Small animal MRI at UiB and possibilities for cardiovascular research

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Chief Engineer on the MRI preclinical scanner

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MIC Home Page

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MOLECULAR IMAGING CENTER

MIC Bergen | User information | Equipment | Image analysis | Booking | Prices | Personnel | Meetings - Courses | Map | Gallery | Links

About MIC Bergen

Advances in technology and chemistry have played a key role in the emergence of molecular imaging as a viable laboratory tool. From the invention of fluorecent-antibody techniques and in situ hybridization to major advances in confocal microscopy, magnetic resonance imaging, electron microscopy and more recent advances in image processing and analysis, today's technologies offer the sensitivity and resolution required to visualize molecules in time and space. The latest developments in fluorescent dyes and proteins have further facilitated the study of complex cellular processes using fluorescent staining or labeling of various proteins, ions and lipids in living cells.

The Molecular Imaging Center is a technological facility providing a variety of equipment, and scientific and technical expertise for the general research community of Norway. The mission of the Center is to maintain and develop modern technologies of biological imaging, and make them available to scientists to be applied in specific projects carried out in different research fields, such as Cell and Developmental Biology, Neurobiology, and Cancer Biology.

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Latest news

2nd NorMIC meeting, 12-13 November, Stavanger

» Partner of the project:

NorMIC

Norwegian Molecular Imaging Consortium

» Supported by:

FUGE Large-scale Programme The Research Council of Norway

UNIVERSITETET I BERGEN

http://www.uib.no/med/mic/index.html

Available equipment at MIC

Electron microscopes

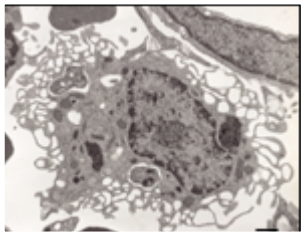
- Scanning EM
- Transmission EM
- (Sample prep. lab)

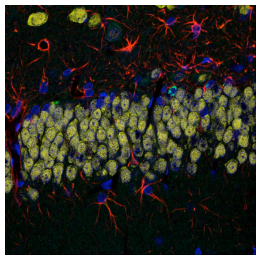
Fluorescence/confocal

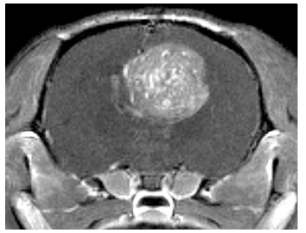
- Fluorescence microscope
- Confocal microscopes (3)
- Live cell confocal imager
- Multi Photon microscope
- High throughput
- Flow cytometry

Small animal imaging

- Optical imaging
- MRI







Nanometer

Micrometer

Sub mm

MIC Personnel working with MRI

Frits Thorsen
Ass. Professor
Platform Leader

Arvid Lundervold
Professor

Tina Pavlin
Chief Engineer

Kai Gunter Brandt
Engineer

Geir Olav Løken
Research Coordinator

Magnetic Resonance Imaging

Non-invasive diagnostic studies on small laboratory animals (rats, mice, small fish).

Some of the ongoing MR projects:

1. Anatomical imaging of tumor development
2. Tumor phenotyping by spectroscopy
3. Perfusion studies in normal/tumors tissue
4. Treatment effects after immunotherapy on tumors
5. Avastin treatment of malignant brain tumors
6. Multiple sclerosis model in mice
7. CNS effects after diving sickness
8. Fat metabolism in rats/mice
9. Heart studies
10. Effects of gene therapy

How to start experiments using MRI

1. Project:
   a) MRI methodology
   b) MRI application =>
2. Questions:
   a) Is MRI useful for this project?
   b) Has it been done before? If so, how? If not, why not?
   c) Is MRI feasible?

How to start experiments using MRI

3. Methodology:

MRI course for small animal imaging
Course in Laboratory Animal Study

a) Phantom studies

=> MRI protocol design

b) Animal trial study

=> protocol optimization and finalization

c) Animal group study

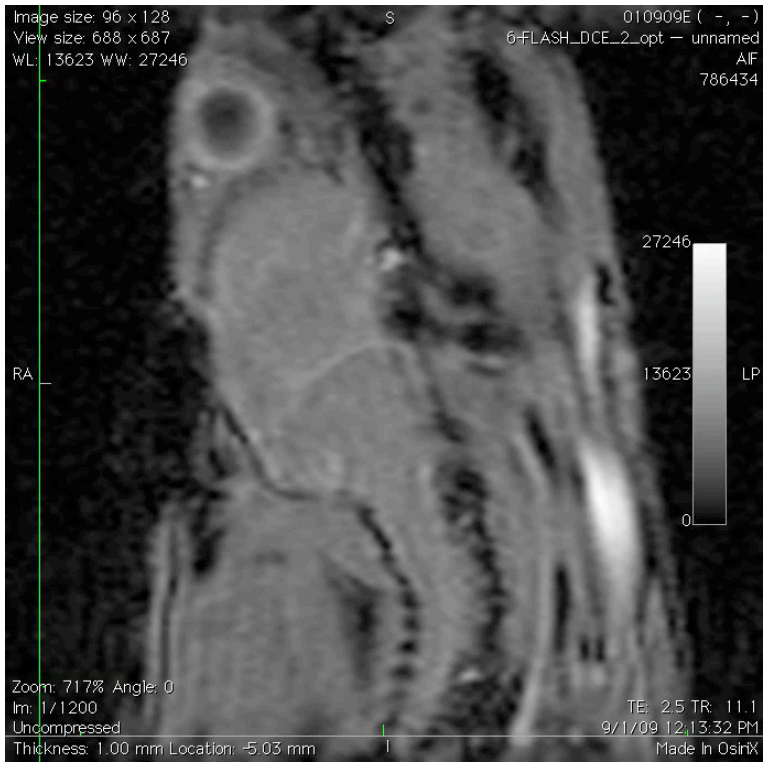
✓ Animal study approval

✓ Animal preparation (breading, treatment, etc…)

✓ Scanner booking

Some Applications

Perfusion measurements in mice

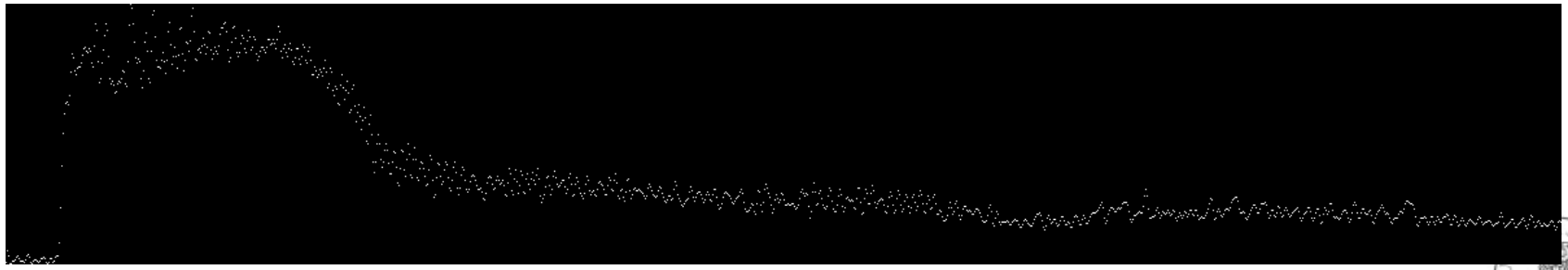


- <u>Goal:</u> Measurement of perfusion (AIF – arterial input function and VIF – venous input function)

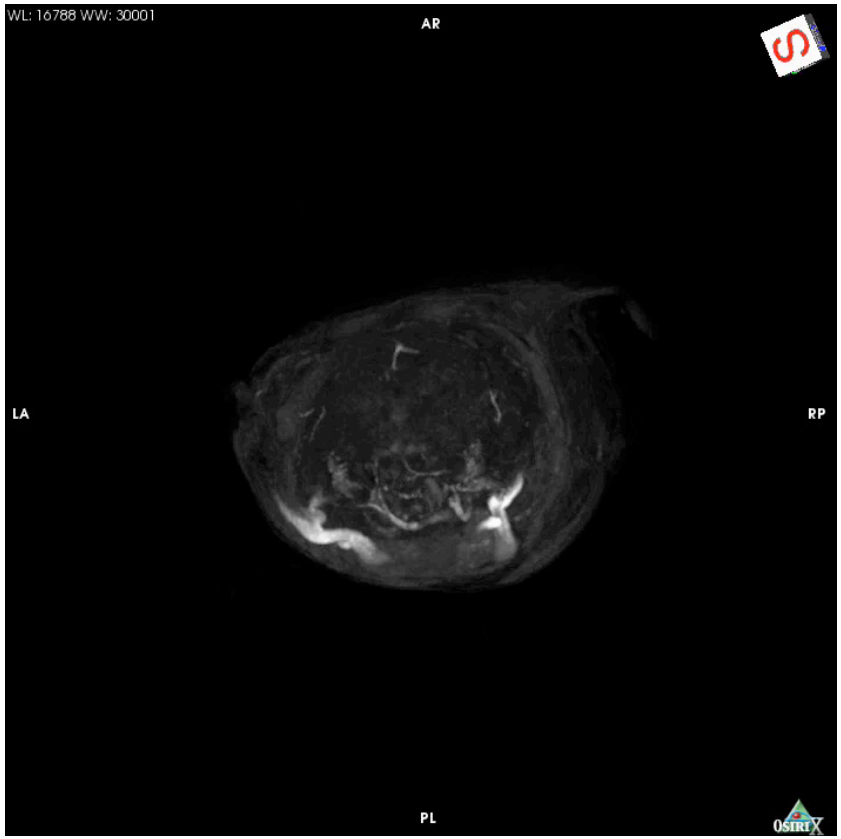
- <u>Pulse sequence</u>:

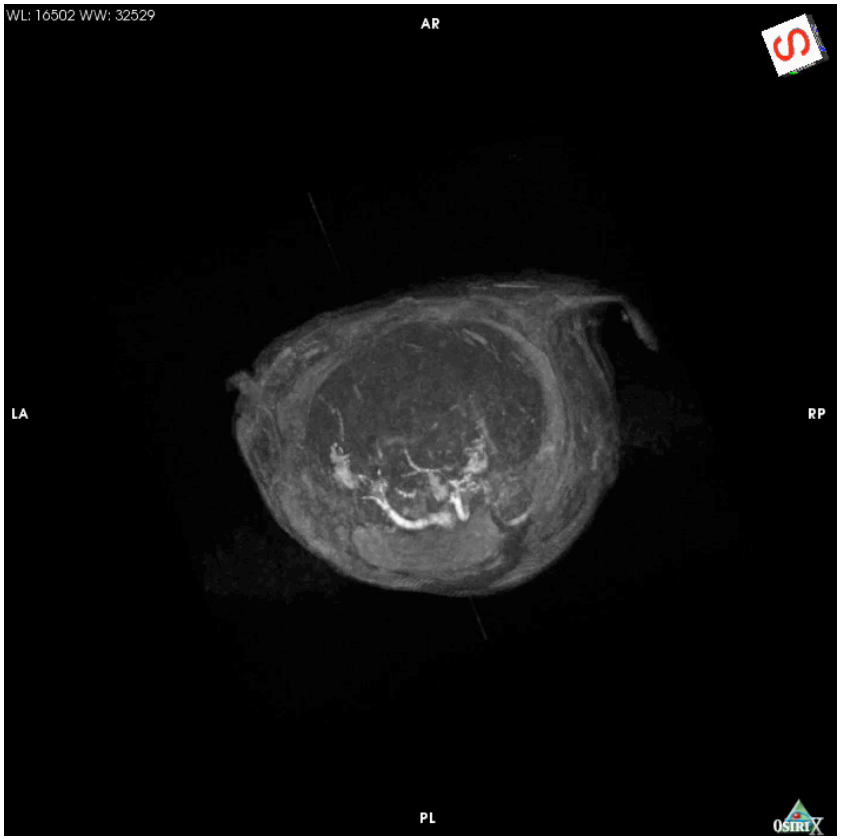
  T_1-weighted FLASH with Gd contrast agent for dynamic perfusion study

- Resolution = 260 x 260 μm^2
- FOV = 2.5 x 2.5 cm^2
- Scan time = 16 min



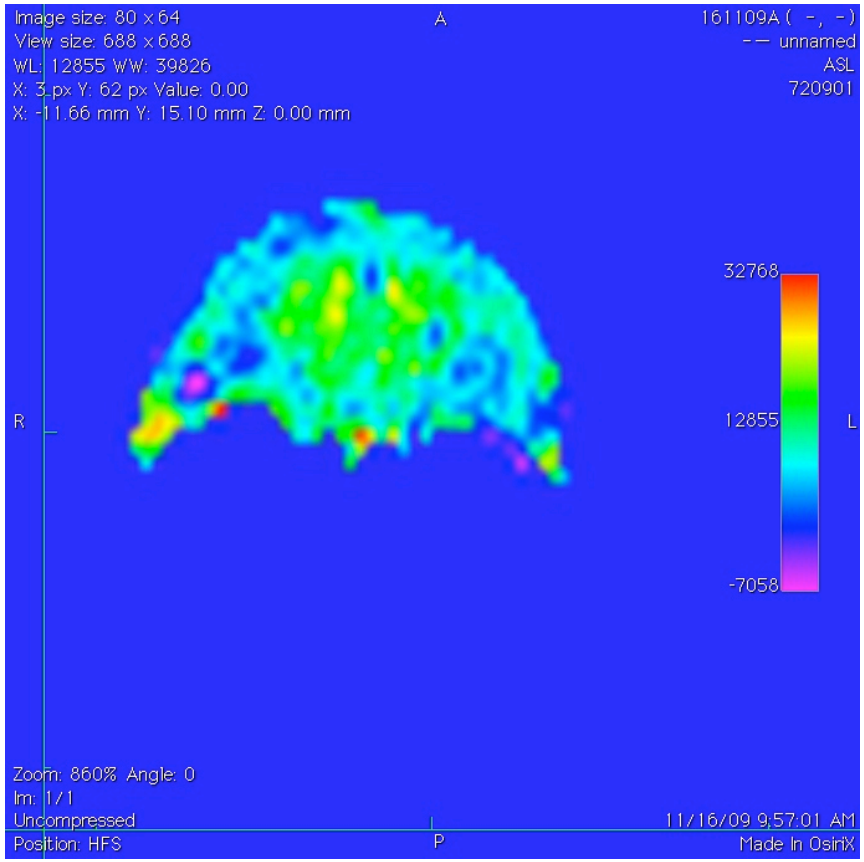
Angiography in mouse





- Pulse sequence: FLASH-3D (T_1 weighted FLASH)
- Resolution = 98 x 98 μm^2, FOV = 2.5 x 2.5 cm^2
- Scan time = 6 min 8 s

Perfusion (with ASL) in mouse brain

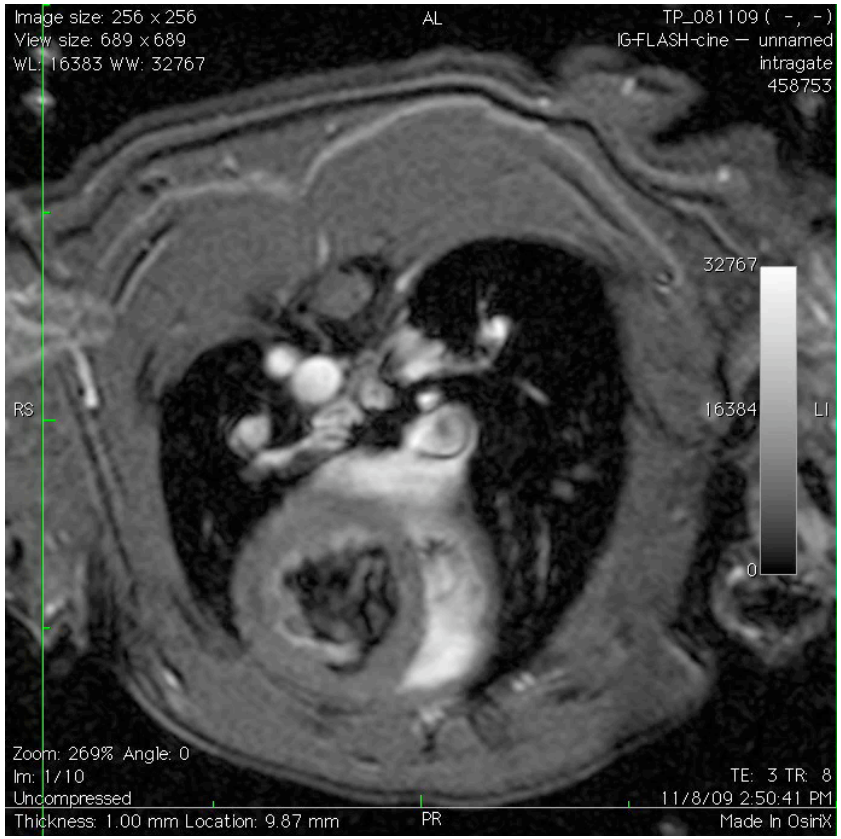


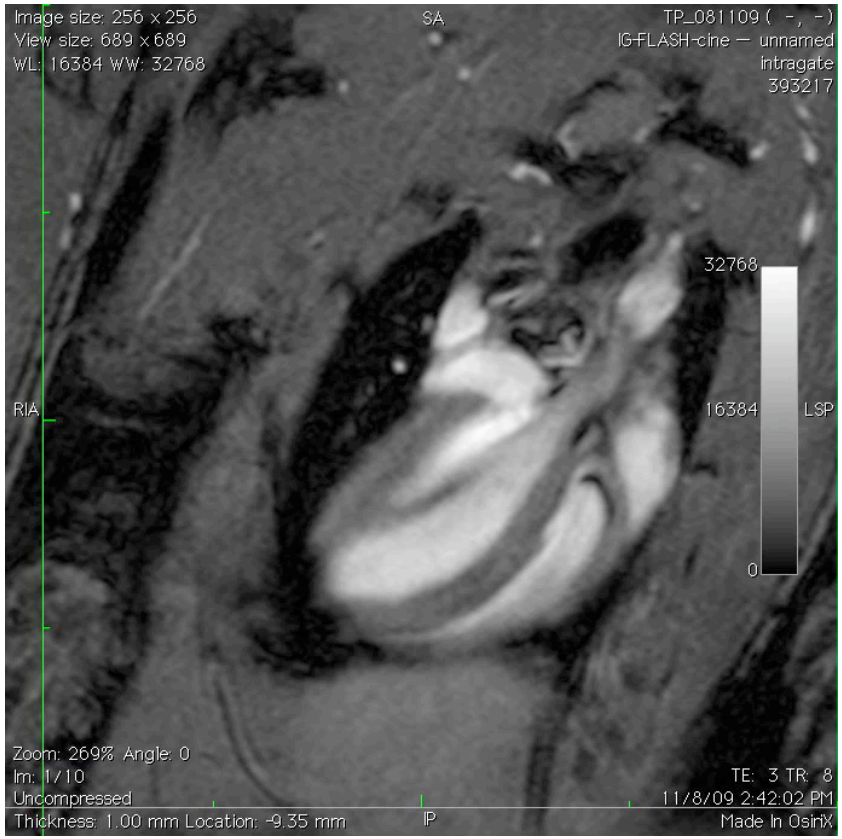
- Goal: Measuring perfusion in mice brain without the use of contrast agent

- Pulse sequence:

  Inversion recovery EPI or FAIR
- global and slice selective inversion pulse
- Resolution = 397 x 397 μm^2
- FOV = 2.54 x 2.54 cm^2
- Scan time = 13 min 12 s

Cardiac Imaging: Rat



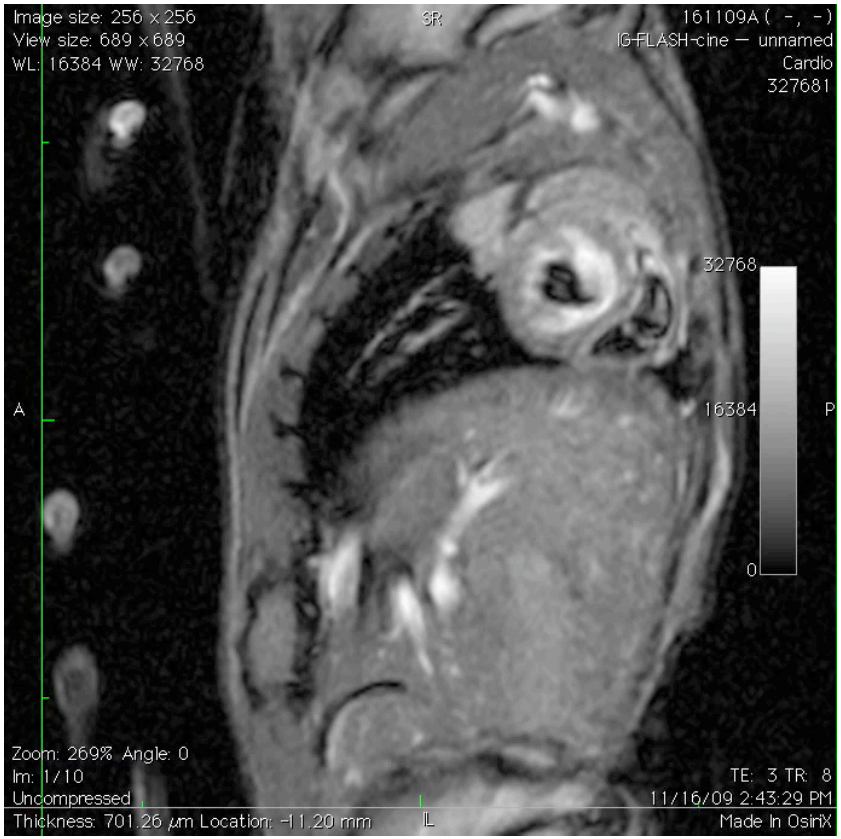


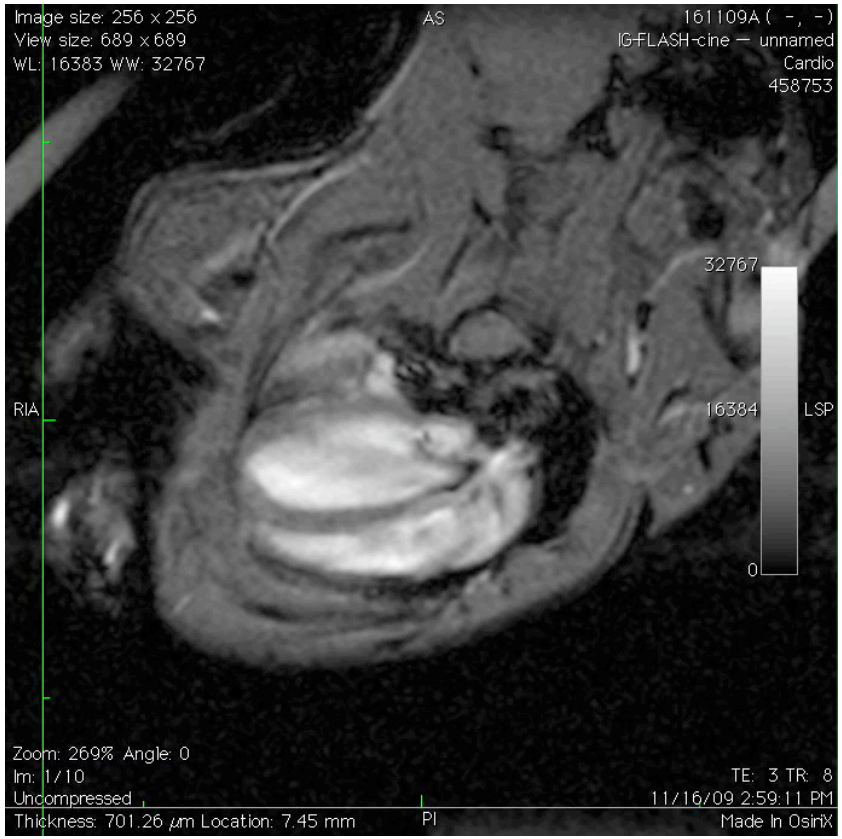
Pulse sequence: IntraGateFLASH, **no external cardiac triggering required!**

Resolution = 156 x 156 μm^2, FOV = 4.00 x 4.00 cm^2

Scan time = 5 min 7s

Cardiac Imaging: Mouse





Pulse sequence: IntraGate, **no external cardiac triggering required!**

Resolution = 117 x 117 µm^2, FOV = 3.00 x 3.00 cm^2

Scan time = 5 min 7 s

Thank you!

Interested?

Contact us at 55586007/6698 or email tina.pavlin@biomed.uib.no.

http://www.uib.no/med/mic/index.html