

Cardio Calcium Scoring Phantom

A calibration standard for calcium scoring in coronary computed tomography (CT). Investigate the influence of scan parameters on the detectability of calcifications. Achieve reproducible scoring results.

The Cardio-CT-Phantom is designed in a modular construction principle. The phantom is made up of two parts:

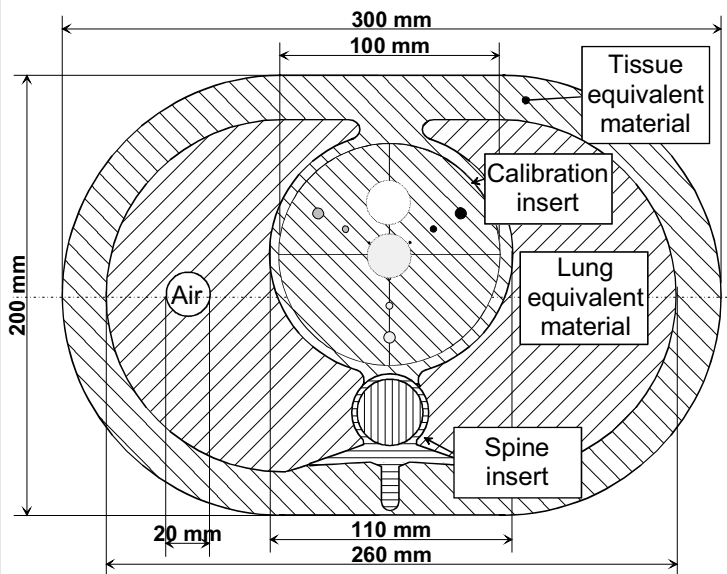
the anthropomorphic thorax phantom body, QRM-Thorax, and the cardiac calcification insert QRM-CCI.

QRM-Thorax comprises artificial lung lobes, a spine insert, and shell of soft tissue equivalent material. The plastics used in this anthropomorphic phantom mimic human tissues in the thorax with respect to density and attenuation characteristics (optimized for 120 kV).

The cylindrical cardiac calcification insert, QRM-CCI, contains nine cylindrical calcifications in varying size and hydroxyapatite (HA) density (see Table next side), and two larger calibration inserts. One of them is made of water equivalent material, the other one contains hydroxyapatite in addition. They are embedded in a tissue-equivalent solid of typically 35 HU (+/- 5 HU) at 120 kV.

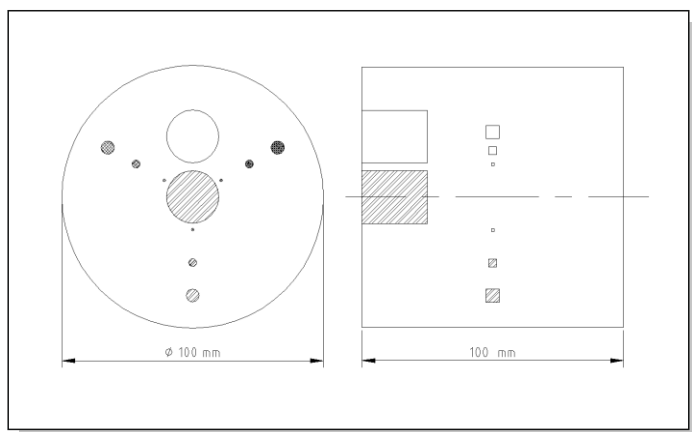


QRM-Thorax with Cardio Calcification Insert



Sketch of the complete Anthropomorphic Cardio CT Phantom comprising QRM-Thorax and Cardiac Calcification Insert QRM-CCI. The depth of the phantom is 100 mm.

Anthropomorphic Cardio Phantom



The Cylindrical Cardiac Calcification Insert, QRM-CCI with its three groups of small, radially arranged calcifications (see Table for details), and the two larger inserts for calibration purposes.

HA density [mg/cm ³]	Length [mm]	Diameter [mm]	Volume [mm ³]	Area [mm ²]	HA mass [mg]
200	5.0	5.0	98.2	19.6	19.6
200	3.0	3.0	21.2	7.1	4.2
200	1.0	1.0	0.8	0.8	0.2
400	5.0	5.0	98.2	19.6	39.3
400	3.0	3.0	21.2	7.1	8.5
400	1.0	1.0	0.8	0.8	0.3
800	5.0	5.0	98.2	19.6	78.5
800	3.0	3.0	21.2	7.1	17.0
800	1.0	1.0	0.8	0.8	0.6

Properties of the nine cylindrical calcifications embedded in the Cardiac Calcification Insert QRM-CCI.

In order to obtain absolute values for the calcium mass, a calibration measurement with the central calibration insert of known hydroxyapatite (HA) density of 200 mg HA/cm³ can be carried out. The water equivalent insert serves as a further calibration standard. In practice the CT number of water should always be checked under the given modalities. If its measured HU value deviates from zero, the known deviation can be taken into account in the applied scoring method.

Specifications

Phantom weight (total) 3620 g
 Diameter of cardiac insert 100 mm
 Height of cardiac insert 100 mm
 Weight of cardiac insert 880 g
 Base material resin

The standard QRM thorax has to be ordered at once or separately:

QRM-Cardio-Phantom

or

QRM-Thorax + QRM-CCI

- References**
- [1] McCollough C., Primak A., et al. Dose Performance of a 64-Channel Dual-Source CT Scanner. 2007, Radiology, Vol. 243, p.775-784.
 - [2] McCollough C., Ulzheimer S., et al. Coronary Atrery Calcium: A Multiinstitutunal, Multimanufacturer international Standard for Quantification at Cardiac CT. 2007, Radiology, Vol. 243, p. 527-538.