NICE National Institute for Health and Care Excellence

Diagnostics Assessment Programme

Technical supplement: summary of main changes to CT scanners

New generation cardiac CT scanners (Aquilion ONE, Brilliance iCT, Discovery CT750 HD and Somatom Definition Flash) for cardiac imaging in people with suspected or known coronary artery disease in whom imaging is difficult with earlier generation CT scanners

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1 Background

This technical supplement is linked to the HealthTech guidance on new generation cardiac CT scanners (Aquilion ONE, Brilliance iCT, Discovery CT750 HD and Somatom Definition Flash) for cardiac imaging in people with suspected or known coronary artery disease in whom imaging is difficult with earlier generation CT scanners. Some of the CT scanners have been updated since publication of this guidance. This technical supplement provides information on the versions of the CT scanners included in the guidance and highlights the major features of the latest versions. It does not include information on any new CT scanners launched since publication of this guidance. This technical supplement does not update or change the recommendations in the guidance. The guidance applies to the product versions described in this technical supplement.

2 Technical information

2.1 GE Healthcare

The Discovery CT750 HD scanner is no longer available in the UK, and has been replaced with 2 updated versions, the Revolution HD and the Revolution GSI. These models have the same functionality, but Gemstone Spectral Imaging (GSI) and dual energy scanning with rapid kV switching technology are optional on the Revolution HD scanner and standard on the Revolution GSI scanner.

The technical specifications of the Discovery CT750 HD and the Revolution HD and GSI scanners are presented in table 1.

Table 1 Technical specifications of the Discovery CT750, the Revolution HD and the Revolution GSI scanners

Technical specification	**Discovery CT750 HD (model no longer available)**	**Revolution HD and Revolution GSI**
Version number	11HW44.11	15MW42.11
Number of X-ray sources	Single	Single
Total z-axis detector coverage (mm)	40	40
z-axis detector configuration (number of detectors × detector width in mm)	64×0.625	64×0.625
Minimum gantry rotation time (seconds)	0.35	0.35 0.058 equivalent with Snapshot Freeze for cardiac applications
X-ray generator power (kW)	100	100
X-ray tube potential range (minimum to maximum kV)	80, 100, 120, 140	80, 100, 120, 140 kV Assist automatic selection of tube potential
Gantry bore diameter (mm)	700	700
Maximum couch load (kg)	227 (optional 306)	227 (optional 306)
Maximum number of reconstructed slices per rotation in axial mode	128 (except for cardiac applications)	128 (except for cardiac applications)
Iterative reconstruction	ASiR (standard)	ASiR-V (standard) Veo, model-based iterative reconstruction (optional)
Dual energy functionality	Rapid kV switching	Revolution HD: Rotate/Rotate (standard) Rapid kV switching (optional) Revolution GSI: Rapid kV switching (standard)
CE-marking or licensing information	Not applicable	Class IIb, awarded on 10 October 2014
Price if bought directly from the company (as at June 2016)	Not applicable	GSI: £600–£650k; HD: £550–£600k

The Discovery CT750 HD scanner has:

- SnapShot Freeze motion correction software
- GSI dual energy functionality for cardiac applications
- enhancements in standard iterative reconstruction (ASIR to ASIR-V)
- kV Assist automatic kV selection tool
- SMART metal artifact reduction software.

Look online or contact GE Healthcare for further information on the Revolution HD and Revolution GSI scanners.

2.2 Philips Healthcare

The iCT Elite scanner is the same model as the Brilliance iCT scanner included in the guidance, but with improved software. The scanner was renamed to follow Philips' current naming convention.

The technical specifications of the Brilliance iCT scanner and the iCT Elite scanner are presented in table 2.

Table 2 Technical specifications of the Brilliance iCT and the iCT Elite scanners

Technical specification	Brilliance iCT	iCT Elite
Version number	Software version: 3	Software version: 4
Number of X-ray sources	Single	Single
Total z-axis detector coverage (mm)	80	80
z-axis detector configuration (number of detectors × detector width in mm)	128×0.625 detectors (with 256 detector electronic channels)	128×0.625 detectors (with 256 detector electronic channels)
Minimum gantry rotation time (seconds)	0.27	0.27
X-ray generator power (kW)	120	120
X-ray tube potential range (minimum to maximum kV)	80, 100, 120, 140	80, 100, 120, 140
Gantry bore diameter (mm)	700	700
Maximum couch load (kg)	204 (optional 295)	204 (optional 295)
Maximum number of reconstructed slices per rotation in axial mode	256 slices acquired with z-axis flying focal spot	256 slices acquired with z-axis flying focal spot
Iterative reconstruction	iDose[4] (standard)	iDose[4] Premium Package (standard) IMR (iterative model reconstruction; optional)
Dual energy functionality		Dual Spin DE[1] acquisition (standard) Dual Energy Analysis Platform

		(optional)
CE marking/ licensing information	Not applicable	Class IIb, awarded on 18 March 2013
Price if bought directly from the company (as at June 2016)	Not applicable	£750–£800k depending on the final specification
[1] Dual spin DE uses dual axial rotation with spin 1 at 80 kV and spin 2 at 140 kV in the same z-position.		

The Brilliance iCT scanner software has:

- iPatient user interface
- DoseRight Indexing (noise level control)
- Liver/Brain Boost (targeted organ dose modulation)
- 3D-DOM (simultaneous x/y and z-plane dose modulation)
- NEMA XR-25 Dose Check
- optional IMR (iterative model reconstruction)
- iDose[4] Premium Package provided with O-MAR metal artifact reduction
- structured dose reporting
- Integrating the Healthcare Enterprise (IHE) radiation exposure monitoring (REM) profiles.

Look online or contact Philips Healthcare for further information about the iCT Elite scanner.

2.3 Siemens Healthcare

The Somatom Definition Flash scanner that was included in the guidance is no longer available in the UK. It has been replaced with an updated version, the Somatom Definition Flash Stellar scanner, which is also often called the Somatom Definition Flash, and has been available since June 2012.

The technical specifications of the Somatom Definition Flash and the Somatom Definition Flash Stellar scanners are presented in table 3.

Table 3 Technical specifications of the Somatom Definition Flash and the Somatom Definition Flash Stellar scanners

Technical specification	**Somatom Definition Flash (model no longer available)**	**Somatom Definition Flash Stellar**
Version number	Software version: VA40A	Software version: VA48
Number of X-ray sources	Dual	Dual
Total z-axis detector coverage per	38.4	38.4

source-detector assembly (mm)		
z-axis detector configuration (number of detectors × detector width in mm)	64×0.6 detectors per source-detector assembly (with 128 detector electronic channels per source-detector assembly)	64×0.6 Stellar detectors per source-detector assembly (with 128 detector electronic channels per source-detector assembly)
Minimum gantry rotation time (seconds)	0.28 (standard in the UK)	0.28 (standard in the UK)
X-ray generator power (kW)	100 per source-detector assembly	100 per source-detector assembly
X-ray tube potential range (minimum–maximum kV)	70, 80, 100, 120, 140 CAREkV automatic selection based on protocol information and patient's physical build	70, 80, 100, 120, 140 CAREkV automatic selection based on protocol information and patient's physical build
Gantry bore diameter (mm)	780	780
Maximum couch load (kg)	227 (optional 300)	227 (optional 307)
Maximum number of reconstructed slices per rotation in axial mode	128 acquired overlapping slices per source-detector assembly	Up to 384 overlapping slices per source-detector assembly can be reconstructed in '3D sequence mode' from the 128 slices acquired with z-axis flying focal spot (z-sharp)
Iterative reconstruction	IRIS iterative reconstruction SAFIRE raw data based iterative reconstruction (standard in UK)	SAFIRE raw data based iterative reconstruction (standard) ADMIRE advanced model based iterative reconstruction (optional)
Dual energy functionality	Dual source dual energy	Dual source dual energy with Selective Photon Shield (standard) Allows dose neutral high speed dual energy scanning
CE marking/ licensing information	Not applicable	Class IIb, awarded on 18 December 2015
Price if bought directly from the company (prices as at June 2016)	Not applicable	£700–£1000k, depending on the final specification

The Somatom Definition Flash scanner has:

- new Stellar detector
- SAFIRE reconstruction software
- optional ADMIRE iterative reconstruction software
- iMAR metal artifact reduction
- faster reconstruction times than the original Flash (60 frames per second compared with 50 frames per second).

Look online or contact Siemens Healthcare for further information about the Somatom Definition Flash Stellar scanner.

2.4 Toshiba Medical Systems

The Aquilion ONE scanner, which was included in the guidance, and its replacement, the Aquilion ONE ViSION scanner, are no longer available in the UK. The Aquilion ONE GENESIS Edition scanner has been available since June 2016.

The technical specifications of the Aquilion ONE and the Aquilion ONE GENESIS Edition scanner are presented in table 4.

Table 4 Technical specifications of the Aquilion ONE and the Aquilion ONE Genesis Edition scanners

Technical specification	Aquilion ONE (model no longer available in the UK)	Aquilion ONE GENESIS Edition
Version number	Product version: TSX-301A Software version: 4.74	Product version: TSX-305A Software version: 8
Number of X-ray sources	Single	Single
Total z-axis detector coverage (mm)	160	160
z-axis detector configuration (number of detectors × detector width in mm)	320×0.5	320×0.5
Minimum gantry rotation time (seconds)	0.35	0.35 (optional 0.275)
X-ray generator power (kW)	72	72 (optional 100)
X-ray tube potential range (minimum maximum kV)	80, 100, 120, 135	80, 100, 120, 135 SUREkV automatic kV selection
Gantry bore diameter (mm)	720	780
Maximum couch load (kg)	315 (including15 kg of accessories)	315 (including15 kg of accessories)
Maximum number of reconstructed slices per rotation in axial mode	320	640
Iterative reconstruction	AIDR (standard)	AIDR 3D Enhanced (standard) FIRST model-based iterative reconstruction (optional)
Dual energy functionality	One rotation at 1 energy level followed by rotation at second energy level, allowing both mA and kV to be optimised (optional)	One rotation at 1 energy level followed by rotation at second energy level, allowing both mA and kV to be optimised (optional)
CE marking/ licensing information	Not applicable	Class IIb, awarded on 17 December 2015
Price if bought directly from the company (prices as at June 2016)	Not applicable	From £600k, depending on the configuration options chosen

The Aquilion ONE scanner has:

- PUREVision Optics detector and X-ray optics
- larger gantry opening

- flared gantry for better patient access
- increased gantry tilt capability to 30°
- lateral couch movement
- laser collimation to aid patient positioning
- SURE kV optimal kV selection
- SURE Exposure 3D adaptive mA modulation (corrects for non-centred patient)
- SEMAR™ and Cardiac SEMAR single-energy metal artifact reduction
- AMC automatic cardiac motion correction
- Further enhancements to SURE Subtraction (for example, SURE Subtraction Coronary, SURE Subtraction Lung, SURE Subtraction Angio, and SURE Subtraction Iodine).

The Aquilion ONE GENESIS Edition scanner also has the following options:

- faster rotation time and more powerful X-ray generator
- image reconstruction enhancements and FIRST model-based iterative reconstruction software
- upgrade of the original AIDR iterative reconstruction software
- doubling of the number of reconstructed slices to 640 per rotation in axial scan mode
- faster image reconstruction rates (from 50 frames per second to 80 frames per second with AIDR 3D).

Look online or contact Toshiba Medical Systems for further information about the Aquilion ONE GENESIS Edition scanner.