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## Disclaimers

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- The University of Tennessee maintains collaborations with Siemens Healthineers

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## Agenda

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- Hospital Overview
- Next Generation PET
- Software Technology

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## University of Tennessee Medical Center

- Not-For-Profit Academic Medical Center
- Magnet recognized
- TNCPPE Excellence Award
- 609 beds
- Region's Only Level I Trauma Center
- #2 Hospital in Tennessee – US News & World Report
- Referral center for Eastern Tennessee, Southeast Kentucky, and Western North Carolina

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## Clinical and Translational Research

Basic Science	Small Animal	Large Animal	Human
 <ul style="list-style-type: none"> <li>• Full lab facilities</li> <li>• Protein &amp; peptide chemistry</li> <li>• Radiochemistry</li> </ul>	 <ul style="list-style-type: none"> <li>• Inveon PET/SPECT/CT</li> <li>• microPET P4</li> <li>• microCAT II + SPECT</li> </ul>	 <ul style="list-style-type: none"> <li>• Biograph 6</li> <li>• 4 ring PET</li> <li>• HD-PET</li> <li>• 6-slice CT</li> </ul>	 <ul style="list-style-type: none"> <li>• Biograph mCT</li> <li>• 4 ring PET</li> <li>• PSF+TOF</li> <li>• 64-slice CT</li> </ul>

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## NEXT GENERATION PET/CT




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## Detector Comparison




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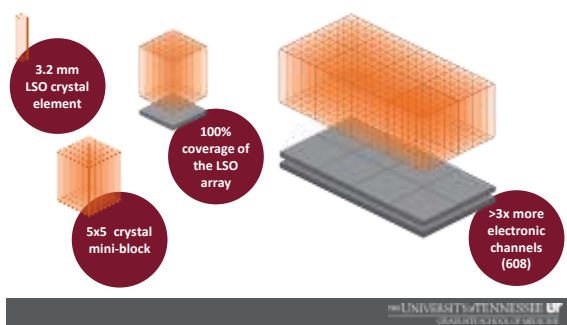
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## Key Detector Design Elements




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## Release Specifications

	Biograph mCT (TrueV)	Biograph Vision
Bore diameter (cm)	78	78
Axial FoV (cm)	22	26.3
Number of crystals	32,448	60,800
Crystal size (mm)	4.0 x 4.0 x 20	3.2 x 3.2 x 20
FBP spatial res @ 1 cm	4.5	3.7
FBP volumetric resolution (mm <sup>3</sup> )	95	51
Sensitivity (cps/kBq)	10.2	16
Peak NEC (kcps)	180	300
ToF (ps)	540	214
Eff. Sensitivity (cps/kBq)	25	100
Eff. NEC (kcps)	445	1870
TOF gain	2.5	6.2

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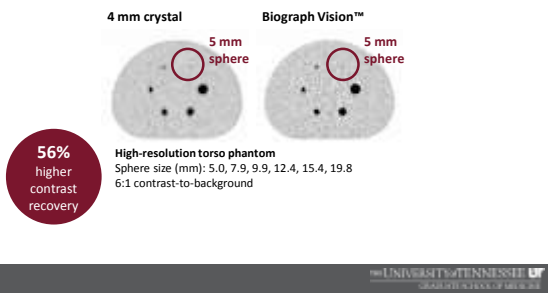
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## Biograph Vision Performance



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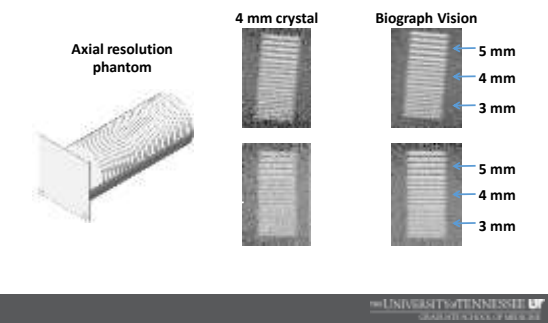
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## Biograph Vision Performance



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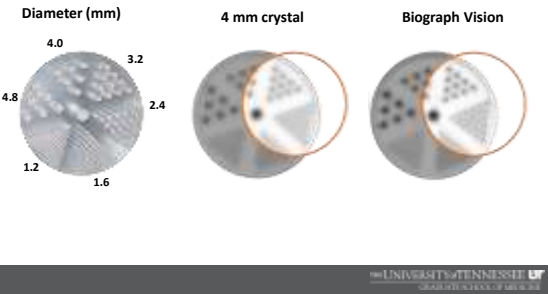
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## Mini-Derenzo



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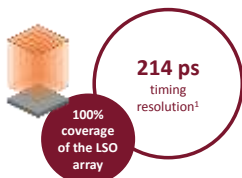
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## SiPMs Cover Full LSO Array



- Time-of-flight performance depends on collecting light from all photons in the scintillation.
- SiPMs cover LSO-array maximizes light detection
- 100% coverage = fast temporal resolution

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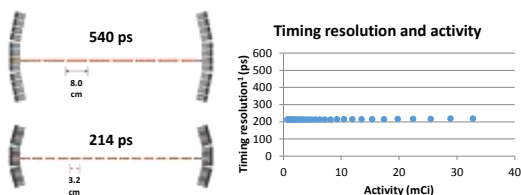
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## TOF Performance



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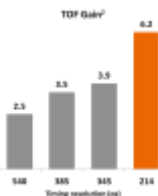
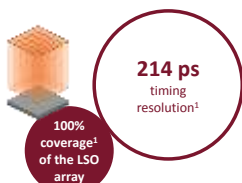
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## Faster TOF amplifies sensitivity

### Faster scanning & lower dose



<sup>1</sup> Based on internal measurements available at time of publication. Data on file. \*Gain calculated for a 20cm cylindrical object.

<sup>2</sup> Biograph Vision and its features and applications are not commercially available in all countries. Their future availability cannot be guaranteed. Please contact your local Siemens Healthcare representative for further details.

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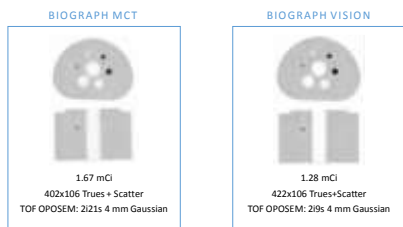
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## Phantom Comparison



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## Small Lesion Detection



**High-resolution torso phantom**  
Sphere size (mm): 5.0, 7.9, 9.9, 12.4, 15.4, 19.8  
6:1 contrast-to-background

- Left and middle image acquired on Biograph MCT. Right image acquired on Biograph Vision. Based on external measurements available at time of publication. Data on file.
- Biograph Vision and its features and applications are not commercially available in all countries. Their future availability cannot be guaranteed. Please contact your local Siemens Healthineers organization for further details.



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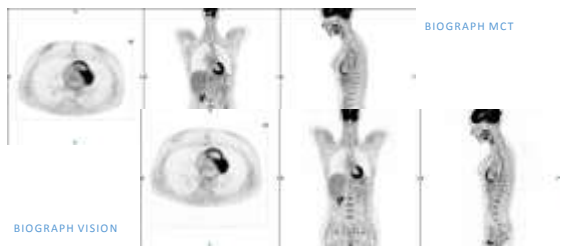
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## Clinical Comparison: Body



Images courtesy of Siemens Healthineers and The University of Tennessee



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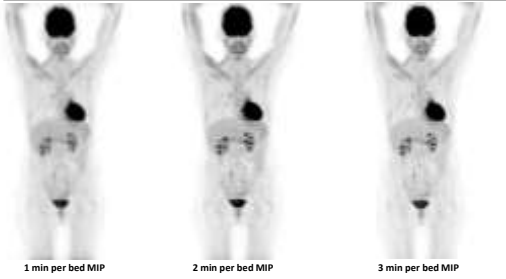
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### Evaluate left lung lesion



Data courtesy of University Medical Center Groningen, Groningen, The Netherlands. 58yr female, 119 lbs, 4.6 mCi, UHD 440 matrix, 4f5s, AllPass



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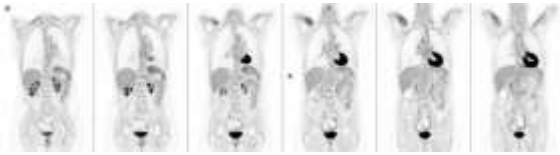
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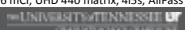
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### Evaluate left lung lesion



1 min per bed coronal Image

Data courtesy of University Medical Center Groningen, Groningen, The Netherlands. 58yr female, 119 lbs, 4.6 mCi, UHD 440 matrix, 4f5s, AllPass



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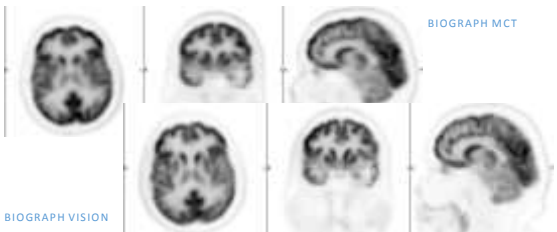
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### Clinical Comparison: Brain



BIOGRAPH VISION

BIOGRAPH MCT

Images courtesy of Siemens Healthineers and The University of Tennessee



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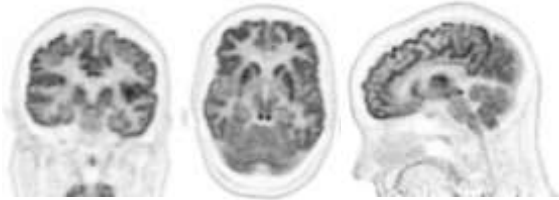
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## Brain Imaging: 18F-FDG

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Dose: 158.2 MBq (4.3mCi)  
Acquisition time: 15 min

With courtesy of Lisa Green, PhD



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## SOFTWARE TECHNOLOGY



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## Respiratory Motion

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Decreases image quality

Reduces quantitative accuracy

Reduces diagnostic confidence



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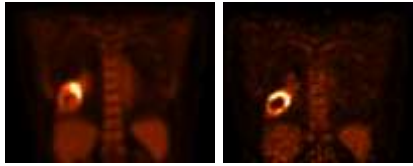
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### Improves Visualization

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↓ Motion ↑ Noise



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### Standard PET vs. 4D Gated PET vs. Amplitude-Based Gating PET

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### Amplitude gating + MoCo

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- Improved motion correction
- Minimal loss of counts
- Shorter scan times



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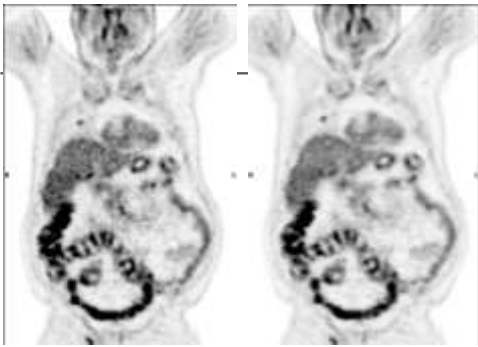
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Amplitude gating Only

Amplitude gating + MoCo



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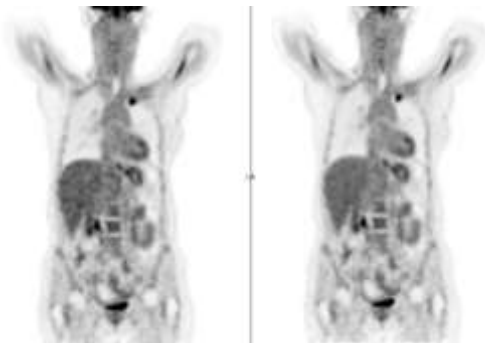
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Amplitude gating only

Amplitude gating + MoCo



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### ECG + Data Driven Gating



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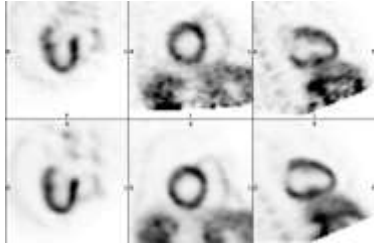
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### Standard Gating vs. ECG+Data



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### Parametric Imaging



On-bed Injection

6 minutes over heart

Input function collection



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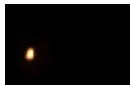
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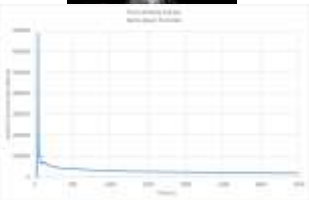
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On-bed Injection

6 minutes over h

Input function collection



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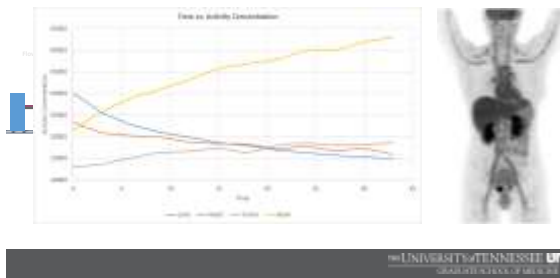
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## Parametric Imaging




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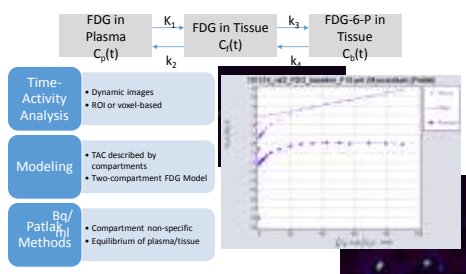
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## Kinetic Modeling




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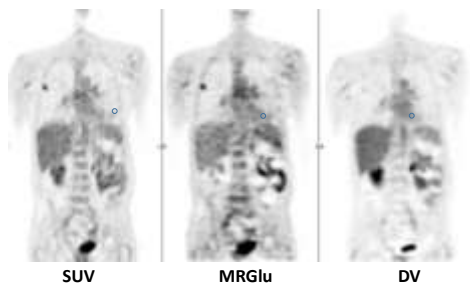
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## 3 Images: SUV, MRGlu, DV




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Acknowledgements:

Shelley Acuff, RT(R), CNMT, CT: Clinical Research Leader

Chris Carr, CNMT: Lead PET/CT Technologist

Erica Carroll, RT(R), CNMT: PET/CT Techologist



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