CT Chest VIDA (Quantitative)

Updated 05/01/24
Reviewed 05/14/25

Indications - quantitative CT (QCT) imaging in the setting of airway obstruction /COPD and should be ordered as VIDA protocol by Pulmonology.

Use CT Chest without Contrast charge.

GENERAL SCAN NOTES

The patient's arms must be over his/her head.

Remove any metal from the imaging field of view.

Have the patient cough a few times to clear secretions. This reduces incidence of small lung nodules.

Topogram - lung apices through diaphragm (obtained during end inspiration).

Craniocaudal scan coverage - lung apices through adrenal glands (obtained during **maximum** end inspiration).

Adjust FOV (field of view) on topogram to smallest without cropping anatomy.

Technique (mAs, kV, etc) and FOV must be the same for every scan for a given patient.

See end of protocol for requirements for the **axial thins** recons.

IV Contrast: not given for this protocol.

SIEMENS PARAMETERS & RECONS

	Scan Mode	kV	Eff mAs	Care Dose	Care kV & Lvl	Pitch	Acq	Coll	Rot Time	Scan Time
Sensation 16	spiral	120	**90/110/160**	**off**	NA	1.00	16	0.75	0.5	12.5
Go Up 32	spiral	110	**90/110/160**	**off**	**off**	1.20	32	0.75	0.8	8.3
Sensation 64	spiral	120	**80/100/150**	**off**	NA	1.00	64	0.6	0.5	7.8
Definition 64	spiral	120	**80/100/150**	**off**	**off**	1.00	64	0.6	0.5	7.8
Go Top 64	spiral	120	**80/100/150**	**off**	**off**	1.00	64	0.6	0.5	3.9
Drive 128	spiral	120	**100/125/180**	**off**	**off**	1.00	128	0.6	0.5	3.9
Force 192	spiral	120	**100/125/180**	**off**	**off**	1.00	128	0.6	0.5	3.9

Use lower mAs for BMI <20, mid mAs for BMI 20-30 and higher mAs for BMI >30.

Name of Series	Thick	Interval	Kernel	Window	IR Lvl	Recon Direction
AX LUNG	3.0	3.0	Br57 / B70f	lung	none	head/feet
AX SOFT	3.0	3.0	Br40 / B41f	mediastinum	none	head/feet
COR SOFT	3.0	3.0	Br40 / B41f	mediastinum	none	front/back
SAG SOFT	3.0	3.0	Br40 / B41f	mediastinum	none	left/right
TLC INSP 1	**0.75**	**0.5**	**Qr36f / B35f**	**mediastinum**	**none**	**head/feet**
TLC INSP 2	**0.75**	**0.5**	**Br46f / B45f**	**mediastinum**	**none**	**head/feet**
AX MIPS	8.0	3.0	Br40 / B41f	lung	none	head/feet

VIDA specific recons.

CT Chest VIDA (Quantitative)

GE PARAMETERS & RECONS

	Scan Type	SFOV	kV	**Manual mA**	Smart mA	Slice Thick	Beam Coll	Pitch	Speed	Rot Time	Dose Red	ASIR	Scan Time
LS 16	helical	large	120	**145/180/270**	off	0.625	20	1.375	27.50	0.5	NA	NA	5.5
Opt 540	helical	large	120	**145/180/270**	off	0.625	20	1.375	27.50	0.5	NA	NA	5.5
LS VCT 64	helical	large body	120	**145/180/270**	off	0.625	40	0.984	39.37	0.5	off	none	3.8
Disc VCT 64	helical	large body	120	**145/180/270**	off	0.625	40	0.984	39.37	0.5	NA	NA	3.8

Use lower mAs for BMI <20, mid mAs for BMI 20-30 and higher mAs for BMI >30.

Name of Series	Thickness	Interval	Recon Algorithm	Window Width/Level	Recon Direction
TLC INSP	**0.625**	**0.5**	**std full**	**400/40**	**head/feet**
AX LUNG	2.5	2.5	lung	1600/-600	head/feet
AX SOFT	2.5	2.5	std full	400/40	head/feet
COR SOFT	2.5	2.5	std full	400/40	front/back
SAG SOFT	2.5	2.5	std full	400/40	left/right
AX MIPS	8.0	3.0	std full	1600/-600	head/feet

This must be the first recon.

VIDA specific recon.

PHILIPS PARAMETERS & RECONS

	Scan Mode	kV	**mA**	3D Dose	Pitch	Detect	Colli	Rot Time	Scan Time
Incisive 128	helical	120	**105/130/190**	off	0.923	64	0.625	0.5	4.1

Use lower mAs for BMI <20, mid mAs for BMI 20-30 and higher mAs for BMI >30.

Name of Series	Thick	Interval	Filter	Window	iDose	Recon Direction
AX LUNG	3.0	3.0	YA	lung	none	head/feet
AX SOFT	3.0	3.0	B	mediastinum	none	head/feet
COR SOFT	3.0	3.0	B	mediastinum	none	front/back
SAG SOFT	3.0	3.0	B	mediastinum	none	left/right
TLC INSP	**0.75**	**0.5**	**B**	**mediastinum**	**none**	**head/feet**
AX MIPS	8.0	2.0	B	lung	none	head/feet

VIDA specific recon.

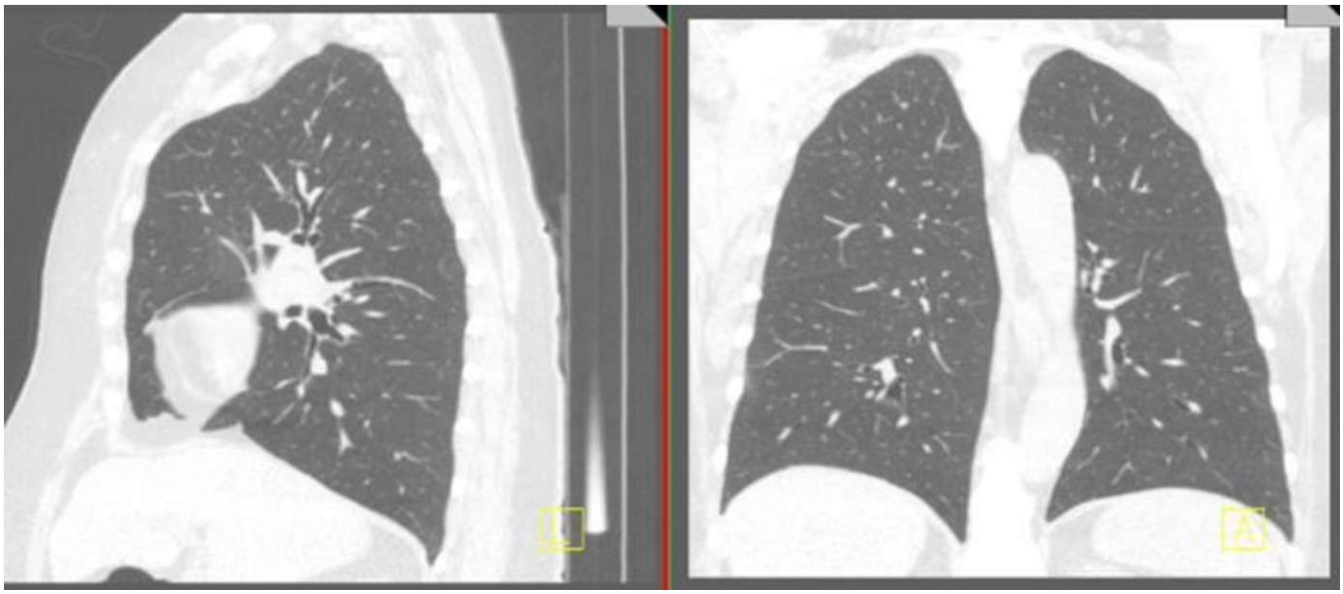
CT Chest VIDA (Quantitative)

For the **Axial TLC Thins** recons:

The cranial/top image should begin 1-2 slices above the top of both lungs.

The caudal/bottom image should stop 1-2 slices below the bottom of both lungs.

The FOV of the transverse/axial plane should tightly fit the lungs (outer rib to outer rib at widest part of the chest).



It is important that the subject fully understands the breath hold and scanning procedure and that all concerns are addressed prior to performing the CT scan. If this is a subsequent visit to the baseline visit, participants must be scanned with the same CT acquisition and reconstruction parameters used during the baseline CT visit.

Subject Positioning

- Place subject in a supine position, arms positioned comfortably above the head in a head-arm rest, lower legs supported.
- Using the laser positioning lights, line up the subject so the chest is iso-center (in the middle: left-right; up-down) of the CT gantry. *Correcting an off-center subject during image reconstruction is not acceptable. Proper positioning must be ensured prior to scanning.*
- Move the table so the subject is in the correct position for a chest CT scan.
- Once the subject is comfortably and properly positioned, remain in the scanner room and work with the subject to rehearse the breathing instructions used during CT acquisition several times. *It is important that the subject fully understands the breath hold and scanning procedure and that all concerns are addressed prior to performing the CT scan.*

Scan Coverage

CT scan must include the entire lungs, but ONLY the lungs. Start the scan precisely at the apex of the lungs and stop it once the scan is through the base of the lungs as shown in Figure 1.

- The DFOV should tightly fit the TLC lung for the QCT reconstruction as shown in Figure 2.
- The same DFOV should be used for all time points of a given subject.

Figure 1

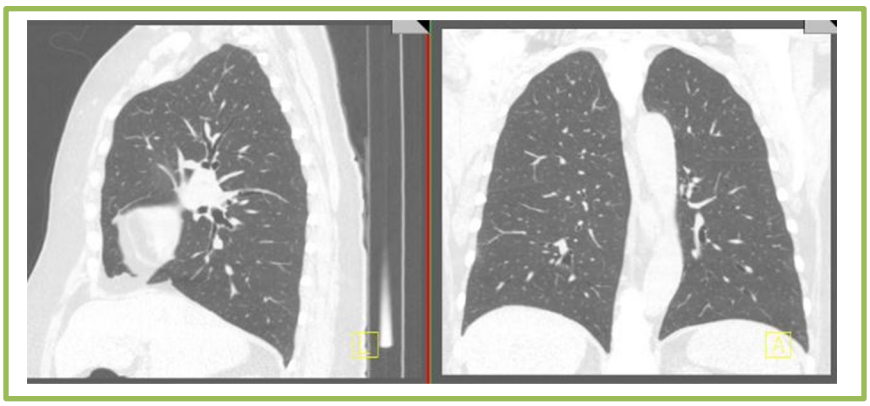


Figure 2

CT Parameters

- The following parameters must be implemented for these CT scans.
- Scout scan uses default parameters (Site discretions on type and number of scouts, however must maintain ALARA principle).

Table 1: CT Protocol Siemens Somatom Drive

	INSPIRATION (TLC)
Scanner	Siemens Somatom Drive
Scan Type	Spiral
Rotation Time (s)	0.5
Det. Configuration	128 x 0.6mm
kV	120
Pitch	1.0
Dose Modulation	Off
Recon Algorithm 1 (For QCT analysis)	B35
Recon Algorithm 2 (For Visual analysis)	B45
Iterative Recon (noise reduction)	Do not use IRIS or SAPHIRE
Thickness (mm)	0.75
Interval (mm)	0.5
Est. Scan Time (Sec) 30cm length	<10

Effective mAs Selection

Small, medium or large effective mAs settings for these scans are based upon the Body Mass Index (BMI). The BMI must be provided to the technologist to set the effective mAs.

All subject scanning visits post-screening will be assigned to a different dose category only if the BMI changes between clinical visits by more than 3 AND crosses the 20 or 30 BMI thresholds.

Please use the table below to select the correct effective mAs setting based on the subject's BMI.

Inspiration (TLC)
Effective mAs as a function of BMI: TLC Scan

BMI Range	Size	Eff. mAs setting to be used
< 20	Small (S)	100
20-30	Medium (M)	125
> 30	Large (L)	180

The following breathing instructions must be given to the subject:

* **Bold instructions are what must be said to the subject during CT.**

** ***(Italic)* information represents reminders directed towards the CT technologist.**

SCANNING:

Use the breathing instructions to perform:

- A practice breathing session
- Scouts - as needed - to position the FOV to cover the entire lung and as little soft tissue as possible
- The Inspiration CT scan (TLC)

Inspiratory CT (TLC)

BREATHING INSTRUCTIONS:

For this scan, I am going to ask you to take a couple of deep breaths in and out before we have you breathe all the way in and hold your breath.

Ok, let's get started,

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Now breathe all the way IN...IN...IN *(watch chest to ensure a deep breath in as far as possible)*

Keep holding your breath – DO NOT BREATHE!

At end of scan or practice: - **Breathe and relax**

It is important that the subject fully understands the breath hold and scanning procedure and that all concerns are addressed prior to performing the CT scan. If this is a subsequent visit to the baseline visit, participants must be scanned with the same CT acquisition and reconstruction parameters used during the baseline CT visit.

Subject Positioning

- Place subject in a supine position, arms positioned comfortably above the head in a head-arm rest, lower legs supported.
- Using the laser positioning lights, line up the subject so the chest is iso-center (in the middle: left-right; up-down) of the CT gantry. *Correcting an off-center subject during image reconstruction is not acceptable. Proper positioning must be ensured prior to scanning.*
- Move the table so the subject is in the correct position for a chest CT scan.
- Once the subject is comfortably and properly positioned, remain in the scanner room and work with the subject to rehearse the breathing instructions used during CT acquisition several times. *It is important that the subject fully understands the breath hold and scanning procedure and that all concerns are addressed prior to performing the CT scan.*

Scan Coverage

CT scan must include the entire lungs, but ONLY the lungs. Start the scan precisely at the apex of the lungs and stop it once the scan is through the base of the lungs as shown in Figure 1.

- The DFOV should tightly fit the TLC lung for the QCT reconstruction as shown in Figure 2.
- The same DFOV should be used for the TLC and RV scans.
- The same DFOV should be used for all time points of a given subject.

Figure 1

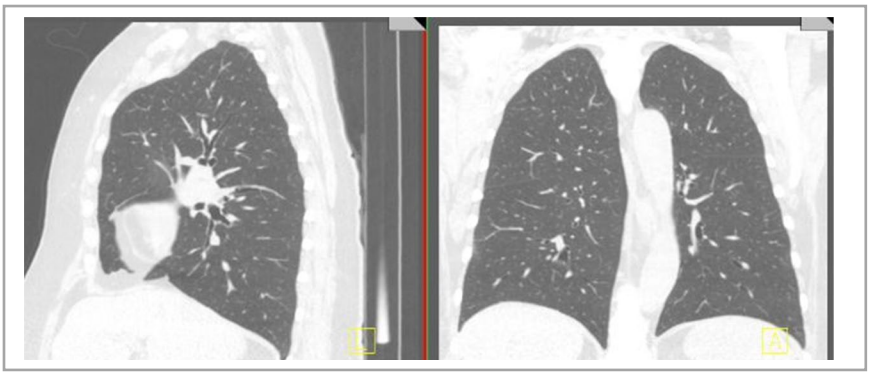
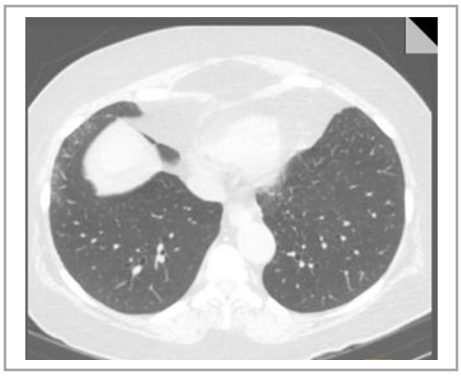


Figure 2



The following breathing instructions must be given to the subject:

*** Bold instructions are what must be said to the subject during CT.**

**** *(Italic)* information represents reminders directed towards the CT technologist.**

SCANNING:

Use the breathing instructions to perform:

- A practice breathing session
- Scouts - as needed - to position the FOV to cover the entire lung and as little soft tissue as possible
- The Inspiration CT scan (TLC)

Inspiratory CT (TLC)

BREATHING INSTRUCTIONS:

For this scan, I am going to ask you to take a couple of deep breaths in and out before we have you breathe all the way in and hold your breath.

Ok, let's get started,

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Now breathe all the way IN...IN...IN *(watch chest to ensure a deep breath in as far as possible)*

Keep holding your breath – DO NOT BREATHE!

At end of scan or practice: - **Breathe and relax**

CT Parameters

- The following parameters must be implemented for these CT scans.
- Scout scan uses default parameters (Site discretions on type and number of scouts, however must maintain ALARA principle).

Table 1: CT Protocol Siemens Somatom Go.Up 32

	INSPIRATION (TLC)
Scanner	Somatom Go.Up
Scan Type	Spiral (single source)
Rotation Time (s)	0.8
Det. Configuration	32 x 0.7mm
kV	110
Pitch	1.2
Dose Modulation	Off
Recon Algorithm 1 (For QCT analysis)	B35
Recon Algorithm 2 (For Visual analysis)	B45
Iterative Recon (noise reduction)	Do not use IRIS or SAPHIRE
Thickness (mm)	0.75
Interval (mm)	0.5
Est. Scan Time (Sec) 30cm length	<20

Effective mAs Selection

Small, medium or large Effective mAs settings for these scans are based upon the Body Mass Index (BMI). The BMI must be provided to the technologist to set the Effective mAs.

All subject scanning visits post-screening will be assigned to a different dose category only if the BMI changes between clinical visits by more than 3 AND crosses the 20 or 30 BMI thresholds.

Please use the table below to select the correct Effective mAs setting based on the subject's BMI.

Inspiration (TLC)

Effective mAs as a function of BMI: TLC Scan

BMI Range	Size	Eff. mAs setting to be used
< 20	Small (S)	90
20-30	Medium (M)	110
> 30	Large (L)	160

It is important that the subject fully understands the breath hold and scanning procedure and that all concerns are addressed prior to performing the CT scan. If this is a subsequent visit to the baseline visit, participants must be scanned with the same CT acquisition and reconstruction parameters used during the baseline CT visit.

Subject Positioning

- Place subject in a supine position, arms positioned comfortably above the head in a head-arm rest, lower legs supported.
- Using the laser positioning lights, line up the subject so the chest is iso-center (in the middle: left-right; up-down) of the CT gantry. Correcting an off-center subject during image reconstruction is not acceptable. Proper positioning must be ensured prior to scanning.
- Move the table so the subject is in the correct position for a chest CT scan.
- Once the subject is comfortably and properly positioned, remain in the scanner room and work with the subject to rehearse the breathing instructions used during CT acquisition several times. *It is important that the subject fully understands the breath hold and scanning procedure and that all concerns are addressed prior to performing the CT scan.*

Scan Coverage

CT scan must include the lungs, but ONLY the lungs. Start the scan precisely at the apex of the lungs and stop it once the scan is through the base of the lungs as shown in figure 1.

- The DFOV should tightly fit the TLC lung for the QCT reconstruction as shown in figure 2.
- The same DFOV should be used for the TLC and RV scans.
- The same DFOV should be used for all time points of a given subject.

Figure 1

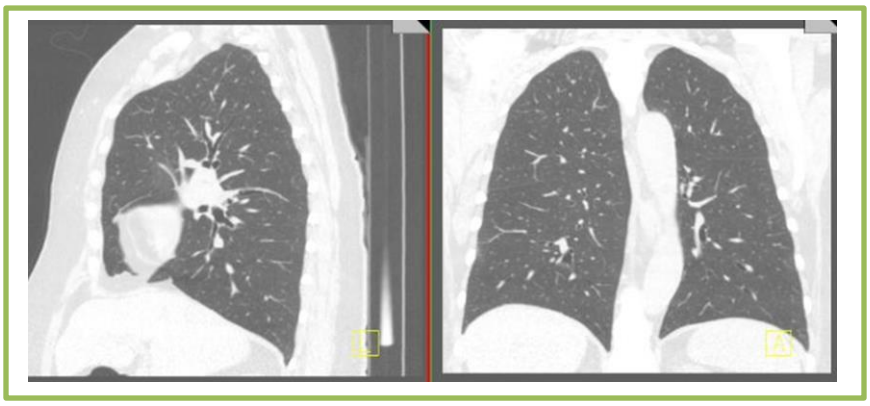


Figure 2

CT Parameters

- The following parameters must be implemented for these CT scans.
- Scout scan uses default parameters (Site discretions on type and number of scouts, however must maintain ALARA principle).

Table 1: CT Protocol Siemens Sensation 64

Scanner	Sensation 64
Scan Type	Spiral
Rotation Time (s)	0.5
Det. Configuration	64 x 0.6mm
kV	120
Pitch	1.0
Dose Modulation	Off
Recon Algorithm 1 (For QCT analysis)	B35
Recon Algorithm 2 (For Visual analysis)	B45
Iterative Recon (noise reduction)	Do not use IRIS or SAPHIRE
Thickness (mm)	0.75
Interval (mm)	0.5
Est. Scan Time (Sec) 30cm length	<10

Effective mAs Selection

Small, medium or large effective mAs settings for these scans are based upon the Body Mass Index (BMI). The BMI must be provided to the technologist to set the effective mAs.

All subject scanning visits post-screening will be assigned to a different dose category only if the BMI changes between clinical visits by more than 3 AND crosses the 20 or 30 BMI thresholds.

Please use the table below to select the correct effective mAs setting based on the subject's BMI.

Effective mAs as a function of BMI: TLC Scan

BMI Range	Size	Eff. mAs setting to be used
< 20	Small (S)	80
20-30	Medium (M)	100
> 30	Large (L)	150

The following breathing instructions must be given to the subject:

*** Bold instructions are what must be said to the subject during CT.**

**** *(Italic)* information represents reminders directed towards the CT technologist.**

SCANNING:

Use the breathing instructions to perform:

- A practice breathing session
- Scouts - as needed - to position the FOV to cover the entire lung and as little soft tissue as possible
- The Inspiration CT scan (TLC)

Inspiratory CT (TLC)

BREATHING INSTRUCTIONS:

For this scan, I am going to ask you to take a couple of deep breaths in and out before we have you breathe all the way in and hold your breath.

Ok, let's get started,

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Now breathe all the way IN...IN...IN *(watch chest to ensure a deep breath in as far as possible)*

Keep holding your breath – DO NOT BREATHE!

At end of scan or practice: - **Breathe and relax**

Table 2. Scanner-Specific Protocol Settings

Scanner Make	Siemens	Siemens	Siemens	GE	GE	Philips
Scanner model	Definition (AS Plus) 128 slice	Definition (DS) 64 slice	Sensation 64 slice	VCT 64 slice/ Discovery STE	Discovery CT 750HD 64 slice	Brilliance 64 slice
Scan type	Spiral	Spiral single source	Spiral	Helical	Helical - standard	Spiral helix
Scan FOV	No selection	No selection	No selection	Large	Large	No selection
Rotation time, s	0.5	0.5	0.5	0.5	0.5	0.5
Detector configuration	128 × 0.6	64 × 0.6	64 × 0.6	64 × 0.625	64 × 0.625	64 × 0.625
Pitch	1.0	1.0	1.0	0.984	0.984	0.923
kVp	120	120	120	120	120	120
Inspiration (TLC)	Effective mAs	Effective mAs	Effective mAs	mA	mA	mAs
Small	90	85	80	145	145	105
Medium	110	105	100	180	180	130
Large	165	150	145	270	270	190
Expiration (RV)	Effective mAs	Effective mAs	Effective mAs	mA	mA	mAs
Extra small	60					
Small		55	50	100	100	70
Medium/large	90	85	80	145	145	105
Dose modulation	Care dose off	Care dose off	Care dose off	Auto mA off	Auto mA off	Dose right (ACS) off
Standard algorithm	B35	B35	B35	Standard	Standard	B
Lung algorithm	B30	B31	None	Detail	Detail	YB
Additional image filters	No selection	No selection	No selection	No selection	IQ enhance off	Adaptive filtering off
Thickness, mm	0.75	0.75	0.75	0.625	0.625	0.67
Interval, mm	0.5	0.5	0.5	0.5	0.5	0.5
Iterative reconstruction (noise reduction algorithm)	Do not use IRIS	Do not use IRIS	No selection	Do not use ASIR	Do not use ASIR	Do not use iDOSE
Scan time, 30-cm length, s	<10	<10	<10	<10	<10	<10
Reconstruction mode	N/A	N/A	N/A	Plus	Plus	N/A
Smart mA	N/A	N/A	N/A	Off	Off	N/A

Definition of abbreviations: ACS = automatic current selection; ASIR = adaptive statistical iterative reconstruction; CT = computed tomography; FOV = field of view; IQ = intelligent quantitation; IRIS = iterative reconstruction in image space; kVp = peak kilovoltage; mAs = milliamperage seconds; N/A = not applicable; RV = residual volume; TLC = total lung capacity.

Standardizing on volumetric computed tomography dose index, protocols were developed for each scanner type within SPIROMICS (Subpopulations and Intermediate Outcome Measures in COPD Study) so as to maximize the similarity of image data across sites. At each of the two lung volumes, the CT protocol specifies the scanner model, scan mode, scan FOV, rotation time, detector configuration, pitch, kVp, mAs, dose modulation setting, reconstruction kernels, post-processing filter settings, slice thickness, slice interval, iterative reconstruction algorithm setting, scan time for 30-cm length, reconstruction mode, smart mA setting, and IQ enhance setting. Effective mAs represents the tube current–time product.

Written directions for the technologist (Appendix 1A and 1B) accompany the patient and include instructions to: (*1*) position the subject at the center of the CT scanner aperture by use of laser beams for left-to-right and ventral-to-dorsal centering, (*2*) scan only the *z*-axis length needed to include the apical to basal extent of the lungs, (*3*) select the display field of view (DFOV) limited to the most lateral extents of the lungs (providing maximal spatial resolution) at TLC and to keep the DFOV the same for TLC (inspiratory volume) and RV (expiratory volume). A consistent DFOV across lung volumes and longitudinally is important for comparison of airway and density metrics.

Breathing/breath-hold instructions (Appendix 2) are supplied within the CT technologist form, and technologists are instructed to coach the subject, as in a pulmonary function testing laboratory, to achieve both TLC and RV with a series of proceeding deep inspirations. Recorded instructions should not be used, as this takes the technologist's attention off of the subject.

At the time of training, it is emphasized that positioning of the patient in the isocenter of the CT scanner aperture is critical, as discussed in the report from the American College of Radiology (ACR) CT accreditation program (24). Isocenter positioning serves to reduce cone-beam and scatter artifacts.

Step 2: CT scanner calibration status. SPIROMICS requires that each scanner pass an initial calibration check. Scanners must have 64 detector rows or higher to provide imaging speeds adequate for a breath-hold. Precertified scanner information must also be preloaded into the QCT-LAS before onset of subject imaging. Each CT manufacturer has their own scanner-specific test object ("phantom") that assesses the calibration of several general scanner parameters, such as the value of water that should be 0 HU. The SPIROMICS CT protocol includes a specialized CT test object (referred to as the "COPDGene 1" test object) developed in the COPDGene study (25). Assurance of measurement stability of a given CT scanner is critical to any quantitative CT effort. If test object Hounsfield unit values shift by more than 3 HU in any material, the site is alerted and action is taken. Guidelines have been developed for the automated assessment of the appropriate positioning of the test object within the scanner to assure that object misalignment is not contributing to measured deviations (26).

Step 3: Scan acquisition and data entry. SPIROMICS developed Procedural Verification Software (PVS) to provide scanner information and track scan data in real time (Figure E2A). PVS provides an automated web portal system requiring a local computer and Internet connection. The main function of PVS is to provide a mechanism for subject registration before scanning and to provide the study coordinator with subject- and scanner-specific scan parameters from the QCT-LAS database using the subject's BMI. In a longitudinal study, such as SPIROMICS, PVS assures that follow-up scans match the baseline scan in terms of scan protocol, including scanning on the same scanner. Details are provided in the online supplement.

Appendix 1

A

SPIROMICS

CT TECHNOLOGIST INSTRUCTION FORM

SIEMENS DEFINITION AS+ & FLASH SCANNERS

It is important that the patient fully understands the breath hold and scanning procedure and that all concerns are addressed prior to performing the CT scan. If this is a subsequent visit to the baseline visit, participants must be scanned with the same CT acquisition and reconstructions parameters used during the baseline CT visit. Study coordinators will provide the baseline effective mAs and DFOV setting to use for the follow-up visit. All other scan parameters are provided below in Table 1. If you do not have the appropriate baseline information, do not perform the CT scans.

Patient Positioning

- Place patient in a supine position, arms positioned comfortably above the head in a head-arm rest, lower legs supported.
- Using the laser positioning lights, line up the patient so the chest is iso-center (in the middle: left-right; up-down) of the CT gantry.
- Move the table so the patient is in the correct position for a chest CT scan.

Scan Coverage

CT scan must include the lungs, but ONLY the lungs. Start the Scan precisely at the apex of the lungs and stop it once the scan is through the base of the lungs as shown in figure 1.

- The DFOV should tightly fit the TLC lung as shown in figure 2, then use the TLC DFOV for the RV scan so that all the scan reconstructions have the same DFOV. If this is a subsequent to the baseline visit, participants must have the same diameter field of view (DFOV) used during the baseline CT visit. Again, refer to the study coordinator for this information.

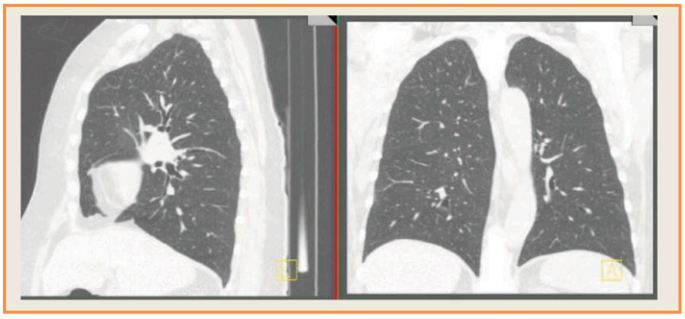


Figure 1

Figure 2

(*A* and *B*) Computed tomography (CT) technologist instruction forms. These forms provide information to ensure the technologists have all the proper information to complete the examinations within the guidelines of the study. The forms are made available through the Procedural Verification Software web system and may be downloaded and printed to take to the scanner room or used for study reference. ALARA = as low as reasonably achievable; DFOV = display field of view; mAs = milliamperage seconds; RV = residual volume; TLC = total lung capacity.

B

CT TECHNOLOGIST INSTRUCTION FORM

SIEMENS DEFINITION AS+ & FLASH SCANNERS

CT Parameters

- The following parameters must be implemented for these CT scans.
- Scout scan uses default parameters (Site discretions on type and number of scouts, however must maintain ALARA principle)

Table 1: CT Protocol Siemens Definition AS+ & FLASH

	INSPIRATION (TLC) EXPIRATION (RV)
Scanner	AS+ & FLASH
Scan Type	Spiral
Rotation Time (s)	0.5
Det. Configuration	128 x 0.6mm
kV	120
Pitch	1.0
Dose Modulation	Off
Recon Algorithm 1	B35
Recon Algorithm 2	B30
Iterative Recon (noise reduction)	Do not use IRIS or SAPHIRE
Thickness (mm)	0.75
Interval (mm)	0.5
Est. Scan Time (Sec) 30cm length	<10

Effective mAs Selection

Small, medium or large effective mAs settings for the SPIROMICS scans are based upon the Body Mass Index (BMI). The BMI must be provided to the technologist to set the effective mAs.

Please use the table below to select the correct mAs setting based on the patient's BMI.

If this is a subsequent visit to the baseline visit, please refer to the study coordinator for the appropriate effective mAs. Do not use these tables for the follow-up scans.

Effective mAs as a function of BMI: TLC Scan

BMI Range	Size	Eff. mAs setting to be used
< 20	Small (S)	85
20-30	Medium (M)	105
> 30	Large (L)	150

Effective mAs as a function of BMI: RV Scan

BMI Range	Size	Eff. mAs setting to be used
< 30	Small (S) Medium (M)	60
> 30	Large (L)	85

Appendix 2

CT TECHNOLOGIST INSTRUCTION FORM

SIEMENS DEFINITION AS+ & FLASH SCANNERS

The following breathing instructions must be given to the patient:

* **Bold instructions are what must be said to the subject during CT.**

** **(italic) information represents reminders directed towards the CT technologist.**

SCANNING:

Use the breathing instructions to perform:

- A practice breathing session
- Scouts - as needed - to position the FOV to cover the entire lung and as little soft tissue as possible
- The Inspiration CT scan (TLC)

Inspiratory CT (TLC)

BREATHING INSTRUCTIONS:

For this scan, I am going to ask you to take a couple of deep breaths in and out before we have you breathe all the way in and hold your breath.

Ok, lets get started,

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Now breathe all the way IN...IN...IN *(watch chest to ensure a deep breath in as far as possible)*

Keep holding your breath – DO NOT BREATHE!

At end of scan or practice: - **Breathe and relax**

SCANNING

Use the breathing instructions to perform:

- A practice breathing session
- Scouts - as needed - to position the FOV to cover the entire lung and as little soft tissue as possible
- The Expiration CT scan (RV)

Expiratory CT (RV)

BREATHING INSTRUCTIONS:

For the second part of this scan, I am going to ask you to take a couple of deep breaths in and out before we have you hold your breath all the way out.

Now we're ready again so please,

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Take a deep breath in *(watch chest to ensure a deep breath in)*

Let it out *(watch chest to ensure air is out)*

Take another deep breath in *(watch chest to ensure a deep breath in)*

Now let it all the way OUT... OUT... OUT... as far as possible and hold it out *(watch chest to ensure all air is out before starting the scan)*

Keep holding your breath – DO NOT BREATHE! *Watch chest to ensure a deep breath as far in as possible, spine remains on the table, patient is not shaking and then start scan and watch for these signs throughout study!)*

Breathe and relax

Each computed tomography (CT) technologist form contains proper breathing instructions for a given site's scanner at the time of scanning the subjects. The form is made available through the Procedural Verification Software web system and may be downloaded and printed to take to the scanner room or used for study reference. FOV = field of view; RV = residual volume; TLC = total lung capacity.