PET/MR 3T

- Nuclear molecular sensitivity meets unlimited possibilities of multiparametric MRI

Innovation with Integrity

Preclinical Imaging

MRI and PET Combined... For The Best of Both Worlds

The latest breakthrough in PET detector technology, together with the proven superior soft tissue contrast of translational field strength MRI, are now combined in one compact, easy to use instrument. Featuring homogeneous, constant PET resolution over the whole field of view, a newly developed 3T MAXWELL magnet and a motorized animal transport system, the PET/MR 3T simplifies your workflow and supports a broad spectrum of application fields, such as oncology, functional and anatomical neuroimaging, orthopedics, cardiac imaging and stroke models.

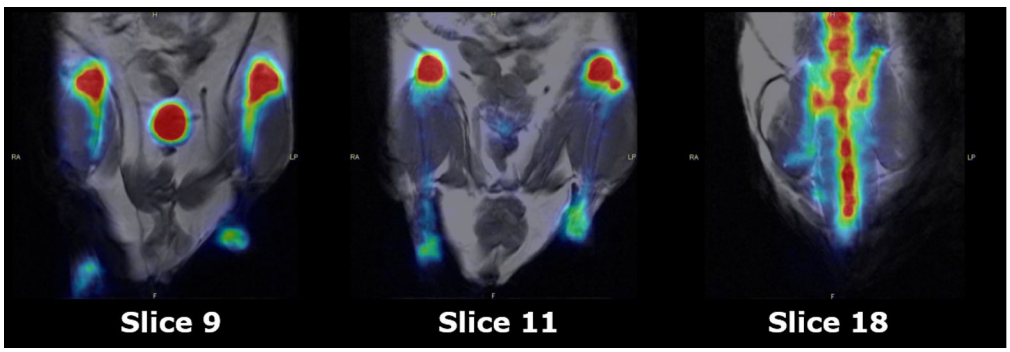
Key Benefits

- Unprecedented PET resolution up to 0.7 mm, with Full Field Accuracy (FFA)[1]
- Save precious instrument time with a leading PET sensitivity of 12%
- Consistent quantification with attenuation correction based on high quality MRI data
- Unique boost of MRI sensitivity and resolution with the MRI CryoProbe™ for mice and rats
- Proven MRI performance with fully featured ParaVision® preclinical user interface, intrinsically supporting multimodal workflows

Multimodal System Features

- Accurate animal positioning with the motorized animal handling system including touchscreen operation enables automatic co-registration of images
- Image fusion and quantitative analysis using PMOD
- Whole body scans with a total field of view of >285 mm enabled by moving table acquisitions

Figure 1



Mouse Knee Osteoarthritis Model. Cartilage degeneration seen in bones and joints in severe osteoarthritis. Assessment of the activity of mesenchymal stem cell transplantation on a knee by NaF-18 uptake in bones. Precise delineation of activity at arthritic areas and excellent definition of knee joints and spine in highly resolved PET images. Courtesy: Dr. Victoria Moreno, Centro de Investigacion Principe Felipe, Valencia, Spain.

Next Generation MRI and PET Combined for Improved, Faster Research Results

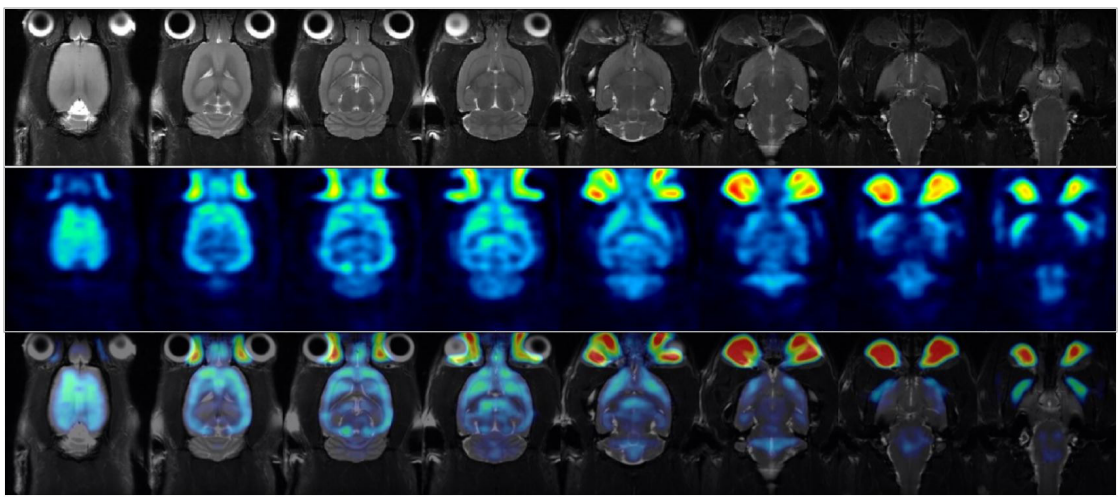
PET Features

- Sharp PET images with new PET Silicon PM detectors deliver consistent and reproducible quantification within the entire FOV, regardless of object size and position
- Patented continuous LYSO crystals, unrestrained by discrete layers, and Silicon position sensitive photomultipliers with advanced depth-of-interaction (DOI) detection enable precise 3D localization of events. This eliminates the resolution degradation when moving out of the center of the PET Field-of-View (FOV)
- No shielding required: PET technology is fully compatible with high magnetic field strength; spatial resolution and energy resolution are unchanged within the magnetic field
- Exceptional count rate performance combined with 12% sensitivity for dynamic and gated studies for high temporal resolution and superior image quality

MRI Features

- Superior MRI magnet technology ensures the magnet remains on field during power outage or cold water failure for up to 4 hours
- Best in class homogeneity of 0.3 ppm for a 50 mm DSV due to solid magnet design
- MRI sequence portfolio of more than 1000 sequence variations, including wireless cardiac imaging using navigator based IntraGate methods with a choice of cartesian or radial readout, as well as short echo time imaging, such as UTE and ZTE
- Widest range of RF-coils (~30) for mice and rats available, including coils for head, brain, cardiac, body, and multi-purpose applications
- Over 100 validated and ready to use *in vivo* protocols and scan programs for mice and rats

Figure 2



Neuro-Imaging in Rats. PET/MRI provides a powerful tool for inquiry into Neurological disorder imaging. MRI's superior soft tissue contrast is a gold standard for in vivo brain imaging. PET adds its outstanding molecular sensitivity combined with huge sensitivity (106 fold increase). An example of healthy rats sequentially imaged with MRI T2 Turbo RARE Angio and PET (F-18) FDG.The PET image comparatively lower resolution than MRI is still capable of differentiating not only the harderian glands, olfactory bulb and cerebellum but also the brain cortices and internal structures. Image parameters: PET: 20 MBq (F-18)FDG, 1 h uptake time and 1h imaging. MLEM 24i and PVC. MRI: T2 TurboRARE Angio. Transmission: 82 mm circ. pol. volume coil. Reception: Rat 2 x 2 brain array,

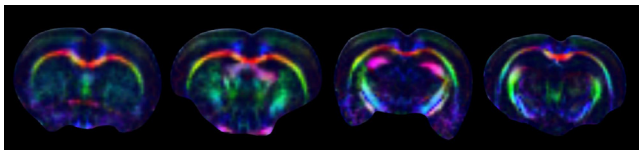
Technical Specifications for MRI

Field strength	3 Tesla (rampable)
Magnet technology	MAXWELL technology - no liquid helium or nitrogen required - no quench line required
Bore diameter	17 cm
Magnet hold-time during power outage or cold water failure	Up to 4 hours
Homogeneity	DSV 50 mm: 0.3ppm
Stray field (center to 0.5 mT)	0.53 / 0.94 m (radial / axial)
Quench pipe required	No
Gradient Specifications	
Inner diameter	105 mm
Gradient strength	450 mT/m (900 mT/m with high power option)
Slew rate	4200 T/m/s
Gradient duty cycle, max. simult. DC	3 x 65 A

Technical Specifications for PET

FOV transaxial	80 mm
FOV axial	148 mm
Spatial Resolution	≤ 0.8 mm accross the entire FOV
Sensitivity	12%
Average energy resolution:	≤ 17
NEMA performance characteristics	
NECR rat	280 kcps @ 21 MBq
NECR mouse	560 kcps @ 21 MBq
Resolution	≤ 1.2 mm accross the entire FOV
Sensitivity	> 9%

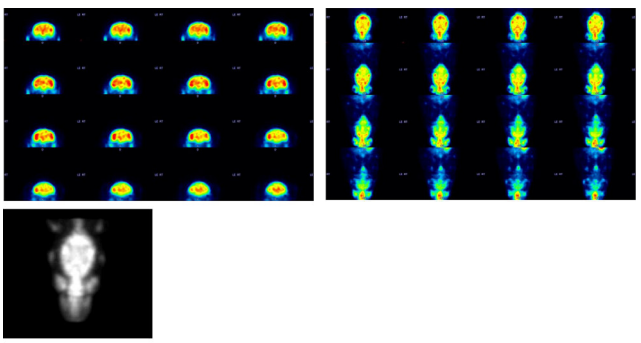
Figure 3



Ultra Fast Diffusion Tensor Imaging (DTI) in rat brain in vivo. 120 diffusion directions in a multi-slice DTI -EPI imaging in only 4 min 40 s total scan time. Image Parameters: Single-shot DTI-EPI. TE/TR: 26.1/2000 ms, resolution:(260×260) µm², slice thickness: 1.25 mm, RF coils, Circularly polarized 82 mm volume coil for signal transmission, 20 mm surface coil for signal reception. Applications of DTI:

- Deformation assessment of white matter by tumors
- Delineation of immature brain anatomy
- Detection of early disease in Alzheimer
- Schizophrenia
- Focal cortical dysplasia
- Plaque assessment in MS
- 120 diffusion directions in a multi-slice DTI -EPI imaging in only 4 min 40 s total scan time

Figure 5



[F-18]FDG Brain Imaging in Healthy Mouse. Mouse brain imaging poses a challenging application for preclinical PET given the small size of dissimilar uptake regions in close proximity. [F-18]FDG PET image: Multiple slices in both the transaxial and axial directions show the level of detail achieved in resolving brain structures with standard reconstruction settings. Below, MIP view

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