

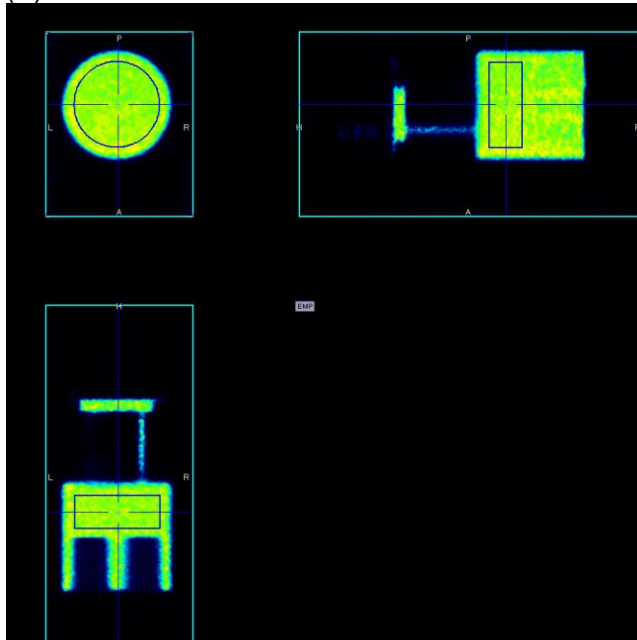
Supplemental Table 1. Scanner parameters and NEMA NU4-2008 testing results derived from literature, (1–13)

Scanner	Scintillator	Coincidence timing (ns)	Ring diameter (cm)	Axial FOV (cm)	Crystal size (mm)	Number of detector modules	Detector	Peak sensitivity (%)	Resolution/crystal size
Bruker Albira	LYSO	5	10.5	14.8	50 x 50 x 10	24	3 ring SiPM	5.3	< 2.0
Mediso nanoPET/CT	LYSO:Ce	5	18.1	9.48	1.12 x 1.12 x 13	12	1 ring PMT	7.7	< 2.5
Sedecal Super Argus	LYSO & GSO	5	11.8	4.8	1.45 x 1.45 x 15	36	2 ring PMT	4.32	1.14
Siemens Inveon	LSO	3.4	16.1	12.7	1.51 x 1.51 x 10	16	PMT	6.72	1.08
Trifoil LabPET/CT	LYSO & LGSO	22	16.2	7.5	2 x 2 x 12	768	APD	2.36	0.82

Supplemental Table 2. Summary of microPET/CT commercial phantoms used in this study at each site.

Phantoms	Size	Brief description	Measurement
microPET			
A: PET Image Quality (IQ), Bartec: PH-60-00-50	8 x 3.5cm	Three chambers: (chamber 1) two 8mm cylinders, (chamber 2) central uniform region and (chamber 3) five rods with varying diameters of 1, 2, 3, 4, and 5mm	Spill over ratio, uniformity and recovery coefficients
B: microPET rod, QRM: MicroPET HotRod	7 x 3.5cm	Set of 6 triangular patterns with rods varying in diameter (0.6, 0.8, 1.0, 1.2, 1.5 and 2.0mm)	Spatial resolution
microCT			
C: Air/water Quality Control (QC), Bartec: PH-60-00-60	6.5 x 3cm	Dual chamber air and water	Accuracy of air and water Hounsfield Units (HU)
D: Tissue Equivalent Material (TEM), CIRS: MicroCT rods 091	9.5 x 3cm	Rods (2 to 5mm) of polymer materials representing lung, muscle, adipose tissue, and hydroxyapatite (0, 50, 250 & 750 mg/ml)	Hounsfield Units (HU) for equivalent/representative tissues
E: CT bar, QRM: MicroCT Barpattern-NANO	4 x 2cm	Chip with bar and circle patterns ranging from 5 to 150µm in thickness and diameter, respectively	Spatial resolution
F: Mouse CT Dose Index (CTDI), Bartec: PH-60-00-05	15 x 3cm	Cylinder with central bore - for ion chamber	Dose Index (radiation delivered)
G: Rat CT Dose Index (CTDI), Bartec: PH-60-00-06	15 x 6cm	Cylinder with central bore - for ion chamber	Dose Index (radiation delivered)

(A)

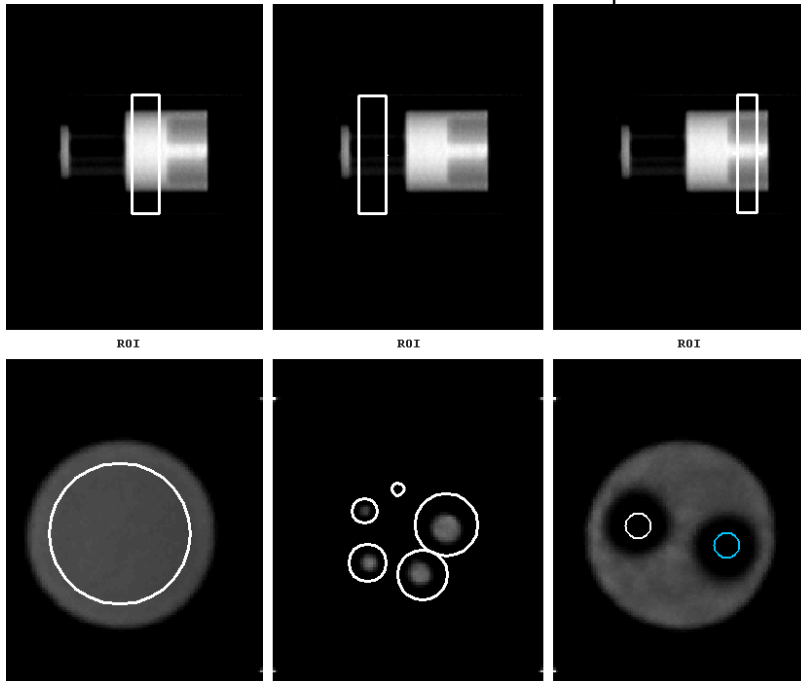


(B)

ROI for uniformity

ROI for recovery coefficient

ROI for water and air spill-out-ratio

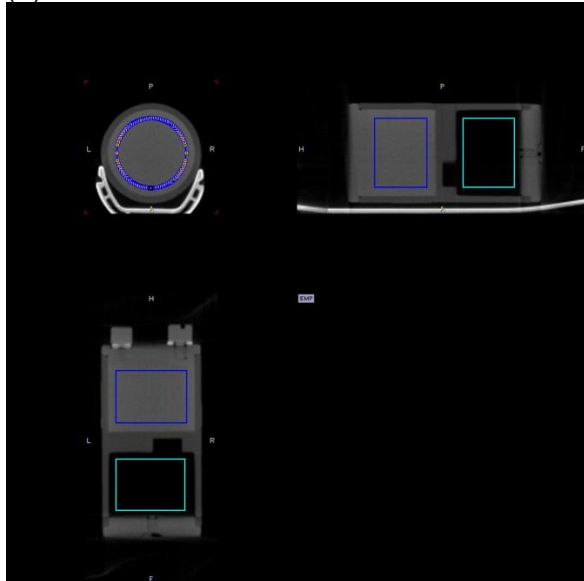


Supplemental Figure 1. (A) PMOD screen shot showing the VOI placement on the PET IQ uniformity region for SUV measurements. (B) Screen shot of the Mediso's MATLAB software tool for the PET IQ analysis displaying the regions of the IQ phantom (uniformity, RC and SOR) as well as the placements of the regions.

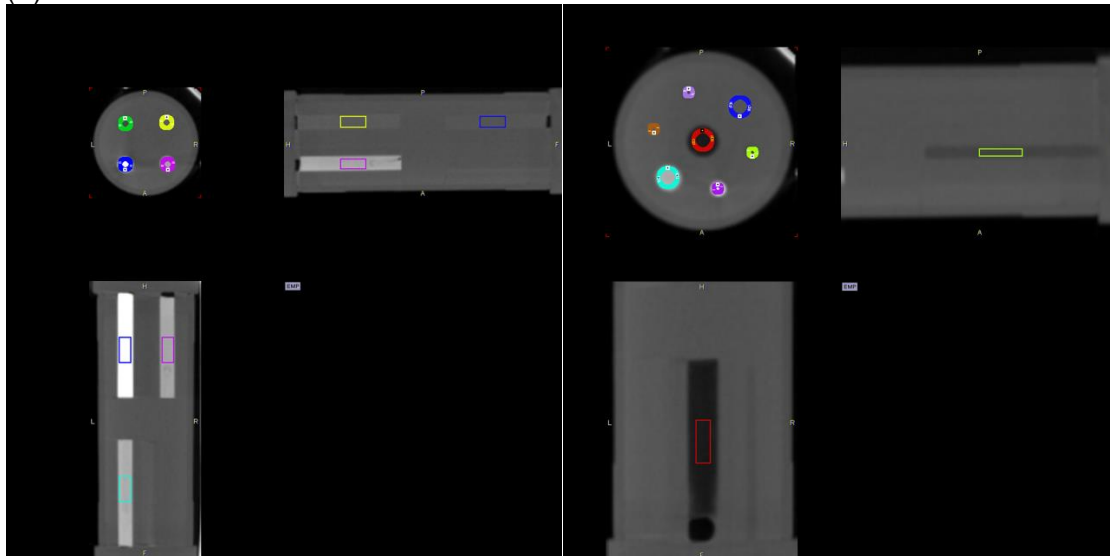
Supplemental Table 3. Summary of site's/scanner's CT default protocols evaluated. Scan duration (s) recorded from CT dose measurements (n=3).

Scanner	Scan method	Number projections	Tube voltage (kVp)	Exposure time (ms)	Scan duration (s)	Binning	Zoom	Focal spot (μm)	Current (μA)
1	circular	360	40	300	130.90	1:1	none	35	140
2	circular	480	50	300	166.80	1:4	max FOV	33	520
3	step-in-shoot	220	80	280	236.30	1:4	low	< 6	500
4	circular	250	35	300	277.70	1:4	none	35	200
5	circular	256	50	555	323.83	1:1	low	33	760

(A)



(B)



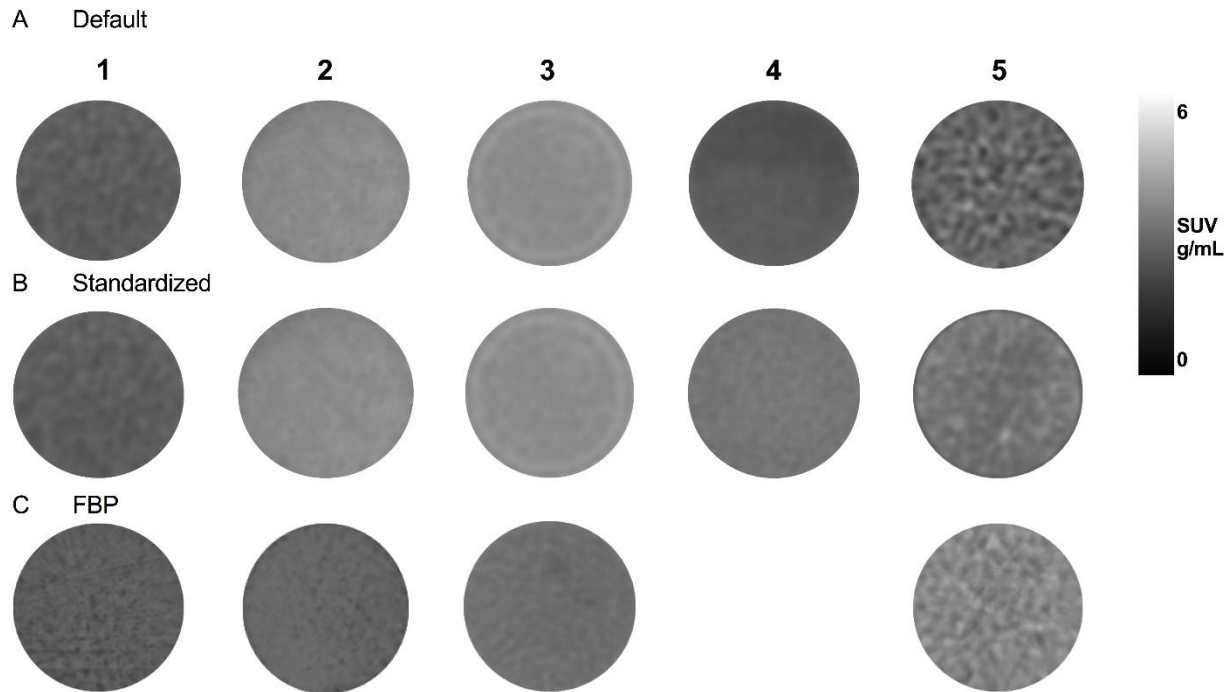
Supplemental Figure 2. (A) PMOD screen shot showing the VOI placement on the CT water and air region for HU measurements. (B) PMOD screen shot showing the VOI placement on the CT TEM phantom rods for HU measurements.

Supplemental Table 4. PET IQ data analysis showing uniformity, RC and SOR for each scanner for the default and additional reconstruction methods. Sections are divided by scanners (1-5) in which rows indicate the reconstruction method used and the data analysis results per column heading.

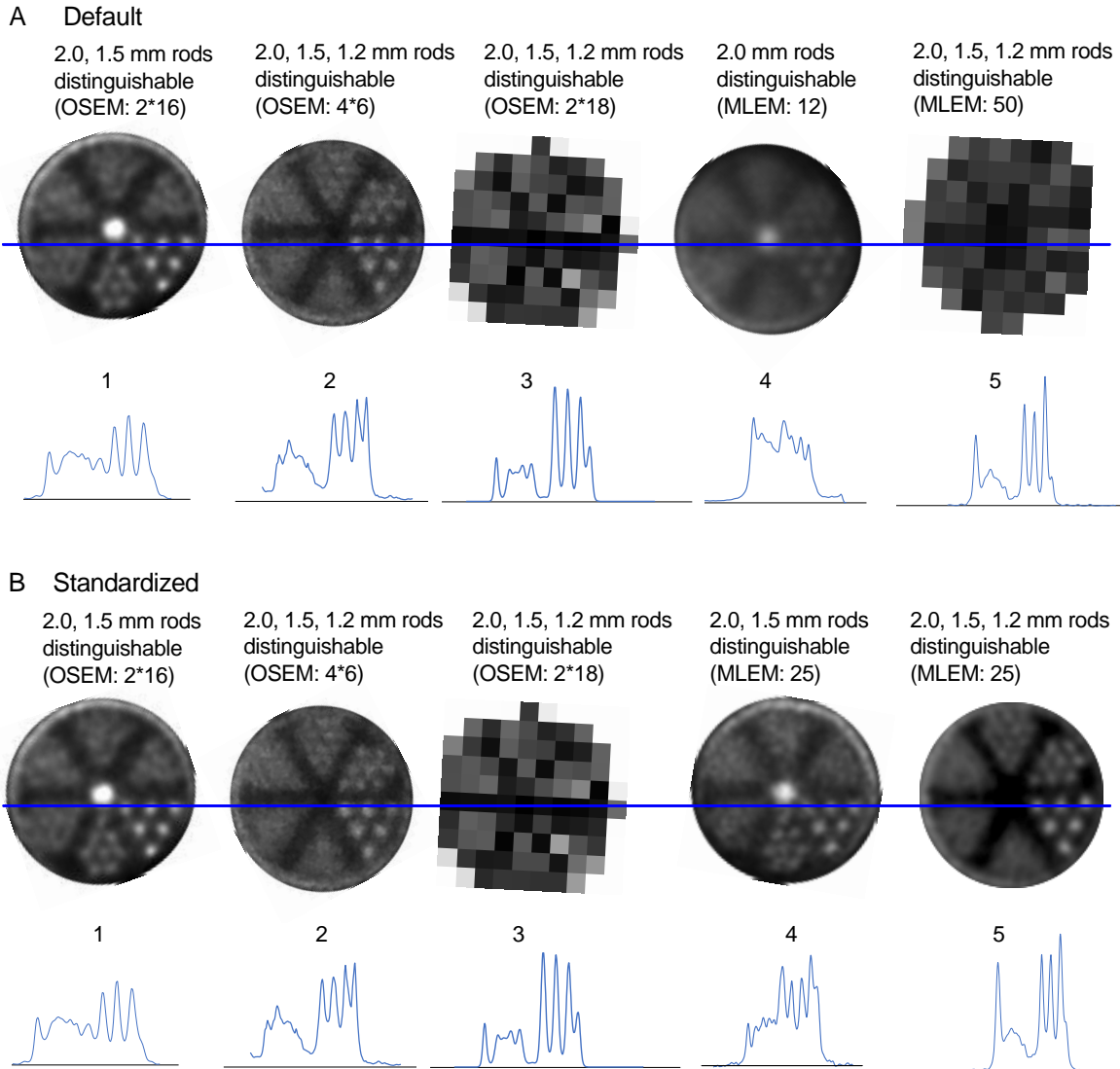
	Reconstruction (updates)	Uniformity (SD%)	RC (1mm)	RC (2mm)	RC (3mm)	RC (4mm)	RC (5mm)	Water SOR	Air SOR
Scanner 1	OSEM								
	24	5.4	0.14	0.67	0.86	0.87	0.87	0.17	0.14
default	32	6.4	0.17	0.75	0.90	0.86	0.87	0.18	0.13
	64	9.2	0.21	0.82	0.85	0.82	0.86	0.17	0.11
	FBP	11.3	0.16	0.41	0.57	0.74	0.76	0.21	0.13
Scanner 2	OSEM								
	12	4.6	0.05	0.40	0.93	1.04	1.09	0.11	0.10
default	24	4.1	0.10	0.73	1.12	1.14	1.09	0.09	0.09
	30	4.6	0.22	0.79	1.17	1.06	1.20	0.09	0.09
	32	4.7	0.13	0.79	1.13	1.06	1.04	0.08	0.10
	36	4.9	0.19	0.77	1.14	1.15	1.09	0.07	0.06
	48	4.4	0.18	0.76	1.16	1.17	1.10	0.07	0.07
	FBP	10.9	0.12	0.37	0.64	0.75	0.79	0.11	0.08
Scanner 3	OSEM								
	12	2.7	0.11	0.84	1.24	1.11	1.02	0.03	0.02
	24	3.2	0.18	0.92	1.17	1.03	1.05	0.02	0.02
	32	3.3	0.19	0.91	1.14	0.98	1.05	0.02	0.02
default	36	3.4	0.18	0.87	1.13	1.05	1.02	0.01	0.02
	64	3.7	0.19	0.88	1.14	1.00	1.04	0.03	0.02
	FBP	4.3	0.13	0.41	0.68	0.81	0.87	0.01	0.01
Scanner 4	MLEM								
default	12	5.2	0.03	0.35	0.64	0.75	0.82	0.28	0.22
	24	4.5	0.09	0.49	0.68	0.79	0.85	0.22	0.13
	25	6.4	0.12	0.64	0.79	0.83	0.87	0.21	0.13
	30	5.1	0.11	0.51	0.68	0.79	0.85	0.21	0.11
	32	6.7	0.12	0.54	0.69	0.78	0.86	0.20	0.12
	40	9.4	0.16	0.68	0.76	0.81	0.88	0.16	0.08

	50	11.70	0.18	0.66	0.74	0.81	0.88	0.18	0.08
Scanner 5	MLEM								
	12	6.7	0.05	0.45	0.82	0.92	0.96	0.33	0.25
	24	12.4	0.11	0.79	0.92	0.93	0.94	0.25	0.13
	25	10.6	0.10	0.74	0.92	0.94	0.94	0.27	0.17
	30	11.9	0.11	0.78	0.92	0.93	0.94	0.26	0.16
	32	12.1	0.11	0.79	0.92	0.91	0.93	0.24	0.13
	40	14.1	0.13	0.82	0.91	0.91	0.95	0.25	0.14
default	50	16.7	0.19	0.78	0.91	0.89	0.94	0.24	0.12
	FBP	20.8	0.12	0.37	0.58	0.71	0.74	0.24	0.06

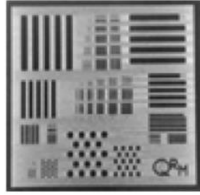
As seen in scanner 1; reconstruction methods (updates) limited by scanner's parameters.



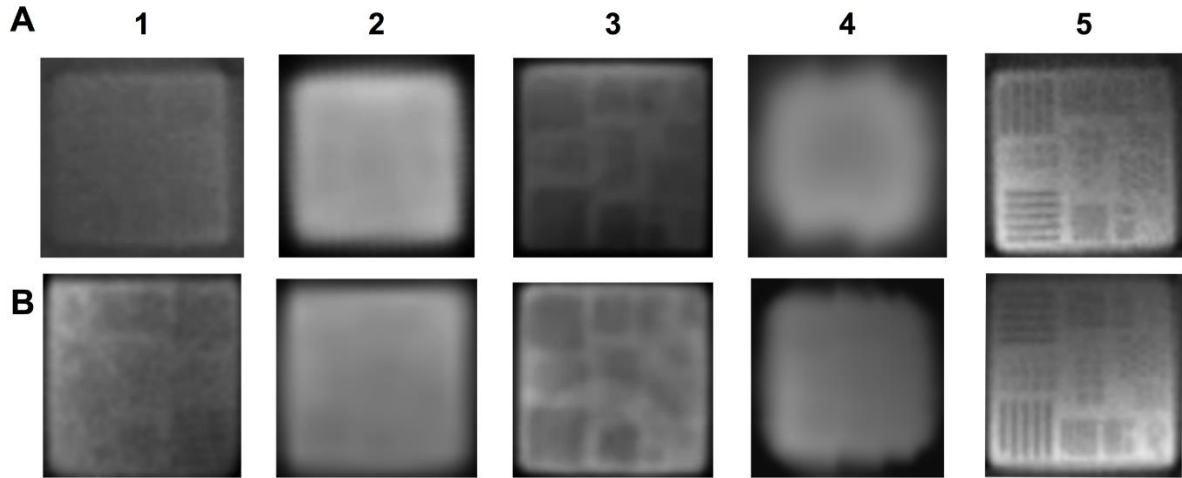
Supplemental Figure 3. Image slice through the uniformity section of the PET IQ phantom for each scanner shows variability in scanner uniformity as well as SUV measurements when using the scanner default and varying reconstruction protocols. Panel (A) shows the default, panel (B) the standard and panel (C) displays the FBP reconstruction method.



Supplemental Figure 4. Image slice and horizontal profile through the PET rod phantom. Panel (A): Scanners 2, 3 and 5 resolved 2.0, 1.5 and 1.2 mm rods using default reconstruction protocols. Panel (B): Standardized reconstruction methods improved the spatial resolution of scanner 4 (2.0 and 1.5 mm rods are seen) and essentially did not change the spatial resolution of scanner 5.



QRM reference



Supplemental Figure 5. CT bar phantom images displaying QRM pattern for spatial resolution using the default (A) and post standardization (B) of CT protocols.

Supplemental Table 5. Proposed preclinical Hounsfield Unit (HU) range generated using the standard CT protocol (tube voltage at 50 kVp, 300 ms and 360 projections) and the tissue equivalent material phantom. Soft tissue and bone HUs are averaged using the 2mm and 4mm rods.

Lung range	-778	to	-686
Adipose range	-233	to	-177
Muscle range	-8	to	64
Soft tissue range (0.95 to 1.115 g/mL)	-204	to	74
Bone range (1.24 to 1.57 g/mL)	987	to	2900

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