PRECLINICAL IMAGING

ParaVision 360 V3.5

Power and efficiency for metabolic, molecular, and morphological imaging.

Innovation with Integrity

ParaVision 360 is the most advanced preclinical imaging software. Its extensive method range and sophisticated analysis capabilites are expanded with version 3.5, that adds ease to morphological scanning, proficiency to molecular scanning, and greatly increases metabolic study options.

Morphological Ease

Faster Isotropic Scanning with RAREvfl

3D isotropic imaging allows arbitrary plane construction. RAREvfl makes fast, T2-weighted 3D, isotropic in vivo imaging possible. By employing variable flip angles as refocusing pulses, RAREvfl enables long RARE factors and thus fast acquisitions.

ParaVision 360 V3.5 includes pre-optimized, T2-weighted, 3D RAREvfl protocols for 3 Tesla, 7 Tesla, and 9.4 Tesla allowing straightforward and fast morphological acquisitions of the brain.

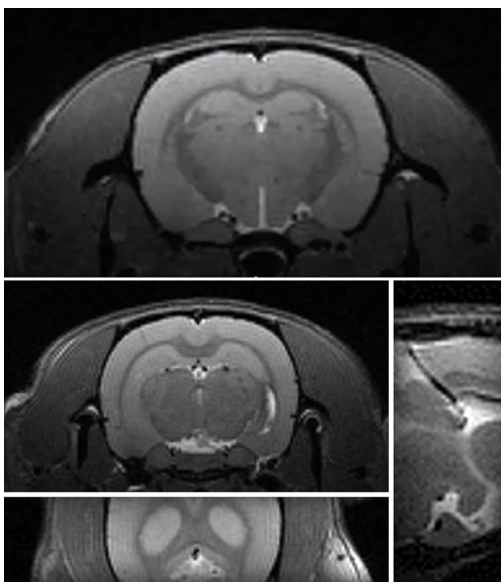

Figure 1 Fast isotropic 3D rat brain image (top) was acquired with 200 µm³ resolution within 6 minutes at 9.4 Tesla and was used for orthogonal reconstructions (bottom)

Comprehensive Metabolic Imaging

Continuous Advancement of the Spectroscopy Package

Bruker has always placed a strong focus on spectroscopic imaging, and has therefore continuously expanded the spectroscopic method and analysis options of ParaVision.

Classic Spectroscopic Imaging

At the forefront of magnetic resonance spectroscopy, ParaVision has long provided users with PRESS, STEAM, CSI, EPSI, and ISIS methods, which address spectroscopic challenges with high SNR, short TE times, and high bandwidths.

Simplified Spectroscopic Preparation with ParaVision 360

The introduction of ParaVision 360 made spectroscopic scanning preparation more straightforward with the dynamic shimming for multi-slice CSI and an automatic reference power adjustment for x-nuclei.

Best Voxel Definition with Semi-LASER

Semi-LASER is used to study a range of neurological and psychiatric diseases, e.g. multiple sclerosis, Parkinson's disease, and bipolar disorder. It is a variation of LASER (Localized Adiabatic Shaped Echo Refocusing), which uses adiabatic pulses to selectively excite and refocus the signal from a specific volume of tissue, resulting in high-quality spectra with minimal contamination from other regions.

Introduced with ParaVision 360 V3.2, semi-LASER combines adiabatic pulses for signal refocusing with a conventional pulse for signal excitation. This allows for shorter echo times and improved sensitivity compared to LASER, while still maintaining high quality localization and spectral quality.

Spectral Editing with MEGA-PRESS

ParaVision 360 V3.5 introduces the MEGA-PRESS sequence, which enhances the PRESS sequence with editing pulses that selectively invert J-coupled resonances, leading to greatly simplified metabolic spectra. In addition to water or lipid suppression, this technique is often used in in vivo measurements of metabolites with low concentrations or with substantial signal overlap, such as the lactate peak, which has a great overlap with the lipid band. Commonly used in studies of the spectrally overlapping γ-aminobutyric acid (GABA), glutamate, and glx (glutamate/glutamine), MEGA-PRESS enables a better quantification and understanding of these primary neurotransmitters.

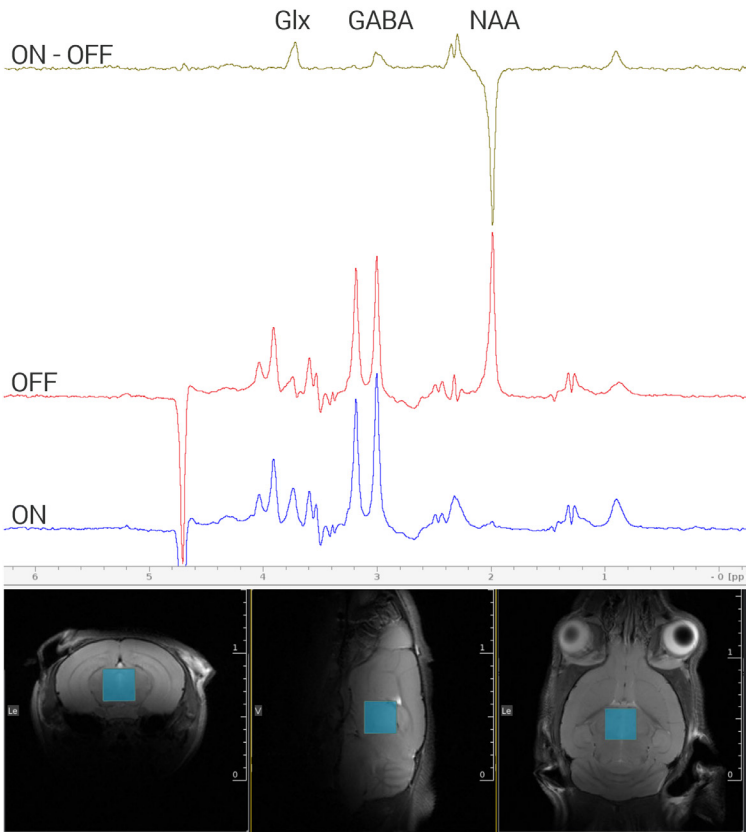

Figure 2 MEGA-PRESS spectrum from mouse brain at 7 Tesla spectrally edited for GABA and Glx.

Spectroscopy Card with Visualization and Analysis

ParaVision 360 V3.5 also introduces the Spectroscopy Card, for efficient visualization and processing of single voxel spectroscopy data as well as chemical shift imaging spectroscopic data (e.g. CSI) directly in ParaVision. During the acquisition process, time domain signal of Fourier transformed individual CSI voxel spectra can be followed in real time for each of the individual voxels by simple selection thereof. As the analysis takes place within ParaVision, spectroscopic data including CSI data with voxel grids can be visualized and overlayed to anatomical reference images. Furthermore, spectra are baseline and phase corrected using an A.I. based correction algorithm. With simple metabolic maps creation via metabolic-specific frequency region definition, the Spectroscopy Card simplifies hyperpolarization, x-nuclei, and metabolic CSI studies.

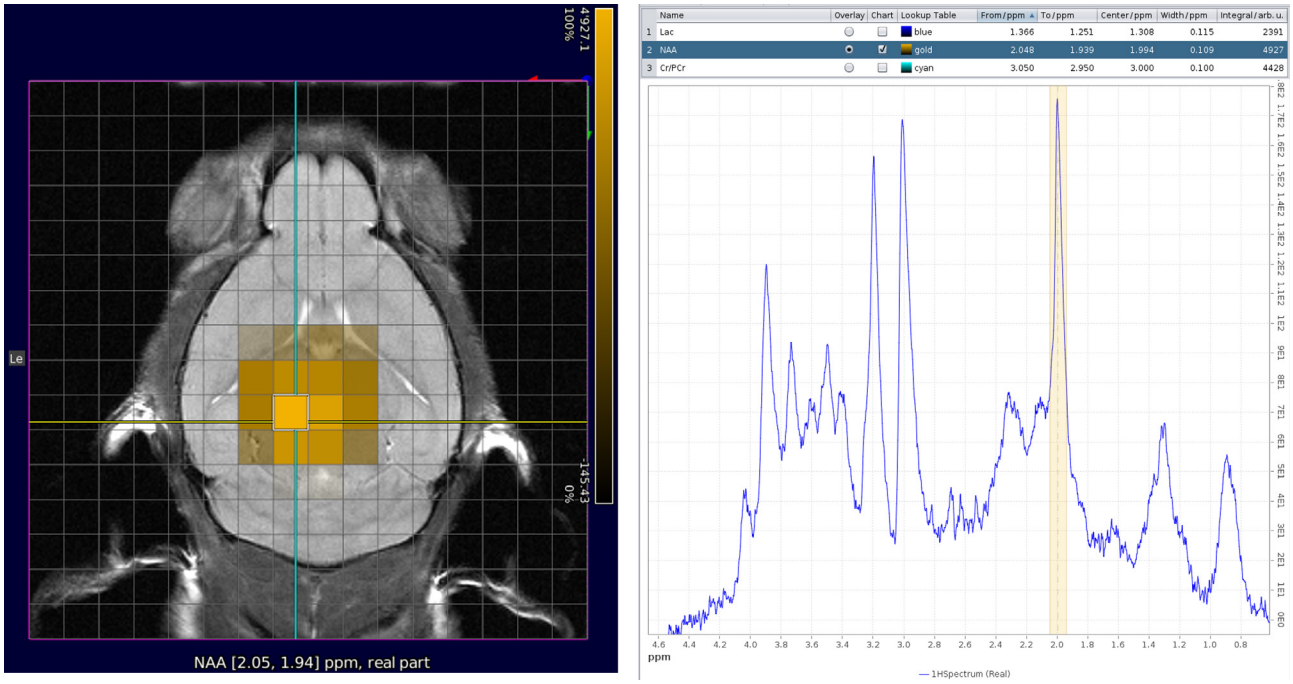

Figure 3 CSI of mouse brain acquired with BioSpec Maxwell 94/17. Visualization of one individual spectra as well as NAA map.

Standarized fMRI

Addressing the vital topic of standardization, ParaVision 360 V3.5 introduces a standardized rat T2* EPI protocol for fMRI, according to the guidelines provided within the MultiRat[1] collaboration. This protocol, which is implemented from 3 Tesla to 11.7 Tesla, is designed to maximize functional connectivity specificity, and can be used to minimize variability across laboratories.

[1]https://github.com/grandjeanlab/StandardRat

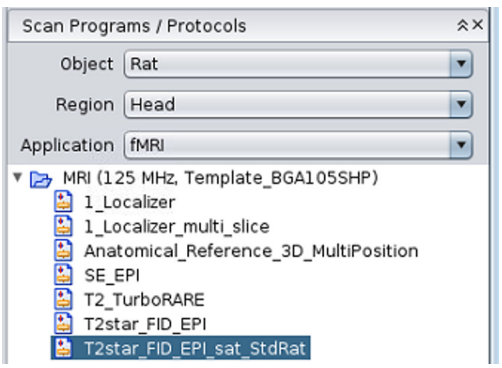

Figure 4 The T2* FID EPI saturation standard rat protocol located within the rat head fMRI protocol tree.

Molecular Proficiency

Larger Range for Morphological and Molecular Scanning

The extent of PET/CT scanning has been increased from 200 mm length to 250 mm for full nose to tail rat body scanning. A fully automatic stitched protocol also includes an attenuation correction (AC) map.

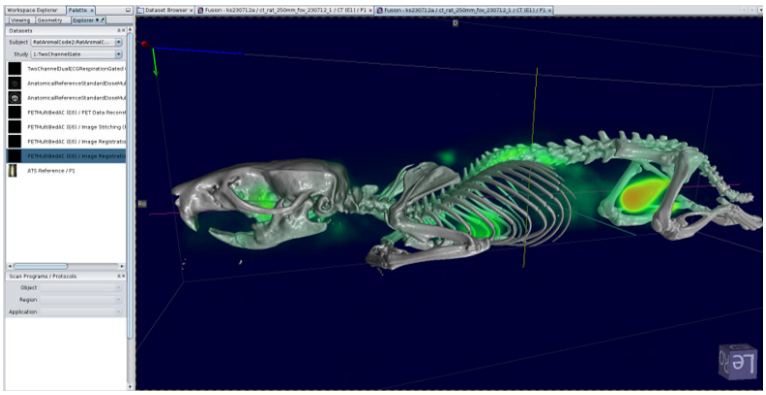

Figure 5 Fast extended PET/CT imaging for full rat body coverage.

Efficient Molecular Imaging with PET Online Reconstruction

Real-time 3D display of tracer biodistribution during scan progression provides immediate confirmation of synchronized tracer administration and timing details. Data display on the touchscreen as well as in pre-defined single slices, and the ability to switch between last and accumulated measurements, allows planning of high-resolution MRI scanning based on tracer biodistribution while the PET scan is still running or the option to proceed to the next subject should the online reconstruction indicate the need. This saves time while increasing animal welfare and enables confident definition and modification of dynamic studies.

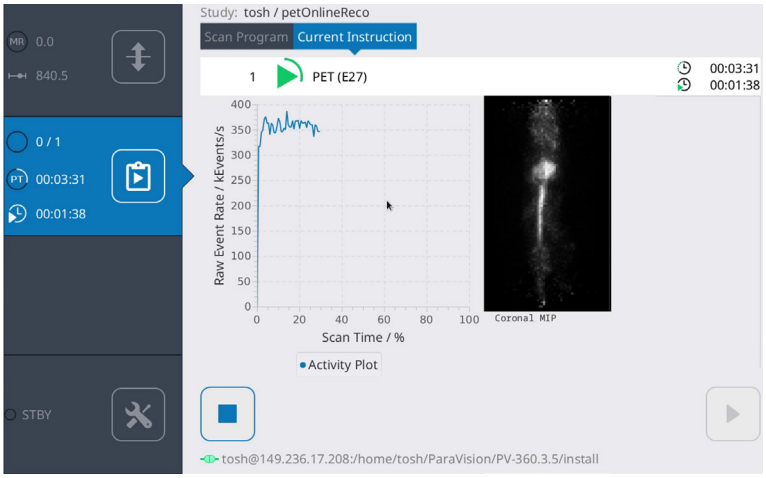

Figure 6 Touchscreen display of count rate evolution and MIP online reconstruction. Example with accumulation of first few seconds of IV injection in mouse, showing initial stages of the F18-FDG biodistribution, with the highest concentration of activity in the inferior vena cava and the heart.

Interested in learning more about ParaVision 360? Visit www.bruker.com or contact us directly via the links below

Bruker BioSpin
info@bruker.com

bruker.com

Customer Support
https://www.bruker.com/en/services/support.html

Online information
https://www.bruker.com/en/products-and-solutions/preclinical-imaging/paravision-360.html

All Bruker in vivo animal work was approved by the institutional animal care and use committee (IACUC) or local authorities and conducted under valid study permit.