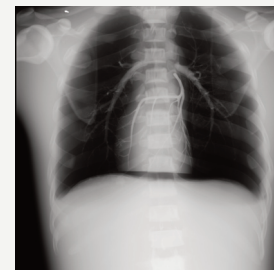
RSD materials are equivalent to natural bone and soft tissues. Animal lungs are selected to match the size of an adult male. Lungs are fixed in the inflated state and are molded to conform to the pleural cavities of the phantom. The pulmonary arteries are injected with a blood equivalent plastic. The Lung & Chest Phantom with simulated left coronary artery reveals several areas of coronary artery irregularity and narrowing.

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

RSD Soft Tissue	RSD Cortical Bone	RSD Trabecular Bone
•	•	

### Specifications

Packing Size	Packing Weight
51W x 51D x 51H cm	23 kg
20W x 20D x 20H in	50 lb.



### Model Numbers

Model No.	Product Description
RS-310	Permanently sealed diaphragm
RS-315	Permanently sealed diaphragm and left coronary artery
RS-320	Removable diaphragm lung pair insert without coronary artery
RS-330	Removable diaphragm lung pair insert with coronary artery

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

**Publication References:** 1) Seong Kim M, Lee J, Geun Kim S, Cheol Kweon D. Comparison of Radiation Dose and Image Quality with Various Computed-Tomography Scout Views: The Angular Modulation Technique Based on Information Calculated from Scout Views, Iranian Journal of Radiology, 14(1):e13477. 2017. DOI: <https://doi.org/10.5812/iranjradiol.35606>. 2) Zhong Y, Lai CJ, Wang T, Shaw CC. A dual-view digital tomosynthesis imaging technique for improved chest imaging. Med Phys. 2015 Sep;42(9):5238-51. DOI: <https://doi.org/10.1118/1.4928214>. PMID: 26328973; PMCID: PMC4537485. 3) Samei E, Majidi-Nasab N, Dobbins JT 3rd, McAdams HP. Biplane correlation imaging: a feasibility study based on phantom and human data. J Digit Imaging. 2012;25(1):137-147. DOI: <https://doi.org/10.1007/s10278-011-9392-z>.

## PELVIS PHANTOM



### Model Numbers

Model No.	Product Description
RS-113	Opaque
RS-113T	Transparent

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

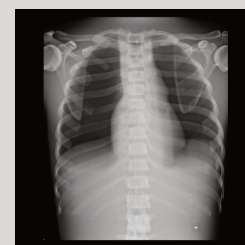
**Materials** See page 30 for more information.

RSD Soft Tissue	RSD Cortical Bone	RSD Trabecular Bone
•	•	•

### Specifications

Packing Size	Packing Weight
51W x 51D x 51H cm	25 kg
20W x 20D x 20H in	55 lb.

## THORAX PHANTOM



### Model Numbers

Model No.	Product Description
RS-111	Opaque
RS-111T	Transparent

Contact RSD or an authorized RSD Dealer for custom pathologies and traumas.

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

RSD Soft Tissue	RSD Cortical Bone	RSD Trabecular Bone
•	•	•

### Specifications

Packing Size	Packing Weight
112W x 30D x 30H cm	21 kg
44W x 12D x 12H in	47 lb.

**Publication References:** 1) Ding, X., Tan, W., Yang, S. et al. How table height influences image quality and radiation dose of chest CT scans with automatic exposure control: a phantom study?. Chin J Acad Radiol 3, 35-40 (2020). DOI: <https://doi.org/10.1007/s42058-020-00023-5>. 2) Zeng D, Huang J, Bian Z, et al. A Simple Low-dose X-ray CT Simulation from High-dose Scan. IEEE Trans Nucl Sci. 2015;62(5):2226-2233. DOI: <https://doi.org/10.1109/TNS.2015.2467219>. 3) Tonkopi E, Daniels C, Gale M, Schofield S, Sorhaindo V, Van-Larkin J. Local Diagnostic Reference Levels for Typical Radiographic Procedures. Canadian Association of Radiologists Journal, Volume 63, Issue 4, Pages 237-241. 2012. ISSN 0846-5371. DOI: <https://doi.org/10.1016/j.carj.2011.02.004>.

**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 discrete 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	1.18
RSD Trabecular Bone	1.17

RSD SOFT TISSUE					
Energy (MeV)	Mean (HU)	Calculated (M)	$\mu$ (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)	$\mu$ (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)	$\mu$ (ICRU 44)	% Difference	Ratio
00.08	551	0.2849	--	--	--
00.10	515	0.2586	--	--	--
00.12	439	0.2337	--	--	--
00.14	318	0.1541	--	--	--