8.0 Tabletops

8.1 Tabletop options

CLINICAL/CUSTOMER BENEFIT: Ergonomic design gives unrestricted access and accuracy even at extremes of travel.

The following table top options are available with Patient Support System:

- C-arm top – a versatile treatment top suitable for therapy, localization and simulation. Movable C-arms permit posterior and oblique fields without the need to move the patient.
- iBEAM' – carbon fiber tabletop with unique advanced design virtually eliminating image artifacts
- iBEAM' evo – next generation of carbon fiber tabletop. This tabletop has no metallic components apart from the rails.

8.2 Tabletop rigidity

- Maximum difference in table height near the isocenter between 30kg load at retracted position and 135kg at extended position is <5mm.
- Additional information and specifications on the patient support system and tabletops can be found in the Precise Table – Functional Description document no. 4513 370 2980.

9.0 Movement controls and display

All motorized movements can be operated simultaneously and at variable speed. Several scaling conventions are available for the customer to choose from (see previous section: mechanical parameters and indicators – position indicators scale conventions).

9.1 Handheld movement controllers

Two handheld movement controllers (one standard, second optional) inside the treatment room allow selection of fieldsize, rotation of gantry and radiation head and control of all motorized table movements. The handheld controller also controls the distance meter, positioning lasers and room lights as well as paging of treatment/machine information displayed on the monitors inside the treatment room.

9.2 Table control panels

Two control panels on the sides of the patient table include controls for longitudinal and lateral movements, isocentric rotation and vertical height adjustments. In addition most movements can be released for manual operation. Rotation about the table support column is manually controlled.

9.3 Motion and position indication

- Patient setting-up is simplified by flat panel screens in the treatment room (one standard, second optional) which provide a visible display of all the positional values as well as patient and treatment prescription information.
- The information display on treatment room monitors can be customized by the customer according to local clinical practice.

9.4 Assisted set-up (ASU)

CLINICAL BENEFIT: Reduced treatment times by simple and accurate patient set-up.

ASU moves the gantry, collimator, and beam geometric parameters and table isocentric rotation to the positions specified in the field prescription. The user can configure the digital accelerator so that the ASU function operates both remotely from the control room and from the handheld controllers inside the treatment room.

- Precision
  - angular positions <0.5°
  - linear positions <0.5mm.

10.0 Accessories

10.1 Coded shadow tray assembly (standard)

The shadow tray assembly for beam-shaping with shielding blocks is supplied as standard with two slots for removable shadow trays. The outermost tray can be uniquely identified by means of cut-outs at the edge. The digital accelerator recognizes up to 110 tray codes that can be verified as part of the prescription.

- Maximum fieldsize: 40cm x 40cm
- Maximum shielding block height: 119mm
- Distance shielding block to isocenter: 32.8cm
- Standard package includes the following perspex trays:
  - one holed tray with star pattern
  - one holed tray with parallel slotted pattern
  - one solid (blank) tray.

10.2 Coded shadow tray assembly short (optional)

CLINICAL BENEFIT: Unique identification ensures patient safety
CUSTOMER BENEFIT: Ability to shield critical structures.

An alternative to the standard shadow tray, 2.5cm shorter, it gives increased tray to isocenter clearance facilitating isocentric treatments.

- Maximum fieldsize: 40cm x 40cm
- Maximum shielding block height: 94mm
- Distance shielding block to isocenter: 35.6cm.

10.3 Other optional accessories for beam blocking

- Clinical beam block set for low energy (optional)
  - clinical beam block system consisting of 14 clinical beam blocks for use with photon energies 6MV or less
- Clinical beam block set for high energy (optional)
  - clinical beam block system consisting of 14 clinical beam blocks for use with photon energies 8MV or greater, or for any dual/triple energy systems
- Port film graticule
  - port film graticule using wire inserts. Fits into upper position of the coded shadow tray, enabling simultaneous fitment of blocking tray for treatment verification
- Wire mesh tray
  - fabricated using one piece of aluminum, this tray is used especially with the clinical beam block set.

10.4 Electron applicators

Standard and optional electron applicators are described in the previous section: electron beams – dose rates.

11.0 Optional beam quality matching

CUSTOMER BENEFIT: Increased workflow efficiency.

11.1 Factory match

The option of matching one or more new Elekta machines to each other and/or to an Elekta machine already installed. Matching will be conducted to the factory archived data for the installed machine, or current factory data for new orders. Available for machines post serial No. 105520.

- Photons
  - beam energy: the central axis dose ratio to Dmax at 10cm depth is within ±1% of the average value of the group of machines to be matched for the same nominal energy. The measurement conditions are SSD = 100cm, 10cm x 10cm fieldsize and gantry and BLD at 0° of angles.
  - beam flatness: the relative dose value at any point in the flattened area of the field is within ±1% of the average relative dose value in the same point for the group of machines to be matched. The point measurements are averaged over an area of ≤1cm² and performed at SSD = 90cm and 10cm depth in a fieldsize of 10cm x 10cm and 30cm x 30cm (95cm and 5cm for 4MV). Flattened area is defined as IEC 60976/60977.
- Electrons
  - beam energy: the distal 80% isodose on the central axis is within ±1mm of the average for the group of electron beams, 95cm SSD, gantry and BLD at 0° for 10cm × 10cm²
  - beam flatness – no electron flatness matching is offered.

11.2 Customer match

As factory data match (including match tolerance and conditions) except that the match will be carried out including beam data supplied by the customer. Customer beam data must be supplied with order. Applicable to all machine ranges, but subject to review and acceptance of supplied data.

Additional information and specifications on Beam Matching options can be found in Flatness, Beam Matching and Analysis Protocols, document ref: PMT B173.

12.0 Optional USA electron beam quality specifications

12.1 Energy

At an SSD of 100cm and for a 14 x 14cm radiation field, the maximum deviation of the actual value from the declared value of penetrative quality (see table 4) shall be ≤2mm. Measured at the distal 80% dose point.

12.2 Flatness

This is defined as the maximum variation in percentage from the mean electron intensity at 100cm SSD, at the depth of R85/2 within the central 80% of the radial, transverse and diagonal axes for fieldsizes from 10 x 10cm to 25 x 25cm and for all electron beam energies. The maximum flatness variation is ±5%.

12.3 Symmetry

Symmetry is defined as the maximum percentage variation in the average electron intensity to the radial and transverse halves of the electron field intensity to the radial and transverse halves of the electron field at R85/2 for a 10 x 10cm and 25 x 25cm field at 100cm SSD. Variation shall not be more than 2% within the central 80% of the geometrical fieldsize.

13.0 Optional beam-shaping devices

CLINICAL/CUSTOMER BENEFIT: Active leakage reduction provided by automatic positioning of diaphragms.

13.1 MLCi

- The Elekta MLCi is a hardware and control software integrated multileaf collimator. It replaces the upper X diaphragms allowing for the external dimensions and excellent treatment clearance of the linear accelerator to be maintained. Both linear accelerator and MLCi are operated from a unique integrated control system ensuring optimum delivery in the most complex techniques.
- The MLCi uses 80 leaves (40 pairs) with 1.0cm resolution at isocenter each one traveling independently up to 32.5cm (12.5cm beyond the central axis) covering a full 40 x 40cm field. It includes backup diaphragms that move in the same direction as the leaves and conventional asymmetric diaphragms in Y direction
- The MLCi supports conformal RT, step and shoot IMRT, dynamic MLC IMRT and dynamic arc techniques such as VMAT. The diaphragms can operate in automatic leaf-tracking mode ensuring a minimum X-ray leakage in the patient plane.
- Additional MLCi information and specifications can be found in the MLCi, product data, document no. 4513 370 1641.

13.2 MLCi2

CLINICAL BENEFIT: Reduced dose to healthy tissue
Efficient treatment of multiple targets using interdigitation.

The Elekta MLCi2 offers all the technical and clinical benefits of the MLCi enhanced with up to 5 times lower leaf transmission and leakage and interdigitation capabilities. Additional MLCi2 information and specifications can be found in MLCi2, Functional Description 4513 371 0798.

13.3 Beam Modulator™

CLINICAL/CUSTOMER BENEFIT: Fully integrated in MLC while maintaining maximum beam angle flexibility

- Beam Modulator is a hardware and control software integrated multileaf collimator. It replaces both X and Y diaphragms allowing for the external dimensions and excellent treatment clearance of the linear accelerator to be maintained. Both linear accelerator and Beam Modulator are operated from a unique integrated control system ensuring optimum delivery in the most complex techniques.
- The Beam Modulator comprises 80 leaves (40 pairs) with fine 0.4cm resolution and a maximum fieldsize of 16cm x 21cm. It offers full leaf interdigitation and over-centre travel capable of closing the leaves beyond the 21cm field.
- The Beam Modulator supports conformal RT, step and shoot IMRT, dynamic MLC IMRT and dynamic arc techniques such as VMAT.
- Additional Beam Modulator information and specifications can be found in the Beam Modulator, Functional Description document no. 4513 371 0486.

14.0 Optional radiotherapy delivery techniques

14.1 High dose rate electron (HDRE)

Certain medical conditions require total body skin irradiation with low energy electrons. Several techniques have been developed for this purpose to achieve a homogenous dose over the body of the patient and keep X-ray contamination of the beam as low as possible. These techniques require the patient to be positioned a considerable distance from the treatment machine (3 to 4 meters), where the dose rate is considerably lower than at the isocenter. HDRE allows the electron dose rate to be significantly increased allowing HDRE dose rates of 3000 MU/min at isocenter.

- Energy range 4 MeV to 10 MeV
- X-ray contamination (at 3 to 4 meters from isocenter) <1%
- Symmetry at isocenter is ±3%
- Maximum dose at isocenter: 10000 MU.

14.2 Intensity modulated delivery techniques

CUSTOMER BENEFIT: A wide selection of treatment delivery options to offer personalized patient care.

Elekta digital accelerators with an MLC head (any of the MLC listed in this document) and operated under control software Desktop Pro™ 7.01 and upwards can be optionally licensed to provide the following advanced intensity modulated delivery techniques.

- PreciseBEAM™ Segmental
  - This option enables the digital accelerator to deliver IMRT in segmental (Step-and-Shoot) mode. Each prescribed segment is delivered accurately and reliably at the highest dose rates for superior patient throughput. Accurate and stable beam control ensures a dose/MU accuracy of ≤1% or 0.1MU, whichever is greater), which is vital during the sequential delivery of low dose IMRT fields.
- PreciseBEAM Dynamic
  - With the same excellent dose and geometry accuracy and functionalities as segmental, this option enables continuous dynamic movement of diaphragms and MLC leaves during treatment delivery. Support for popular techniques such as "sliding windows".
  - The Automatic Leakage Reduction function ensures that during treatment delivery the four individually controlled diaphragms are automatically moved tracking the position where they maximize protection against leakage through MLC leaves, whilst not infringing on the field defined by the multileaf assembly
- PreciseBEAM Dynamic Arc
  - In this arc therapy the linear accelerator delivers a constant number of MU per degree of movement. During delivery simultaneous gantry rotation and motion of diaphragm and MLC leaves is permitted. Dose rate and gantry speed can change along the arc and are automatically selected by the control system to achieve the prescribed dose/deg. Multiple and continuous arcs in CW and CCW direction can be delivered.
- PreciseBEAM™ VMAT
  - This license enables the Elekta volumetric intensity modulated arc therapy (VMAT) treatment delivery. VMAT is capable of simultaneous dynamic control of MLC, diaphragms, gantry and collimator. It allows continuously variable MU per degree along the arc and, as in dynamic arc, the control system automatically adjusts all linear and angular speeds as well as dose rate. Multiple and continuous arcs in CW and CCW direction can be delivered.

CUSTOMER BENEFIT: Reduced delivery times allow for increased patient throughput
CLINICAL BENEFIT: Reduced dose to critical structures
Improved MU efficiency reduces dose to healthy tissue.

Additional information and specifications on intensity modulated delivery options can be found in the Desktop Pro™ 7.01 Control System – Product Data document no. 4513 371 0681.

15.0 Optional IGRT techniques

15.1 iViewGT™

CUSTOMER BENEFIT: Simple and efficient technique for patient positioning verification using easy-to-use registration tools.

- iViewGT is a megavoltage electronic portal imaging device (EPID) intended to augment the existing recording and verification systems providing proof the radiation field has been correctly positioned with respect to the target area. Image detection is performed by means of a scintillator plate attached to an amorphous silicon detector. Image processing within a PC workstation offers a range of options for superimposed graphics, multiple exposures and selectively enlarged images through high-speed analysis and enhancement. Image acquisition is possible before, during and after treatment.
- Additional information and specifications on iViewGT™ can be found in the iViewGT Product Data 4513 371 0294.

15.2 X-ray volume imaging (XVI)

CLINICAL BENEFIT: Ability to visualize soft tissue structures and precisely target dose to the tumor whilst protecting surrounding healthy tissues and critical structures

- The X-ray Volume Imaging system provides high quality kV images for target localization and on-line patient position correction at the time of treatment. XVI provides the option for 2D kV image acquisition using PlanarView™ or MotionView™ and 3D VolumeView™ acquisition with integrated image manipulation and registration tools. Workflow and clinical accuracy are further enhanced by the remote automatic table movement function.
- For additional information and specifications on XVI see the XVI Product Data document no. 4513 371 0650.

16.0 Site requirements

This list includes only some relevant site requirements in general terms. For detailed site planning information please refer to Site Planning Reference documentation no. 1008403.

16.1 Electrical

Electrical supply for linear accelerator: Peak power 30 kVA, Radiating 18kVA. Three-phase, neutral and earth. Nominal voltage 380 to 420V, Nominal frequency 50 or 60Hz.

16.2 Water cooling

A supply of cooling water is required that can be configured as a one-pass system or a closed loop. If the hospital is not ordering an Elekta water cooler then the client is required to supply the linear accelerator with cooled water to the following specification:

- temperature of water at input to the linear accelerator between 12° and 20°C
- maximum flow – 30 liters/minute
- maximum (absolute) pressure at the input to the linear accelerator should not exceed 4 bar.

Maximum heat input into the hospital water is approximately 12kW, thus temperature gain of hospital water at 30 liters/minute flow is approximately 6°C.

16.3 Lighting

There should be no lighting on the ceiling or walls within 500mm either side of the isocenter.

16.4 Cable ducting

Cable ducts are required to run from the rear of the accelerator to the control room. Ducting should be set into the concrete floor for this. Smaller ducts are required to run from the linear accelerator gantry to the water cooler (if used) and to the Client Interface Terminal.

16.5 Lifting equipment

An I-section girder with a safe working load (SWL) of 2200kg should be mounted on to the concrete ceiling directly above and parallel to the rotation axis of the gantry (end stops must be fitted if girder is open-ended)

16.6 Room safety and radiation protection

It should be noted that before constructing or modifying any treatment room, the design must have the approval of the National Radiological Protection Authority. Interlocks must be provided by the customer to interface the treatment room with the Linear Accelerator. These include emergency off switches, room door switches, radiation warning lights and a time delay switch. Connection to these and other customer interfaces is via an interface PCB. The PCB is provided by Elekta.

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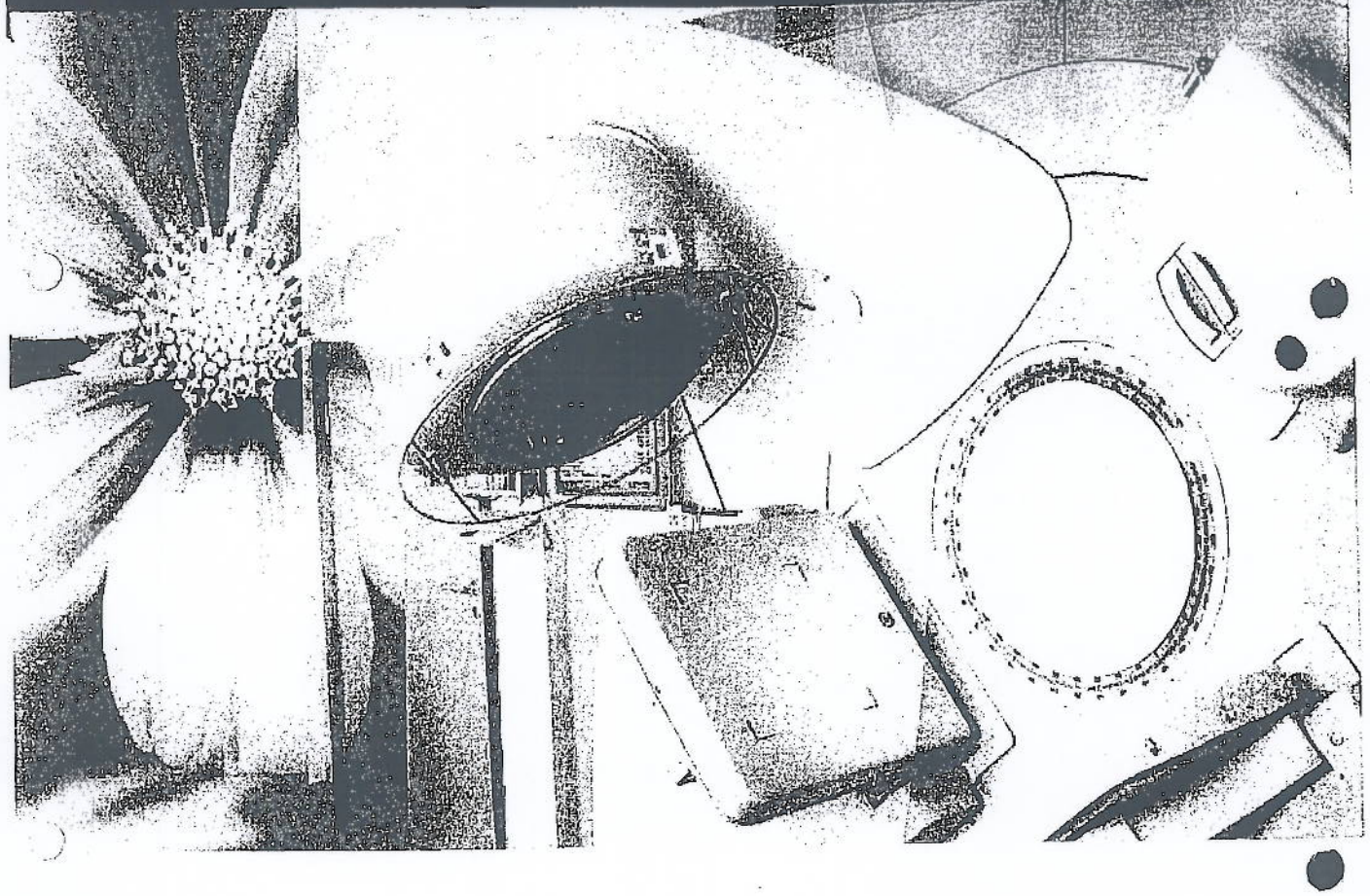
ELEKTA

Elekta Synergy®

Digital accelerator for advanced IGRT

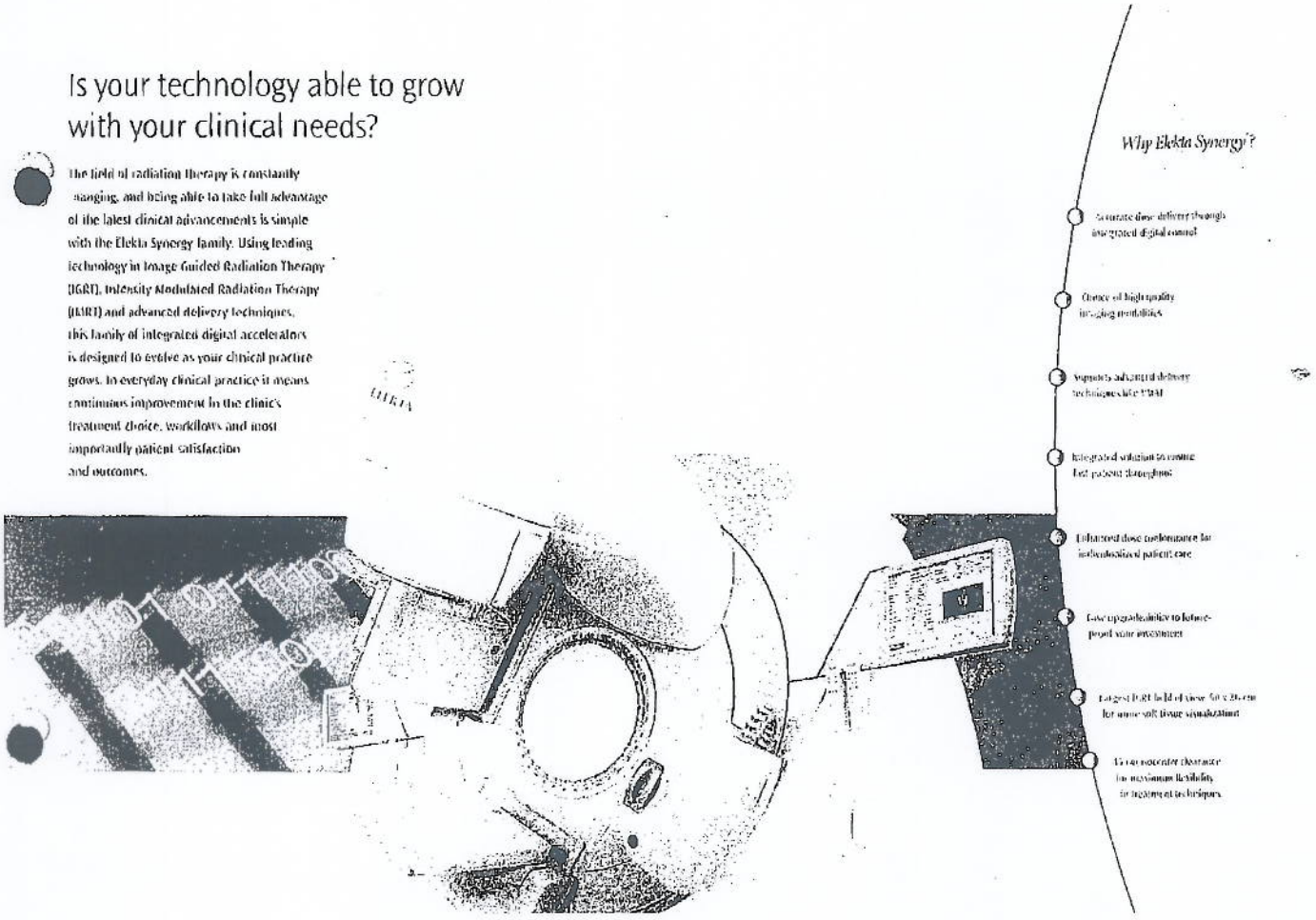


Setting the standard
for confident care

ELEKTA

Is your technology able to grow with your clinical needs?

The field of radiation therapy is constantly changing, and being able to take full advantage of the latest clinical advancements is simple with the Elekta Synergy family. Using leading technology in Image Guided Radiation Therapy (IGRT), Intensity Modulated Radiation Therapy (IMRT) and advanced delivery techniques, this family of integrated digital accelerators is designed to evolve as your clinical practice grows. In everyday clinical practice it means continuous improvement in the clinic's treatment choice, workflows and most importantly patient satisfaction and outcomes.



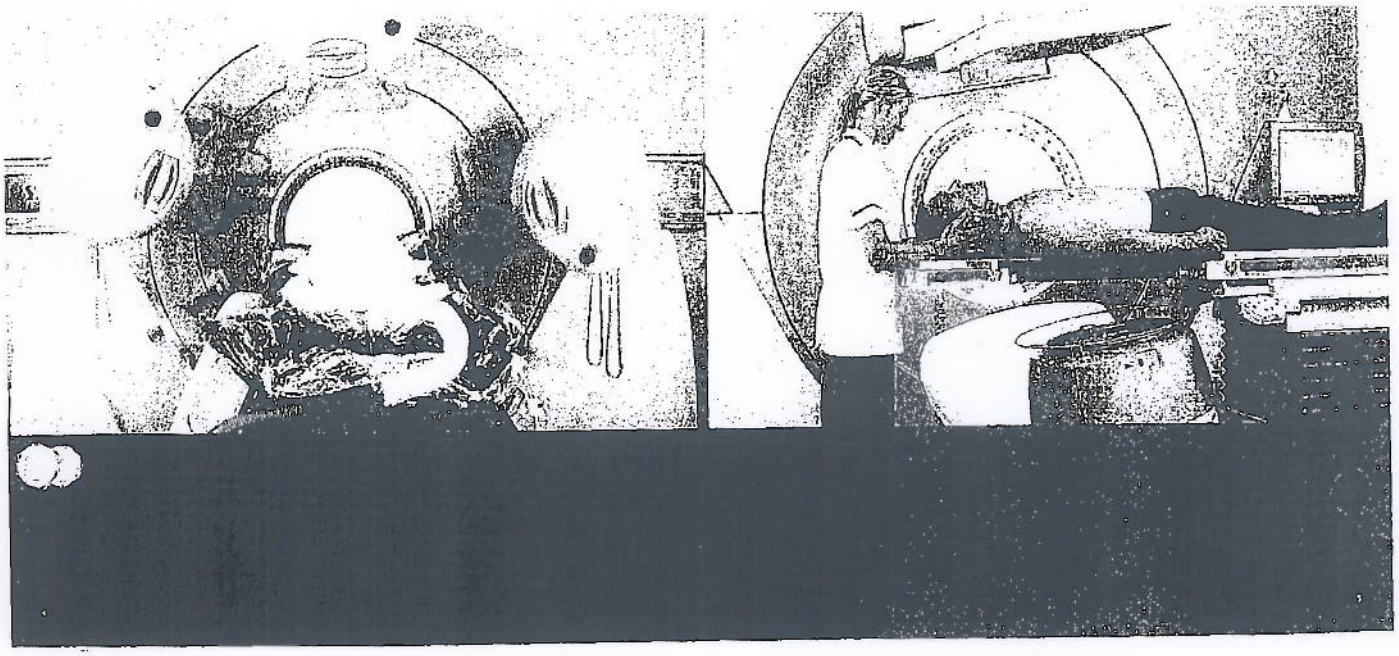
Elekta Synergy®
Inspiring clinical confidence

Elekta Synergy was the first advanced digital linear accelerator to introduce soft tissue volumetric Image Guided Radiation Therapy. With a suite of advanced guidance tools, imaging of soft tissue at the time of treatment allows efficient verification of tumor and critical structure position, providing increased confidence in dose placement.

Elekta Synergy® Platform
Foundation for the future

As the foundation of the Elekta Synergy family of digital accelerators, Elekta Synergy Platform has been designed to grow with your practice. It introduces real-time patient position verification, to ensure confidence in patient set-up accuracy, and efficient guidance of dose placement.

Through the addition of kV imaging to its current IGRT technology, the Synergy Platform can be easily upgraded to Elekta Synergy, allowing centers to offer a choice of imaging modalities best suited to the patient's need.



Patient-centric

The application of evidence-based medicine allows advanced decision making on treatment techniques, outcomes and performance. From patient-centric treatment planning solutions and MOSAIQ® comprehensive patient management information system, Elekta Synergy® gives users access to the entire Oncology chain in a single integrated solution.

Unmatched Clinical Confidence

With IGRT becoming an integral part of the standard of care for many patients, Elekta Synergy® not only provides the ability to deliver tailored imaging through a variety of imaging modalities, but includes many unique features, such as the industry's largest IGRT field of view that enable you to deliver personalized patient care throughout the entire radiotherapy treatment process.

Oncology Information Systems
At the heart of Oncology Management, MOSAIQ image-enabled electronic medical record provides tools to streamline the radiotherapy process as a whole, while delivering secure access to the patient information and images that drive clinical decision making.

Treatment Planning
Elekta's patient-centric planning solutions provide a broad range of leading edge applications and comprehensive workflow solutions, supporting the requirement for increasingly tighter coupling between treatment planning, delivery workflow management and review.

Imaging
For unmatched clinical confidence, Elekta Synergy delivers a choice of 2D MV, 2D kV, 3D and 4D kV image guidance, for visualization and tumor verification. With a suite of advanced image guidance tools, Elekta Synergy provides clinicians with the ability to provide tailored image guidance to meet the needs of each individual patient.

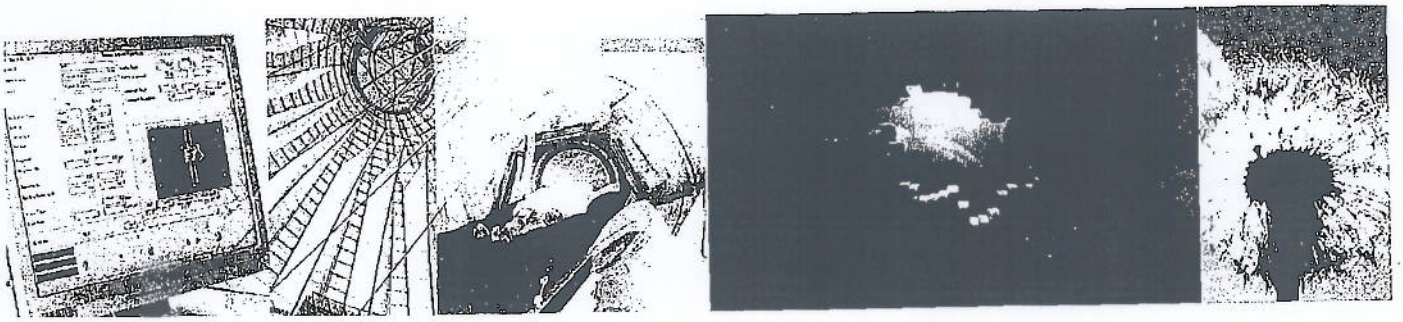
Image Guided Treatment Management
Through coordinated image guidance and treatment delivery, Elekta Synergy® provides a synchronized workflow for Radiation Oncology. Fundamentally image-enabled, MOSAIQ provides the flexible treatment management solution designed to support the complexities of image-guided radiation therapy.

Digitally Controlled, Clinically Focused

Accuracy and reliability of treatment delivery are imperative to be able to deliver individual patient care with confidence. Powered by Elekta's 6th generation of integrated digital control, Elekta Synergy® seamlessly combines advanced guidance through IGRT with flexible treatment delivery across a wide number of techniques. With the market leading isocentric clearance of 45cm, Elekta Synergy provides significantly more freedom to deliver non-coplanar therapies.

Flexible Beam Shaping

Supporting the range of treatment delivery techniques, Elekta Synergy supports a range of integrated multileaf collimators, allowing users to choose the beam shaping that meets the need of their clinic. Through innovative design, Elekta Synergy provides the ability to reduce dose to critical structures while meeting today's clinical desire to deliver higher doses to the target.



Digital Control
Through simple, intelligent resolution of multiple linac functions, Elekta Synergy is powered by digital control that orchestrates the linac's myriad of operations to ensure that any treatment is delivered safely, accurately, quickly and intelligently.

Treatment Delivery
Individualized patient care is possible through a range of techniques from 3D conformal techniques through static and dynamic IMRT to VMAT. With these advanced delivery techniques, you no longer have to choose between speed and accuracy.

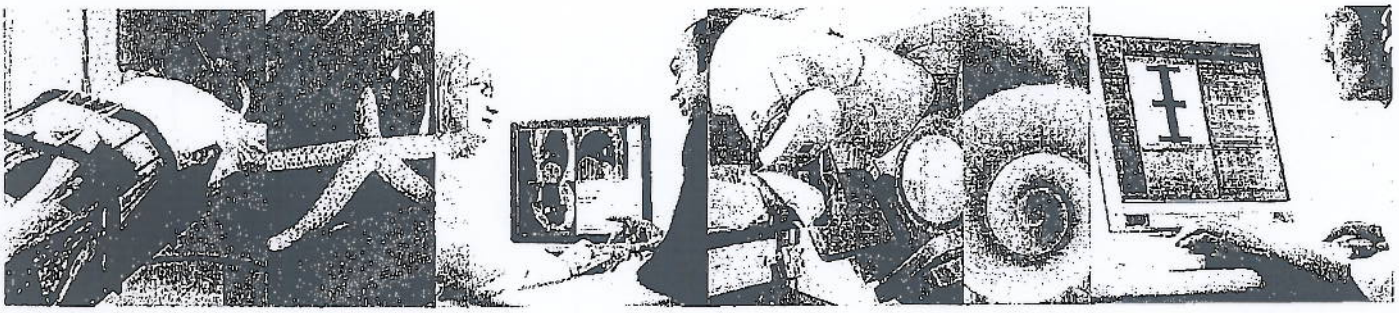
Beam Shaping
With a range of advanced integrated multileaf collimators, Elekta provides excellent beam-shaping capabilities across the range of delivery techniques. Through fully integrated digital control with continuous real-time optical verification, accurate placement of all leaves allows for faster, safer and more accurate delivery.

Active Motion Management

Delivery of high doses associated with lesion's minimum damage techniques requires not only accurate reproduction of patient positioning, but also management of internal patient motion during both imaging and treatment delivery. Elekta's clinically efficient solutions address the challenges of patient immobilization and actively manage motion, facilitating margin reduction and dose escalation.

Expanding Clinical Practice

More and more clinics are undertaking practice expansion in stereotactic treatment techniques. Supporting you in this area, Elekta Synergy has been designed to be compatible with the Elekta range of stereotactic accessories, providing you with the option to introduce stereotactic practice into your clinic simply, efficiently and cost-effectively.

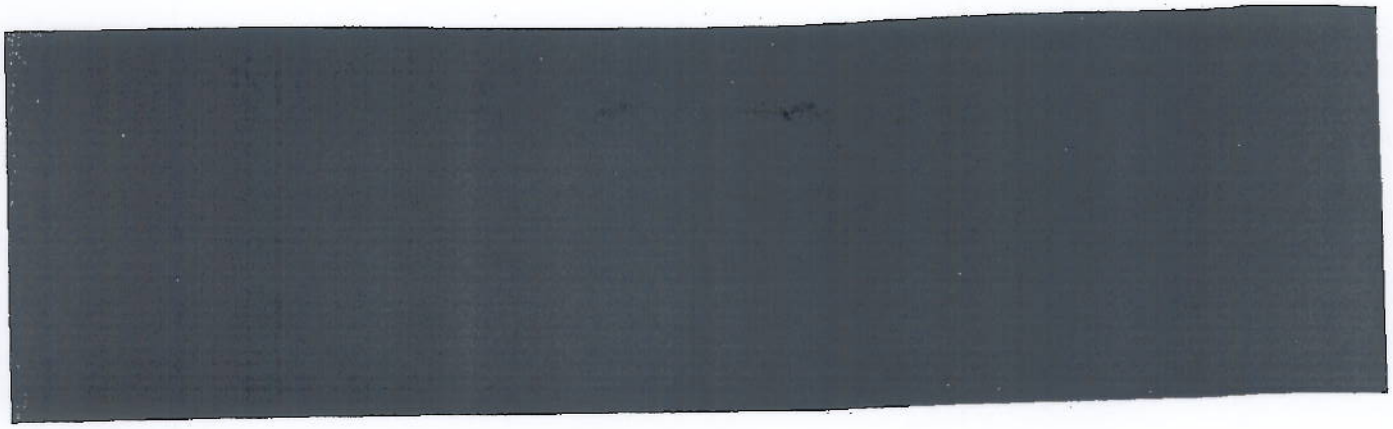


Motion Management and Patient Positioning
Through a versatile range of positioning and immobilization solutions, optimal treatment setup is achieved through innovative designs which focus on the patient experience as a whole, combining accurate comfort, safety and reproducibility.

Respiratory Motion Management
Addressing target localization associated with respiratory motion management can be challenging. Elekta Synergy's 4D customizable gated motion management capabilities allow clinicians to visualize respiratory motion and account for location shifts.

Stereotactic Accessories
With a range of stereotactic accessories, including add-on mini-MLCs, precise, small-field delivery enables implementation of stereotactic radiosurgery and stereotactic radiation therapy.

Quality Assurance
Completing the picture, Elekta offers a full range of QA tools for fast accurate verification of performance, providing the confidence that treatments are delivered as planned.



A human care company, Elekta pioneers significant innovations and clinical solutions for treating cancer and brain disorders. Elekta provides intelligent and resource-efficient technologies that improve, prolong and save patient lives. We go beyond collaboration seeking long-term relationships built on trust with a shared vision, offering confidence to healthcare providers and their patients.

Human Care Makes the Future Possible

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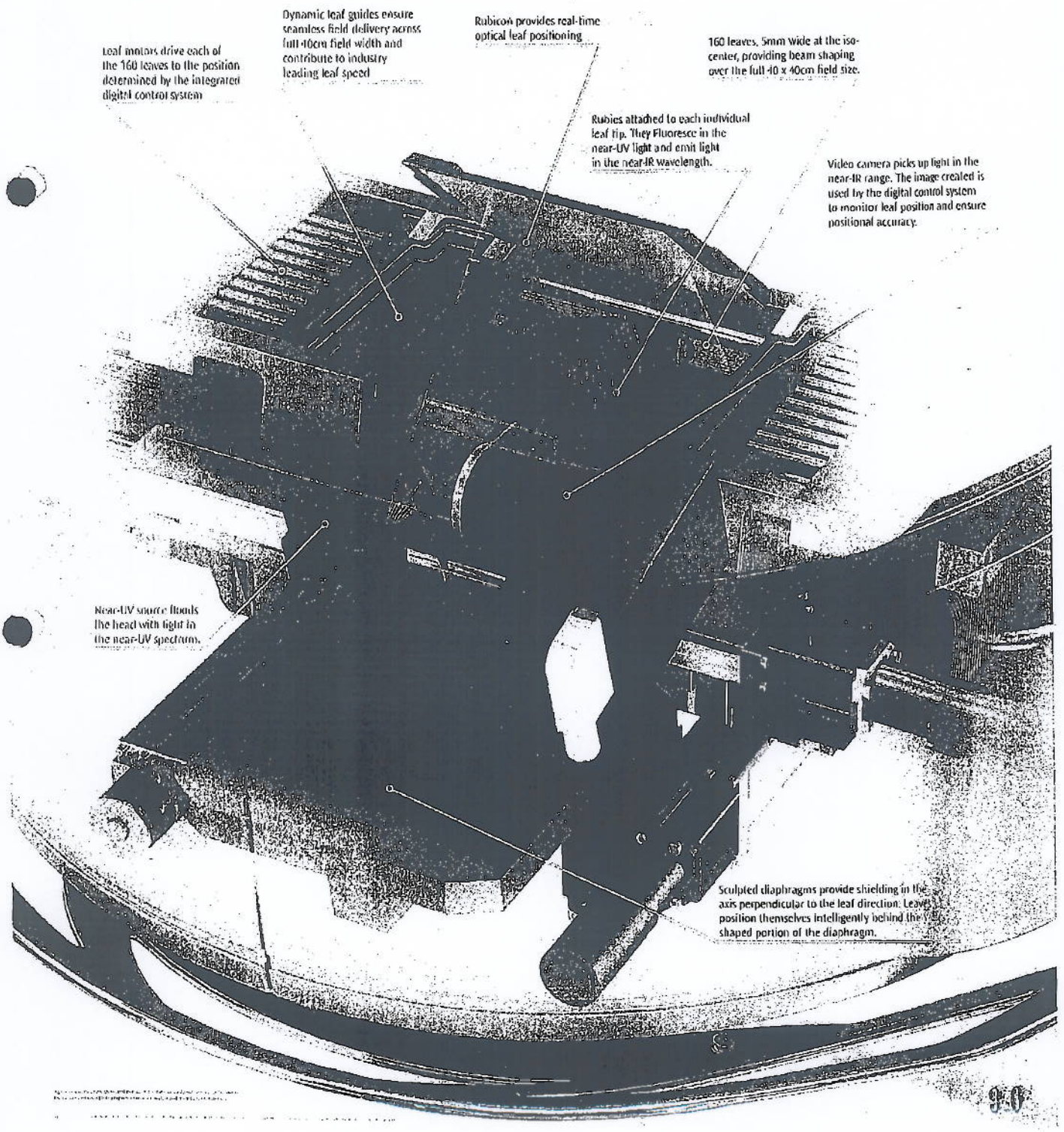
ELEKTA

Agility

ELEKTA

High-resolution full field MLC



Agility™

High Resolution Beam Shaping
Product Data

Agility™ from Elekta provides high resolution beam-shaping across a 40 x 40cm fieldsize. The unique low leakage integrated MLC head from the comprehensive Elekta beam-shaping portfolio, builds on Elekta's long experience with optical positioning.

Advanced Clinical Features

- 160 Interdigitating leaves with 5 mm width at isocenter
- Fast leaf speed and high precision
- Integrated dynamic leaf guide removing the need for a split field
- Accurate leaf positioning with Rubicon optical technology*

1.0 Beam Shaping Hardware

Attributes: Mechanical

Interdigitation capable	yes
Number of leaves	160
Nominal leaf width projection at iso-center	5 mm
Maximum field size	40 x 40 cm
Minimum recommended field size	0.5 x 0.5 cm
Maximum distance between leaves on same leaf guide	20 cm
Leaf travel over central axis	15 cm
Leaf nominal height	9 cm
Leaf positioning resolution	0.1 mm
Leaf positioning verification method	Optical
Diaphragm overtravel	12 cm

Leaf Positioning

The robust and reliable Rubicon optical positioning system provides valuable real-time assurance of accurate leaf positioning. Agility's Rubicon optical technology offers advanced real-time leaf monitoring and positioning. Ultraviolet light from an LED source produces infrared fluorescence when it falls on the ruby tips of the multileaf collimator leaves. This infrared fluorescence, detected by an infrared camera, is used to reliably monitor and accurately position the leaves and can be viewed in real-time on the linear accelerator's display screen

ELEKTA

X-ray Volume Imaging (XVI)
Product Data

Elekta was the first company to introduce kV imaging at the time of treatment with XVI. With its cutting-edge capabilities, XVI brings 2D, 3D and 4D anatomical soft tissue visualization. With fast integrated imaging and registration tools, XVI effortlessly facilitates patient set-up correction to provide confidence in dose placement. XVI is a flexible imaging solution that gives you choices to ensure the most suitable image guided treatment is available for your patient.

This product data describes in more detail, the XVI solution and the suite of sophisticated imaging tools available.

1.0 Image Acquisition and Registration

XVI provides the option for 2D kV image acquisition using PlanarView™ or MotionView™, 3D acquisition using VolumeView™ and 4D acquisition using Symmetry™.

1.1 MotionView™ kV Sequence Imaging (2D)

CLINICAL BENEFIT:

- *Real-time evaluation of patient motion, optimizing delivery*

A pre-programmed sequence of images is acquired via preset driven protocols. It enables the viewing of intrafraction motion while the patient is in the treatment position, and is suitable for 2D anatomical motion studies.

1.2 PlanarView™ kV Single Exposure (2D)

CLINICAL BENEFIT:

- *Aids initial patient set-up*
- *High quality images at very low dose (0.2cGy) delivery*

Single kV image, equivalent to radiographic mode, suitable for orthogonal or stereoscopic imaging using surrogate implanted seeds/clips/bony anatomy for patient set-up. Acquisition is preset based. Images can be manipulated within XVI, and transferred to MOSAIQ® Image Management software for additional image registration features and trend analysis.

1.3 VolumeView™ 3D Volume Acquisition Mode

CLINICAL BENEFIT:

- *Fast acquisition in the treatment position enables real time modification*
- *Visualization of all soft tissue structures at the time of treatment decreases risk of geometric miss*
- *Ease of structure identification*

A 3D volume of image data is reconstructed from a series of 2D projection images acquired as the linear accelerator gantry is rotated. This image data can be used for verification of patient position and target motion. The number of projection images acquired can be varied within the preset functionality, depending on the image quality required and patient imaging dose that is considered appropriate for the anatomical region being imaged. This flexibility is provided by utilizing full or partial gantry rotations, with the opportunity to select a choice of gantry rotation speeds.

ELEKTA

The reconstruction engine that is included in the VolumeView option is based on a FeldKamp backprojection algorithm specifically optimized for X-ray volume (cone-beam CT) acquisition.

1.4 Symmetry™ 4D Volume Acquisition Mode

CLINICAL BENEFIT:

- *Volumetric visualization of the moving tumor at the time of treatment, in the treatment position*

A 4D volumetric image is reconstructed using a unique anatomy based sorting algorithm which identifies the respiratory phase using anatomical information available within the 2D projection images. Each 2D projection image is sorted into a phase based bin, and reconstructed into a volumetric data set. Within the Symmetry functionality, XVI displays all phase based volumetric images in sequence allowing easy visualization and registration of the moving tumor.

1.5 Intra-fraction Imaging Mode

CLINICAL BENEFIT:

- *Visualization of target motion during treatment enables correctional strategies to be implemented*

This mode allows simultaneous kV imaging during MV treatment delivery.

2D intra-fraction imaging allows visualization of images during treatment either as static or fluoroscopic images and provides an opportunity to monitor and correct for motion during treatment.

3D VolumeView intrafraction imaging allows 3D kV acquisition during rotational MV treatment delivery, providing post treatment verification of the patient position. This allows for online and offline correctional strategies to be implemented.

4D VolumeView intrafraction imaging provides verification of real tumor motion as treatment delivery is undertaken.

1.6 Preset Driven Acquisition and Reconstruction

For both 3D and 4D volumetric imaging, flexibility of acquisition parameters is assured through the implementation of preset parameters that can be configured by the user within the software. These parameters include generator settings, required gantry sweep, appropriate field-of-view settings and collimated X-ray field. All kV acquisition protocols are initiated via a single button press on the integrated function key pad.

Fast in-line reconstruction can be selected for maximum workflow efficiency, reconstruction takes place during image acquisition so that the 3D or 4D image is available immediately following acquisition. The resolution of the reconstruction matrix used can be configured by the user. Presets are supplied for 0.5mm, 0.75mm, 1mm and 2mm voxels

1.7 Remote Table Movement

Workflow and clinical accuracy are further enhanced by the remote automatic table movement function. This enables repositioning of Precise Table with sub-millimeter accuracy in three dimensions following a VolumeView acquisition and image registration. This automatic move can be performed from the control area function keypad, or within the treatment room using the hand held controller.

1.8 Patient Aperture

CLINICAL BENEFIT:

- *No compromise in patient set-up positioning*

The patient clearance aperture is 90cm for both imaging and treatment delivery. The XVI hardware folds away against the gantry when not required. This enables techniques such as non-coplanar treatment techniques to be achieved with maximum efficiency

1.9 Field-of-view

CLINICAL BENEFIT:

- *Largest axial image length*

Field-of-view is determined as the visible reconstructed VolumeView image. The available field-of-view options are as follows:

- small = 27cm x 26cm
- medium = 41cm x 26cm
- large = 50cm x 26cm

Below are typical acquisition parameters for VolumeView image guidance.

CTDIw measurements were made with a phantom length of 40cm to account for scatter from a cone beam CT acquisition

1.9.1 Head-and-neck

CLINICAL BENEFIT:

- *40 second acquisition and reconstruction for low dose, efficient volumetric corrections*

Parameter	Value
kV	100
mA	10
ms	10
Field-of view	27cm (small)
Filter	None
No. of projections	183
Gantry sweep (arc)	200 degrees
Gantry speed (deg/min)	360
Reconstruction	In-line
CTDIw	0.5mGy (Head phantom: length 40cm)

1.9.2 Chest

Parameter	Value
kV	120
mA	20
ms	20
Field-of view	41cm (medium)
Filter	Bow tie filter
No. of projections	660
Gantry sweep (arc)	360 degrees
Gantry speed (deg/min)	180
Reconstruction	In-line
CTDIw	4.9mGy (Body phantom: length 40cm)

1.9.3 Prostate Seed

CLINICAL BENEFIT:

- *Facilitates fast, efficient registration while still providing full 3D anatomical information*
- *40 second acquisition and reconstruction for low dose, efficient volumetric corrections*

Parameter	Value
kV	120
mA	16
ms	16
Field-of-view	27cm (small)
Filter	None
No. of projections	183
Gantry sweep (arc)	200 degrees
Gantry Speed (deg/min)	360
Reconstruction	In-line
CTDIw	1.5mGy (Body phantom: length 40cm)

1.9.4 Pelvis

Parameter	Value
kV	120
mA	40
ms	40
Field-of-view	41cm (medium)
Filter	Bow tie filter
No. of projections	660
Gantry sweep (arc)	360 degrees
Gantry Speed (deg/min)	180
Reconstruction	In-line
CTDIw	19.9mGy (Body phantom: length 40cm)

1.9.5 Symmetry

CLINICAL BENEFIT:

- *Advanced 4D information with low acquisition doses*

Parameter	Value
kV	120
mA	20
ms	16
Field-of-view	27cm (small)
Filter	None
No. of projections	975
Gantry sweep (arc)	200 degrees
Gantry speed (deg/min)	67*
Reconstruction	In-line
CTDIw	12.2mGy (Body Phantom: length 40cm)

* Gantry speed is slowed to ensure adequate respiratory cycles are included in the reconstructed 4D data set.

1.10 Typical file sizes for reconstructed images

	Reconstructed image	Projection data *
VolumeView™ (half rotation scan, 360°/min)	20MB	100MB
VolumeView (full rotation scan, 180°/min)	35MB	350MB
Symmetry™ scan	41MB	525MB

* Projection images can be deleted following reconstruction

2.0 Registration Workflows

2.1 VolumeView™ Registration

CLINICAL BENEFIT:

- *Utilize physician defined anatomy for daily registration*
- *Workflow oriented registration ensures minimum time to analyze, correct and treat the patient in the optimal position*

Specific anatomy for registration can be selected by utilizing a clipbox (cube) volume or a shaped region of interest. The shaped registration region of interest allows structures imported from the treatment planning system to be utilized for generation of the registration volume.

The following optimized registration workflows are available for efficient, intuitive image guidance.

2.1.1 Automated Bone Registration (based on chamfer matching)

2.1.2 Grey Value Registration (automated soft-tissue matching)

2.1.3 Manual Registration

2.1.4 Automated Seed Registration

CLINICAL BENEFIT:

- *Fast and efficient image guidance with no compromise on volumetric anatomy*

This provides an optimized algorithm which facilitates fast, efficient registration of implanted markers within a volumetric environment. Markers/fiducials which have been validated are as follows:

- Visicoil fiducial marker (0.35mm x 10mm)
- CIVCO Gold Soft Tissue Markers (0.8 & 0.9 x 3mm)
- CIVCO Coupled Markers (1.0 x 3mm)
- CIVCO Carbon Marker (1.0 x 3mm)

2.1.5 Critical Structure Avoidance

CLINICAL BENEFIT:

- *Increased confidence in accurate treatment delivery, by providing assurance that changes in internal anatomy have not put adjacent critical structures at increased risk since the original treatment plan*

This workflow allows registration of the clipbox and the shaped registration region of interest on two separate areas of anatomy. XVI calculates the relationship of both areas of anatomy to the proposed correction vectors. User defined tolerances input into the software will automatically prompt the user if the target has moved closer to the critical structures due to anatomical changes.

2.2 Symmetry™ Registration

CLINICAL BENEFIT

- *Fast, efficient visualisation and registration of the moving tumour at the time of treatment*

Each reconstructed phase of the respiratory cycle is automatically matched to a static 3D reference image. Following registration an optimized display allows efficient review of all registration results. Correction vectors can be automatically calculated to position the moving tumor to an average position, facilitating a symmetrical dose delivery, alternatively an exhale matching position can be selected. The Symmetry workflow can be utilized in combination with critical structure avoidance.

3.0 Product Performance

3.1 3D VolumeView™ Image Quality

CLINICAL BENEFIT:

- *The ability to clearly visualize soft tissue at the time of treatment allows margin reduction for high dose delivery to the target while protecting critical structures*

The 3D image quality has been determined using the Phantom Laboratories CATPhan 503 Phantom with contrast resolution module, spatial resolution module and uniformity resolution module. Example parameters used for image acquisition are:

Parameter	Value
kV	120
mA	20
ms	20
Field-of-view	27cm (small)
No. of projections	650
Gantry sweep (arc)	360 degrees
Reconstruction	in-line
Slice width	1.5mm

3.1.1 Low Contrast Visibility

The contrast resolution module contains 8 x 1.5mm inserts (LDPE, polystyrene, air (x2), Teflon, Delrin™, acrylic and PMP)

- low contrast resolution (using LDPE and polystyrene) ≤ 3.0% at 1mm slice thickness

3.1.2 Spatial Resolution

The spatial resolution module contains 21 spatial resolution sections measuring from 1 to 21 line pairs per cm

- spatial resolution ≥10 lp/cm at 1mm slice thickness

3.1.3 Uniformity

The uniformity module contains a material within 2% (2HU) of water

- uniformity is within ±1.5% across a 15cm diameter region at 1mm slice thickness

3.1.4 Geometric Accuracy

CLINICAL BENEFIT:

- *Confidence in delivery of high dose treatments*

Geometric accuracy is the accuracy of distances measured in the reconstructed data against the physical dimension. The measurements are one using the CATPhan 503 Phantom:

- axial geometric accuracy** ≤1mm
- sagital geometric accuracy** ≤1mm

** dependent on operator.

3.1.5 Hounsfield Unit Accuracy

Hounsfield Unit accuracy: ±40 HU for a 20cm diameter (air and water equivalent) phantom

3.2 3D System Accuracy

CLINICAL BENEFIT:

- *Confidence in delivery of high dose treatments*

	RMS error	Max. error
Alignment of MV radiation field center to kV isocenter	0.7mm	1mm
Image registration (on XVI)* Auto-registration bony anatomy	0.5mm	1mm
Automatic table correction	0.5mm	1mm
Total clinical accuracy** (image reconstruction, bony anatomy registration, automatic table correction)	1mm	2mm

* subject to planning CT quality and clinical site

** total clinical accuracy is the accuracy has been determined using a geometric phantom

3.3 4D System Accuracy

CLINICAL BENEFIT: Confidence in delivery of high dose treatments

	Max error
Alignment of Symmetry calculated average position to kV isocenter	1mm
Accuracy of Symmetry calculated amplitude	1mm

3.4 2D PlanarView™ Image Quality

The 2D image quality has been determined using the Leeds TOR 18FG phantom with a 1mm copper plate placed on top of the phantom. The parameters used for image acquisition are:

Parameter	Value
kV	120
mA	10
ms	25
Frames	15
Total mAs	3.75

3.4.1 Low Contrast Visibility

The Leeds test object contains contrast objects from 16% to 0.9%

- low contrast resolution is ≤2.7%

3.4.2 Spatial Resolution

The Leeds test object contains spatial resolution blocks from 0.5 to 5.0 line pairs per mm

- spatial resolution is ≥1.4 lp/mm

3.5 2D System Accuracy

The 2D system accuracy is determined by the difference between the XVI show center position on acquired 2D images on the MV radiation isocenter

- 2D system accuracy <1mm

4.0 kV Imaging System

Peak power	40kw, iso spec.		
Radiographic kv range	70kVp – 150kVp		
Max mAs	500mAs		
Voltage ripple	typical <1% @ 100kvp	certified	UL, FDA, CSA, CE
Rise time	typical 1ms		
Power input	3 phase		
Weight approx.	75kg		
External dimensions approx.	(w) 545mm (l) 360mm (h) 642mm		

4.1 X-ray Tube

- Fan cooled
- X-ray tube housing assembly: total heat storage capacity: 1200kHU
- Cooling rates for anode and housing (HU/min.) 705HU/s
- X-ray tube and housing filtration 2.6mm Al and 0.1mm Cu

4.1.1 Duty Factor

- Nominally two VolumeView™ scans in 15 mins

4.2 Amorphous Silicon Detector

- 41cm x 41cm
- Nominally 5.5fps
- Image matrix 1024 x 1024 x 16 bits

5.0 DICOM

CLINICAL BENEFIT:
- *Easy transfer of information*

5.1 DICOM CT Import

5.2 DICOM RT Plan Import

5.3 DICOM RT Structure Import

5.4 DICOM RT Image Import

5.5 Optional DICOM CT Export

5.6 Optional Automatic DICOM CT Export (to a Configured Destination)

5.7 DICOM 4D CT Export

5.8 DICOM RT Image Export

See www.elekta.com for latest DICOM conformance statement

6.0 Calibration Phantoms

6.1 Flexmap Phantom

The single ball bearing phantom and table mount and associated software tools are used for routine QA checks, MV isocenter determination and kV system calibration.

6.2 Optional Phantoms

6.2.1 2D: TOR18FG Leeds X-ray Phantom
The test object contains both a line pair/mm section and low contrast discs

6.2.2 3D: CATPhan 503 Phantom
Incudes contrast resolution module, spatial resolution module and uniformity resolution module.

6.2.3 4D: CIRS Dynamic Thorax Phantom or Quasar Respiratory Motion Phantom
4D phantoms which simulate respiratory motion for analysis of Symmetry functionality.

6.2.4 Quasar Penta-Guide
Cube phantom for daily QA checks of 3D VolumeView registration, kV and MV system coincidence, 2D projection images, laser and field light.

6.2.5 Oval Body Annulus (20cm long)
Oval shaped annulus to simulate the non-uniformity attenuation created by a patient torso shape. Used with the CATPhan for Hounsfield Unit calibration.

6.2.6 Water Calibration Tank
Water tank used for multiple level gain calibration, for enhanced image quality.

7.0 Optional Back-up and Archive

CLINICAL BENEFIT

- *Storage in MOSAIQ® for distributed review*

Tape drive back-up and archive solution – LT03 or LT04 tapes which have 400GB or 800GB native capacity respectively. Alternate archiving solution is available via MOSAIQ® Oncology PACS.

8.0 Optional SYNERGISTIQ™ User Interface

Optional user interface which coordinates MOSAIQ and XVI workflow for IGRT for enhanced efficiency. Allows automatic storage of table correction vectors and CT/RT images within MOSAIQ for offline review, registration and trend analysis.

Note: availability subject to local regulatory clearances. Please contact your local Elekta representative or authorised distributor for details.

Attributes: Dimensions / Weight / Speeds

Head rotation	365°
Head weight	420 kg
Radiation head diameter	81.5 cm*
Head to isocenter clearance	45 cm
Head rotation speed for set-up	12°/s maximum
Head rotation speed for dynamic delivery techniques	6°/s maximum
Leaf speed	Up to 3.5 cm/s Combined with leaf guide up to 6.5 cm/s
Diaphragm speed	Up to 9 cm/s

* *Maximum swept diameter*

Attributes: Wedge

Integrated wedge size	0-60°
Wedge field size	30 (Y_{IEC}) x 40 (X_{IEC}) cm

Attributes: Physics

X-ray to light coincidence	Maximum distance along the major axes between the light field edge and the radiation field edge for centred fields at normal treatment distance: 5x5 cm to 20x20 cm = 1 mm; 20x20cm to maximum square = 1%
Penumbra (80-20%) for centred fields (at 6 and 10 MV)	< 5.5 mm
Leaf tip penumbra variation for 5x5 cm field over the full travel range (for 6 and 10 MV)	< 1 mm
Leaf position accuracy*	1 mm at isocenter 0.5 mm RMS
Leaf position repeatability	< 0.5 mm
Average transmission through leaves**	<0.375%
Peak transmission through leaves**	<0.5%
X-radiation leakage in patient plane outside primary collimator cone region ***	<0.2% max. <0.1% avg
X-radiation leakage outside patient plane (at 1 m) ****	<0.5%

* *Measured using a stripe test. Maximum error quoted as maximum positional error in any leaf pair abutment and root mean square for any leaf pair across all abutments.*

** *IEC 60601-2-1, 2009, clauses 201.10.1.2.103.2.1a/c and 201.10.1.2.103.2.1b/c for peak and average leakage respectively.*

*** *IEC 60601-2-1: 2009, clauses 201.10.1.2.103.3a and 201.10.1.2.103.3b for maximum and average leakage respectively.*

**** *IEC 60601-2-1: 2009, clause 201.10.1.2.104.1a*

2.0 Integrated Digital Control System

Integrity™ R3.0 is the seventh generation of integrated digital control system which is the monitoring and controlling foundation of Elekta's digital treatment delivery system. It incorporates the robust medical and aerospace operating system LynxOS. This platform powers the digital linear accelerator offering a system optimized for smooth and efficient delivery of advanced treatment and offering a platform supporting future technologies.

Integrity R3.0 supports a wide variety of techniques from conformal, through IMRT to VMAT for conventional and stereotactic applications, providing clinicians with the freedom to choose the treatment techniques best suited to individual patients.

2.1 Digital Control System Hardware

The Integrity R3.0 software is designed to run on the Agility control system rack cabinet. The control system cabinet (800 mm long x 600 mm wide x 700 mm high) is a small profile cabinet housing dual processors that control both the linear accelerator and the MLC and supports a graphical user interface.

Beam Monitor Unit Display Module (BMDM)

The BMDM module shows the delivered dose in MU. It continues to show the number of monitor units delivered in the last field for a minimum of 20 minutes after power is removed.

User Interface

Elekta Integrity R3.0 user interface is accessed via the control console comprising monitor, keyboard and mouse in the delivery system control area. The graphical user interface supports clinical and service functions and is easy to use and learn. Integrity R3.0 can be configured with up to four monitors, two in the control area and two in the treatment room. The information presented on the monitors is customizable by the user according to local requirements and practice.

Function Key Pad

The Function Key Pad in the control area allows the clinical user to perform Assisted Set-Up (ASU) and to initiate, interrupt or terminate delivery.

2.2 Digital Control System Software

The Integrity software supports two modes of operation which are accessible via a graphical user interface. These modes are designed to meet the needs of the clinical or service user.

2.2.1 Clinical Mode

Provides all the tools required by the clinical user to support and monitor treatment delivery.

Receive External Prescription

Allows the user to deliver radiation using parameters defined by an external record and verify (R&V) system and loaded into the digital accelerator using the Elekta iCom protocol. The patient prescription is stored and managed on the external R&V system.

Receive External Prescription mode also allows the user to copy beams into Service Mode. In Service Mode, copied beams can be delivered as part of any local quality assurance checks or procedures, with no effect on the patient treatment history recorded on the R&V system.

View Item Parts

Allows the performance of selected linac components to be monitored during clinical use.

Assisted Set Up (ASU)

Allows the user to automatically position the gantry, collimator, beam geometric parameters and, optionally the table isocentric rotation to the positions specified in the field prescription. Through the Integrity software, the user can set the configuration of the digital accelerator so that the ASU function operates from the control room and/or the treatment room. It is also possible to disable ASU from the control room when the room doors are open. Table ASU is not possible unless it is licensed and enabled.

CLINICAL BENEFIT: Efficiency in patient set up
Elimination of set up errors
Increased patient throughput

System Administration

Supports the following administration functions

- Manage User Access – used to create and delete users and edit access authorization.
- Customize System Settings – allows the user to define what checks the system will perform when a logged on user attempts to perform a task. It supports user definable tolerance tables to be used in Receive External Prescription.
- Linac Customization – Allows the user to turn linac record printing on or off. Also allows the user to change the valid ranges of the digital accelerator parameters that appear on the user interface. This can be used if, for example, there is a restriction in travel of a certain parameter due to room size

Beam Timer

Automatic calculation of the backup beam time based on the dose rate. Radiation delivery will terminate when the time is reached.

Support for XVI Image Acquisition

Enables movement of the gantry to the image start position without loading a prescription and gives the option to configure the gantry speed - this feature is enabled through XVI 4.5 or higher.

2.2.2 Service Mode

Provides all the tools required to support routine machine maintenance and calibration, as well as supporting fault finding activities.

Calibration Workflow

Integrity R3.0 introduces new service workflows to support

- Optical system calibration
- Leaf bank height and lateral position set-ups
- Leaf and diaphragm radiation calibration
- X-ray to light field coincidence
- Modules for return to work post-maintenance activities

Intellimax™ Connect

Allows a service user to start or stop a remote access session using Elekta Intellimax.

Service QA tools

- Dynamic log file Viewer – the dynamic log files contain parameter data to assist in reviewing the delivery of dynamic beams. records all parameters for all IMRT, dynamic and VMAT prescriptions delivered.
- DICOM to service mode – direct import of plans from a planning system into service mode
- Copy field via iCom – supports import of clinical prescriptions to service mode via clinical mode.

Configuration Utility

Allows the Service User to configure various aspects of the Control system, for example:

- Perform some standard Windows® configuration functions.
- Configure network printers
- Configure server maintenance activities eg. backup and restore data such as configuration settings and calibration information.
- Configure Intellimax™ settings
- Configure the way parameters are displayed in the user interface
- Configure Scheduled Startup

Diagnostic Utility

Supports the Service User in performing fault finding and maintenance activities, for example:

- Windows® diagnostics and maintenance
- View linac records
- Test network connections
- Cabinet diagnostic tests
- Support for remote support

3.0 Treatment Delivery Options

Agility is driven by Integrity Integrated Control System release 3.0.

3.1 X-ray Beams

Integrity supports up to 3 X-ray beam energies which can be delivered using the following delivery techniques.

Static

Square or irregular shaped beams delivered with a static gantry

Wedged

Supports delivery of wedged fields using an automatic, integrated wedge with angles continuously variable in the range 0° to 60° (by combining an open field with a 60° wedged field). The automatic wedge eliminates the need for manual selection and insertion of individual wedge filters.

CLINICAL BENEFIT: Increased flexibility to improve conformance to tumor shape
Efficient treatment delivery time
Removes manual handling concerns
Wedge insertion automatically controlled by the control system reducing operator errors.

Arc

Gantry rotation during delivery with a fixed field shape and constant gantry speed and dose rate

PreciseBEAM™ Segmental

This optional delivery technique, allows the system to deliver IMRT as a number of sequential segments with different digital accelerator parameters and MLC shapes. The MLC is static for each irradiating segment. Between the delivery of each irradiating segment, the following digital accelerator parameters may move or change as prescribed: Diaphragm position, MLC shape, Wedge position, Radiation energy, Dose rate, Gantry angle and the Collimator angle.

Combining irradiating and move only segments enables the precise delivery of complex IMRT techniques. This includes Step- and- Shoot and Skip-and-Scan arc techniques that use sequential irradiating and move only arcs. Accurate and stable beam control ensures a dose/MU accuracy of ≤ 1% or 0.1MU (whichever is greater), which is vital during the sequential delivery of low dose IMRT fields.

CLINICAL BENEFIT: Improved conformance to target structures
Reduce dose to critical structures

PreciseBEAM™ Dynamic

This licensable option, provides the ability to move the MLC leaves (and diaphragms where applicable) during irradiation, at a specified gantry angle.

CLINICAL BENEFIT: Improved conformance to target structures
Improved delivery speed

PreciseBEAM™ Dynamic arc

This licensable option supports simultaneous movement of the gantry, diaphragms and MLC during irradiation. The beam is delivered with a constant number of MU/degree. Doserate and gantry speed can change along the arc and are automatically selected by the control system to achieve the prescribed MU/Degree. Multiple and continuous arcs in CW and CCW directions can be delivered.

CLINICAL BENEFIT: Improved conformance to target structures
Reduce dose to critical structures and normal tissue
Reduced long and short term side effects.

PreciseBEAM™ VMAT

This optional license provides Volumetric Intensity Modulated Arc Therapy. This technique offers simultaneous dynamic control of the MLC, diaphragms, gantry and collimator. It allows continuously variable MU/degree along the arc and the control system automatically adjusts all linear and angular speeds as well as dose rate to ensure the prescribed MU/degree is achieved. Multiple and continuous arcs in CW and CCW directions can be delivered.

CLINICAL BENEFIT: Enhanced or superior shaping of the dose
Reduction of the dose outside of the tumour volume
Reduced patient plane dose
Fast and efficient delivery
Improved MU efficiency
Reduced patient waiting times
Increased patient throughput

Continuously Variable Dose Rate (CVDR)

This feature enables fine resolution changes in the dose rate for all dynamic delivery techniques, in the range 30cGy to 600cGy/min allowing selection of the ideal value, when delivering either a dynamic or VMAT prescription. This makes the delivery of prescriptions smoother and faster when compared to previous discrete dose rates.

CLINICAL BENEFIT: Smoother, faster delivery
Increased patient throughput
Reducing opportunities for intra-fraction motion

Interdigitation

Integrity supports interdigitation, enabling planning and delivery of island fields.

CLINICAL BENEFIT: Faster delivery
Improved plan quality
Improved conformance

Hybrid Plan Capability

Allows different treatment techniques to be incorporated in a single delivery.

3.2 Electron Beams

Integrity supports up to 9 electron energies.

Additional Options

Integrity is specifically designed to offer simple upgrades by supporting a range of options that secure investment in this technology.

Remote Automatic Table Movement (RATM)

This licensable option allows the user to perform translational table corrections using values automatically sent from XVI or MOSAIQ following an on-line image guided workflow.

Table moves can be made from either the control or treatment room

CLINICAL BENEFIT: Efficiency in patient set up
Elimination of set up errors
Increased patient throughput

Linac Record

This licensable option allows patient and treatment delivery information to be continuously recorded to a printer. This information can be used as a backup to an R&V system or for billing purposes.

Linac Record to File

This licensable option offers the user the option to send patient and treatment delivery information to a network file rather than to a printer.

Table ASU

This option allows the user to request assisted set up of the patient support system either within the treatment room or from the control area resulting in more efficient clinical workflows.

In-Room Monitor, Keyboard and Mouse

This option provides an additional monitor, keyboard and mouse in the treatment room providing access to all the clinical and service functions of the Integrity R 3.0 control system.

Extended Service

This optional software licence provides additional service tools and functionality which includes

- Scheduled start up
- Display log files
- Edit look up tables
- Create/Edit stored beams
- Full Service graphing
- Calculate Reference Dose
- Table Calibration Wizard

Availability

Please, contact your Elekta representative or an authorized distributor who will advise on regional configuration clearance.

XVI Intra-fraction Imaging

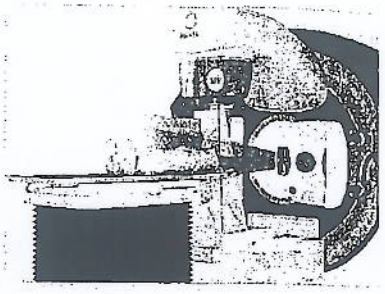
Monitor and manage internal motion

2D, 3D & 4D soft tissue imaging during treatment delivery

ELEKTA

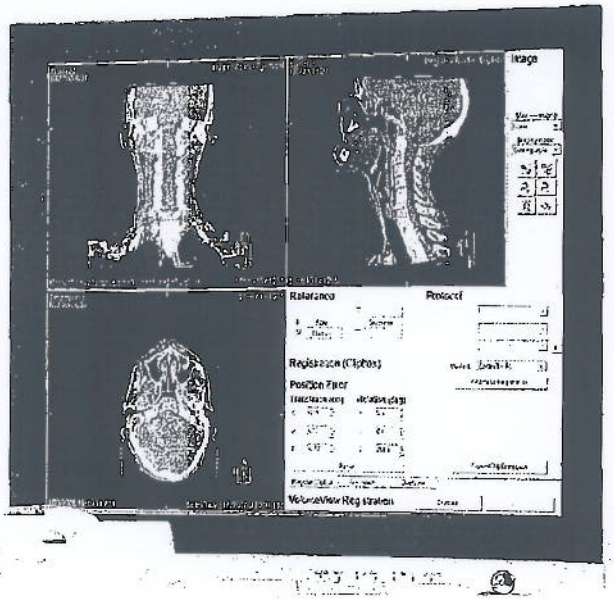
Building on proven excellence in advanced image guidance

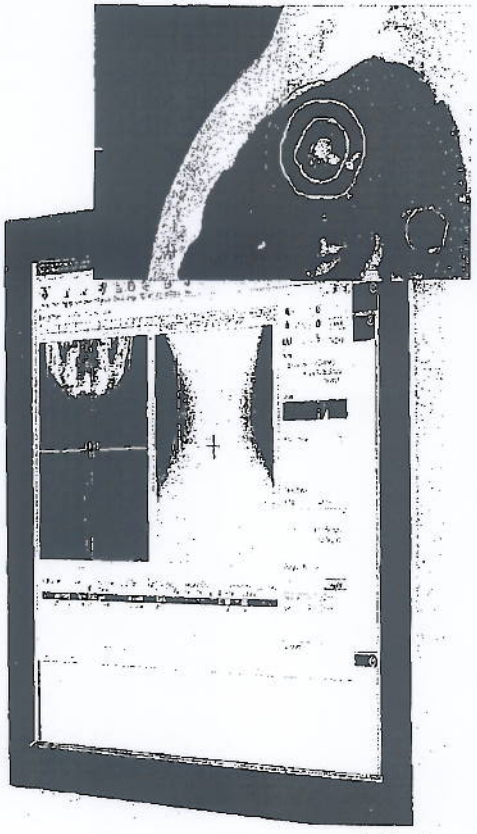
Elekta was the first to develop 2D, 3D and 4D kV soft tissue imaging that allowed visualization of not only the tumor but also the surrounding critical structures at the time of treatment. In recent years Elekta has taken this further by moving from soft tissue imaging to true treatment guidance. Today with XVI intra-fraction imaging, Elekta takes another leap forward in IGRT towards greater excellence and confidence in patient care by providing the tools to monitor and manage internal motion.



XVI intra-fraction imaging is a part of XVI 5.0 and builds on the proven ability and excellence of XVI from Elekta. With the ability to image during treatment delivery, it allows for opportunity to reduce treatment time-slots to maximize clinical efficiency.

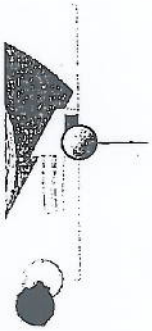
Combining imaging and treatment delivery also reduces the likelihood of patient movement and changes in internal organ position during the treatment session. This means that patient care is further enhanced while allowing flexibility to clinicians to provide a workflow that is specific to each patient.





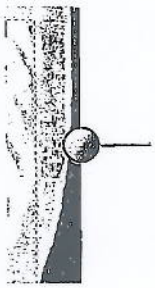
Why XVI Intra-fraction Imaging?

- Intra-fraction 2D, 3D & 4D for management of internal motion
- Verify anatomical position and motion during treatment
- Increased confidence for dose escalation
- Distributed workflows with MOSAIQ for further clinical efficiency



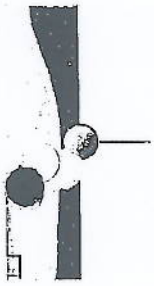
2D Intra-fraction Imaging

This new tool allows visualization of soft tissue images during treatment either as static or fluoroscopic-like images. This real-time monitoring provides opportunity to monitor and correct for motion during treatment. With this 2D intra-fraction imaging approach critical structures can be protected by utilizing real-time images that can be interpreted using the annotation overlay tool. This functionality allows structures drawn onto the reference image to be overlaid on the real-time image that is being captured during treatment.



3D Intra-fraction Imaging

The ability to acquire 3D VolumeView™ images during rotational treatment delivery including VMAT, provides a post treatment record of patient position verification. This allows for online and offline correctional strategies to be implemented utilizing information from the exact moment of treatment. With this additional information, confidence can be further increased by accounting for changes before the next treatment session or even between treatment fields.



4D Intra-fraction Imaging

Symmetry™ introduced a new approach in the management of respiratory motion. With the new XVI and its ability to take images during delivery, this approach can provide a verification of real tumor motion as treatment delivery is being undertaken. With moving tumors being a complex challenge in radiation treatment, this confirmation of real-time tumor movement during delivery provides added confidence especially when looking to escalate doses.

Workflow Reinvented

Utilizing the power of MOSAIQ® image-enabled oncology information system (OIS), XVI 5.0 also provides greater flexibility in the use of image-guided workflows to enable distributed workflows for clinical efficiency and optimized use of resources. The advanced integration with MOSAIQ means that information regarding each patient's imaging scan, setup and correction are available as an integral part of the patient's electronic medical record.

XVI 5.0 is not available in all regions. Please contact your local representative for more details.