

## X-RAY MICROCOMPUTED TOMOGRAPHY

# X4 POSEIDON – Cow femoral bone

### Innovation with Integrity

Bone and mineral research traverses imaging and analysis of bone samples ranging from small mouse bones to large mammal bones and teeth.

MicroCT imaging of bone with path lengths through mineralised bone ranging from tens of microns to centimeters, requires the special imaging solution of the X4 POSEIDON. This system offers the configuration of a high resolution sCMOS detector and a large area high energy-sensitive flat panel detector.

The X4 POSEIDON with the 7MP flat panel detector in combination with the reflection type source proved able to scan robust bovine femoral cortical bone, an exceptional challenge for desktop microCT. Innovative technology both of flat panel camera and molybdenum filters make this possible as this application note illustrates.

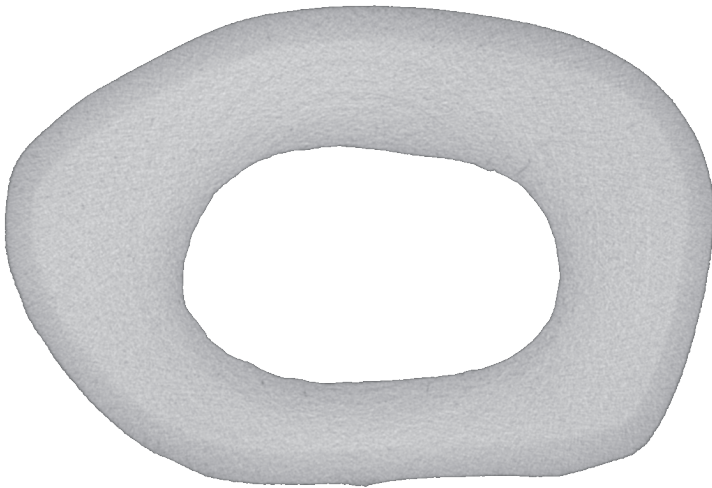
Previous research into large animal bone, such as sheep, has necessitated synchrotron imaging (Statnik et al 2020). Now this capability exists in the laboratory desktop X4 POSEIDON microCT imaging workstation.

### References

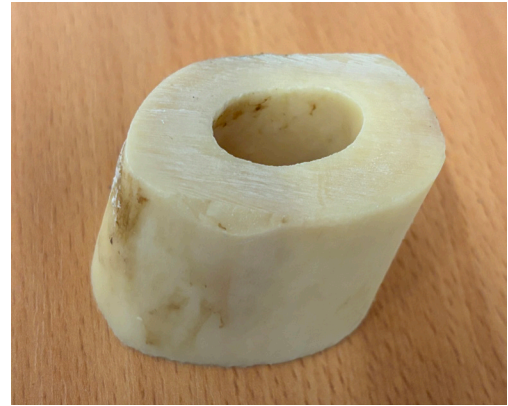
Statnik, E. S., Salimon, A. I., Besnard, C., Chen, J., Wang, Z., Moxham, T., ... & Korsunsky, A. M. (2020). Ovine bone morphology and deformation analysis using synchrotron X-ray imaging and scattering. *Quantum Beam Science*, 4(3), 29.

### Scan parameters

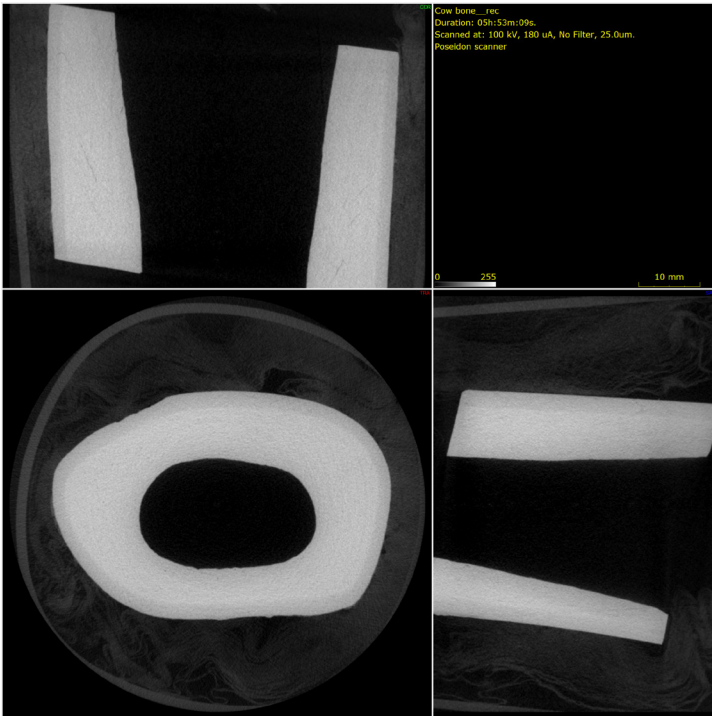
- Detector: 7 MP flat panel
- Voxel size: 25  $\mu\text{m}$  (1x1 binning mode)
- Source: Reflection type
- Source power: 100 keV, 18 W
- X-ray filter: 1.5 mm molybdenum
- Rotation step: 0.18° over 360°



**Figure 1:** Reconstructed cross-section through bovine (cow) femur diaphyseal cortical bone, imaged at 25 µm voxel size.



**Figure 3:** Bovine cortical bone with thickness of several centimeters is a challenge to desktop microCT imaging



**Figure 2:** 3-axis view of bovine femur cortical bone, imaged at 25 µm voxel size, showing canal porosity and regional differences in mineralization density reflecting growth history

The high resolution and low noise active pixel performance of the flat panel camera in X4 POSEIDON allows successful imaging of a large bone sample size. This widens the range of bone research possibilities using a single microCT desktop imaging workstation.

Veterinary, agricultural, equine as well as orthopedic research applications are made possible by this imaging capability of the X4 POSEIDON system.

The Bruker 3DxSUITE software package includes all tools needed for image processing and analysis, and allows creating realistic 3D models through volume and surface rendering algorithms.

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