ENGLISH

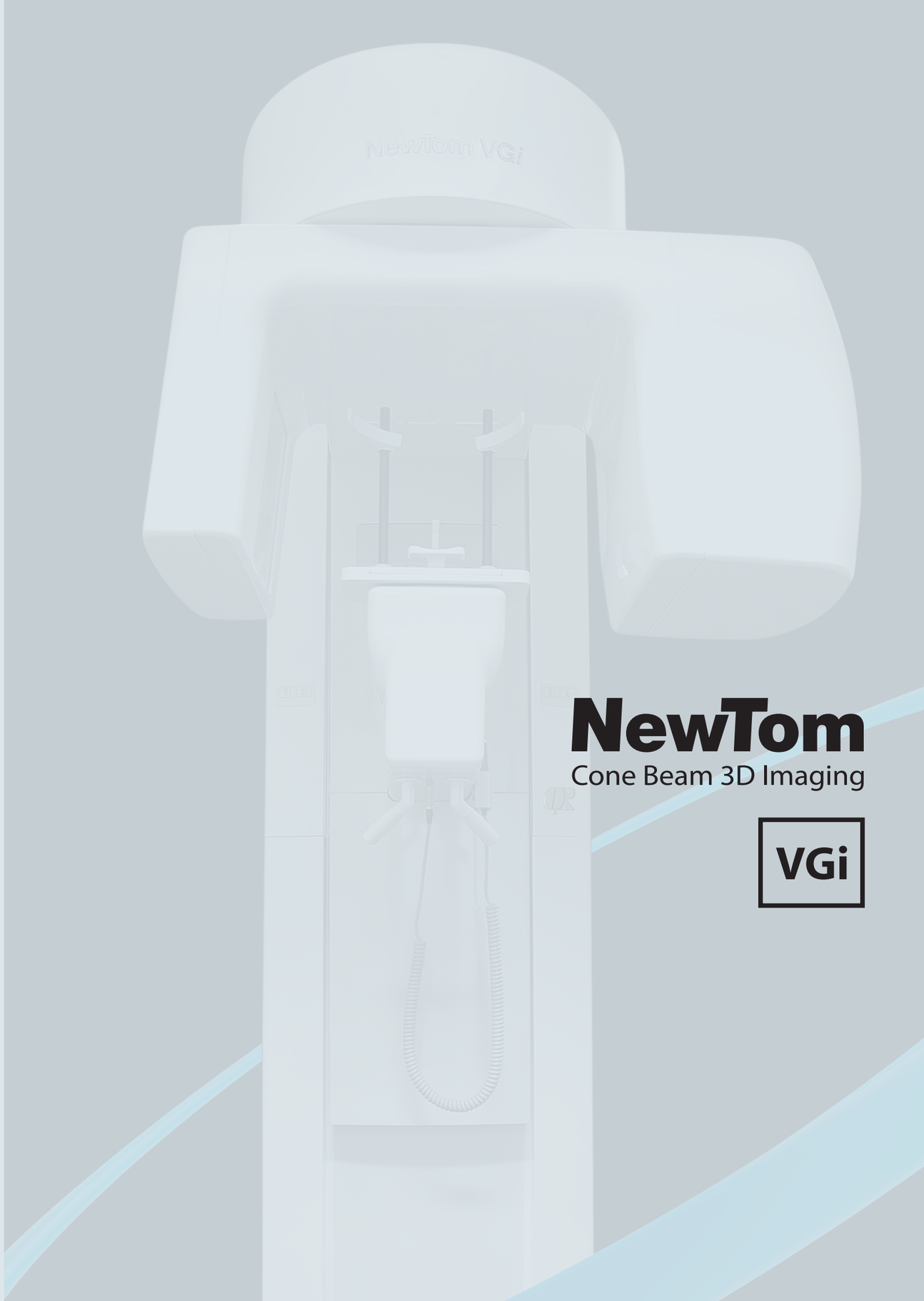
NewTom

Cone Beam 3D Imaging

VGi

First in Cone Beam,

Accurate in Results



NewTom

Cone Beam 3D Imaging

VGi

NewTom

360 Degree Imaging
No Image Scatter
or Artifacts.

Smallest Possible Focal Spot
Single Flat Panel Create
the Clearest Images.

Dedicated Digital Sensor and
Specific Image Algorithms
Provide a Full Range
of Information.

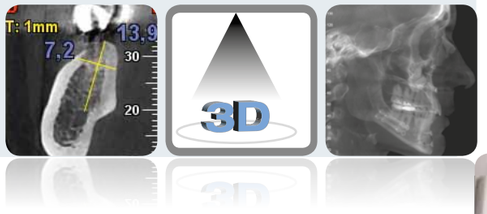
First User of Cone Beam in Dental Field

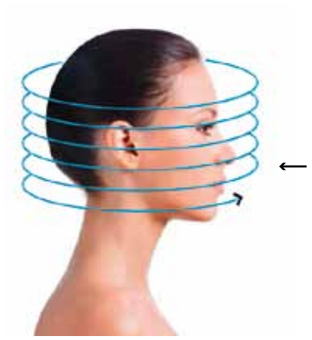
QR s.r.l. is the name that stands behind NewTom Cone Beam 3D imaging units and we were the creators of Cone Beam technology for the dental field. NewTom 9000 (also known as Maxiscan) was the very first Cone Beam equipment in the world, which was installed in 1996. It is the forefather of NewTom product line and, in general, of the entire X-Ray units based on Cone Beam technology. QR's 20 plus years of experience and success in research, development, manufacturing and distribution of NewTom products affirms our commitment to excellence and quality. QR s.r.l. is based in Italy and all NewTom products are designed and manufactured at our factory in Verona. Our products represent the Italian tradition of specialized manufacture and NewTom is known all over the world for its reliability, high standards and state-of-the-art technology. QR s.r.l. is a comprehensive and independently working company consisting of a research and development department (hardware and software), production and technical assembling division, technical support staff, customer service, sales and marketing department and management offices. Our national and international sales network relies on strong and long-term partnerships with all our dealers and representatives spread all over the world. NewTom's team-oriented staff are committed to provide not only the best product available on the market, but also excellent before and after- sales support, as a happy customer is the best advertisement!

The Global Market Leader.

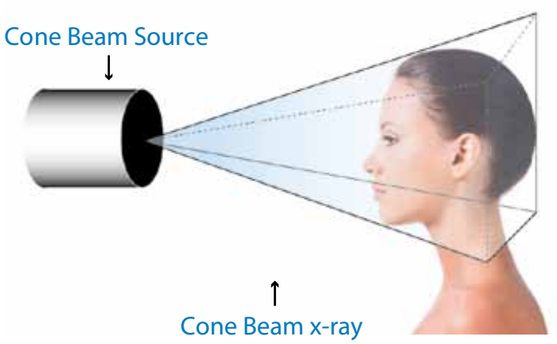
Cone Beam 3D vs. CT Imaging and 2D Imaging

Traditional CT (CAT scan) uses a narrow fan beam that rotates around the patient acquiring thin axial slices with each revolution. In order to create a section of anatomy, many rotations must be done. During these repeated rotations, traditional CT emits a high radiation dose, but it leaves a gap of information between each rotation. Therefore software must stitch together the images and calculate what is missing. Cone Beam 3D imaging uses a cone-shaped beam to acquire the entire image in a scan using only one rotation. The result is a more accurate image without missing information and a considerably low radiation exposure. The American Academy of Oral and Maxillofacial Radiology (AAOMR) prescribes the use of Cone Beam 3D imaging when evaluating periodontal, implant, and oral/maxillofacial surgery patients. One NewTom scan obtains a complete dentomaxillofacial image in a single database of digital information. It also helps avoid potential errors due to the image distortion found in 2D imaging technology. Various views of the information in 3D images can be created using NewTom NNT software.





← Fan-Beam x-ray



Precise 1:1 Scale Imaging

With precise 1:1 scale imaging, NewTom technology eliminates the magnification errors of conventional cephalometric and opg imaging technology. 3D imaging allows the dental professional to identify potentially serious problems, such as airway passage obstructions and soft tissue abnormalities.

3D CBCT imaging technology is the standard of care for implantologist, orthodontists, periodontists and oral/maxillofacial surgeons.

Less Radiation than Traditional CT Scans

Multiple FOV

The scanner's FOV determines how much of the patient's anatomy will be visualized. If using a flat panel detectors (FPD), the dimensions of their cylindrical FOV can be described as Diameter by Height (DxH). Nowadays the need to scan different R.O.I. (Regions Of Interest) with different dimensions is regulated by international standards in order to reduce the effective dose to the patient following the "*As Low As Reasonably Achievable*" (ALARA) dose principles. In particular the use of a **small FOV** (on user-defined region in endo, perio, implant surveys and for the localization of impacted teeth) in addition to reducing the dimension of the irradiated region, allows for a dramatic increase in the accuracy and resolution of images for all the pathologies diagnosis where it is necessary to identify very small details at high definition. On the contrary, the **biggest FOV** (which include the roof of the orbits and the Nasion down to the hyoid bone) allows with **one single rotation** to scan patients where the referring doctors need to see the major part of the anatomical regions of the head (e.g. Orthodontics, Orthognatics and Maxillofacial surgeons, etc.). Even in this case NewTom has different dose protocols: finally, we can say that NewTom Technical Developers have researched the proper balance between **FOV, dose and accuracy,** using different dose protocols for each single FOV. Additionally, **medium FOV** are also selectable. They can capture from the middle of the orbits down to the Menton (vertically) and condyle-to-condyle (horizontally) and they are useful for ENT, TMJ, pano's and implant surveys.

15 X 15 cm

15 X 12 cm

12 X 8 cm

8 X 8 cm

6 X 6 cm

HiRes Scan

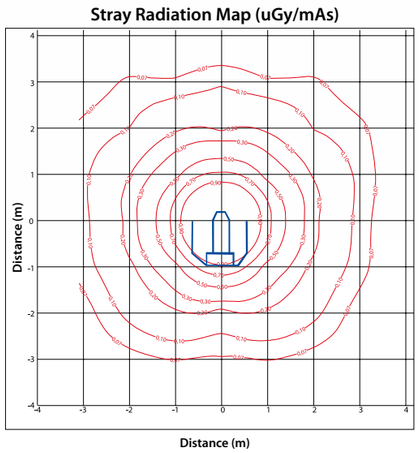
NewTom VGi allows to irradiate small portion of body, in order to see small anatomical details. This ca be useful for proper implant assessment, because it requires the visualization of all aspects of the mandibular canal and other small parts, suche as tooth roots, periodontal ligaments and any present lesion. Only 3D High Resolution imaging produces both the quality and the quantity of details necessary to accuratel view those small details.

Small FOV

A voxel size reduction of 50% creates superior quality images. The smallest FOV selected can be performed in a HiRes mode. This allows the selection of just a small portion of the body, obtain a high definition image and allow the visualization of all the fine details. This scan mode improves the clarity of the image, the visualization of soft tissue and the definition of artifacts.

Stray Radiation

Measured in head phantom according to IEC 60601-2-44 par. 29.1.102.2



Effective Dose

Table: effective dose from conventional dental imaging techniques in Sv. MSCT = multislice CT*

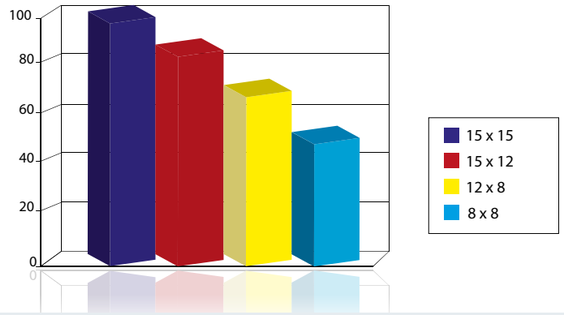
	Effective dose (µSv)
Intraoral radiograph	<1.5*
Panoramic radiograph	2.7 - 24.3
Cephalometric radiograph	<6
MSCT maxillo-mandibular	280 - 1410

* Sedentex CT. *Radiation Protection: Cone Beam CT for dental and maxillofacial radiology - Evidence based guidelines 2011.*

NewTom VGi Dose

Comparison of effective dose for 4 different size volumes acquired with standard resolution

VOLUME D x H (cm)	VOLUME Dose (µSv)
15 x 15	99
15 x 12	86
12 x 8	69
8 x 8	51



Low Dose Literature

Over the past few years there have been different research conducted on the differences between MSCT and CBCT radiation dose. The radiation dose of a Multi-slice CT (MSCT) is relatively high and the difference registered between MSCT and CBCT is significant. Palomo et al in 2008[1] states that what allows the CBCT to lower the radiation dose mostly is: the use of a low-output fixed anode tube, which is similar to what is used in dental panoramic x-ray machines and the single rotation of the machine around the patient, during which the data is captured by using a cone-shaped x-ray beam. De Cock et al in 2011[2] reports that multiple dentomaxillofacial studies affirm that CBCT dose are lower than MSCT dose. It also states that thanks to the fast and comfortable acquisition technique of CBCT, it is suitable for routine imaging. The American Dental Association Council on Scientific Affairs highly recommends the use of techniques that would reduce the amount of radiation received during dental radiography. The ALARA (*As Low as Reasonably Achievable*) principle tries to reach the same target, optimizing image quality atreasonably low radiation dose levels.

[1] Palomo J M, Rao P S, Hans M G. *Influence of CBCT exposure conditions on radiation dose.* (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008; 105:773-82)

[2] De Cock J, Mermuys K, Goubau J, Van Petegem S, Houthoofd B, Casselman JW. *Cone-beam computed tomography: a new low dose, high resolution imaging techinique of the wrist, presentation of three cases with technique.* (Skeletal Radiol, doi: 10.1007/s00256-011-1198-z)

SafeBeam™ Technology

SafeBeam™ Technology for Automatic Dose Exposure

Only NewTom systems employ SafeBeam™ technology, the safest technology available for patient and staff. Featured in all NewTom units, SafeBeam™ **automatically adjusts the radiation dosage according to the patient's age and size.** This technology uses intermittent bursts of radiation, which last only milliseconds, during image acquisition. Other systems deliver a constant stream of radiation and the same amount of radiation, whether scanning a 100 Kg (220.46 lb) adult or a small child. **SafeBeam™ technology automatically and continuously monitors system operations, thus eliminating the possibility of unnecessary exposures.** In conjunction with our patented SafeBeam™ technology, when compared to other CB3D systems, NewTom VGi has a wider range of adjustments for the X-ray power and quantity (kV=110 and mA=1-20). **As a result, patient exposure is tailored and image contrast remains consistent regardless of patient size or bone density.**

Greater Patient Comfort and Treatment Acceptance

All NewTom units add a sense of comfort for patients, allowing the patient to relax during the scan and limiting the patient movements in order to improve the image quality. NewTom scans provide the practitioner and the patient unprecedented visualization of cranial anatomic information.

This leads to a better diagnosis and better treatment planning, increasing the patient treatment knowledge. The result is a more cooperative and informed consent process, understanding the need for treatment and improving the doctor-patient relationship.

NewTom

SafeBeam™ Technology

Software Flexibility

NewTom NNT analysis software is the perfect integration to Cone Beam 3D imaging. NNT allows the creation of different kinds of 2D and 3D images, in a 16-bit grey-scale, and it takes only a few seconds to evaluate the data taken during the scan. It is entirely designed by NewTom software developers, and it fits all the requirements and needs of our clients. NNT can easily identify and mark root inclination, the position of impacted and supernumerary teeth, absorption, hyperplastic growth, tooth structure anomalies and the mandibular canal. The software delivers high quality images, which allows safer surgical planning. The images can be gathered and used in report templates, which are defined by the users and can be delivered digitally (burn on CD or DVD), on paper or on film.

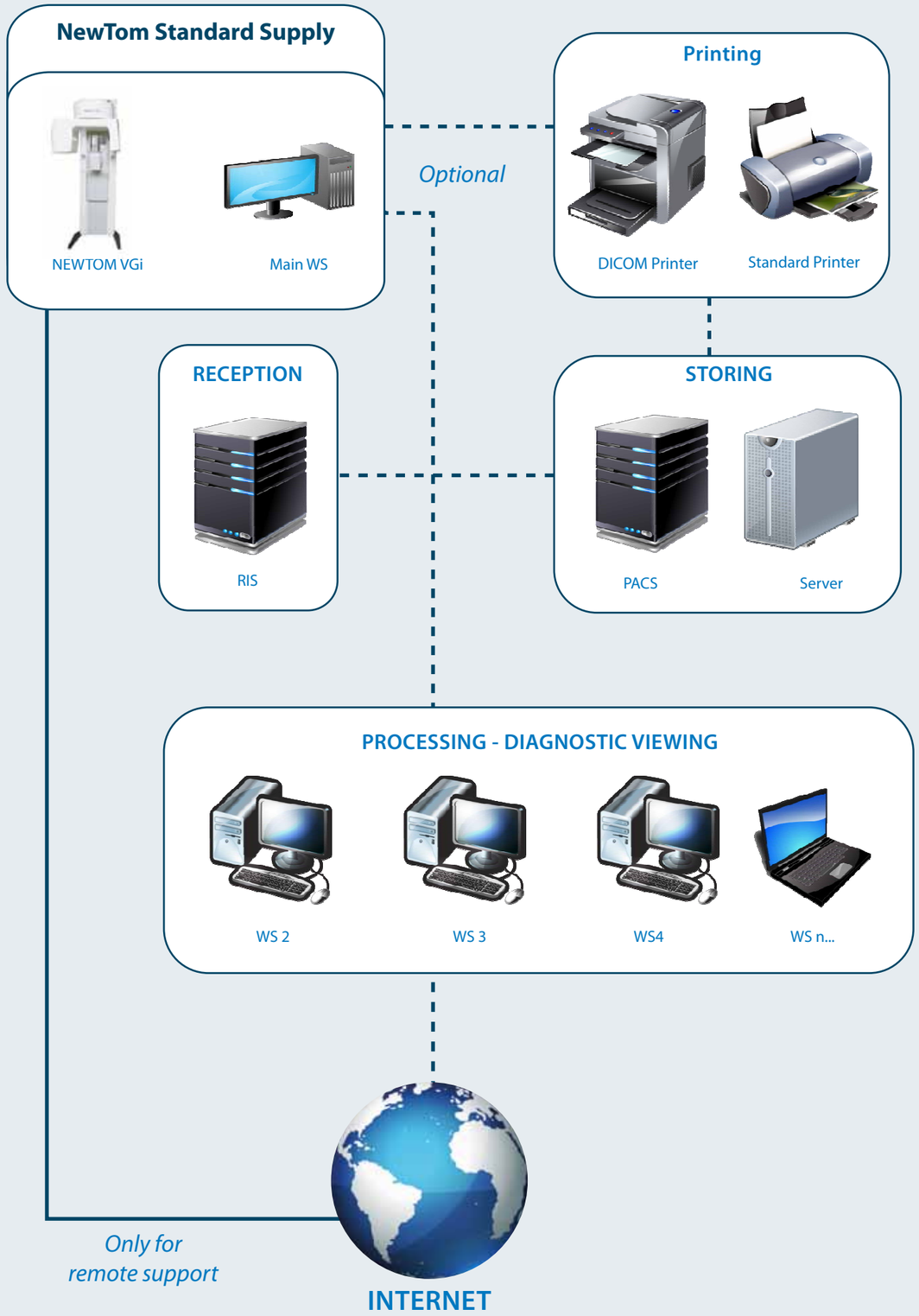
The software is available in different versions: an Expert version used for taking exams, a Professional version for data processing and an NNT Viewer that gives to ogher professionals the ability to view the images processed by NNT. The images can then be exported with DICOM 3.0, in order to allow for easy sharing between imaging centers and referring doctors and they are perfectly compatible with third party software.

NNT Station
Cone Beam 3D Imaging

Superior Third-Party Compatibility

NewTom images are compatible with most major third-party software on the market as well as guided implant and maxillofacial surgery software. 3D imaging data is highly adaptable and can be imported and used in countless diagnostic and educational modes. Software segmentation adjusts the amount of soft tissue, underlines the hard tissue and accentuates the structure of the skull. Different software applications allow the creation of realistic models that can be positioned on images obtained from the scan. **This creates infinite options that help in diagnosis, treatment planning, pre-surgical analysis, and patient education.**

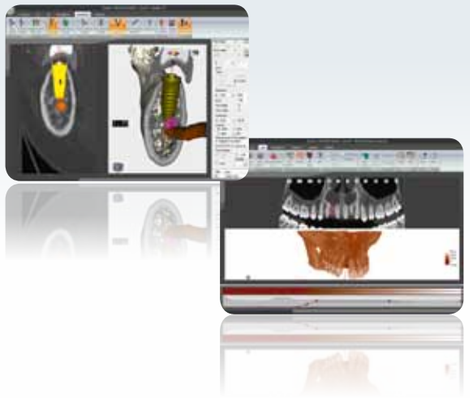
Local Network



NewTom Implant Planning

New Tom Implant Planning is a software package that can perform 3D implant simulation on any PC. It can simulate the implant placement on 2D and 3D models, identify the mandibular canal, draw panoramic and cross sections of the bone model. It also shows the 3D bone model and calculates the bone density. NewTom Implant Planning is used to plan prosthesis implant surgery in a faster, safer and more efficient way. It also allows the ability to export in .stl format.

NewTom Implant Planning



Supported format

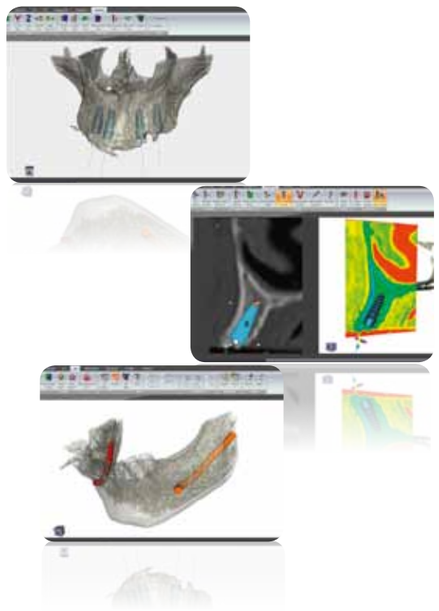
NewTom Implant Planning reads axials slices saved in DICOM 3.0 or in NNT format, which is the same format used by NewTom 5G, NewTom VG and previously released systems (NewTom 3G and NewTom 9000).

2D & 3D

It generates panoramics, cross sections and 3D bone models reading the axial slices. This helps in identifying all the anatomic aspects of the patient, the mandibular canal, the bone structure and the exact implant positions, in order to facilitate the surgery.

Measures and information

NewTom Implant Planning can plan the prosthesis implant surgery by identifying both the implant and the mandibular canal position. It measures accurately the proportion and density of the bone and makes the surgery more effective and faster.



A useful communication & motivation tool

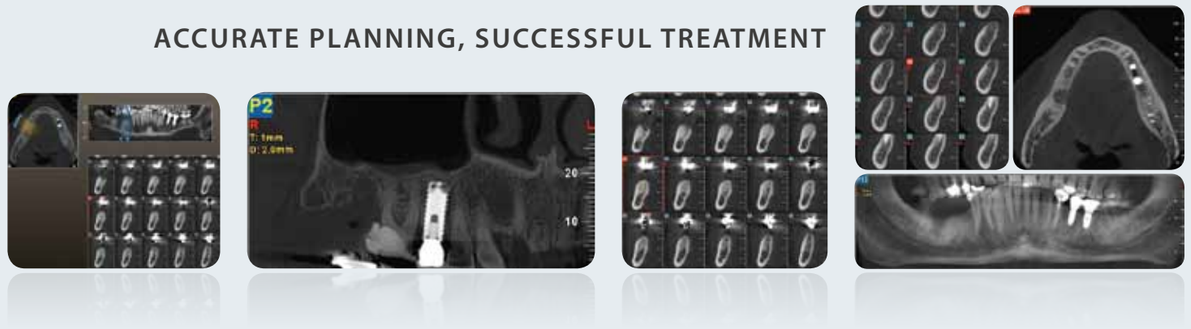
All the images generated by NewTom Implant Planning can be used to communicate with the patient, in compliance with the compulsory rules about the informed consent. The most interesting cases can be saved on a CD-ROM through the image exporting functions. Thanks to the user-friendly interface, learning is a quick matter.

Clinical Cases

Implants

CB3D is one of the most effective tools available for analyzing implant sites. 3D images can accurately identify possible pathologies and structural abnormalities. Cross sectional and panoramic views facilitate various calculations as: height and width of the implant sites, mandibular edentulous site, a potential implant site near the mental foramen, width of the buccal/lingual ridge and cortical bone density. 3D images highlight the cortical bone thickness, the cancellous bone density, the inferior alveolar nerve and mental foramen location. They also influence the choice of the appropriate implant to be used, its placement, its width and consideration of "die back" from dense cortical bone.

ACCURATE PLANNING, SUCCESSFUL TREATMENT

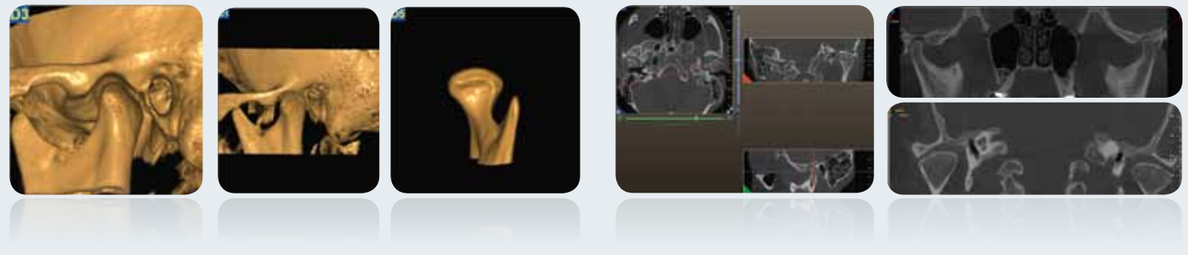


Endo-Perio

These application fields need extremely high quality images in order to define the tooth structure, determine the exact pathology and accurately plan the perfect treatment. Only a proper investigation of the interested area will make the dentist aware of the less invasive and dedicated action to take. Where the patient has had root canal therapy, but continued to complain about extreme sensitivities and endodontic retreatment did not abate the problem, **the CB3D scan can reveal that the maxillary second premolar has a palatal root.** It is common to expect two roots and two canals in maxillary first premolars, but it is less common to find two in maxillary second premolars. Once the dentist observed this, successful treatment could be instituted.

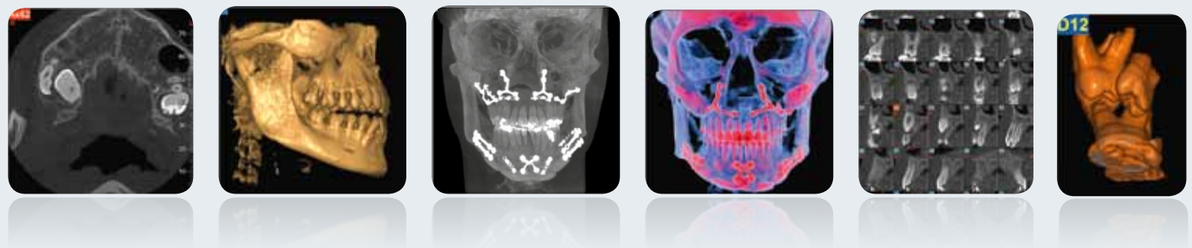
TMJ

CB3D takes the examination of the Temporomandibular Joint to a new level. After a single scan, Sagittal and Coronal views can be sectioned to show joint space and pathologies. 3D images reconstruction can clearly provide exhaustive information of the TMJ and Cervical Spine anatomy. A wide panoramic view allows a gross screening tool, where we are able to check the differences in condylar and ramus height as well as other dental pathologies.



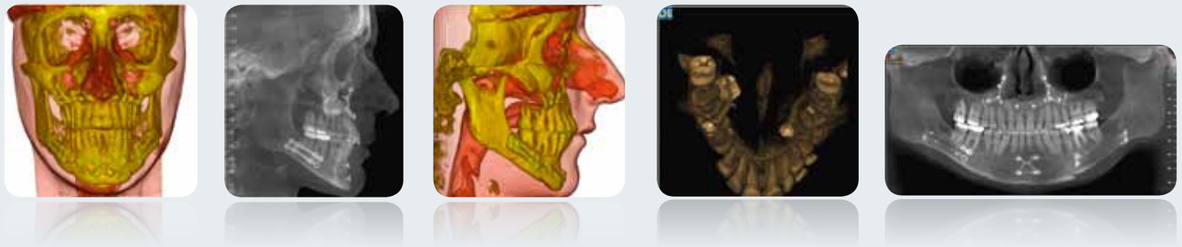
Oral and Maxillofacial Surgery

A 3D post-operative scan can show the exact individual anatomy and define the anatomical structures, bringing the patient to a better acceptance of the treatment. NewTom scans are useful also for maxillofacial post-surgery imaging, due to reduced image scatter and lower radiation. High Resolution 3D images (utilizing the MIP and Volume options), despite the possible high number of screw fixings present, show that there are virtually no artifacts to obstruct the images.



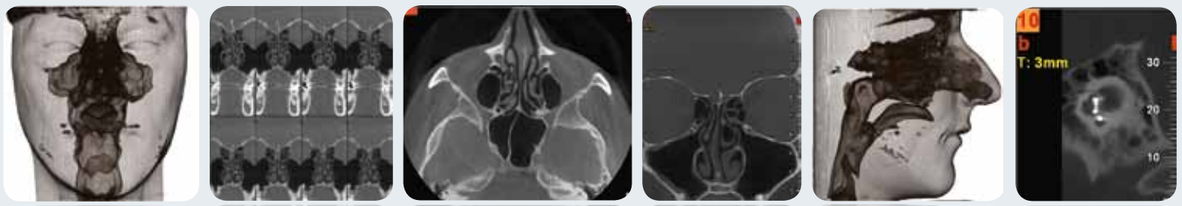
Orthodontics

While various pan-cephalometric machines create adequate images, Cone Beam scanners produce many types of images, including panoramic, cephalometric and 3D. Based on the physics of this technology, images are more accurate than 2D dental x-rays and 3D medical scanners. As a result, cephalometric tracings from dental Cone Beam scanners can be generated with confidence. The 3D image, in case of palatal expansion, can clearly show the buccal bone and molar roots in order to avoid unnecessary gingival recession. Impacted teeth may cause dental problems that produce few, if any symptoms. Only 3D imaging provides a complete picture of the scanned area and allows manipulation of both the angle and slick thickness of the image. There is a significant difference between the demarcation capabilities of plain radiographs vs. 3D images in determining the existence and the root shape of an impacted tooth in the maxilla.



ENT Protocols

NewTom VGi represents the gold standard for ENT examinations. Due to its multiple FOV and high level of accuracy, it shows clearly all the airways, structures of the ears, TMJ and Sinuses using always the proper radiological parameters in order to avoid unnecessary radiation to the patient. The accuracy is granted by the operator that can select the high resolution for the smallest parts like in the inner ear. Many of the exams that were done by using the conventional CT scanners can now be performed by NewTom VGi showing much more details at a lower exposure for the patient.



Clinical Case Studies

NewTom
Cone Beam CT

VGi

NewTom Benefits

The smallest possible focal spot
combined with the use of a flat panel create the
clearest images possible.

A dedicated digital sensor and
specific algorithms provide a full range
of information.

A greater comfort for patients leads
to a better acceptance of the treatment.

NNT software makes the image
sharing process easier.

The margin of error is reduced thanks to the
precise 1:1 scale and a 16-bit grey scale.

SafeBeam™ Technology adjusts the radiation
dosage for patient safety.

Multiple FOV and different scan modes
are selectable from the software
and adaptable to various fields of application.

VGi

NewTom VGi, from the company that was the first to use the Cone Beam technology in dental field, represents the newest in CB3D technology. NewTom VGi takes an image at every degree of rotation, 360° rotation = 360 images, increasing the range of possibilities for image manipulation. It couples a revolutionary flat panel x-ray detector technology with a very small focal spot (0.3 mm), to produce the clearest, sharpest images possible. VGi features an adjustable Field Of View, which allows doctors to irradiate just the right volume, depending on the different clinical applications. The size of FOV can vary from the smallest 6x6 cm to the biggest 15x15 cm and they can be selected directly from the software, before the scan. VGi emits up to 20-50 times less radiation than conventional CT, by using a “pulsed” emission, that unlike other systems, activates the x-ray source only when required. For a full scan, it takes no more than 5 seconds of total x-ray exposure. The exam can be performed while the patient is standing or seated. The scanner is wheelchair accessible. Patient positioning tools include cross-hair lasers and a mirror, which are powerful tools for exact vertical patient positioning. The small footprint and the variable positioning make NewTom VGi the best choice for locations, where space is at a premium. NewTom VGi does not need an air-conditioned room, its weight does not require a reinforced floors and it can function in rooms without complicated and expensive radiation protection structures.

All the operations executed by NewTom, the patient’s examination and the following calculations, are computer guided. The user, when performing the scan, is supported by user friendly menus. Each step is associated to a mouse-activated icon. Following the same process, one can easly review the integrated file of image-data.

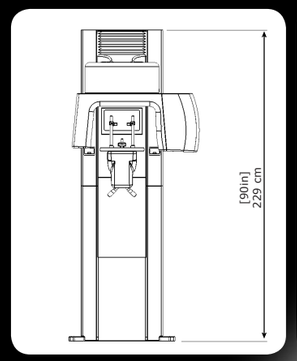
NewTom VGi Specifications

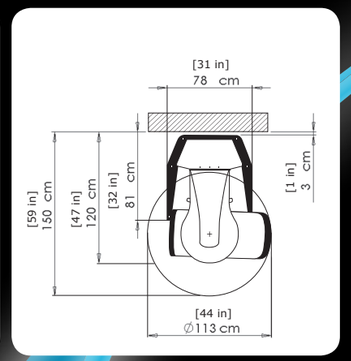
X-ray Source	High frequency, rotating anode: 110 kV; 1-20 mA (pulsed mode)					
Focal Spot	0,3 mm					
Aquisition Technique	Single scan and Cone Beam acquisition Safebeam™ control reduces radiation based on patient size					
Effective Dose	99 µSv Full FOV (ICRP 2007, estimate for adult)					
Scan Time	18s÷26s					
X-ray Emission Time	3.6s÷5.6s					
Image Acquisition	360 Images - 360 degree rotation					
Image Detector	Amorphous silicon flat panel, 20 cm x 25 cm Field of View (7.87 in x 9.84 in)					
Signal Grey Scale	14-bit scanning, 16-bit reconstruction					
Multiples Scan Modes	FOV sizes D x H		Voxel size options (µm)			
	Centimeters	Inches				
Standard scan - Boosted scan	**15 x 15**	**5.90 x 5.90**	300	250	200	150
	15 x 12	5.90 x 4.72	300	250	200	150
	12 x 8	4.72 x 3.14	300	250	200	150
	8 x 8	3.14 x 3.14	300	250	200	150
HiRes scan	12 x 8	4.72 x 3.14	150	125	100	75
	8 x 8	3.14 x 3.14	150	125	100	75
	6 x 6	2.36 x 2.36	150	125	100	75
Patient Positioning	Standing or seated and wheelchair accessible					
Reconstruction Time	Approximately 1 minute					
Weight	Scanner unit 272 kg (600 lb), Control box 100 kg (220 lb)					
Software	NNT™ with free viewer and sharing application					
Power Required	10A @ 100/115V~, 5A @ 200/215/230/240V~, 50/60Hz					

Specifications subject to change without prior notice.

NewTom VGi is the commercial name for a special configuration of the medical device model NewTom VG.

- Free Viewer and Sharing Application
- DICOM Conformant
- Improved Software Integration
- Small Footprint





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NewTom - Today's Standard of Care

QR srl

Via Silvestrini 20, 37135 Verona - Italy

Tel. +39 045 8202727 - 583500

Fax +39 045 8203040

info@qrverona.it

www.newtom.it

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