

# 4D Dynamic Contrast-Enhanced Breast CT: Evaluation of quantitative accuracy

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Radboudumc

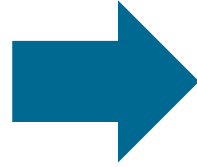


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# BREAST4D



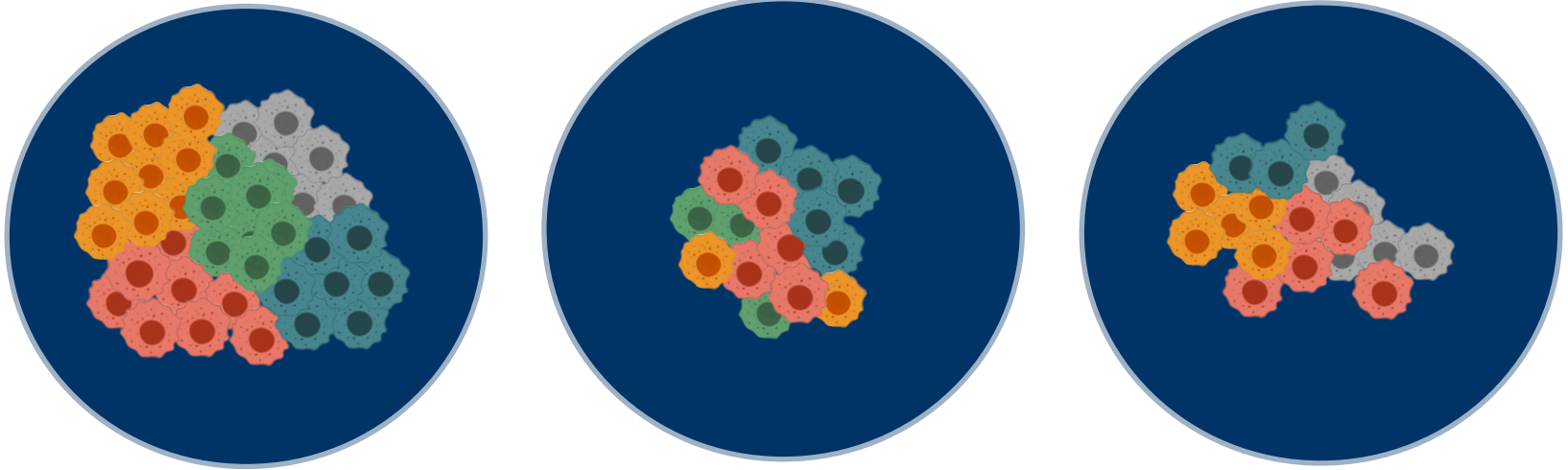
European Research Council  
Established by the European Commission

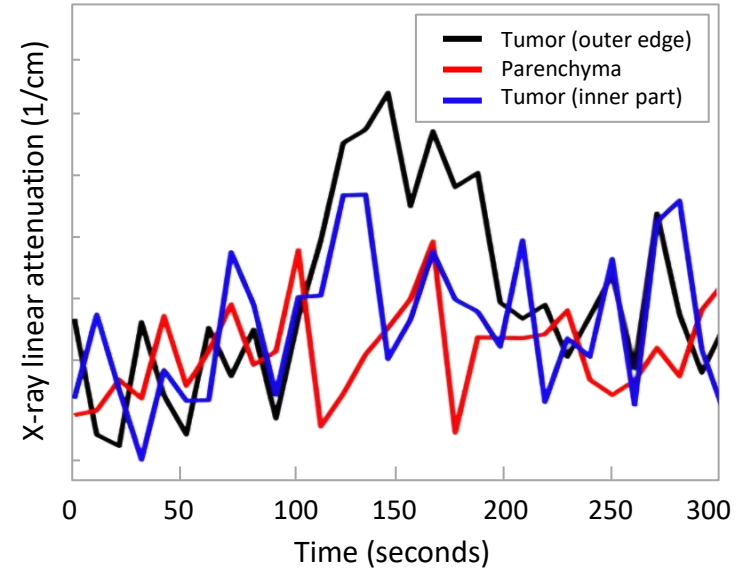
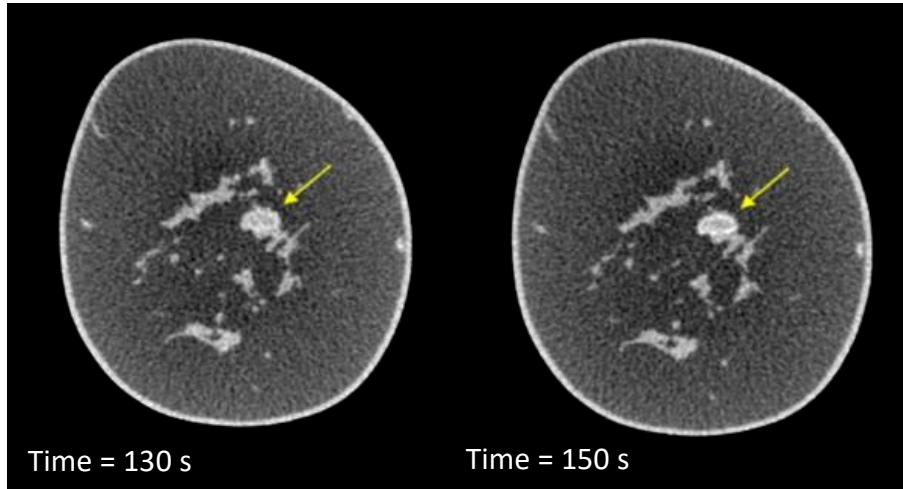


**Treatment**



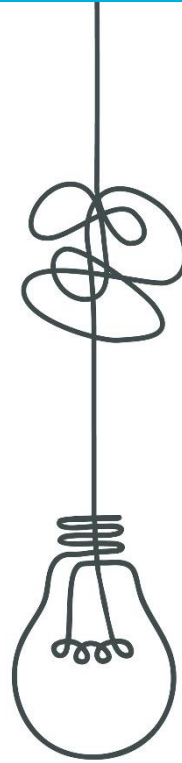
# Breast cancer heterogeneity





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# 4-dimensional dynamic contrast-enhanced dedicated breast computed tomography





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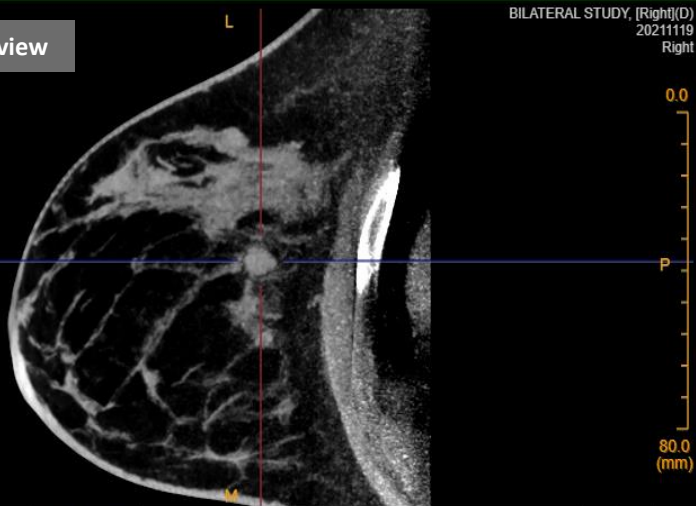
# 4-dimensional dynamic contrast-enhanced dedicated breast computed tomography



SUBJECT 061  
19780813  
00061

## Transverse view

Looking down  
from head

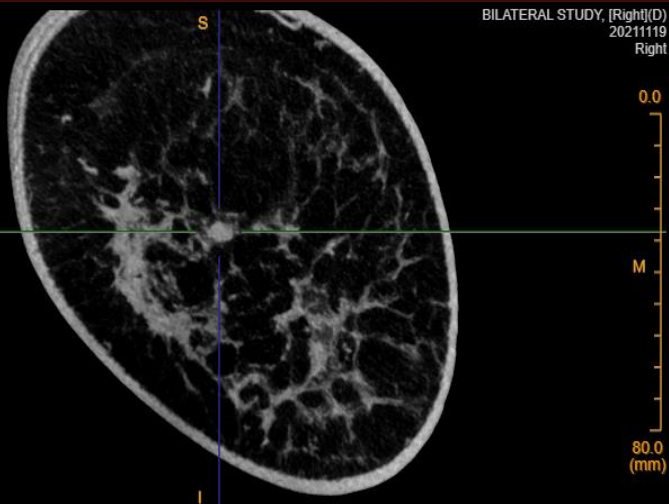


W/L: 456 / 40 Type: MIP Slab: 3.0mm Zoom: 71%

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19780813  
00061

## Coronal view

Looking from  
anterior

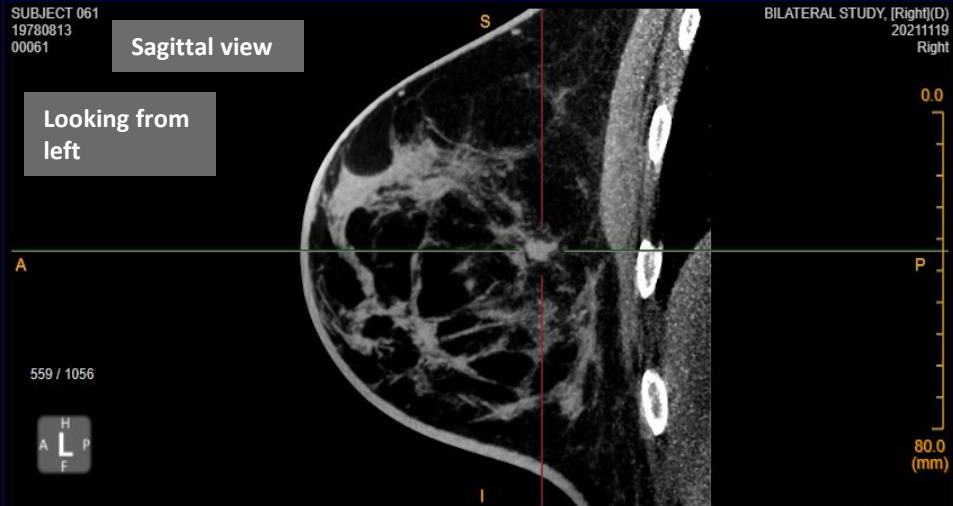


W/L: 456 / 40 Type: MIP Slab: 3.0mm Zoom: 71%

SUBJECT 061  
19780813  
00061

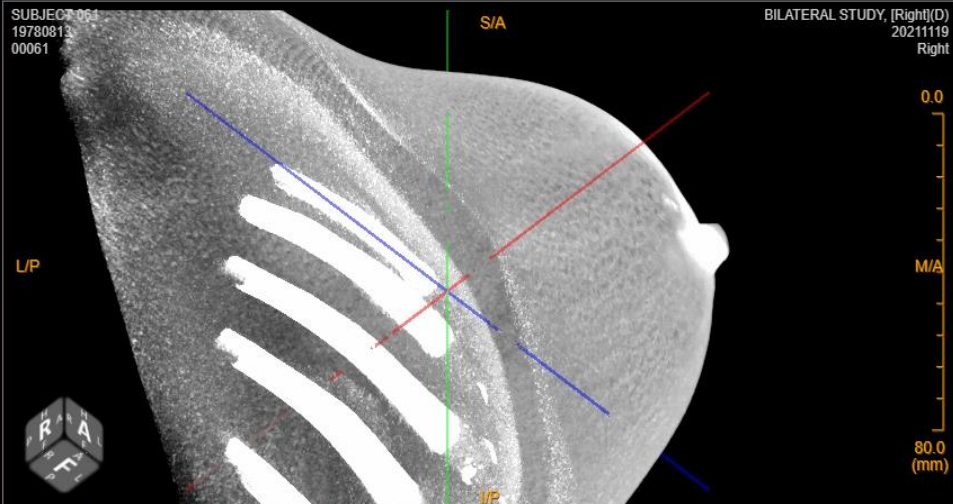
## Sagittal view

Looking from  
left

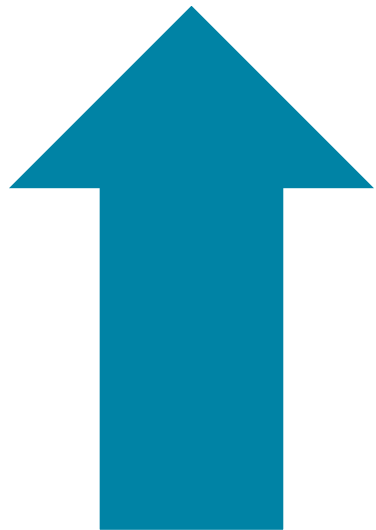


W/L: 456 / 40 Type: MIP Slab: 3.0mm Zoom: 71%

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00061



W/L: 456 / 40 Type: MIP Zoom: 63% Full

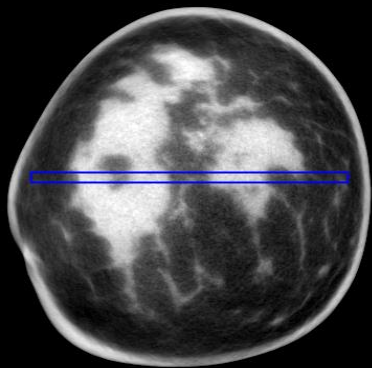


**X-ray scatter**

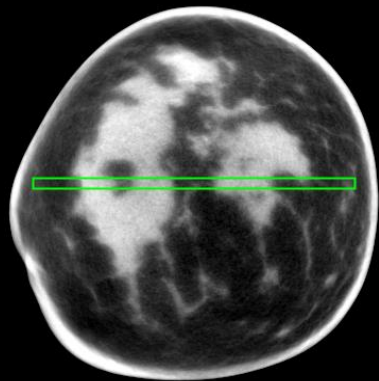


**Image quality**  
(quantitative information)

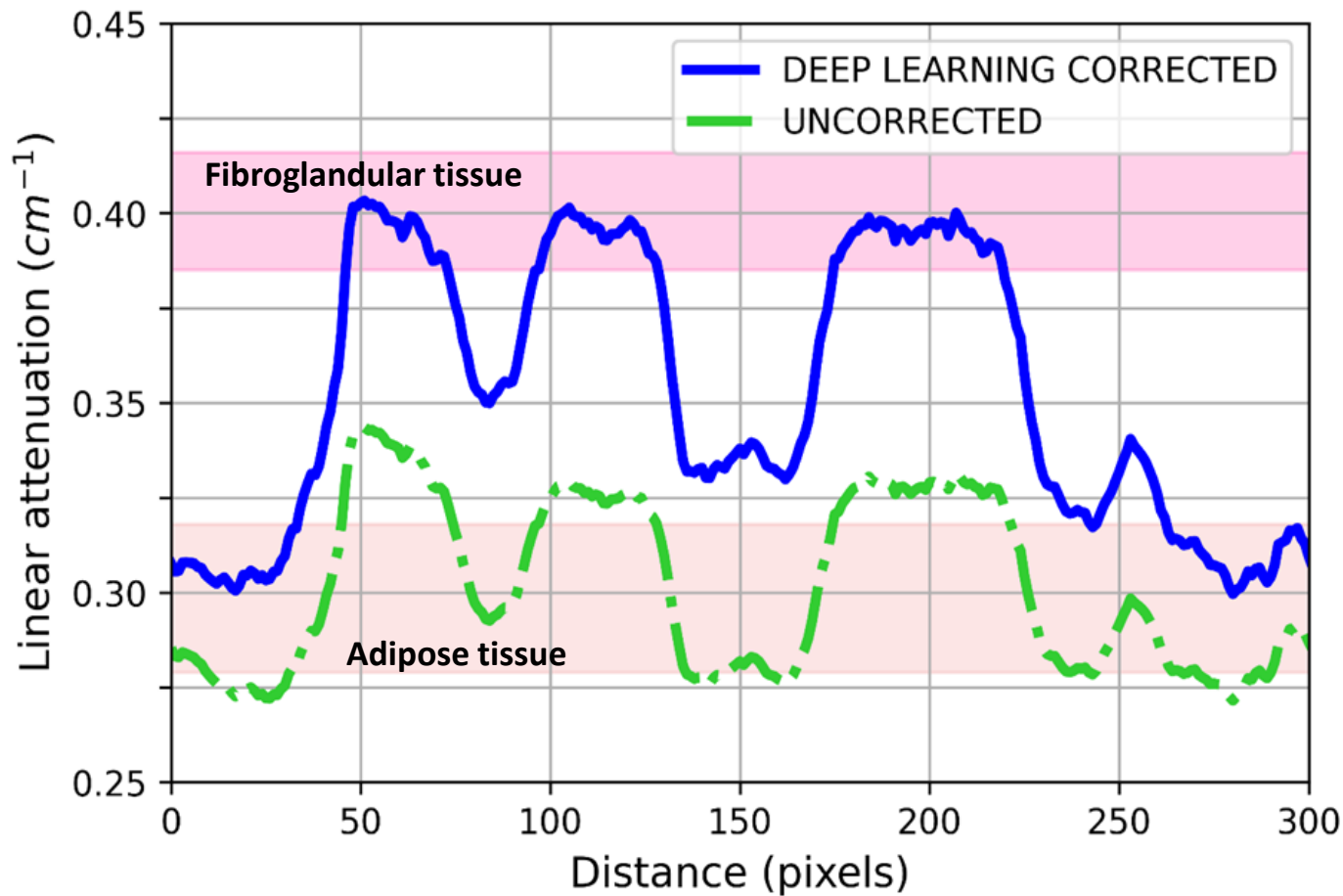
## DEEP LEARNING CORRECTED



## UNCORRECTED



WW/WL: 0.01/0.03  $\text{mm}^{-1}$

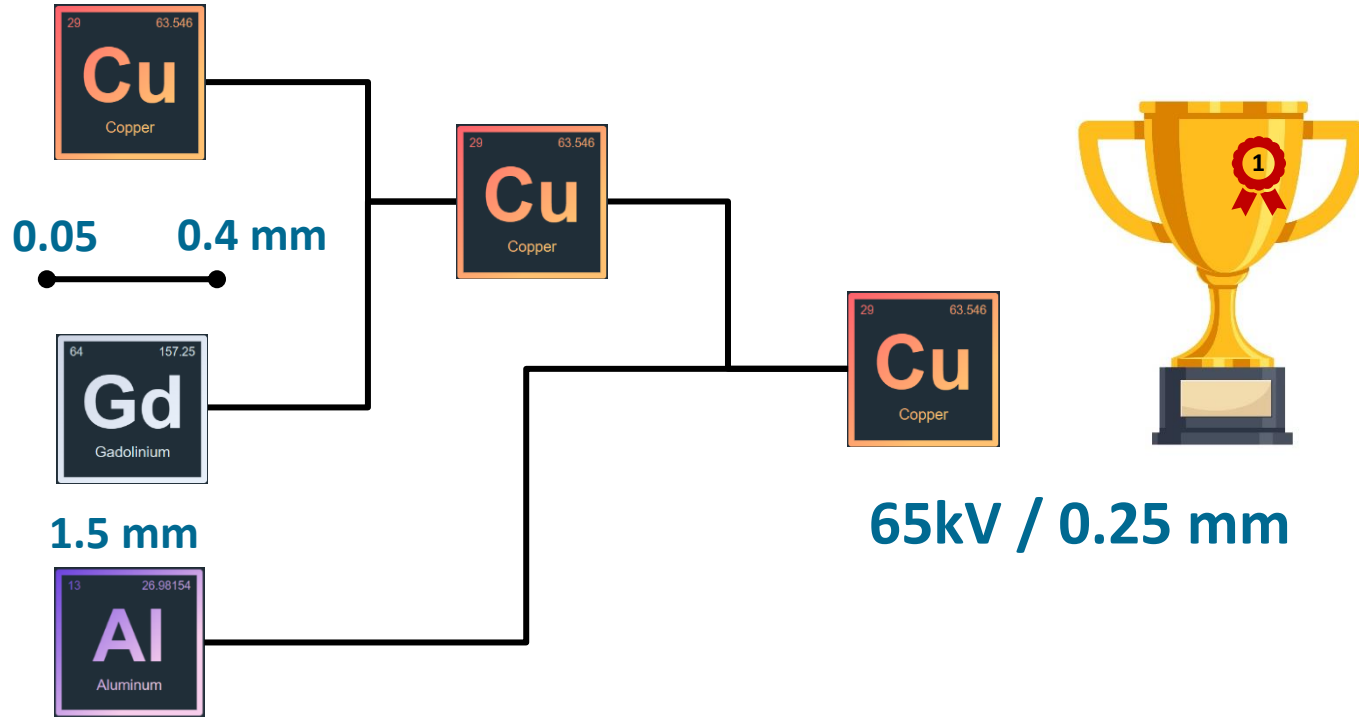


Ref.: Pautasso, J. J., Caballo, M., Mikerov, M., Boone, J. M., Michielsen, K., & Sechopoulos, I. (2023). Deep learning for x-ray scatter correction in dedicated breast CT. *Medical physics*, 50(4), 2022-2036.

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# 4-dimensional dynamic **contrast-enhanced** dedicated breast computed tomography

## Optimal settings for imaging



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# 4-dimensional dynamic contrast-enhanced dedicated breast computed tomography



# 4D DCE-bCT protocol

Contrast Enhanced Contrast Timer (sec)  Description **IWBI 2024**

Contrast R 

Pre-contrast

Post-contrast 1

Post-contrast 2

Post-contrast 3

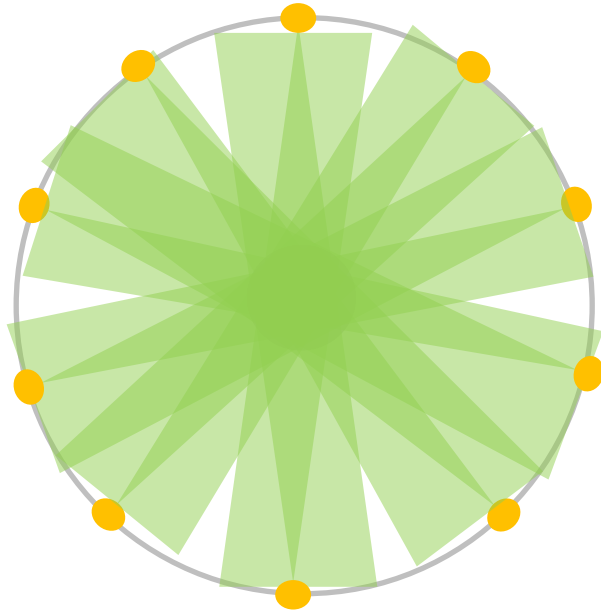
Prep Ends: 0 secs (Inject) 100ml, 2ml/s

Pulse Width (ms):

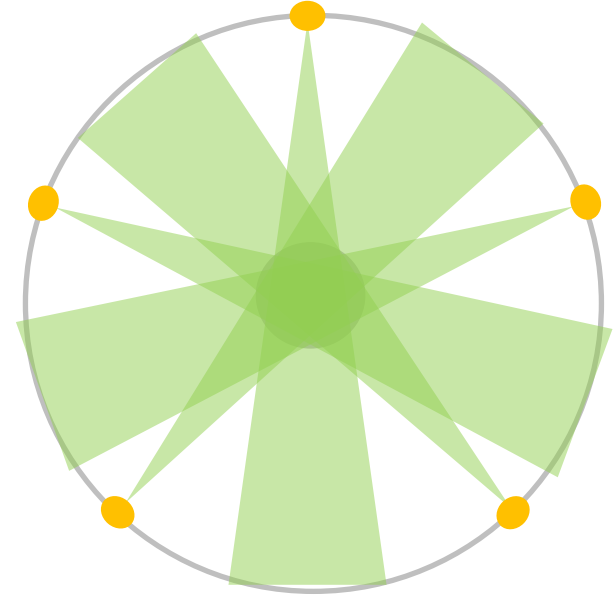
Scan Duration (s):

Total Pulses:

Pulses / Rev:

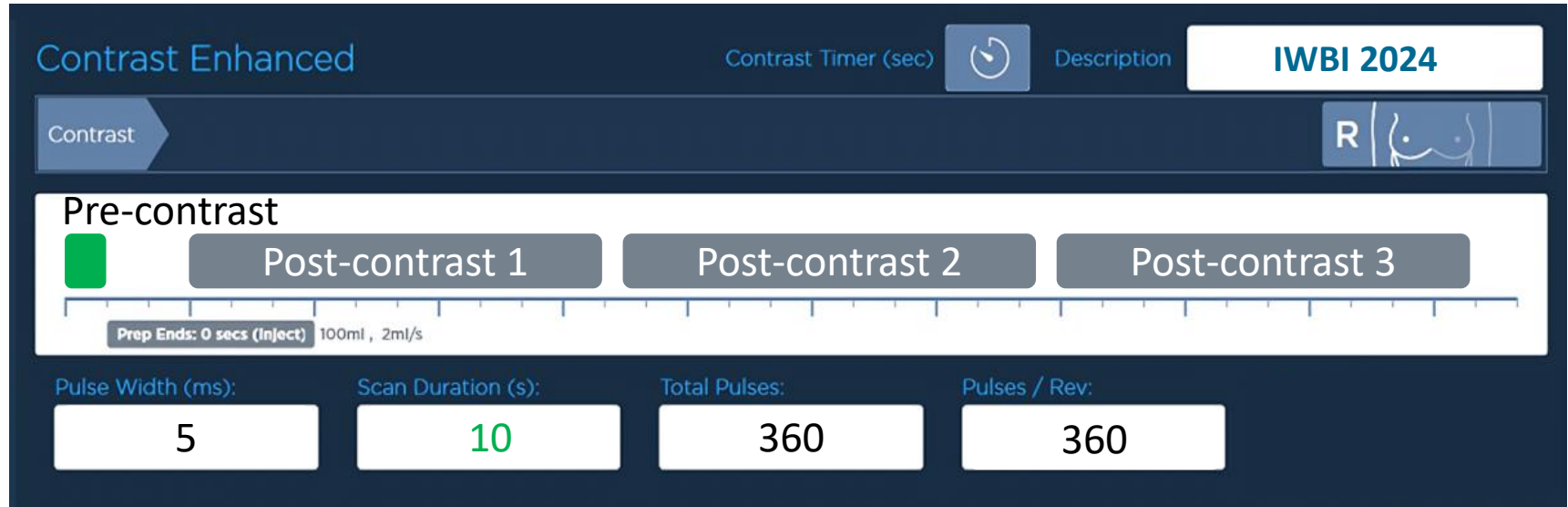


**Pre-contrast**

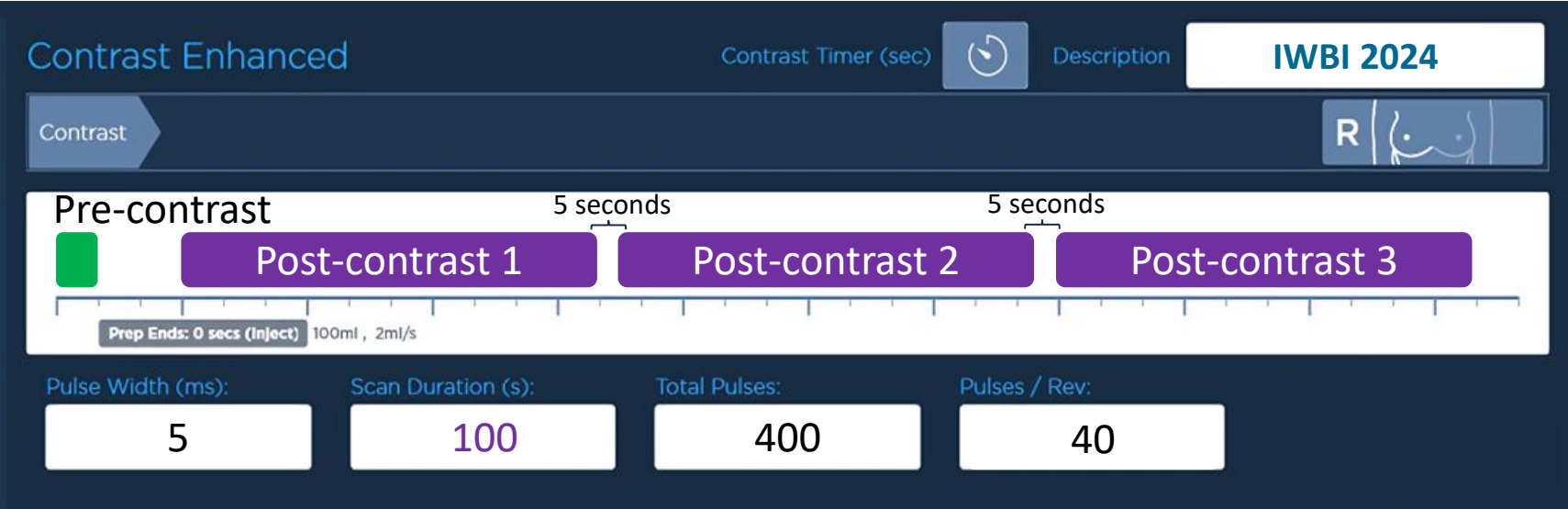


**Post-contrast**

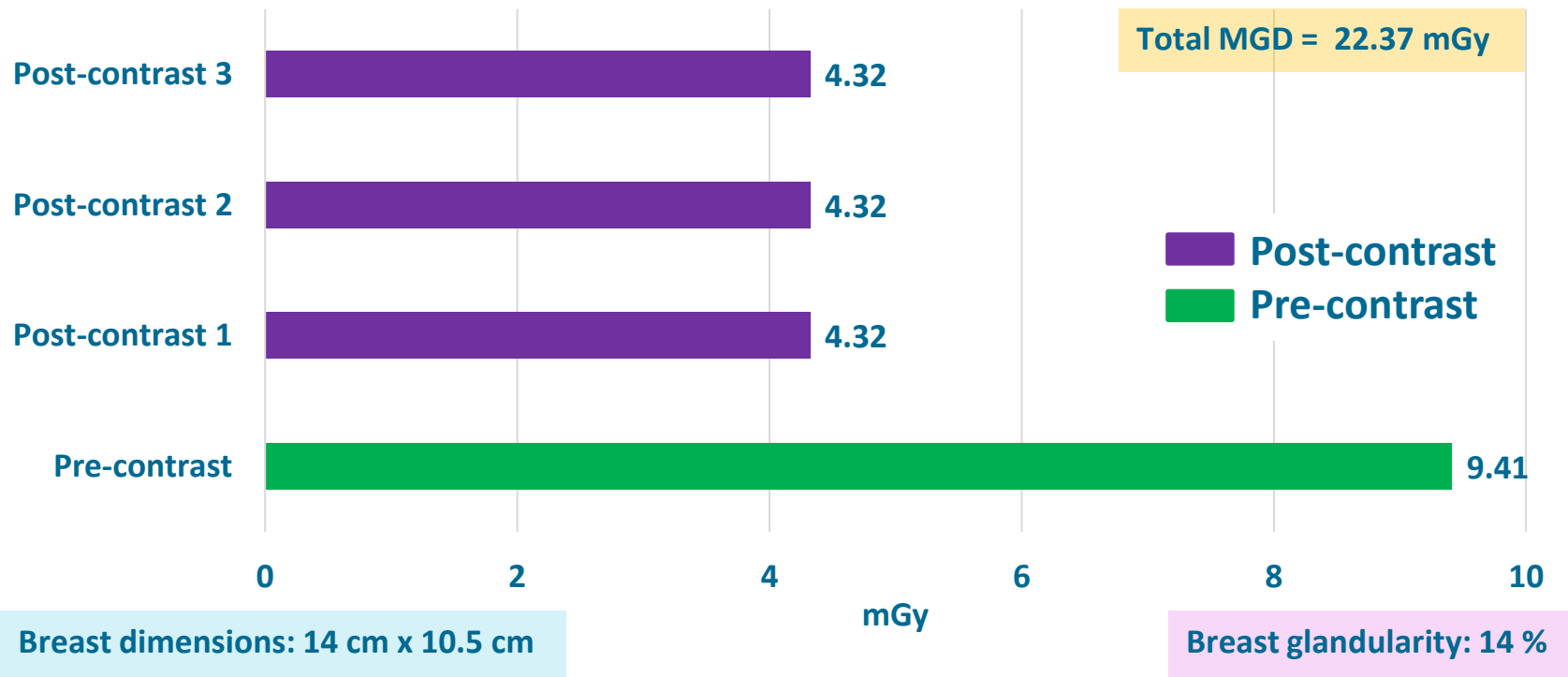
# 4D DCE-bCT protocol

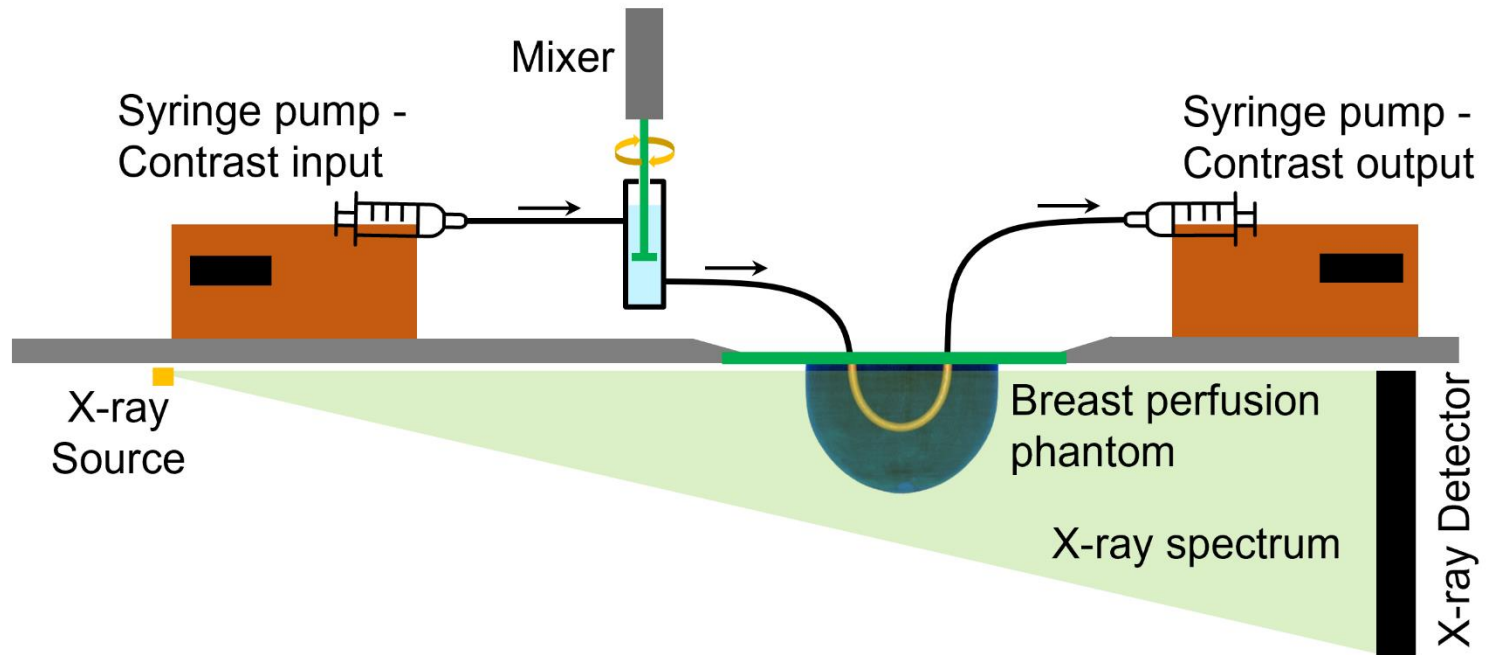


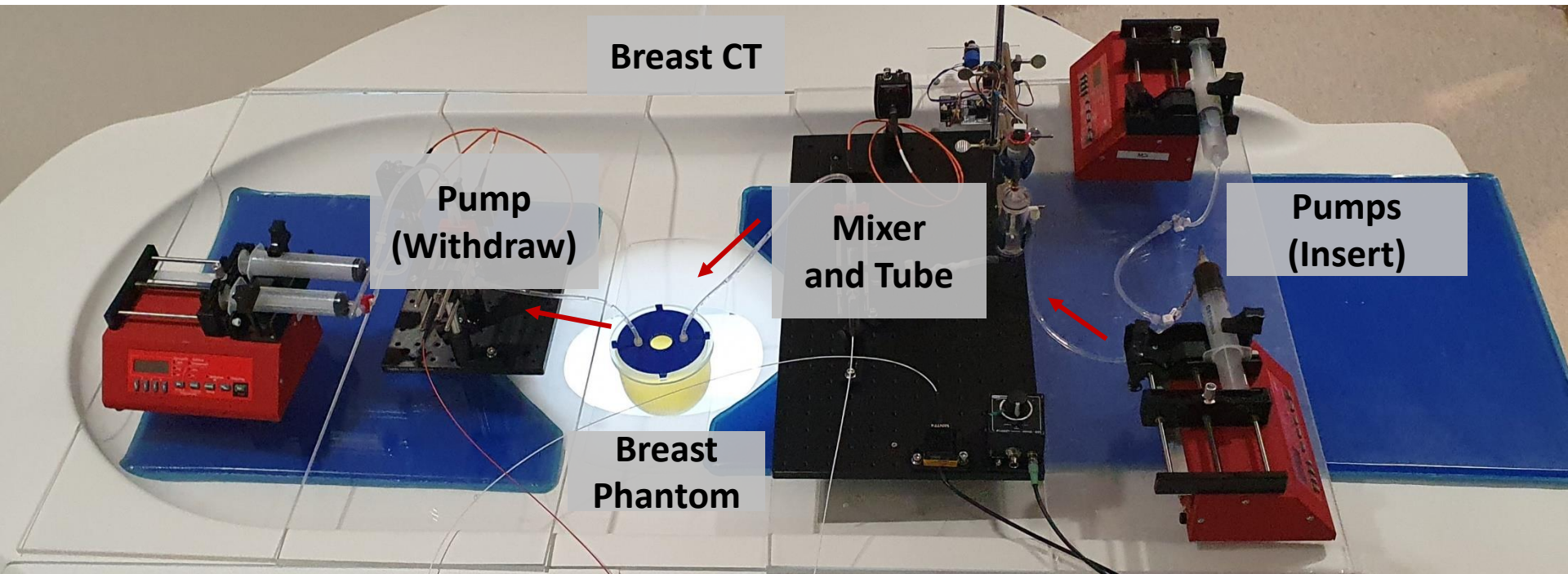
# 4D DCE-bCT protocol



# Mean glandular dose in 4D DCE-bCT protocol







In



Out

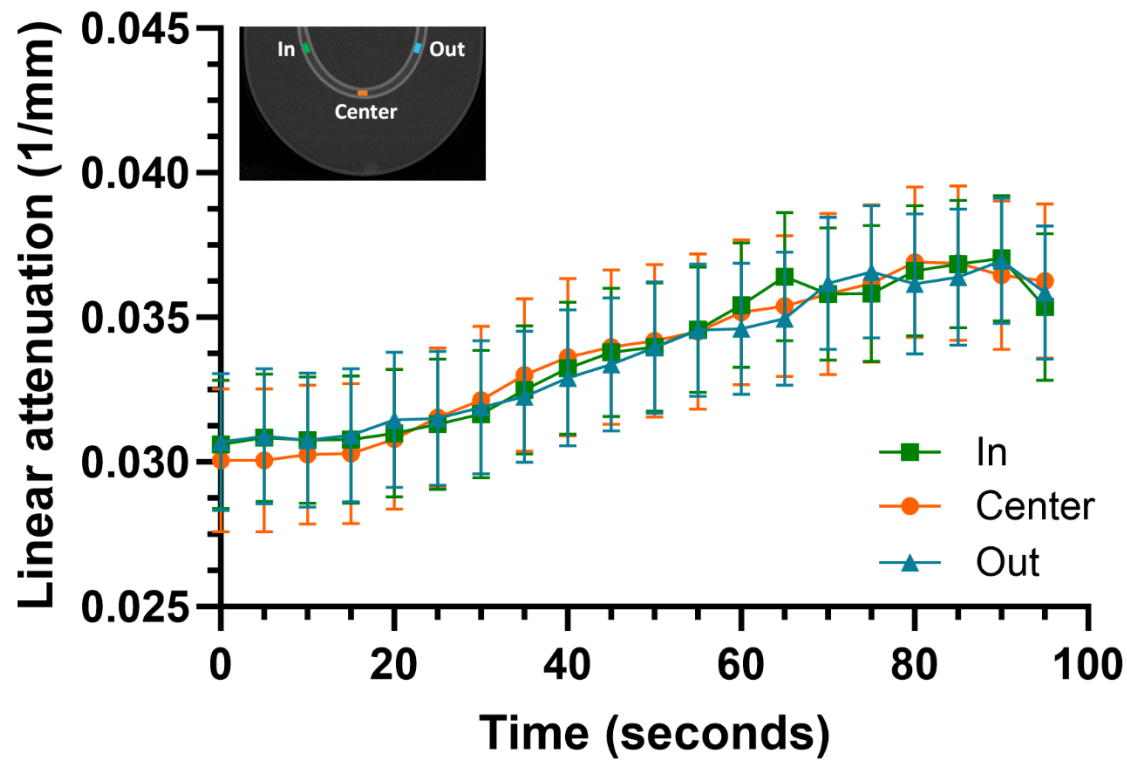


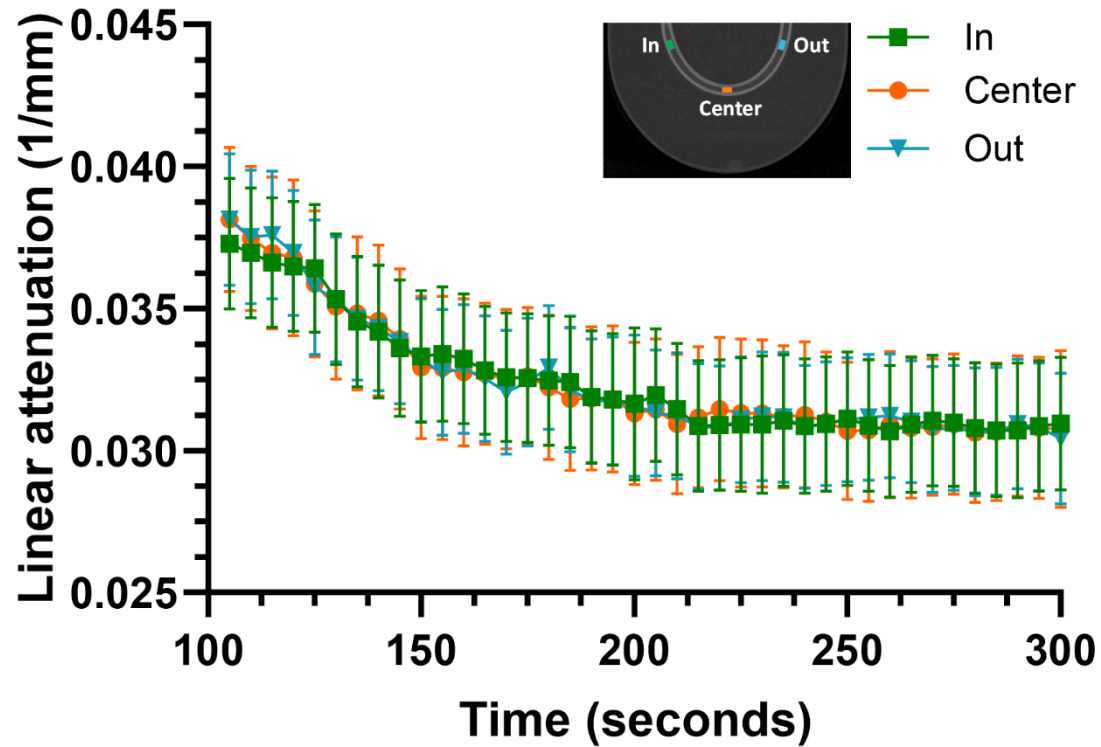
Center

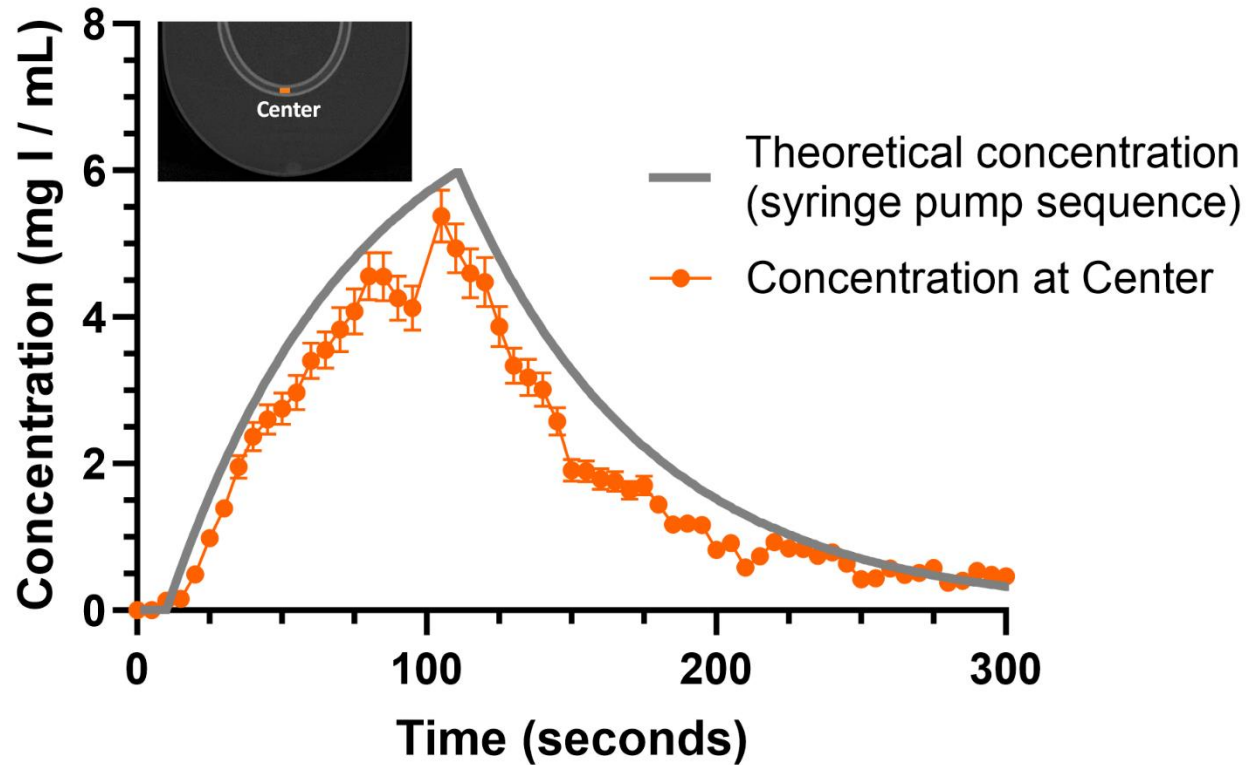


= 0.25 mm

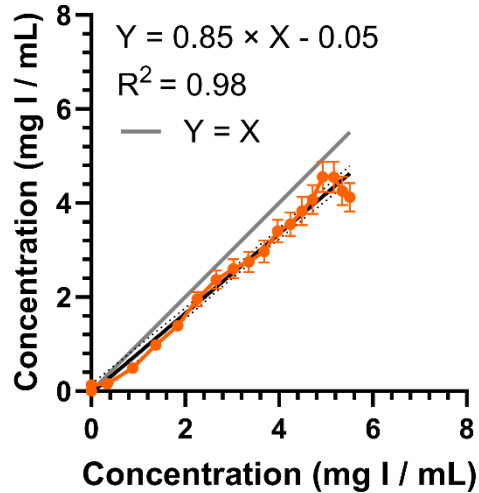




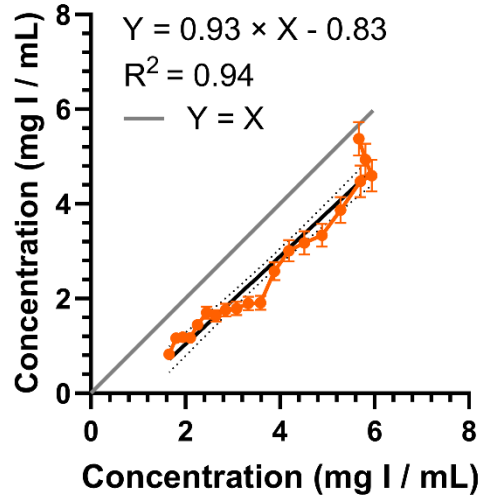




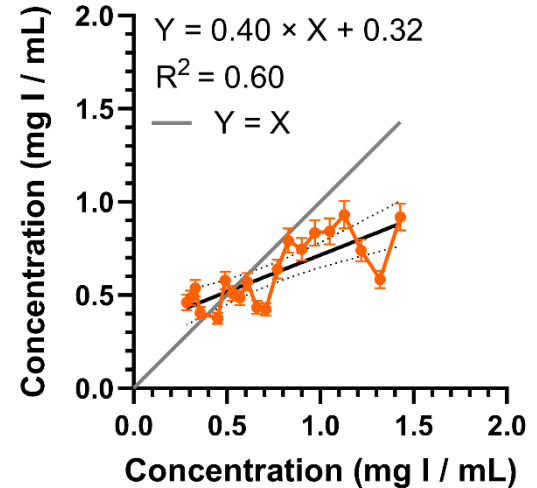
# Post-contrast analysis (100-second Intervals)



Post-contrast 1

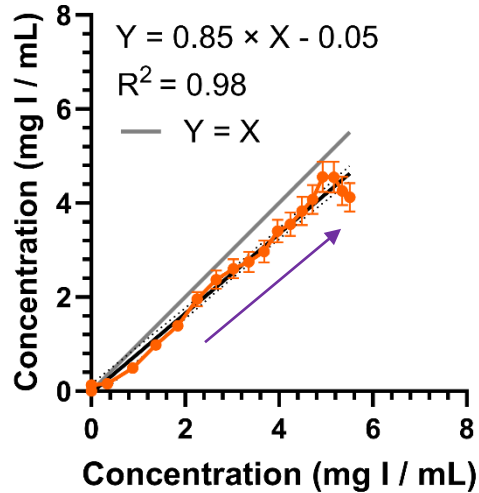


Post-contrast 2

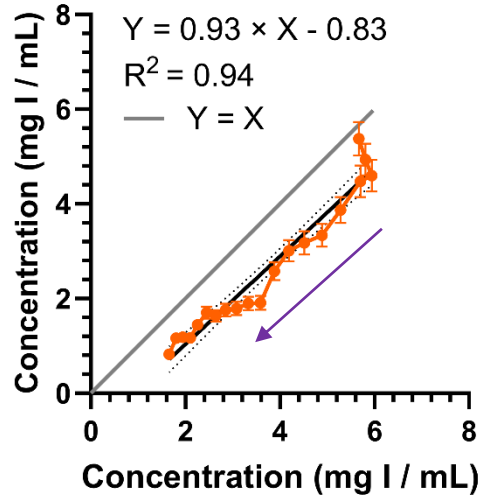


Post-contrast 3

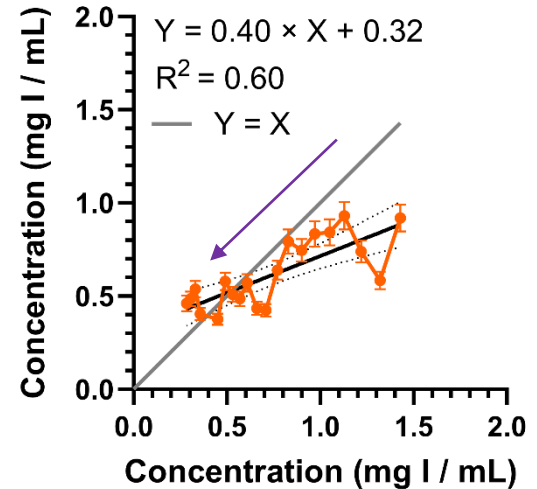
# Post-contrast analysis (100-second Intervals)



Post-contrast 1

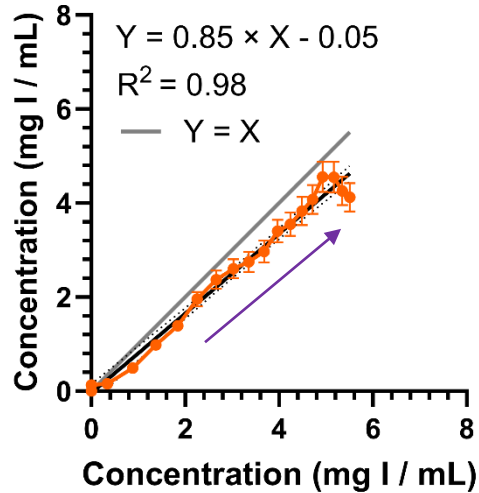


Post-contrast 2

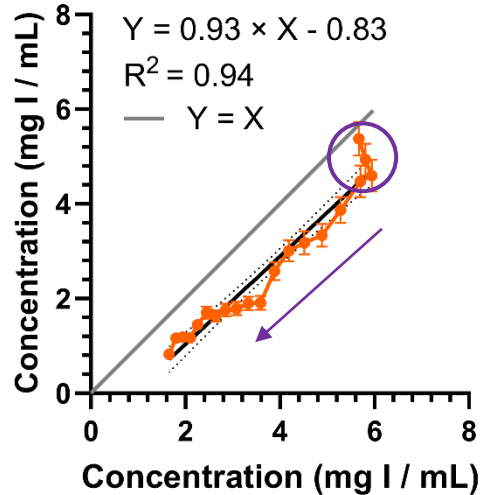


Post-contrast 3

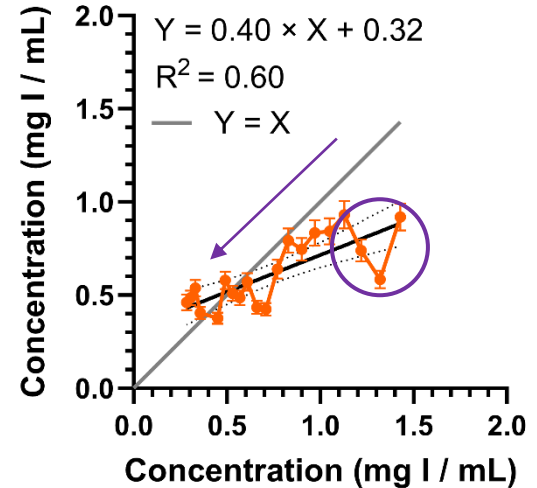
# Post-contrast analysis (100-second Intervals)



Post-contrast 1



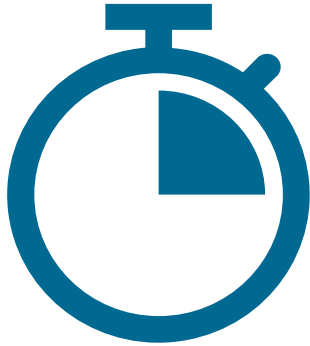
Post-contrast 2



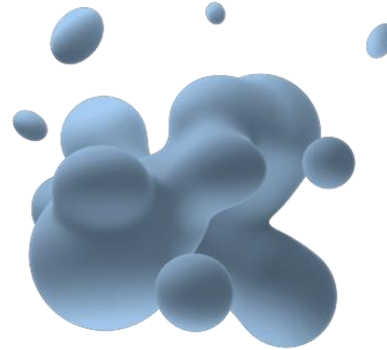
Post-contrast 3

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# Limitations

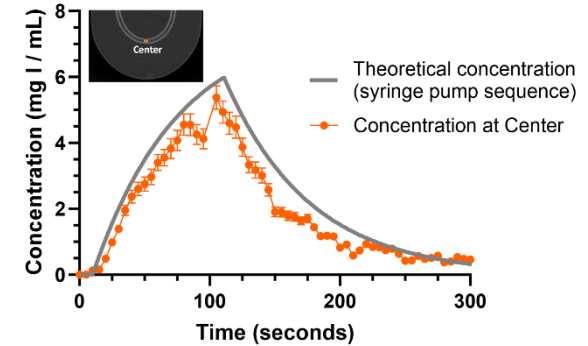


**Timing of peak  
capture**



**Fluid bolus behavior**

# Conclusion



**4D DCE-bCT has the potential to provide quantitatively accurate estimates of iodine concentration**