



## Pre-clinical *in vivo* imaging

### Key Features:

- High resolution (4.5  $\mu\text{m}$  voxel size)
- High speed (8 second scans)
- Low dose imaging for longitudinal studies
- Co-registration of molecular optical signals with anatomical microCT data
- Two physical magnifications for a range of resolutions and doses
- Two-phase respiratory and cardiac gating
- Mouse/rat/rabbit imaging capabilities

## High Performance High Speed High Resolution microCT

The Quantum GX is the most advanced microCT imaging system for preclinical research, offering industry leading resolution combined with high

speed imaging capability at an X-ray dose low enough to enable true longitudinal imaging of animals. The Quantum GX is the only multispecies microCT system with the capability to image entire mice, rats and rabbits.

This high resolution, high speed integrated platform enables researchers to gain a better understanding of disease in a broad range of applications in cardiovascular, respiratory, bone, lung and brain imaging research.

Gain more insight into the molecular, functional and anatomical readouts of the experimental model by coregistering of 3D optical data from PerkinElmer's IVIS® and FMT® platforms with the Quantum GX microCT system for a better understanding of disease and its progression.

## High Resolution Imaging at a 4.5 $\mu\text{m}$ Voxel Size

The Quantum GX offers the highest resolution among all the microCT scanners for *in vivo* imaging. The wide field of view (FOV) scanning at 36 mm and 72 mm allows for high resolution imaging of mice, rats and rabbits. The system has three modes: high resolution, high speed and standard modes. As an example, in the high resolution mode, a 4.5  $\mu\text{m}$  voxel size resolution can be attained at a 36 x 36 mm FOV, while a 9  $\mu\text{m}$  voxel size resolution can be attained at 72 x 72 mm FOV.

An advanced bone analysis software package is available as a companion to the Quantum GX that offers superior visualization tools for bone segmentation, BMD measurements and bone morphology assessment (trabecular and cortical parameters) in a user-friendly workflow.

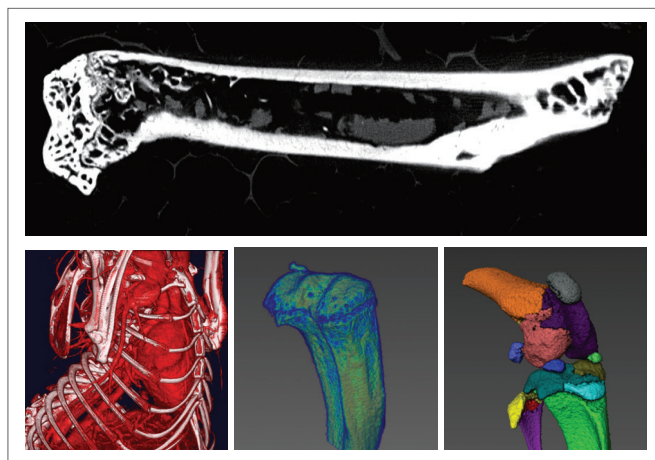


Figure 1. Top: High resolution microCT image of mouse femur (4.5 micron voxel, 8k x 8k pixels) Bottom: Heart and vasculature imaging with contrast agent, Cortical bone and bone segmentation images.

## Superior Workflow for High Resolution Scans

The Quantum GX imaging system features an advanced workflow for creating high resolution images from the original whole image scan. A whole body scan is first taken and then regions of interests (ROIs) are defined to reconstruct a high resolution image. Since there is no need to rescan the animal, the throughput is higher and radiation exposure is significantly reduced. The larger field of view scan offers flexibility to select an ROI for detail at a later stage. Subvolume reconstructions with various resolution settings can be performed at anytime using an FOV defined by the user.

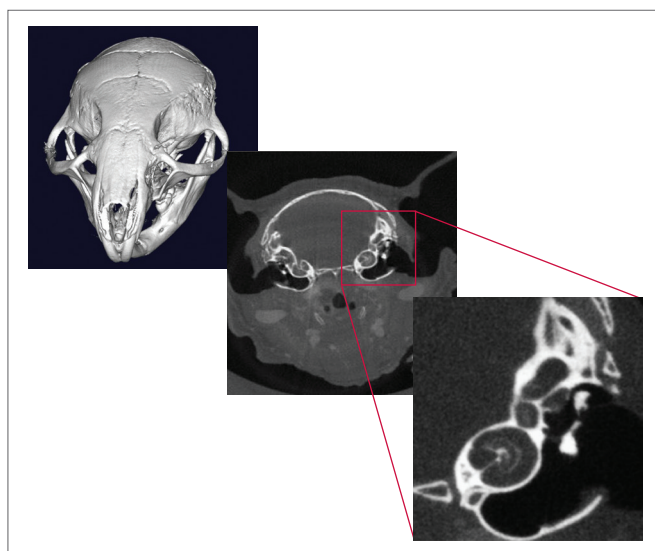


Figure 2. A 4.5 micron post reconstruction (bottom image) from initial image (top) which was taken in high resolution mode (FOV 36, 72 micron pixel size).

## High Speed/Low Dose Imaging

The Quantum GX is the fastest microCT system with industry leading scan times of 8 seconds in the high speed mode. With a reconstruction time of 15 seconds, a 3D image can be acquired and reconstructed with the GX in 23 seconds.

With the Quantum GX, follow and characterize disease progression throughout the entire study using microCT at every imaging point. Using the 8 second scan time that is designed to simultaneously give low dose and good image quality, researchers can be confident that their biological model will remain relevant throughout the span of the experiment. Fast imaging and smooth workflows also enable the throughput required to scan cohorts of animals quickly and draw sound conclusions from experimental data.

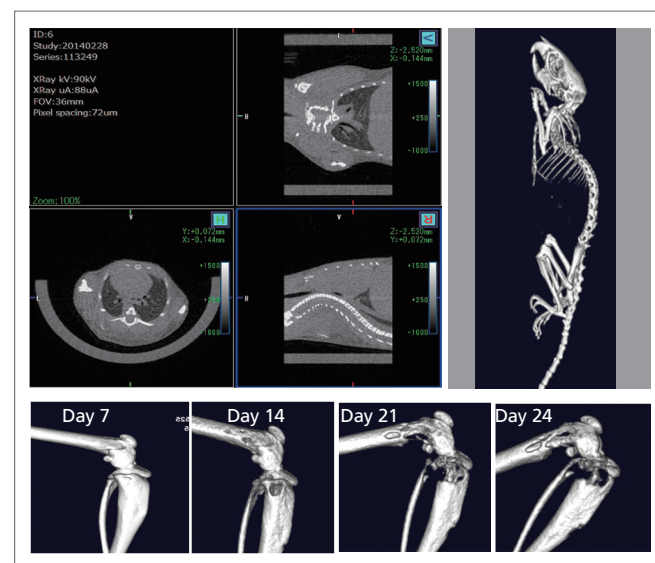


Figure 3. Top: High Speed Imaging: 8 second scan of mouse lung region and whole mouse scan in 24 seconds. Bottom: Low dose: Longitudinal imaging tibial osteolytic lesions caused by human breast cancer cell line MDA-MB-231.

## Optical Co-registration for Multimodality Imaging

PerkinElmer has revolutionized preclinical 3D optical imaging with the IVIS and FMT platforms. The Quantum GX makes microCT imaging as easy as optical imaging on the IVIS and allows researchers to co-register functional optical signals with anatomical microCT data. Throughput and user workflow have been simplified to seamlessly co-register anatomical and functional data at every step of a longitudinal study.



Figure 4. Optical co-registration of luciferase labeled MDA-MB-231 metastases with microCT.

## Two-Phase Cardiac and Respiratory Gating

For accurate microCT reconstruction in cardiac and respiratory gated applications, it is extremely important to minimize the motion from the diaphragm and heart. The Quantum GX's advanced and simple intrinsic retrospective two-phase gating techniques are ideally suited for cardiac and lung function measurements. By simply drawing a region of interest over the diaphragm and/or apex of the heart, the optional software then reprocesses the data, using only the views from the selected slice in the respiratory or cardiac cycle, reducing motion artifacts in the reconstruction.

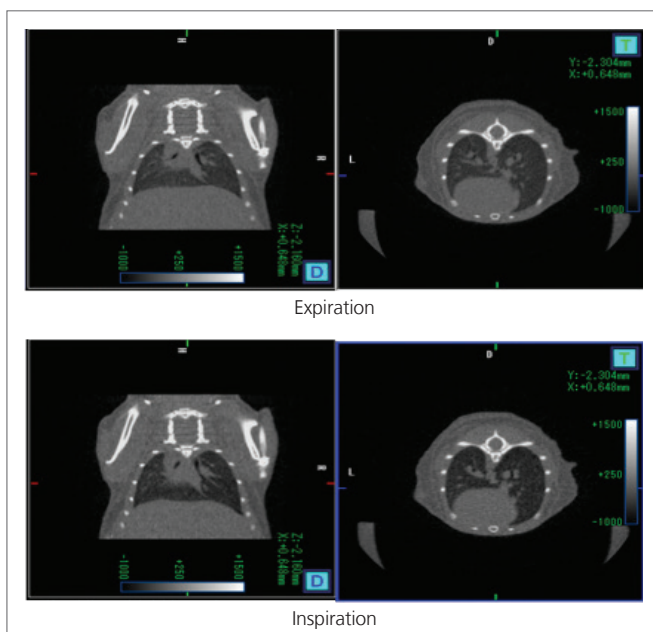


Figure 5. Two-phase gating technique on the Quantum GX offers reconstructions with less motion artifacts.

## Multispecies Imaging

The Quantum GX features is a true multispecies microCT system with a bore size large enough to fit entire mice, rats and even rabbits. The bore size in the Quantum GX is 163 mmφ and with available mouse, rat and rabbit beds, animals up to 5 kg can be easily imaged. An entire mouse can be imaged in one scan. A rat can be imaged in two sets of scans and a guinea pig can be imaged in three sets of scans.

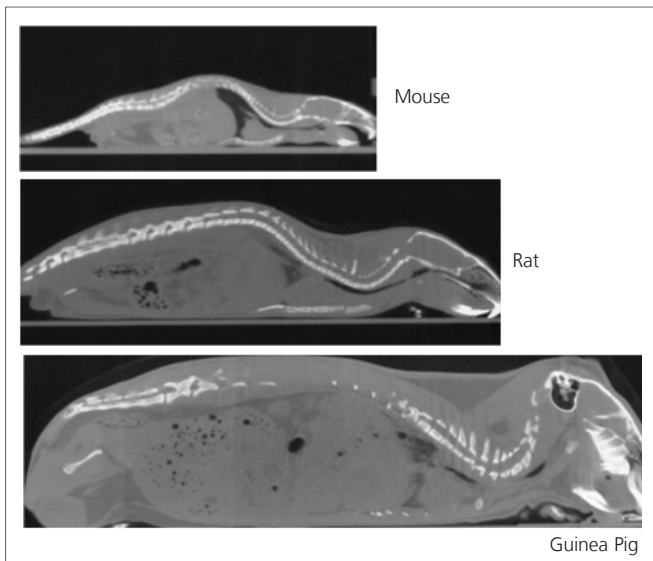
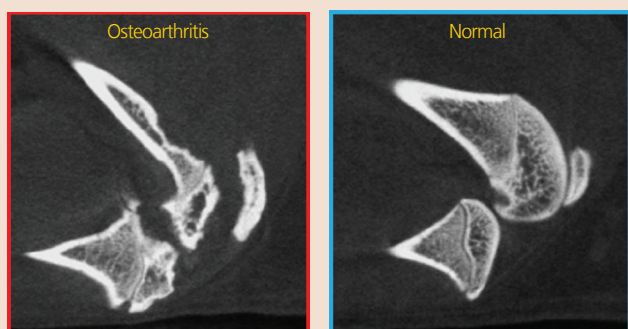
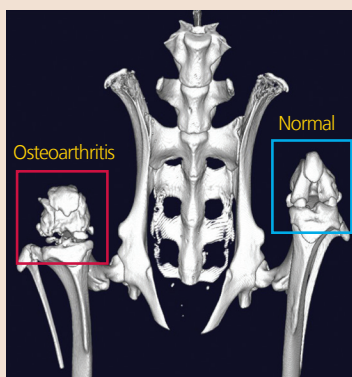


Figure 6. The Quantum GX is an ideal multispecies imaging system. The system can image entire mice, rats, guinea pigs and even rabbits.



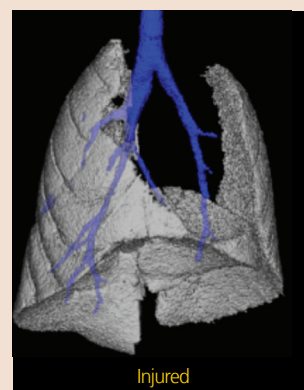
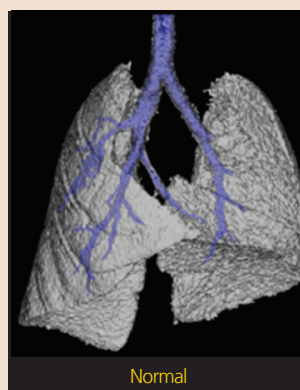
## Quantum GX High Performance microCT for Preclinical Applications

### Osteoarthritis



Rat with MIA-induced osteoarthritis in the knee. The image on the left shows a diseased joint compared to the normal joint on the right

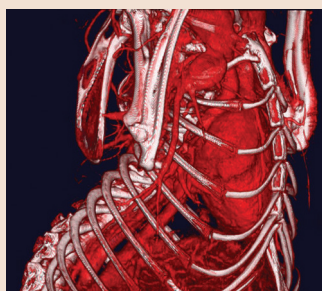
### Lung Injury



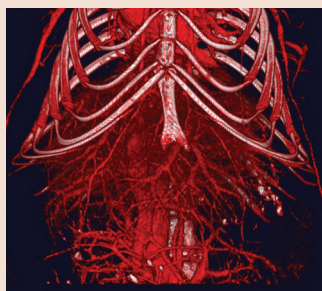
### Additional Applications

- **Bone research**
  - Bone morphology (trabecular and cortical bone) assessment, BMD measurements
- **Cardiovascular disease**
  - Myocardial viability, calcium scoring, ventricular function and metabolism, infarct healing
- **Pulmonary disease**
  - Lung airway structure and whole lung in acute injury models
  - Volume, density and FRC (functional residual capacity) measurements
- **Metabolic disease**
  - Differentiation of visceral and subcutaneous fat

### Contrast Agent Enhanced Imaging



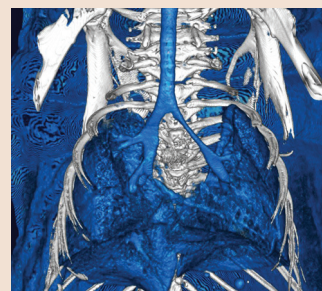
Heart and pulmonary vasculature



Liver vasculature imaging

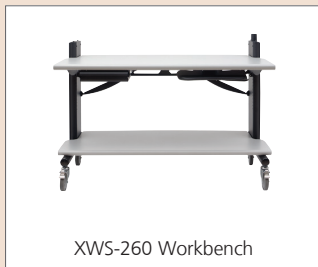


4T1 tumor vasculature



Lung segmentation

## Optional Accessories



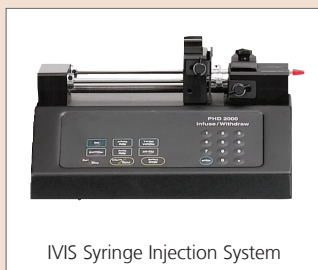
XWS-260 Workbench



Mouse Imaging Shuttle



XGI-8 Anesthesia System



IVIS Syringe Injection System

## Other Accessories

- Advanced microCT analysis software
- Cardiac/respiratory gating software
- 3D multimodality module
- Adapter arms (Spectrum, FMT)
- Rabbit bed

## Quantum GX Technical Specifications

CT image	Field of view	72 mm $\phi$ (max)
	Resolution (pixel size)	4.5 $\mu$ m (min)
	Number of pixels	512 $\times$ 512 $\times$ 512 - 8000 $\times$ 8000
X-ray tube	Maximum tube voltage	90 kV
	Maximum tube current	200 $\mu$ A
	Maximum output	8 W
Detector	Type	Flat panel detector
	Frame Rate	60 fps (max)
CT gantry	Bore Size	163 mm $\phi$ (max)
	Scanable range	240 mm (max)
Scan times		High Speed: 8 sec Standard: 18 sec, 2 min High Resolution: 4 min, 14 min, 57 min
Image reconstruction		Min.15 sec @ 512 $\times$ 512 pixels $\times$ 512 view
Software		Acquisition and visualization package
Dimensions (H $\times$ W $\times$ D)		1450 $\times$ 980 $\times$ 930 mm
Weight		450 kg

*For research use only. Not for use in diagnostic procedures.*

For more information, please visit [www.perkinelmer.com/invivo](http://www.perkinelmer.com/invivo)

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