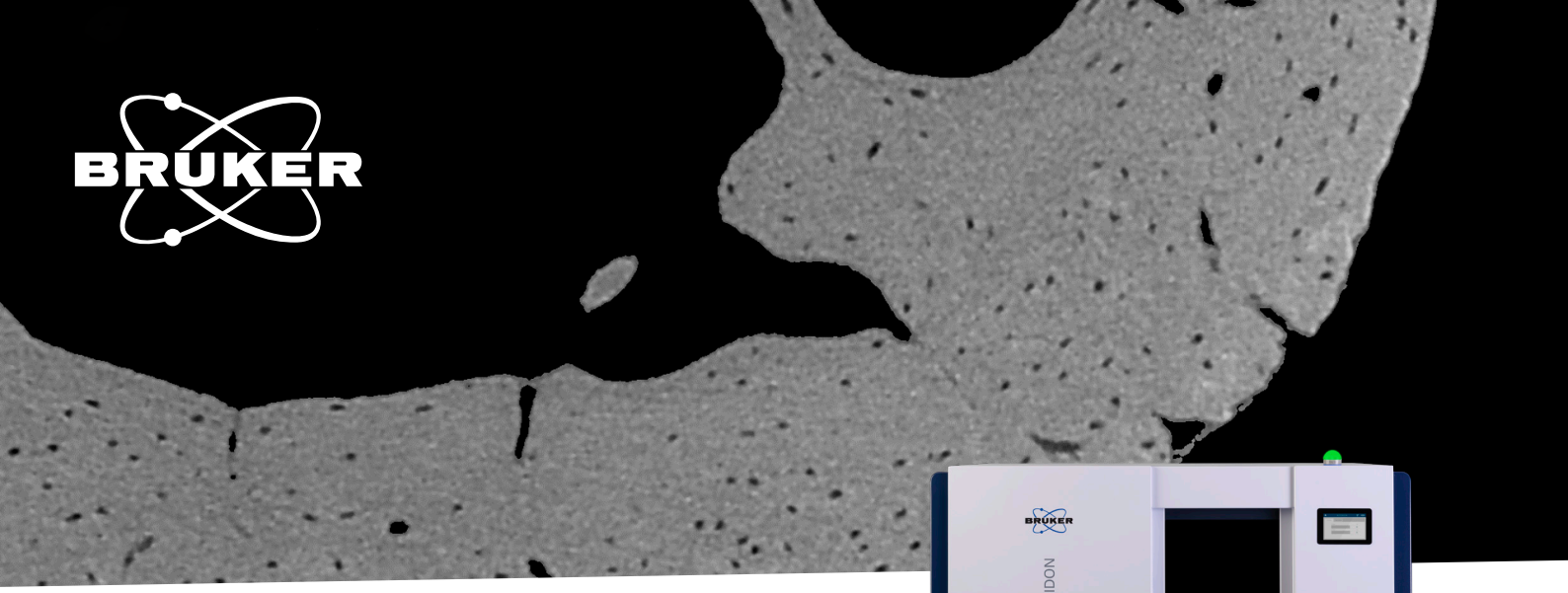

X-RAY MICROCOMPUTED TOMOGRAPHY

X4 POSEIDON – Mouse bone osteocytes

Innovation with Integrity

Submicron imaging of mineralised bone opens the field of ultra-structural analysis of bone including the distribution of osteocyte lacunae (spaces) and blood vessel canals. Both of these are highly informative of the metabolic state and signalling responses of bone in a rodent research model.

In the image above, submicron pixel scanning of the midshaft mouse femur diaphysis clearly resolves both blood vessel canals and osteocyte lacunae. 3D morphometric analysis of both extends the knowledge of the status of the bone, illucidating physiological and disease processes.

References

Javaheri et al. (2015) Bone 81: 277-291.

Ahmed et al. (2023) Annals of Anatomy-Anatomischer Anzeiger 250: 152142.

Azari et al. (2024) Calcified Tissue International 115(1): 78-84

Scan parameters

- Detector: 16MP sCMOS
- Voxel size: 550 nm (1x1 binning mode)
- Source: Transmission type
- Source power: 50 keV, 6 W
- X-ray filter: 0.25 mm Al
- Rotation step: 0.12° over 360°
- Phase retrieval (Paganin) reconstruction, β/δ ratio 100

Cover Image: Mouse femur cortical bone imaged at 550nm voxel size visualizing mouse bone osteocytes.

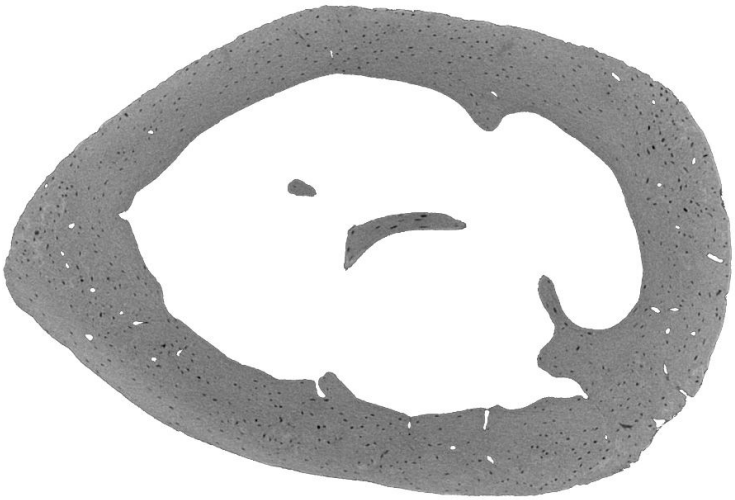

Figure 1: Mouse femur diaphyseal cortical bone, imaged at 550 nm voxel size, with absorption reconstruction. Osteocyte lacunae and blood vessel canals are clearly resolved.

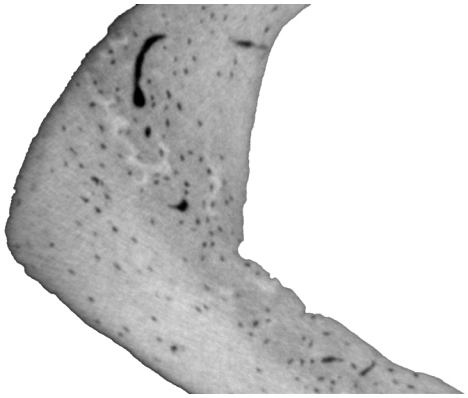

Figure 3: Phase retrieval processingof the cortical bone scan reveals mineral density inhomogeneities

The high resolution and low noise active pixel performance of the sCMOS camera in the X4 POSEIDON, as well as its large 16Mp format, allows ultrastructural analysis of a whole mouse femur with no cutting required. Osteocyte lacunae and blood vessel canals are clearly resolved (figure 1, 2). Phase retrieval (Paganin) allows spatial mapping of mineralization density (figure 3) revealing the history of remodeling events, possibly indicating the relative age of bone regions based on nanodensitometry.

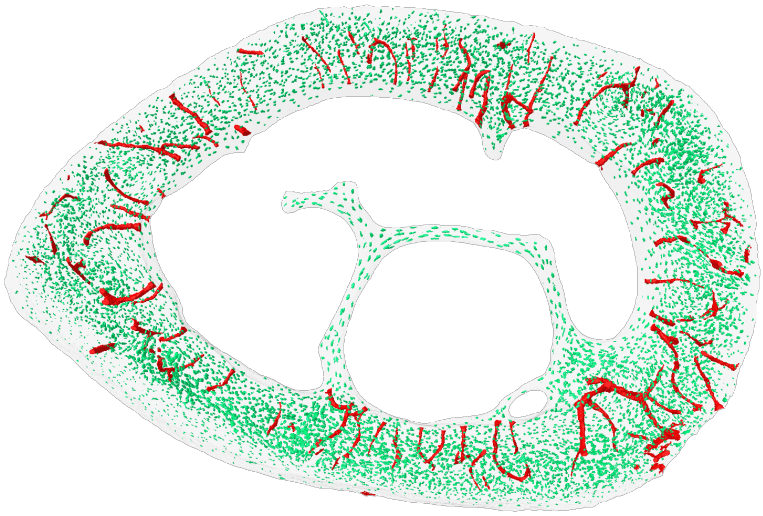

Figure 2: Mouse femur diaphyseal cortical bone, imaged at 550 nm voxel size, allowed segmentation of osteocyte lacunae (green) and blood vessel canals (red)

Bruker BioSpin
info@bruker.com

bruker.com

Worldwide Offices
bruker.com/

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