

Bruker microCT
Kartuizersweg 3B
B-2550 Kontich, Belgium
Tel: +32 (0)3 877 5705
Fax: +32 (0)3 877 5769
applications.BmCT@bruker.com
www.bruker-microCT.com

In this issue:

- Scan setup and reconstruction
- Accurate analysis
- Image of the month
- Upcoming events

● Welcome

This month we will look at an *in-vivo* application of microCT – “ECG-based-synchronization”, or the analysis of the heart in a live animal using our latest low-dose SkyScan 1278 scanner. The use of a contrast agent is required in order to get sufficient density difference between the blood pool and the surrounding tissue.

● Scan setup and reconstruction

A correct choice of the anesthesia is crucial to avoid irregular breathing and possible heavy contractions during the scan. Often gas-anesthesia (isoflurane) is used because of the easiness of adjusting the concentration, and the fast recovery of the animals. However, also injectable anesthesia can be applied: Nembutal is preferred over Ketamin/Xylazine combination as the latter results in increased breathing frequency making it more difficult to synchronize.

Retrospective synchronization is applied, acquiring up to 20 images per rotation step, and thereby covering the entire heart-beat cycle at every rotation angle. Before reconstruction, the dataset is sorted in multiple bins covering the different phases of the beating heart. A more detailed description on how the parameters are set can be found in the method note: “[MN079 Heart ejection fraction analysis in vivo using SkyScan 1278](#)”.

● Accurate analysis

After adjustment of the 3D orientation in Dataviewer, the different phases of the beating heart can be visualized. Isolating the left ventricle by drawing an ROI and thresholding the blood, allows us to calculate the blood volume at every phase, and from this the ejection fraction. The same ROI can be loaded on every dataset (corresponding to the different bins) because all bins are originating from the same animal. The thresholding and possible additional image processing steps can easily be transferred to the custom processing tab in CTAn. Once the protocol or ‘task list’ is generated, we can use BatMan to load all datasets and fully automate the analysis process. For visualization purposes, adding a ‘3D model’ in the task list, multiple 3D surface rendering models will be generated corresponding to the change in blood volume of the left ventricle. A step by step explanation can be found in the method note *MN079*.

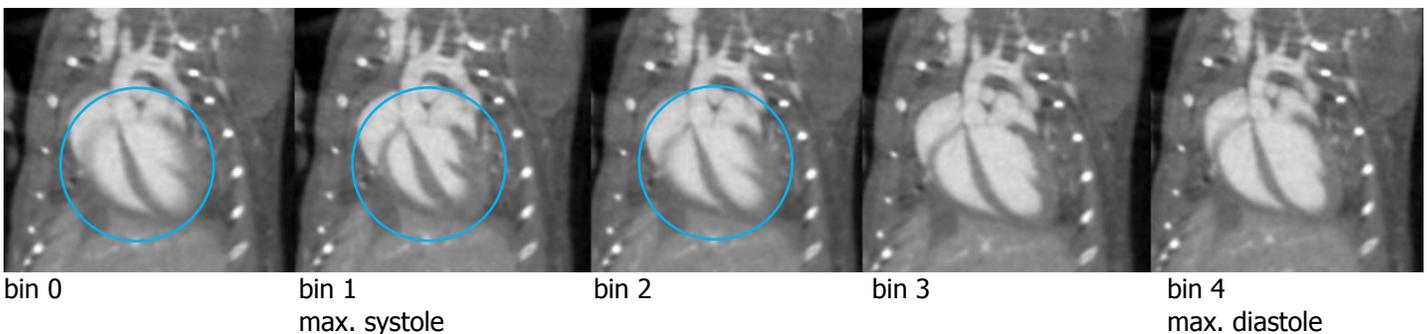


Figure: images of the mouse heart covering the different phases



Besides the volumetric data obtained from these 4D datasets, the change in the diameter of left ventricle can also be analyzed. For this, the 3D sphere-fitting method is applied resulting in a distribution of the diameter lumen of the left ventricle, calculated over the different phases, representing diastole/systole.

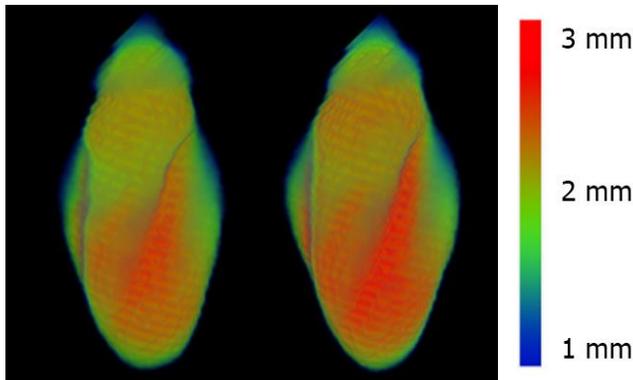


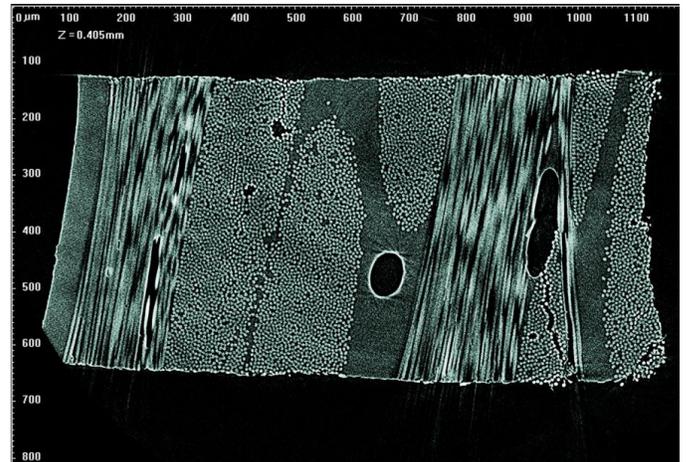
Figure: Thickness distribution of the left ventricle measured during diastole and systole.

● Upcoming events

Bruker microCT will participate with an exhibit in the forthcoming conferences. Please click the link below for more information. We hope to see you there!

● Image of the Month

Carbon fiber reinforced plastic (CFRP) scanned and reconstructed in the SkyScan2211 nanoCT at a voxel size of 350nm.



- [TCES](#) Jul. 17-21 Southampton, UK
- [SCA](#) Aug. 16-20 Newfoundland & Labrador, Canada
- [Metfoam](#) Aug.31-Sep.02 Barcelona, Spain
- [WMIC](#) Sep. 2-5 Hawaii, USA
- [XNPIG](#) Sep. 8-11 Maryland, USA
- [TERMS](#) Sep. 8-11 Boston, USA
- [ASBMR](#) Oct. 9-12 Seattle, USA
- [MRS](#) Nov.29-Dec.04 Boston, USA