



Looking aHead: Simultaneous PET/MRI for Brain at UC Davis

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Introduction: Simultaneous acquisition of MRI and PET enables novel measurements of functional-metabolic dynamics in brain function; and mitigates patient burden and radiation dose in complex neurological disorders that require multiple scan modalities. The BrainPET (Cubresa, Inc.) is a PET insert for a whole-body 3T MRI scanner that provides PET/MRI imaging capacity for brain scans in a cost-efficient and accessible manner. The BrainPET design targets 5.4% sensitivity and 1.5-2.0 mm PET spatial resolution with silicon photomultiplier scintillators; and accommodates high MRI signal-to-noise ratio with 32 radiofrequency receive channels.

Planned Collaboration: UC Davis Health Departments of Radiology and Neurology have a memorandum of understanding with Cubresa to develop, test, and apply the BrainPET in new brain disease settings. Specific technical collaborations will include (a) development of time-of-flight capabilities (target 200-300ps); (b) rigorous assessment of quantitative accuracy for dynamic PET scans at different count rates; and (c) evaluation of MRI-based attenuation correction methods for the PET images. For neurological disease applications, our initial target patient population will recruit from the UC Davis Alzheimer's Disease Research Center, which studies a diverse elderly cohort with mixed neurodegenerative pathologies and early cognitive impairment. A subset of ADRC patients currently receive PET scans with new radioligands to assess amyloid ($[^{18}\text{F}]$ -florbetaben) and tau ($[^{18}\text{F}]$ -PI2620) accumulation in tandem with separate structural and functional MRI protocols.

Impact: The BrainPET will open new capabilities on existing MRI scanners at UC Davis for dynamic, functional assessment of the brain, and reduce patient scantime while preserving quantitative image accuracy in a broad range of neurological conditions.

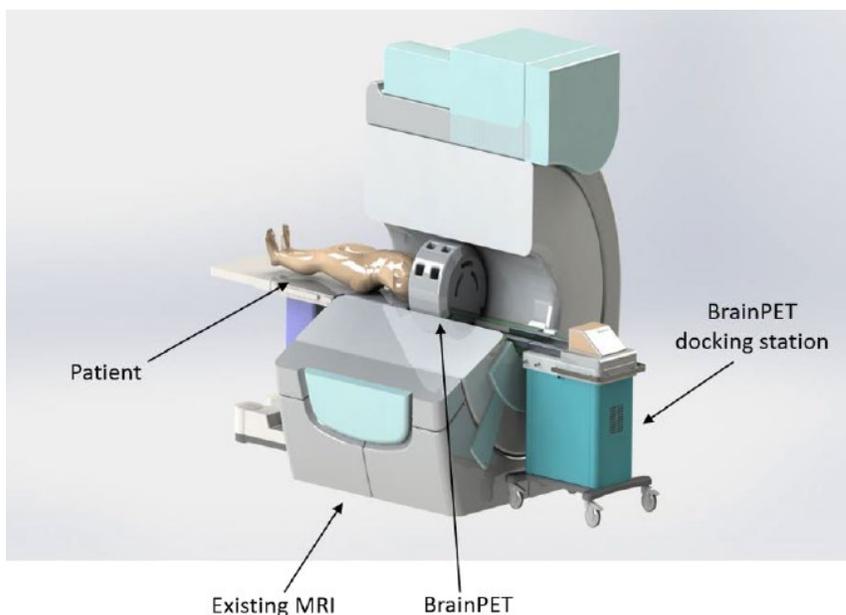


Figure caption: Schematic of the versatile BrainPET insert that integrates with existing whole-body MRI systems to enable high quality, simultaneous PET/MRI brain scans.