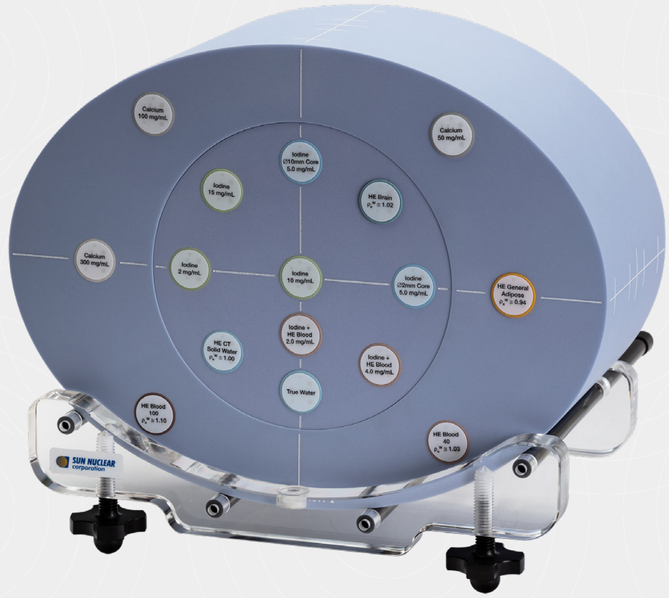
Multi-Energy CT Phantom

Comprehensive Testing, Tissue Equivalence

- Features 28 inserts representing different dimensions and concentrations of iodine, calcium, blood, adipose and other materials of particular interest to Multi-Energy CT (MECT)
- Enables comprehensive tests of Multi-Energy CT scanner performance
- Expanded range of HE Iodine and HE Calcium



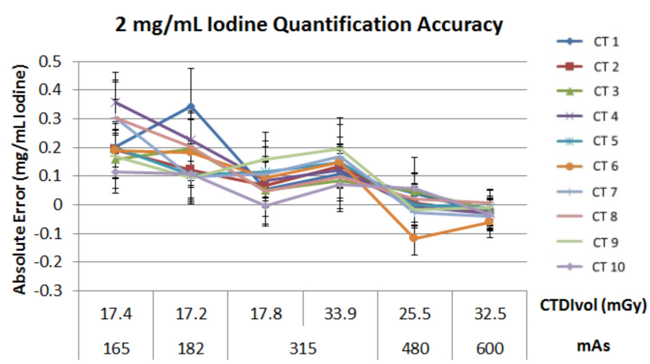
Multi-Energy CT scanners have enabled improved clinical differentiations, such as distinguishing blood from calcification and calcification from iodinated contrast.[1,2] They can also create virtual mono-energetic images for clinical evaluation. However, the ability to achieve these benefits depends not only on one's equipment, but on the protocols used.

Sun Nuclear's Multi-Energy CT Phantom enables robust evaluation of scanner performance.

- Test material discrimination using solid rods representing iodine, calcium, blood, adipose, and more
- Ensure the efficacy of clinical protocols for multi-energy analysis
- Verify the quantitative accuracy of multi-energy scans
- Compare the consistency and stability across different scanners
- Check for artifacts in an extended field-of-view
- Test in both head (20 cm) and body (40cm x 30 cm) configurations
- Enable automated analysis with patented rod marker technology

Ensure Accuracy

Scanner accuracy can vary based upon scanner hardware, the dual energy post-processing, and the mAs used. Without an appropriate phantom, neither scanner accuracy nor variability are well known. Use of our calibrated high-Z inserts enables such quantification. Additionally, protocols that appropriately balance patient dose with system performance can be identified.



2mg/mL iodine rod quantification accuracy by mAs for 10 fast-kVp switching Multi-Energy CT scanners. Accuracy averaged over a 1 year period.

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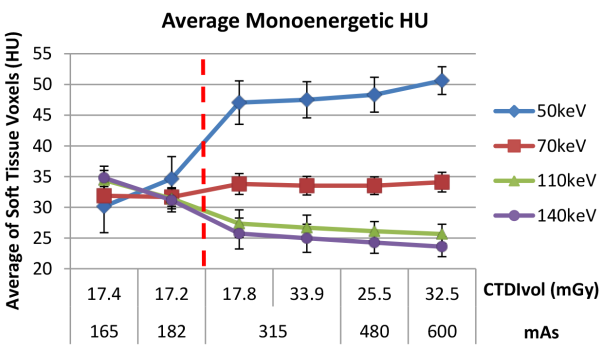
Automated analysis

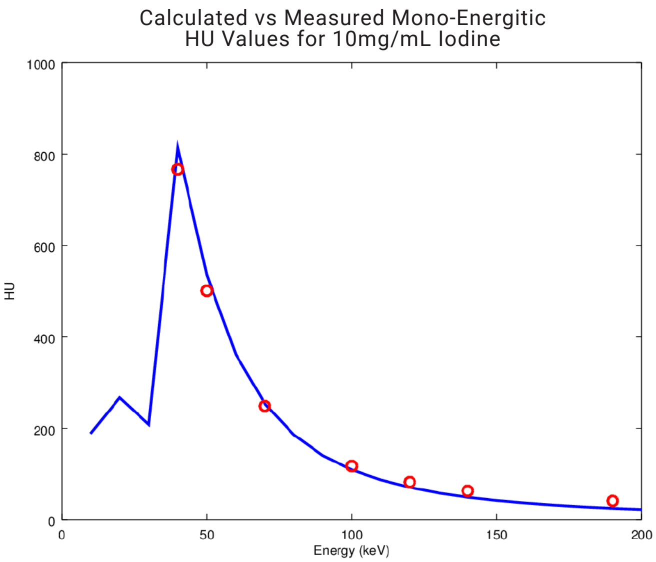
The Multi-Energy CT Phantom supports automated analysis using patented rod marker technology. Each insert is tagged with a pattern, making it uniquely identifiable in a CT scan. Upcoming software will leverage these identifiers to evaluate results quickly and with minimal user interaction.

Enhance confidence in your virtual mono-energetic images

Monochromatic HU numbers have been shown to vary between scanners.[3] Moreover, the performance of multi-energy algorithms can be compromised by insufficient mAs. By utilizing Tissue Mimicking Material that replicates expected HU dependencies from 40-200 keV, the Multi-Energy CT Phantom lets you quantify these effects and define effective operating parameters.



Average soft tissue monoenergetic HU for 50, 70, 110, and 140 keV reconstructions versus mAs, averaged over a 1 year period. Protocols left of the red dashed line were insufficient to provide reliable HU values.



HU values of iodinated rod for mono-energetic reconstructions. Calculated values based on material compositions and NIST values (blue curve) vs HU values from mono-energetic reconstructions (red circles).

Evaluate an extended field-of-view

The ACR Quality Control Manual recommends checking for artifacts in a larger phantom on a weekly or monthly basis. The 40 cm extended field size of the Multi-Energy CT Phantom enables this artifact check to be performed concurrently with other evaluations, efficiently fitting into your workflow.

Specifications

In-plane Dimensions:	40.0 cm (15.7 in) x 30.0 cm (11.8 in)
Depth:	16.5 cm (6.3 in), up to 26.5 cm (10.2 in) with extension plates
Diameter of Removable Head Section:	20.0 cm (7.87 in)
Material:	HE CT Solid Water®
Interchangeable Inserts:	27 solid inserts plus 1 true water container, each tagged with a CT-visible rod identification code
8 HE Iodine Inserts with Variable Concentrations:	Concentrations of 0.2, 0.5, 1.0, 2.0, 5.0, 10.0, 15.0, and 20.0 mg/mL
3 Iodine Inserts with Variable Diameters:	5.0 mg/mL concentration at diameters of 2.0, 5.0, and 10.0 mm
8 HE Calcium Inserts with Variable Concentrations:	Concentrations of 0, 5, 10, 20, 50, 100, 200, and 300 mg/mL
3 Blood [iron] Inserts:	Blood-mimicking material at relative electron densities of 1.03, 1.07, and 1.10
2 Blood [iron] with Iodine Inserts:	Blood-mimicking material plus iodine at 2.0 and 4.0 mg/mL
3 Tissue-Mimicking Inserts:	High-Equivalency Brain, High-Equivalency Adipose, High-Equivalency CT Solid Water
Weight:	15.5 kg (34.1 lbs)
Case:	Wheeled case is included
Stand:	Stand is included

DATA PROVIDED BY UT MD ANDERSON

[1] Nute JL, Jacobsen MC, Chandler A, Cody DD, Schellinghout D, Dual-Energy Computed Tomography for the Characterization of Intracranial Hemorrhage and Calcification: A Systematic Approach in a Phantom System. Invest Radiol. 2016; Jul 1

[2] Knoss N, Hoffman B, Krauss B, et al. Dual energy computed tomography of lung nodules: Differentiation of iodine and calcium in artificial pulmonary nodules in vitro. Eur J Radiology. 2011; 80(3): E516-519

[3] Mileto A, Barina A, Marin D, Stinnett S, Choudhury K, Wilson J, Nelson R Virtual monochromatic images from dual-energy multidetector CT: Variance in CT numbers from the same lesion between single-source projection-based and dual-source image-based implementations Radiology 2016 (in press)