MRI CryoProbe™

New Signal-to-Noise Horizons in Small Animal MRI

Bruker's new series of MRI CryoProbes for MRI systems feature very low temperature, closed-cycle cooled RF-coils and preamplifiers delivering an increase in signal-to-noise ratio (SNR) by a factor of 2.5 over standard room temperature ^{1}H RF-coils in routine MRI applications.

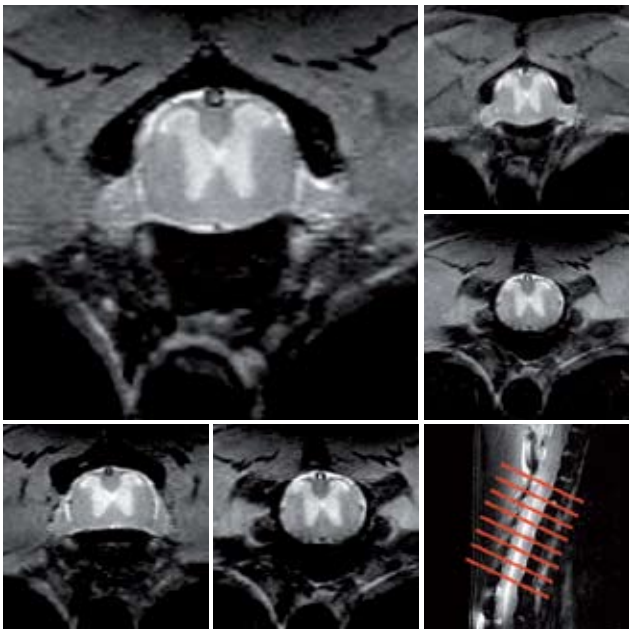
think forward

MRI

MRI CryoProbe Applications

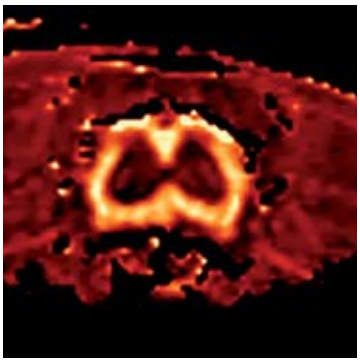
Mouse Spine Imaging

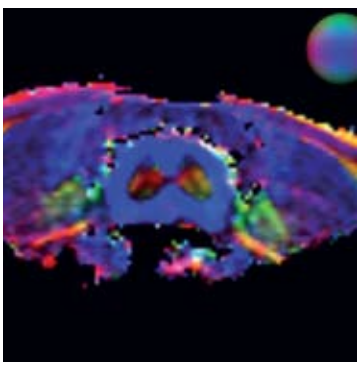
High-resolution (46 x 46 µm in-plane) mouse spine imaging using TurboRARE, acquired in less than 7 minutes at 9.4 T. Excellent differentiation of gray and white matter and visualization of fine anatomical details, such as root ganglions, vessels, and cerebrospinal fluid.

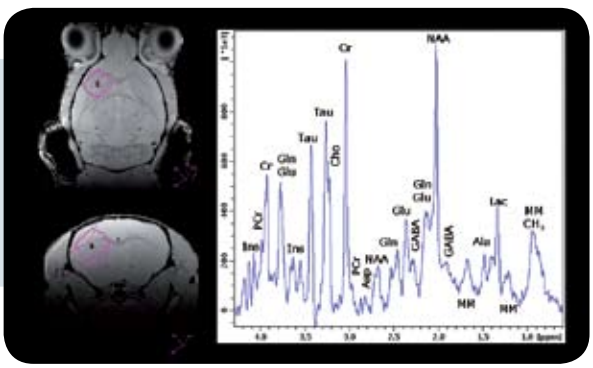


Diffusion Tensor Imaging of Mouse Spine at 9.4 T

Segmented echo planar diffusion tensor imaging of the mouse spine. The fractional anisotropy (FA) exhibits very high contrast between gray and white matter. The color encoded directional components of the diffusion tensor displays fibers in left-right direction in red, allowing for identification of nerve fibers leaving the spinal cord (here towards the front extremities left and right).





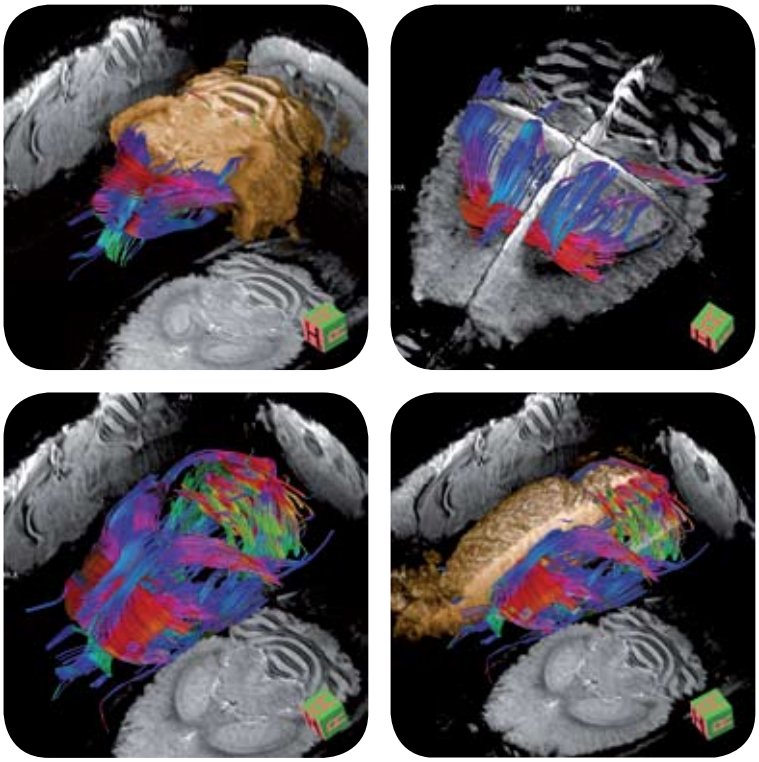


^{1}H MRS (STEAM)

STEAM localized ^{1}H spectroscopy in mouse frontal brain at 9.4 T. The 8 µl voxel was acquired within 20 minutes. J-coupled resonances show minimal temporal evolution due to the short TE of 3 ms. This simplifies quantication of *in vivo* spectra and allows the investigation of macromolecules while maintaining a high signal yield.

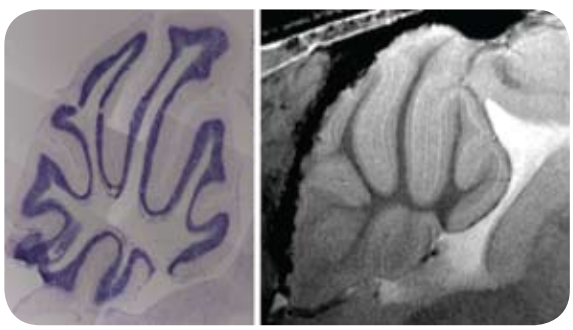
DTI Fibers

Color encoded mouse brain fiber tracking overlaid on T_2* weighted anatomical images. The 195 x 195 µm² in-plane resolution DTI data set with full brain coverage was acquired with diffusion weighted single-shot echo-planar imaging within 18 minutes at 7 T. (b = 650 s/mm², 256 diffusion directions).



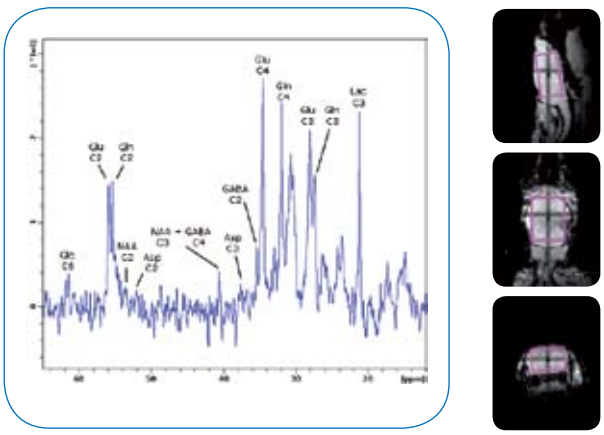
Comparison with Nissle staining

Comparison of micro-structures in the mouse cerebellum measured at 9.4 T with histological Nissle staining (left). Identification of anatomical structures like white matter, granular layers, molecular layers and Purkinje cell layers are possible. Courtesy: Baltes C. et al., ETH Zurich, Switzerland.



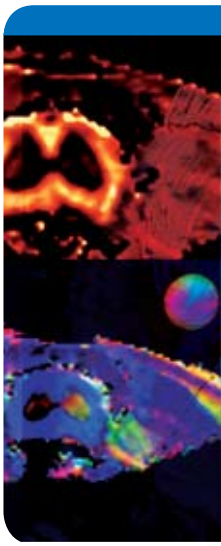
^{13}C MRS (ISIS)

Mouse brain ISIS localized ^{13}C spectroscopy using the ^{13}C MRI CryoProbe following intravenous [1-^{13}C] glucose infusion. The 4.5 x 7 x 9 mm³ voxel was acquired after 2 h of infusion within 1 h measurement time. The SNR gain of a factor of 3 at 100 MHz or 9.4T, respectively compared to a room temperature coil allows for the direct detection of glucose metabolism in the mouse brain. Courtesy: R. Pohmann, MPI Tübingen, Germany.



High Resolution MRI of Mouse Brain *in vivo*

Use of the MRI CryoProbe in routine imaging of the mouse brain *in vivo* delivers outstanding image quality. The increased signal-to-noise ratio enables the acquisition of high resolution images of the microscopic structures in the mouse brain down to the cellular level.



Main Features

- Increase in proton sensitivity up to a factor of 2.5 compared to room temperature quadrature receive-only coil
- Flexible transfer lines for easy siting
- Standardized interface enabling different MRI CryoProbes to be used with one cooling platform
- Efficient design minimizes distances between RF-coil and object
- Carefully controlled thermal environment with no cold surfaces in contact with animal
- Cooling down and warming up outside the magnet possible
- Automatic cool-down and warm-up procedure

Technology

Our MRI CryoProbe technology uses cryogenically-cooled RF-coils and preamplifiers cooled by a closed-cycle refrigeration system. As a consequence the coil performance is improved and the noise contribution of the associated electronics is strongly reduced. Bruker BioSpin is the pioneer in the development of cryogenically cooled probes for high-resolution NMR and has installed more than 1,000 systems at customer sites worldwide during the last 10 years.

Easy-to-use CryoProbe Setup

Animal handling and supervision of the MRI CryoProbe is very similar to standard room temperature RF-coils. MRI CryoProbe cooling can be accomplished outside the magnet ensuring optimum usage of the scanner time.

Bruker BioSpin

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