UNIQUE™
The Complete Radiation Oncology Solution

SPECIFICATIONS
Specifications

This specification sheet provides information for the UNIQUE™ radiation oncology solution and in particular the UNIQUE™ Single Energy linear accelerator. UNIQUE comes in two different bundles: the Power and the Performance edition (see table 2 for details).

1.0 Photon Beams

1.1 Energy: One (1) photon beam, with a nominal energy of 6 MV, is provided in accordance with the specifications listed in Table 1.

1.2 Dose Rate can be selected in fixed steps and ranges per the specifications listed in Table 1.

1.3 Maximum Field Intensity at Dmax: The intensity at the depth of maximum buildup (Dmax) will not exceed 109% of central axis intensity anywhere in the measurement plane of any field size.

1.4 Leakage: The X-ray absorbed dose does not exceed 0.1% of the absorbed dose at the isocenter measured anywhere in the patient plane outside of the maximum useful beam. The patient plane is defined as a circular plane with a radius of 2 meters, centered on and perpendicular to the axis of the beam at isocenter. The X-ray measurements may be averaged over an area not to exceed 100 cm².

1.5 Collimator Transmission: The X-ray transmission of the upper and lower movable collimators does not exceed 0.5%.

1.6 Spot Size: The spot size is less than 2 mm in diameter at the X-ray target.

1.7 Penumbra: The distance between the 20% and 80% isodose lines for a 10 x 10 cm² field at a depth of 10 cm and at 100 cm TSD shall be less than or equal to 7 mm along the major axes for UNIQUE with MLC, less than or equal to 9 mm for UNIQUE without MLC.

2.0 Accelerator System Features

2.1 RF Power Source: high-power microwave tube (magnetron) that produces RF energy, amplifies it and supplies it to the UNIQUE through a waveguide system for beam generation.

2.2 Standing Wave Accelerator: the Varian side-coupled cavity accelerator structure has been developed for optimum use of RF power and narrow output spectrum.

2.3 The fixed vertical beam line that allows exact and safe control of the dose rate.

2.4 The automatic frequency control system (AFC) varies the operating frequency of microwave power tube to maintain constancy of radiation output.

Table 1: X-ray Beam Performance

<table>
<thead>
<tr>
<th>Energy (MV)</th>
<th>Dmax (cm)</th>
<th>Dose @10 cm²</th>
<th>Flatness²</th>
<th>Symmetry³</th>
<th>Dose Rate⁴ (MU/Min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>6</td>
<td>1.6±0.15</td>
<td>67±1.0</td>
<td>±2.5% or ±3.0%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Performance</td>
<td>6</td>
<td>1.6±0.15</td>
<td>67±1.0</td>
<td>±2.5% or ±3.0%</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

1 Depth of ionization applies to a 10 x 10 cm² field at 100 cm TSD. If measurements are made to the “effective measurement point” per AAPM TG-51 protocol, deduct 0.6% from the stated depth dose values.

2 Flatness is defined as the maximum variation from the mean dose delivered within the central 80% Full Width Half Max (FWHM) region measured at 100 cm TSD at a depth of 10 cm. The mean is the average of the maximum and minimum points within the central 80% FWHM region. For the UNIQUE 6MV, the specification of ±2.5% applies to both the radial and transverse axes of all square field sizes from 10 x 10 cm² to 20 x 20 cm².

3 Symmetry is defined as the maximum difference between the X-ray dose delivered to any two points which are equidistant and symmetrical about the central axis and within the 80% FWHM region measured at 100 cm TSD at a depth of 10 cm. This specification applies to the radial and transverse axes of all square field sizes from 10 x 10 cm² to 20 x 20 cm².

4 Dose rate for the UNIQUE Power Edition has four fixed steps of 100 MU/minute from 100 to 400 MU/minute. The UNIQUE Performance Edition has six fixed steps of 100 MU/minute from 100 to 600 MU/minute. An “MU” is nominally one centiGray delivered to a tissue-equivalent material at Dmax and 100 cm SSD, with a 10 x 10 cm² field size.
3.0 Dosimetry System
The following specifications apply for both independent dosimetry channels:

3.1 Precision: Reproducibility of the dosimetry measurement system is ±1% or 1 MU, at a fixed dose rate.
3.2 Linearity: The linearity shall be ±1% or 1 MU.
3.3 Reproducibility of Dose vs. Gantry Angle: The precision of the dosimetry system is ±1% or 1 MU, at any gantry angle from 0° to 360°.
3.4 Reproducibility of Dose vs. Dose Rate: The dose rate dependence of the dosimetry system with variations in the dose rate from minimum to maximum is ±1% or 1 MU.
3.5 Energy: The dosimetry system will monitor the beam energy and will terminate irradiation should an energy change exceeding ±3% of the nominal value occur.
3.6 Beam-Off Interlocks: The radiation beam automatically terminates in the event of any of the following:
   • Monitor Units 1 complete
   • Monitor Units 2 complete
   • Treatment time complete
   • Radial symmetry not less than 2%
   • Transverse symmetry not less than 2%
   • Excess dose rate
   • Excess dose per pulse
   • Excess dose per degree
   • Loss of ion chamber voltage

4.0 Mechanical Features
4.1 Gantry:
   4.1.1 Rotation: ±185° from the vertical
   4.1.2 Controls: Local and remote
   4.1.3 Target to Axis Distance: 100 ± 0.2 cm
   4.1.4 Mechanical and Radiation Isocenter Accuracy: < 0.1 cm radius sphere
   4.1.5 Position Indicators (Gantry and Console):
     • IEC Scale Convention or Varian Scale may be used for position readouts. Customers must choose this at time of order.
     • Digital Readouts: Accuracy: ± 0.5° Resolution: 0.1°
     • Mechanical Scales: Accuracy: ± 1.0° Resolution: 1.0°
     • Alternate Gantry Display (Only): Available on pendant command, Enhanced Dynamic Wedge™ (EDW) graphic indicator showing that Y1 or Y2 is enabled to help orient therapists at time of setup.

4.1.6 Target to Surface Distance Indicators:
   • Optical Range Finder: Range: 70-156 cm Accuracy: ± 0.1 cm at 100 cm TSD Resolution: 0.5 cm
   • Mechanical Front Pointer: Range: 90-110 cm Accuracy: ± 0.1 cm at 100 cm TSD Resolution: 0.2 cm ± 1.0 mm

5 Whichever is greater. Based on a minimal total dose of 5 MU.
4.2 Collimator Rotation:
4.2.1 Extended Rotation Range: ± 165˚
4.2.2 Controls: Local and remote
4.2.3 Position Indicators for Rotation
(In-Room and Console):
  • Digital Readouts:
    Accuracy: ± 0.5˚
    Resolution: 0.1˚
  • Mechanical Scales:
    Accuracy: ± 1.0˚
    Resolution: 1.0˚

4.3 Field Size Collimation:
4.3.1 The field size is continuously variable from 0.5 x 0.5 cm² to 40 x 40 cm² at 100 cm TSD. Field sizes larger than 35 x 35 cm² are limited to a 49.5 cm diagonal (the diameter of the circle defined by the primary collimator at 100 cm TSD). The field size is defined as the distance along the radial and transverse axes between the points of 50% density on a X-ray film taken at 100 cm TSD with minimum buildup.
4.3.2 Position Indicators for Lower and Upper Collimators
  • Digital Readouts:
    Accuracy: ±0.2 cm
    Resolution: 0.1 cm

4.4 Upper and Lower Independent Collimators:
Asymmetrical collimation is provided with upper and lower sets of collimators.
4.4.1 Upper Travel Range: 30 cm (-10 cm to +20 cm relative to central axis)
4.4.2 Lower Travel Range: 22 cm (-2 cm to +20 cm relative to central axis)

4.5 Light and X-Ray Field Coincidence: The field defining light coincides to within 0.2 cm of the 50% isodensity line on an X-ray film. This is defined at 100 cm TSD with minimum buildup for any field size.

4.6 The Exact Couch with Indexed Immobilization™ and the IGRT Couch Top are standard with both UNIQUE Power and Performance edition. Specifications and standard vs. optional accessories for Exact IGRT Couch are provided on specification sheet RAD 2661. For information on upgrading your installed couches to use Indexed Immobilization along with your UNIQUE, please contact your sales representative.
4.6.1 Motion Controls:
  • Two Hand Pendants that control both accelerator and Exact Couch
  • Two Couch Side Panels
  • Control Area Console
  • Performance edition only: Remote couch control

4.6.2 Position indicators
  • Translation
  • Rotation
    Accuracy: ± 0.5˚
    Resolution: 0.1˚

4.7 Combined mechanical and Radiation Isocenter accuracy gantry, collimator and couch:
<0.1 cm radius sphere

5.0 Accessories
5.1 Collimator Accessories:
  • Interface Mount
  • Accessory Mount
  • 4-Way Wedge Set (four wedges at 15˚, 30˚, 45˚, 60˚)
  • Mechanical Front Pointer (holder and 4 rods)
  • Solid Block Trays or Slotted Block Trays or Drilled Star Trays
    (Qty. 10 - .635 cm thickness)
5.2 Spare Parts Kit
UNIQUE Schematic of Accelerator and Collimator Subsystems

Exact™ Couch Motions with IGRT Couch Top

<table>
<thead>
<tr>
<th>Couch Parameter</th>
<th>Longitudinal</th>
<th>Vertical</th>
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<tbody>
<tr>
<td>a-In (with extension)</td>
<td>93.9 cm</td>
<td>169 cm</td>
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<tr>
<td>b-Out (with extension)</td>
<td>262 cm</td>
<td>106.0 cm</td>
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<tr>
<td>c-Out (without extension)</td>
<td>63 cm</td>
<td>50.0 cm</td>
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<tr>
<td>Lateral</td>
<td>±25.0 cm</td>
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<tr>
<td>Angular Rotation</td>
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<td>±90°</td>
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### Table 2: UNIQUE Configurations

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<th>UNIQUE Feature</th>
<th>Power Edition*</th>
<th>Performance Edition</th>
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<td>Millennium Multileaf Collimator Model</td>
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<tr>
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<td>Isocal</td>
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</tbody>
</table>

*Not all combinations are possible. Pre-requisites exist.*
6.0 Basic Static Procedures Mode
6.1 Static beam X-Ray Mode
   6.1.1 Power Edition: Up to 999 MU can be delivered in a single field.
   6.1.2 Performance Edition: Up to 1999 MU can be delivered in a single field.
6.2 Total Body X-Ray Mode
   6.2.1 Special accessory plugs are provided
   6.2.2 All beams are calibrated at machine isocenter
   6.2.3 Integrated dose monitor is 4 digits, 1 to 9000 MU
   6.2.4 Exposure time setting is 3 digits, 0.1 to 99.9 min.

7.0 Advanced Static Procedures Mode
7.1 Auto Field Sequencing (AFS), is standard with the UNIQUE system for automated delivery of multiple coplanar fields in sequence from the UNIQUE console. With this time-saving feature, the UNIQUE system automatically acquires the accelerator mode up and setup information from the R&V system, and then allows the operator to remotely move the gantry, jaws and collimator axes between co-planar treatment fields. This feature saves the operator’s need to go back into the treatment room to alter setup between coplanar fields.
7.2 AFS provides greater treatment efficiency as it fully integrates and utilizes the Varian multileaf collimator (Millennium™ MLC). AFS works in concert with the MLC to deliver both static and dynamic plans efficiently and smoothly.

8.0 Basic Dynamic Procedures Modes
8.1 Photon Arc Mode: The UNIQUE system is capable of delivering 0.3 MU to 20 MU per degree over a preset gantry rotation of up to 360° or any fraction thereof. MU per degree (MU/ DG) is automatically computed based on the preset total dose and the preset arc segment.
   8.1.1 Precision: During arc treatment, the position of the gantry deviates no more than 0.7 degrees from the desired instantaneous gantry angle, and the dose deviates no more than 0.20 MU from the desired instantaneous total dose, as specified by the user-preset total dose and arc segment. If these tolerances are exceeded, the dose delivery is suspended and the gantry position is targeted to the position dictated by the actual dose delivered. When the gantry is again within 0.7 degrees of the desired position, the treatment will resume. The Dose Position (DPSN) interlock is asserted if the gantry is not positioned within 0.7 degrees of the desired position within 3 seconds. The DPSN interlock will terminate the beam immediately if the position deviates 3.0 degrees or more from the desired position, or the dose delivered exceeds 0.45 MU from the desired dose.
   8.1.2 Arc Dose Rate: The dose rate during a dynamic arc treatment is automatically modulated between zero and the maximum dose rate selected in Physics Mode.
   8.1.3 Arc Direction: The UNIQUE system may be programmed to perform arc therapy in either a clock wise or counter-clockwise direction.

9.0 Advanced Dynamic Wedge™ (EDW)
9.1 EDW offers both precision jaw collimator movement and dose rate control to create wedge-shaped dose distributions. Therapists save time with EDW, especially when used with AFS, by avoiding the need for room reentry to add or remove wedges. Enhanced Dynamic Wedges of 10, 15, 20, 25, 30, 45, and 60 degrees are included, with up to 30 cm (wedge direction) by 40 cm field sizes, using the Y jaw to create the wedge angle.
   9.2 Precision: Refer to EDW Specifications RAD 1880.
   9.3 Dose Rate: The dose rate during the EDW treatment is automatically modulated between zero and the maximum dose rate selected in Physics Mode.

10.0 Advanced Dynamic Procedures
In combination with the Varian Millenium™ MLC true three-dimensional dose distribution can be created using Intensity Modulated Radiation Therapy (IMRT) techniques. Additional information on how clinicians accomplish IMRT using Varian’s integrated system is available through your Sales Office.
10.1 Dose Dynamic MLC allows delivery of MLC fields as a function of percent dose delivered, also known as Intensity Modulated Radiation Therapy (IMRT). Both dynamic IMRT (i.e., sliding window) and segmental IMRT (i.e., step and shoot) techniques are supported. Combinations of the two IMRT techniques are supported as well. In addition, Dose Dynamic MLC enables treatment delivery with electronic compensation, in which MLC leaf motion simulates the dosimetric effect of a physical compensator.
10.2 Arc Dynamic MLC allows delivery of MLC fields as a function of gantry arc angle, also known as conformal arc therapy.
11.0 In-Room Display
A high-resolution, flat screen, color display monitor is included for in-room display of accelerator parameters and patient-specific information.

12.0 SmartConnect® Technology
SmartConnectSM (refer to RAD 9410 for more information) is a secure, easy-to-use, remote monitoring service that connects Varian Medical Systems’ customer service department to the customer site, so Varian technicians can remotely monitor equipment, generate performance reports, diagnose problems, and provide real-time solutions. Varian customers enjoy the benefits of increased productivity and shortened response times.

13.0 Typical UNIQUE Facility Requirements
13.1 Varian offers facility planning support to UNIQUE customers. Please contact your local Sales Office to obtain planning support.
13.2 Input Voltage Typical US: 200-240 VAC, 60 Hz, line-to-line, 3-phase, 4-wire plus ground 15 KVA load line voltage regulation ± 5%
13.3 Input Voltage Typical International: 360-440 VAC, 50 Hz or 60 Hz, line-to-line, 3-phase, 4-wire plus ground, 15 KVA load, line voltage regulation ± 5%
13.4 Cooling Water Requirements: The cooling water requirements can be satisfied with a one pass system (domestic supply and and waste return) or a closed loop system.
13.5 Ventilation Requirements: Sufficient to remove from 5 kW from treatment room and 1 kW from control console.
13.6 Machine installation does not include rigging, grouting the baseframe into the floor, conduit runs, attaching utilities to the machine or construction of therapy room.
13.7 For typical facilities requirements, refer to the Installation Data Package.

14.0 Features and options
14.1 Multileaf Collimators
14.1.1 Varian Millenium 80-leaf multileaf collimator (MLC) with 1 cm leaf resolution (measured at isocenter) is standard with the Power Edition. Leaves retract to allow conventional techniques, and interdigitate for intensity modulated techniques.
14.1.2 Varian Millenium MLC-120 offers 0.5 cm leaf resolution at isocenter for the central 20 cm of the 40 cm x 40 cm field and is standard with Performance Edition. Leaves retract to allow conventional techniques, and interdigitate for intensity modulated techniques. Dynamic capability for the MLC is included when purchased with an Performance Edition.
14.1.3 Large Field IMRT (LFIMRT): Allows the maximum allowable IMRT field to be delivered as a single planned field.
14.2 PortalVision™ Electronic Portal Imaging System:

14.2.1 The PortalVision aS500-II imager allows patient position verification before treatment delivery, verification of treatment field size and shape, and rapid acquisition of portal dose images for Portal Dosimetry QA (optional).
Resolution: 512x384 pixels (Refer to RAD 2600 for information and specifications.)

14.2.2 The PortalVision aS1000 third generation flat panel detector is a solid-state matrix of 1024 x 768 pixels. The IAS3 Image Acquisition System used with the PortalVision aS1000 coordinates the readout of the image detector with irradiation by the accelerator, enabling high quality image acquisition with radiation doses as small as 1 monitor unit (MU). Refer to RAD 2553 for information and specifications.

14.2.3 MV image based IGRT
The MV-repositioning option offers 2D/2D Match and Marker Match (orthogonal paired images) using Digitally Reconstructed Radiographs (DRRs) or simulator images as reference and remote arm motions for easy and safe operation. Remote couch motions for easy patient repositioning.

14.3 LaserGuard™ Collision Detection System
LaserGuard monitors the MLC collimator face with a plane of infrared light that emanates from a device located within the gantry. Any object that intrudes into this area, called the protection zone, triggers an emergency stop of all accelerator motion. Refer to Auto Field Sequencing with LaserGuard Specification, RAD 6046 for information and specifications.

14.4 RapidArc® Radiotherapy Technology
RapidArc delivery uses Dynamic MLC, variable dose rate, and variable gantry speed to generate IMRT-quality dose distributions in a single or multiple optimized arcs around the patient. RapidArc planning, powered by the Eclipse™ treatment planning system, uses a unique algorithm to simultaneously modulate aperture shape, dose rate, and gantry speed at every gantry angle. This results in improved dose conformity for greater normal tissue sparing. Up to 7200 MU can be delivered in a single arc. (Refer to RAD 5610 for further information and specification)
Some of the pre-requisites for RapidArc are MLC-120, aS1000, 600MU/min dose rate, MV Repositioning, Eclipse and ARIA

14.5 4D Integrated Treatment Console
The 4D Integrated Treatment Console provides a streamlined front end to the UNIQUE delivery system. The console integrates the management and use of the UNIQUE accelerator, the Millennium MLC, and the PortalVision MV imager into one application on a single workstation. For IGRT using orthogonal MV portal images, the console is used in combination with a second dedicated imaging screen. The 4D Integrated Treatment Console uses a DICOM RT interface to communicate with the ARIA oncology information system.

14.6 ARIA™ Oncology Information System
ARIA is a comprehensive information system that addresses the clinical, administrative, and imaging needs of the oncology department. ARIA streamlines departmental operations by eliminating redundant data entry and makes the treatment process faster and easier by providing a single user interface that integrates record and verify the multi-leaf collimator, and PortalVision. The different UNIQUE radiation oncology solutions feature the main ARIA applications. See individual RAD documents for information and specifications on the various products available in ARIA.

14.7 Eclipse™ Treatment Planning System
Eclipse is an advanced Windows® based treatment planning system. It provides intuitive automatic and manual contouring and image registration tools, including automatic image registration based on a mutual information algorithm. It supports the different planning methods such as 3D conformal static and arc planning, inverse planning for intensity modulated radiotherapy (IMRT) and RapidArc® planning for the RapidArc® delivery option of the UNIQUE Performance Edition. The system offers the high quality dose calculation algorithm AAA (a superposition convolution algorithm). Eclipse is focused to support the clinical workflow and uses clinical protocols to speed up the planning part and to enable you to use class-solutions for the different clinical indications.
15.0 Additional Options

15.1 Laser Alignment System
   • Wall and Ceiling Lasers
   • Diode Backpointer Line Laser

15.2 CCTV Camera System
   This two camera CCTV system is used for monitoring patient activity inside of the treatment room and patient activity from outside the room at the treatment console.

15.3 Patient Intercom System
   The Patient Intercom System is used for audio communication with the patient in the treatment room from the treatment console area.

15.4 Fine Beam Matching
   The new UNIQUE system can be beam matched to your already installed Varian Clinacs to allow for easy movement of patient treatment plans between machines of similar energy. (Please refer to RAD 2055A for detailed information on beam matching, and ask your Varian Sales representative for availability.)

15.5 Custom Coding
   Custom Coding provides recognition of the presence of one or more beam-shaping accessories. Accessory recognition includes confirmation of the presence of a beam-shaping accessory in one of four possible accessory positions and identification of the type of accessory. Standard Varian beam-shaping accessories (e.g., 30-degree wedges) are identified by name. Custom beam-shaping accessories (e.g., blocks in Varian-provided block trays) are identified by a custom code for that accessory.

15.6 Additional Training/Education package
   For customers that are not so experienced in for example IGRT, 3D treatment planning, IMRT, …, Varian offers individualized training programs upon your request. After performing a site-survey, a training package will be created, ensuring a smooth start-up of the clinical operations.

15.7 RPM Respiratory Gating
   The Varian Real-time Position Management™ (RPM) system (refer to RAD 5616 for more information) is a patient-friendly, video-based system that compensates for target motion, enabling improved imaging and treatment in areas such as lung, breast and upper abdominal sites. RPM is accurate and easy-to-use, and provides both respiratory gating for respiration-synchronized imaging and treatment, as well as 3D real-time patient position monitoring. It is comfortable for the patient and accommodates all clinic-breathing protocols, including free-breathing.

15.8 Motion Management Interface (MMI)
   The Motion Management Interface (refer to RAD 10155 for more information) is a proprietary interface from Varian Medical Systems. MMI allows third-party devices* to transfer patient information from the 4D Integrated Treatment Console (4DITC), gate beam delivery and perform couch shifts remotely (remote couch motions option required) before and during treatment.
   * third-party devices need to be validated and verified by Varian, contact your sales organisation for more information.

15.9 Comprehensive Service Package
   The comprehensive service package will protect your UNIQUE system against any unexpected costs or downtime and help you to stay within budget. It will not only cover the UNIQUE accelerator, but also ARIA and Eclipse, starting with the date of acceptance, lasting for a period of multiple years.
   Following conditions apply. Service agreement does not cover damage relating to environmental changes, abuse, neglect and others. Comprehensive Service package may not be available in some countries

15.10 Portal Dosimetry
   Perform fast, high-resolution intensity-modulated radiation therapy (IMRT) QA with Portal Dosimetry. Portal Dosimetry allows you to compare PortalVision acquired dose images of IMRT, LFMRT and RapidArc radiotherapy technology to “portal dose” images calculated by the treatment planning system. Portal dosimetry automates and simplifies the pretreatment QA process. (Please refer to RAD 2559C for detailed information)

15.11 Isocal
   Deflections due to gantry motion and gravity can cause shifts in the alignment between the treatment and imaging isocenters. Isocal calibration software corrects for these inevitable shifts so that the treatment and imaging isocenter are perfectly aligned. (Please refer to RAD 10171 for detailed information)

UNIQUE is not for sale in the USA, Canada. Please contact your local Varian Medical Systems representative or authorized distributor.
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Disclaimer and Safety Statement

Intended Use Summary
Varian Medical Systems’ linear accelerators are intended to provide stereotactic radiosurgery and precision radiotherapy for lesions, tumors, and conditions anywhere in the body where radiation treatment is indicated.

Important Safety Information
Radiation treatments may cause side effects that can vary depending on the part of the body being treated. The most frequent ones are typically temporary and may include, but are not limited to, irritation to the respiratory, digestive, urinary or reproductive systems, fatigue, nausea, skin irritation, and hair loss. In some patients, they can be severe. Treatment sessions may vary in complexity and time. Radiation treatment is not appropriate for all cancers.

Medical Advice Disclaimer
Varian as a medical device manufacturer cannot and does not recommend specific treatment approaches. Individual treatment results may vary.

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