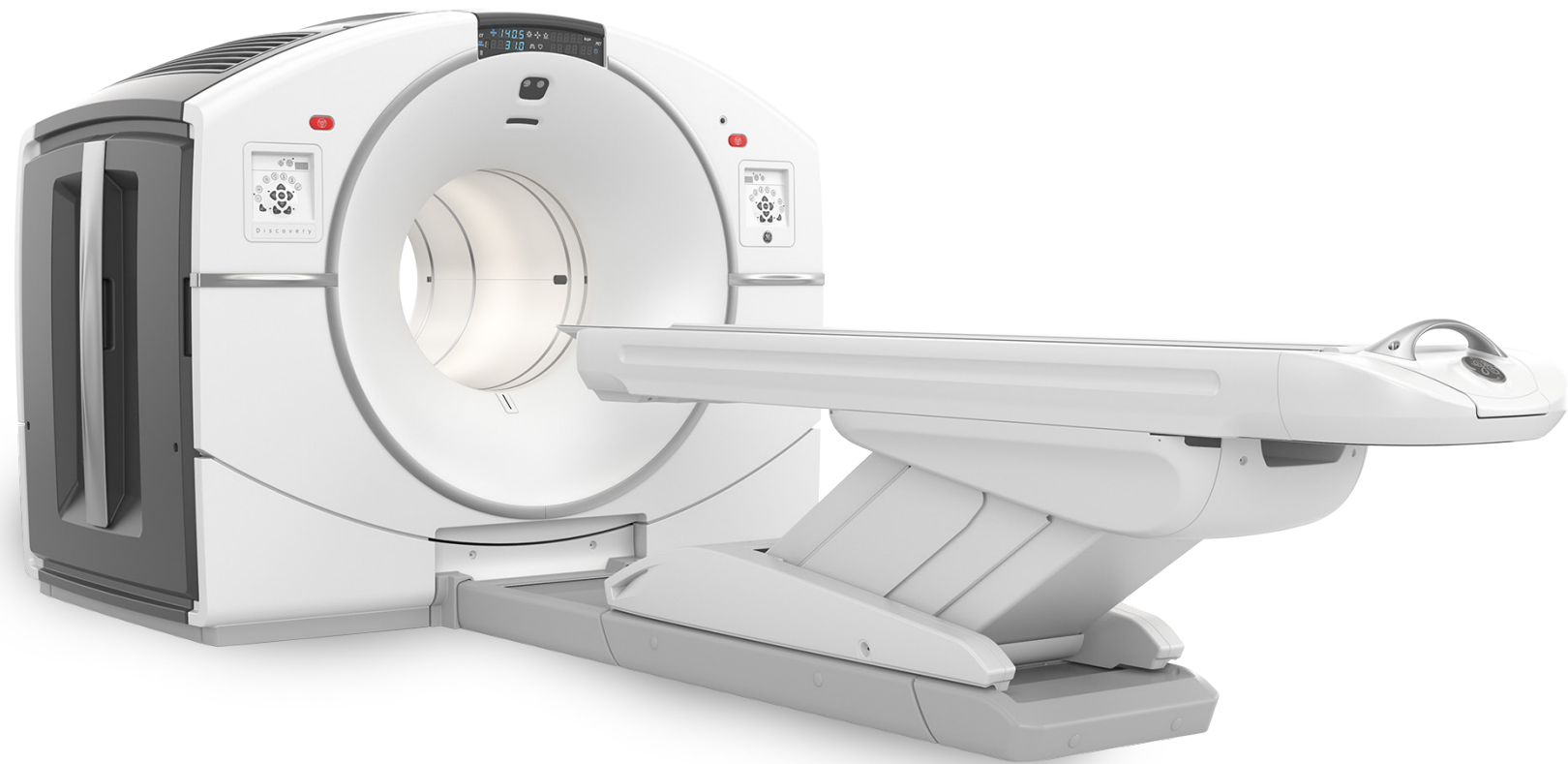GE Healthcare

Discovery MI

with LightBurst Digital 4-Ring Detector

Discovery™ MI is a PET/CT system conceptualized with lofty goals, equal only to your own. It was created to help you diagnose and stage disease earlier and better guide your treatment strategies. It was designed with the hope you can conduct more compelling research more often with more novel, faster decaying tracers; permitting you to push the boundaries of PET. And it was built with capabilities aimed to more economically support increased patient volumes so your facility doesn't need to sacrifice advanced clinical work to accelerate its research initiatives.

We understand these are the types of outcomes you want to achieve. Discovery MI was engineered to help you get there. By delivering what you need for meaningful insights, we look forward to your next true discovery – something we all need.

PET Features - Quantitative Imaging

ACCURATE RESULTS START WITH THE LETTER 'Q'

Quantitation helped establish PET/CT as a valuable clinical tool. It provided an important starting point to find and follow disease throughout the course of treatment, but it was limited by the technologies used to produce it. Now, consistent, accurate SUV measurements are possible with Q.SUV. The 'Q' is important. It signifies the SUV measurement was produced exclusively from our innovative PET image reconstruction technology, Q.Clear, which delivers not only up to a 2x improvement in PET quantitation accuracy (SUVmean), but also up to a 2x improvement in image quality (SNR). For this reason, Q.Clear is a critical component of Discovery MI.

Q.SUV is more than a starting point for clinical decisions. Because it is more accurate and consistent than conventional methods, it becomes more than a number, it becomes a tool for communication. As a result, it sharpens communication between radiologists, oncologists and patients. Be sure your SUV starts with a 'Q'.

Quantitative Imaging – PET Reconstruction

PET Reconstruction	Powerful, expandable GE PET reconstruction technology makes the latest PET/CT workflows clinically relevant by handling massive PET/CT data sets with ease, delivering the clinical and research flexibility our customers demand.
	Reconstruct Q.Clear and motion-corrected gated studies at incredible speeds with Q.CorePower – 4 GPUs or Q.CorePower+ – 8 GPUs.[‡]
Q.Clear[‡]	Full convergence iterative reconstruction technology providing up to 2 times improvement in PET quantitation accuracy (SUV$_{mean}$) and up to 2 times improvement in image quality (SNR) for small lesion detection, fast and efficient reading and a more confident diagnosis.
Q.AC[‡]	Accurate attenuation correction is required for quantitative PET imaging. But in large anatomy imaging at low doses, the CT beam may not be strong enough to fully penetrate through the patient to the detector, potentially resulting in variations in attenuation measurements. Our next-generation Q.AC algorithm is designed to reduce potential variance, helping to ensure that the attenuation coefficients used in image reconstruction are accurate. This may improve consistency even in the most clinically-demanding circumstances.

Quantitative Imaging – Motion Correction

Q.Freeze[‡]	Q.Freeze is designed to combine the quantitative benefits of 4D phase-matched PET/CT imaging into a single static image. By collecting CT and PET data at each phase of the breathing cycle, then matching the data for attenuation correction purposes, Q.Freeze is designed to facilitate quantitative consistency. None of the acquisition data is wasted, as 100% of the counts collected are combined to create a single static image. The goal – a resulting image that has the dual benefit of frozen patient motion and reduced image noise. Combine with Q.AC to create 4D cine data for attenuation correction of PET images at low dose levels.
Q.Static[‡]	Represents a starting point for adding motion correction techniques to your facility and the opportunity to build towards a full 4D phase-matched workflow. Without disrupting your standard whole-body workflow, Q.Static automatically isolates data when organs are in a low-motion state, thereby correcting for motion across the entire chest or torso. The result is a single image series with reduced blurring from organ motion and therefore more consistent quantitation compared to a static image.

[‡]Optional

PET Features - Quantitative Imaging & Innovative Acquisition

Quantitative Imaging – Quality Control, Workflow & Reporting	
Daily Quality Assurance	The new Discovery MI Daily Quality Assurance (DQA) procedure helps to minimize radiation exposure and optimize efficiency. The newly developed ^{68}Ge phantom, which lasts for at least 27 months, is only 25% the weight of a conventional 30 cm flood phantom. The procedure takes less than 10 minutes.[1]
Q.Temp	Q.Temp is a Real Time Temperature Compensation technology that uses the sensors to measure the temperature of each detector unit and individually adjusts the gain in real time to ensure that temperature fluctuations in the scan room do not impact system performance and, therefore, quantitative measurements.
Q.Prep‡	Q.Prep is designed to facilitate the patient exam preparation. Q.Prep offers the following functions: • Ability to view parameters of prior exams • Compare prior parameters to current exams • Ability to pre-enter study information
Q.Check	User configurable data integrity check that can help ensure parameters important for quantitative imaging are saved in the patient DICOM data prior to network. Now includes blood glucose level, date of last therapy, and ability to note if patient is diabetic.
PET VCAR‡	Integrated into the OncoQuant oncology platform, PET VCAR (Volume Computer Assisted Reading) improves visualization and analytical monitoring of disease progression or response to therapy. It provides the ability to compute various Standard Uptake Values (SUV), to measure metabolic activity and volume for PET defined areas of activity, and compare CT, PET/CT and MR studies for baseline and follow-up studies. PET VCAR is an advanced application available on AW and AW Server. • SUV PEAK generated by PERCIST recommendations • Summary Table for interactive, efficient review of PET functional and CT morphological ROI/VOI data • Q.Check outputs quantitative information for PET imaging and patient parameters for each loaded study. • Adaptable workflow for clinical reading to advanced research using tools supporting PERCIST, EORTC, RECIST 1.0, 1.1, and WHO criteria (optional). • Direct access to Integrated Registration option.

Q.CorePower - Next Generation PET Reconstruction Architecture	
	Q.CorePower is the next generation expandable PET reconstruction technology that makes the latest PET/CT workflows clinically relevant by handling massive PET data sets with ease. The Q.CorePower computer with GPU processors (Sl270 8-core 2.6 GHz Intel® Xeon processors with 96Gb DDR3 RAM and AMD FirePro S9150 Graphics Processing Units) routinely reconstruct PET images for clinically relevant data reconstruction and display of images while your patient is still on the table. Reconstruct Q.Clear and motion-corrected gated studies at incredible speeds.
Q.CLEAR‡	Full convergence iterative reconstruction designed to provide • up to 2 times improvement in PET quantitation accuracy (SUV$_{mean}$) • up to 2 times improvement in image quality (SNR)
SharpIR	Point Spread Function modeling enhances visual contrast and resolution in both whole-body and brain PET images. SharpIR provides uniform High Definition resolution over a 70 cm PET FOV.
VUE Point FX	VUE Point FX, time-of-flight image reconstruction, leverages the innovative VUE Point HD iterative process by adding timing information to each step within the iterative loop and improving signal-to-noise ratio.
VUE Point HD	VUE Point HD utilizes a full 3D Iterative Reconstruction technique with all corrections within the loop. It offers: enhanced resolution detector geometry modeling; model-based 3D scatter correction; scatter estimation outside the FOV; exclusive randoms corrections based on singles; dead time correction with pileup estimates.
WideView	See the entire FOV with 70 cm DFOV in PET and CT.

‡Optional
[1]Represents typical system performance.

TECHNOLOGY

ENGINEERED FOR PRECISION

Our vision for the future of PET is completely digital, from acquisition to reconstruction to open source reporting solutions. Each component of the PET workflow is important to the results you and your patients seek. A digital PET experience is what connects all the important technologies, data, insights and people together to make PET an indispensable tool – the tool you need to help you raise the clinical value of PET and then push its limits even further.

The scalable LightBurst Digital Detector is the critical next step of our vision for a digital future for PET. It combines a small lutetium-based scintillator crystal array with a Silicon Photomultiplier (SiPM) bloc design for high NEMA sensitivity of 13.5 cps/kBq and a large 20 cm extended axial FOV. This state-of-the-art PET detection technology delivers significant improvements over TOF-analog technology in scan times, required dose levels and small lesion detectability[2].

Discovery MI is the only PET/CT system that brings together the sensitivity of digital detection with the the most innovative reconstruction technology available, the combination of Time-of-Flight and Q.Clear. The result is outstanding resolution to improve the detection of small lesions[2].

In addition to advancements in reconstruction and detection technology, Discovery MI includes diagnostic CT innovations from our Revolution™ EVO. It combines the Clarity Imaging System with the speed of the Performix 40 Plus tube with our proprietary HiLight CT detector to deliver up to a 2x increase in spatial resolution when used with ASiR-V[3]. Our innovative ASiR-V iterative reconstruction method comes standard to reduce CT dose by up to 82 percent at the same image quality in routine imaging across applications[3,4]. And with Smart MAR virtually eliminating streaks and shadows from metal artifacts, you'll save valuable time previously spent correcting images. Designed with a purpose, with you in mind, this CT technology is the ideal fit for Discovery MI.

A BRILLIANT INTRODUCTION TO ALL THAT DISCOVERY MI CAN DO

Up to 2x improvement in volumetric resolution[2]

Half the time, or half the dose[5]

Highest NEMA sensitivity of any TOF PET/CT system

Significantly better small lesion detectability[2]

Highest NECR[6] of any TOF PET/CT system

Up to 82 percent reduction in CT dose with ASiR-V, at the same image quality[3,4]

100 percent better spatial resolution, with no increase in image noise with ASiR-V[3]

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[2]Improved detectability as demonstrated in phantom testing.

[3]In clinical practice, the use of ASiR-V may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task. Low Contrast Detectability (LCD), Image Noise, Spatial Resolution and Artifact were assessed using reference factory protocols comparing ASiR-V and FBP. The LCD measured in 0.625 mm slices and tested for both head and body modes using the MITA CT IQ Phantom (CCT183, The Phantom Laboratory), using model observer method.

[4]Image quality as defined by low contrast detectability.

[5]Compared to Discovery PET/CT 710.
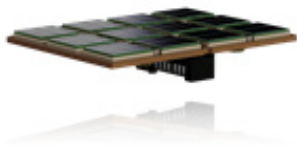
[6]Up to 20 kBq/ml.

PET Specifications

Light Shield

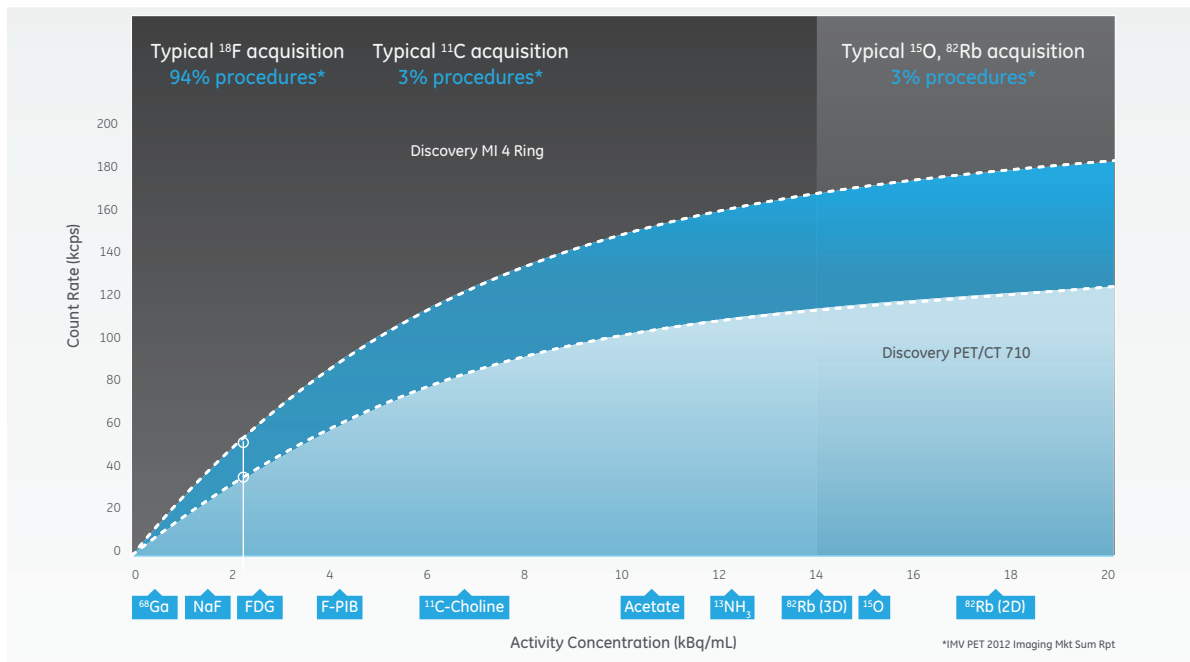**Scintillator** (LBS) crystal array **with light guides** and Enhanced Spectral Reflectors (ESR)

Silicon Photomultiplier (SiPM) with electronics (ASICS) designed for Digital Compton Recovery

LightBurst Digital Detector	
Scintillator material	LBS-Lutetium based scintillator
Scintillator dimensions	3.95 mm x 5.3 mm x 25 mm
Number of detector rings	36 (19,584 total crystals)
SiPM Channels	9,792 (1,632 Hex-Anode SiPMs)
Number of detectors	544 blocks
Axial field of view	20 cm
Transaxial field of view	70 cm
Slice overlap	User defined 1-35

LightBurst Digital Detector	
Sensitivity[††]	13.5 cps/kBq
Timing Resolution	385 psec
Sensitivity/mm[††]	0.068 cps/kBq*mm
Scatter fraction[††]	41%
Clinical NECR[††]	53 kcps @ 2.4 kBq/ml
Peak NECR[††]	180 kcps @ 20 kBq/ml
Coincidence window	4.9 ns
Energy threshold	425 KeV

Resolution	VUE Point HD[7]
Axial @ 1 cm	4.8 mm
Axial @ 10 cm	4.7 mm
Transaxial @ 1 cm	4.0 mm
Transaxial @ 10 cm	4.5 mm

Typical ^{18}F acquisition
94% procedures*

Typical ^{11}C acquisition
3% procedures*

Typical ^{15}O, ^{82}Rb acquisition
3% procedures*

Discovery MI 4 Ring

Discovery PET/CT 710

Count Rate (kcps)

Activity Concentration (kBq/mL)

^{68}Ga NaF FDG F-PIB ^{11}C-Choline Acetate ^{13}NH$_3$ ^{82}Rb (3D) ^{15}O ^{82}Rb (2D)

*IMV PET 2012 Imaging Mkt Sum Rpt

[††]The following specifications represent typical system performance, measured according to NEMA Standards Publication NU2-2012. Sensitivity represents the average of measurements at 0 and 10 cm.

[7]VUE Point HD - Data measured for typical system with 4 iterations and 34 subsets.

CT Innovative Technologies

High IQ with CT Clarity Imaging Chain

CT Clarity Imaging Chain consists of HiLight Clarity Detector, DAS, Performix40 Plus X-ray Tube and ASiR-V reconstruction, to deliver high resolution imaging.

For better performance CT Clarity Imaging Chain provides enhancement of spatial resolution up to 20% compared with previous GE technology.

HiLight Clarity Detector
Inherited directly from our breakthrough Revolution CT system, the Clarity detector is the heart of Revolution EVO. With its high-resolution imaging capabilities, you can see details as small as 0.28 mm. The Clarity detector delivers improved dose efficiency and signal-to-noise ratio, in addition to large coverage with z-axis uniformity.

Integrated Clarity Data Acquisition System (DAS)

Thanks to its revolutionary, patented design, the data acquisition system is integrated directly onto the photo diode. This reduces the size of the data acquisition system by 75%, reduces electronic noise by 44%, and lowers power consumption by 90% compared to previous-generation systems.

Perfomix™ 40 Plus X-ray Tube

- Performix 40 Plus X-ray tube provides less focus movement.
- A liquid bearing tube that has a capability of less-wear of Tube bearing and is enabled up to 0.35 second rotation speed with a routine scan. Discovery MI allows users to utilize helical pitches up to 1.531 and 0.35 second rotation speed that meets GE's image quality specifications for lower pitch acquisitions. This high pitch and 0.35 second rotation speed enables faster scan times which may allow for shorter breath holds, simultaneously reducing motion artifacts from patient and organ movement. As an example, using this higher pitch, a full-body trauma scan of 1000 mm can be acquired in as few as 6 seconds.

High Speed with IQ Enhance

IQ Enhance (IQE) is an advanced algorithm designed to help reduce artifact in thin-slice helical scanning. Use of IQE allows fast pitch scanning for larger anatomical coverage at the same image quality compared to slower helical scanning without IQE (up to 1.531 for 175 mm/sec acquisitions).

Without IQE	With IQE

AAR – Advanced Artifact Reduction

Advanced Artifact Reduction Filter significantly reduces streaking artifacts when highly absorbent objects are in the field of view; e.g., a large shoulder.

Two Path Dual-Energy Acquisitions

GE's protocol management is improved with the addition of a workflow improvement feature, which allows easy configuration of back-to-back axial or helical scans of the same anatomy at two different X-ray energies (kVps). To further improve registration accuracy, patient immobilization may be utilized. The additionally acquired dual energy data can be post-processed on the console or AW workstation using Add/Sub function to gain additional clinical information.

Conjugate Cone-Beam Back Projection

Conjugate Cone-Beam Back Projection utilizes two sets of counter-opposed projections to provide 128 distinct projection measurements per rotation for axial and a helical acquisition mode to significantly improve Z-resolution.

Overlapped Reconstruction[‡]

The overlapped reconstruction feature enables 128 slices per rotation in axial scanning modes and delivers improved Z-axis visualization performance relative to non-overlapped reconstruction.

Ultra Kernel[‡]

Adaptive Enhance Level Adjustment (AELA) can improve visual spatial resolution while maintaining pixel noise standard deviation and artifact. The Ultra Kernel feature is helpful in enhancing the visualization of small anatomical structures with high contrast.

Emergency Patient Mode

Discovery MI has a dedicated User Interface (UIF) for emergency cases to start the examination quickly. Patient Name and Patient ID are assigned automatically. Once a protocol is selected, scan setup interface displays.

Smart MAR[‡]

Smart Metal Artifact Reduction uses a three-stage, projection-based process to help deliver consistent, enhanced image quality. It is designed to enhance clarity across a range of cases with metal including scans with hip implants, dental fillings, screws or other metals in the body.

[‡]Optional

CT Features & Benefits

Dose Management Technology	
ASiR[8]: Adaptive Statistical Iterative Reconstruction dose reduction technology	ASiR™ dose reduction technology: A reconstruction technology that may enable reduction in pixel noise standard deviation. The ASiR reconstruction algorithm may allow for reduced mA in the acquisition of diagnostic images, thereby reducing the dose required.
ASiR-V™: Adaptive Statistical Iterative Reconstruction dose reduction technology[9]‡	ASiR-V allows healthcare providers to lower dose by 50 to 82% as compared to standard filtered back-projection (FBP) reconstruction at the same image quality. ASiR-V combines the speed of ASiR with additional capabilities from Veo, GE's full model-based iterative reconstruction technology. By applying more advanced modeling and optimization technologies in projection- and image-space as part of the iterative reconstruction process, ASiR-V provides dose reduction well beyond that of ASiR, while maintaining low-contrast detectability, like Veo. Lower dose: ASiR-V reduces dose by 50% to 82% relative to FBP at the same image quality. Low contrast detectability improvement: ASiR-V improves low contrast detectability by 59% to 135% at the same dose. Image Noise improvement: ASiR-V reduces image noise up to 91% at the same dose. Spatial resolution enhancement: ASiR-V improves spatial resolution up to 2.07x (107%) at same image noise. Artifact reduction: ASiR-V image reconstruction has the capability to reduce low signal artifact such as streak artifact compared to FBP.
3D mA modulation[10]	Real-Time 3D mA dose modulation acquisitions deliver consistent image quality and may reduce dose compared with fixed mA acquisitions. mA modulation is designed to optimize the dose for the user prescribed noise index. Its effect on dose depends on the patient body habitus, and prescribed noise setting.

[8]In clinical practice, the use of ASiR may reduce CT patient dose depending on the clinical task, patient size, anatomical location and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

[9]In clinical practice, the use of ASiR-V may reduce CT patient dose depending on the clinical task, patient size, anatomical location and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task. Image quality as defined by low contrast detectability. (LCD), Image Noise, Spatial Resolution and Artifact were assessed using reference factory protocols comparing ASiR-V and FBP. The LCD measured in 0.625 mm slices and tested for both head and body modes using the MITA CT IQ Phantom (CCT183, The Phantom Laboratory), using model observer method.

[10]mA modulation is designed to optimize the dose for user prescribed noise index. It's effect on dose depends on the patient body habitus, and prescribed noise setting.
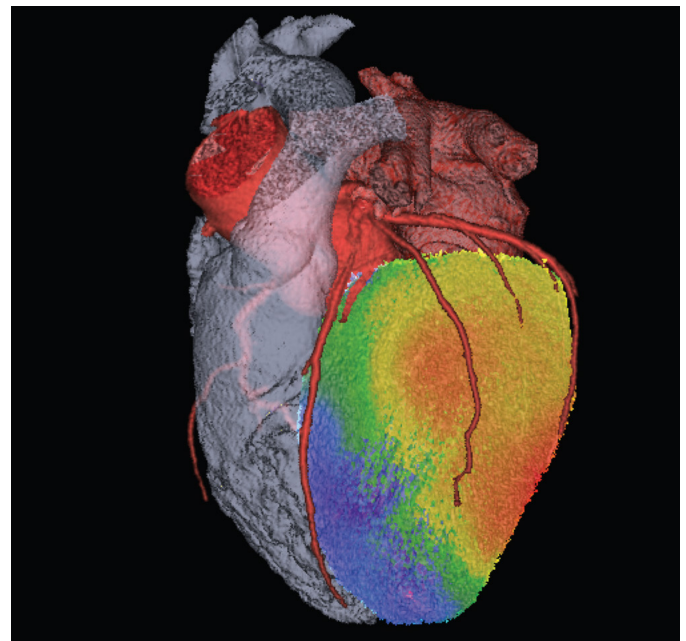
‡Optional

CT Features & Benefits

Dose Management Technology	
OptiDose™	For years, GE has followed the ALARA principle in helping its customers optimize dose. GE has provided many tools to help the clinician minimize dose while achieving diagnostic quality images.
	• ECG mA Modulation: For cardiac applications, prospective ECG mA modulation automatically adjusts the mA to minimize the patient's exposure to X-rays – reducing mA during systolic phases of the cardiac cycle. This provides clear images and allows you to reduce mA primarily in the systolic phases of the cardiac cycle – yet gives you enough power to obtain quality images for functional analysis.
	• CT 4Kids: The pediatric protocols are based upon a child's size, age, and weight andtailor the dose or treatment to the size of the patient. The Head and Orbit categories areage based. The rest of the categories are height and weight based protocols.
	• Color Coding Kids provides pediatric scan protocols based on the Broselow-Luten Pediatric System®. This Color Coding system is incorporated into the protocol selection on the operator's console.
	• SmartTrack: The tracking collimator keeps the beam focused only on the active detector cells, and makes sub-millimeter scanning possible with high dose efficiency.
	• SmartBeam: The collimator contains two independently controlled tungsten cams. The rotation of the cams provides continuous variable beam thickness and Z-axis position. The collimator also contains three bowtie beam filters that filter and shape the beam to optimize dose and image performance.

Dose Management Technology	
Dose Reporting	Dose Reporting: CTDIvol, DLP, Geometric Dose Efficiency and Phantom size displays during scan prescription and provides dose information. The CTDIvol, DLP, and Phantom size used to calculate dose is automatically saved once the user selects End Exam.
	DICOM Structured Dose Report generates a CT Dose Report, which can enable tracking of dose (CTDIvol, DLP and Phantom size) for the patient by the hospital radiation tracking system/RIS/HIS.
Dose Check	Provides the user tools to guide dose given in clinical practice and is based on the standard XR-25-2010 published by The Association of Electrical and Medical Imaging Equipment Manufacturers (NEMA).
	Dose Check provides the following:
	• Checking against a Notification Value if the estimated dose for the scan is above your site typical dose value
	• Checking against an Alert Value where the user needs specific authority to continue the scan at the current estimated dose without changing the scan parameters
	• Defining Alert Values for Adult and Pediatric with age threshold
	• Audit logging and review
	• Protocol Change Control
Dose Display	CTDIvol (Volume CTDIw), DLP (Dose Length Product), Geometric Dose Efficiency and Phantom size are displayed during scan prescription and provide dose information to the operator.
Biopsy Mode	Biopsy Mode improves the efficiency of setting up and acquiring slices during a biopsy. All biopsy scan parameters are available on a single screen from which you can launch the biopsy scan.
Organ Dose Modulation	ODM provides reduction of radiation dose via X-ray tube current modulation for superficial tissues, such as breasts.
	ODM may enable equivalent pixel noise standard deviation without decreasing productivity as with the use of conventional superficial dose reduction techniques.

CT Features & Benefits

Cardiology Technology	
5-Beat Cardiac™	Discovery MI has the ability to cover the heart in as little as 5 beats. The following calculation is based on a patient heart rate of 60 bpm, and a total coverage of 120 mm (nominal scan length to cover the heart), using a helical pitch of 0.22:1, and a rotation speed of 0.35 second rotation. $$Table\_Speed = \frac{0.22 * 40 \; mm/rotation}{0.35s/rotation} = 25.14 \; mm/s$$ $$Total\_Scan\_Time = \frac{120 \; mm}{25.14 \; mm/s} = 4.8s$$ $$Number\_of\_Beats = \frac{60 \, beats/min}{60s/min} * 4.8s = 4.8 \, beats$$
Snapshot Pulse‡, 11, 12	SnapShot Pulse mode is for low dose imaging of the coronary arteries. SnapShot Pulse can also be used to image structures that are near to the heart and may be affected by heart motion such as thoracic aortas or pulmonary arteries. Prospective Gating based SnapShot Pulse achieves up to 83% dose reduction compared to ECG gated helical acquisition mode.
44 msec cardiac temporal resolutions	With 0.35 second rotation and SnapShot scan algorithm the product not only offers fast acquisition speed, it builds on GE's variable speed technology that has now been expanded for cardiovascular imaging to include 0.35, 0.375, 0.40, 0.425, 0.45, 0.475 and 0.50 second scans – so you have the power to customize rotation speed to your patients' heart rates
SnapShot Freeze‡	Provides 29 msec effective temporal resolution. An intelligent motion correction algorithm, which is designed to reduce blurring of coronary arteries due to motion artifacts. Utilization of SnapShot Freeze in clinical practice may assist the physician's diagnostic interpretability of coronary CTA by reducing the burden of non-diagnostic segments. Using a mechanical heart phantom it was shown that SnapShot Freeze reduces motion artifacts up to 6x, equivalent to a 0.058 second gantry rotation speed with effective temporal resolution of 29 msec.
ECG viewer/ editor	Allows users to view and retrospectively modify intervals and adjust location of triggers for cardiac cycles based on the ECG waveform displayed on the console. This capability may improve successful cardiovascular acquisition rate in cases with suboptimal triggers or irregular heartbeats such as PVCs, PACs and arrhythmias.

Cardiology Technology	
SnapShot Assist‡	Helps users optimize ECG-gated CT acquisitions based on patient heart rate characteristics. SnapShot Assist uses the patient's recorded heart rate information to display scan parameters (including scan mode, cardiac phases, padding and pitch) that could be used during the cardiac CT scan. SnapShot Assist generates a cardiac scan parameter recommendation using the patient's ECG analysis and user defined protocol selection algorithm. It uses the patient's recorded heart rate information to predict the heart rate behavior during a CCTA scan to assist the user with optimization of the parameters on a per-patient basis. Acquisition parameters displayed include scan mode (Cine SnapShot Pulse, Helical SnapShot Segment, etc.), cardiac phases, padding, and pitch. User Profiles define scan parameters within the heart rate and variability categories for a specific patient group and cardiac scan mode.
SmartScore™ Pro‡	Acquires prospective ECG gating measurements, which provides information that is valuable for scan timing. Using the measurements, the system synchronizes the collection of data with the cardiac cycle.

CT Features & Benefits
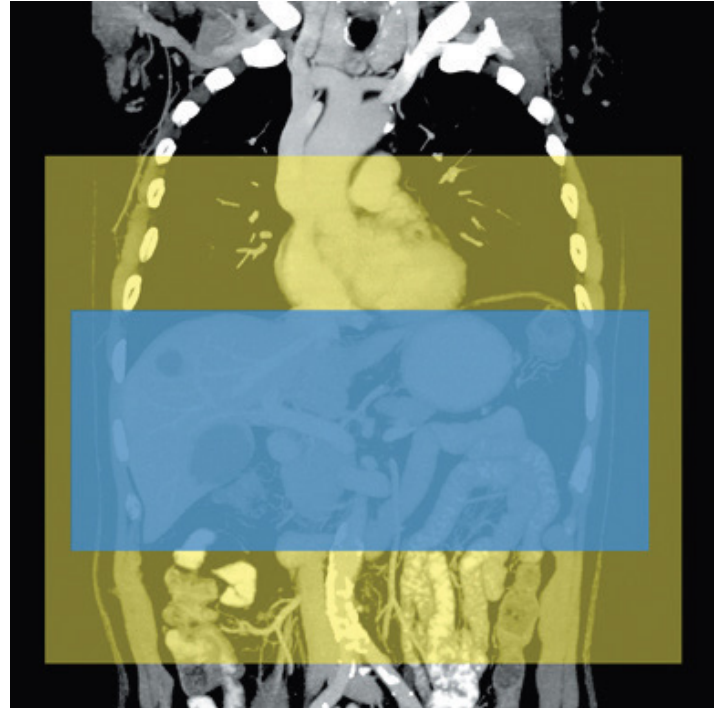
Neurology & Perfusion Technology	
Volume Shuttle‡	Provides the single-injection 80 mm (2x wider coverage, 128 slice-width) Volume Shuttle acquisition scan. Volume Shuttle is a repetitive axial scan mode where the table shuttles back and forth between two consecutive imaging locations (X-ray is off during table movement). Each location covers 40 mm in the Z-direction for a total of 80 mm of axial coverage in Z. The shuttle action repeats over a defined duration to enable evaluation of tissue changes over time.
Volume Helical Shuttle‡	Volume Helical Shuttle is a continuous scan technique that is a bi-directional scan mode, covers up to 312.5 mm or 500 slices (0.625 mm 500 slice) for 4D imaging. Volume Helical Shuttle provides data to support up to 140 mm of coverage repeatability within 3.2 seconds. Dynamic Pitch Reconstruction extends Z-coverage and improves temporal sampling by utilizing acquired scan data during table acceleration and de-acceleration.

Volume Helical Shuttle

‡Optional

CT Performance & Specifications

CT Performance

Display field of view	70 cm with WideView
Scan field of view	50 cm diagnostic
Minimum slice thickness	0.625 mm
Scan modes	Axial: axial slices acquired simultaneously with each 360° rotation, with the time between scans set by the user-selected interscan delay (ISD) or intergroup delay (IGD).
	Helical: continuous 360° scanning with table incrementation and no interscan delay
	Cine: contiguous axial slices acquired simultaneously with each 360° rotation. Half-scan imaging and segmented reconstruction is supported with acquisitions times of 0.65 times that of the scan speed.
	128 slices per Rotation‡ - The overlapped reconstruction feature enables 128 slices per rotation in Axial scanning modes and delivers improved Z-axis visualization performance relative to non-overlapped reconstruction.
	Generating images at fine intervals, as small as 0.1 mm, results in reconstructed images that exceed 128 image slices per gantry rotation in Helical Multi-slice mode. The number of slices able to be generated per gantry rotation is a function of rotations and coverage

Rotations	Z coverage (mm)	Generated slices (images)/rotation[13]
1.71	30	176
2.00	46	230
3.00	101	337
4.00	156	390
5.00	211	422
6.00	266	443

[13]64 slice x 0.625 mm & 1.375:1 helical pitch

CT Performance

Pitch	Helical Pitch (nominal): 0.516 to 1.531
	Cardiac Pitch: 0.16 to 0.35
Rotational speeds (360°)	Axial: 0.35, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, and 2.0 seconds
	Helical: 0.35, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0 seconds
	Cardiac application: 0.35, 0.375, 0.40, 0.425, 0.45, 0.475, and 0.50.
HU scale	-31,743 to 31,743
Reconstruction matrix	512 x 512
Display matrix	1024 x 1024

X-ray tube

Performix 40 Plus X-ray Tube	A liquid bearing tube that has a capability of less-wear of Tube bearing and is enabled up to 0.35 second rotation speed with a routine scan.
Thermal ratings	The maximum anode heat capacity: 5.0 MJ (7.0MHU)
Distance of focal spot to detector	95 cm
Small focal spot	0.9 x 0.7 per IEC 60336/2005
Large focal spot	1.2 x 1.1 per IEC 60336/2005
Maximun power	72 kW
mA	10 to 600mA, 5mA increments

CT Performance & Specifications

Clarity Detector

Number of elements	54,272
Number of rows	64 rows of 0.625 mm thickness at isocenter
Detector coverage	40 mm
Perfusion coverage	120 mm with Volume Helical Shuttle‡
Absorption efficiency	98%
Special Resolution	0.28 mm

Data Acquisition system

Volara XT Digital DAS	Clarity Detector and Data Acquisition System • Designed as analog cable free between ASIC and Diode, and has a capability to reduce electronic noise. • Designed for less heat generation, up to 90%, compared with previous GE technology and all in one DAS / Detector. It has capability to reduce electronic noise. • Designed for less floor-noise, up to 44% compared with previous GE technology and it has capability to reduce electronic noise. • Optimized collimator with ability to reduce scatter noise.

‡Optional

Image quality

Low-contrast detectability (CATPHAN 20 cm) – helical			
Reconstruction mode	Object size	% contrast	Dose Level (mGy TDIvol) 10 mm slice
Standard Algorithm with ASiR-V	5 mm	0.30%	4.54
CTDI expressed in mGy/100 mA on CTDI head and body dose reference phantoms	Axial head: 16.7 mGy/100 mAs		
	Axial body: 8.7 mGy/100 mAs		
	Helical head: 17.0 mGy/100 mAs		
	Helical body: 8.8 mGy/100 mAs		
Noise[5]	Axial: 0.43% at 4.95 mGy CTDIvol with ASiR-V Reconstruction Algorithm		
	Helical: 0.43% at 4.70 mGy CTDIvol with ASiR-V Reconstruction Algorithm		

Discovery MI Workspace

Innovative and ergonomic working environment designs to ease the operator's workflow in daily clinical and research studies. It features powerful and expandable GE PET reconstruction technology that streamlines PET/CT workflow by handling massive PET/CT data sets with ease. Everything you need at your fingertips--an intuitive quantitative workflow that fully integrates into your daily routine.

PET/CT Workflow Solutions

Q.Flow	**Ease of use and automation** • Common PET and CT user interface • Up to 3 PET prospective reconstructions • Up to 8 list mode record/replay **Enhanced Graphic Rx** • Edit Scan Parameters on Scout View • One Click Hybrid Protocol Set-up from CT • Auto Direct Multi-Planar Reformats • PET Copy PMR to copy reconstruction parameters **Flexibility** • Variable acquisition time per bed • Multi-bed Gated PET • Cardiac and respiratory PET gating • Integrated PET gating **Networking and compatibility** • DICOM HIS/RIS • DICOM PET RAW • Auto-store and auto-networking
ViP replay	Volume Interface Protocol (ViP) is an intuitive and comprehensive PET list mode prospective reconstruction solution. Provides integrated list mode processing for generating a variety of scan types (static, dynamic, gated) from a single acquisition.
RadRx	• Create your own PET/CT protocol from any CT protocol. • Automated CTAC creation from CT acquisitions, including contrast enhanced, perfusion and gated CTs. • Integrated Average Cine CT protocol for improved attenuation correction.
ACQC‡	Attenuation Correction Quality Control ensures proper cardiac registration between PET and CT.
PET/CT pediatric protocols	Default protocols specifically designed for FDG oncology pediatric exams based on Broselow-Luten Pediatric System®, which is designed to minimize CT radiation exposure in PET/CT attenuation correction to meet ALARA guidelines.
Remote table retract	Increase technologist shielding from the patient by allowing the use of operator console-based controls for bed retraction and lowering out of the gantry at the end of the exam.

PET/CT Advanced Clinical Applications

Motion Match‡	Ideal for radiation therapy planning where precise motion definition is required to optimize treatment planning. Enables phased-matched PET and CT reconstruction and fusion on the console and Advantage Workstation, which can improve the contrast to noise ratio of moving lesions up to 60% over a static acquisition.
SmartStep‡	Enables a step-and-shoot imaging mode for performing biopsies and other interventional procedures. A highly functional image display presents a set of three interventional images in three viewports.

Clinical Protocols	ASiR or ASiR-V‡	Q.AC‡
Oncology		
• Whole-body PET/CT (Static)	Yes	Yes
• Q.Static PET/CT	Yes	Yes
• Q.Freeze PET/CT (Integrated)	Yes	Yes
• 2 meter scan whole-body PET/CT	Yes	Yes
• MotionMatch PET/CT	Yes	Yes
Cardiology		
• ^{82}Rb/ Ammonia stress/rest protocol	Yes	Yes
• FDG Gated PET/CT	Yes	Yes
Neurology		
• Amyloid PET imaging	Yes	Yes
• Brain PET	Yes	Yes

‡Optional

Discovery MI Workspace

PET/CT Workflow Solutions	
Xtream Injector‡	A powerful integrated injection option that starts the injection process in synchronization with "Start Scan" to simplify the enhancement exam workflow. The Enhanced Xtream Injector supports injector parameters that are entered on console.
Direct MPR with Auto-Batch	Automatic real-time direct reconstruction and transfer of fully-corrected multiplanar images, in any plane. Up to 10 fps transfer speed of images, in real-time during acquisition, to up to four different destinations.
Auto Transfer	Distribute images where and when you need them.
Exam Split‡	Allows multi-anatomic exams to be read in separate anatomic sections. This allows specialists to review only those images needed for a given requisition.
SmartPrep	Enables intermittent monitoring of IV contrast enhancement in an area of interest. The contrast flow is monitored by low-dose scans until the contrast enhancement reaches the preferred point and then the user initiates the scan prescription.
AWE connection‡	The software based AW Server client on the CT console allows access to applications hosted on an AW Server, right from the CT console for improved workflow and productivity.
PET Data Storage	2.4 TB List Data Storage, 1.2 TB Sinogram Data Storage and Network Storage Capability. Storage space is amplified by utilizing GE's patented sinogram and list compression technology to shrink the data size while it resides on the scanner. Data is backed up in a RAID configuration to reduce the potential for lost data and system downtime in the event of a storage disk failure.
PET Exam Report	PET Exam Report highlights key aspects from the PET scan including injected dose, uptake time, patient demographics and other important information that is intended to be passed along to reading physicians and streamline their workflow. The PET Exam Report is a DICOM screen capture that can be networked to any device accepting DICOM images and archived to PACS or other storage device.

PET/CT Workflow Solutions	
Data Export	Ensures that the relevant images and reports can be visualized by the referrals in a PC friendly format (MPEG, AVI, etc.)
Compatible peripherals	• DVD-R: Creation of interchange media of PET and CT image data with viewer option. • USB 2.0 external hard drive: ViP data offline storage.
Direct Connect	AW VolumeShare 5 supports a direct connection between AW VolumeShare 2, 3 or 4 workstations. This feature requires a Gigabit Network between the AW's and HP XW8200 (minimum hardware requirement). Post processing can be done on image residing on Direct Connect linked systems by launching applications without having to DICOM transfer the exam to the AW.

Other	
Acquisitions	• Static, gated, dynamic • Multi-static, multi-gated, multi-dynamic • Real time **list mode** coincidence data acquisition for clinical and research applications that provides the opportunity for principal component analysis of the PET raw data (i.e., sinogram) and therefore facilitates user development of advanced motion corrections that eliminate the need of an external respiratory device.
Image matrix sizes	128 x 128, 192 x 192, 256 x 256, 384 x 384
Optional post-processing applications‡	• CT Perfusion 4D • CardIQ Express • Autobone Express • Advanced Vessel Analysis • CardIQ Plus • Dynamic VUE • Motion VUE • CardIQ VUE DentaScan • CT Perfusion 4D Multi Organ • CardEP • Advantage DentaScan

‡Optional

Siting requirements

PET/CT Gantry and System

Description	Height		Width		Depth		Weight
	cm	inch	cm	inch	cm	inch	kg
Gantry	193	76	224	88	156	62	3612
Table	107	42	66	26	345	136	1049

Gantry Depth including the back trailer is 265 cm.

Patient Table

Maximum load	500 lbs (226 kg)
Maximum horizontal scannable range	Standard 170 cm with up to full 200 cm‡
Vertical scannable range	8 to 205 mm below isocenter
Maximum horizontal speed	100 mm/sec

Patient Table Compatible‡

IV Pole integrated at the foot-end of the table prevents IV lines from becoming crossed and tangled, and ensures that the lines stay securely in place on the patient.

2 m table extender: Carbon fiber table extender to enable full 2 m scan range for complete head to toe studies.

Radiation treatment planning flat table overlay securely lock into the PET/CT.

GE integration kit for Varian respiratory patient monitor composed of a table-mounting bracket with connector to support the RPM device; allows respiratory gating with and without radiation treatment planning flat table overlay.

Siting Requirements

Scan room

Minimum scan room size	3912 mm x 7772 mm 154 in x 306 in
Scan room temperature range	18° C (64° F) – 26° C (79° F)
Scan room cooling requirements	Air cooled, recommended 55414 BTU/hr with heavy CT utilization

Control room

Minimum control room size	2743 mm x 3912 mm 108 in x 154 in
Control room temperature range	18° C (64° F) – 26° C (79° F)
Control room cooling requirements	Air cooled Recommended 3625 BTU/HR
Power requirements	150 kVA maximum 30 kVA average

Equipment room

Equipment Room	Not required. Heat and noise output for Power Distribution Unit and computer hardware are low enough to allow inclusion in the patient scanning suite with the table and gantry.

‡Optional

Misc.

DICOM Conformance Standards

PET sinogram data can be saved as a DICOM file.

DICOM storage service class

Service Class User (SCU) for image send

Service Class Provider (SCP) for image receive

DICOM query/retrieve service class

DICOM storage commitment class push

DICOM modality work list

DICOM modality performed procedure step

DICOM print

Filming Protocol

3M-952 standard

Supported film and hardcopy devices:

- A DICOM print interface is standard on the system
- DICOM basic grayscale and color print via ethernet
- Sterling/AGFA Helios via ethernet
- Post script level 2 printer via TCP/IP ethernet

HIPAA

Password protected user login and authentification

Image annonimization tool

Product network filters restricts access to scanner system by IP address, services type (IE ftp, telnet) and DICOM port number

User configurable

Standard, Selectable Items

Language selectable keyboard ConnectPro HIS/RIS interface with performed procedure step

DICOM storage service class

Regulatory Compliance

This product is designed to comply with applicable standards under the Radiation Control for Health and Safety Act of 1968.

Laser alignment devices contained within this product are appropriately labeled according to the requirements of the Center for Devices and Radiological Health.

CAUTION
Laser Radiation
Do not stare into beam
635, 670nm Laser Product
1 Milliwatt Maximum Output
Class II Laser Product

This product complies with laser standard IEC 60825-1:2007-03. Rear PET laser is an IEC Class 1M laser product. Laser Radiation - Do not view directly with optical instruments. Do not expose users of telescope optics. Max power: 0.39 mW. Wavelength: 635 nm.

Discovery MI has been designed to follow PET/CT international standards: ACR, ACRIN, EARL, QIBA

Discovery MI system meets MITA XR-29-2013 Smart Dose standards.

Imagination at work

Product may not be available in all countries and regions.
Contact a GE Healthcare Representative for more information.
Please visit www.gehealthcare.com/promotional-locations.