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LUNG CANCER SCREENING CT

NOTE: The Lung Cancer Screening Protocols described in this document are a set of reasonable protocols developed by the AAPM's Working Group on Standardization of CT Nomenclature and Protocols that are to be used in the specific context of Lung Cancer Screening. These protocols were based in part on manufacturers' Low Dose Chest protocols, but were adapted based on the Working Group's experience with the National Lung Screening Trial and other screening studies.

The primary goal of lung cancer screening CT is to detect abnormalities that may represent lung cancer and may require further diagnostic evaluation. In addition, examinations should be reviewed for other abnormalities in accordance with the ACR–SCBT-MR–SPR Practice Parameter for the Performance of Thoracic Computed Tomography (CT).

This document is ONLY meant to describe the technical elements of a lung cancer screening CT exam. **It is NOT intended to be a comprehensive description of the elements of a screening program (e.g. who should and should not be screened, the patient management process for following up a positive screen test)**. Some examples of guidance in such a program are the ACR–STR Practice Parameter for the Performance and Reporting of Lung Cancer Screening Thoracic Computed Tomography (CT), the USPSTF recommendations and the CMS Decision Memo on Lung Cancer Screening; these provide information on eligibility criteria, exam specifications, interpretation and reporting of these exams. Additional resources are available on the ACR Lung Cancer Screening Resources webpage.

Indications For individuals with no known signs or symptoms of lung cancer that have appropriate risk factors, such as those recommended by professional societies and health care organizations. See the ACR Lung Cancer Screening Resources webpage for more information.

Diagnostic Tasks (include but are not limited to)

- The primary goal of lung cancer screening CT is to detect abnormalities that may represent lung cancer and may require further diagnostic evaluation.
- Therefore, the primary task is to detect nodules or masses, and characterize their size, shape and relationships to organs;

Key Elements

- One breath-hold (thoracic motion is problematic);
- Thin image thicknesses (≤2.5 mm, ≤1.0 mm preferred); reconstruction of coronal and sagittal reformations as well as MIPS may be helpful and are encouraged.
- CTDIvol ≤ 3.0 mGy for a standard sized patient (see table), with adjustments made for smaller and larger patients.
- This typically requires a 16 detector row (or greater) scanner to meet these requirements.

Contrast

- **These studies are *performed without any contrast*:**
- **Oral**: None.
- **Injected**: None.

Patient Positioning

- Center the patient within the gantry; this is critical for proper functioning of AEC systems.
- Patient supine, arms above head;

Scan Range

- From top of lungs through the bottom of lungs.

Suspension of Respiration

- Patient should be instructed to hold his/her breath at end of inspiration during entire scan.

Additional Image Reconstructions

- Coronal and sagittal planar MPRs as well as axial MIPS may be helpful and are encouraged.
- Very thin images (approximately ≤ 1 mm) may need to be reconstructed to serve as source images for the sagittal and/or coronal reformatted images.
- Creation, use, and archival of these additional images are at the discretion of the supervising radiologist and/or departmental policy. Very large datasets may result from these additional reconstructions.

Radiation Dose Management

- **CTDIvol must be ≤ 3.0 mGy** for a standard sized patient, as measured using the 32-cm diameter CTDI phantom. By definition, a standard sized patient is approximately 5'7" and 155 pounds or 170 cm and 70 kg, with a BMI ≈ 24.
- **Some form of scanner output adjustment for patient size must be used**. This adjustment may be accomplished through **either**:
  - Use of **automatic methods,** such as automatic exposure control (AEC) and/or automatic kV selection
  - Use of a **manual technique chart** that prescribes different tube current and/or kV values as a function of patient size.
    - Examples of manual adjustment may include (but are not limited to):
      - Reducing the mAs for small patients (defined below) by 50%
      - Increasing the mAs for large patients (defined below) by 50-100%
  - Either technique (automatic or manual) can be used effectively, but the automatic methods will adjust the CT scanner output based on the patient size (as measured on the CT localizer radiograph).
  - IT SHOULD BE NOTED that in this version, there are two sets of protocols provided for GE scanners:
    - One with automatic methods (AutomA/SmartmA)
    - One with manual methods (fixed tube current scans, but with mA values that can be adjusted to account for patient size).

- When AEC is used, careful attention must be paid to the values selected to define the desired level of image quality (e.g., Noise Index, Quality Reference mAs, Standard Deviation, Dose Right Index).
- Each manufacturer may have recommendations unique to their systems and system features. Be sure to work with your CT equipment manufacturer and a qualified medical physicist to ensure safe and appropriate operation of AEC systems.
- If more than one CT localizer radiograph is acquired, AEC systems from different manufacturers can differ with respect to which one is used to determine mA and/or kV settings. Please refer to individual manufacturer protocol instructions.
- AEC systems also may differ in response when the prescribed scan range extends beyond the boundaries of the CT localizer radiograph; please consult the user manual to identify how the AEC system will respond when this occurs.

Effective Dose

Effective dose is defined in ICRP 103 as a population dose metric and should not be used to estimate dose or risk to an individual. From a *screening population* point of view, one method to estimate the effective dose is to calculate the Dose Length Product (DLP) and then apply a conversion factor described in AAPM TG Report 96 to estimate the effective dose. For an idealized standard sized patient (defined above) and a 25 cm scan length, and using the k factor of 0.014 mSv/mGy*cm; these protocols should result in an effective dose below 1 mSv (see table below).

Dose values for an idealized standard sized patient (NOT for any individual)

Dose Descriptor	Value	Reported at Scanner (Y/N)
CTDIvol*	≤ 3.0 mGy	Y
DLP*	≤ 75 mGy*cm	Y
Effective Dose (DLP x .014)**	≤ 1.0 mSv	N**

* The CTDIvol and DLP values in this table are for an idealized patient only; individual patients may have higher or lower values to reflect adjustment for patient size.

** Effective Dose is calculated for a population and should NOT be reported for an individual

CTDI measurements and calculations

- Some manufacturers utilize a z-axis "flying focal spot", in which two unique projections are acquired at the same z-axis table position. When this technique is used, we identify it with **. The CTDIvol on the console accurately accounts for use of this feature.

Approximate Volume CT Dose Index (CTDIvol) Values

- Approximate values for CTDIvol are listed for three different patient sizes:

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	0.25 - 2.8
Average Patient	70-90	155-200	0.5 - 4.3
Large Patient	90-120	200-265	1.0 – 5.6

The approximate CTDIvol values are for reference only, and represent a dose to the 32-cm diameter CTDI phantom under very specific conditions. The CTDIvol displayed on the scanner for a patient of a given size should be similar, but not necessarily an exact match, to those listed in the above table.

It is essential that users recognize that, when using automatic exposure control, the CTDIvol values reported on the user console prior to acquiring CT localizer radiographs on a particular patient do not represent the CTDIvol that will be delivered during that patient's scan. CT systems rely on the CT localizer radiograph to 1) estimate the patient's size, 2) determine the tube current settings for each tube angle and table position that will yield the requested level of image quality, and 3) calculate the average CTDIvol for the patient over the prescribed scan range. Until the CT localizer radiograph is acquired, the reported CTDIvol is not patient-specific, but is based on a generic patient size.

The CTDIvol values provided here are approximate, and are intended only to provide reference ranges for the user to consider.

In this document, a small patient is considered to be approximately 50-70 kg (110-155 lbs), an average patient approximately 70-90 kg (155-200 lbs), and a large patient 90-120 kg (200-265 lbs). However, weight is not a perfect indication of patient size. A person's height, gender and distribution of weight across the body also must be taken into account. The thickness of the body over the area to be scanned is the best indication of patient size. Body mass index (BMI) may also be considered:

- Underweight = BMI <18.5
- Normal weight = BMI of 18.5–24.9
- Overweight = BMI of 25–29.9
- Obesity = BMI of 30 or greater

It is recognized that the median (50th percentile) patient size for adults in the USA is larger than 70 kg. However, the 70 kg patient represents the "Reference Man", as defined by the International Commission on Radiation Protection (ICRP), upon which AEC systems and tissue weighting factors (used for effective dose estimation) are based.

References

ACR–STR Practice Parameter for the Performance and Reporting of Lung Cancer Screening Thoracic Computed Tomography (CT). Available at: http://www.acr.org/~/media/ACR/Documents/PGTS/guidelines/LungScreening.pdf

United States Preventive Services Task Force (USPSTF) Recommendations on Lung Cancer Screening using Low Dose CT. Available at: http://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/lung-cancer-screening

CMS (Medicare) Decision Memo for Screening for Lung Cancer with Low Dose Computed Tomography (LDCT) (CAG-00439N) http://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=274

ACR Lung Cancer Screening Resources. Available at: http://www.acr.org/Quality-Safety/Resources/Lung-Imaging-Resources

ICRP Report 103
International Commission on Radiological Protection, "The 2007 Recommendations of the International Commission on Radiological Protection," *ICRP Publication 103* International Commission on Radiological Protection, Essen, 2007.

AAPM TG Report 96:
American Association of Physicists in Medicine, "The Measurement, Reporting and Management of Radiation Dose in CT: Report of AAPM Task Group 23". ISBN: 9781888340730 http://www.aapm.org/pubs/reports/RPT_96.pdf

INDEX OF LUNG CANCER SCREENING PROTOCOLS (by manufacturer)

LUNG CANCER SCREENING CT (Selected GE scanners) with Auto/Smart mA

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SCOUT: AP S60-I400; scan from top of shoulder through mid-liver, if automatic exposure control is used. PA scout if manual mA is used.

GE	LightSpeed 16	BrightSpeed 16	Optima 660	LightSpeed VCT	Discovery CT750 HD
Scan Type	Helical	Helical	Helical	Helical	Helical
Rotation Time (s)	0.5	0.5	0.5	0.5	0.5
Beam Collimation (mm)	10/20	20	40	40	40
Detector Configuration	16x0.625/16x1.25	16x1.25	64x0.625	64x0.625	64x0.625
Pitch	1.375	1.375	0.984	0.984	0.984
Speed (mm/rot)	13.75/27.50	27.50	39.36	39.36	39.36
kV	120	120	120	120	120
min mA	40	40	30	30	30
max mA	130	130	110	110	110
Noise Index (Auto/Smart mA)[1]	32	32	32	32	37
SFOV	Large Body	Large Body	Large Body	Large Body	Large Body
CTDIvol[2]	2.6 / 2.4 mGy	2.4 mGy	2.2 mGy	2.2 mGy	2.2 mGy

[1]Noise Index value of 32 ONLY applies if the 2.5 mm reconstructed image thickness is selected as the first reconstruction; if other slice thicknesses (e.g. 0.625 mm or 1.25 mm) are selected for the first reconstruction, then a different Noise Index value must be chosen in order to achieve the CTDIvol values described here. This is because the Noise Index value is related to the image thickness of the first reconstruction.
[2]For standard sized patient, defined as 5'7", 155 pounds

RECON 1

Plane	Axial	Axial	Axial	Axial	Axial
Algorithm[3]	Lung or Bone	Lung or Bone	Lung or Bone	Lung or Bone	Lung or Bone
Recon Mode	Full or Plus	Full or Plus	Full or Plus	Full or Plus	Full or Plus
Thickness (mm)	2.5	2.5	2.5	2.5	2.5
Interval (mm)	1.25	1.25	1.25	1.25	1.25
ASiR (if used)			SS70	SS70	SS70

RECON 2

Plane	Axial	Axial	Axial	Axial	Axial
Algorithm[3]	Lung or Bone	Lung or Bone	Lung or Bone	Lung or Bone	Lung or Bone
Thickness (mm)	0.625/1.25	1.25	0.625	0.625	0.625
Interval (mm)	0.4/0.625	0.625	0.4	0.4	0.4
ASiR (if used)			SS70	SS70	SS70

RECON 3

Algorithm[3]	MIP	MIP	MIP	MIP	MIP
Thickness (mm)	6	6	6	6	6
Interval (mm)	3	3	3	3	3

RECON 4

Algorithm[4]	[5]Veo/TX/RP05
Thickness (mm)	0.625
Interval (mm)	0.4

[3]MIP: Maximum Intensity Projection
[4]Veo/TX/RP05 if Veo is available

LUNG CANCER SCREENING CT (Selected GE scanners) with constant mA

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SCOUT: AP S60-I400; scan from top of shoulder through mid-liver, if automatic exposure control is used. PA scout if manual mA is used.

GE	LightSpeed 16 BrightSpeed 16	Optima 660	LightSpeed VCT	Discovery CT750 HD
Scan Type	Helical	Helical	Helical	Helical
Rotation Time (s)	0.5	0.6	0.5	0.5
Beam Collimation (mm)	10/20	40	40	40
Detector Configuration	16x0.625/ 16x1.25	64x0.625	64x0.625	64x0.625
Pitch	1.375	1.375	0.984	0.984
Speed (mm/rot)	13.75/ 27.50	55.0	39.37	39.37
kV*	120	120	120	120
mA*	60	50	50	50
SFOV	Large Body	Large Body	Large Body	Large Body
CTDIvol*	2.3/ 2.0 mGy	1.8 mGy	1.9 mGy	1.9 mGy

RECON 1

Plane	Axial	Axial	Axial	Axial
Algorithm	Bone or Lung	Bone or Lung	Bone or Lung	Bone or Lung
Recon Mode	Full	Full	Full	Full
Thickness (mm)	1.25 or 2.5	1.25 or 2.5	1.25 or 2.5	1.25 or 2.5
Interval (mm) (should be ≤ slice width)	1.25 or 2.5	1.25 or 2.5	1.25 or 2.5	1.25 or 2.5
ASIR (if used)	SS50	SS50	SS50	SS50

RECON 2

Plane	***Axial DMPR-create Sag/Cor reformats	**Axial DMPR-create Sag/Cor reformats	**Axial DMPR-create Sag/Cor reformats	**Axial DMPR-create Sag/Cor reformats
Algorithm	Bone or Lung	Bone or Lung	Bone or Lung	Bone or Lung
Recon Mode	Full	Full	Full	Full
Thickness (mm)	0.625	0.625	0.625	0.625
Interval (mm)	0.625	0.625	0.625	0.625
ASIR (if used)	SS50	SS50	SS50	SS50

* For standard sized patient, defined as 5'7", 155 pounds. For small patients, mA may be reduced by as much as 50%; for large patients, mA may be increased by 50-100%.

** These protocols use direct multi-planar reconstruction (DMPR) on Recon 2 to automatically create Sagittal and Coronal reformats. The user may select the thickness of the Sagittal and Coronal images to be 1.25 - 5mm.

***For LightSpeed 16/BrightSpeed 16 and depending on system configuration, DMPR could be used if available. If DMPR is not available, user will need to create Sag/Cor images manually in Reformat, using an image thickness of 1.25 - 5mm.

	Approx. Weight (kg)	Approx. Weight (lbs)	mA	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	25-50	0.9-2.3
Avg. Patient	70-90	155-200	50-75	1.8-3.6
Large Patient	90-120	200-265	75-100	2.7-4.6

LUNG CANCER SCREENING CT (selected HITACHI scanners)

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SCANOGRAM: PA; scan from top of shoulder through mid-liver.

HITACHI	ECLOS 16	SCENARIA 64	SCENARIA 128
Scan Type	Volume	Volume	Volume
Rotation Time (s)	0.8	0.5	0.5
Detector Collimation- T	1.25 mm	0.625 mm	0.625 mm
Number of Active Channels	16	64	64
Detector Configuration	1.25 x 16	0.625 x 64	0.625 x 64
Mode (thick/ pitch/ speed)	1.25/ 1.3125/ 26.25	0.625/ 0.8281/ 33.13	0.625/ 0.8281/ 33.13
Pitch	1.3125	0.8281	0.8281
Speed (mm/rot)	26.25	33.13	33.13
kV*	120	120	120
mA*	50	50	50
Adaptive mA/IntelliEC	No	No	No
SFOV	500	500	500
CTDIvol*	2.6	2.7	2.7
RECON 1			
Series Description	Lung	Lung	Lung
Type	Axial	Axial	Axial
Filter	21 Lung	21 Lung	21 Lung
Thickness (mm)	1.25	1	1
Interval (mm)	0.625	0.5	0.5
RECON 2			
Series Description	Soft Tissue	Soft Tissue	Soft Tissue
Type	Axial	Axial	Axial
Filter	31 Soft tissue	31 Soft tissue	31 Soft Tissue
Thickness (mm)	1.25	1	1
Interval (mm)	0.625	0.5	0.5

* For standard sized patient, defined as 5'7", 155 pounds. For small patients, mA may be reduced by as much as 50%; for large patients, mA may be increased by 50-100%.

	Approx. Weight (kg)	Approx. Weight (lbs)	mA	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	25-50	1.3-2.7
Avg. Patient	70-90	155-200	50-75	2.6-4.1
Large Patient	90-120	200-265	75-100	3.9-5.4

LUNG CANCER SCREENING CT (selected NEUSOFT scanners)

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SCOUT: PA, scan from top of shoulder through mid-liver. Adjust Displayed FOV to 1 cm beyond the rib cage.

NEUSOFT	NeuViz 16	NeuViz 16	NeuViz64i/ NeuViz64e	NeuViz64i/ NeuViz64e
Scan Type	Helical	Helical	Helical	Helical
Patient size	Small-Med	Large (≥38cm)	Small-Med	Large (≥40cm)
Rotation Time (s)	0.6	0.6	0.5	0.5
Collimation	16 x 1.5	16 x 1.5	64 x 0.625*	64 x 0.625*
kVp	120	140	100	120
Reference mAs	35	35	40	50
Pitch	1.2	1.2	1.2	1.2
Displayed FOV(mm)	300	350	300	350
Resolution	Standard	Standard	Standard	Standard
Dose Modulation	ACS & DOM	ACS & DOM	O-Dose	O-Dose
ClearView	N/A	N/A	20%	30%
SNR Level	N/A	N/A	1	1
CTDIvol*	2.8*mGy	4.3**mGy	1.9*mGy	3.3**mGy
RECON 1		**Thin Lung**		
Type	Axial	Axial	Axial	Axial
Filter	EA	EA	Lung20	Lung20
Thickness (mm)	1.5	1.5	1	1
Increment (mm)	0.75	0.75	0.5	0.5
ClearView	N/A	N/A	20%	30%
RECON 2		**Thin Mediastinum**		
Type	Axial	Axial	Axial	Axial
Filter	SB	SB	F20	F20
Thickness (mm)	1.5	1.5	1	1
Increment (mm)	0.75	0.75	0.5	0.5
ClearView	N/A	N/A	20%	30%
RECON 3		**Coronal & Axial 8 x 4 MIPS Lung**		
Type	MIP	MIP	MIP	MIP
Thickness (mm)	8	8	8	8
Increment (mm)	4	4	4	4

* For standard sized patient, defined as 5'7", 155 pounds.
** Because this technique is for a large patient, the CTDIvol exceeds 3.0 mGy
*** Indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections per rotation as detector rows.

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	1.0-2.8
Avg. Patient	70-90	155-200	1.9-4.3
Large Patient	90-120	200-265	3.3-5.6

Lung Cancer Screening CT (selected PHILIPS scanners)

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SURVIEW: PA; scan from top of shoulder through mid-liver.

PHILIPS	Brilliance 16 slice	Brilliance 64 slice	Ingenuity CT	Ingenuity CT w/iPatient
Scan Type	Helical	Helical	Helical	Helical
Rotation Time (s)	0.5	0.5	0.4	0.4
Collimation	16 × 1.5 mm	64 × 0.625 mm	64 × 0.625 mm	64 × 0.625 mm
Coverage (mm)	24	40	40	40
kV	120	120	120	120
mAs (mAs/slice) @ water equivalent diameter	DoseRight 26 mAs @ 33 cm reference*	DoseRight 26 mAs @ 33 cm reference*	DoseRight 26 mAs @ 33 cm reference*	DoseRight 26 mAs @ 29 cm ref., DRI = 6
Tube current modulation	ZDOM	ZDOM	ZDOM	3D Modulation
Pitch	1.0	1.0	1.1	1.1
CTDIvol**	1.8 mGy	1.7 mGy	1.7 mGy	1.7 mGy
RECON 1 – Axial Lung				
Type	Axial	Axial	Axial	Axial
Filter	YA	YA	YA	YA
Thickness (mm)	2	1	1	1
Increment (mm)	1	0.5	0.5	0.5
Matrix	768^2	768^2	768^2	768^2
iDose^4 Level	5	5	5	5
RECON 2 – Axial Soft tissue				
Type	Axial	Axial	Axial	Axial
Filter	A	A	A	A
Thickness (mm)	3	3	3	3
Increment (mm)	1.5	1.5	1.5	1.5
Matrix	512^2	512^2	512^2	512^2
iDose^4 Level	5	5	5	5

* For scanners without the iPatient interface, the default water equivalent diameter is 33 cm for all protocols, unless otherwise defined by the user with a manual DoseRight reference image.

** For standard sized patient, defined as 5'7", 155 pounds

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	0.9-1.8
Avg. Patient	70-90	155-200	1.7-2.7
Large Patient	90-120	200-265	2.7-3.6

Lung Cancer Screening CT (selected PHILIPS scanners)

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SURVIEW: PA; scan from top of shoulder through mid-liver.

PHILIPS	Brilliance iCT SP	Brilliance iCT SP w/ iPatient	Brilliance iCT	Brilliance iCT w/ iPatient
Scan Type	Helical	Helical	Helical	Helical
Rotation Time (s)	0.4	0.4	0.4	0.4
Collimation	64 × 0.625 mm	64 × 0.625 mm	128 × 0.625 mm	128 × 0.625 mm
Coverage (mm)	40	40	80	80
kV	120	120	120	120
mAs (mAs/slice) @ water equivalent diameter	DoseRight 23 mAs @ 33 cm reference*	DoseRight 23 mAs @ 29 cm ref., DRI = 5	DoseRight 23 mAs @ 33 cm reference*	DoseRight 23 mAs @ 29 cm ref., DRI = 5
Tube current modulation	ZDOM	3D Modulation	ZDOM	3D Modulation
Pitch	1.0	1.0	0.9	0.9
CTDIvol**	1.7 mGy	1.7 mGy	1.6 mGy	1.6 mGy
RECON 1 - Lung				
Type	Axial	Axial	Axial	Axial
Filter	YA	YA	YA	YA
Thickness (mm)	1	1	1	1
Increment (mm)	0.5	0.5	0.5	0.5
Matrix	768^2	768^2	768^2	768^2
iDose^4 Level	5	5	5	5
RECON 2 – Soft tissue				
Type	Axial	Axial	Axial	Axial
Filter	A	A	A	A
Thickness (mm)	3	3	3	3
Increment (mm)	1.5	1.5	1.5	1.5
Matrix	512^2	512^2	512^2	512^2
iDose^4 Level	5	5	5	5

* For scanners without the iPatient interface, the default water equivalent diameter is 33 cm for all protocols, unless otherwise defined by the user with a manual DoseRight reference image.

** For standard sized patient, defined as 5'7", 155 pounds

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	0.8-1.7
Avg. Patient	70-90	155-200	1.6-2.6
Large Patient	90-120	200-265	2.4-3.4

LUNG CANCER SCREENING CT (selected SIEMENS scanners)

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TOPOGRAM: PA; scan from top of shoulder through mid-liver.

SIEMENS	Sensation 16	Emotion 16	Perspective 64	Sensation 64/ Definition DS (64)[a]
Software version	VB30	VB42	VC28	VB42/VA40
Scan Mode	Spiral	Spiral	Spiral	Spiral
Rotation Time (s)	0.5	0.6	0.6	0.5 / 0.33
Detector Configuration	16 x 0.75 mm	16 x 0.6 mm	*64 x 0.6 mm (32 x 0.6 mm = 19.2 mm)	*64 x 0.6 mm (32 x 0.6 mm = 19.2 mm)
Pitch	1.2	1.0	1.2	1.0
kV	120	110	110	120
Quality ref. mAs	25	20	25	25
CARE Dose4D	ON	ON	ON	ON
CARE kV	NA	NA	NA	OFF
CTDIvol***	1.9 mGy	1.6 mGy	2.0 mGy	1.8 / 1.7 mGy
RECON 1				
Type	Axial	Axial	Axial	Axial
Kernel	B50	B50	B50 I50, strength = 2**	B50 I50, strength = 2**
Slice (mm)	1.0	1.0	1.0	1.0
Increment (mm)	0.7	0.7	0.7	0.7
RECON 2				
Type	Axial MIP	Axial MIP	Axial MIP	Axial MIP
Kernel	B50	B50	B50 I50, strength = 2**	B50 I50, strength = 2**
Slice (mm)	20	20	20	20
Increment (mm)	2.5	2.5	2.5	2.5
RECON 3				
Type	Axial	Axial	Axial	Axial
Kernel	B31	B31	B31 I31, strength = 2**	B31 I31, strength = 2**
Slice (mm)	1.0	1.0	1.0	1.0
Increment (mm)	0.7	0.7	0.7	0.7
RECON 4				
Type	Axial MIP	Axial MIP	Axial MIP	Axial MIP
Kernel	B31	B31	B31 I31, strength = 2**	B32 I31, strength = 2**
Slice (mm)	20	20	20	20
Increment (mm)	2.5	2.5	2.5	2.5

* Indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections per rotation as detector rows. This is referred to as IVR (Interleaved Volume Reconstruction) on the Perspective system.

** With SAFIRE.

*** For standard sized patient, defined as 5'7", 155 pounds. Do not adjust the Quality Reference mAs as patient size varies. CAREDose4D adjusts for patient size automatically

[a] With exception of rotation time, a Definition DS operated in single source mode can use the same protocol as a Sensation 64.

[b] The tube potential selected by CARE kV can differ from exam to exam if patient positioning or size changes substantially. Because it is important to use the same tube potential on serial (follow up) exams, manual kV selection is recommended.

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	0.8-2.5
Avg. Patient	70-90	155-200	1.6-3.8
Large Patient	90-120	200-265	2.4-5.0

LUNG CANCER SCREENING CT (selected SIEMENS scanners, continued) (Back to INDEX)

TOPOGRAM: PA; scan from top of shoulder through mid-liver.

SIEMENS	Definition AS+ (128-slice)	Definition Flash (Dual source 128-slice)	Definition Force (Dual source 192-slice)
Software version	VA44	VA44	VA50
Scan Mode	Spiral	Spiral	Spiral
Rotation Time (s)	0.33 or 0.30	0.28	0.25
Detector Configuration	*128 × 0.6 mm (64 x 0.6 mm = 38.4 mm)	*128 × 0.6 mm (64 x 0.6 mm = 38.4 mm)	*192 × 0.6 mm (96 x 0.6 mm = 57.6 mm)
Pitch	1.0	1.0	1.0
kV	120	120	100Sn[c]
Quality ref. mAs	25	25	150[c]
CARE Dose4D	ON	ON	ON
CARE kV	OFF	OFF	Not applicable
CTDIvol***	1.7 mGy	1.7 mGy	0.5 mGy
RECON 1			
Type	Axial	Axial	Axial
Kernel	B50 I50, strength = 2**	B50 I50, strength = 2**	Bv49, strength = 2**
Slice (mm)	1.0	1.0	1.0
Increment (mm)	0.7	0.7	0.7
RECON 2			
Type	Axial MIP	Axial MIP	Axial MIP
Kernel	B50 I50, strength = 2**	B50 I50, strength = 2**	Br54, strength = 2**
Slice (mm)	20	20	20
Increment (mm)	2.5	2.5	2.5
RECON 3			
Type	Axial	Axial	Axial
Kernel	B31	B31	Br40, strength = 2**
Slice (mm)	1.0	1.0	1.0
Increment (mm)	0.7	0.7	0.7
RECON 4			
Type	Axial MIP	Axial MIP	Axial MIP
Kernel	B31	B31	Br40, strength = 2**
Slice (mm)	20	20	20
Increment (mm)	2.5	2.5	2.5

* Indicates that a z-axis "flying focal spot" technique is used to obtain twice as many projections per rotation as detector rows. This is referred to as IVR (Interleaved Volume Reconstruction) on the Perspective system.

** With SAFIRE or ADMIRE

*** For standard sized patient, defined as 5'7", 155 pounds. Do not adjust the Quality Reference mAs as patient size varies. CAREDose4D adjusts for patient size automatically

[a] With exception of rotation time, a Definition DS operated in single source mode can use the same protocol as a Sensation 64.

[b] The tube potential selected by CARE kV can differ from exam to exam if patient positioning or size changes substantially. Because it is important to use the same tube potential on serial (follow up) exams, manual kV selection is recommended.

[c] 100Sn = 100 kV with 0.6 mm tin (Sn) filtration. This removes lower energy photons and hence a higher Quality ref. mAs is required.

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	0.25 -1.7
Avg. Patient	70-90	155-200	0.5- 2.7
Large Patient	90-120	200-265	1.0 -3.4

Lung Cancer Screening CT (selected Toshiba scanners)

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Scanogram: PA and LAT dual Scanogram; scan from top of shoulder through mid-liver.

TOSHIBA	Aq RXL	Aq PRIME (40 Rows)	Aq PRIME (80 Rows)	Aq ONE/Premium	Aq ONE Vision
Scan Type	Helical	Helical	Helical	Helical	Helical
Rotation Time (s)	0.5	0.35	0.35	0.35	0.275
Detector Configuration	16 x 0.5 mm	40 x 0.5 mm	80 x 0.5 mm	80 x 0.5 mm	80 x 0.5 mm
Pitch	Fast (1.434)	Standard (0.825)	Standard (0.813)	Standard (0.813)	Standard (0.813)
kV	120	120	120	120	120
Minimum & Maximum mA	Min mA = 20 / Max mA = 110	Min mA = 20 / Max mA = 120	Min mA = 20 / Max mA = 120	Min mA = 20 / Max mA = 120	Min mA = 20 / Max mA = 150
SURE IQ Setting	Body Std Axial (5 mm Target Slice)	Body Std Axial (5 mm Target Slice)	Body Std Axial (5 mm Target Slice)	Body Std Axial (5 mm Target Slice)	Body Std Axial (5 mm Target Slice)
SURE Exposure	ON	ON	ON	ON	ON
***SD**	25*	25*	25*	25*	25*
****CTDIvol**	1.8	1,8	1.8	1.7	1.6

* Create a new SureExp setting using Body Std Axial SureIQ with 5 mm Target Slice and the given SD, min and max mA values.

** For standard sized patient, defined as 5'7", 155 pounds. Do not adjust the SD as patient size varies. SureExposure modulates mA automatically based on patient size.

Recon 1 – Axial Soft Tissue					
Type	Axial	Axial	Axial	Axial	Axial
SURE IQ Setting	Body Std Axial	Body Std Axial	Body Std Axial	Body Std Axial	Body Std Axial
AIDR 3D	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD
Thickness (mm)	1	1	1	1	1
Interval (mm)	1	1	1	1	1

Recon 2 – Axial Lung					
Type	Axial	Axial	Axial	Axial	Axial
SURE IQ Setting	Lung Std Axial	Lung Std Axial	Lung Std Axial	Lung Std Axial	Lung Std Axial
AIDR 3D	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD
Thickness (mm)	1	1	1	1	1
Interval (mm)	1	1	1	1	1

Recon 3 – MPR Soft Tissue Volume* **					
Type	Volume***	Volume***	Volume***	Volume***	Volume***
SURE IQ Setting	Body Std Volume	Body Std Volume	Body Std Volume	Body Std Volume	Body Std Volume
AIDR 3D	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD
Thickness (mm)	0.5	0.5	0.5	0.5	0.5
Interval (mm)	0.3	0.3	0.3	0.3	0.3
Multiview					
Type	Sagittal/Coronal	Sagittal/Coronal	Sagittal/Coronal	Sagittal/Coronal	Sagittal/Coronal
SURE IQ Setting	Body Std Volume	Body Std Volume	Body Std Volume	Body Std Volume	Body Std Volume
Thickness (mm)	1	1	1	1	1
Interval (mm)	1	1	1	1	1

*** Volume reconstructions are required in order to create Multiplanar reconstructions.

Recon 4 – MPR Lung Volume ***					
Type	Volume***	Volume***	Volume***	Volume***	Volume***
SURE IQ Setting	Lung Std Volume	Lung Std Volume	Lung Std Volume	Lung Std Volume	Lung Std Volume
AIDR 3D	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD	AIDR 3D STD
Thickness (mm)	0.5	0.5	0.5	0.5	0.5
Interval (mm)	0.3	0.3	0.3	0.3	0.3
Multiview					
Type	Sagittal/Coronal	Sagittal/Coronal	Sagittal/Coronal	Sagittal/Coronal	Sagittal/Coronal
SURE IQ Setting	Lung Std Volume	Lung Std Volume	Lung Std Volume	Lung Std Volume	Lung Std Volume
Thickness (mm)	1	1	1	1	1
Interval (mm)	1	1	1	1	1

*** Volume reconstructions are required in order to create Multiplanar reconstructions.

	Approx. Weight (kg)	Approx. Weight (lbs)	Approx. CTDIvol (mGy)
Small Patient	50-70	110-155	0.8-1.8
Avg. Patient	70-90	155-200	1.6-2.7
Large Patient	90-120	200-265	2.4-3.6