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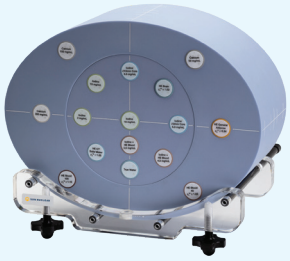
Phantoms for Photon-Counting CT Applications

Featured Reference Standards for the Photon-counting Era:
How Research Teams Worldwide Use Sun Nuclear Phantoms to Validate the Advances in CT

Quantitative and Spectral Accuracy

Multi-Energy CT Phantom



First clinical photon-counting CT (PCCT) characterization. Researchers at the University of Pennsylvania used the Sun Nuclear Multi-Energy CT Phantom to evaluate one of the first clinical PCCT scanners, demonstrating **precise, repeatable Hounsfield units across a wide dose range and a substantial reduction in electronic background noise** at ultra-low dose versus dual-energy CT. [1]

1. Liu LP, Shapira N, Chen AA, et al. First-generation clinical dual-source photon-counting CT: ultra-low-dose quantitative spectral imaging. Eur Radiol. 2022;32(12):8579-8587. doi.org/10.1007/s00330-022-08933-x

Potential to reduce iodine contrast. A 2025 abdomen-pelvis phantom study used the Sun Nuclear MECT Phantom to show that PCCT virtual monoenergetic images **significantly improved iodine contrast-to-noise ratio**, indicating a potential reduction of up to roughly 49% in the iodine contrast dose required. [2]

2. Dabli D, Pastor M, Faby S, et al. Photon-counting versus energy-integrating CT of abdomen-pelvis: a phantom study on the potential for reducing iodine contrast media. Eur Radiol Exp. 2025;9(1):36. doi.org/10.1186/s41747-025-00573-2

Ultra-low-dose and Pediatric Imaging

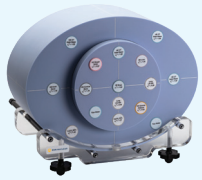
Pediatric ATOM® Phantom

Pediatric protocol optimization. Before scanning pediatric patients, a clinical team used the Sun Nuclear ATOM pediatric phantom to **develop and optimize an ultra-low-dose chest protocol** – subsequently achieving effective doses near 0.19 mSv with good-to-excellent lung image quality. [3]

3. Tsiflikas I, Thater G, Ayx I, et al. Low dose pediatric chest computed tomography on a photon counting detector system - initial clinical experience. Pediatr Radiol. 2023;53(6):1057-1062. doi.org/10.1007/s00247-022-05584-4

Radiotherapy and Proton Planning

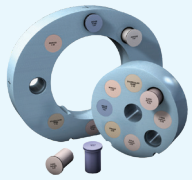
Advanced Electron Density Phantom



Material characterization for treatment planning. Using the Sun Nuclear Advanced Electron Density Phantom, investigators found PCCT estimated relative electron density, effective atomic number, and proton stopping-power ratio to within about 0.8%, comparable to dual-energy CT with reliable material differentiation. [4]

4. Lustermans D, Fonseca GP, Jeukens C, et al. Evaluating photon-counting computed tomography for quantitative material characteristics and material differentiation in radiotherapy. Phys Med Biol. 2025;70(10). doi.org/10.1088/1361-6560/add3ba

Electron Density Phantom



Proton stopping-power accuracy. Benchmarked against ion-chamber measurements with the Sun Nuclear SPR/Density Phantom, PCCT **predicted proton stopping-power ratios within about 1% for most tissue-equivalent inserts**, achieving the lowest overall error among the modalities compared. [5]

5. Huijskens S, van Straten M, Cambraia Lopes P, et al. Photon-counting computed tomography for stopping power ratio prediction in proton therapy. Med Phys. 2025;52(12): e70146. doi.org/10.1002/mp.70146

Proton Therapy Dosimetry Head

Anthropomorphic realism. In the field's flagship radiation-oncology journal, the Sun Nuclear anthropomorphic head-and-neck phantom was used to show that PCCT **produced tighter, more consistent tissue-characterization values** than dual-energy CT methods in a realistic, patient-like geometry. [6]

6. Zimmerman J, Poludniowski G. Assessment of photon-counting computed tomography for quantitative imaging in radiation therapy. Int J Radiat Oncol Biol Phys. 2024;121(5):1316-1327. doi.org/10.1016/j.ijrobp.2024.11.069

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Bibliographic data via PubMed; findings paraphrased from the cited peer-reviewed publications, each of which evaluated a photon-counting CT system using the Sun Nuclear phantom named.