SOMATOM Force

Computed Tomography

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Computed Tomography

SOMATOM Force

SOMATOM Force

SIEMENS
Healthineers

Is CT nog het stralingskanon van de radiologie?

Computed Tomography

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Key components

Vectron™ X-ray tubes

- 2 x 1,300 mA @ 70 - 150 kV
- 2 x 120kW generator

Stellar^{Infinity} detectors

- 2 x 96 rows (2 x 6 cm)
- 3,120 detector channels

High-speed patient table

- 737 mm/s speed
- up to 22 cm perfusion range
- up to 80 cm dynamic range
- Turbo Flash or High Pitch scan

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Low-dose early detection with Tin Filter
CT imaging at the dose of conventional X-ray[1]

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Collimation: 192 x 0.6 mm
Scan time: 0.4 s

allow **doses of conventional X-ray[1]**

| Table 1		Radiology 2008;248:254-63
Adult Effective Doses for Various Diagnostic Radiology Procedures		
Examination	Average Effective Dose (mSv)	Values Reported in Literature (mSv)
Skull	0.1	0.03–0.22
Cervical spine	0.2	0.07–0.3
Thoracic spine	1.0	0.6–1.4
Lumbar spine	1.5	0.5–1.8
Posteroanterior and lateral study of chest	0.1	0.05–0.24
Posteroanterior study of chest	0.02	0.007–0.050
Mammography	0.4	0.10–0.60
Abdomen	0.7	0.04–1.1
Pelvis	0.6	0.2–1.2
Hip	0.7	0.18–2.71
Shoulder	0.01	. . .
Knee	0.005	. . .
Other extremities	0.001	0.0002–0.1
Dual x-ray absorptiometry (without CT)	0.001	0.001–0.035
Dual x-ray absorptiometry (with CT)	0.04	0.003–0.06
Intravenous urography	3	0.7–3.7
Upper gastrointestinal series	6*	1.5–12
Small-bowel series	5	3.0–7.8
Barium enema	8*	2.0–18.0
Endoscopic retrograde cholangiopancreatography	4.0	. . .

Early detection with low-dose lung scans
Outstanding image quality even in obese patients

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Collimation: 192 x 0.6 mm
Scan time: 2.0 s
Scan length: 274 mm
Rotation time: 0.5 s
110 kV, 79 mAs
$CTDI_{vol}$: 4.13 mGy
DLP: 134 mGy cm
Eff. dose: 0.28 mSv

Early detection low-dose lung scan in an **obese patient** with a **very low dose of 0.28 mSv** with outstanding image quality.

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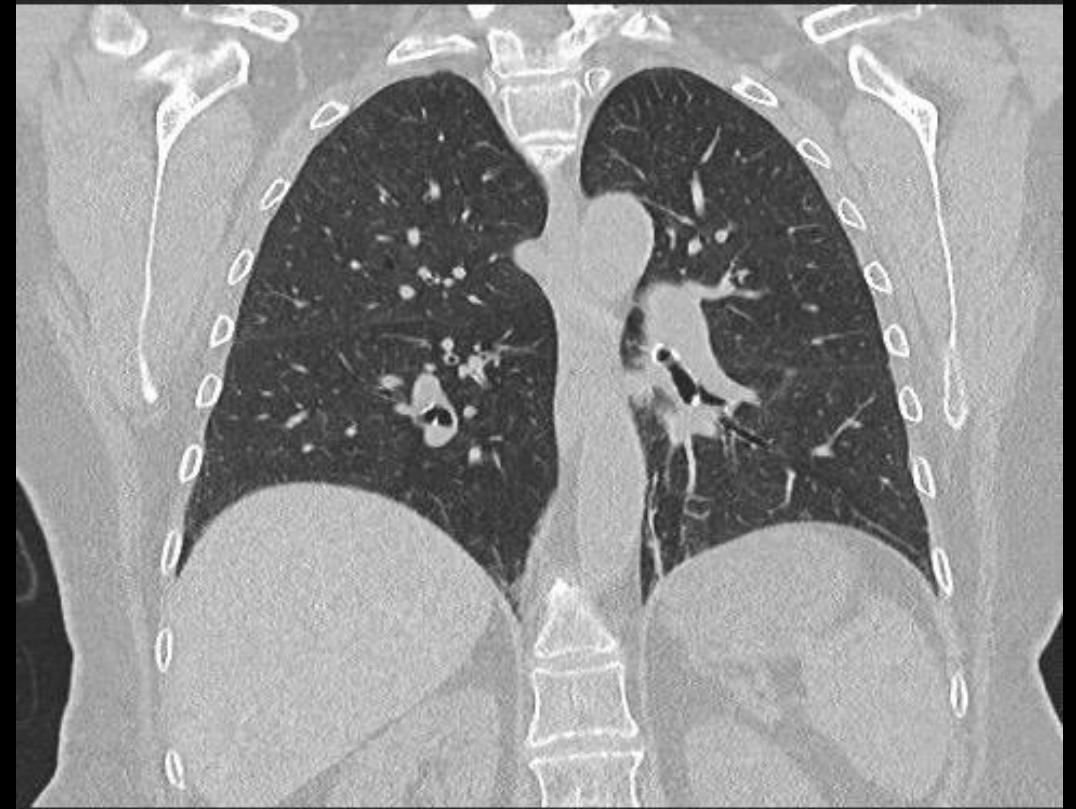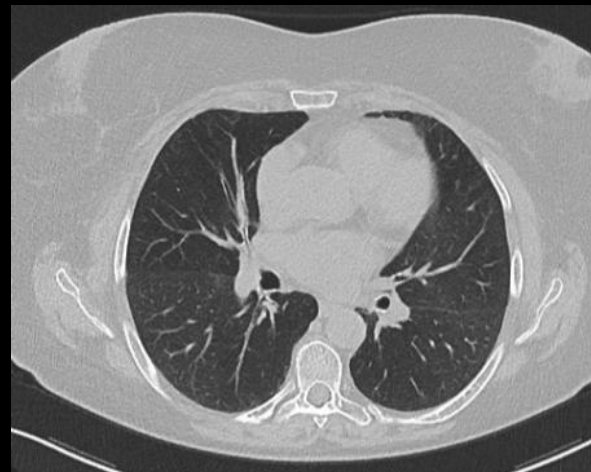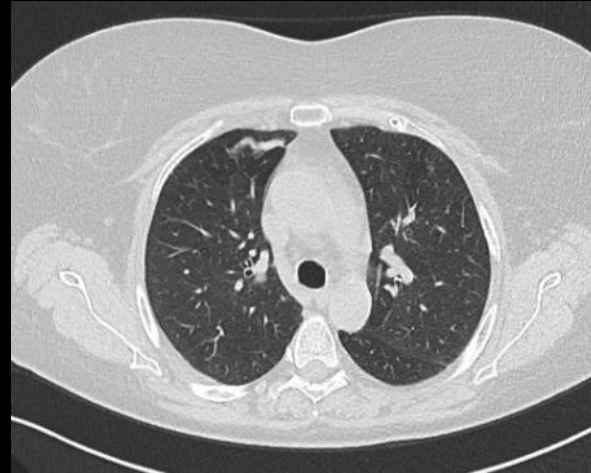
Cardiac imaging with high heart rates – ultra-low-dose Turbo Flash Spiral at a heart rate of 117 bpm

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Collimation: 2 x 192 x 0.6 mm
Scan time: 0.12 s
Scan length: 93 mm
Rotation time: 0.25 s
80 kV, 289 mAs
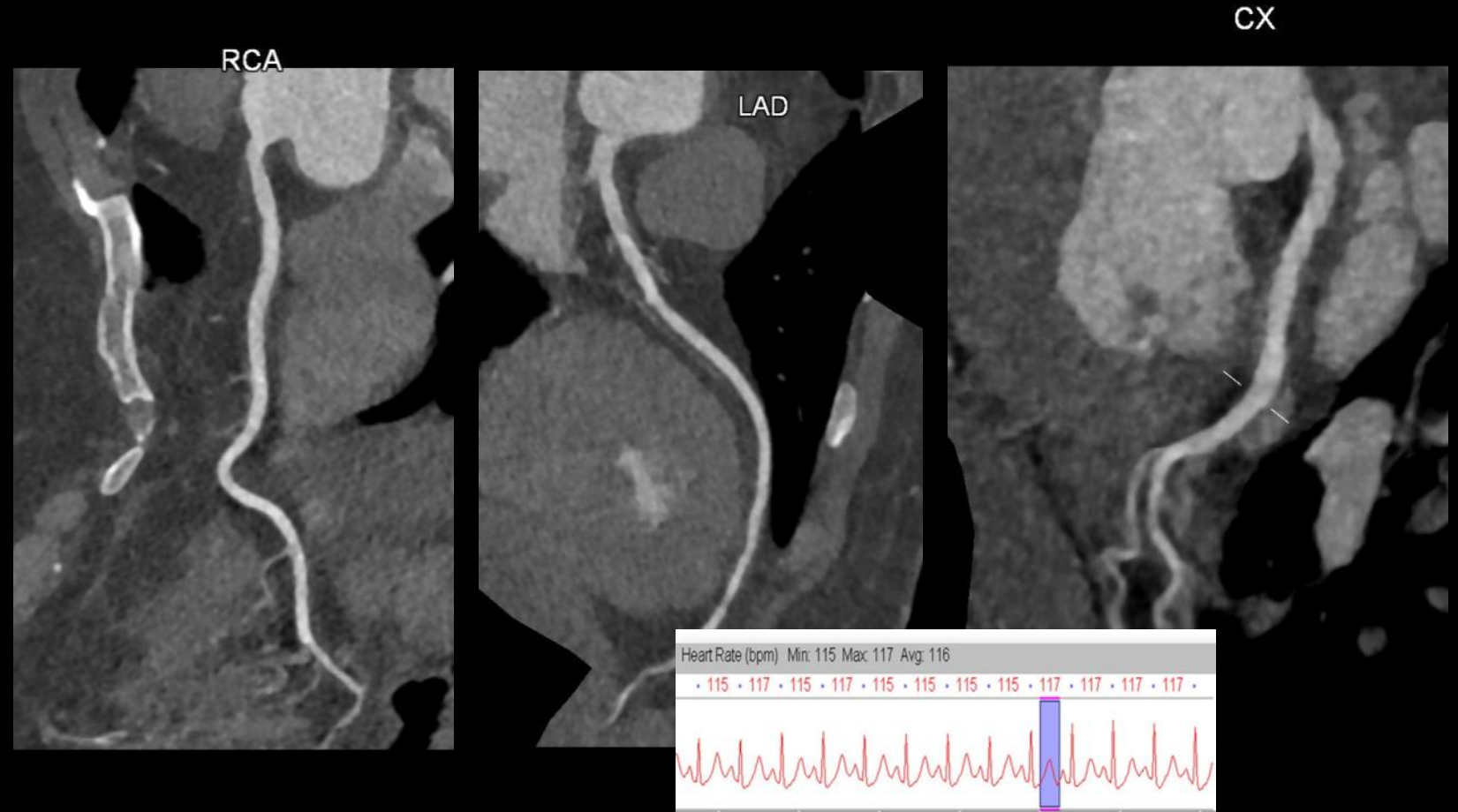**CTDI$_{vol}$: 1.33 mGy**
DLP: 19.7 mGy cm
Eff. dose: 0.28 mSv
HR: 117 bpm
CM: 30 mL

Rule out of coronary disease
within 0.12 s at average heart rate
of **117 bpm** with **Turbo Flash mode.**

RCA

LAD

CX

Heart Rate (bpm) Min: 115 Max: 117 Avg: 116
115 117 115 117 115 115 115 115 117 117 117 117

Computed Tomography

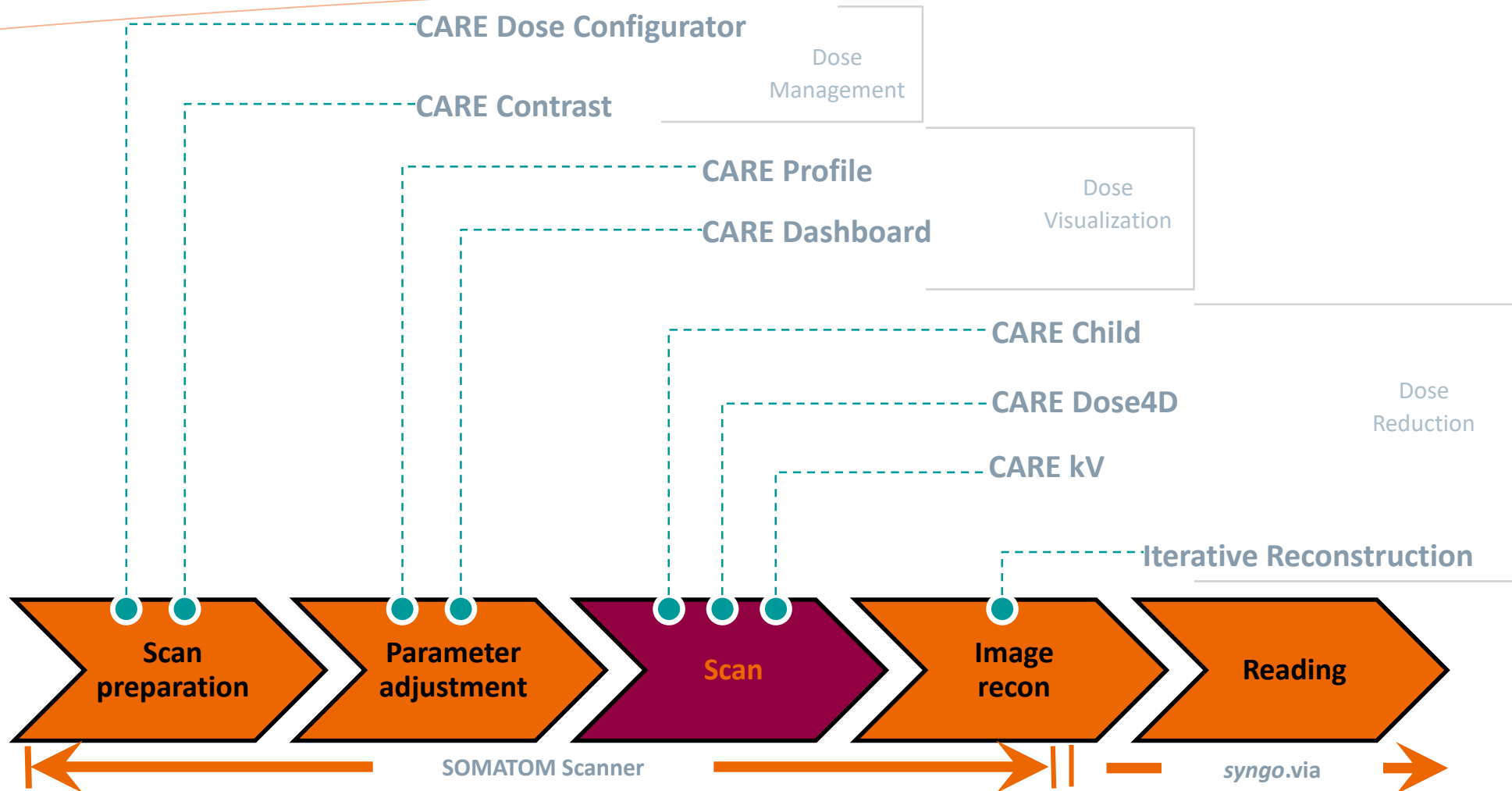**SIEMENS**
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Is CT nog het stralingskanon van de radiologie?

Dosis reducerende technologie in de Siemens SOMATOM Force

CARE technology
Combine Applications Reduce Exposure

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CARE Dose Configurator

Dose Management

CARE Contrast

CARE Profile

Dose Visualization

CARE Dashboard

CARE Child

CARE Dose4D

Dose Reduction

CARE kV

Iterative Reconstruction

Scan preparation → Parameter adjustment → Scan → Image recon → Reading

SOMATOM Scanner

syngo.via

mSv dose

Computed Tomography

CARE Dose4D

More precise configuration of dose modulation

- Configuration for different body habitus and organs individually

- New and more specific modulation curves

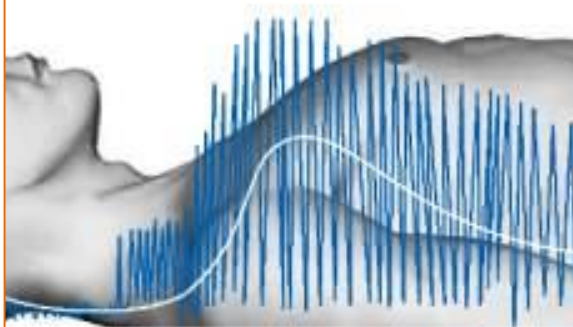- Definition of threshold values for Dose Alert according to IEC regulations
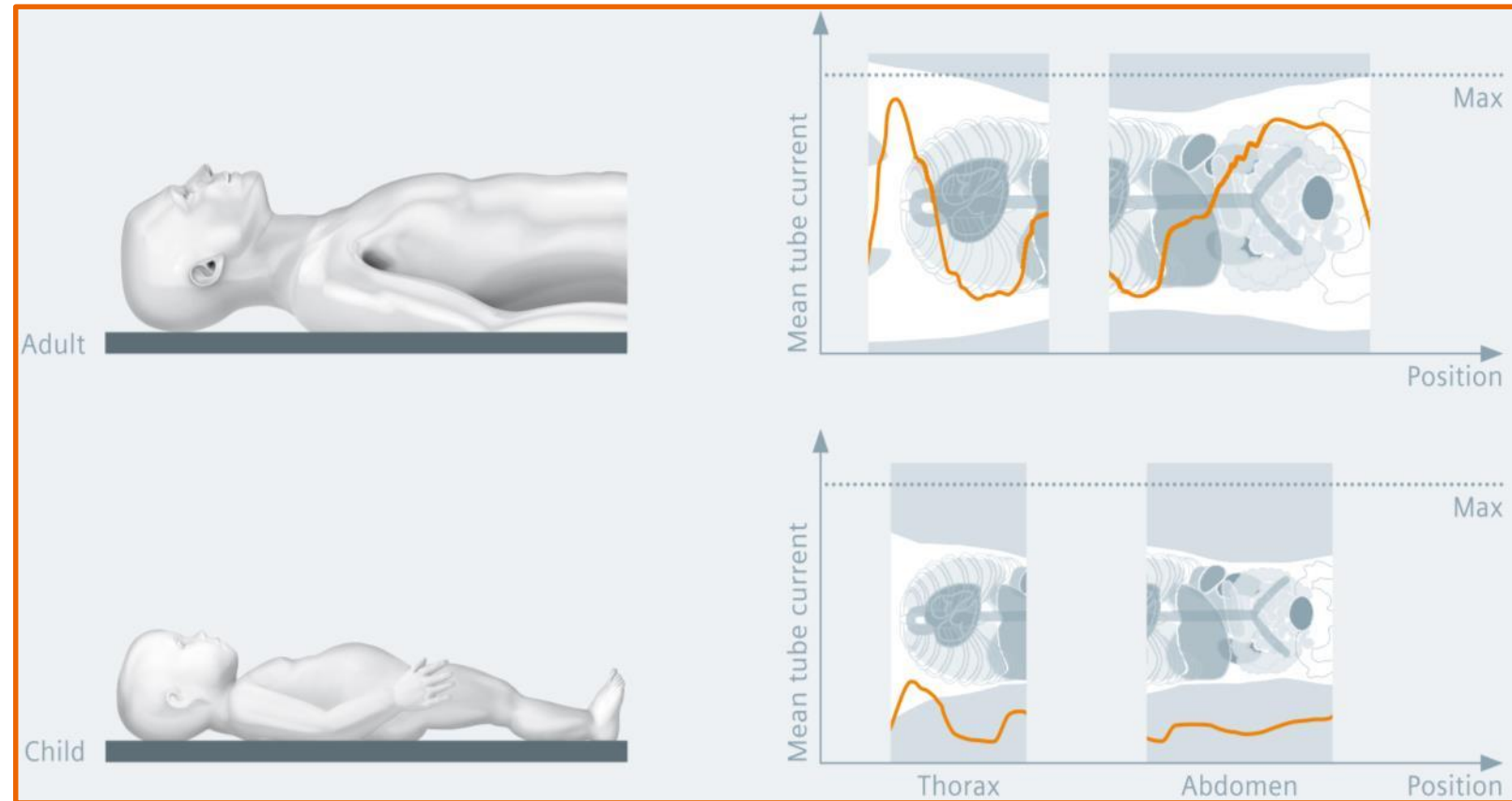
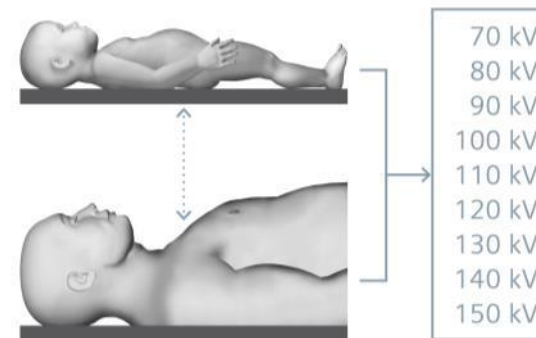# CARE Dose4D and CARE kV

Dose relevant scan parameters
- Patient's body habitus
- Effective current (mAs)
- Voltage dep. on examination (kV)

Current modulation w/ CARE Dose4D

- Automatic patient and organ specific protocol adaption
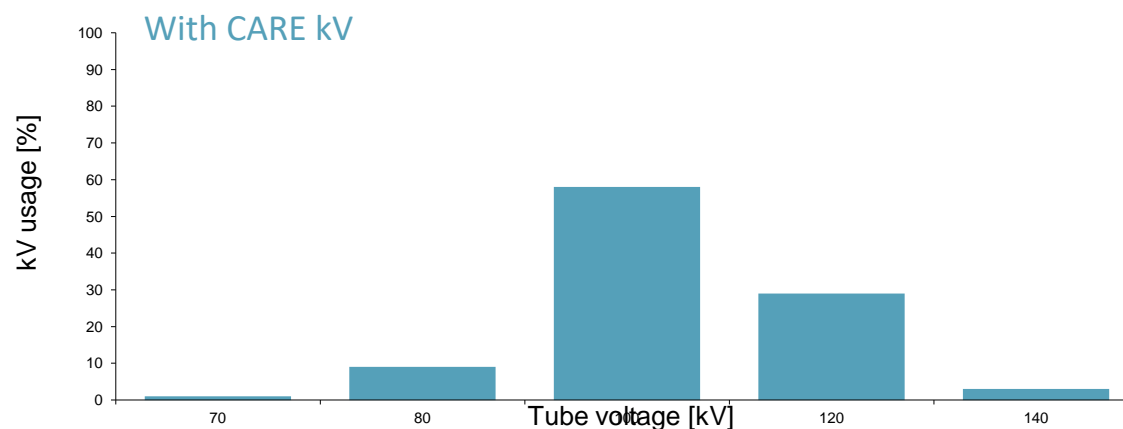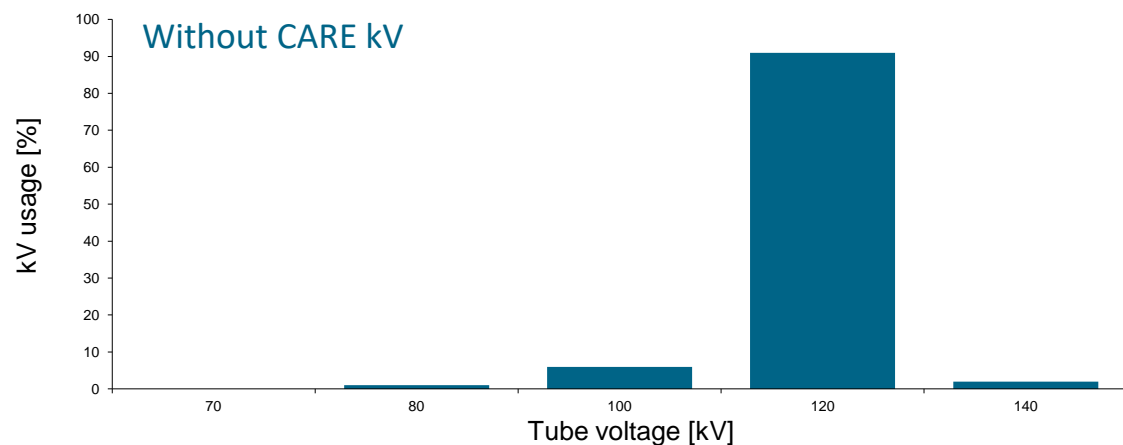- Automatic modulation in X,Y & Z direction in real time

Voltage setting with CARE kV

70 kV
80 kV
90 kV
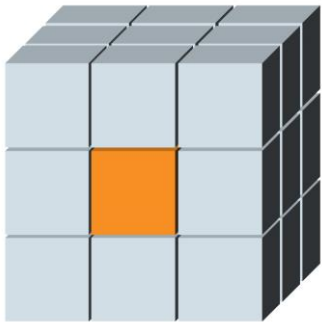100 kV
110 kV
120 kV
130 kV
140 kV
150 kV

CARE kV

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Example: Abdomen @ 100 kV

Without CARE kV

With CARE kV

Dose (CTDIvol): 9.7 mGy

Dose reduction compared to:
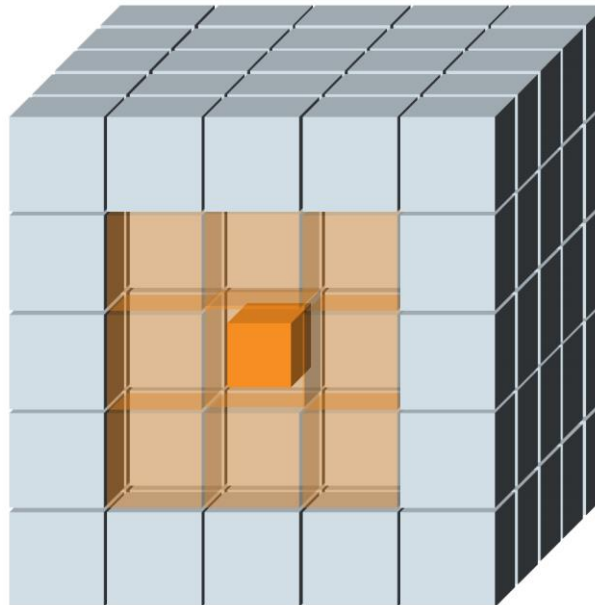- Siemens 120 kV stand. prot.: 14 mGy
- Competitor's 120 kV protocol*: 25 mGy

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ADMIRE
The newest generation in iterative reconstruction

Non ADMIRE

ADMIRE

## ADMIRE in three steps

- Raw data statistical modeling:
  Statistical weighting of all projections in raw data space

- **Model based noise cancelation:**
  Noise cancelation based on an intelligent approach in image space

- Advanced system modeling:
  Advanced modeling is the base for the forward projection and eliminates artifacts

ADMIRE
Excellent image quality

WFBP*

ADMIRE

*) Weighted Fil

Courtesy of UMM, Mannheim, Germany

Computed Tomography
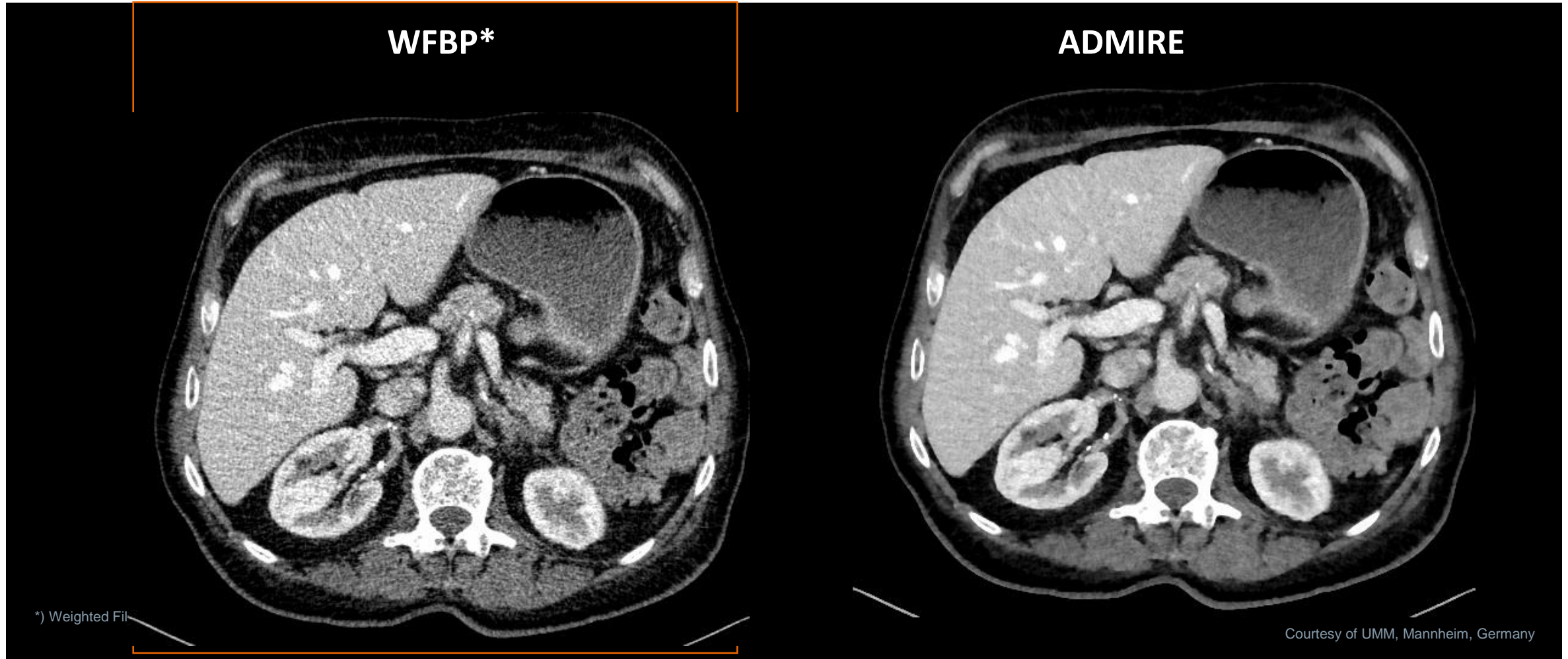
Patient with dissection
Low kV imaging with reduced contrast media (20 mL)

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Collimation: 2 x 192 x 0.6 mm
Scan time: 1.1 s
Scan length: 740 mm
Rotation time: 0.25 s
80 kV, 140 mAs
$CTDI_{vol}$: 2.09 mGy
DLP: 155 mGy cm
Eff. dose: 2.32 mSv

Gated, examination with
20 mL[1] of contrast media
without breath-hold
in patient with
limited function in right kidney.

Two steps ahead in Freezing Motion "Free-breathing" CT imaging

Ultra-high-speed imaging with the unique SOMATOM Force in combination with ADMIRE

Next generation Dual Source CT (DSCT) with

- Two Vectron™ tubes

- Two Stellar^{Infinity} detectors with 25% more detector channels (1,840)

- Up to 22 lp/cm (0.24 mm) spatial resolution

- Advanced Modeled Iterative Reconstruction (ADMIRE)[1] for lowest possible dose
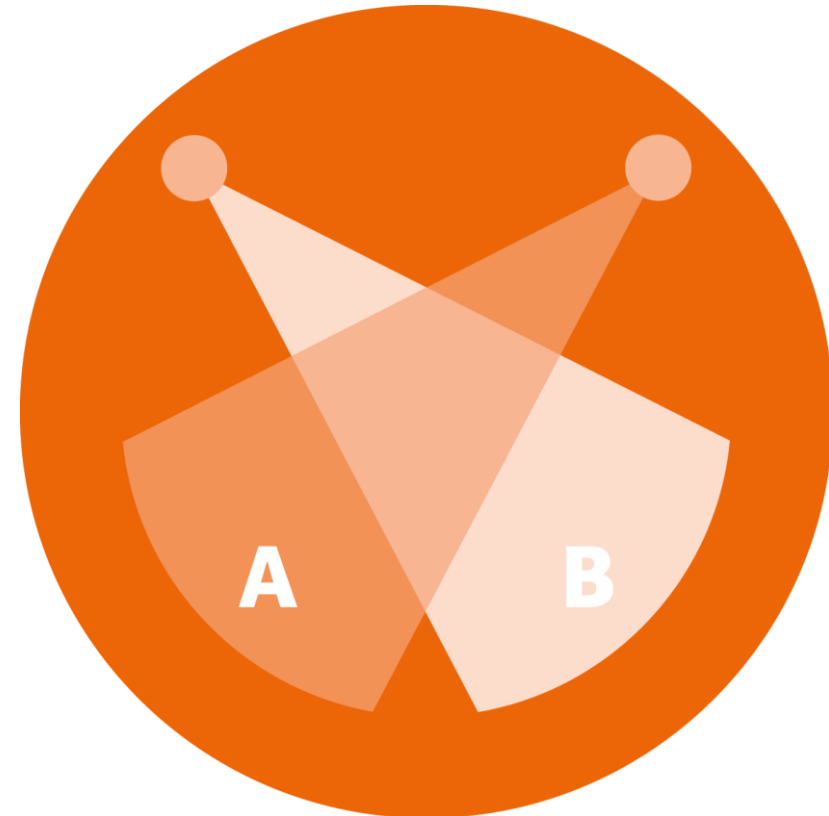
Up to 66 ms native temporal resolution utilizing DSCT at 250 ms rotation speed

1) Image quality as defined by low contrast detectability using a model observer method for evaluation. Equivalent low contrast detectability can be achieved with 80% to 85% less dose using ADMIRE at highest strength level for thin (0.6 mm) reconstruction slices in measured and simulated body and head phantoms for low contrast objects with different contrasts. See ADMIRE date sheet for further information. In clinical practice, the use of ADMIRE may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

"Free-breathing" CT imaging
No anesthesia, no sedation[1] for babies/kids
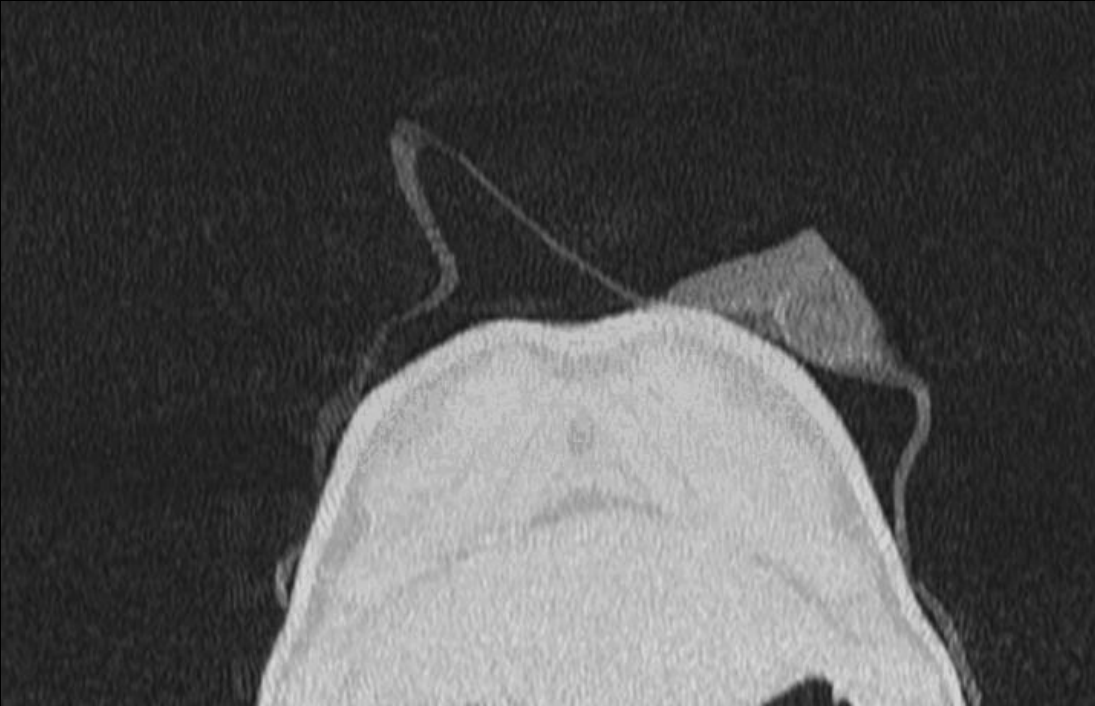
Baseline (previous high-end CT)

Standard low-dose thorax CT

3 mSv effective dose

11 s scan time

Follow-up (SOMATOM Force)

Turbo Flash ultra-low-dose thorax CT

0.4 mSv effective dose; **0.3 s** scan time

Pediatric imaging without breath-hold and sedation![1]

Courtesy of UMM, Mannheim, Germany

1) The inherent temporal resolution – the 'native' temporal resolution acquired by the scanner – is highly important to freeze patient motion, e.g. in lung exams or in patients who cannot hold their breath long enough. This is also important, in pediatric CT where it also can help reducing the need for potentially harmful sedation.

Preventive care in cardiac imaging
Ultra-low-dose Turbo Flash Spiral with 0.09 mSv

SOMATOM Force

Collimation: 2 x 192 x 0.6 mm
Scan time: 0.2 s
Scan length: 142 mm
Rotation time: 0.25 s
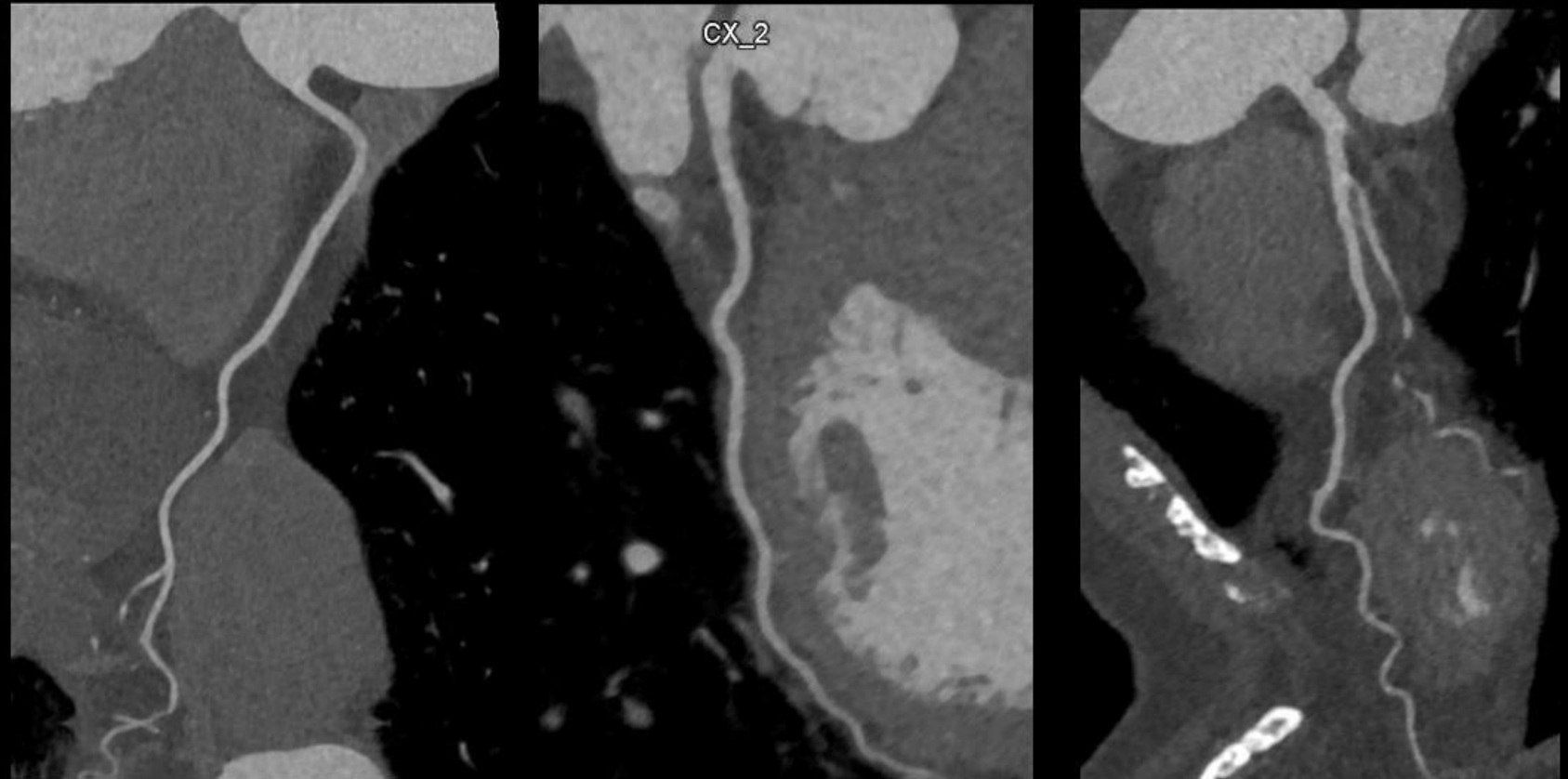**70 kV, 128 mAs**
CTDI$_{vol}$: 0.36 mGy
DLP: 6.6 mGy cm
Eff. dose: 0.09 mSv
HR: 56 bpm
BMI: 24

Rule out of coronary disease **within 0.2 s** and with ultra-low-dose with **only 0.09 mSv.**

Computed Tomography
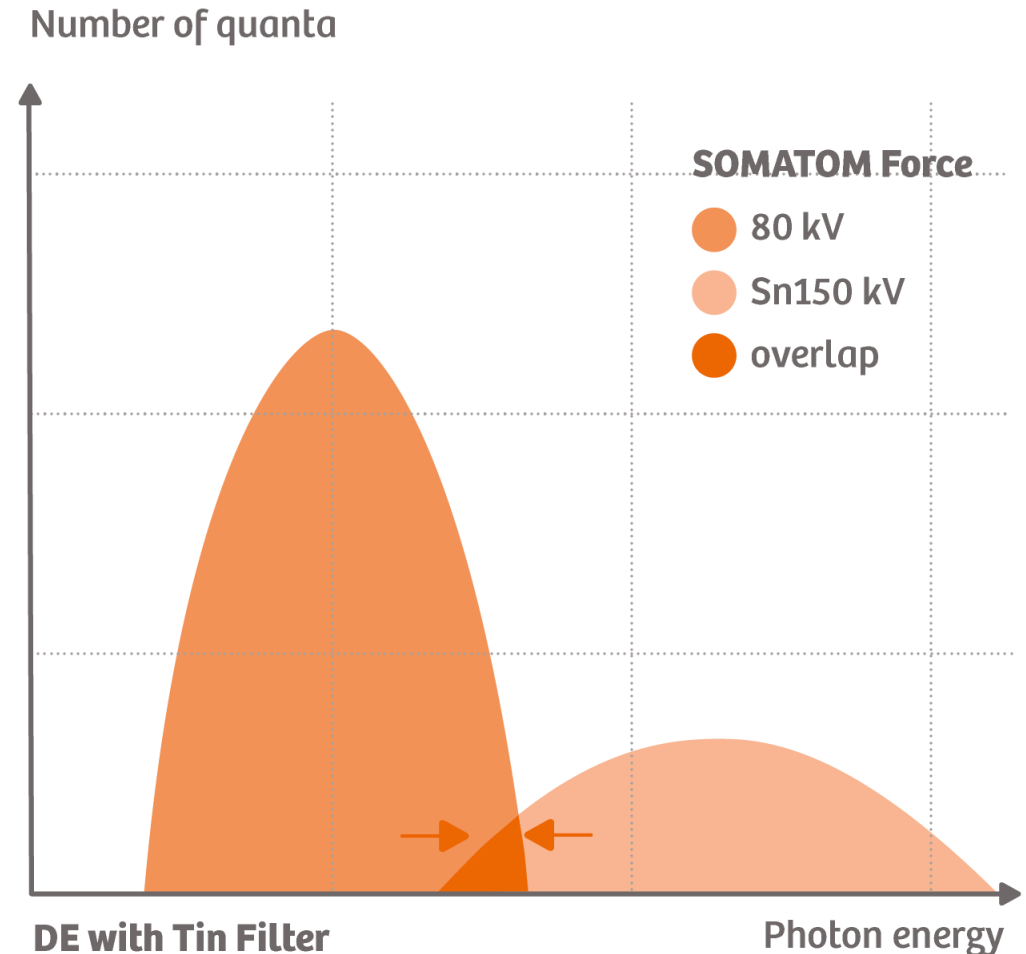
Two steps ahead in Decision Making
Precise Dual Energy quantification

Dual Energy (DE) imaging with improved energy separation

Vectron™ tube plus Stellar^{Infinity} detectors

- New energy pairings, e.g. 90 and 150 kV Sn for imaging of obese patients

- Up to 35 cm DE field of view (FoV)

- Up to 258 mm/s DE scan speed

- Tin Filter (Selective Photon Shield II) utilization

Up to 30% increased energy separation for better DE imaging outcomes

Number of quanta

SOMATOM Force
- 80 kV
- Sn150 kV
- overlap

DE with Tin Filter

Photon energy

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Precise Dual Energy quantification – pancreatic head tumor illustrated with different DE reconstructions

SOMATOM Force

Collimation: 2 x 128 x 0.6 mm
Scan time: 4.35 s
Scan length: 207mm
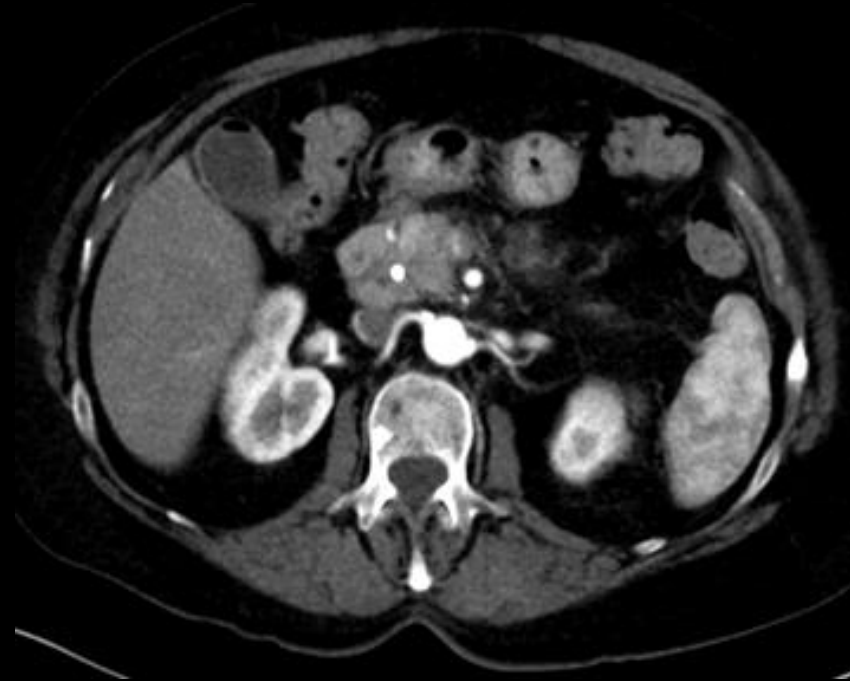**Rotation time: 0.5 s**
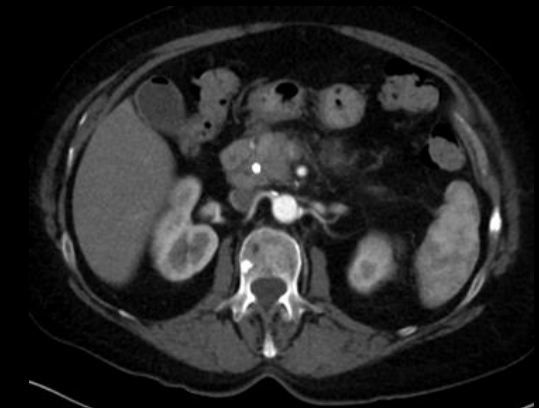**100/Sn150 kV, 117/60 mAs**
$CTDI_{vol}$: 6.88 mGy
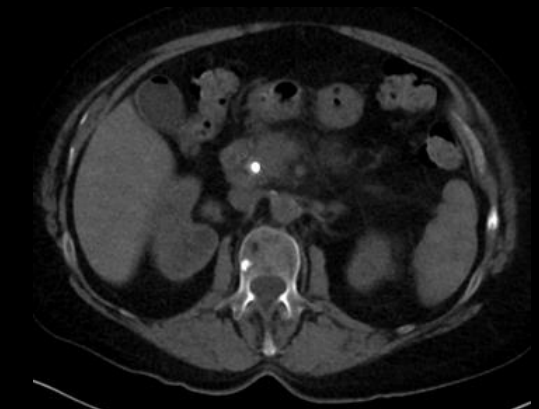**DLP: 162.9 mGy cm**
Eff. dose: 2.4 mSv

Advanced diagnostic information: Monoenergetic Plus allows energy spectrum shift to lower levels which **significantly improves** image quality and **pancreas-to-lesion constrast[1].**

Mono+ 55 keV

Mixed

VNC

Courtesy of MUSC Medical Center, Charleston, USA
1) Frellesen et al. (2015): Dual Energy CT of the pancreas: improved carcinoma-to-pancreas contrast with a noise-optimized monoenergetic reconstruction algorithm.

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Precise DE quantification – tissue differentiation and therapy response assessment of liver cancer

SOMATOM Force

Collimation: 2 x 192 x 0.6 mm
Scan time: 4 s
Scan length: 182 mm
Rotation time: 0.5 s
100/Sn150 kV, 202/190 mAs
CTDI$_{vol}$: 11.99 mGy
DLP: 254 mGy cm
Eff. dose: 3.81 mSv

Dose neutral Dual Energy enables advanced diagnosis of liver metastases and cyst tissue.

Suspected cyst

Tumor tissue

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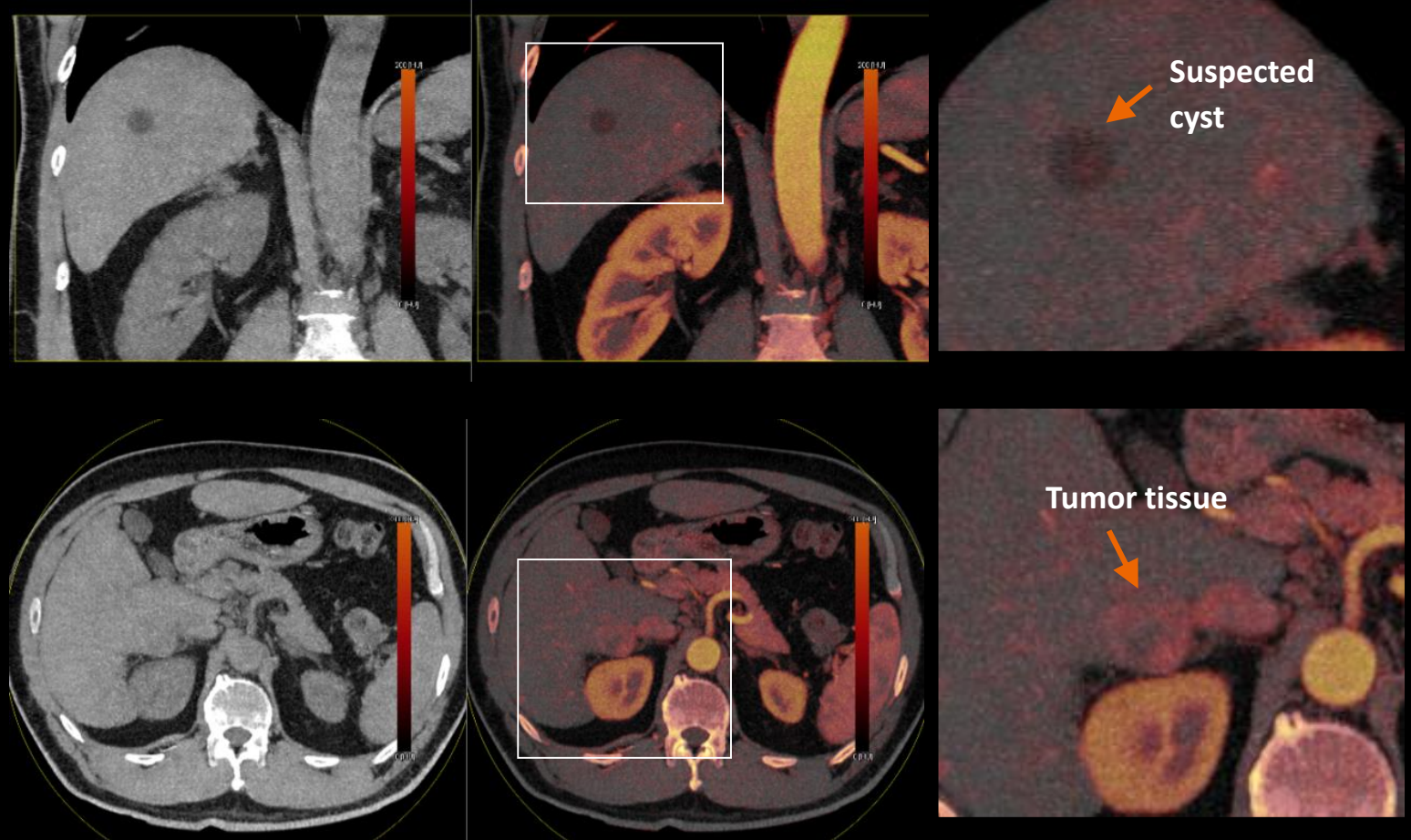
Kidney-friendly scanning – change treatment decisions with more comprehensive 4D imaging

SOMATOM Force

Collimation: 48 x 1.2 mm
Scan time: 36 s
Scan length: 222 mm
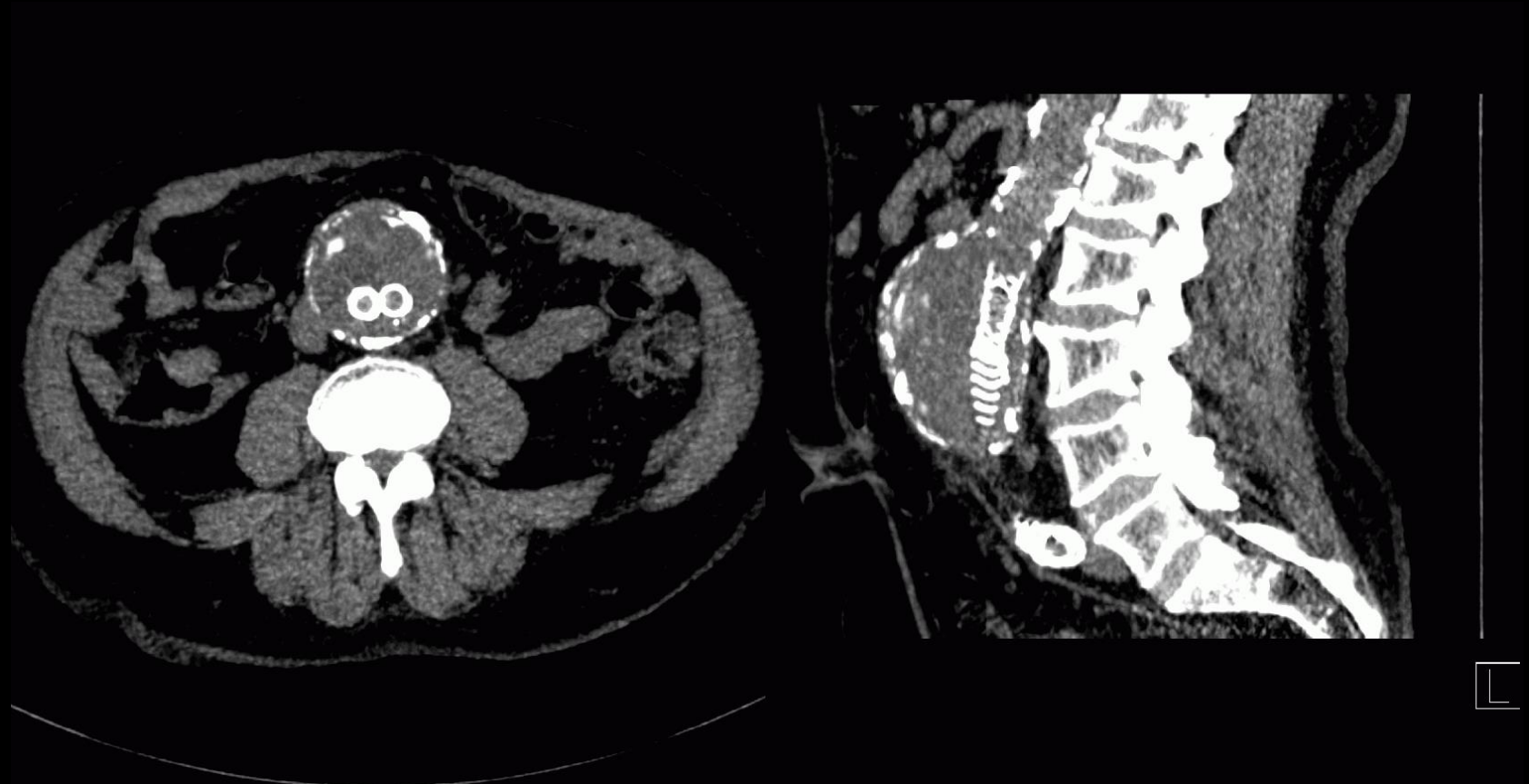**Rotation time: 0.25 s**
70 kV, 200 mAs
$CTDI_{vol}$: 43.46 mGy
DLP: 905 mGy cm
Eff. dose: 13.6 mSv
CM: 12 mL

Kidney-friendly dynamic angiography of EVAR, Type II endoleak scanned **with only 12 mL[1]** of contrast media in 72 year old patient.

Courtesy of UMM, Mannheim, Germany
1) 400 mgI/mL

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Two steps ahead

Freezing motion – avoiding artifacts
Dual Source CT with Turbo Flash Spiral

Kidney-friendly scanning
Vectron™ X-ray tubes with maximum power at low kV

Perfusion imaging in routine
Dynamic imaging with low kV and unique Adaptive Dose Shield

Outstanding quantitative certainty
Fast Dual Energy acquisition with improved spectral separation

More channels. More coverage. Excellent image quality.
Stellar^{Infinity} detectors – with anti-scatter 3D collimator grid

Low-dose early detection
Tin Filters with ADMIRE

Slices	2 x 192 (2 x 576 recon)	mA	1,300 mA@70 kV 1,300 mA@80 kV	Rotational coverage	184 mm/rot	kV	70 - 150 kV 10 kV Steps
Max. scan speed	737 mm/s	Temp. res.	66 ms	Power	240 kW (2 x 120 kW)	Channels	1,840

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Is CT nog het stralingskanon van de radiologie?

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Dank voor uw aandacht

Computed Tomography
Listen.
Care.
Improve.