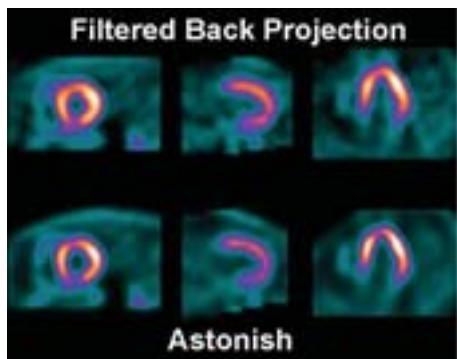


Astonish SPECT

Cardiac Astonish Acquisition Guide

Astonish SPECT is an advanced reconstruction algorithm within the AutoSPECT application of JETStream Workspace to dramatically reduce cardiac acquisition times or improve image quality in SPECT data sets. Astonish provides patient-specific and photon-specific corrections for resolution, scatter and attenuation and uses a Philips exclusive matched dual filtering technique.



How does Astonish SPECT work?

Astonish uses an iterative 3D-OSEM (Ordered Subset Expectation Maximum) algorithm with built-in corrections for resolution recovery, scatter, and attenuation correction. An accurate model of each Philips camera, each collimator, and the measured imaging distance for each acquisition angle is applied to the patient data to remove the blurring effect of the collimator. Scatter and attenuation correction can also be applied if an attenuation map* is present.

What image quality improvement is possible?

Reconstructed resolution has been shown in the NEMA SPECT phantom to improve from 10-11 mm to PET-like levels of 4-5 mm. Image contrast and signal-to-noise ratio also are improved with Astonish reconstruction.**

Can Astonish be used with Gated SPECT data?

Yes, Astonish supports both SPECT and Gated SPECT data sets.

What cardiac radionuclides are supported with Astonish?

Astonish supports both Tc-99m and TI-201 agents.

How can Astonish be used to improve throughput?

Astonish cardiac images with half the counts as standard imaging have been shown*** to have equivalent image quality as filtered back projection data with full counts. Tc-99m MIBI Perfusion SPECT, Gated SPECT, and TI-201 SPECT acquisition times may be reduced due to the improved signal-to-noise characteristics of Astonish. Astonish may be used on full count data (64 projections @ 20 sec/proj, per ASNC guidelines) to improve image quality or on half count data with equivalent image quality. Half count data may be acquired at either half frame (32 projections @ 20 sec/proj) or half time (64 projections @ 10 sec/proj).

What other studies may be used with Astonish?

Astonish can be applied to SPECT studies using Tc-99m, TI-201, In-111, Ga-67, I-123, or I-131. Care should be used that the user evaluates, as with any reconstruction technique, the processing parameters for appropriate resolution and noise characteristics.

* Astonish supports CT-based attenuation maps. Vantage attenuation maps have not been validated for use with Astonish.

** White Paper: "SPECT Image Quality Improvement with Astonish Software"; January, 2006; available in Philips Literature Store

*** Society of Nuclear Medicine Midwinter Meeting; February 11, 2006; Tempe, Arizona

PHILIPS

Example 1: Full Count acquisition for improved image quality.

Acquisition

Patient Information Protocol Information

Protocol Name: RST-STR CARDIOLITE Step: REST Step Type: SPECT

Detector / Imaging

Detector(s): 1 & 2 Study Save Option:

Detector 1: PROJECTION-R Detector 2:

View ID: Position: Supine

Flood: Tc-99m_INTR Tc-99m_INTR

Collimator ID: LEHR

Zoom: 1.46 x (40.9) cm

Matrix Size: 64 x 64

Orientation / State

Orientation: Feet First

State: None

Organ: Other

Save Location

Save Location: Pegasys

Dosage / Energy Window

Radiopharma: Dosage: Date: (8 Mar 29, 2006) Time: (8:51 AM)

 mCi mCi

Detector 1: Tc-99m Detector 2:

Stop Criteria

Stop Control: Stop all series

Number of Angles: 64 Rotations: 1

Detector 1: 20 Detector 2: 10 sec

Time/Angle:

Counts/Angle:

Saturation Level: 32,767

Saturation Behavior: Continue

SPECT

Detector Relative Angle: 90 1 

Starting Angle: 45

Rotation Direction: Counterclockwise

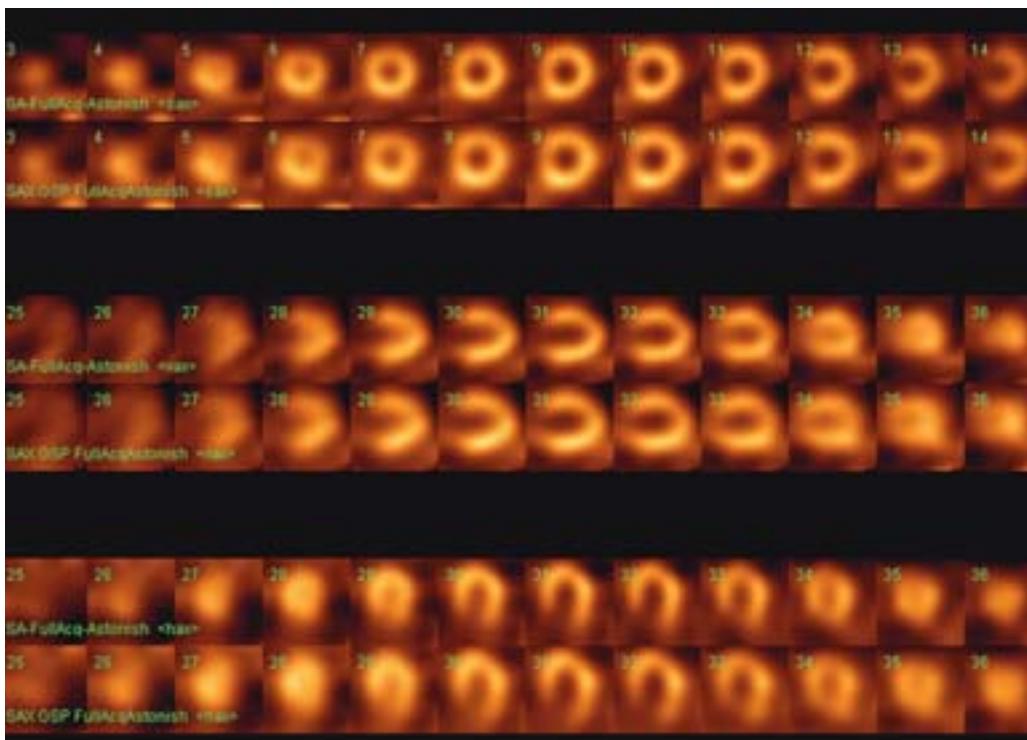
Imaging Arc:

SPECT Mode: Step

Orbit type: Non-Circular

Processing

Astonish: 4 iterations, 16 subsets, Hanning 1.50 (Perfusion and Gated SPECT)



Top row:
Full Count Astonish Perfusion
Bottom row:
Full Count Astonish
Gated SPECT

Example 3: HalfTime acquisition for equivalent image quality.

Acquisition

Protocol Name: RST-STR CARDIOLITE Step: REST Step Type: SPECT

Detector / Imaging

Detector(s): 1 & 2	Study Save Option: <input type="button" value="Save Study"/>
Detector 1	Detector 2
View ID: PROJECTION-R	<input type="button" value="View Options"/>
Flood: Tc-99m_INTR	Tc-99m_INTR
Collimator ID: LEHR	<input type="button" value="Collimator Options"/>
Zoom: 1.46 x (40.9) cm	<input type="button" value="Zoom Options"/>
Matrix Size: 64 x 64	<input type="button" value="Matrix Options"/>

Orientation / State

	Position: Supine	Save Location: Pegasys
	Orientation: Feet First	
	State: None	Organ: Other

Dosage / Energy Window

Radiopharma: Tc-99m	Dosage: <input type="text" value=""/>	Date: (8 Mar 29, 2000)	Time: (0:51:14 AM)
	<input type="button" value="mCi"/>		
	<input type="button" value="mCi"/>		

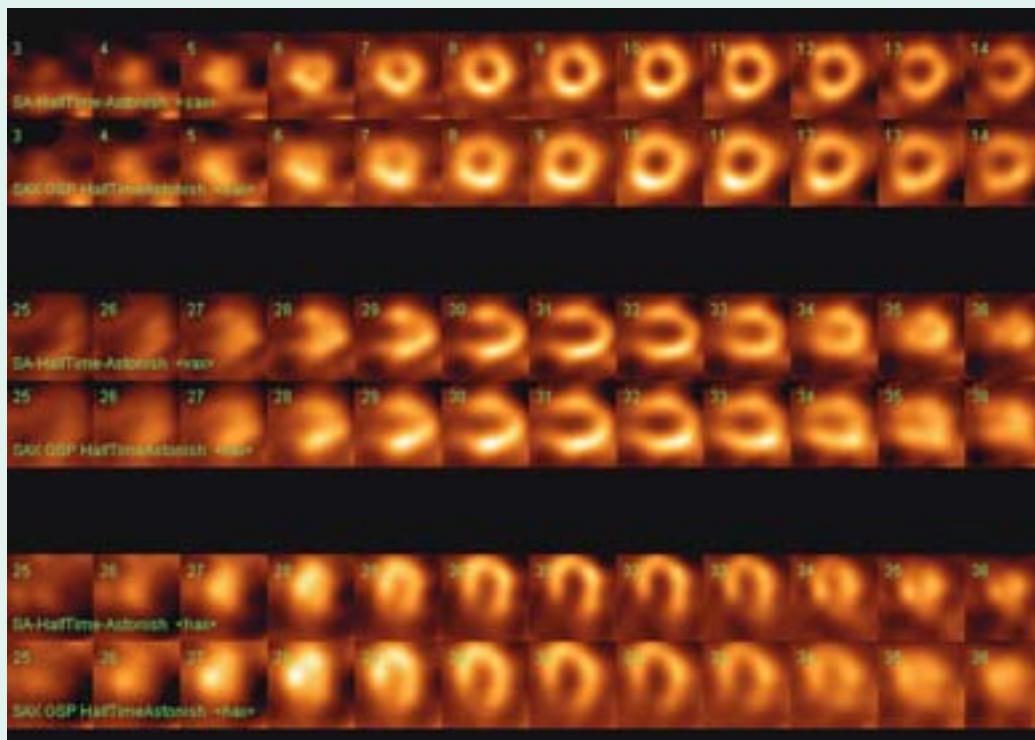
Detector 1 Tc-99m

Stop Criteria

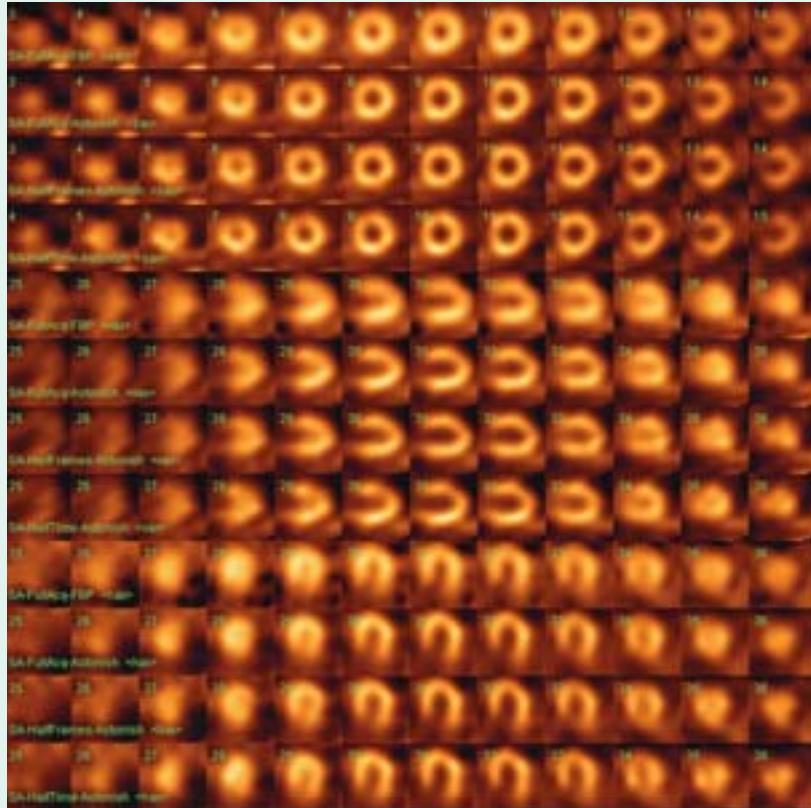
Stop Control: <input type="button" value="Stop All Views"/>	SPECT
Number of Angles: 64	Detector Relative Angle: 90
Detector 1	Starting Angle: 45
Detector 2	Rotation Direction: Counterclockwise
Time/Angle: 10	Imaging Arc: <input type="button" value=""/>
KCounts/Angle:	SPECT Mode: Step
Saturation Level: 32,767	Orbit type: Non-Circular
Saturation Behav...: Continue	

Processing

Astonish: 4 iterations, 8 subsets, Hanning 1.14 (Perfusion and Gated SPECT)



Top row:
Half Time Astonish Perfusion
Bottom row:
Half Time Astonish Gated SPECT



Comparison of FBP with Astonish (Perfusion)

Row 1: FBP

Standard FBP; Butterworth; Analytic; Cut-off 0.66, Filter Order 5.00

Row 2: Full Count Astonish

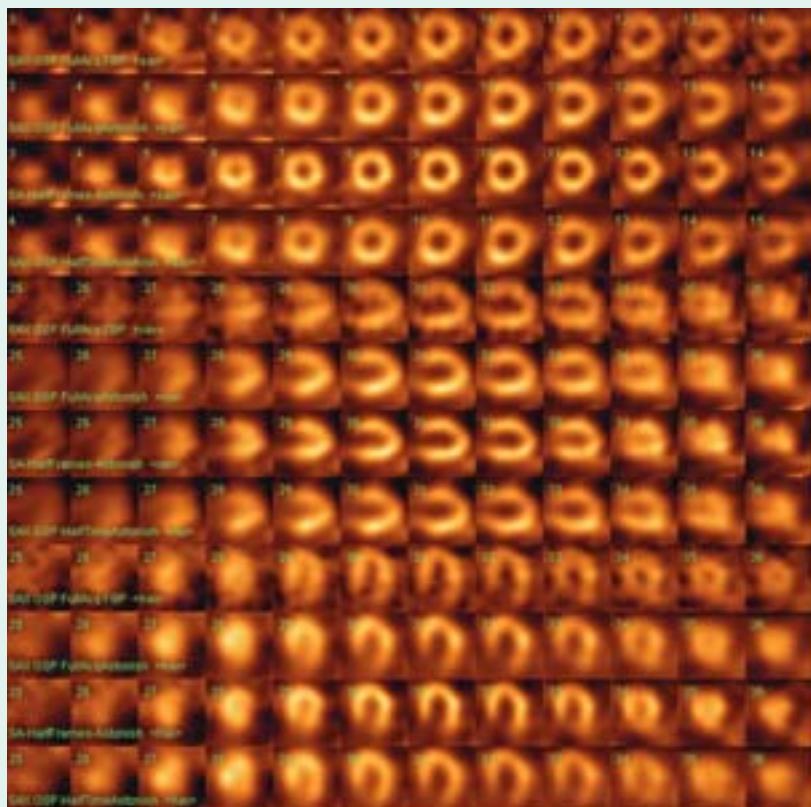
4 iterations, 16 subsets, Hanning 1.50

Row 3: Half Frame Astonish

4 iterations, 8 subsets, Hanning 1.14

Row 4: Half Time Astonish

4 iterations, 8 subsets, Hanning 1.14



Comparison of FBP with Astonish (Gated SPECT)

Row 1: FBP

Standard FBP; Butterworth; Analytic; Cut-off 0.66, Filter Order 5.00

Row 2: Full Count Astonish

4 iterations, 16 subsets, Hanning 1.50

Row 3: Half Frame Astonish

4 iterations, 8 subsets, Hanning 1.14

Row 4: Half Time Astonish

4 iterations, 8 subsets, Hanning 1.14

Example 2: Half Frame acquisition for equivalent image quality.

Acquisition

Protocol Name: RST-STR CARDIOLITE Step: REST Step Type: SPECT

Detector / Imaging		Orientation / State		Save Location	
Detector(s): 1 & 2	Study Save Option:	Position: Supine	Orientation: Feet First	Save Location: Pegasys	
View ID: PROJECTION-R	Detector 1	Detector 2			
Flood: Tc-99m_INTR	Tc-99m_INTR				
Collimator ID: LEHR	LEHR				
Zoom: 1.46 x (40.9) cm	1.46 x (40.9) cm	Hanning			
Matrix Size: 64 x 64	64 x 64				

Dosage / Energy Window

Radiopharma:	Dosage:	Date:	Time:
	mCi	(e.g. Mar 29, 2006)	(e.g. 11:14 AM)
	mCi		

Detector 1 Tc-99m Detector 2

Stop Criteria

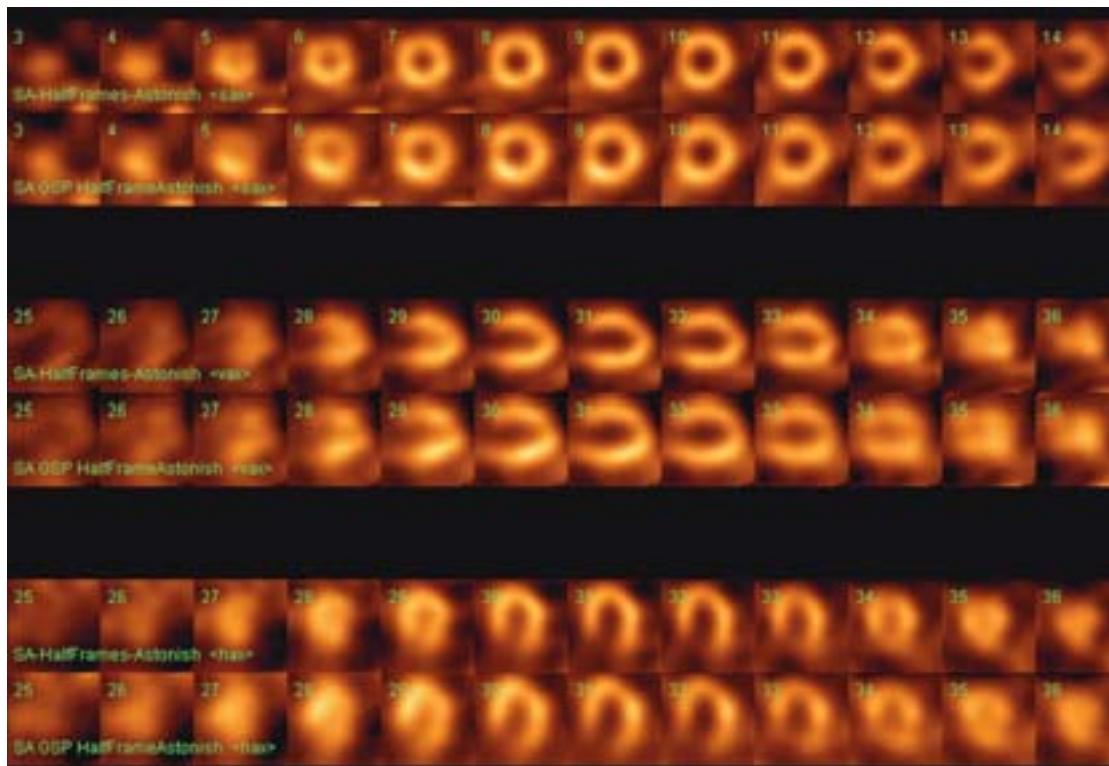
Stop Control:	Stop all views
Number of Angles:	32
Detector 1	Rotations: 1
Time/Angle:	20 sec
KCounts/Angle:	
Saturation Level:	32,767
Saturation Behav.:	Continue

SPECT

Detector Relative Angle:	90
Starting Angle:	45
Rotation Direction:	Counterclockwise
Imaging Arc:	
SPECT Mode:	Step
Orbit type:	Non-Circular

Processing

Astonish: 4 iterations, 8 subsets, Hanning 1.14 (Perfusion and Gated SPECT)



Top row:
Half Frame Astonish Perfusion
Bottom row:
Half Frame Astonish Gated SPECT



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