SUN NUCLEAR
A MIRION MEDICAL COMPANY

Tissue-Equivalent Phantom for Mammography

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- Supports performance testing of mammographic systems
- Monitor image quality and dose performance with test objects embedded in breast tissue-equivalent materials

The Tissue-Equivalent Phantom for Mammography supports performance evaluation of mammographic imaging systems. The phantom incorporates embedded test objects including simulated microcalcifications, fibrous structures, and tumor masses spanning a range of sizes to enable system assessment across multiple levels of detection difficulty.

The tissue-equivalent materials are engineered to replicate the photon attenuation characteristics of various breast tissues. The average elemental composition is derived from the reported elemental compositions of adipose and glandular tissues as described by Hammerstein.[1]

Attenuation coefficients are calculated using the mixture rule in conjunction with the Photon Mass Attenuation and Energy Absorption Coefficient tables published by J. H. Hubbell[2], ensuring accurate and consistent representation of breast tissue attenuation.

The phantom's design methodology was developed by Dr. Panos Fatouros and colleagues at the Medical College of Virginia.[3, 4]

Key Benefits

- Tissue-equivalent materials simulate a realistic compressed breast shape
- Includes embedded simulated calcifications, fibrous ducts, and tumor masses as test objects

Specifications

Dimensions	18.5 x 12.5 x 4.5 cm (7.3" x 5" x 1.8")
Weight	0.7 kg (1.5 lbs)
Materials	Epoxy resin Background: BR5050 Adipose layer: BRFAT, 5mm layer Calcium Carbonate ($CaCO_3$)

References:

[1] Hammerstein R., Miller D., White D., et al; Absorbed Dose in Mammography; RADIOLOGY;130:485-491.

[2] Hubbell J.H.; INTERNATIONAL JOURNAL RADIATION ISOT; Vol. 33:1269-1290; 1982.

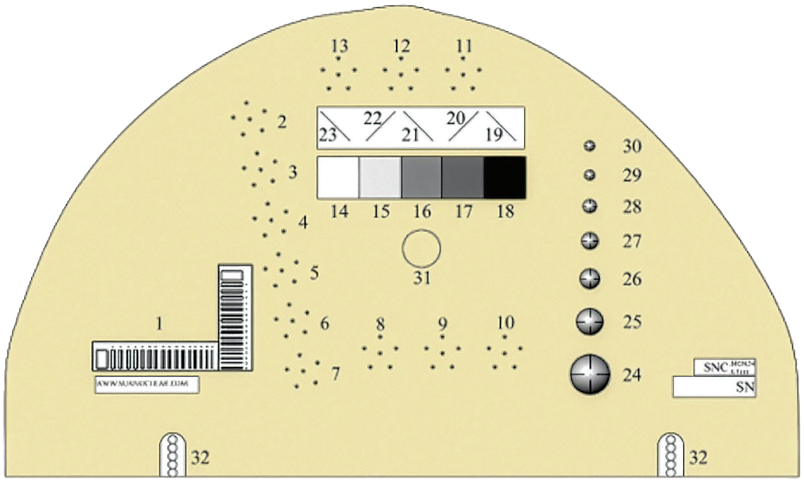
[3] Fatouros PP, Skubic S.E., Goodman H. The Development and Use of Realistically Shaped, Tissue-equivalent Phantoms for Assessing the Mammographic Process. Radiology, 1985 157(p):32.

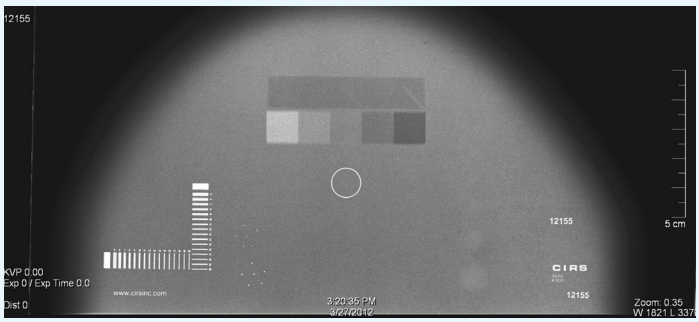
[4] Skubic S.E., Fatouros PP. Absorbed Breast Dose: Dependence on Radiographic Modality and Technique, and Breast Thickness. Radiology,1986, 161:263-270.

Tissue-Equivalent Phantom for Mammography

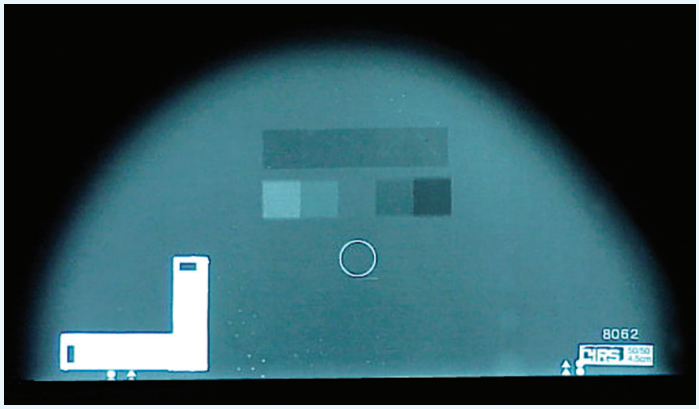
Supports performance evaluation of mammographic imaging systems

Location	Target	Details
1	Line Pair Target	5 to 20lp/mm (16 segments with 5 lines each: 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20)
2	$CaCO_3$ Specs	0.130 mm grain size
3	$CaCO_3$ Specs	0.165 mm grain size
4	$CaCO_3$ Specs	0.196 mm grain size
5	$CaCO_3$ Specs	0.230 mm grain size
6	$CaCO_3$ Specs	0.275 mm grain size
7	$CaCO_3$ Specs	0.400 mm grain size
8	$CaCO_3$ Specs	0.230 mm grain size
9	$CaCO_3$ Specs	0.196 mm grain size
10	$CaCO_3$ Specs	0.165 mm grain size
11	$CaCO_3$ Specs	0.230 mm grain size
12	$CaCO_3$ Specs	0.196 mm grain size
13	$CaCO_3$ Specs	0.165 mm grain size
14	Step Wedge, 1 cm thick	100% gland
15	Step Wedge, 1 cm thick	70% gland
16	Step Wedge, 1 cm thick	50% gland
17	Step Wedge, 1 cm thick	30% gland
18	Step Wedge, 1 cm thick	100% adipose
19	Nylon Fibers	1.25 mm diameter
20	Nylon Fibers	0.83 mm diameter
21	Nylon Fibers	0.71 mm diameter
22	Nylon Fibers	0.53 mm diameter
23	Nylon Fibers	0.30 mm diameter
24	Hemispheric Mass, 75% gland/25% adipose	4.76 mm height (radius)
25	Hemispheric Mass, 75% gland/25% adipose	3.16 mm height (radius)
26	Hemispheric Mass, 75% gland/25% adipose	2.38 mm height (radius)
27	Hemispheric Mass, 75% gland/25% adipose	1.98 mm height (radius)
28	Hemispheric Mass, 75% gland/25% adipose	1.59 mm height (radius)
29	Hemispheric Mass, 75% gland/25% adipose	1.19 mm height (radius)
30	Hemispheric Mass, 75% gland/25% adipose	0.90 mm height (radius)
31	Optical Density	Reference zone
32	Edge of Beam	Localization target: circular on superior surface, triangular on inferior surface.





CT Image



X-ray Image