

European Spine Phantom

QRM-ESP

The standard for quality control in bone mineral densitometry by DXA and QCT.

The European Spine Phantom QRM-ESP is now the standard for quality control - accuracy and reproducibility - in spinal BMD quantification for more than a decade [3]. Its design is closely anthropomorphic by its outer measures and internal lumbar vertebrae inserts such that standard patient protocols can be utilized, both in DXA and QCT.

The phantom's main body consists of water-equivalent resin, the three inserts contain varying amounts of calcium hydroxyapatite (CaHA) to cover the full physiological range of spongy and cortical bone densities for all age groups.

QRM-ESP allows to check reproducibility and accuracy with the following quantities:

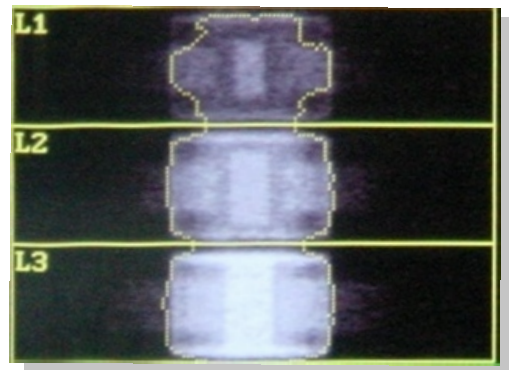
- ✓ bone mineral content (BMC) in g for DXA
- ✓ bone mineral area density (BMD) in g/cm² for DXA
- ✓ projected area (A) in cm² for DXA
- ✓ trabecular and cortical bone mineral density in g/cm³ for QCT
- ✓ cortical thickness in mm for QCT
- ✓ positioning accuracy in QCT

Cross-sectional view of the three vertebrae

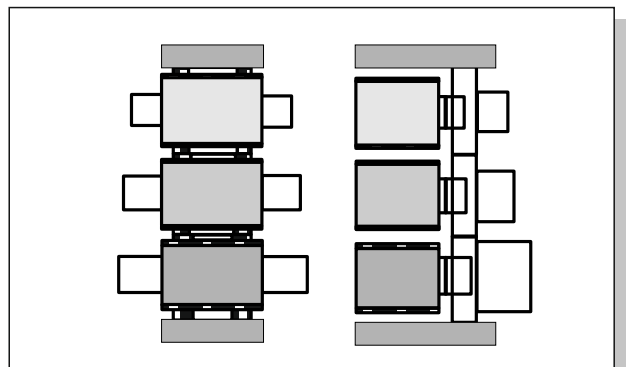
- L1 Spongy: 50 HA (mg/cm³)
Cortical: 800 HA (mg/cm³)
- L2 Spongy: 100 HA (mg/cm³)
Cortical: 800 HA (mg/cm³)
- L3 Spongy: 200 HA (mg/cm³)
Cortical: 800 HA (mg/cm³)



Resin based water-equivalent phantom body approximately oval shape but with flattened sides for ease of positioning.



DXA scan of QRM-ESP



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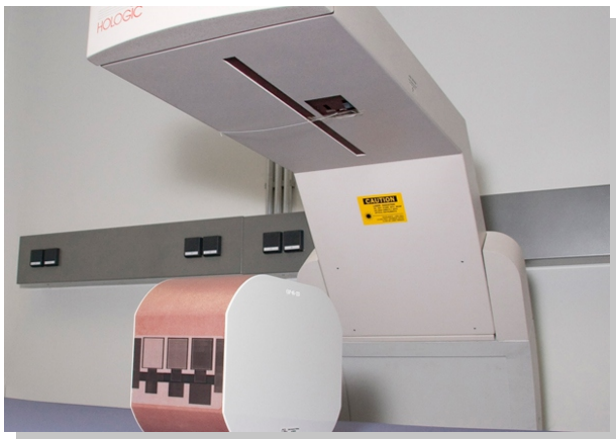
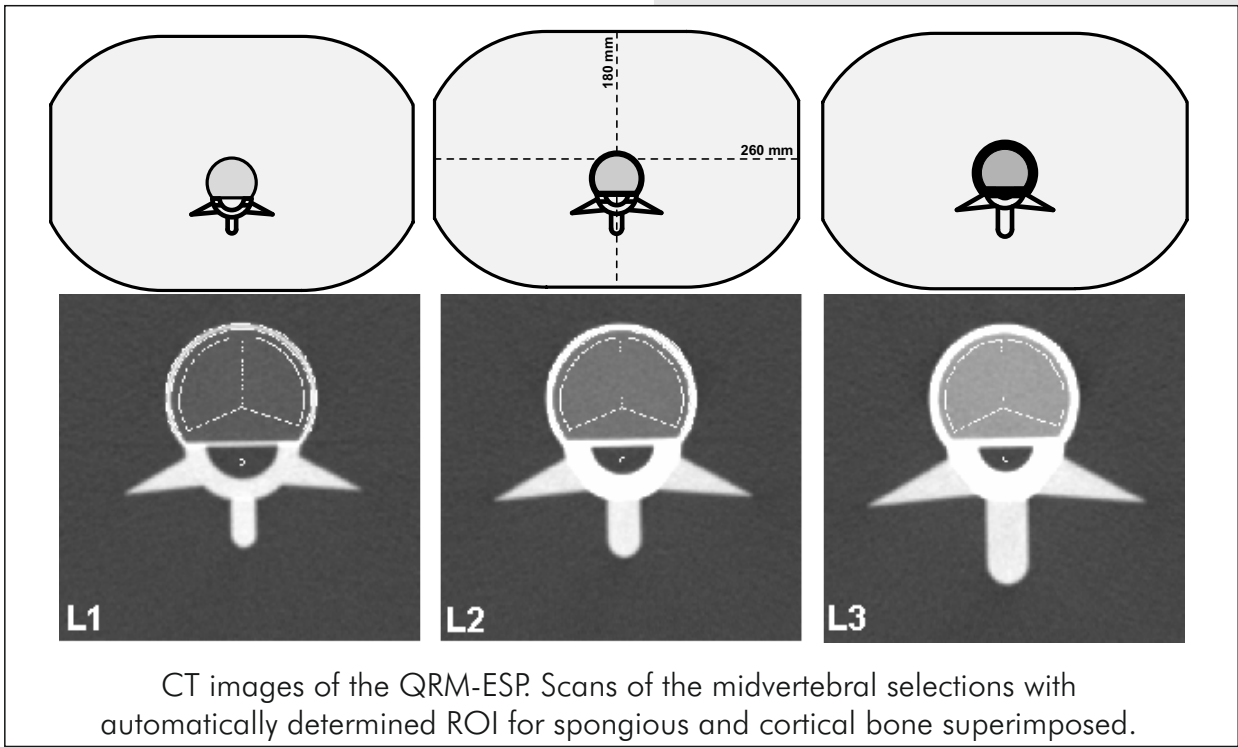
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DXA scan of QRM-ESP

Specification

Dimensions of phantom	260 x 180 mm H = 110 mm
Base material	water-equivalent plastic
Spongy bone densities	50, 100, 200 HA (mg/cm ³)
Area density of vertebrae (AP):	0.5, 1.0, 1.5 (g/cm ²)
HA in cortical structures and spinal process:	400, 800 HA (mg/cm ³)
Accuracy	±3% of specified values ±1% of certified values

References

- [1] Kalender, W.A.: A Phantom for Standardization and Quality Control in Spinal Bone Mineral Measurements by QCT and DXA. Design Considerations and Specifications. Med. Phys. 19 (1991) 583-588
- [2] Genant, H.K. et al.: Universal Standardization for Dual X-Ray Absorptiometry: Patient and Phantom Cross-Calibration Results. J.Bone Miner. Res. 9 (1994) 1503-1514
- [3] Kalender, W.A., Felsenberg, D., Genant, H., Fischer, M., Dequeker, J., Reeve, J.: The European Spine Phantom - a tool for standardization and quality control in spongy and cortical bone measurements by DXA and QCT. European J. Radiology 20 (1995) 83-92

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