MicroCT Imaging of Dental Models

- High Resolution microCT and nanoCT

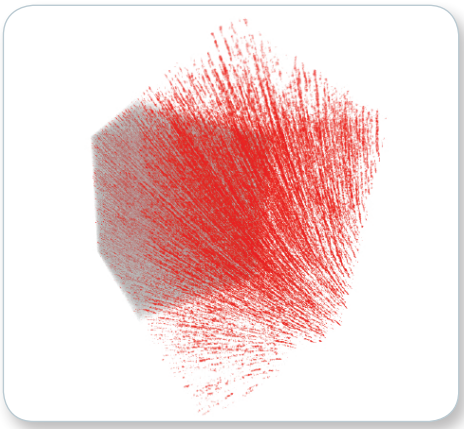
Innovation with Integrity

Microtomography

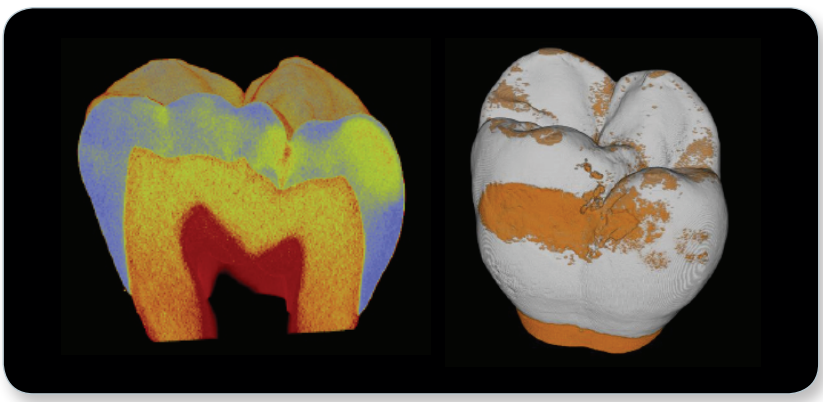
State-of-the-Art microCT Imaging

X-ray micro-computed tomography (microCT) is one of the most advanced methods for gaining 3D insights into samples of any material and shape non-destructively, with little to no sample preparation. Bruker microCT, a pioneer of microCT, has now made this technology easier and more accessible for everyone to analyze:

- Biomechanical reactions
- Biomaterials and implants
- Enamel and bone mineralization
- Marginal fit in restorations
- Pulp pathosis
- Root canal morphology
- Skeletal development
- Tissue engineering



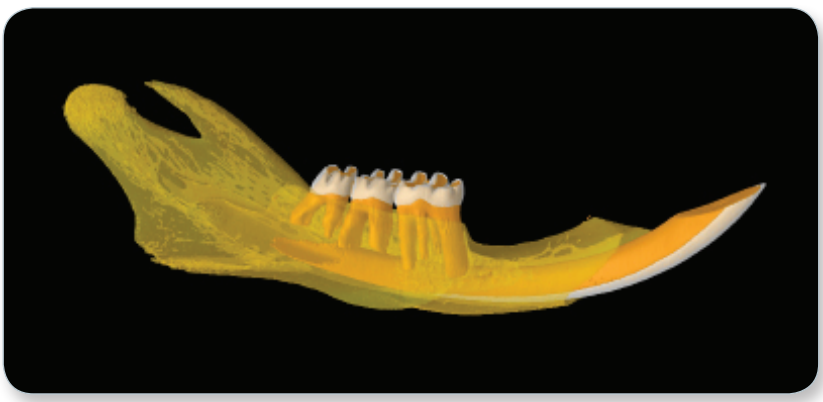
3D reconstruction of dentinal tubules at a resolution of 350 nm (SkyScan 2214).



MIH molar showing mineralization defects in the occlusal level (SkyScan 1272).

Molar Incisor Hypomineralization (MIH)

- Detect hypomineralized enamel areas
- Measure mineral density defects and distribution
- Make virtual representations of crown mineralization by surface and volume rendering in real time



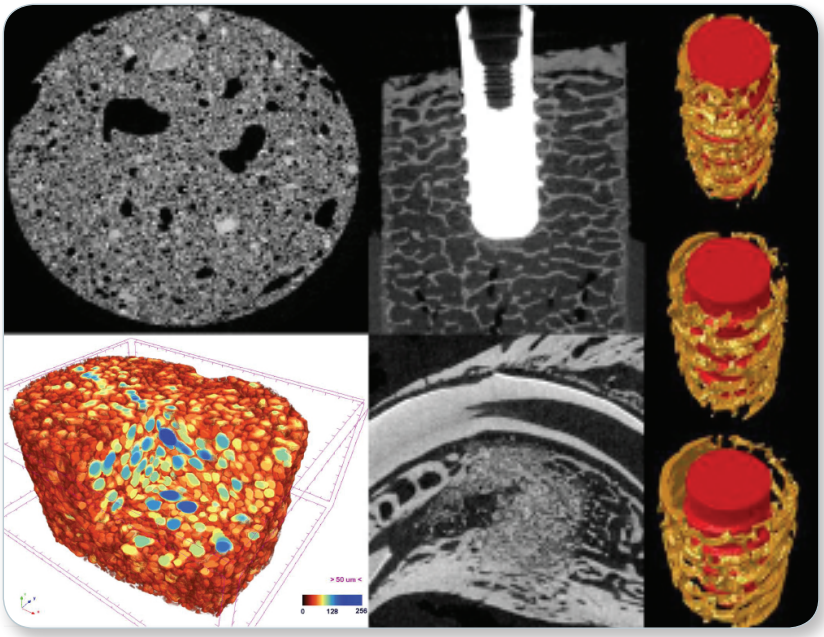
3D model of the rat mandible with automatic segmented enamel, root and jaw bone (SkyScan 1272).

Periodontics & Orthodontics

- Evaluate tooth movement and root resorption
- Evaluate the micro-leakage at interface of bone and the root
- Dynamic monitoring of bone quality *in vivo* over time using fast and low dose scans

Implants and Scaffolds

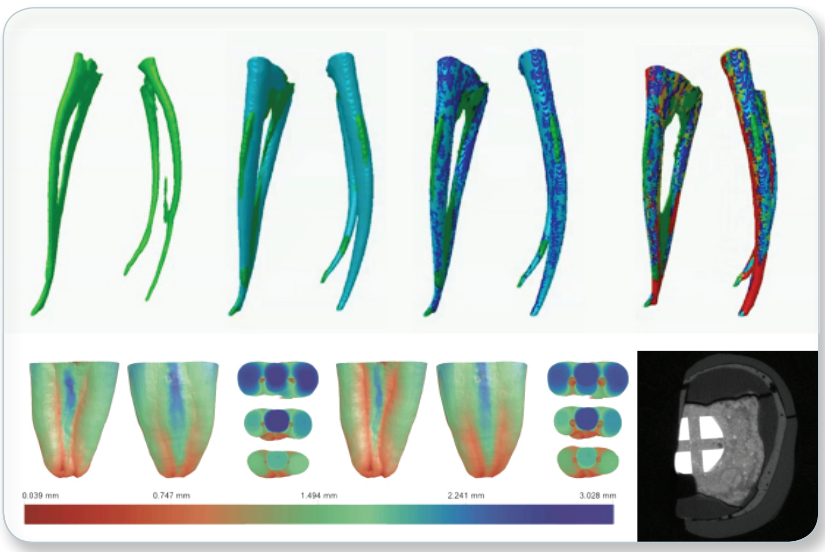
- Resolve internal fine structures with 3D non-destructive imaging
- Analysis of osteointegration
- Quantify scaffold porosity (open, closed, interactions, accessibility to bone cells)
- 4D in situ examination under controlled temperature, compression or tension



Left: Calcium hydroxyapatite scaffolds with various scales of porosity (SkyScan 1272).
Middle: Osseointegration around titanium implant and Ca_3PO_4 scaffold (SkyScan 1276).
Right: 3D reconstructions showing peri-implant healing in different regions of interest.

Endodontics

- 4D analysis of the root canal morphology
- Evaluate root canal treatments
- Compare various endodontic instruments and filling materials
- Quantify micro-defects and changes inside root canals

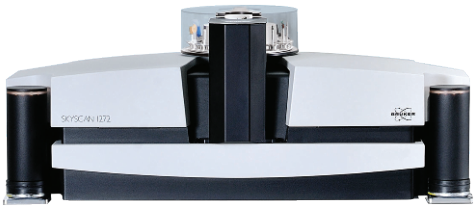


Top: series of scans presenting successive root canal preparation procedures over time;
Bottom left: 3D models of root canal fillings color-coded for local thickness changes (SkyScan 1174); Courtesy of Prof. Marco Versiani, Univ. Sao Paulo, Brazil.
Bottom right: reconstructed slice through a root canal with high density filling materials (SkyScan 1275).

Front cover: 3D rendering of human tooth (left: ancient; right: modern) showing lesions including caries, root canal calcification and root resorption

SkyScan 1272

High resolution ex vivo microCT

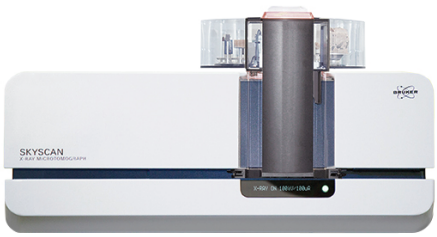


X-ray source	20-100 kV, 10 W, <5 µm spot size @ 4 W
X-ray detector	16 Mp or 11 Mp, 14-bit cooled CCD
Maximum object size	75 mm in diameter, 70 mm high
Detail detectability	0.35 µm (16 Mp) or 0.45 µm (11 Mp) smallest pixel size
Reconstruction	Heirarchical (InstaRecon®) and multithreaded CPU/GPU 3D reconstruction

Dedicated software package for acquisition, reconstruction, dataviewing, 3D modeling and image analysis

SkyScan 1275

High throughput ex vivo microCT



X-ray source	20-100 kV, 10 W, <5 µm spot size @ 4 W
X-ray detector	3 Mp active pixel CMOS flat panel
Maximum object size	96 mm in diameter, 120 mm high
Detail detectability	4 µm smallest pixel size
Reconstruction	Multithreaded CPU/GPU 3D reconstructions

Dedicated software package for acquisition, reconstruction, dataviewing, 3D modeling and image analysis

SkyScan 2214

High resolution multiscale nanoCT

X-ray source	20-160 kV, < 500 nm spot size
X-ray detector	6 Mp flat-panel + 11 Mp large format CCD + 11 Mp mid format CCD + 8 Mp hi-res CCD
Maximum object size	300 mm in diameter (140 mm scanning size), 400 mm in length, maximum object weight 25 kg
Detail detectability	60 nm smallest pixel size, <500 nm low-contrast resolution (10 % MTF)
Reconstruction	Hierarchical (InstaRecon®) and multithreaded CPU/GPU 3D reconstruction

Dedicated software package for acquisition, reconstruction, dataviewing, 3D modeling and image analysis

SkyScan 1276

High resolution in vivo microCT

X-ray source	20-100 kV, 20 W, <5µm spot size @ 4 W
X-ray detector	11 Mp, 14-bit cooled CCD
Scanning space	80 mm diameter, >300 mm in length
Spatial resolution	2.8 µm smallest pixel size, 5-6 µm details resolved with more than 10 % contrast
Reconstruction	Heirarchical (InstaRecon®) and multithreaded CPU/GPU 3D reconstruction

Dedicated software package for acquisition, reconstruction, dataviewing, 3D modeling and image analysis

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