The ICRP Phantoms

Task Group 113 Workshop:
Reference Organ Absorbed and Effective Dose Coefficients for Computed Tomographic Examinations
October 20th 2026

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ICRP

Annals of the ICRP

ICRP Publication 110

Adult Reference Computational Phantoms

ELSEVIER

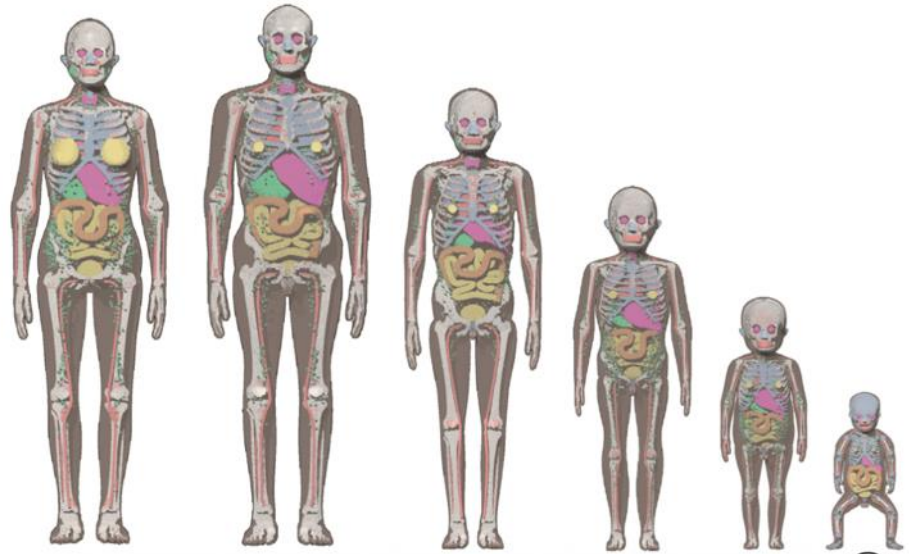
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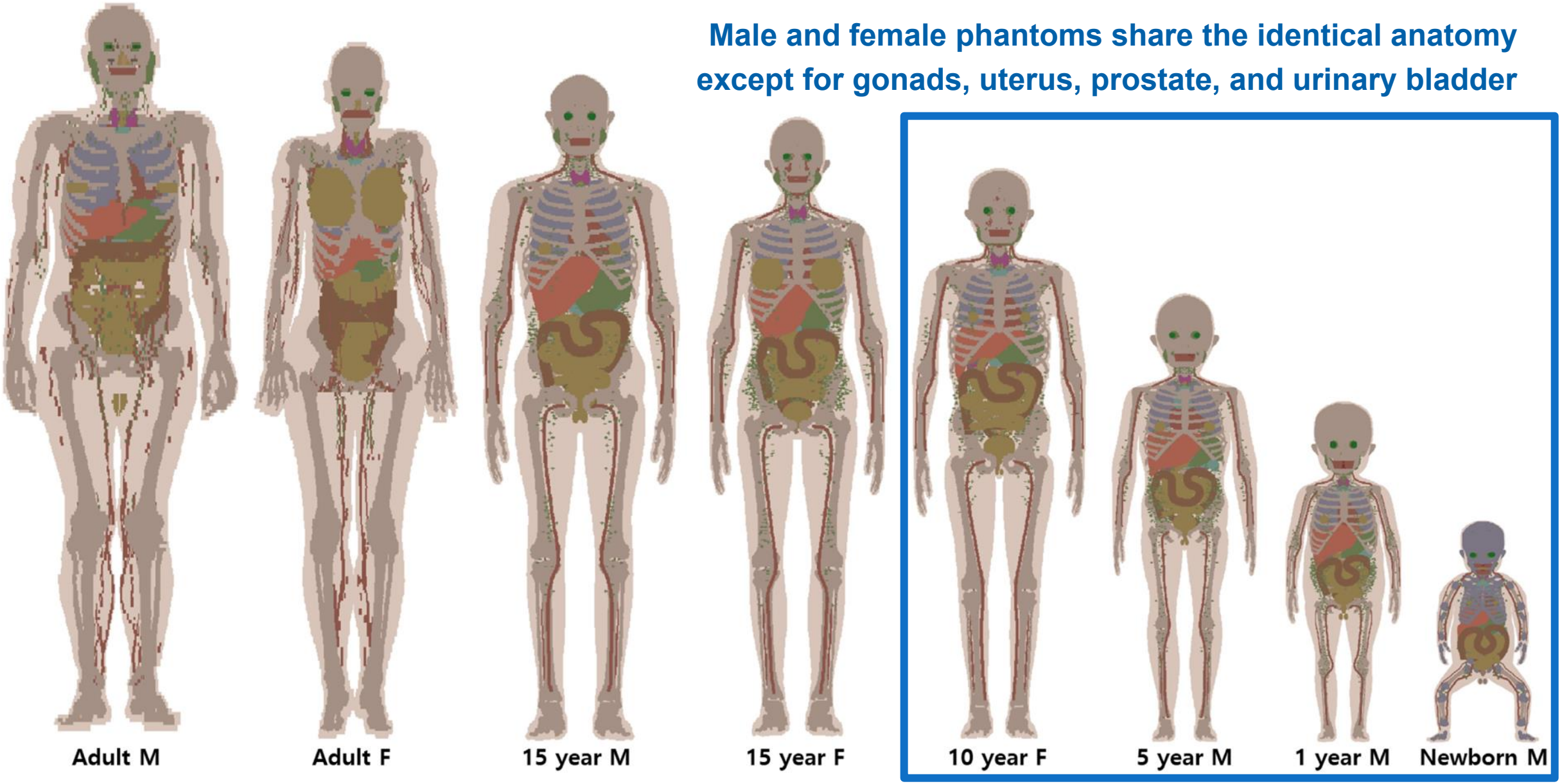
Paediatric Reference Computational Phantoms

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Adult M
Adult F
15 year M
15 year F
10 year F
5 year M
1 year M
Newborn M

Male and female phantoms share the identical anatomy except for gonads, uterus, prostate, and urinary bladder



ICRP

Table 2.1. Reference values for standing height and body mass for the ICRP reference individuals (ICRP, 2002).

	Height (cm)		Mass (kg)	
	Male	Female	Male	Female
Newborn	51	51	3.5	3.5
1 year	76	76	10	10
5 years	109	109	19	19
10 years	138	138	32	32
15 years	167	161	56	53
Adult	176	163	73	60

*ICRP Publication 89 (2002)

Table 2.1. Reference values for standing height and body mass for the ICRP reference individuals (ICRP, 2002).

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10 years	138	138	32	32
15 years	167	161	56	53
Adult	176	163	73	60

Height of the newborn phantoms is 47 cm with curved legs.

Table 2.2. Voxel resolution, array size, and total matrix size (no of voxels) for each of the ICRP adult and paediatric reference phantom series.

Phantom	Voxel resolution (mm)			Array size			Matrix size (million)
	x	y	z	x	y	z	
Newborn, Male, Female	0.663	0.663	0.663	350	215	720	52.1
1–year male, Female	0.663	0.663	1.400	396	253	550	53.2
5–year male, Female	0.850	0.850	1.928	424	235	576	55.1
10–year male, Female	0.990	0.990	2.425	432	226	580	54.5
15–year male	1.250	1.250	2.832	416	230	590	53.6
15–year female	1.200	1.100	2.828	408	242	574	54.0
Adult male	2.137	2.137	8.000	254	127	222	7.2
Adult female	1.775	1.775	4.840	299	137	348	14.3

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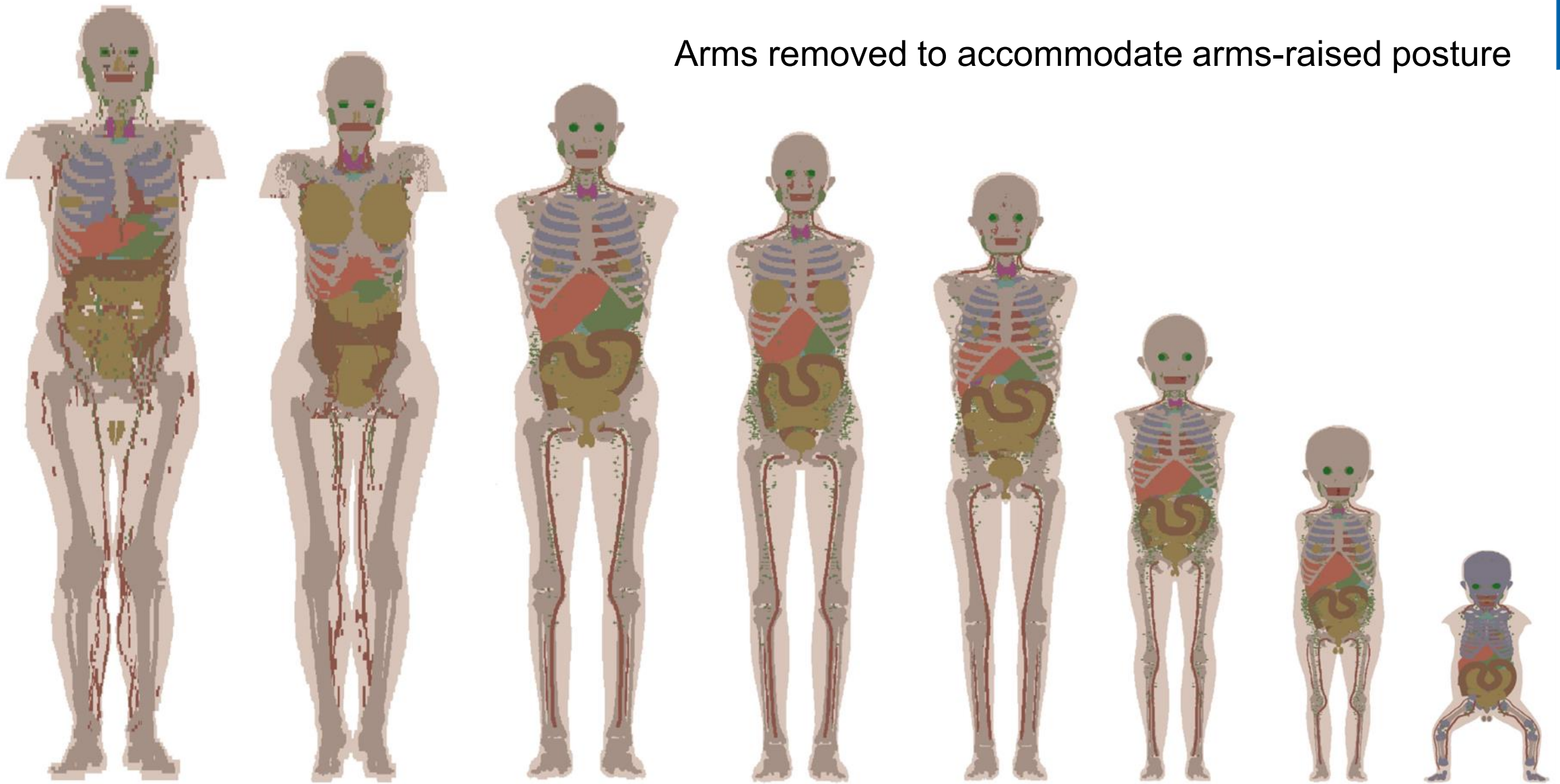
Used for slice thickness in Monte Carlo organ dose calculations except the newborn 1.326 mm

Arm removal process

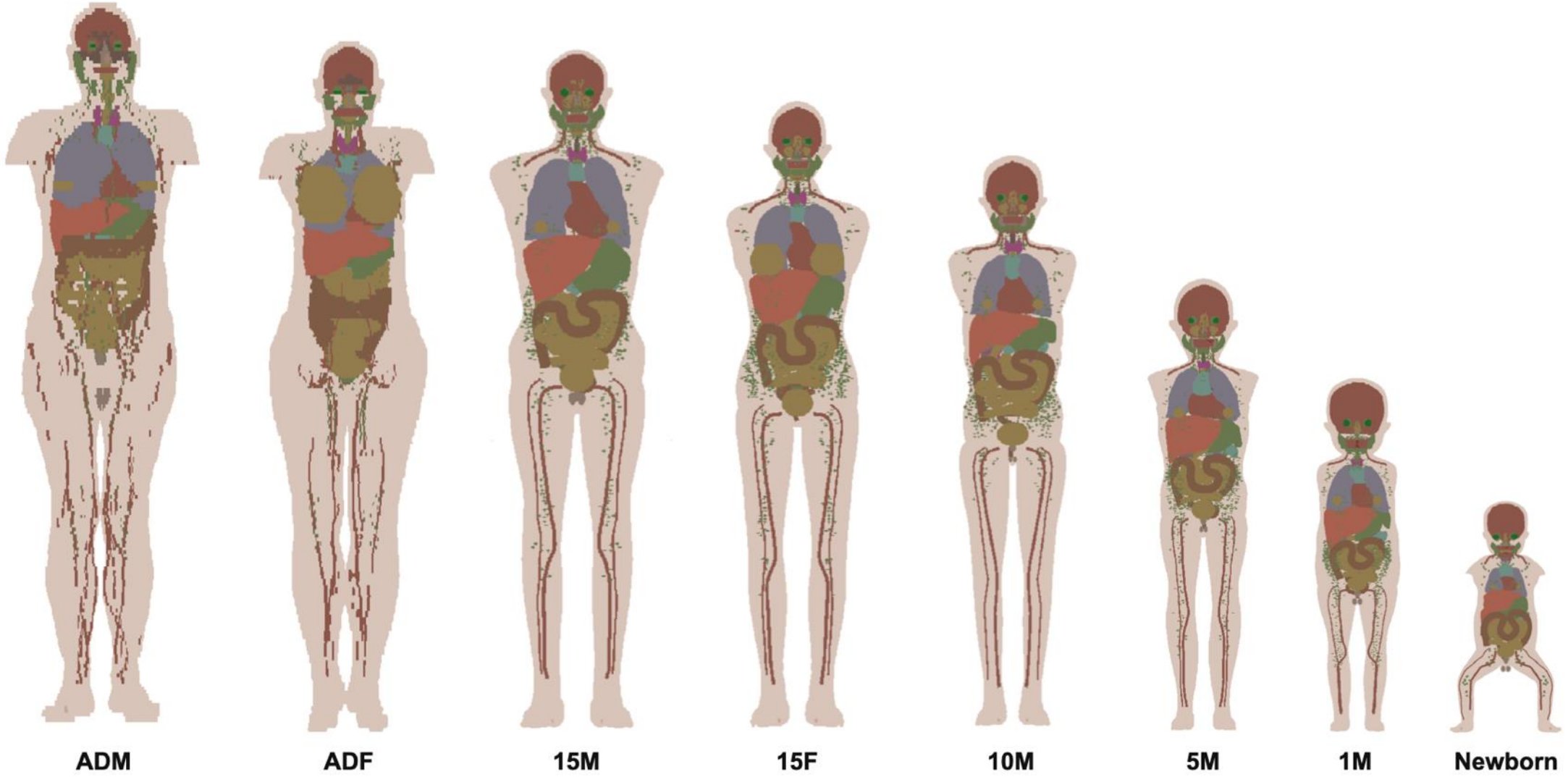
- Typical clinical CT positioning
  - Arms raised for torso CT
  - Arms lowered for head CT
- Arms cannot be easily repositioned in voxel phantoms
- Our approach: Arms removed; shoulders retained
- Torso organ dose increases by about 10% without arms*

*Jansen PMB (2022)

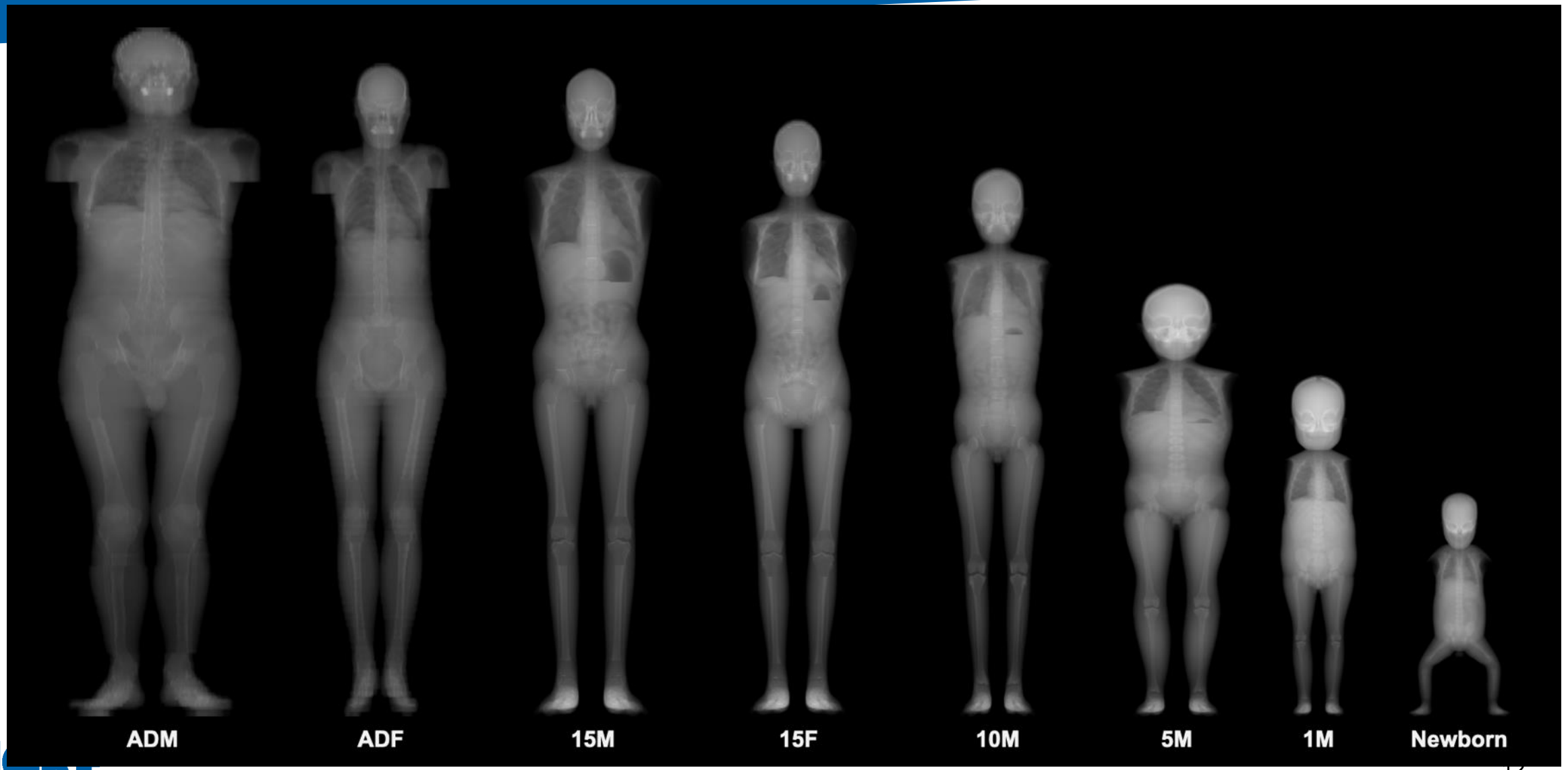
Arms removed to accommodate arms-raised posture



Additional renderings for Web application - Skeleton removed



Additional renderings for Web application - Scout images



The GUI Based Calculator and Examples

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Dose calculation examples

Phantom	Tube Potential	Filter	ATCM	CTDIvol (mGy)	Start position	End position
Adult Male	120 kV	Body	None	15	28 cm	58 cm
Adult Female	120 kV	Body	Longitudinal	10	42 cm	84 cm
5-year Male	100 kV	Head	Longitudinal and Angular	8	23 cm	58 cm

ICRPCT Dose Calculator
Ask Gemini
icrpct-temp.ncidosetools.com

ICRP CT DOSE CALCULATOR ver. 20250825

Phantom Age
- Newborn
- 1-year
- 5-year
- 10-year
- 15-year
- Adult

Phantom Gender
- Female
- Male

Phantom View
- With Skeleton
- Without Skeleton
- Scout

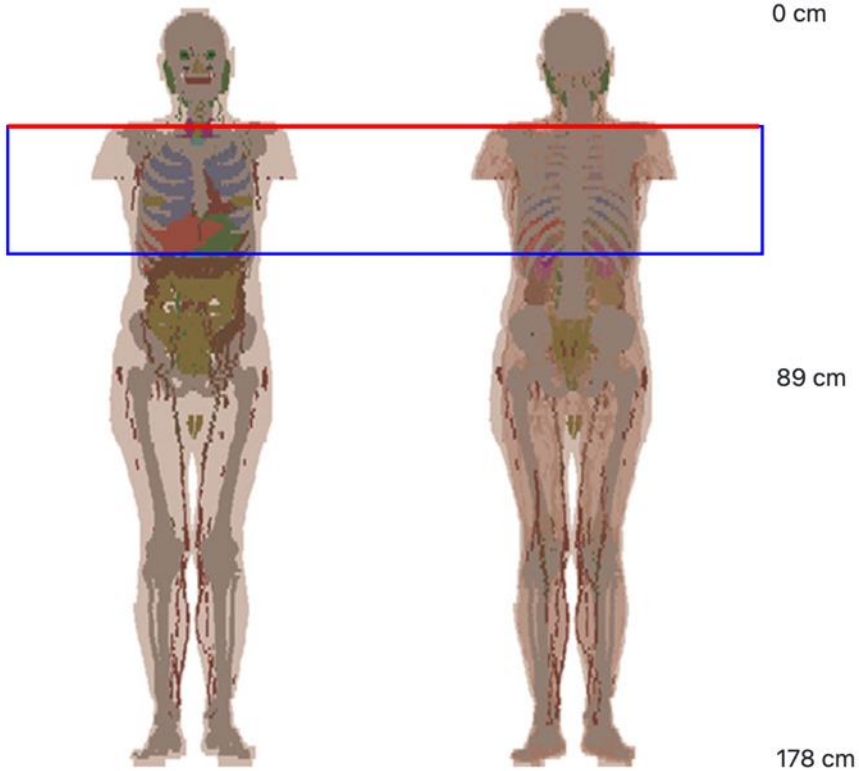
CT Scanner parameters

Tube potential (kV)
- 80
- 100
- 120
- 140

Bowtie filters
- Head Filter
- Body Filter

Tube current modulation
- No TCM
- Longitudinal TCM
- Longitudinal & angular TCM

CTDIvol 32 cm	15
DLP (mGy-cm)	450



Scan start (cm)	28	UP	DOWN
Scan end (cm)	58	UP	DOWN
Scan length (cm)	30	Slice thickness (cm): 0.8	

Organ	Dose (mGy)
R-marrow	6.7
Colon	5.5
Lungs	20.7
St-wall	19.7
Breast	18
Gonads	0.03
UB-wall	0.149
Oesophagus	15.8
Liver	19.2
Thyroid	21.6
E103M (mSv)	12.2

Export Dose

Dose calculation examples

Phantom	Tube Potential	Filter	ATCM	CTDIvol (mGy)	Start position	End position
Adult Male	120 kV	Body	None	15	28 cm	58 cm
Adult Female	120 kV	Body	Longitudinal	10	42 cm	84 cm
5-year Male	100 kV	Head	Longitudinal and Angular	8	23 cm	58 cm

ICRPCT Dose Calculator
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ICRP CT DOSE CALCULATOR ver. 20250825

Phantom Age
- Newborn
- 1-year
- 5-year
- 10-year
- 15-year
- Adult

Phantom Gender
- Female
- Male

Phantom View
- With Skeleton
- Without Skeleton
- Scout

CT Scanner parameters

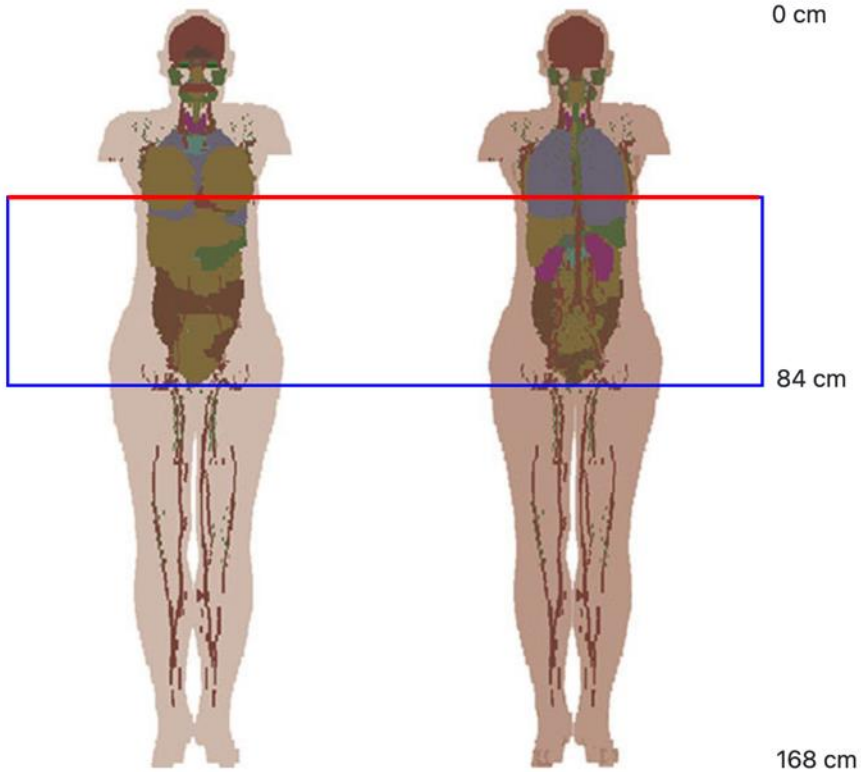
Tube potential (kV)
- 80
- 100
- 120
- 140

Bowtie filters
- Head Filter
- Body Filter

Tube current modulation

Educational use only
- No TCM
- Longitudinal TCM
- Longitudinal & angular TCM

CTDIvol 32 cm	10
DLP (mGy-cm)	420



Scan start (cm)	42	UP	DOWN
Scan end (cm)	84	UP	DOWN
Scan length (cm)	42	Slice thickness (cm): 0.484	

Organ	Dose (mGy)
R-marrow	7.7
Colon	18.2
Lungs	1.45
St-wall	7.2
Breast	0.81
Gonads	25.8
UB-wall	34
Oesophagus	1.18
Liver	6.5
Thyroid	0.146
E103F (mSv)	8.9

Export Dose

Dose calculation examples

Phantom	Tube Potential	Filter	ATCM	CTDIvol (mGy)	Start position	End position
Adult Male	120 kV	Body	None	15	28 cm	58 cm
Adult Female	120 kV	Body	Longitudinal	10	42 cm	84 cm
5-year Male	100 kV	Head	Longitudinal and Angular	8	23 cm	58 cm

ICRPCT Dose Calculator

Ask Gemini

icrpct-temp.ncidosetools.com

ICRP CT DOSE CALCULATOR ver. 20250825

Phantom Age

- ○ Newborn
- ○ 1-year
- ● 5-year
- ○ 10-year
- ○ 15-year
- ○ Adult

Phantom Gender

- ○ Female
- ● Male

Phantom View

- ○ With Skeleton
- ○ Without Skeleton
- ● Scout

CT Scanner parameters

Tube potential (kV)

- ○ 80
- ● 100
- ○ 120

Bowtie filters

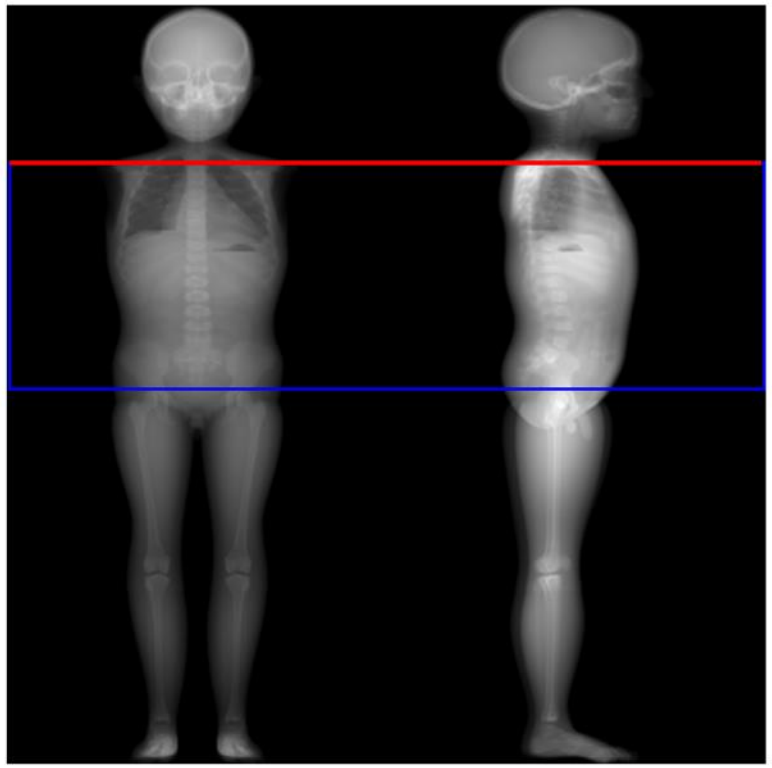
- ● Head Filter
- ○ Body Filter

Tube current modulation

Educational use only

- ○ No TCM
- ○ Longitudinal TCM
- ● Longitudinal & angular TCM

CTDIvol 16 cm	8
DLP (mGy-cm)	264



● Scan start (cm)	23	UP	DOWN
○ Scan end (cm)	56	UP	DOWN
Scan length (cm)	33	Slice thickness (cm): 0.1928	

Organ	Dose (mGy)
R-marrow	0.296
Colon	0.94
Lungs	0.91
St-wall	1.16
Breast	0.83
Gonads	0.06
UB-wall	0.4
Oesophagus	0.71
Liver	1.13
Thyroid	0.157
E103M (mSv)	5.5

Export Dose