

## X-RAY MICROCOMPUTED TOMOGRAPHY

# X4 POSEIDON – Morphometric bone analysis

### Innovation with Integrity

The X4 POSEIDON is a very capable microCT platform that can do both high resolution and fast acquisition of samples, something which is extremely valuable in bone morphometry research. It ensures high throughput of bone imaging and a quality output usable for further standardized analysis.

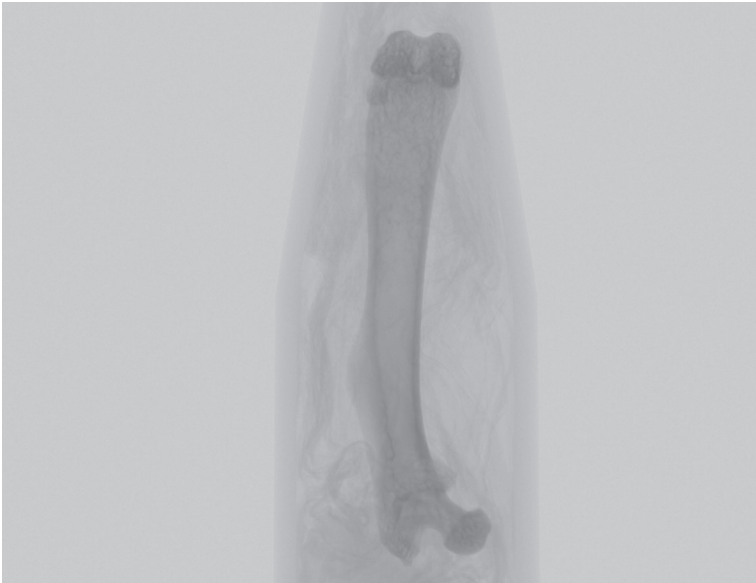
Morphometric analysis of bone can be performed *in vivo* and *ex vivo*, and many types of species can be imaged, such as mouse, rat or human. After imaging, analysis on the datasets acquired can show the 3D architecture of structures and can be used to study for example osteoarthritis, osteoporosis, cancellous bone formation, bone remodelling and densitometry (BMD, TMD) of long bones or vertebrae.

There are many specific parameters that can be analysed, which include, but are certainly not limited to, the relative bone volume (BV/TV), bone surface, structure model index and trabecular and cortical thickness. It is effectively an extension to bone histomorphometric analysis using light microscopy but simplifies the capability to obtain information about the 3D structures of bone, in which the X4 POSEIDON excels.

An additional advantage of microCT, aside from the possibility of obtaining high-quality 3D datasets for external and internal review, is its non-destructive character. This means that the samples can still be used for an array of other types of analysis after the acquisition. This can broaden any spectrum of research, potentially adding information otherwise not considered.

### Scan parameters

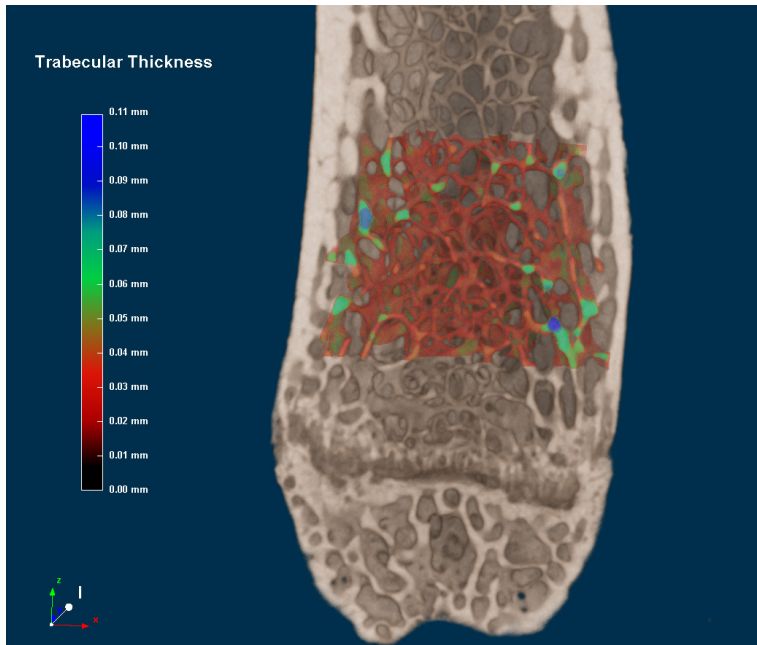
- Detector: 7 MP Flat Panel
- Voxel size: 8  $\mu\text{m}$  (1x1 binning mode)
- Source: Transmission type
- Source settings: 60 keV, 12 W
- Filter: 0.25 mm Al
- Rotation step: 0.5° over 360°
- Scan time: 6 minutes



**Figure 1:** Projection image of a whole mouse femur in one single field of view using the Flat Panel detector, 8 μm voxel size.



**Figure 2:** Reconstructed image of a 6 minute scan of a whole mouse femur.



**Figure 3:** 3D volume rendering of a mouse femur with the trabecular network color-coded for local thickness, 8 μm voxel size.

The fast scan time in combination with the low noise active pixel performance of the Flat Panel detector and flexible geometry allows imaging of a mouse femur in one field of view (Figure 1) at a standard resolution for morphometry analysis in only 6 minutes. To further optimize and ensure high throughput, batch scanning or the use of the sample changer are excellent options the X4 POSEIDON offers.

At this resolution, the dataset quality from X4 POSEIDON is more than sufficient to visualize cortical bone, fine trabecular structures, the growth plate and the condyles in detail (Figure 2). This ensures the possibility to generate precise analysis, such as the trabecular thickness shown in figure 3 and proves its value towards the ever-expanding bone field.

The software to visualize, analyze and create comprehensive data is included in Bruker's 3DxSUITE package, supporting the most pressing needs in research.

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