Looking at drug discovery in a whole new way
How does microPET® work?

microPET® is a molecular imaging technology that, when combined with appropriate radiotracers, can assess a wide range of molecular targets and events in vivo. A positron-emitting labeled compound injected into a subject distributes throughout the body and accumulates in tissue. This accumulation occurs by either binding to specific molecular targets, or by enzymatic or metabolic trapping in cells. microPET® is then able to generate quantitative, volumetric images representative of this compound’s distribution as well as its temporal rate of change. Through this process, microPET® provides images representing substrate metabolism, specific receptor distribution, enzymatic activity, drug pharmacokinetics and pharmacodynamics, DNA synthesis, gene expression and many other bio-molecular processes.

Researchers around the world are currently using microPET® to:

- Assess new pharmacological agents in drug development
- Assess drug delivery and gene therapy approaches
- Study animal models of human disease and new therapeutic approaches in these models
- Study genetically engineered animals
- Develop new molecular imaging assays
- Develop new radiotracers for use in diagnostic imaging

Flexibility

microPET® is used to image a wide range of laboratory animals. The ability to make repeat measurements in individual animals is particularly valuable in animal models that have high intrinsic value or that exhibit high variability.

microPET® is offered in two configurations:

- microPET® P4, with a bore size of 22 cm, can accommodate a wide range of animal models including mice, rats, rabbits and non-human primates
- microPET® R4, with a bore size of 12 cm, for the dedicated use of smaller rodents (mice and rats)

Ease of Use

Both models of microPET® feature easy-to-use, Windows®-based software. Data acquisition is controlled by microPETManager®, a user-friendly interface that enables an unlimited number of acquisition and post-processing protocols to be set up, saved and categorized. The raw data are stored in list-mode format, which gives the user tremendous flexibility for histogramming the data into sinograms for later reconstruction into images. The display, analysis and setup of the system are controlled through ASIPro®, which provides advanced data analysis and visualization functionality, including simultaneous viewing and linking of images and sinograms, as well as an image/sinogram calculator that can preview and save normalized and attenuation-corrected emission files.
LSO Crystals
Fast, bright and high-stopping-power scintillator, leading to excellent sensitivity, timing resolution, energy resolution and count-rate performance.

Laser Alignment System
Assures that the selected region of interest is located precisely in the center of the field of view.

Detector Technology
Optimized for small-animal imaging using LSO blocks coupled to position sensitive PMTs via fiber optics.

Continuous Bed Motion/Removable Bed Pallet
Continuous movement is computer controlled. The pallet, made of 100% composite materials, is removable for use in various modalities.

Attenuation Correction and Normalization
Transmission, normalization and blank acquisitions are obtained using a point source that is rotated and translated in a helical orbit through the field of view for full coverage of all the crystals.
Defining the future with microPET®

Scientists from around the globe are using microPET® to push their research to new heights. Pictured below is a small sampling of recent research being conducted with microPET®.

**microPET® P4: Whole-Body FDG Mouse Image**

Mouse Position: Axially
4 bed positions, 20 minutes per bed position

**microPET® R4: 18F Bone Scan**

5.5 MBq, 100-minute scan
Images courtesy of Max-Planck-Institute for Neurological Research, Cologne, Germany

**microPET® P4: Whole-Body Rat 18F-FDG**

Images courtesy of University of Cambridge, UK

**microPET® P4: Non-Human Primate Data**

Images provided by Crump Institute for Molecular Imaging, Los Angeles, CA

**microPET® R4 and MRI: Hamster Images**

Abdominal GW39 Tumors (week 6)
1 mCi 18F, 1 hour post injection
Images provided by Mallinckrodt Institute of Radiology and Washington University, St. Louis, MO
JS Lewis et al., J Labelled Compds Radiopharmas 2001; in press.

**microPET® R4: [18F]FECNT Rat Study**

60-minute scan
Images courtesy of Dr. John Votaw, Emory University, Atlanta, GA

**microPET® R4: FMZ Dynamic Rat Study**

~70-minute scan, frame 9 of 15
Images courtesy of Dr. M. Kilbourn, University of Michigan, Ann Arbor, MI
Targeting the needs of molecular imaging, biology, and pharmaceutical labs, microPET® is a dedicated small animal PET scanner. Offering the best sensitivity and resolution of any full ring PET system, microPET® is available in three models to accommodate a wide variety of research applications and budgets.

The microPET® R4 is the lowest priced, full ring PET system in the world. Despite its low cost the microPET® R4 outperforms every competing system in terms of count rate performance, energy resolution, timing resolution, and feature set.

Utilizing Concorde's proprietary Focus™ detector technology and possessing virtually the same imaging volume as the R4, the microPET® Focus™ 120 offers the highest sensitivity of any commercially available PET system. Focus™ systems also possess the highest spatial resolution of any scintillator based PET system. The combination of high resolution and sensitivity gives the Focus™ 120 uncompromised performance and unmatched quantitative accuracy for dynamic and static imaging.

Utilizing Focus™ detector technology, the microPET® Focus™ 220 possesses resolution, sensitivity, and a large imaging volume providing for the flexibility to image multiple mice or large primates without compromising image quality.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>microPET® R4</th>
<th>microPET® Focus™ 120</th>
<th>microPET® Focus™ 220</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detector Diameter (cm)</td>
<td>15</td>
<td>15</td>
<td>26</td>
</tr>
<tr>
<td>Bore Size (cm)</td>
<td>12</td>
<td>12/15*</td>
<td>22/26*</td>
</tr>
<tr>
<td>Transaxial Active Field of View (FOV in cm)</td>
<td>10</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Axial Field of View (cm)</td>
<td>7.8</td>
<td>7.6</td>
<td>7.6</td>
</tr>
<tr>
<td>Number of Detector Blocks</td>
<td>96</td>
<td>96</td>
<td>168</td>
</tr>
<tr>
<td>Total Number of LSO Elements</td>
<td>6,144</td>
<td>13,824</td>
<td>24,192</td>
</tr>
<tr>
<td>Pixel Element Size (mm&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>2.1 x 2.1 x 10</td>
<td>1.5 x 1.5 x 10</td>
<td>1.5 x 1.5 x 10</td>
</tr>
<tr>
<td>Absolute System Sensitivity (%)**</td>
<td>4.0</td>
<td>6.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Resolution at Center of FOV (mm)</td>
<td>≤ 1.8</td>
<td>≤ 1.3</td>
<td>≤ 1.3</td>
</tr>
<tr>
<td>Average Energy Resolution (%)</td>
<td>≤ 18</td>
<td>≤ 18</td>
<td>≤ 18</td>
</tr>
<tr>
<td>Volumetric Resolution (Center FOV) (µl)</td>
<td>≤ 7.0</td>
<td>≤ 2.5</td>
<td>≤ 2.5</td>
</tr>
<tr>
<td>Volumetric Resolution (Central 8 cm) (µl)</td>
<td>≤ 35</td>
<td>≤ 9</td>
<td>≤ 9</td>
</tr>
</tbody>
</table>

** With lead shields removed.

Features

- Normalization (point source or cylinder acquisition)
- Deadtime Correction
- Scatter Correction
- Decay Correction (> 24 Isotope supported)
- Dynamic Framing (variable from 1msec to static)
- Simultaneous Respiratory and Cardiac Gating
- Interchangeable bed pallet
- Mobile (does not require new setup)
- Wholebody mouse imaging in a single bed position

* For more details, see enclosed CD "microPET® specifications"

microPET® is a registered trademark of Concorde Microsystems, Inc.
**microPET® Engineering Specifications**

### Structural

<table>
<thead>
<tr>
<th>Specification</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit weight</td>
<td>Approx. 600 lbs. (272 kg)</td>
</tr>
<tr>
<td>Unit height</td>
<td>58 in. (1473.2 mm)</td>
</tr>
<tr>
<td>Unit width (including handles)</td>
<td>47 in. (1193.8 mm)</td>
</tr>
<tr>
<td>Unit depth (without bed)</td>
<td>27.5 in. (698.5 mm)</td>
</tr>
<tr>
<td>Bed extension</td>
<td>19 in. (482.6 mm)</td>
</tr>
</tbody>
</table>

**Note:** Additional space is necessary for placement of the PC.

### Temperature and Humidity

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating room temperature</td>
<td>70°F (21°C) or below</td>
</tr>
<tr>
<td>Operating humidity</td>
<td>30–70% non-condensing</td>
</tr>
</tbody>
</table>

**Note:** The maximum power consumption of the microPET® system is 2 kW (equivalent to 6800 Btu/hr). The actual system consumption can be significantly less during normal operations.

### Electrical Requirements

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>microPET® tomograph</td>
<td>110V/20A isolated outlet (requires a 20A outlet for use with a 20A power connection)</td>
</tr>
<tr>
<td></td>
<td>240V/10A isolated outlet (Europe)</td>
</tr>
</tbody>
</table>

**Note:** The appropriate power connection will be provided for each individual country.

### Computer

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC electrical requirements</td>
<td>Standard 110V (220V) outlet</td>
</tr>
</tbody>
</table>

### Magnetic Field Restrictions

The magnetic field strength must be less than 10 Gauss.

### Additional Equipment Required

Ge-68 point source (0.5 mCi)