



Integrated Hybrid Imaging

- Yields Efficiency and Accuracy

An efficient imaging pipeline helps your lab to maximize the value extracted from imaging hardware. However, throughput should not come at the cost of accuracy. Integrated hybrid PET/CT has become the clinical standard, with the benefits of CT to PET for anatomical registration and gold-standard attenuation correction proven many times over. SPECT/CT is not far behind. Integrated PET/CT and SPECT/CT use a single patient bed to minimize motion between acquisitions, improving image co-registration, and to save substantial amounts of time in positioning/planning compared to separate standalone modalities.

In small animal imaging, integrated hybrid imaging offers the same benefits. In addition, time savings reduce the duration of anesthesia, an important ethical concern, and can help recoup the value of hardware investment. They also allow more efficient use of radiotracer batches and optimization of molar activity for tracer injections. Efficiency gains are further possible in animal preparation, simultaneous multi-mouse imaging, acquisition planning and protocols, and in image reconstruction, post-processing and analysis.

Animal Transport System

The development of animal imaging cradles has improved physiological stabilization and monitoring while also making it feasible to move animals between modalities. This can facilitate the combination of PET/CT (or SPECT/CT) with MRI for improved anatomical contrast and complimentary functional methods while saving setup time. It has also enabled some labs to work with standalone imaging modalities, in some cases suiting limited lab space. However, each movement of the animal cradle requires additional time compared to hybrid imaging, including extra scout scans for acquisition planning. It risks small movements of the animal, which has high consequences for e.g. brain studies. The risk is amplified for multi-animal cradles. In the case of CT following PET, animal cradle transfer also increases the radiation dose to staff.

Dual- and tri-modality systems such as the PET/CT Si78 and Albira Si PET/SPECT/CT that are equipped with automatic animal transport systems avoid these problems. Bruker's animal cradles and animal cradle connectors are fully MR-compatible for studies where the benefit of adding MRI outweighs the risk of cradle transport. Hybrid and simultaneous PET/MR are of course an excellent choice where CT is not required.

Benchtop Animal Preparation

Animal preparation stations are now available for both integrated and standalone modalities. Combined with animal cradles, these allow the next animal or animals to be anesthetized and prepared for imaging while the scanner is still occupied. When used with dual modality systems such as the PET/CT Si78 or even tri-modality systems such as the Albira Si PET/SPECT/CT, two anesthesia setups are required to separate induction/maintenance of anesthesia. In the case of separate standalone PET/SPECT/CT, up to four anesthesia setups are required (e.g. PET, SPECT, CT and preparation).

Unified ParaVision Interface

Bruker's trusted ParaVision software further supports an efficient imaging pipeline across modalities by providing streamlined acquisition planning, drag-and-drop imaging protocols, entire PET/CT scan programs and automatic execution of complete experiments combined with automated image reconstruction including co-registration. In addition to in-built study archiving, ParaVision efficiently exports DICOM data to PMOD for full quantitation. Our application teams will support you and help optimize your imaging pipeline every step of the way.

The table below summarizes key points and the similarities/differences between separate standalone imaging modalities and fully integrated hybrid imaging using the multi-modal imaging platform ParaVision 360.

	Standalone NMI, CT	Bruker inline NMI/CT
Preparation station for animal cradles enhances throughput	Yes	Yes
Automated execution of PET and CT (animal positioning, scan start and image reconstruction using scan programs)	No	Yes
Automated registration between modalities	Yes	Yes
Avoids transfer of animal cradles between modalities	No	Yes
Standard output format (DICOM)	Yes	Yes, direct integration with PMOD
MR-compatible animal cradle	No	Yes, direct compatibility with Bruker MR animal transport systems
Multi-mouse imaging	Yes	Yes
High-throughput imaging	Yes	Yes, with reduced transfer time between PET and CT
Anesthesia stations required for PET, CT and preparation	3	2
Anesthesia stations required for PET, SPECT, CT and preparation	4	2
Parallel acquisition and reconstruction	Yes	Yes, even multi-parallel PET reconstruction
Unified software for PET, SPECT, CT, MRI	No	Yes