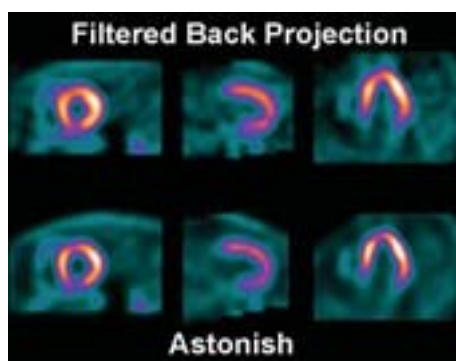


Astonish SPECT

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		Orientation / State	Save Location
Detector(s): 1 & 2	Study Save Option: <input type="button" value="Change Study"/>		Save Location: Pegasys
Detector 1: PROJECTION-R	Detector 2: PROJECTION-R		
Flood: Tc-99m_INTR	Tc-99m_INTR		
Collimator ID: LEHR	LEHR		
Zoom: 1.46 x (40.9) cm	1.76 x (45.7) cm		
Matrix Size: 64 x 64	64 x 64		

Dosage / Energy Window

Radiopharm: Dosage: Date: (e.g. Mar 29, 2006) Time: (e.g. 5:54 AM)

Detector 1: Detector 2:

Stop Criteria

Stop Control: ☐ Stop all series

Number of Angles: 64 Rotations: 1

Time/Angle: 20 10 sec

Counts/Angle:

Saturation Level: 32,767 32,767

Saturation Behav... Continue

SPECT

Detector Relative Angle: 90

Starting Angle: 45

Rotation Direction: Counterclockwise

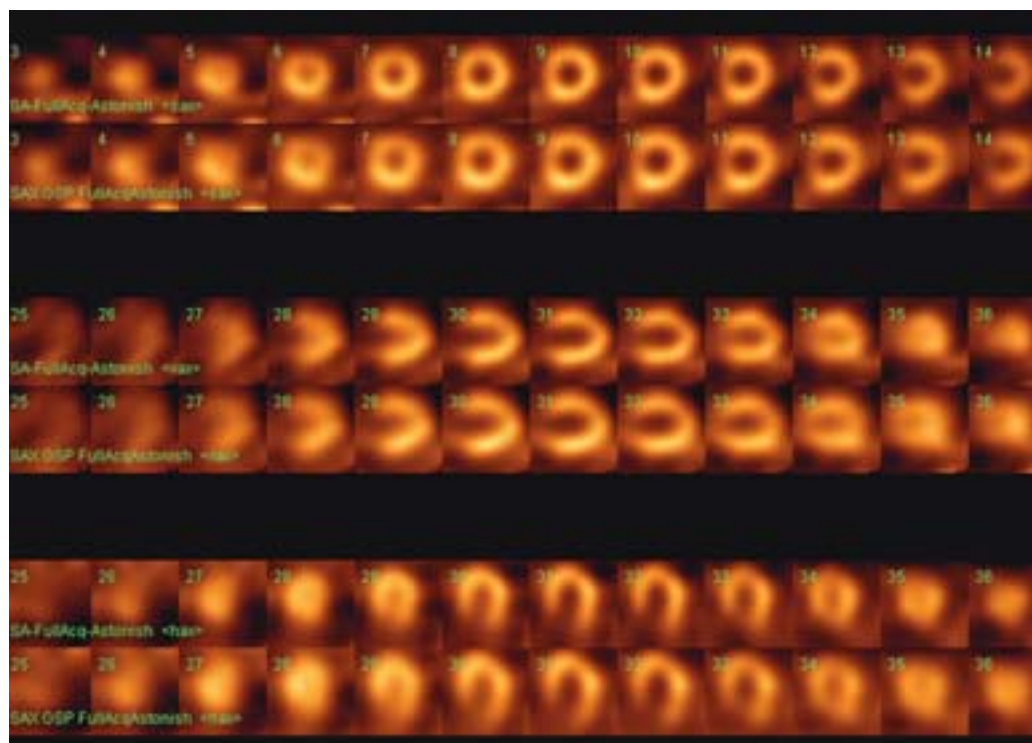
Imaging Arc:

SPECT Mode: Step

Orbit type: Non-Circular

Processing





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



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

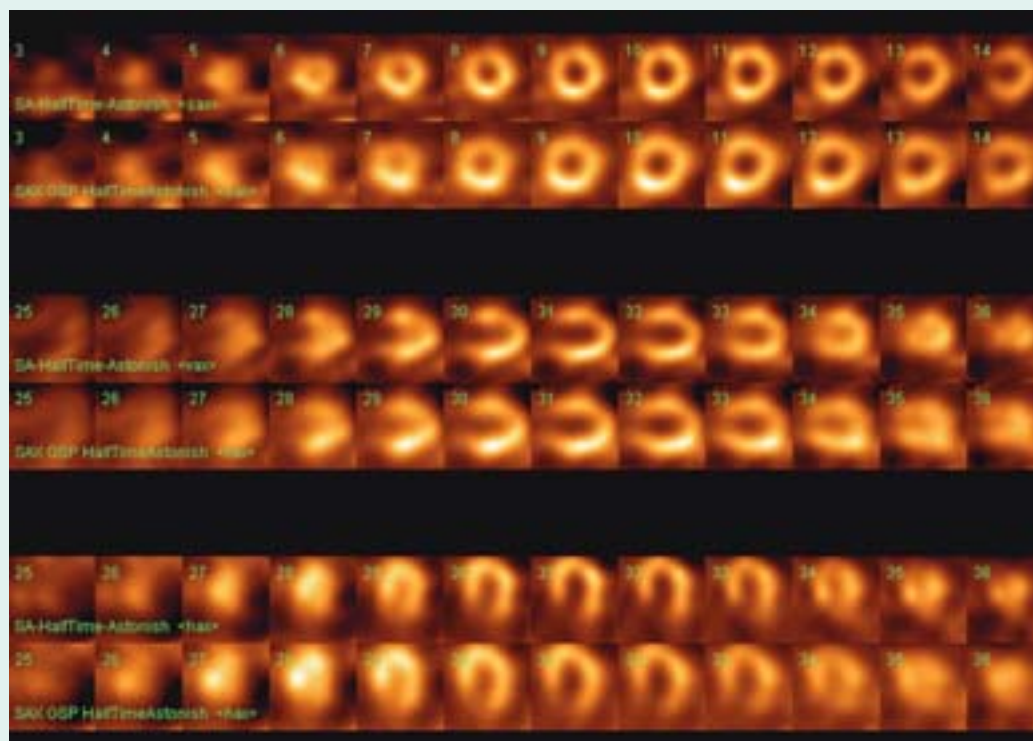
Example 3: HalfTime acquisition for equivalent image quality.

Acquisition

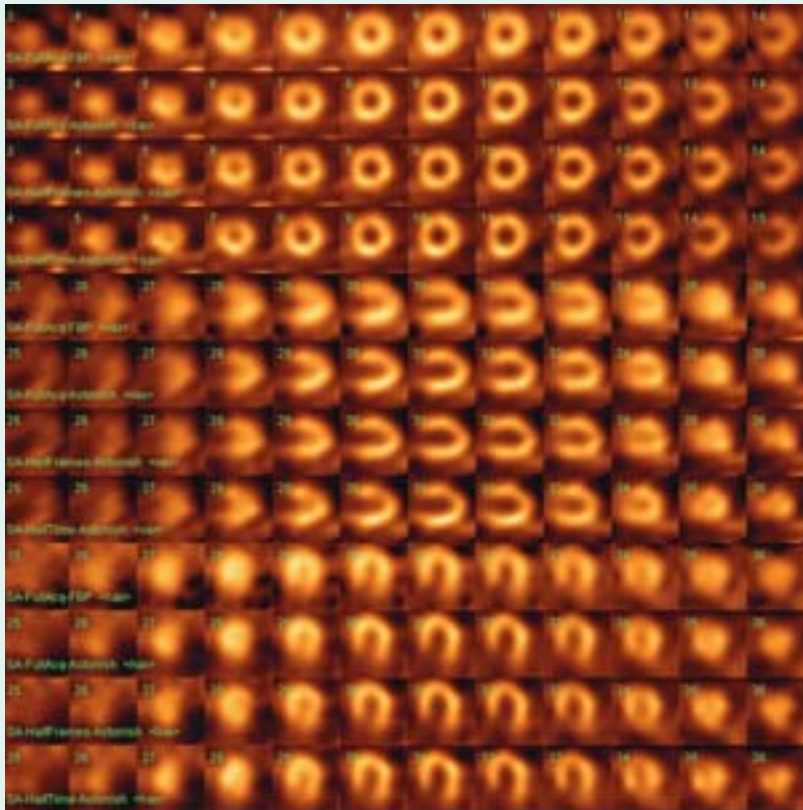
Protocol Name: RST-STR CARDIOLITE		Step: REST	Step Type: SPECT
Detector / Imaging		Orientation / State	Save Location
Detector(s): 1 & 2	Study Save Option: Single Study		Position: Supine
Detector 1	Detector 2		Save Location: Pegasys
View ID: PROJECTION-R	PROJECTION-L		Orientation: Feet First
Flood: Tc-99m_INTR	Tc-99m_INTR		State: None
Collimator ID: LEHR	LEHR		Organ: Other
Zoom: 1.46 x (40.9) cm	1.46 x (40.9) cm	Transax	
Matrix Size: 64 x 64	64 x 64		
Dosage / Energy Window			
Radiopharma:	Dosage:	Date: (Fri Mar 26, 2004)	Time: (Fri 5:14 AM)
	mCi		
	mCi		
Detector 1:  Tc-99m	Detector 2:  Tc-99m		
Stop Criteria		SPECT	
Stop Control: 23. Stop all views			
Number of Angles: 64	Rotations: 1	Detector Relative Angle: 90	
Detector 1	Detector 2	Starting Angle: 45	
Time/Angle: 10	10	Rotation Direction: Counterclockwise	
KCounts/Angle:		Imaging Arc:	
Saturation Level: 32,767	32,767	SPECT Mode: Step	
Saturation Behav...: Continue	Continue	Orbit type: Non-Circular	

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**

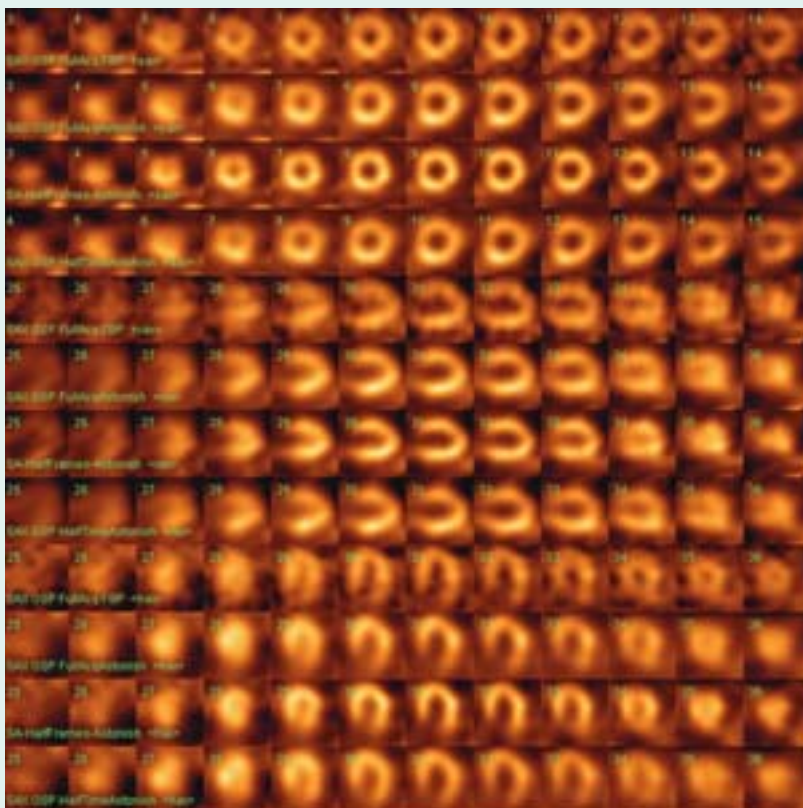
4 iterations, 16 subsets, Hanning 1.50

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

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

Detector 1: View ID: PROJECTION-R Flood: Tc-99m_INTR Collimator ID: LEHR Zoom: 1.46 x (40.9) cm Matrix Size: 64 x 64

Detector 2: View ID: PROJECTION-L Flood: Tc-99m_INTR Collimator ID: LEHR Zoom: 1.46 x (40.9) cm Matrix Size: 64 x 64

Orientation / State

Position: Supine Orientation: Feet First State: None Organ: Other

Save Location

Save Location: Pegasus

Dosage / Energy Window

Radiopharma: Dosage: Date: (4/5 Mar 2006) Time: (4:5:14 AM)

Detector 1: Tc-99m Detector 2: Tc-99m

Stop Criteria

Stop Control:

Number of Angles: 32 Rotations: 1

Time/Angle: 20 sec

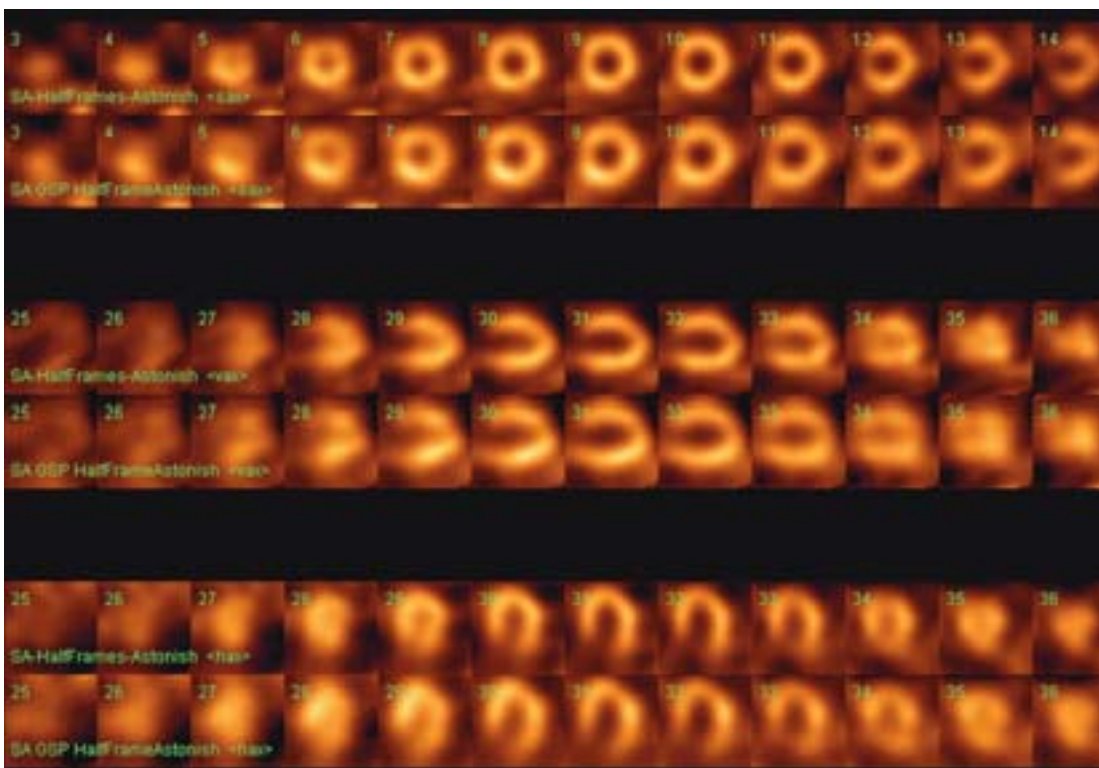
KCounts/Angle: Saturation Level: 32,767 Saturation Behav: Continue

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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