Dual Energy Phantom V5

The phantom is specially designed for dual energy (DE) purposes and can be used for quality assurance, scanner performance and evaluation of different DE post-processing techniques.

Dual energy capabel CT devices offer the opportunity to distinguish between different tissues and materials in CT images of clinical interest. In particular, the focus is on Ca (-Hydroxyapatite) and Iodine (I).

The DEP-V5 is an easy to use phantom providing the opportunity to test CT-scanner performance and to evaluate different DE post processing techniques.

Therefore the phantom provides different virtual tissue equivalent lesions, partially enriched with Ca and Iodine.

Ca and Iodine enriched lesions appear on an equivalent HU level at a standard scan. The DE scan shows material separation to Ca and Iodine.

The DEP-V5 fits to our additionally available thorax phantom. Extension rings, to simulate obese patients are available, as well.
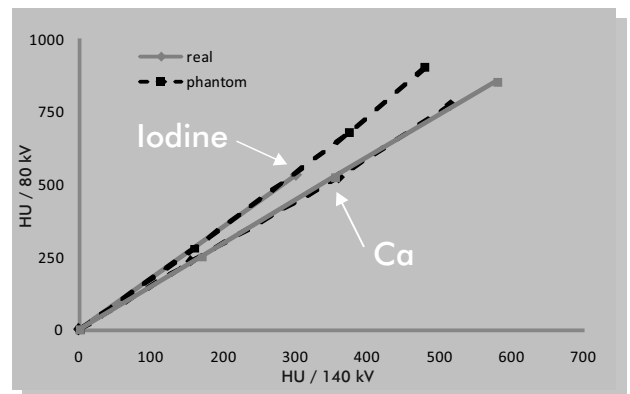
Specifications

Phantom diameter .... 100 mm
Phantom length .... 100 mm
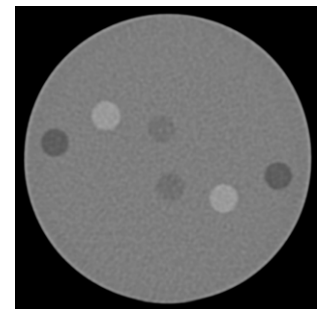Phantom weight .... 1.0 kg
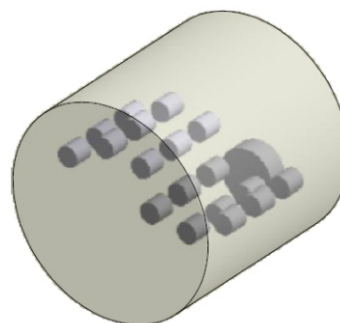
Material ...... CTWater® (0 HU @ 80 - 120 kV)
CTIodine® (solid iodine)
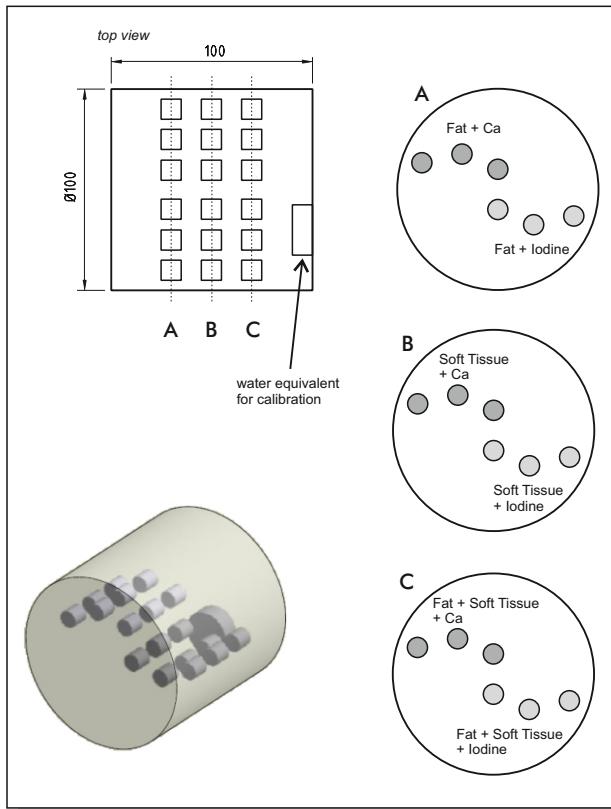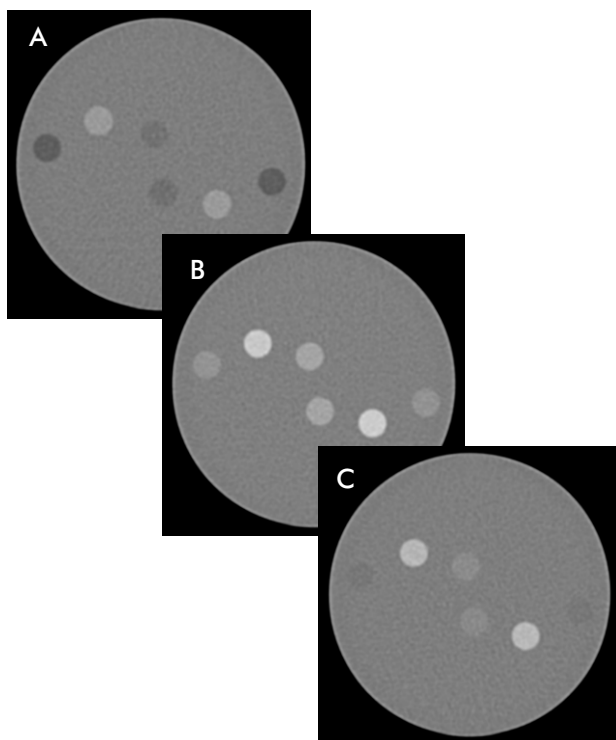CaHA (Ca^{++})

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The graph shows the correlation between real tissue and phantom material [1].

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Schematic view of the DE-Phantom

CT-Scan at 120 kV

Specifications of lesions

Dimensions of the cylindrical inserts:
    18 lesions .... Ø 10 mm / H 10 mm
    1 calibration cylinder ...... Ø 25 / H 10 mm

CT-values (HU) valid for 120 kV (± 5 HU)*:

Phantom body .... 0 HU at 80 - 140 kV*

Calibration cylinder (0 HU at 80 - 140 kV)*

Layer A   Fat + Ca^{++} / Iodine*
    • Fat -110/-100HU at 80/140kV
    • Fat + Ca 60HU at 120kV
    • Fat + Ca -50HU at 120 kV

    • Fat -110/-100HU at 80/140kV
    • Fat + I 60HU at 120kV
    • Fat + I -50HU at 120 kV

Layer B   Soft Tissue + Ca^{++} / Iodine*
    • Tissue 60/55HU at 80/140kV
    • Tissue + Ca 200HU at 120kV
    • Tissue + Ca 100HU at 120 kV

    • Tissue 60/55HU at 80/140kV
    • Tissue + I 200HU at 120kV
    • Tissue + I 100HU at 120 kV

Layer C   Fat + Soft Tissue + Ca^{++} / Iodine*
    • Fat + Tissue -28/-24 HU at 80/140 kV
    • Fat + Tissue + Ca 140 HU at 120 kV
    • Fat+ Tissue + Ca 30 HU at 120 kV

    • Fat + Tissue -28/-24 HU at 80/140 kV
    • Fat + Tissue + I 140 HU at 120 kV
    • Fat + Tissue + I 30 HU at 120 kV

*specified values. Eff. values can vary due to manufacturing method and imaging device!

References:

[1]   Schmidt B, Sedlmair M, et al. Assessment of a Quality Assurance Phantom for Dual Energy CT.
2009, in Proceedings of Radiological Society of North America (RSNA) 95th Scientific Assembly and Annual