

GE Healthcare

Discovery NM/CT 670 Pro

Data Sheet



Overview

Discovery* NM/CT 670 Pro is a premium hybrid SPECT/CT imaging system. It is an all-purpose, dual-detector, free-geometry integrated nuclear imaging camera that features the advanced all-digital Elite NXT detector technology, slim gantry, cantilevered patient table, an acquisition station and the Xeleris* processing and review workstation, now combined with the high-performance Optima* CT540 system.

Elite NXT detectors feature 3/8" or 5/8" detectors for all-purpose nuclear imaging.

The Optima CT540 features a 16-slice CT configuration with short-geometry, Performix Ultra X-Ray Tube, 6.3 MHU Tube anode heat storage capacity, maximum power of 53.2 kW and the HiLight Matrix detector with Volara DAS and other advanced OptiDose* dose management features for exceptional CT image quality and low dose to patients.

Key features of the free-geometry Discovery NM/CT 670 Pro design include:

- Slim-profile, wide-bore, robotic gantry design
- 180° and 90° orientations of the detectors for high SPECT and WB scanning efficiency
- Rapid, simultaneous multi-axis gantry motions
- Upright and horizontal detector orientations for exceptional clinical versatility, including patients that are in a hospital bed, standing or sitting during scan
- Multi-functional, dual-axis imaging table
- Automatic "home" positioning enables easy setup of the gantry and the table using pre-programmed detector geometries and imaging modes
- Real-time automatic body contouring
- User-friendly, intuitive Linux-based user interface
- Ignite integrated workflow with Xeleris processing and review workstation designed to help enhance departmental productivity

Primary Benefits

- Excellent image quality based on advanced Elite NXT detector technology with SPECT-optimized design
- Dose reduction without compromising image quality, enabled in both CT and NM scans by:
 - Innovative CT OptiDose and ASiR*⁵ dose management technologies
 - Evolution⁵ family of advanced reconstruction algorithms
- Exceptional productivity enabled through half-time planar and SPECT scans, fast and flexible robotic gantry motions for maximal clinical versatility and Ignite streamlined workflow
- Advanced, integrated Xeleris workstation clinical applications with remote PC and PACS processing and review solutions
- Simple and easy upgradeability path to ASiR⁵ dose reduction technology, and ability to add Xeleris advanced applications and other options

System Components

Elite NXT NM Detectors

Discovery NM/CT 670 Pro NM image quality is based on two Elite NXT slim, large field-of-view rectangular digital detectors, performing the following five corrections on each detected event in real time, even at high count-rates:

- Uniformity
- Linearity
- Energy
- Isotope decay
- Center-of-Rotation (COR)

3/8" NM Detector

- 59 circular PMTs - 53 x 3" (76 mm) and 6 x 1.5" (38 mm)
- Crystal thickness: 3/8" (9.5 mm)
- One ADC per PMT, 30.0 MHz sampling rate
- UFOV: 21.25" x 15.75" (54 x 40 cm)
- Energy range: 40 - 620 keV

5/8" NM Detector

- 59 circular PMTs - 53 x 3" (76 mm) and 6 x 1.5" (38 mm)
- Crystal thickness: 5/8" (15.9 mm)
- One ADC per PMT, 30.0 MHz sampling rate
- UFOV: 21.25" x 15.75" (54 cm x 40 cm)
- Energy range: 40 - 620 keV

NM Gantry

Discovery NM/CT 670 Pro 70 cm wide-bore gantry combines a slim NM gantry with a CT compact design. It enables acquisition of SPECT, whole body planar and SPECT, gated planar and gated SPECT studies in various geometries, combined with multi-slice CT scanning for a wide patient population.

Key features include:

- Automated detector radial motion (in/out), rotation around the ring, transitions between 180° and 90° **geometries or other orientations
- Flexible design enabling a variety of orientations to enable scanning of patients that are sitting upright, standing or lying prone on a stretcher
- A stationary gantry secured to the floor for tomographic center-of-rotation precision
- Camera setup performed interactively by the remote control handset and via user-definable, pre-programmed acquisition-specific "home" positions
- A gantry display unit showing current status of the gantry's moving parts and the patient table
- Real-time, infrared-based Automatic Body Contouring (ABC) designed to enhance scanning efficiency and resolution in 90° and 180° SPECT and whole body procedures and help minimize patient-detector distance and maximize image quality

Patient Table

Discovery NM/CT 670 Pro features a dual-axis cantilevered table, used for planar, whole body, SPECT and other scanning procedures performed in a horizontal patient orientation.

Key features include:

- Maximum patient weight - 500 lbs. (227 kg)
- Whole body scan range - 78.7" (200 cm) or 88.6" (225 cm) with optional table extender
- Minimum table height - 59 cm (23.2") - facilitating patient loading and unloading from a wheelchair or stretcher
- Dual-axis cantilevered table with a dual-position CT-NM telescopic transporter for precise SPECT-CT registration
- Low attenuation carbon fiber tabletop includes mattress pad with straps for patient comfort

- Automated positioning simplifying setup
- Optional interactive bedside touch-ruler for easy setup of scan range
- Manual emergency patient egress
- Mobile design enabling easy swiveling of the table away from the gantry around a pivot point which facilitates fast dual-collimator exchange and scanning of patients who are either seated or on a hospital bed/stretcher
- Firm anchoring to the floor with locking pins and floor plates allowing for free access from both sides for patient loading/unloading with IV, EKG or other devices
- Optional accessories such as a head holder, table extender, arm support, leg support and table pads/straps

NM Acquisition Station

The integrated SPECT-CT acquisition console employs a Graphic User Interface for exam scheduling, scan acquisition, CT reconstruction and scan QC as well as utilities for protocol editing, routine quality control and analysis and networking, including:

- Universal connectivity via DICOM 3.0 (as per DICOM conformance statement) and Interfile 3.3 TCP/IP based protocols
- HIS-integrated workflow including DICOM Worklist and MPPS which creates and updates a Modality Performed Procedure Step report whenever scans are successfully completed, for streamlined hospital diagnostic imaging billing management
- The Optima CT540 desktop environment, available for CT imaging*** including: protocol definition, networking and archiving manual film control, as well as CT image processing such as multi-planar reformatting (MPR), multi-projection volume rendering (MPVR) and MR image display

Display

- 1280 x 1024 true-color display
- Threshold and windowing control in multiple window settings
- Cinematic display of dynamic and all multi-frame datasets
- Online, live display of acquired data and imaging parameters

Main Features

Acquisition

The Discovery NM/CT 670 Pro acquisition station is based on the Linux operating system with an icon-based graphical user interface shared with the Xeleris workstation.

Data acquisition may be performed in any of the following imaging modes: static, dynamic, multi-gated, whole body, SPECT and gated SPECT.

Operation of the Discovery NM/CT 670 Pro is done with the interactive, graphical GE Common User Interface (CUI). The CUI is designed to help maximize flexibility and productivity and includes the following features:

- Pre-defined or user-configurable protocols for rapid recall and setup
- On-the-fly digital linearity, energy and uniformity corrections
- Energy spectrum histogram (PHA) display with 16 windows per detector ensuring acquisition into a correct energy window for a given isotope(s)

- Acquisition termination by preset time, preset count or manual stop
- Pan/zoom and rotate modes
- Ability to resume paused acquisitions for whole body, SPECT and gated SPECT

Utilities

Acquisition software includes control of camera maintenance activities including:

- Disk space management
- Pulse Height Analysis (PHA)
- Center-of-Rotation (COR)
- Single isotope uniformity correction map for all isotopes
- Single isotope energy, sensitivity and linearity maps for all isotopes
- Daily/periodic QC including gantry calibrations
- Customizable system parameters
- Definition and setup of acquisition sequences
- Use of preset acquisition protocols

Discovery NM/CT 670 Pro is capable of acquiring single or multi-isotope scans in the following acquisition modes:

Static Acquisition

- Single frame image (word mode), frame sizes: 32², 64², 128², 256², 512²
- Optional bi-lateral detector motion with Pinhole collimator, motion range: 13.8" (35 cm)

Dynamic Acquisition

- Frame sizes: 32², 64², 128², 256²
- Maximum frame rate: 50 frames/sec

Whole Body Scanning

- Infrared-based real-time Automatic Body Contouring
- Sequential multi-spot ("step-and-shoot") or continuous scanning modes
- Maximum scan range-78.7" (200 cm) or up to 88.6" (225 cm) with optional table extender
- Minimum WB continuous scan speed: 1.97"/min (5 cm/min)
- Maximum WB continuous scan speed
 - Standard: 11.8"/min (30 cm/min)
 - optional: 78.7" (200 cm/min)
- Simultaneous anterior/posterior dual view scan
- Image matrix: 256 x 1024

Multi-Gated Acquisition

- Equi-time and equi-phase gating modes with real-time irregular beat rejection
- ECG display during acquisition
- On-line R-to-R histogram display
- Multi-gated acquisition capacity: 8, 16, 24, or 32 frames per cycle

SPECT Acquisition

- Infrared-based on-line Automatic Body Contouring system
- Step-and-shoot mode with: 2°, 3°, 5°, 6°, 9°, 10°, 12°, 15°, 18°, 30°, 36°, 45°, 60° and 90° angular steps

- Continuous mode with 3°, 4°, 5° or 6° angular sampling
- Maximum scan range – 78.7" (200 cm) + noncontinuous 15.7" (40 cm) with tabletop extender
- Consecutive multiple SPECT scans combined with table translation enable Volumetrix pasting of up to 7 FOVs
- Either 90° ("L-mode") or 180° ("H-mode") geometries
- Matrix size: 64 x 64, 128 x 128, 256 x 256

Gated SPECT Acquisition

- Gated tomography with real-time irregular beat rejection
- User-modified R-R acceptance window
- An extra bin sums all data, both accepted and rejected, securing non-gated study completion in case of an exceptionally irregular heart rate
- Number of frames per R-R interval may vary between 4, 8, 12, 16 and 24

Dynamic SPECT Acquisition (option)

- SPECT scan time: Minimum – 1 min/360°
Maximum – 15 min/180°
- Up to 40 consecutive SPECT scans in H-mode
- Supported collimators: LEHR, ELEGP, MEGP, HEGP + fan beam
- Continuous mode acquisition & angular sampling: 3°, 4°, 5°, 6°
- Supports pan and zoom
- Supports multi-isotope and multi-peak energy settings

CT Acquisition

- All CT acquisition features provided by the Optima CT540 are available***, **excluding:**
 - Gantry tilt
 - SmartStep (CT Interventional Kit)
 - SmartView Fluoro
- Maximum CT scan range: 191 cm with head holder or tabletop extender

Hybrid SPECT/CT Acquisition

Any supported SPECT and CT single or multiple exams may be combined to create hybrid protocols.

- Hybrid scans may be performed for attenuation correction or for anatomical mapping purposes
- CT modes include: Scout, Axial and Helical scans
- Scan range defined on persistence (SPECT first) or CT scout image (CT first)
- Consecutive multiple SPECT scans followed or preceded by multiple CT scans combined with Volumetrix enable pasting of up to 5 Hybrid SPECT/CT FOVs.
- Maximum SPECT/CT scan range: 159 cm with an additional 32 cm acquisition from a separate scan with head holder

NM Data Processing and Review

The Discovery NM/CT 670 Pro acquisition station allows networking to local area networks.

Data acquired on the Discovery NM/CT 670 Pro is transferred under Ignite workflow, a one-click productivity solution, to Xeleris processing and review workstations via DICOM 3.0 standard for processing, archiving, reporting and hard copying.

SPECT Processing and Review

Xeleris offers Volumetrix* MI, a hybrid imaging tomography review package to superimpose and display matching pairs of nuclear and CT tomograms. Volumetrix MI is an interactive display allowing users to navigate in 3D throughout the entire tomographic study, including comparative display of corrected and uncorrected images.

Ignite

The Ignite feature for Discovery NM/CT 670 Pro and Xeleris is designed to help streamline clinician workflow via three simple steps:

- Select the patient in worklist
- Set up patient and utilize auto-home positioning
- Click once to begin acquisition of scan and automatic transfer and processing of results on Xeleris

Volumetrix MI

Volumetrix MI is a tomographic data viewing and processing package that is a consolidated application for SPECT and PET data processing with or without anatomical data (CT or MR), capable of multi-SPECT sessions pasting, follow up on multiple studies and input of anatomical oblique slices.

Its integrated SPECT reconstruction and correction algorithm includes interactive selection of optimal image reconstruction parameters and Hybrid QC (ACQC) tools to help improve alignment of SPECT and CT data sets for accurate attenuation correction and localization.

- Inputs anatomical oblique slices and features on-the-fly for oblique creation/manipulation
- Facilitates dual isotope and study follow-up reading and accepting multiple SPECT, PET, CT and MR datasets
- Supports standard uptake value (SUV) calculation and display mode for PET (LBM, BSA and BW methods)
- Flexible and user-customized layouts
- Auto Condense mode to automatically condense slices to fit on one screen for printing or filming
- Multiple fusion modes, including weighted fusion, which allows the user to adjust the contribution of the NM and CT images to the fused results
- Both the anatomical and the functional images retain resolution
- Fast CT scroll

MDC - Motion Detection and Correction (option)

- Automated cardiac and general purpose SPECT motion correction
- Sinogram and linogram images for QC analysis
- Tools for manual adjustment and correction

SPECT Reconstruction

- Adjustment of any of the reconstruction settings
- On-the-fly image correction setup including resolution recovery (option), attenuation and scatter
- Filter selection with filter gallery review to determine the most effective filter and filter parameters-2D Hanning, Metz, Butterworth, Hamming and Wiener filters are available for FBP reconstruction... 3D Butterworth, Hanning and Gauss filters are available for OSEM reconstruction

QC Package for Hybrid NM/CT Studies

This package enables effective alignment of hybrid NM and CT data sets in order to minimize potential inter-study misalignments. It can help reduce the potential need for study retakes and features:

- Automatic Hybrid QC (user overridden) of the NM FOV relative to Hybrid CT FOV
- Confirm or reject each FOV separately
- Correct or generate attenuation maps

Multi-FOV Pasting

- Automatic pasting (user overridden) up to 7 FOVs (covering the whole body)
- Preview pasted volume on SPECT/CT (NM & fused available – up to two FOVs)

Registration

- Manual adjustment via shift/rotate
- Single landmark registration
- Regional registration
- Fusion and spots collection are supported on registered images
- Auto accept or user intervention are allowed at any one of the above packages

Evolution for Bone (details under “options”)

Evolution for Cardiac (details under “options”)

Evolution toolkit (details under “options”)

Volumetrix Suite

Optional software for Volumetrix MI that expands the review capabilities of SPECT/CT, including:

- Volumetrix 3D optional s/w package, integrating 3D Fusion into nuclear medicine workflow (more details under “options”)
- Volumetrix IR optional s/w package, registering external CT or MR to SPECT or PET data (more details under “options”)

Attenuation Correction

Using CT transmission maps for reducing SPECT scans attenuation artifacts, Discovery NM/CT 670 Pro provides a highly effective cardiac and general purpose SPECT attenuation correction system. Imported CT transmission data can be used in both 90° and 180° detector geometries.

Standard Selectable Items

- Local language kits including user’s manuals and local keyboard layout

Options

Volumetrix Suite

Optional software for Volumetrix MI that expands the review capabilities of Discovery NM/CT 670 Pro and offers extended display and reporting flexibility.

Volumetrix 3D

Optional software package, integrating 3D Fusion into the nuclear medicine workflow, bringing together the benefits of advanced 3D visualization with the productivity of traditional 2D image analysis.

- 3D VR of fused SPECT-CT, PET-CT or MR images
- NM segmentation tools to include or exclude portions of either volume in the 3D rendered images, including removal of the table from the CT image and threshold based semi-automatic segmentation
- Clip & Cut Planes to integrate traditional Axial, Sagittal and Coronal slices simultaneously into the 3D rendered objects

Volumetrix IR

Optional software which provides a choice of DICOM 3.0 CT data sets to be registered to NM or PET data sets in the NM workflow:

- Rigid registration of NM to CT or MR
- Manual adjustment via shift/rotate
- Full or regional registration (fusion and collect supported)
- Auto accept or user intervention are allowed

High Precision Collimators

Discovery NM/CT 670 Pro features a choice of optional collimators which cover a comprehensive selection of applications in a wide range of energies including fan beam and pinhole collimators. For a detailed list of collimators is provided on pages 11 and 12.

Evolution for Bone

This is an optional iterative reconstruction with resolution recovery well-suited for Bone SPECT studies. The Evolution for Bone algorithm, which was developed at John Hopkins University and UNC Chapel Hill, models the collimator-detector response, improves Bone SPECT resolution and signal-to-noise ratios and reduces noise variability.

Use of the option enables:

1. Improved resolution of Bone SPECT studies acquired over standard acquisition time or
2. Non-inferior image quality with up to 50% reduction in count density, enabling:
 - a. Imaging at half the acquisition time compared to standard Bone SPECT protocols or
 - b. Imaging at half the dose compared to standard Bone SPECT imaging protocols or
 - c. Various combinations of (a) and (b).

Evolution Toolkit

Optional package enabling improved resolution and reduced noise for SPECT studies of Tc-99m, I-123, In-111 and Ga-67 by the use of the Evolution reconstruction technique with resolution-recovery. Compared to standard FBP or iterative reconstruction, Evolution Toolkit can enable improved visual clarity.

Evolution for Bone Planar

Optional add-on feature to Whole Body and Spots Bone Review application. Evolution for Bone Planar is an Adaptive Structure Matching Non-Local Filter which preserves the fine structures in the image. It employs an effective noise-reduction algorithm, well-suited pixel size and optimal energy window settings. Evolution for Bone Planar enables up to 50% reduction in count density compared to standard protocol, delivering any of the following:

1. Improved WB planar image quality*** for the same scan time
2. Shorter WB planar scan time while preserving image quality
3. Reduced injected dose of the same scan time while preserving image quality

Evolution for Cardiac

This is an optional OSEM resolution recovery reconstruction algorithm which models the collimator-detector response developed at John Hopkins University and UNC Chapel Hill. It improves cardiac SPECT resolution, signal-to-noise ratios and noise variability. The package provides non-inferior image quality with up to 50% reduction in count density of Cardiac SPECT studies, enabling:

1. Imaging at half the acquisition time compared to standard MPI protocols or
2. Imaging at half the dose compared to standard MPI protocols or
3. Various combinations of (1) and (2).

***Note: Image quality improvement is defined in terms of SNR and lesion contrast.

Cardiac Morphing

Optional software providing the following performance:

- Delivers enhanced perfusion image quality for Gated SPECT data
- Overcomes non-uniform blurring of the myocardium due to cardiac motion, enhancing the visual clarity of the images
- Based on elastic summation of tomograms representing all bins in a cardiac cycle – rescaled to match end-diastolic LV size

Quantitation

Advanced quantitation and CT AC enhancement options include:

- **Dosimetry Toolkit** optional application enabling quantification of changes in radiopharmaceutical absorption at multiple body organs over time through analysis of SPECT or planar WB studies and a hybrid SPECT/CT scan. The results may help in radiotherapy treatment planning. The quantification algorithm includes:
 - Aligning multiple planar WB and/or SPECT studies to each other and to a registered hybrid SPECT/CT scan of the same patient
 - Delineating organ VOIs through CT segmentation
 - Applying the VOIs for organ uptake quantification in a series of NM scans acquired over time resulting in calculated residual time per organ
- **Q.Metrix**[†] option, employing SPECT and CT segmentation tools for quantifying radiopharmaceutical uptake using patient demographics information and the same methods that are currently used to calculate SUV for PET images to quantify the following parameters:
 - Radiotracer uptake in Bq/ml
 - % of injected dose
 - Total uptake assessment in segmented organs/lesions
- **Q.AC**[†] option, for maintaining AC quality at low CT dose. Its unique CT reconstruction and processing algorithms provide SPECT attenuation correction that maintains quantitative SPECT measurements accuracy even at very low CT dose.
- **WideView**[†] option for reduced CT clipping artifacts, enabling CT attenuation correction of SPECT scans throughout the entire reconstructed SPECT field-of-view.

Other Options

Additional options include:

- High Performance Collimators (refer to pages 11-12)
- Carbon fiber axial head holder for brain SPECT scans
- External IVY R-Wave Trigger with and without ECG chart recorder
- Table Leg Extender
- QA bar phantom
- Rectangular Co-57 flood (Site license required)
- Butterfly arm support
- Leg support
- Pediatric scanning accessory
- A variety of Uninterruptible Power Supply (UPS) models

Siting Requirements

Minimum Room Size

- Exam Room Size: 20'8" x 12'1" (6.3 m x 3.7 m)
- Control Room Size: 9' x 14' (2.74 m x 4.27 m)
- With single desktop table: 15'5" x 8'11" (4.7 m x 2.4 m)

These values meet minimum clearance requirements under U.S. Federal Regulations and National Standards: 29 CFR 1910 (OSHA), NFPA 70E (Standard for Electrical Safety in the Workplace) and NFPA 101 (Life Safety Code). Specific room requirements may also need to comply with local and regulatory requirements.

Power Requirements

Power conditioning is incorporated into the primary power supply of the system. The system can operate on line voltage based on local conditions and codes.

380-480 VAC nominal, 3 phase Delta or Wye, 50/60 Hz. Power consumption is 90 kVA peak, 22 kVA average.

Operating Conditions

Parameter	Maximum	Minimum	Maximum Change Rate
Temperature	26° C (79° F)	18° C (64° F)	3° C/hr (5° F/hr)
Humidity	60% non-condensing relative	30% non-condensing relative	5 % / hr

Cooling Requirements

- The cooling requirements do not include cooling for the room lighting, personnel or non-NM/CT equipment present. Cooling requirements are listed by subsystem to allow planning for each room of the NM/CT suite.
- Cooling requirements are given for minimum, recommended and growth allowance scenarios.
- The minimum cooling figures assume patient throughput of 3 patients per hour and 75 scan rotations per patient
- The recommended cooling requirements assume patient throughput limited by the tube-cooling algorithm.
- The suite cooling can be sized for future developments by using

the growth allowance figures. This cooling will accommodate more patients per hour and/or potential future system enhancements.

Regulatory Compliance

This product is designed to comply with applicable safety standards. The Discovery NM/CT 670 Pro system is CE marked and it complies with the requirements of IEC 60601-1 and relevant collateral, UL 60601-1, Safety Standards for Medical Electrical Equipment.

GE Healthcare has been certified to be ISO-9001 and ISO-13485 compliant.

Warranty

Please contact your sales representative for information.

Subsystem	Minimum Allowance (± 10%)	
	Watts	BTU/hr
Gantry	7,700	26,300
Table	500	1,700
PDU	1,000	3,400
Operator Console	2,165	7,400

Discovery NM/CT 670 Pro Mechanical Specifications

Patient Table	Specification
Table weight	1,246 lbs. (565 kg)
Maximum patient load capacity	500 lbs. (227 kg)
Maximum NM WB scan length	78.7" (200 cm) + 9.9" (25 cm) with tabletop extender
Maximum SPECT scan range	78.7" (200cm) + 15.7" (40 cm) SPECT FOV with tabletop extender
Maximum CT scan length	75.2" (191 cm) with head holder or tabletop extender
Maximum hybrid NM/CT scan length	62.6" (159 cm) + non-continuous 12.6" (32 cm) with head holder
Table width	24.0" (61 cm)
Tabletop width	15.8" (40 cm)
Table length	9'2" (280 cm)
Height	Minimal: 23.2" (59 cm) Maximal: 39.4" (100 cm)
Attenuation	<10% for 140 keV gamma rays <27% for 120 kVp X-rays
Maximum pallet height at center	34.1" (86.7 cm)
Vertical travel time (full range)	Slow: 34 sec Fast: 26 sec
Horizontal speed (manual, handheld controller)	Slow: 0.98"/s (24.8 mm/s) Fast: 3.94"/s (100 mm/s)

NM/CT Gantry	Specification
Depth (length)	86.6" (220 cm)
Width	85.8" (218 cm)
Height (excluding the gantry display pole)	83.1" (211 cm)
Gantry bore size (diameter)	27.6" (70 cm)
Weight	8,322 lbs. (3,778 kg) without collimators
NM Rotational (Axial) Motion Speed	0.033 to 3.0 rpm automatically; 1.0 or 3.0 rpm manually
NM Independent Radial Motion Speed	19.7" or 29.5"/min (50 or 75 cm/min)
Emergency stops	5
NM rotation range	540°
NM Gantry Orientations SPECT Planar	90° and 180° opposing, Horizontal 0° Planar, Vertical 180° Planar 90° and 180° opposing
NM Swivel Tilt Range	0° to 180° about detector axis
NM Caudal/Cephalic Tilt Range	Each detector can swivel independently ± 45° (available only on hospital bed/gurney)
NM Detector Scan Radius (With LEHR Collimators)	Minimum: 3.9" (10 cm) radius/7.8" (20 cm) diameter Maximum: 13.8" (35 cm) radius/27.6" (70 cm) diameter
NM Lateral Motion Speed	19.7" or 29.5"/min (50 or 75 cm/min)



Main programmed orientations of Discovery NM/CT 670 Pro gantry

Discovery NM/CT 670 Pro NM Features Summary

SUBSYSTEM	KEY FEATURE	USER/PATIENT BENEFIT
NM Elite NXT 3/8" or 5/8" DETECTORS	2 rectangular digital detectors with real-time corrections for sensitivity, linearity, energy, isotope decay and COR	High resolution large FOV detectors with excellent image quality and stability
	Slim detectors	Low gantry load for excellent mechanical precision and wide detector clearance for wide referral population
	Real-time Automatic Body Contouring	Automatically follows the contour of the patient for both SPECT and whole body imaging, maintaining minimal patient-to-detector distance for high resolution images; minimizes time-to-position patients
	Energy range: 40 - 620 keV	Optimized for wide energy range and multiple isotope studies
COLLIMATION	Collision sensitive pads on collimators surface and on body contouring device	Protect against collision with patient body: automatically halt detector/table motions for patient safety
	High Precision Collimators	Maintain excellent image quality in all applications
	Dual-collimator cart combines storage and exchange functions	Productivity, ease of use and safety; both collimators removed/replaced during one exchange session

SUBSYSTEM	KEY FEATURE	USER/PATIENT BENEFIT
DUAL AXIS IMAGING TABLE	Single table for all study types with automatic setup of table positions	Ease of use and productivity: fast and easy planar Whole Body, SPECT, SPECT/CT and CT procedures setup and acquisition
	Telescopic transporter design provides solid support for the tabletop in both the NM and the CT scanning positions	Improves SPECT/CT registration precision by minimizing potential table-sagging-induced NM-CT misalignments
	Patient weight load of up to 500 lbs. (227 kg)	Accommodates greater portion of the scanned population compared with previous GE NM camera models
	Tabletop longitudinal travel accommodates 6'7" (200 cm) patient	Accommodates greater portion of the scanned population compared with previous GE NM camera models
	Table vertical travel range: Minimal: 23.2" (59 cm) Maximal: 39.4" (100 cm)	Ease of patient transfer from wheelchair or stretcher; well suited for geriatric and pediatric patients
	Mobile design pivots on rear floor pin	Study flexibility for seated and stretcher patients, as well as collimator exchange; reduces tripping hazards
	Curved profile, low attenuation carbon-fiber tabletop	Patient comfort on wide table can help reduce patient movement and, therefore, improve image quality
	Touch ruler for scan range delineation	Fast and simple, may enhance operator productivity
	Hand grips on sides and cradle release on rear of table	Ease of table positioning and fast patient egress (cradle release) in case of emergency
	Accommodates head holder	Fixed patient positioning for high quality brain SPECT studies
	Accommodates wide arm support straps	Patient comfort and user productivity
	Accommodates tabletop extender	Ability to image taller patients in legs-in position and extend WB scan range from standard 200 cm to 225 cm
NM HANDHELD CONTROLLER	Icon-based design	Ease of use for simple patient setup
	Pole-mounted handheld controller on top of gantry	User can operate controller from either side of the gantry for flexibility; user can start exam without leaving the patient's side
NM GANTRY	Exam Room Size: 20'8" x 12'1" (6.3 m x 3.7 m)	Minimal room layout requirements
	Detectors shape optimized for 90° geometry (valid for LEHR and ELEGP)	Shaped detector edges fit together tightly during 90° cardiac mode, minimizing dead space for high sensitivity and resolution
	Secured position on floor	Gantry does not move on rails, providing for mechanical stability and reliability; reduces tripping hazards
	Automatic study "Home" positions	Ease of use and quick patient setup with factory home positions of: collimator exchange, 180° SPECT, 180° Brain SPECT, 180° Whole Body, Vertical orientation facing out, 90° Cardiac SPECT, 90° SPECT Spine and Stretcher
	Externally mounted dual detectors	Patient friendly; ease and speed of patient positioning
	Emergency Stop buttons	Stops all system motions upon emergency for patient safety
	Motorized radial detector movement in 90° position	Highly flexible patient positioning for cardiac imaging; COR stability and reproducibility
	Free geometry capability of various 0°, 90° and 180° configurations	High throughput configurations for cardiac SPECT and whole body imaging, as well as providing flexibility of a single-head camera
	Flexible detectors positioning including upright standing or seated patients and hospital bed scanning	High clinical utility including "single-head positioning flexibility"
Rapid transition between the various gantry geometries	Technologist productivity; ease and speed of study set-up	

SUBSYSTEM	KEY FEATURE	USER/PATIENT BENEFIT
NM ACQUISITION STATION	Graphical user interface with Xeleris workstation	Facilitates ease of use
	Standard high-end Windows PC running a real-time multi-tasking interface	May enhance productivity with multi-window, multi-tasking system
	Linux operating system	Parallel operations allow simultaneous acquisition and display to help enhance productivity
	Fully-integrated PECT/CT workflow solution with Ignite	Workflow productivity for streamlined imaging procedures including camera/patient setup, acquisition, processing and archiving
	Networks to Xeleris Processing & Review	Non-proprietary communication protocols; open system
DICOM CONNECTIVITY	Networks to DICOM-compliant systems	Communicates with 3rd party DICOM-compliant workstations
	DICOM Modality Worklist	Streamlines patient admittance and scheduling

Elite NXT NM Detector Performance Specifications[§] Summary

SPECIFICATION	PARAMETER		RANGE	DATA (3/8" Crystal)	DATA (5/8" Crystal)
Field-of-View	UFOV	Length	=	54 cm	54 cm
		Width		40 cm	40 cm
Intrinsic Energy Resolution (Tc-99m @ 20 kcps)	UFOV	FWHM	≤	9.5 %	9.5 %
Intrinsic Spatial Resolution	CFOV	FWHM	≤	3.7 mm	4.5 mm
		FWTM	≤	6.8 mm	8.5 mm
	UFOV	FWHM	≤	3.8 mm	4.6 mm
		FWTM	≤	6.9 mm	8.7 mm
Intrinsic Uniformity	CFOV	Differential	≤	2.1%	2.1%
		Integral	≤	3.0%	3.0%
	UFOV	Differential	≤	2.3%	2.3%
		Integral	≤	3.6%	3.6 %
Intrinsic Spatial Linearity	CFOV	Differential	≤	0.2 mm	0.2 mm
		Absolute	≤	0.4 mm	0.5 mm
	UFOV	Differential	≤	0.2 mm	0.2 mm
		Absolute	≤	0.4 mm	0.5 mm
Multiple Window Spatial Registration			≤	0.5 mm	1.0 mm
Intrinsic Count Rate	Maximum Count Rate		≥	460 kcps	460 kcps
	Maximum @ 20% Window		≥	400 kcps	400 kcps
	20% Loss @ 20% Window		≥	250 kcps	250 kcps
SPECT Reconstructed Spatial Resolution with Scatter (LEHR Collimators)	Central		≤	9.9 mm	10.3 mm
	Radial		≤	9.9 mm	10.3 mm
	Tangential		≤	7.5 mm	7.9 mm

[§]Per NEMA NU-1 2007.

Evolution for Bone SPECT Performance Specifications

SPECIFICATION	PARAMETER	RANGE	Full time	Half time
Evolution for Bone SPECT Reconstructed Spatial Resolution with Scatter[§] (LEHR Collimators)	Central	≤	6.4 mm	7.0 mm
	Radial	≤	5.7 mm	6.0 mm
	Tangential	≤	5.1 mm	5.4 mm

[§]reconstructed without post-filtering

Discovery NM/CT 670 Pro Parallel Hole Collimators

DESCRIPTION	NAME	CATALOG NUMBER (a)	RECOMMENDED ISOTOPE	FIELD OF VIEW (cm) (b)	CALCULATED PENETRATION (%)	SYSTEM SENSITIVITY (cpm/μCi) @100 mm 3/8"/5/8" Per Detector (c)	SYSTEM SENSITIVITY (cps/MBq) @100 mm 3/8"/5/8" Per Detector (c)	SYSTEM RESOLUTION FWHM (mm) @100mm 3/8"/5/8" (d)	TYPE OF HOLE	HOLE DIAMETER (mm)	SEPTAL THICKNESS (mm)	HOLE LENGTH (mm)	WEIGHT (kg/lb) 1 pcs
Low Energy** Ultra-High Resolution	LEUHR	H2506TH	Tl-201/ Tc-99m Studies	54 x 40	0.3 (Tc-99m)	83/N.A. (Tc-99m)	38/N.A. (Tc-99m)	6.1/N.A.	hex	1.22	0.15	38	80/176
Low Energy** High Resolution	LEHR	H2506TB	Tl-201/ Tc-99m Studies	54 x 40	0.3 (Tc-99m)	160/165 (Tc-99m)	72/74 (Tc-99m)	7.4/7.7	hex	1.5	0.2	35	60/132
Extended** Low Energy General Purpose	ELEGP	H2506TD	I-123/ Kr-81 Studies	54x 40	0.3 (I-123) 2.3 (Kr-81)	320/330 (Tc-99m) 224/245 (I-123)	144/148 (Tc-99m) 101/110 (I-123)	10.3/10.6	hex	2.5	0.4	40	62/136
Medium Energy General Purpose	MEGP	H2506TC	Ga-67/ In-111 studies	54 x 40	2.0 (Ga-67)	144/150 (Ga-67)	65/67 (Ga-67)	9.4/9.8	hex	3.0	1.05	58	103/227
High Energy General Purpose	HEGP	H2506TE	I-131 studies	54 x 40	2.0 (I-131)	97/165 (I-131)	43/73 (I-131)	12.0/12.5	hex	4.0	1.8	66	131/289

- a. Each commercial item includes 2 collimators mounted on a cart
- b. Collimator field-of-view
- c. Measured with 20% window using relevant isotope for each collimator, with ±10% tolerance
- d. Measured at 100 mm distance from collimator face with ±4% tolerance

**L-mode SPECT (90° detectors geometry) is effective with low energy collimators (LEUHR, LEHR, and ELEGP)

Discovery NM/CT 670 Pro Pinhole Collimator

DESCRIPTION	NAME	CATALOG NUMBER	RECOMMENDED APPLICATION/ ISOTOPE	FIELD OF VIEW (mm)	Weight (kg/lb)	Insert hole diameter (mm)	SYSTEM SENSITIVITY (cpm/μCi) @100 mm 3/8"/5/8" Per Detector (b)	SYSTEM SENSITIVITY (cps/MBq) @100 mm 3/8"/5/8" Per Detector (b)	SYSTEM RESOLUTION FWHM (mm) @100mm 3/8"/5/8" (c)
General Purpose Pin Hole (3 inserts)	GPPH(a)	H2506TF	Thyroid/Tc99m, I123, I131	200 diameter	98/216 – 1 pcs. 169/370 – 2 pcs.	2 4.45 8	43/47 200/216 570/600	19/20 90/95 258/268	3.8/4.2 6.5/7.1/11.4/12.1

- a. Commercial item includes a single collimator mounted on a cart
- b. Sensitivity measured with Co57 (point source at 100 mm from insert center with PSD cover, 20% window) extrapolated to Tc-99m with ±10% tolerance
- c. Resolution measured with ±4% tolerance

Discovery NM/CT 670 Pro Fan Beam Collimator

The optional Fan Beam Collimator enables higher efficiency brain SPECT studies compared to LEHR collimator.

DESCRIPTION	NAME	CATALOG NUMBER (a)	RECOMMENDED APPLICATION/ ISOTOPE	FIELD OF VIEW (mm) @ (b)	CALCULATED PENETRATION (%)	TYPE OF HOLE	HOLE DIAMETER (mm)	SEPTAL THICKNESS (mm)	HOLE LENGTH (mm)	Volume sensitivity (c) 3/8"/5/8"	SPECT resolution 3/8"/5/8" (d)	Weight (kg/lb) 1pcs
Fan Beam	Fan Beam	H2506TG	Brain/ Tc99m	540 x 250	0.1 (Tc99m)	hex	1.5	0.2	40	39,960 [cpm/ μ Ci/cm ²] 18,000 [cps/MBq/cm ²]	Central 8.0/8.2 mm Peripheral Radial 8.5/8.7 mm Peripheral Tangential 6.7/7.0 mm	64/140

- a. Commercial item includes 2 collimators mounted on a cart
b. Collimator field-of-view
c. Sensitivity measured on two detectors, Tc99m with 15% window, with $\pm 10\%$ tolerance
d. SPECT resolution measured with $\pm 6\%$ tolerance

Notes:

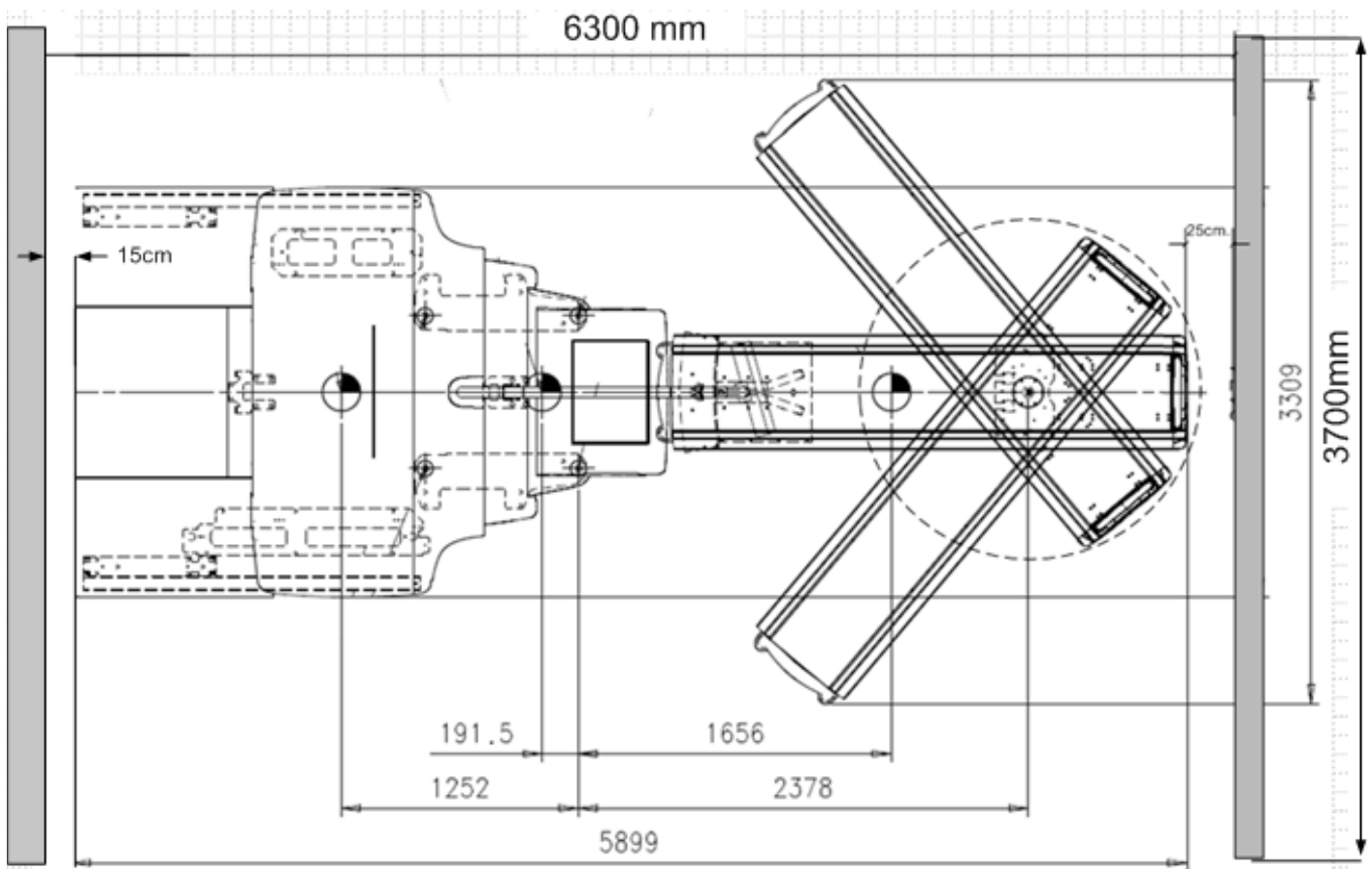
- Recommended brain scan radius is 14-16 cm
- Focal distance from collimator surface is 350 mm
- Effective collimator thickness is 57 mm

Discovery NM/CT 670 Pro 16-slice CT Key Specifications

CT Features	Discovery NM/CT 670 Pro CT Performance
Gantry	
Aperture	70 cm
Scan Field	50 cm (up to 70 cm with WideView option)
Rotation Time	0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 2.0, 3.0, 4.0
Temporal Resolution (min)	125 ms
Data Acquisition System	
Maximum Number of Slices/Rotation	16
Number of Physical Detector Rows	24
Axial Acquisition Modes	1 x 1.25 mm, 1 x 5 mm, 1x 10 mm, 2 x 0.625 mm, 2 x 2.5 mm, 2 x 5 mm, 2 x 7.5 mm, 2 x 10 mm, 4 x 1.25 mm, 4 x 2.5 mm, 4 x 3.75 mm, 4 x 5 mm, 8 x 1.25 mm, 8 x 2.5 mm, 16 x 0.625 mm, 16 x 1.25 mm
Tube Assembly	
Tube	GE Performix Ultra CT X-ray Tube
Tube Current Voltage	10 - 440 mA
Tube Voltage	80, 100, 120, 140 Kv
Tube Anode Heat Storage Capacity	6.3 MHU
Heat Dissipation	Anode (max) 840 KHU/min Casing (cont) 300 KHU/min Tube Unit 6.9 kW continuous for 10 min
Focal Spot Size According to IEC 60336/1993	small 0.7x 0.6 mm large 0.9 x 0.9 mm

CT Features		Discovery NM/CT 670 Pro CT Performance	
Generator			
Maximum Power	53.2 Kw		
Axial Acquisition			
Reconstructed Slice Widths	0.625, 1.25, 2.5, 3.75, 5.0, 7.5, 10.0 mm		
Scan Times Full Scan (360°)	0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 2.0, 3.0, 4.0s		
Multi-slice Helical Acquisition			
Reconstructed Slice Widths	0.625, 1.25, 2.5, 3.75, 5.0, 7.5, 10.0 mm		
Scan Times Full Scan (360°)	0.5, 0.6, 0.7, 0.8, 0.9, 1.0s		
Reconstruction Increment	0.1 mm		
Pitch Factor	0.5625:1, 0.9375:1, 1.375:1, 1.75:1 for 16-Slice Helical		
Spiral Scan Time (max)	120 s (single helical scan)		
Scan Length (max)	159 cm (continuous) 191 cm (including 32 cm, noncontinuous)		
Low-Contrast Detectability (CATPHAN Phantom measured in both helical and axial scans)			
at 6.67 mGy with ASiR (ASiR 60% enabled)	5 mm @ 0.32%		
at 10.0 mGy with ASiR (ASiR 60% enabled)	5 mm @ 0.30%		
at 20.84 mGy with ASiR (ASiR 60% enabled)	3 mm @ 0.32%		
at 27.9 mGy with ASiR (ASiR 60% enabled)	3 mm @ 0.30%		
at 8.90 mGy without ASiR	5 mm @ 0.32%		
at 13.3 mGy without ASiR	5 mm @ 0.30%		
at 27.47 mGy without ASiR	3 mm @ 0.32%		
at 37.2 mGy without ASiR	3 mm @ 0.30%		
High Contrast Resolution - Axial			
Standard Algorithm	4.0 lp/cm @ 50% MTF 6.5 lp/cm @ 10% MTF 8.5 lp/cm @ 0% MTF		
Hi-Res Algorithm	8.5 lp/cm @ 50% MTF 13.0 lp/cm @ 10% MTF 15.4 lp/cm @ 0% MTF		
High Contrast Resolution - Helical			
Standard Algorithm - typical	4.3 lp/cm @ 50% MTF (X/Y) 6.8 lp/cm @ 50% MTF (X/Y) 8.5 lp/cm @ 50% MTF (X/Y)	7.5 lp/cm @ 50% MTF (Z) 14.2 lp/cm @ 50% MTF (Z) 19.6 lp/cm @ 50% MTF (Z)	
Hi-Res Algorithm (Edge) - typical	10.2 lp/cm @ 50% MTF (X/Y) 13.9 lp/cm @ 50% MTF (X/Y) 15.4 lp/cm @ 50% MTF (X/Y)	7.9 lp/cm @ 50% MTF (Z) 15.1 lp/cm @ 50% MTF (Z) 19.6 lp/cm @ 50% MTF (Z)	
Dose, CTDI100 Values			
Head	17.0 mGy/100mAs - Center 16.8 mGy/100mAs - Surface		
Body	5.5 mGy/100mAs - Center 10.0 mGy/100mAs - Surface		

Discovery NM/CT 670 Pro Minimal Room Layout: 630 cm x 370 cm (20'8" x 12'1")



The floor plan of minimum room layout above (6.30 m x 3.70 m / 20'8" x 12'1") meets the following egress and service clearance requirements under U.S. Federal Regulations and National Standards:

- 29 CFR 1910 (OSHA), NFPA 70E (Standard for Electrical Safety in the Workspace)
- NFPA 101 (Life Safety Code)

Specific room layouts may be subject to additional local and regulatory requirements. For non-U.S. installations, specific installations are subject to country, local and regulatory requirements. For more information, please contact your local GE representative.

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**Only LEHR, LEUHR and ELEGP collimators can be used for SPECT at 90° geometry

***See Optima CT540 Data Sheet for more detail

§ (1) ASiR is licensed for use with a GE x-ray tube. Use of a third party x-ray tube will require an additional license.

(2) 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.

(3) Evolution Disclaimer and tags:

- In clinical practice, Evolution options (Evolution for Bone, Evolution for Cardiac, Evolution for Bone Planar) and Evolution Toolkit are recommended for use following consultation of a NM physician, physicist and/or application specialist to determine the appropriate dose or scan time reduction to obtain diagnostic image quality for a particular clinical task, depending on the protocol adopted by the clinical site.
- Evolution claims are supported by simulation of count statistics using default factory protocols and imaging of Tc-99m based radiotracers with LEHR collimator on anthropomorphic phantom or realistic NCAT – SIMSET phantom followed by quantitative and qualitative images comparison.
- Evolution Toolkit claims are supported by simulation of full count statistics using lesion simulation phantom images based on various radiotracers and collimators and by showing that SPECT image quality reconstructed with Evolution Toolkit provides equivalent clinical information but has better signal-to-noise, contrast and lesion resolution compared to the images reconstructed with FBP/OSEM.



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