



Tomotherapy[®]
ACCURAY[®]



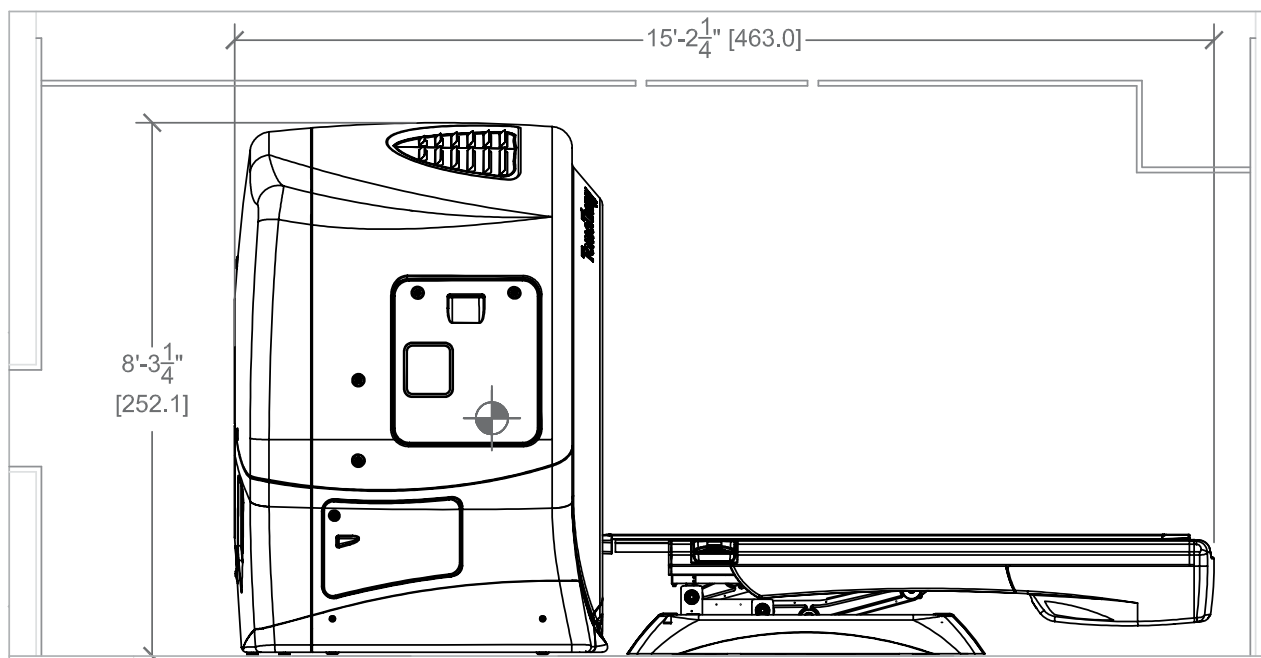
TOMOHD[™] TREATMENT SYSTEM

Product Specifications

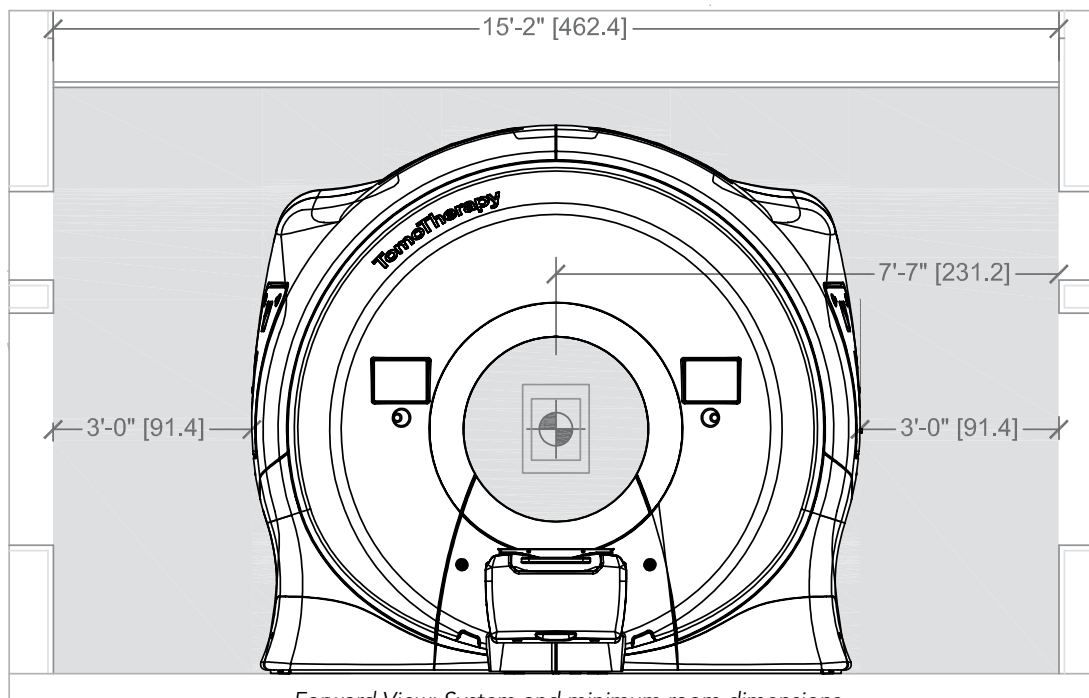
1. Complete Treatment System

Dimensions

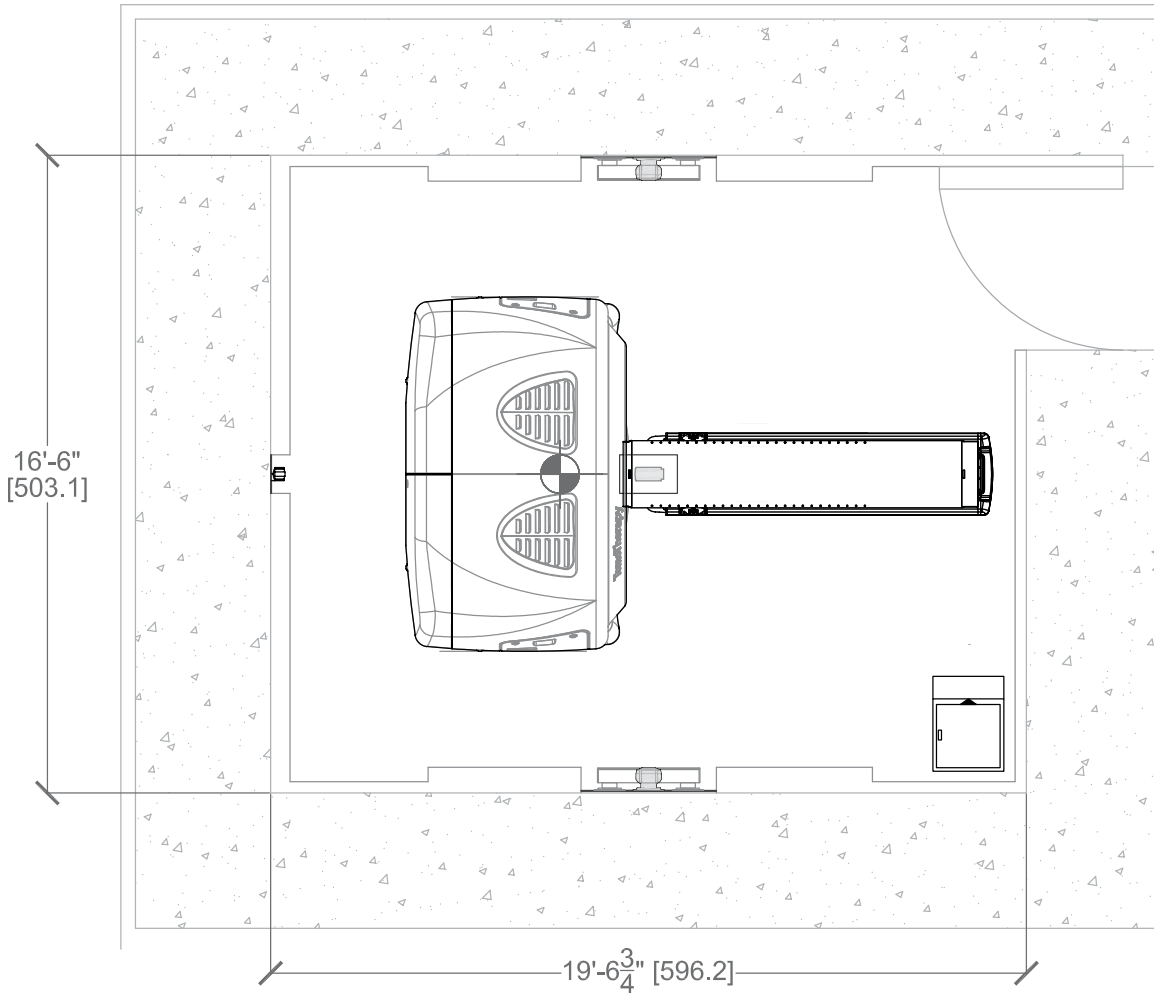
- Height 8 ft., 3.25 in. (252.1 cm)
- Width 9 ft., 2.50 in. (280.6 cm)
- Length 15 ft., 2.25 in. (463.0 cm)
- Weight 10,000 lbs. (4,536 kg)



Lateral View: System and minimum room dimensions



Forward View: System and minimum room dimensions



Top View: System and minimum room dimensions

2. Installation

Minimum room size - requirements

- Height 8 ft., 10.13 in. (269.6 cm)
- Width 15 ft., 2.00 in. (462.4 cm)
- Length 19 ft., 6.75 in. (596.2 cm)

Typical schedule (receipt of system to first treatment)

30 days, although completion has been achieved within two weeks

Commissioning

Integrated system completely pre-commissioned in the factory and re-verified at customer site

3. Treatment Vault Environment

SPECIFICATION

Line voltage, VAC

REQUIREMENTS

480 volts, 3-phase; others may be supported

Ambient room temperature

68 - 75 degrees Fahrenheit (20 - 24 degrees Celsius)

Relative humidity

30% - 60%, noncondensing

4. Mechanical Features

SPECIFICATION

Gantry

- Degrees of rotation
- Direction of rotation
- Rotational angle accuracy
- Speed of rotation
- Controls
- Source to axis distance
- Mechanical to radiation isocenter offset
- Mechanical isocenter stability
- Position indicators
- Isocenter height
- Cooling

PERFORMANCE

Rotates around IEC-y axis, continuous rotation
 Clockwise viewed from the foot of the couch
 Within 0.5 degrees
 Varies; dependent upon plan
 Rotational speed set during treatment planning
 85 cm
 Included in beam model (within accuracy 0.25 mm)
 < 0.4 mm
 5-axis laser system
 113 cm typical (dependent upon finished flooring)
 Integrated onboard cooling system eliminates need for facility-chilled water loop

5. Photon Beam

SPECIFICATION

Accelerator type

- Length

Microwave

- Power
- Source

Nominal dose rate at Dmax**

Nominal Dmax**

Percentage depth dose at 10 cm**

Number of beamlets

Nominal energy

Nominal spot size

Penumbra of treatment beam - IEC-y axis

Field size range at isocenter

Maximum radiation field length

Treatment volume - TomoHelical™

Treatment volume - TomoDirect™

PERFORMANCE

Standing Wave
 0.3 meters

2.5 MW
 Magnetron

850 cGy/min

1.5 cm

Typical 61.4%

Plan dependent; system capable of efficiently delivering tens of thousands of beamlets which allows for very high fidelity intensity modulation

6 MV, single energy

2 mm

The 80% - 20% penumbra widths are approximately 4.9 mm, 4.6 mm, and 4.1 mm (respectively for the 5.0 cm, 2.5 cm, and 1.0 cm field widths).

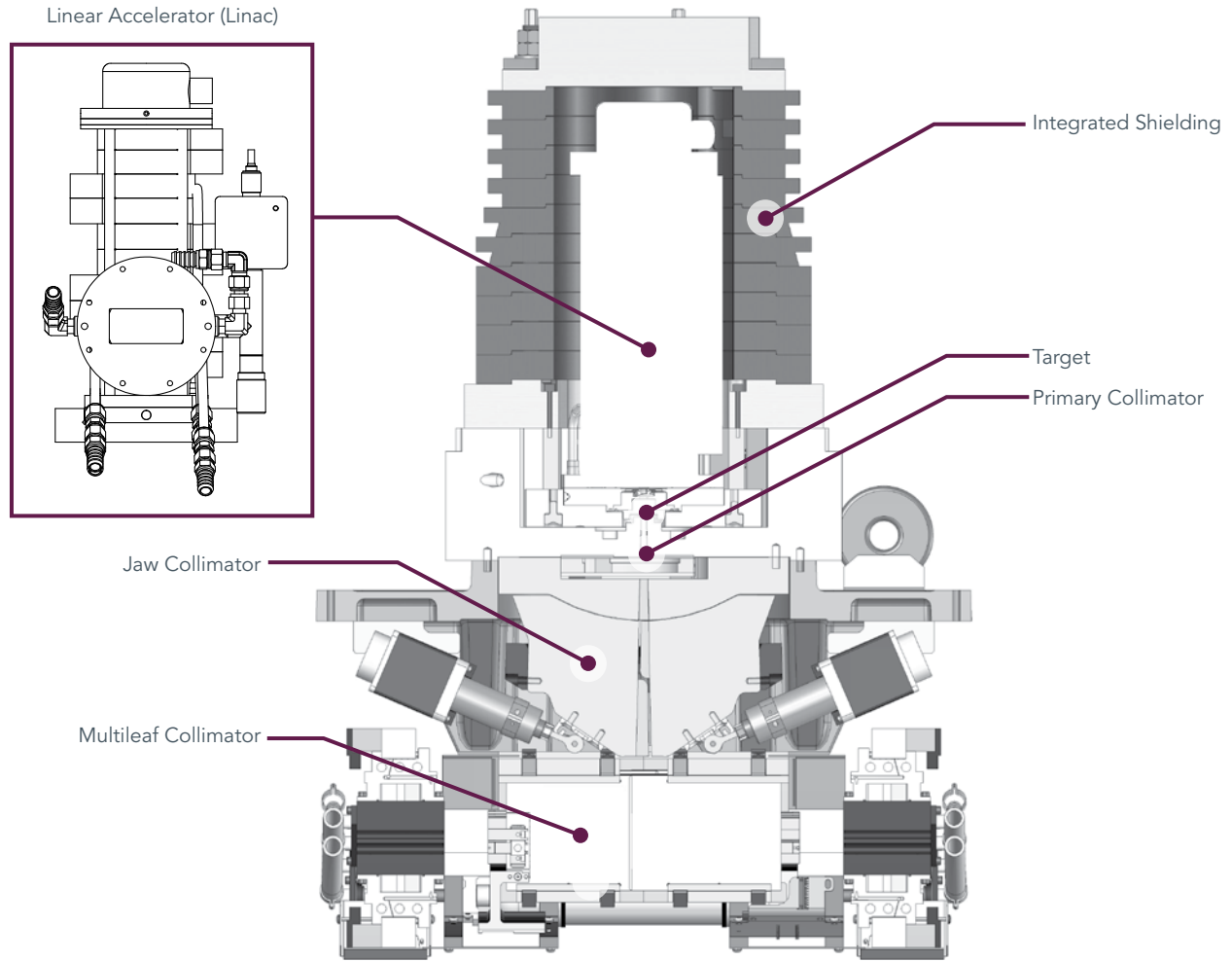
Selectable	1.0 cm x 0.625 cm to 1.0 cm x 40 cm
	2.5 cm x 0.625 cm to 2.5 cm x 40 cm
	5.0 cm x 0.625 cm to 5.0 cm x 40 cm

150 cm with Couch at height of isocenter plane

80 cm (transverse diameter) x 135 cm (longitudinal) for typical patient set-up; Actual treatment volume length is variable depending upon couch height; Note: Region of treatment used is determined by the planning CT image field of view (FOV) Provided the FOV is 80 cm or less and all patient anatomy is present in the planning image, the *TomoHD* system can import the image, plan, and treat.

40 cm (transverse diameter) x 135 cm (longitudinal) for typical patient set-up; Actual treatment volume length is variable depending upon couch height.

** Performance based on 5 cm field size at SSD=85 cm.



Accelerator and collimator subsystems

Average MLC leakage

Primary collimation

Jaw collimation

- Travel range
- Axis of travel
- Speed of travel

- Basic dimensional description

Multileaf collimation

- Number of leaves
- Basic dimensional description
- Mode of operation
- Axis of travel
- Speed of travel
- Resolution
- Leaf drive mechanism
- Position indicator

0.25% (typical)

Tungsten block with rectangular, fixed aperture

1.0 cm - 5.0 cm treatment field width at isocenter
IEC-y

Selectable fixed primary collimation widths set
at the start of a given treatment

13.5 cm tungsten thickness

64 binary interlaced leaves (tongue and groove side profile)

10 cm leaf thickness in beam direction

Binary leaves either fully in or fully out of beam path

1 axis, longitudinal direction (IEC-y)

Binary leaf state changed within 20 msec

0.625 cm leaf widths in IEC-x direction at isocenter

Pneumatic

Continuous monitoring with interlock, checks that leaves
open and close at correct time

6. Dosimetry

SPECIFICATION

Chamber type
Precision
Linearity
Variation of dose rate vs. gantry angle
Beam-off interlocks

PERFORMANCE

Full beam transmission, hermetically sealed dual chamber
Within 1%
Within 1%
Within 2%
Radiation System; Dose Monitoring, Patient Table Position; Gantry Angle; Computer Communications; Vault Door; Facility E-stops

7. CTrue™ Imaging

SPECIFICATION

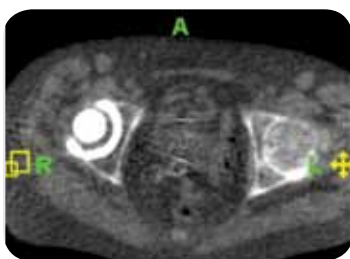
Geometry
Dose per MVCT image (typical)
Detector configuration
Image resolution (xy)
Slice spacing available
Scan time
Field of view (FOV)
Source to detector distance
Isocenter to detector distance
Image noise
Image uniformity
Spatial resolution
Contrast resolution
Image reconstruction algorithm
Image reconstruction time
Image registration tools
Application of adjustments obtained via image registration
Frequency of correction for geometry flexion
Image guidance mode

PERFORMANCE

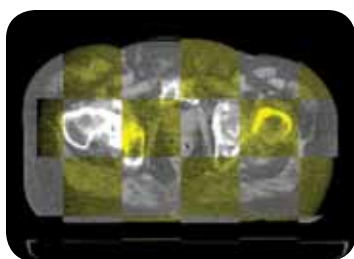
Fan-beam
0.5 - 3 cGy depending on resolution and body thickness
528 channels, single-row xenon ion chamber array used for image acquisition
512 x 512 (0.78 mm pixels)
2 mm, 4 mm, 6 mm
Typically 2 minutes per 10 cm length at 4 mm slice spacing
40 cm diameter
145 cm
60 cm
2% - 4%
Within 2.5%
Nominal 0.5 lp/mm at 10% MTF
2% density for 2 cm object (typical)
Filtered backprojection
Real-time; slice-by-slice at time of acquisition
MVCT/kVCT image overlay with adjustable checkerboard; manual or automatic registration (maximization of mutual information) using bone and/or soft tissue; translations and pitch/roll/yaw determination
Translations applied via couch, roll applied via gantry
None required; rigid ring gantry platform
Daily 3D MVCT matched with 3D kVCT



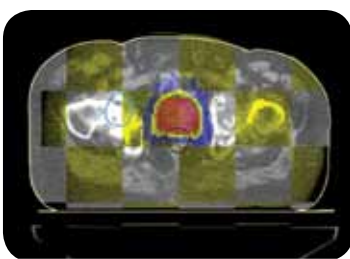
Prostate visibility



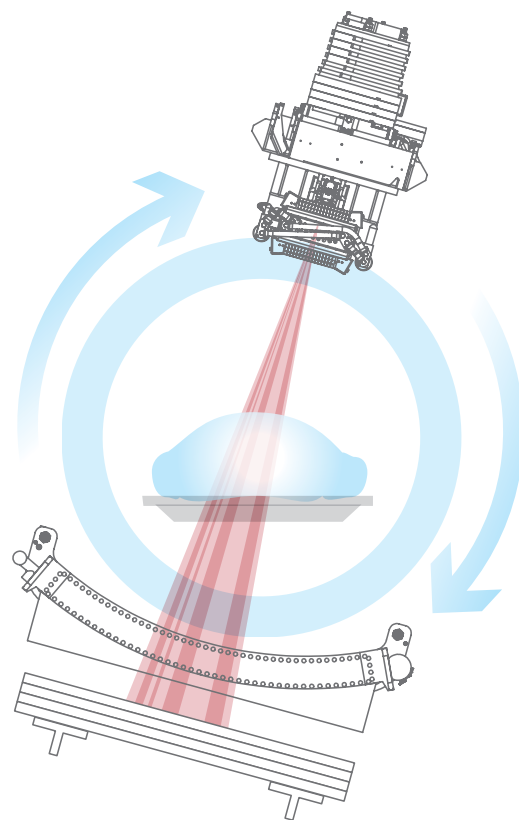
No high-Z artifact



Multi-planar image overlay



Overlay images, structures, dose



Common imaging and treatment subsystem

8. Safety Features

Integrated treatment planning: Planning and treatment systems use a common database

Integrated quality assurance: Patient-specific QA via a dedicated application on the planning station

Integrated R&V: Built-in record and verify in addition to DICOM compliant MOSAIQ and Aria interfaces

Single database: Common database for planning, imaging and treatment data

No plan data transfer: Planning data retrieved by treatment system from common database

Common imaging and treatment beam source: Imaging geometry consistent with treatment geometry (imaging and treatment source are the same), thus avoiding the need for repeated geometric calibration of 2 different sources

Fully enclosed gantry: Integrated gantry enclosures protecting the patient from beam delivery system components

No auxiliary beam collimation: Integrated binary MLC (multileaf collimator) provides all beam collimation and modulation, removing the possibility of incorrect component installation and maintaining maximum physical patient clearance; also reduces handling of hazardous material

No bending magnet: No beam bending required, therefore eliminating the possibility of geometry errors resulting from redirection of the beam

No electron mode: The treatment system cannot be set to an unintended mode of delivery (note that helical IMRT with 6 MV x-rays can be planned to deliver treatments similar to electron mode treatments)

Full system integration: Level of system integration results in software for all components being designed and tested in unison, reducing concerns of disparate system interfaces and compatibility concerns across products and across companies

STANDARD SYSTEM

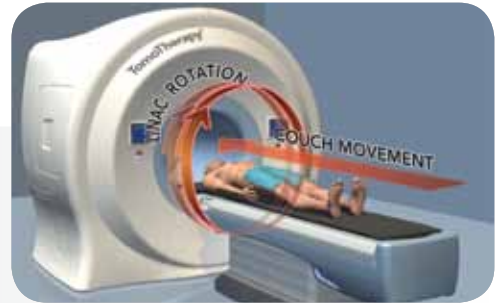
9. TomoHelical™ Treatment Delivery Mode

The *TomoHelical* delivery mode provides IMRT and 3D CRT treatment delivery in a continuous (360°) helical pattern, using thousands of narrow beamlets, which are individually optimized to target the tumor. The *TomoHelical* mode maximizes conformality and uniformity of dose to the tumor while minimizing exposure to healthy tissue.

The user is able to create a treatment plan that defines dose goals and constraints for target and avoidance structures, the level of modulation for the plan, as well as the fractionation schedule.

During treatment delivery, the linear accelerator completes multiple 360° rotations around the patient while the couch passes through the bore of the system, initiated by a single turn of the operator console key.

Targets of up to 135 cm in length* can be treated, with no need to reposition the patient and with no field junctioning.



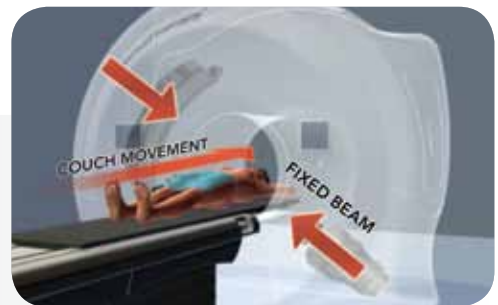
The gantry rotates around the patient in TomoHelical delivery mode, delivering radiation in a continuous spiral pattern

10. TomoDirect™ Treatment Delivery Mode

The *TomoDirect* delivery mode is a discrete angle, non-rotational delivery mode. *TomoDirect* allows creation of treatment plans that include between 2 and 12 target-specific gantry angles. It also allows the user to define the level of modulation for the plan, including a 3D delivery mode. Treatment planning is completed rapidly due to the power of the system's computing platform.

During treatment delivery, all beams for each target are delivered sequentially with the couch passing through the bore of the system at an appropriate speed for each gantry angle. The complete treatment delivery is initiated by a single turn of the operator console key.

Targets of up to 135 cm in length* can be treated, with no need to reposition the patient and with no field junctioning.



2 – 12 discrete gantry angles can be used in TomoDirect delivery mode

11. High Performance Couch

The High Performance Couch, with Medical Intelligence indexing system, provides sub-millimeter accuracy and precision in point-to-point and translational positioning.

Clinical workflow is enhanced with ergonomically designed dual Couch Control Keypads mounted to each side of the couch. The Couch Control Keypads allow motorized patient position modification in the X, Y and Z directions with simple, single-handed operation.

The custom patient couch has a high strength carbon-fiber top with an indexing system designed to accommodate immobilization systems from multiple vendors.

See High Performance Couch brochure for additional specification information.

12. Laser Positioning System

The TomoHD™ System configuration includes stationary green lasers for virtual isocenter and moveable red lasers for patient positioning and registration.

* Typical patient set-up; Actual treatment volume lengths are variable depending upon couch height.

13. Computing Hardware

Includes the following items, housed in a rack enclosure (dimensions: 59"/150 cm H x 26"/66 cm W x 38"/97 cm D):

- The VoLO™ System for dose calculation and optimization during treatment planning. VoLO technology comprises a computer node with high-performance Graphics Processing Units (GPUs), coupled with Accuray's Non-Voxel Broad Beam (NVBB) algorithm;
- The Data Server and Storage Area Network (SAN), which stores data required to run the treatment system and deliver prescribed treatments to the patient. It also stores patient planning information (CT images, contours, dose volumes, and plans). The Data server is connected to the Optimization Server, Planning Stations, Operator Station and the Treatment Delivery System;
- The TomoGateway™ system hardware enables remote system diagnostics and monitoring by Accuray Technical Support (note: additional software may be required);
- Tape drive system for database backup;
- KVM and LCD display for administration of the Optimizer/Data Server assembly;
- Uninterruptible Power Supplies (UPS) to support the complete Optimizer/Data Server assembly;
- Network switch and firewalls.

14. Planning Stations

Two TomoTherapy® Planning Stations allow the definition and management of treatment plans and initiation of plan optimization. Delivery Quality Assurance (DQA) tools are also integrated into the Planning Station software. The Planning Stations further include the Data Management System application software, for archiving and management of patient data. An Uninterruptible Power Supply, high-resolution LCD monitor, keyboard, mouse, and required cables are included with each Planning Station. A color printer for printing treatment plans and reports is also included.

An optional third Planning Station is available for purchase.

15. Operator Station

One TomoTherapy Operator Station, which connects to the TomoHD™ Treatment System database and provides control of CTrue™ MVCT imaging, patient treatment and quality assurance delivery, and basic record & verify functionality.

The Operator Station is provided with a color printer capable of printing CTrue images and treatment data, plus an LCD monitor, keyboard, mouse, and required cables.

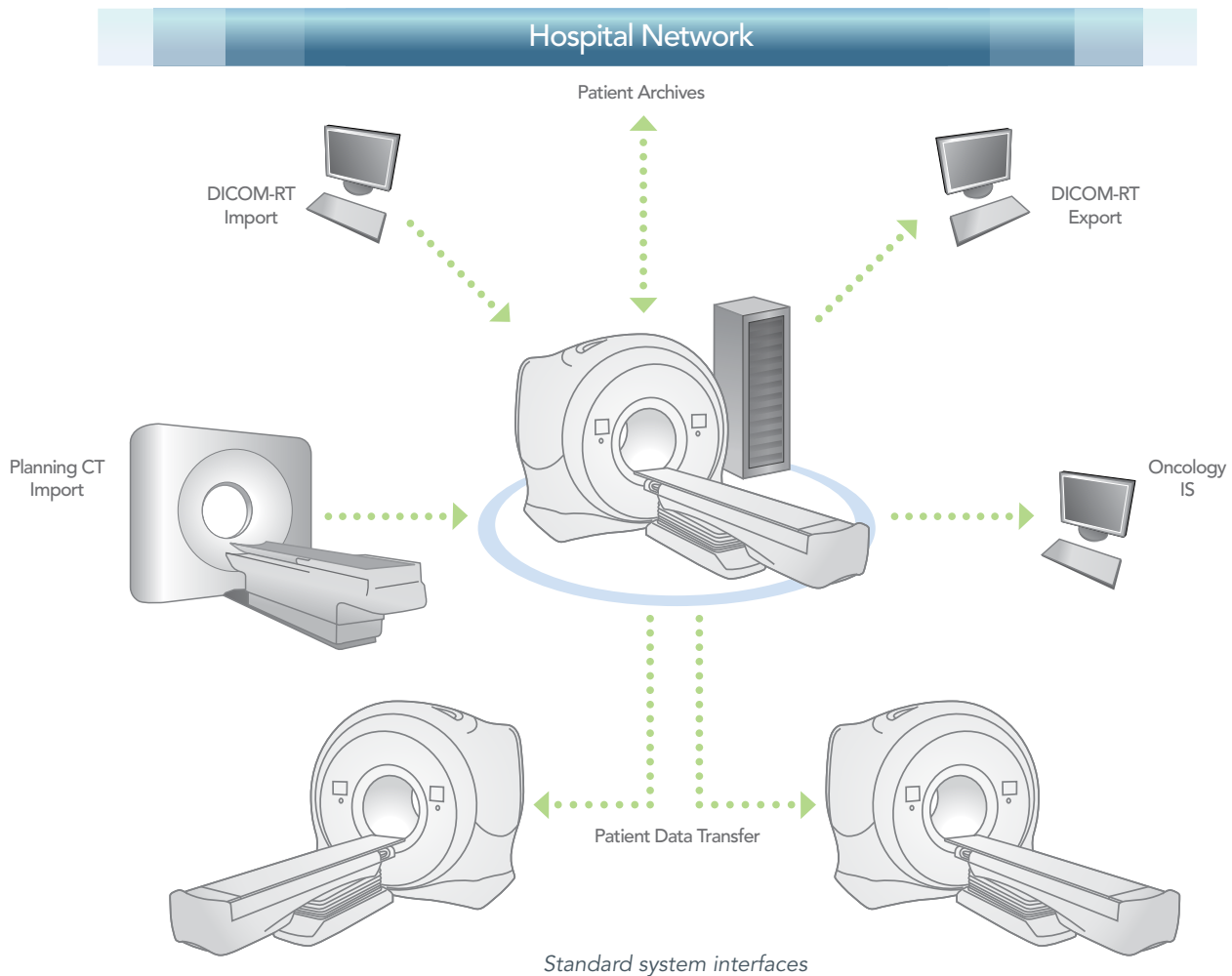
16. Remote Software Solutions - Remote Planning and TomoPortal™

Remote Planning securely and easily provides fully functional operation of the TomoTherapy Planning Station application from outside of the TomoHD Treatment System network, via the internet. It allows a remote user to operate the Planning Station application and develop plans without being physically present in the facility where the TomoHD Treatment System is installed.

The TomoPortal™ application also resides on the same Remote Software Solutions computer node as the Remote Planning application. The TomoPortal Remote Viewer securely and easily provides a web-enabled link to patient information stored in the TomoHD Treatment System. It is possible to review a plan, registration, and treatment data from down the hall or across a continent.

The standard configuration includes server computer hardware and both Remote Software Solutions - Remote Planning and TomoPortal with licensing required for one (1) remote planning user and up to two (2) concurrent TomoPortal users.

Options to purchase up to two additional Remote Planning licenses and up to six additional TomoPortal Remote Viewer licenses are available



17. Standard System Interfaces

OIS Connect™ Software

The *OIS Connect* software provides the ability to interface a TomoHD™ Treatment System to a compatible Oncology Information System (OIS). The software facilitates greater integration of the TomoHD Treatment System into the radiation oncology department, by:

- Allowing scheduling of TomoTherapy treatments on the OIS;
- Providing automatic capture of *TomoTherapy* procedures on the OIS;
- Aiding in charge capture and billing (where applicable);
- Aiding in integrating *TomoTherapy* treatments into patients' electronic medical records, via the OIS.

The *OIS Connect* software is based on DICOM-RT Worklist communication, as specified in DICOM Supplements 74 and 96.

DICOM Export

The DICOM Export Data Services Package allows the following DICOM objects to be sent from the TomoHD Treatment System to third-party systems and clinical/research databases:

- DICOM-CT Image Set
- DICOM-RT Structure Set
- DICOM-RT Dose
- DICOM-RT Plan

Network Data Storage

This feature allows patient archives created on the TomoHD™ Treatment System to be sent to, or retrieved from, a storage location outside of the treatment system network.

Network Data Storage provides configuration of the system firewall, workstation configuration and FTP system set up for data transfer via network.

Patient Data Transfer

Patient Data Transfer allows the transfer of patient data from the TomoHD Treatment System upon which it is installed, to another *TomoTherapy* treatment system.

Patient Data Transfer provides configuration of the system firewall, workstation configuration and FTP system set up for data transfer via network, and an external USB hard drive for physical data transfer.

18. Quality Assurance

QA Package (Plan quality assurance)

The standard QA package includes quality monitoring and performance testing phantoms. Components include the following:

- One Slit Beam Virtual Water;
- One TomoTherapy® Phantom & Holder (“Cheese Phantom”) with Density Plug Set;
12 density plugs are included, representing the following materials: LN-300 Lung, LN-450 Lung, Adipose, Breast BR12, Brain, CT Solid Water, Liver, B200 Bone Mineral, CB2-30% CaCO₃, CB2-50% CaCO₃, Cortical Bone and Inner Bone;
- Two Calibrated Mini Ion Chambers, and approximately 59’ (18 m) Interconnect Cables;
- One Calibrated CT Slice Ion Chamber, Buildup Cap and Jig.

TomoTherapy® Quality Assurance (TQA™) Total Package (Machine quality assurance)

The *TQA* application is a calendar-based productivity tool that simplifies the collection and analysis of machine performance data for the TomoHD Treatment System.

The application leverages internally-generated data to provide results quickly and easily. The *TQA* application offers trending and reporting of many system and dosimetric parameters that allow physicists to monitor the performance of the TomoHD System. All data may be exported.

The Total Package includes the base *TQA* package, Enhanced Dosimetry package, Longitudinal Beam Profile package, and the LINAC Alignment package, plus the *TQA* Step-Wedge Phantom.

See TQA brochure for more information.

19. Installation Services

Includes:

- Pre-installation Site Planning and Project Management services;
- Installation and commissioning;
- Completion of Acceptance Test Procedure (ATP) and system handover.

TomoTherapy[®]



UNITED STATES

Accuray Corporate Headquarters

1310 Chesapeake Terrace
Sunnyvale, CA 94089
USA
Tel: +1.408.716.4600
Toll Free: 1.888.522.3740
Fax: +1.408.716.4601
Email: sales@accuray.com

TomoTherapy

1240 Deming Way
Madison, WI 53717
USA
Tel: +1 608 824 2800
Fax: +1 608 824 2996

ASIA

Accuray Japan K.K. - Tokyo

Shin Otemachi Building 7F
2-2-1 Otemachi, Chiyoda-ku
Tokyo 100-0004
Japan
Tel: +81.3.6265.1526
Fax: +81.3.3272.6166

Accuray Asia Ltd. - Hong Kong

Suites 1702 - 1704, Tower 6
The Gateway, Harbour City
9 Canton Road, T.S.T.
Hong Kong
Tel: +852.2247.8688
Fax: +852.2175.5799

Accuray Chengdu

#39 Huatai Road, Longtan
Industrial Zone,
Section 2 East, 3rd Ring Road,
Chengdu, Sichuan 610051
China

EUROPE

Accuray Europe

Tour Atlantique 25e
1 Place de la Pyramide
92911 Paris La Défense Cedex
France
Tel: +33.1.5523.2021
Fax: +33.1.5523.2039

TomoTherapy Belgium BVBA

Pegasuslaan 5
1831 Diegem
Belgium
Tel: +32 (0)2 400 4400
Fax: +32 (0)2 400 4401/02