SUPPLEMENTARY MATERIALS

Section S1

The repeatability of the measurements was assessed using a three-level random effects model for each combination of equivalent soft tissue phantom insert and energy value: first level corresponded to the variability due to the noise (e_{ij}, with i=1,...,6 representing the acquisition and j=1,...,9 the slice); second level modeled the variability between slices, nested within acquisitions (S_j with j=1,...,9); third level accounted for the variability between acquisitions (A_i with i=1,...,6). The equation of the three-level random effects model for the measurement y_{jk} is the following:

$$y_{ij} = \gamma + A_i + S_j + e_{ij}$$

where γ is the fixed intercept and the other three terms A_i, S_j, and e_{ij} are described above and are modelled as random variables with gaussian distributions having zero mean and variances V_A, V_S, and V_e, respectively. The repeatability R_G of the grouping factors (due to noise, between acquisitions, or across slices within acquisitions) was calculated as

$$R_G = 1 - (V_G / V_T)$$

where V_G is the variance of the grouping factor G (namely A, S, or e) and V_T is the total variance, that is the sum of the variances of the three grouping factors. Therefore, the three R_G need to sum up to 2 and each R_G can range from 0 (i.e., data variability is totally explained by the grouping factor) to 1 (i.e., grouping factor has no effect on the data variability). In particular, obtaining a repeatability value equal to 1 for the second and third levels of the models would mean that the CT measurement variability is completely independent of the slice and the acquisition.

The three-level regression model indicated that the variation related to between-acquisition heterogeneity was approximately 0 for almost all measurements, as well as that attributed to the slices within acquisition (Supplementary Table S1). This indicates that the measurements were consistent among acquisitions and slices ($R_G \approx 1$), taking into account the noise. The only exception was related to the Siemens Force CT machine when measuring the bone 200 mg insert at 70 keV, for which we obtained a slightly lower repeatability value between acquisitions of 0.89. The repeatability of the measurements was similar when using the iterative algorithms for reconstruction, although lower values were obtained in few cases (see Supplementary Table S1 for details).

Supplementary Table S1. Variability of the measurements for each combination of tissue, energy value, and reconstruction method, separately for each CT scanner. Data are mean values and standard deviations estimating the variability due to noise (level 1), across slices within acquisitions (level 2), and between acquisitions (level 3), using a 3-level random effect regression model. Reported values are in Hounsfield units. In parenthesis, corresponding repeatability values are also reported.

Abbreviations: SD = standard deviation; DE = dual-energy; SE = single-energy; FBP = filtered back-projection; IR = iterative reconstruction.

Tissue – Energy – Method	Siemens Confidence			
	Mean value	Level-1 SD	Level-2 SD	Level-3 SD
Adipose - SE_120kVp - FBP	-70.79	15.82 (0)	0 (1)	0 (1)
Adipose - DE_40keV - FBP	-137.62	34.59 (0)	0 (1)	0.01 (1)
Adipose - DE_50keV - FBP	-106.62	25.53 (0)	0 (1)	0.01 (1)
Adipose - DE_70keV - FBP	-76.08	16.67 (0)	0 (1)	0 (1)
Adipose - DE_100keV - FBP	-60.13	15.69 (0)	0 (1)	0 (1)
Adipose - DE_120keV - FBP	-55.85	15.93 (0)	0 (1)	0 (1)
Adipose - DE_140keV - FBP	-53.50	15.96 (0)	0 (1)	0 (1)
Adipose - SE_120kVp - IR	-70.81	10.11 (0)	0 (1)	0 (1)
Adipose - DE_40keV - IR	-137.51	22.07 (0)	0 (1)	0.01 (1)
Adipose - DE_50keV - IR	-106.48	16.18 (0)	0 (1)	0 (1)
Adipose - DE_70keV - IR	-76.04	10.50 (0)	0 (1)	0 (1)
Adipose - DE_100keV - IR	-60.13	9.83 (0)	0 (1)	0 (1)
Adipose - DE_120keV - IR	-55.89	9.98 (0)	0 (1)	0 (1)
Adipose - DE_140keV - IR	-53.46	10.01 (0)	0 (1)	0 (1)
Breast - SE_120kVp - FBP	-29.15	13.80 (0)	0 (1)	0 (1)
Breast - DE_40keV - FBP	-66.28	30.58 (0)	0 (1)	0.01 (1)
Breast - DE_50keV - FBP	-48.87	22.65 (0)	0 (1)	0.01 (1)
Breast - DE_70keV - FBP	-31.62	14.86 (0)	0 (1)	0 (1)
Breast - DE_100keV - FBP	-22.65	14.34 (0)	0 (1)	0 (1)
Breast - DE_120keV - FBP	-20.24	14.63 (0)	0 (1)	0 (1)
Breast - DE_140keV - FBP	-18.91	14.66 (0)	0 (1)	0 (1)
Breast - SE_120kVp - IR	-28.95	8.79 (0)	0 (1)	0 (1)
Breast - DE_40keV - IR	-66.37	19.40 (0)	0 (1)	0.01 (1)
Breast - DE_50keV - IR	-48.79	14.30 (0)	0 (1)	0 (1)
Breast - DE_70keV - IR	-31.51	9.37 (0)	0 (1)	0 (1)
Breast - DE_100keV - IR	-22.05	9.01 (0)	0 (1)	0 (1)
Breast - DE_120keV - IR	-20.10	9.18 (0)	0 (1)	0 (1)
Breast - DE_140keV - IR	-18.76	9.21 (0)	0 (1)	0 (1)
Liver - SE_120kVp - FBP	58.20	18.19 (0)	0 (1)	0 (1)
Liver - DE_40keV - FBP	66.66	40.97 (0)	0 (1)	0.01 (1)
Liver - DE_50keV - FBP	63.54	30.27 (0)	0 (1)	0 (1)
Liver - DE_70keV - FBP	60.59	19.79 (0)	0 (1)	0.01 (1)
Liver - DE_100keV - FBP	59.06	18.54 (0)	0 (1)	0.01 (1)

Liver - DE_120keV - FBP	58.65	18.82 (0)	0 (1)	0.01 (1)
Liver - DE_140keV - FBP	58.42	18.84 (0)	0 (1)	0.01 (1)
Liver - SE_120kVp - IR	58.43	11.63 (0)	0 (1)	0 (1)
Liver - DE_40keV - IR	65.94	26.27 (0)	0 (1)	0.01 (1)
Liver - DE_50keV - IR	63.24	19.31 (0)	0 (1)	0.01 (1)
Liver - DE_70keV - IR	60.59	12.56 (0)	0 (1)	0 (1)
Liver - DE_100keV - IR	59.22	11.69 (0)	0 (1)	0 (1)
Liver - DE_120keV - IR	58.87	11.86 (0)	0 (1)	0 (1)
Liver - DE_140keV - IR	58.66	11.88 (0)	0 (1)	0 (1)
Muscle - SE_120kVp - FBP	45.91	15.30 (0)	0 (1)	0 (1)
Muscle - DE_40keV - FBP	53.16	33.53 (0)	0 (1)	0 (1)
Muscle - DE_50keV - FBP	50.67	24.89 (0)	0 (1)	0 (1)
Muscle - DE_70keV - FBP	48.37	16.36 (0)	0 (1)	0 (1)
Muscle - DE_100keV - FBP	47.16	15.11 (0)	0 (1)	0 (1)
Muscle - DE_120keV - FBP	46.85	15.28 (0)	0 (1)	0 (1)
Muscle - DE_140keV - FBP	46.67	15.29 (0)	0 (1)	0 (1)
Muscle - SE_120kVp - IR	46.20	9.77 (0)	0 (1)	0 (1)
Muscle - DE_40keV - IR	53.48	21.21 (0)	0 (1)	0.01 (1)
Muscle - DE_50keV - IR	50.95	15.67 (0)	0 (1)	0 (1)
Muscle - DE_70keV - IR	48.59	10.29 (0)	0 (1)	0 (1)
Muscle - DE_100keV - IR	47.34	9.45 (0)	0 (1)	0 (1)
Muscle - DE_120keV - IR	47.03	9.57 (0)	0 (1)	0 (1)
Muscle - DE_140keV - IR	46.85	9.60 (0)	0 (1)	0 (1)
Bone 200 mg - SE_120kVp - FBP	203.07	16.50 (0)	0 (1)	0 (1)
Bone 200 mg - DE_40keV - FBP	515.21	52.15 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_50keV - FBP	373.29	35.04 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_70keV - FBP	233.95	18.27 (0)	0 (1)	0 (1)
Bone 200 mg - DE_100keV - FBP	161.52	16.79 (0)	0 (1)	0 (1)
Bone 200 mg - DE_120keV - FBP	142.22	16.42 (0)	0 (1)	0 (1)
Bone 200 mg - DE_140keV - FBP	131.54	16.04 (0)	0 (1)	0 (1)
Bone 200 mg - SE_120kVp - IR	202.59	10.54 (0)	0 (1)	0 (1)
Bone 200 mg - DE_40keV - IR	515.56	32.79 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_50keV - IR	373.40	22.03 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_70keV - IR	233.64	11.51 (0)	0 (1)	0 (1)
Bone 200 mg - DE_100keV - IR	161.01	10.55 (0)	0 (1)	0 (1)
Bone 200 mg - DE_120keV - IR	141.64	10.33 (0)	0 (1)	0 (1)
Bone 200 mg - DE_140keV - IR	130.91	10.11 (0)	0 (1)	0 (1)

Supplementary Table S1 (continued)

Tissue – Energy – Method	Siemens Edge			
	Mean	Level-1 SD	Level-2 SD	Level-3 SD
Adipose - SE_120kVp - FBP	-71.55	14.80 (0)	0 (1)	0 (1)
Adipose - DE_40keV - FBP	-162.15	35.40 (0)	0 (1)	0 (1)
Adipose - DE_50keV - FBP	-119.64	25.15 (0)	0 (1)	0 (1)
Adipose - DE_70keV - FBP	-77.94	16.63 (0)	0 (1)	0 (1)
Adipose - DE_100keV - FBP	-56.03	12.59 (0)	0 (1)	0 (1)
Adipose - DE_120keV - FBP	-50.22	12.75 (0)	0 (1)	0 (1)
Adipose - DE_140keV - FBP	-47.00	12.80 (0)	0 (1)	0 (1)
Adipose - SE_120kVp - IR	-71.63	9.44 (0)	0 (1)	0 (1)
Adipose - DE_40keV - IR	-162.57	24.24 (0)	0 (1)	0 (1)
Adipose - DE_50keV - IR	-119.85	17.15 (0)	0 (1)	0 (1)
Adipose - DE_70keV - IR	-77.95	11.22 (0)	0 (1)	0 (1)
Adipose - DE_100keV - IR	-55.96	8.51 (0)	0 (1)	0 (1)
Adipose - DE_120keV - IR	-50.13	8.63 (0)	0 (1)	0 (1)
Adipose - DE_140keV - IR	-46.88	8.68 (0)	0 (1)	0 (1)
Breast - SE_120kVp - FBP	-25.13	14.08 (0)	0 (1)	0 (1)
Breast - DE_40keV - FBP	-101.61	29.07 (0)	0 (1)	0.01 (1)
Breast - DE_50keV - FBP	-67.64	20.98 (0)	0 (1)	0.01 (1)
Breast - DE_70keV - FBP	-34.21	14.16 (0)	0 (1)	0 (1)
Breast - DE_100keV - FBP	-16.93	11.41 (0)	0 (1)	0 (1)
Breast - DE_120keV - FBP	-12.31	11.66 (0)	0 (1)	0 (1)
Breast - DE_140keV - FBP	-9.74	11.75 (0)	0 (1)	0 (1)
Breast - SE_120kVp - IR	-24.94	8.88 (0)	0 (1)	0 (1)
Breast - DE_40keV - IR	-101.35	19.60 (0)	0 (1)	0.01 (1)
Breast - DE_50keV - IR	-67.47	14.19 (0)	0 (1)	0 (1)
Breast - DE_70keV - IR	-34.12	9.53 (0)	0 (1)	0 (1)
Breast - DE_100keV - IR	-16.87	7.61 (0)	0 (1)	0 (1)
Breast - DE_120keV - IR	-12.27	7.78 (0)	0 (1)	0 (1)
Breast - DE_140keV - IR	-9.71	7.85 (0)	0 (1)	0 (1)
Liver - SE_120kVp - FBP	53.32	17.43 (0)	0 (1)	0.01 (1)
Liver - DE_40keV - FBP	60.61	40.32 (0)	0 (1)	0 (1)
Liver - DE_50keV - FBP	60.88	29.49 (0)	0 (1)	0 (1)
Liver - DE_70keV - FBP	61.20	20.19 (0)	0 (1)	0 (1)
Liver - DE_100keV - FBP	61.48	15.07 (0)	0 (1)	0 (1)
Liver - DE_120keV - FBP	61.56	15.25 (0)	0 (1)	0 (1)

Liver - DE_140keV - FBP	61.61	15.32 (0)	0 (1)	0 (1)
Liver - SE_120kVp - IR	53.09	11.07 (0.02)	0.03 (1)	1.38 (0.98)
Liver - DE_40keV - IR	61.96	28.44 (0)	0 (1)	0 (1)
Liver - DE_50keV - IR	61.77	20.66 (0)	0 (1)	0 (1)
Liver - DE_70keV - IR	61.49	13.90 (0)	0 (1)	0 (1)
Liver - DE_100keV - IR	61.46	10.31 (0)	0 (1)	0 (1)
Liver - DE_120keV - IR	61.47	10.43 (0)	0 (1)	0 (1)
Liver - DE_140keV - IR	61.47	10.49 (0)	0 (1)	0 (1)
Muscle - SE_120kVp - FBP	46.91	14.85 (0)	0 (1)	0 (1)
Muscle - DE_40keV - FBP	45.48	32.87 (0)	0 (1)	0.01 (1)
Muscle - DE_50keV - FBP	46.83	24.01 (0)	0 (1)	0.01 (1)
Muscle - DE_70keV - FBP	48.42	16.12 (0)	0 (1)	0 (1)
Muscle - DE_100keV - FBP	49.16	12.44 (0)	0 (1)	0 (1)
Muscle - DE_120keV - FBP	49.34	12.64 (0)	0 (1)	0 (1)
Muscle - DE_140keV - FBP	49.43	12.72 (0)	0 (1)	0 (1)
Muscle - SE_120kVp - IR	46.88	9.38 (0)	0 (1)	0 (1)
Muscle - DE_40keV - IR	45.88	22.53 (0)	0 (1)	0.01 (1)
Muscle - DE_50keV - IR	47.08	16.35 (0)	0 (1)	0 (1)
Muscle - DE_70keV - IR	48.53	10.82 (0)	0 (1)	0 (1)
Muscle - DE_100keV - IR	49.23	8.38 (0)	0 (1)	0 (1)
Muscle - DE_120keV - IR	49.38	8.54 (0)	0 (1)	0 (1)
Muscle - DE_140keV - IR	49.47	8.60 (0)	0 (1)	0 (1)
Bone 200 mg - SE_120kVp - FBP	193.26	15.95 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_40keV - FBP	587.95	50.36 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_50keV - FBP	415.73	33.78 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_70keV - FBP	246.37	17.61 (0)	0 (1)	0 (1)
Bone 200 mg - DE_100keV - FBP	158.27	13.46 (0)	0 (1)	0 (1)
Bone 200 mg - DE_120keV - FBP	134.82	13.57 (0)	0 (1)	0 (1)
Bone 200 mg - DE_140keV - FBP	121.82	13.55 (0)	0 (1)	0 (1)
Bone 200 mg - SE_120kVp - IR	192.41	10.13 (0.04)	0.04 (1)	2.10 (0.96)
Bone 200 mg - DE_40keV - IR	585.77	34.53 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_50keV - IR	414.21	23.14 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_70keV - IR	245.50	12.06 (0)	0 (1)	0 (1)
Bone 200 mg - DE_100keV - IR	157.74	9.15 (0)	0 (1)	0 (1)
Bone 200 mg - DE_120keV - IR	134.38	9.23 (0)	0 (1)	0 (1)
Bone 200 mg - DE_140keV - IR	121.43	9.24 (0)	0 (1)	0 (1)

Supplementary Table S1 (continued)

Tissue – Energy – Method	Siemens Force			
	Mean	Level-1 SD	Level-2 SD	Level-3 SD
Adipose - SE_120kVp - FBP	-68.77	15.14 (0)	0 (1)	0 (1)
Adipose - DE_40keV - FBP	-125.18	27.93 (0)	0 (1)	0.01 (1)
Adipose - DE_50keV - FBP	-93.2	18.79 (0)	0 (1)	0.01 (1)
Adipose - DE_70keV - FBP	-66.82	12.74 (0)	0 (1)	0 (1)
Adipose - DE_100keV - FBP	-54.04	10.87 (0)	0 (1)	0.01 (1)
Adipose - DE_120keV - FBP	-50.40	10.85 (0)	0 (1)	0.01 (1)
Adipose - DE_140keV - FBP	-48.49	10.90 (0)	0.01 (1)	0.01 (1)
Adipose - SE_120kVp - IR	-68.82	10.02 (0)	0 (1)	0 (1)
Adipose - DE_40keV - IR	-122.00	19.61 (0.02)	0.02 (1)	3.06 (0.98)
Adipose - DE_50keV - IR	-91.88	13.93 (0.02)	0.05 (1)	2.13 (0.98)
Adipose - DE_70keV - IR	-66.64	8.62 (0)	0 (1)	0 (1)
Adipose - DE_100keV - IR	-53.70	7.38 (0)	0 (1)	0 (1)
Adipose - DE_120keV - IR	-50.28	7.42 (0.04)	0.02 (1)	1.48 (0.96)
Adipose - DE_140keV - IR	-48.38	7.47 (0.07)	0.01 (1)	2.02 (0.93)
Breast - SE_120kVp - FBP	-28.53	12.77 (0)	0 (1)	0 (1)
Breast - DE_40keV - FBP	-62.89	26.3 (0)	0 (1)	0.01 (1)
Breast - DE_50keV - FBP	-45.82	17.46 (0)	0 (1)	0.01 (1)
Breast - DE_70keV - FBP	-27.34	12.12 (0)	0 (1)	0 (1)
Breast - DE_100keV - FBP	-18.15	10.08 (0)	0 (1)	0 (1)
Breast - DE_120keV - FBP	-16.77	10.03 (0)	0 (1)	0 (1)
Breast - DE_140keV - FBP	-14.16	10.05 (0)	0 (1)	0 (1)
Breast - SE_120kVp - IR	-28.47	8.35 (0)	0 (1)	0 (1)
Breast - DE_40keV - IR	-62.88	17.67 (0.03)	0.03 (1)	3.15 (0.97)
Breast - DE_50keV - IR	-45.01	12.89 (0)	0 (1)	0.03 (1)
Breast - DE_70keV - IR	-27.46	8.12 (0)	0 (1)	0 (1)
Breast - DE_100keV - IR	-18.30	6.77 (0)	0 (1)	0 (1)
Breast - DE_120keV - IR	-15.93	6.79 (0)	0 (1)	0 (1)
Breast - DE_140keV - IR	-14.61	6.83 (0)	0 (1)	0 (1)
Liver - SE_120kVp - FBP	61.87	17.62 (0)	0 (1)	0 (1)
Liver - DE_40keV - FBP	72.95	31.23 (0)	0 (1)	0.01 (1)
Liver - DE_50keV - FBP	68.29	20.83 (0)	0 (1)	0.01 (1)
Liver - DE_70keV - FBP	63.91	14.71 (0)	0 (1)	0 (1)
Liver - DE_100keV - FBP	61.49	13.39 (0)	0 (1)	0 (1)
Liver - DE_120keV - FBP	60.76	13.42 (0)	0 (1)	0 (1)
Liver - DE_140keV - FBP	60.38	13.48 (0)	0 (1)	0 (1)

Liver - SE_120kVp - IR	62.05	11.64 (0)	0 (1)	0 (1)
Liver - DE_40keV - IR	73.58	21.47 (0)	0 (1)	0.01 (1)
Liver - DE_50keV - IR	68.34	15.38 (0)	0 (1)	0 (1)
Liver - DE_70keV - IR	63.93	9.83 (0)	0 (1)	0 (1)
Liver - DE_100keV - IR	61.74	9.04 (0)	0 (1)	0 (1)
Liver - DE_120keV - IR	61.15	9.12 (0)	0 (1)	0 (1)
Liver - DE_140keV - IR	60.82	9.19 (0)	0 (1)	0 (1)
Muscle - SE_120kVp - FBP	50.49	13.26 (0)	0 (1)	0 (1)
Muscle - DE_40keV - FBP	73.56	27.06 (0)	0.01 (1)	0 (1)
Muscle - DE_50keV - FBP	65.68	18.09 (0)	0 (1)	0 (1)
Muscle - DE_70keV - FBP	55.41	12.68 (0)	0 (1)	0 (1)
Muscle - DE_100keV - FBP	50.40	10.54 (0)	0 (1)	0 (1)
Muscle - DE_120keV - FBP	48.77	10.45 (0)	0 (1)	0 (1)
Muscle - DE_140keV - FBP	48.16	10.45 (0)	0 (1)	0 (1)
Muscle - SE_120kVp - IR	50.60	8.68 (0)	0 (1)	0 (1)
Muscle - DE_40keV - IR	73.35	18.32 (0.03)	0.03 (1)	3.46 (0.97)
Muscle - DE_50keV - IR	64.25	13.36 (0.03)	0.05 (1)	2.51 (0.97)
Muscle - DE_70keV - IR	55.26	8.55 (0)	0 (1)	0 (1)
Muscle - DE_100keV - IR	50.80	7.07 (0)	0 (1)	0 (1)
Muscle - DE_120keV - IR	49.56	7.02 (0)	0 (1)	0 (1)
Muscle - DE_140keV - IR	48.86	7.05 (0)	0 (1)	0 (1)
Bone 200 mg - SE_120kVp - FBP	214.49	16.02 (0)	0 (1)	0 (1)
Bone 200 mg - DE_40keV - FBP	557.07	37.65 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_50keV - FBP	390.68	23.12 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_70keV - FBP	227.17	12.91 (0.11)	0 (1)	4.47 (0.89)
Bone 200 mg - DE_100keV - FBP	141.58	11.90 (0.14)	0 (1)	4.81 (0.86)
Bone 200 mg - DE_120keV - FBP	116.65	12.15 (0.10)	0 (1)	4.10 (0.90)
Bone 200 mg - DE_140keV - FBP	104.00	12.35 (0.40)	0.08 (1)	9.98 (0.60)
Bone 200 mg - SE_120kVp - IR	214.20	10.60 (0)	0 (1)	0 (1)
Bone 200 mg - DE_40keV - IR	558.96	26.11 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_50keV - IR	390.66	17.31 (0)	0.01 (1)	0 (1)
Bone 200 mg - DE_70keV - IR	226.32	8.78 (0.25)	0.05 (1)	5.09 (0.75)
Bone 200 mg - DE_100keV - IR	140.73	8.18 (0.31)	0.04 (1)	5.48 (0.69)
Bone 200 mg - DE_120keV - IR	117.99	8.41 (0.30)	0.09 (1)	5.52 (0.70)
Bone 200 mg - DE_140keV - IR	105.37	8.57 (0.30)	0.03 (1)	5.55 (0.70)

Supplementary Table S1 (continued)

Tissue – Energy – Method	GE Revolution GSI			
	Mean	Level-1 SD	Level-2 SD	Level-3 SD
Adipose - SE_120kVp - FBP	-72.35	19.00 (0)	0 (1)	0.01 (1)
Adipose - DE_40keV - FBP	-147.50	35.83 (0)	0 (1)	0 (1)
Adipose - DE_50keV - FBP	-112.60	24.88 (0)	0 (1)	0.01 (1)
Adipose - DE_70keV - FBP	-77.36	12.74 (0)	0 (1)	0 (1)
Adipose - DE_100keV - FBP	-60.22	10.14 (0)	0 (1)	0 (1)
Adipose - DE_120keV - FBP	-55.34	8.81 (0)	0 (1)	0 (1)
Adipose - DE_140keV - FBP	-52.74	8.12 (0)	0 (1)	0 (1)
Adipose - SE_120kVp - IR	-72.12	11.73 (0)	0 (1)	0 (1)
Adipose - DE_40keV - IR	-147.20	32.41 (0)	0 (1)	0.01 (1)
Adipose - DE_50keV - IR	-112.30	22.98 (0)	0 (1)	0.01 (1)
Adipose - DE_70keV - IR	-77.43	7.78 (0)	0 (1)	0 (1)
Adipose - DE_100keV - IR	-60.14	9.19 (0)	0 (1)	0 (1)
Adipose - DE_120keV - IR	-55.45	8.07 (0)	0 (1)	0 (1)
Adipose - DE_140keV - IR	-53.01	7.52 (0)	0 (1)	0 (1)
Breast - SE_120kVp - FBP	-30.02	17.15 (0)	0 (1)	0 (1)
Breast - DE_40keV - FBP	-69.31	32.60 (0)	0 (1)	0 (1)
Breast - DE_50keV - FBP	-51.20	23.07 (0)	0 (1)	0.01 (1)
Breast - DE_70keV - FBP	-33.23	11.65 (0)	0 (1)	0 (1)
Breast - DE_100keV - FBP	-23.75	9.04 (0)	0 (1)	0 (1)
Breast - DE_120keV - FBP	-21.34	7.90 (0)	0 (1)	0 (1)
Breast - DE_140keV - FBP	-20.03	7.35 (0)	0 (1)	0 (1)
Breast - SE_120kVp - IR	-30.11	10.71 (0)	0 (1)	0 (1)
Breast - DE_40keV - IR	-69.92	29.91 (0)	0 (1)	0 (1)
Breast - DE_50keV - IR	-51.47	20.90 (0)	0 (1)	0.01 (1)
Breast - DE_70keV - IR	-33.14	7.11 (0)	0 (1)	0 (1)
Breast - DE_100keV - IR	-23.84	8.33 (0)	0 (1)	0 (1)
Breast - DE_120keV - IR	-21.33	7.25 (0)	0 (1)	0 (1)
Breast - DE_140keV - IR	-19.93	6.75 (0)	0 (1)	0 (1)
Liver - SE_120kVp - FBP	63.52	22.81 (0)	0 (1)	0.01 (1)
Liver - DE_40keV - FBP	84.79	38.88 (0)	0 (1)	0.01 (1)
Liver - DE_50keV - FBP	72.77	27.05 (0)	0 (1)	0.01 (1)
Liver - DE_70keV - FBP	60.69	14.04 (0)	0 (1)	0 (1)
Liver - DE_100keV - FBP	56.27	10.75 (0)	0 (1)	0 (1)
Liver - DE_120keV - FBP	54.69	9.47 (0)	0 (1)	0 (1)

Liver - DE_140keV - FBP	53.74	8.80 (0)	0 (1)	0 (1)
Liver - SE_120kVp - IR	63.44	13.67 (0)	0 (1)	0 (1)
Liver - DE_40keV - IR	84.04	32.84 (0)	0 (1)	0.01 (1)
Liver - DE_50keV - IR	73.59	23.24 (0)	0 (1)	0.01 (1)
Liver - DE_70keV - IR	60.95	8.44 (0)	0 (1)	0 (1)
Liver - DE_100keV - IR	56.09	9.17 (0)	0 (1)	0 (1)
Liver - DE_120keV - IR	54.62	8.26 (0)	0 (1)	0 (1)
Liver - DE_140keV - IR	53.62	7.67 (0)	0 (1)	0 (1)
Muscle - SE_120kVp - FBP	49.65	19.1 (0)	0 (1)	0.01 (1)
Muscle - DE_40keV - FBP	68.00	33.52 (0)	0 (1)	0 (1)
Muscle - DE_50keV - FBP	57.13	23.58 (0)	0 (1)	0 (1)
Muscle - DE_70keV - FBP	46.19	12.33 (0)	0 (1)	0 (1)
Muscle - DE_100keV - FBP	42.17	9.42 (0)	0 (1)	0 (1)
Muscle - DE_120keV - FBP	40.74	8.18 (0)	0 (1)	0 (1)
Muscle - DE_140keV - FBP	39.97	7.51 (0)	0 (1)	0 (1)
Muscle - SE_120kVp - IR	49.64	11.88 (0)	0 (1)	0 (1)
Muscle - DE_40keV - IR	67.02	30.73 (0)	0 (1)	0.01 (1)
Muscle - DE_50keV - IR	57.09	21.37 (0)	0 (1)	0.01 (1)
Muscle - DE_70keV - IR	46.27	7.45 (0)	0 (1)	0 (1)
Muscle - DE_100keV - IR	41.97	8.58 (0)	0 (1)	0 (1)
Muscle - DE_120keV - IR	40.62	7.32 (0)	0 (1)	0 (1)
Muscle - DE_140keV - IR	39.90	6.78 (0)	0 (1)	0 (1)
Bone 200 mg - SE_120kVp - FBP	215.95	29.15 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_40keV - FBP	524.65	37.28 (0)	0 (1)	0 (1)
Bone 200 mg - DE_50keV - FBP	376.07	25.71 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_70keV - FBP	223.25	13.25 (0)	0 (1)	0 (1)
Bone 200 mg - DE_100keV - FBP	146.20	10.08 (0)	0 (1)	0 (1)
Bone 200 mg - DE_120keV - FBP	125.84	8.79 (0)	0 (1)	0 (1)
Bone 200 mg - DE_140keV - FBP	114.20	8.13 (0)	0 (1)	0 (1)
Bone 200 mg - SE_120kVp - IR	215.74	17.96 (0)	0 (1)	0 (1)
Bone 200 mg - DE_40keV - IR	525.51	33.46 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_50keV - IR	373.51	23.21 (0)	0 (1)	0.01 (1)
Bone 200 mg - DE_70keV - IR	223.22	8.07 (0)	0 (1)	0 (1)
Bone 200 mg - DE_100keV - IR	146.16	8.94 (0)	0 (1)	0 (1)
Bone 200 mg - DE_120keV - IR	125.78	7.84 (0)	0 (1)	0 (1)
Bone 200 mg - DE_140keV - IR	114.19	7.25 (0)	0 (1)	0 (1)

Supplementary Table S2. RMSE obtained with Iterative reconstructions.

Tissue and energy level	RMSE (HU)			
	Siemens Confidence	Siemens Force	Siemens Edge	GE Revolution GSI
Adipose				
40 keV	15	34	14	5
50 keV	5	20	11	3
70 keV	1	9	3	2
100 keV	1	6	3	2
120 keV	1	6	5	2
140 keV	1	5	6	1
Breast				
40 keV	22	26	14	18
50 keV	13	18	6	11
70 keV	9	13	6	7
100 keV	7	12	13	6
120 keV	7	12	15	6
140 keV	7	12	16	6
Muscle				
40 keV	4	21	17	14
50 keV	2	15	9	7
70 keV	4	10	1	2
100 keV	4	7	5	2
120 keV	4	7	6	3
140 keV	4	6	6	4
Liver				
40 keV	4	12	14	21
50 keV	5	9	8	14
70 keV	6	9	7	7
100 keV	7	9	9	4
120 keV	7	9	9	3
140 keV	6	8	9	2
Bone 200 mg				
40 keV	170	127	100	161
50 keV	89	72	49	90
70 keV	32	39	20	42
100 keV	14	35	17	29
120 keV	11	35	18	27
140 keV	11	37	20	28

Abbreviations: RMSE = root mean square error.

Supplementary Table S3. Mean difference (with unadjusted 95% confidence interval) between each of three low energy levels (40, 50, and 70 keV) of DECT with respect to SECT of other pairwise comparison of five tissue-equivalent inserts for four CT machines, using FBP reconstruction method. Bold numbers indicate differences between DECT and SECT with statistical significance (p-value < 0.05/30 after multiple comparison correction with Bonferroni procedure).

Tissue Comparison	DECT Level vs SECT images	Mean difference in HU (95% CI)			
		Confidence	Edge	Force	Revolution GSI
Adipose vs Bone 200 mg	40 keV	**378.9** (377.5; 380.3)	**485.7** (482.8; 488.7)	**399.1** (396.3; 401.9)	**384.0** (381.6; 386.5)
	50 keV	**206.0** (205.0; 207.0)	**270.9** (269.0; 272.7)	**201.3** (198.9; 203.7)	**200.5** (198.7; 202.4)
	70 keV	**36.2** (35.6; 36.8)	**59.7** (58.8; 60.6)	**10.8** (8.9; 12.8)	**12.5** (11.7; 13.3)
Breast vs Muscle	40 keV	**44.2** (42.8; 45.6)	**75.1** (73.0; 77.1)	**57.0** (52.9; 61.1)	**57.5** (56.3; 58.7)
	50 keV	**24.4** (23.3; 25.4)	**42.5** (41.2; 43.9)	**30.7** (28.3; 33.1)	**28.7** (27.8; 29.6)
	70 keV	**5.0** (4.2; 5.7)	**10.6** (9.9; 11.3)	**3.6** (2.6; 4.6)	-0.2 (-0.9; 0.6)
Breast vs Liver	40 keV	**45.6** (44.5; 46.7)	**83.0** (78.4; 87.6)	**45.4** (42.7; 48.1)	**60.4** (59.1; 61.8)
	50 keV	**25.0** (24.3; 25.8)	**49.5** (46.5; 52.5)	**23.2** (21.5; 24.8)	**30.4** (29.5; 31.4)
	70 keV	**4.8** (4.3; 5.3)	**16.7** (15.1; 18.3)	0.9 (0.2; 1.7)	0.3 (-0.3; 1.0)
Muscle vs Bone 200 mg	40 keV	**305.1** (303.7; 306.5)	**396.3** (393.6; 398.9)	**319.9** (317.2; 322.6)	**290.5** (287.8; 293.2)
	50 keV	**165.5** (164.5; 166.6)	**222.6** (220.9; 224.3)	**162.2** (160.5; 163.8)	**152.6** (150.5; 154.7)
	70 keV	**28.4** (27.7; 29.1)	**51.7** (50.6; 52.7)	**8.0** (6.6; 9.4)	**10.7** (9.8; 11.6)
Liver vs Bone 200 mg	40 keV	**303.6** (302.4; 304.9)	**388.3** (383.6; 393.1)	**331.5** (329.4; 333.6)	**287.6** (285.1; 290.0)
	50 keV	**164.9** (164.0; 165.7)	**215.6** (212.7; 218.5)	**169.7** (168.0; 171.4)	**150.9** (148.9; 152.9)
	70 keV	**28.6** (28.0; 29.1)	**45.6** (44.4; 46.8)	**10.7** (9.0; 12.3)	**10.2** (9.4; 11.0)

Abbreviations: DECT = dual-energy CT, SECT = single-energy CT, FBP = filtered back-projection, CI = confidence interval.
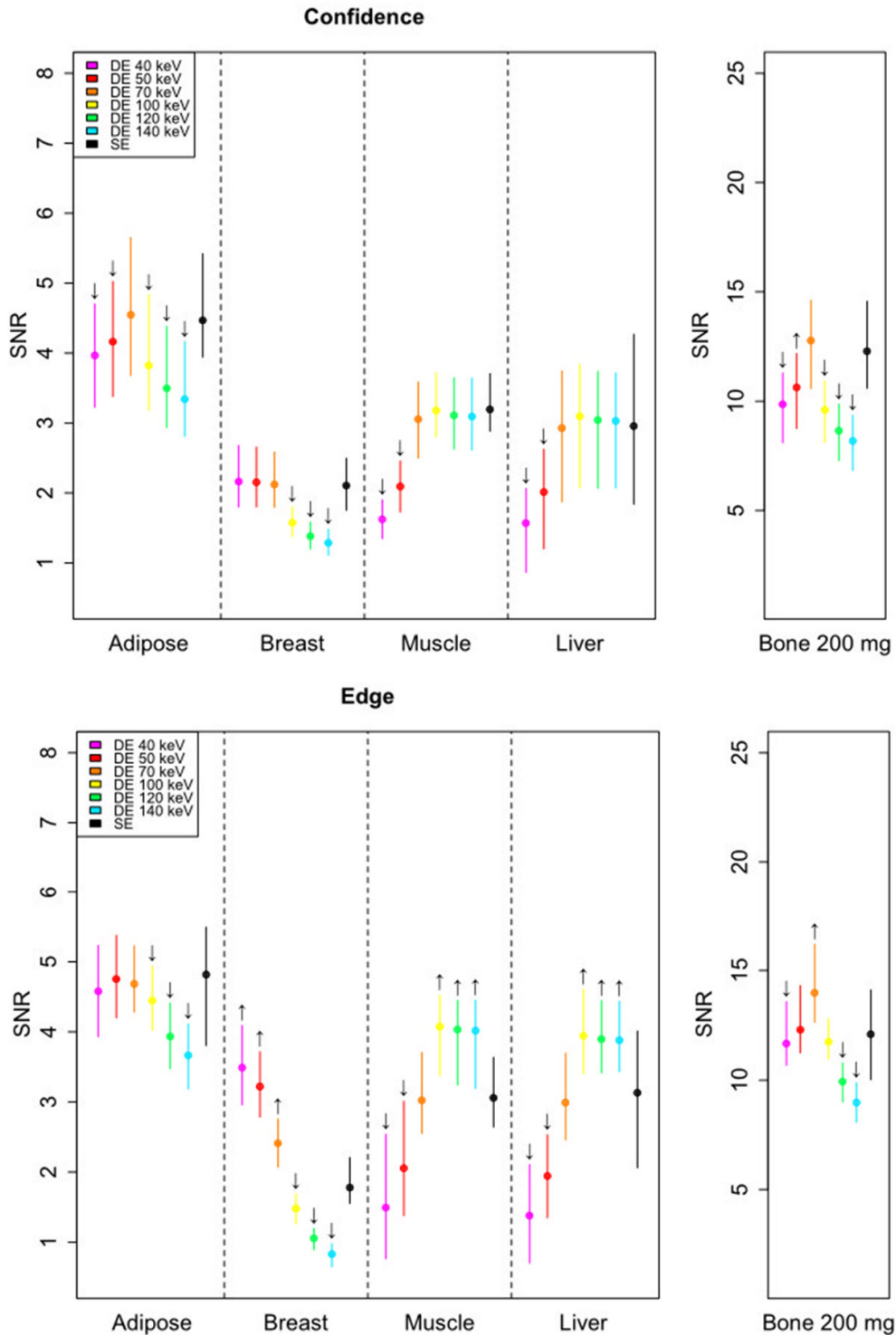
Supplementary Table S4. Mean difference (with unadjusted 95% confidence interval) between each of three VMI levels (40, 50, and 70 keV) of DECT with respect to SECT of all the pairwise comparison of five tissue-equivalent inserts for four CT scanners using iterative algorithms for reconstruction. Bold numbers indicate differences between VMI and SECT with statistical significance (p-value < 0.05/30 after multiple comparison correction with Bonferroni procedure).

Abbreviations: VMI = Virtual Monochromatic Image, SECT = single-energy CT, DECT = dual-energy CT, CI = confidence interval.
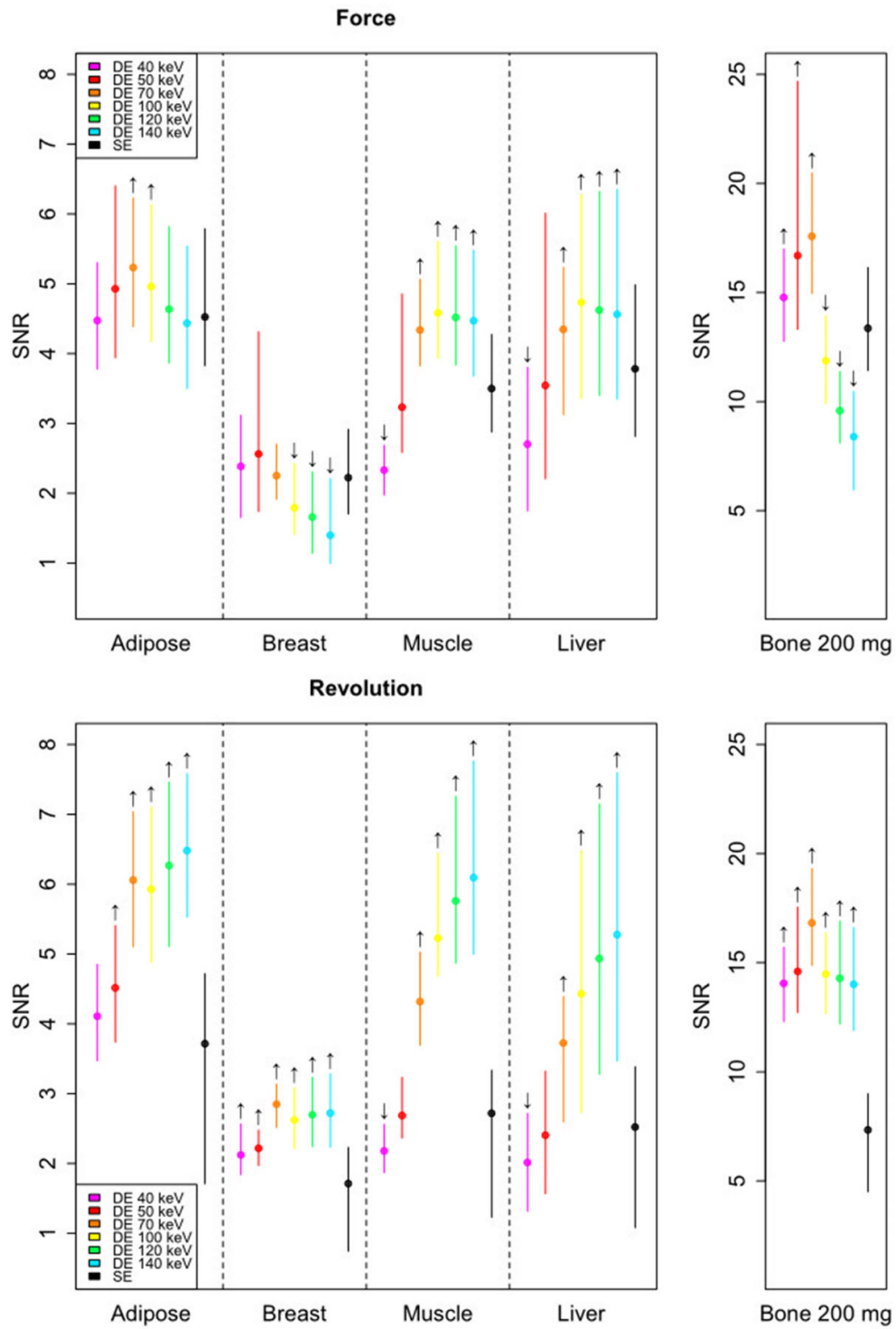
Tissue Comparison	DECT Level vs SECT images	Mean difference in HU (95% CI)			
		Confidence	**Edge**	**Force**	**Revolution GSI**
Adipose vs Breast	40 keV	**29.2** (28.1; 30.3)	**14.7** (11.9; 17.4)	**20.8** (17.8; 23.8)	**35.2** (34.2; 36.2)
	50 keV	**15.8** (15.1; 16.5)	**5.8** (4.1; 7.5)	**6.1** (3.6; 8.6)	**18.8** (18.1; 19.5)
	70 keV	**2.6** (2.2; 3.1)	**-2.8** (-3.6; -2.0)	-1.2 (-2.0; -0.3)	**2.2** (1.8; 2.7)
Adipose vs Muscle	40 keV	**73.7** (72.5; 74.9)	**90.0** (88.4; 91.6)	**75.6** (71.1; 80.1)	**92.5** (91.1; 93.8)
	50 keV	**40.2** (39.4; 41.0)	**48.5** (47.5; 49.5)	**36.2** (34.4; 37.9)	**47.6** (46.7; 48.5)
	70 keV	**7.6** (7.2; 8.0)	**8.0** (7.4; 8.6)	**2.4** (1.4; 3.4)	**1.9** (1.2; 2.6)
Adipose vs Liver	40 keV	**74.2** (73.4; 74.9)	**99.3** (96.5; 102.1)	**64.8** (60.4; 69.1)	**95.0** (93.9; 96.1)
	50 keV	**40.5** (40.0; 40.9)	**56.5** (54.6; 58.4)	**29.0** (27.3; 30.7)	**49.9** (49.0; 50.7)
	70 keV	**7.3** (7.0; 7.7)	**14.5** (13.4; 15.7)	-0.2 (-1.1; 0.6)	**2.8** (2.3; 3.4)
Adipose vs Bone 200 mg	40 keV	**379.5** (378.3; 380.8)	**484.6** (481.7; 487.6)	**398.0** (393.0; 403.0)	**385.1** (382.7; 387.5)
	50 keV	**206.4** (205.6; 207.2)	**270.3** (268.5; 272.1)	**199.2** (197.0; 201.5)	**198.1** (196.6; 199.5)
	70 keV	**36.3** (35.8; 36.7)	**59.6** (58.7; 60.5)	**10.0** (8.1; 11.9)	**12.7** (12.1; 13.4)
Breast vs Muscle	40 keV	**44.5** (43.6; 45.5)	**75.3** (73.2; 77.4)	**57.0** (53.3; 60.7)	**57.3** (56.1; 58.4)
	50 keV	**24.4** (23.7; 25.2)	**42.8** (41.4; 44.1)	**30.0** (27.6; 32.5)	**28.8** (27.9; 29.6)
	70 keV	**4.9** (4.4; 5.5)	**10.8** (10.1; 11.5)	**3.5** (2.5; 4.6)	-0.3 (-1.0; 0.4)
Breast vs Liver	40 keV	**45.0** (44.1; 45.8)	**84.6** (80.0; 89.3)	**46.2** (43.4; 48.9)	**59.8** (58.4; 61.2)
	50 keV	**24.7** (24.0; 25.3)	**50.7** (47.7; 53.8)	**22.9** (21.3; 24.4)	**31.1** (30.0; 32.1)
	70 keV	**4.7** (4.3; 5.1)	**17.3** (15.7; 19.0)	0.9 (0.2; 1.6)	0.6 (0.0; 1.2)
Breast vs Bone 200 mg	40 keV	**350.3** (349.1; 351.6)	**470.0** (467.9; 472.1)	**379.4** (376.5; 382.2)	**349.9** (347.7; 352.2)
	50 keV	**190.6** (189.8; 191.5)	**264.5** (263.0; 266.0)	**193.1** (190.9; 195.2)	**179.3** (177.9; 180.6)
	70 keV	**33.6** (33.1; 34.1)	**62.4** (61.2; 63.6)	**11.2** (9.4; 13.0)	**10.5** (9.9; 11.1)
Muscle vs Liver	40 keV	0.5 (-0.5; 1.4)	**9.4** (6.6; 12.3)	**-3.5** (-5.0; -2.0)	2.6 (0.9; 4.2)
	50 keV	0.2 (-0.5; 0.9)	**8.0** (6.0; 9.9)	**-4.8** (-5.8; -3.8)	**2.3** (1.2; 3.3)
	70 keV	-0.2 (-0.7; 0.2)	**6.5** (5.4; 7.7)	**-2.6** (-3.4; -1.9)	0.9 (0.3; 1.6)
Muscle vs Bone 200 mg	40 keV	**305.8** (304.8; 306.8)	**394.7** (392.0; 397.3)	**322.4** (320.1; 324.7)	**292.7** (290.1; 295.3)
	50 keV	**166.2** (165.4; 166.9)	**221.7** (220.1; 223.4)	**163.0** (161.4; 164.6)	**150.5** (148.9; 152.1)
	70 keV	**28.7** (28.2; 29.2)	**51.6** (50.5; 52.6)	**7.6** (6.3; 9.0)	**10.8** (10.1; 11.6)

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Supplementary Figure S1. Comparison of the average SNR between SECT and DECT for five equivalent soft tissue phantom inserts in the Siemens Confidence, Siemens Edge, Siemens Force, and GE Revolution GSI CT scanners, using FBP reconstruction method. Dots represent average SNR values and segments extend from minimum to maximum SNR values. Up arrows indicate when DECT has significantly higher SNR than SECT, whereas down arrows when DECT has significantly lower SNR than SECT. P-values were computed with the Wilcoxon test for paired samples and adjusted with Bonferroni procedure; the adjusted significance level was $p<0.05/30$.
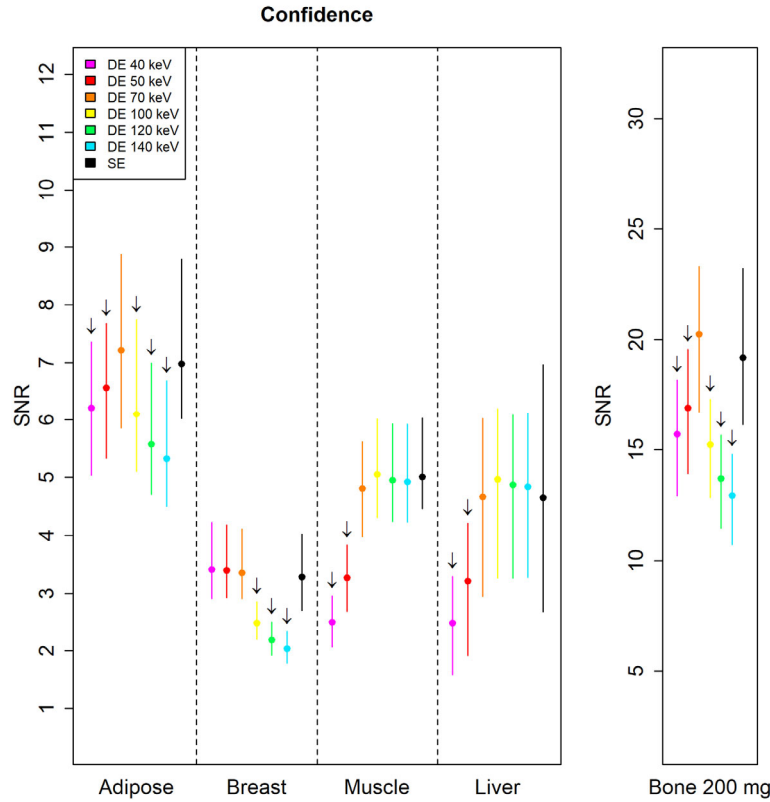
Abbreviations: SNR = Signal-to-Noise Ratio, CT = Computed Tomography, SECT = Single-Energy CT, DECT = Dual-Energy CT, FBP= filtered back-projection.
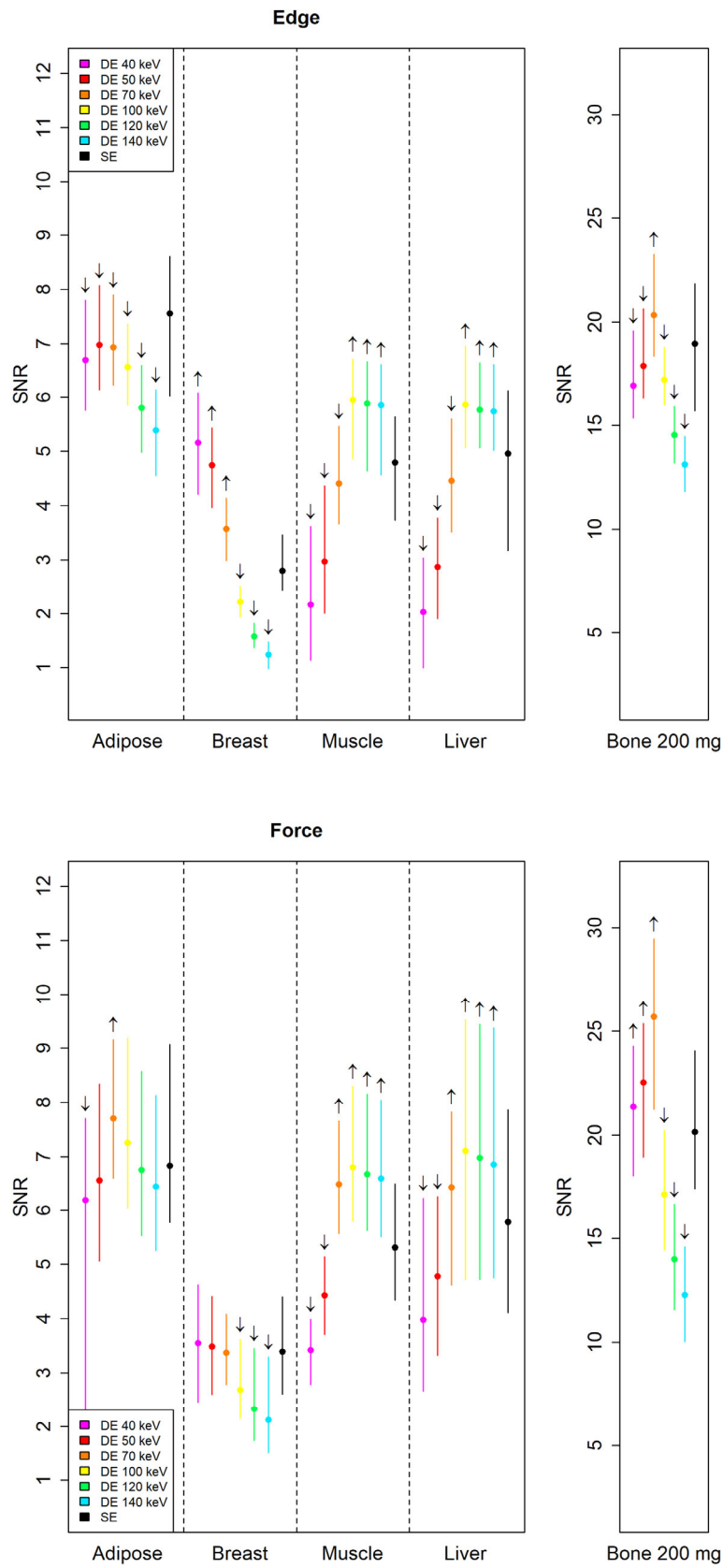
Force

Revolution

Supplementary Figure S2. Comparison of the average SNR between SECT and DECT for five equivalent soft tissue phantom inserts in the Siemens Confidence, Siemens Edge, Siemens Force, and GE Revolution GSI CT scanners, using iterative reconstruction methods. Dots represent average SNR values and segments extend from minimum to maximum SNR values. Up arrows indicate when DECT has significantly higher SNR than SECT, whereas down arrows when DECT has significantly lower SNR than SECT. P-values were computed with the Wilcoxon test for paired samples and adjusted with Bonferroni procedure; the adjusted significance level was $p<0.05/30$.

Abbreviations: SNR = signal-to-noise ratio, SECT = single-energy CT, DECT = dual-energy CT.

Edge

Force