

# DENTAL RADIOGRAPHY & TEKNOLOGI PERGIGIAN

---

PREPARED BY:

NORFAIZAL BIN MAHAT NOR

UNIT PERUNDING REKABENTUK KESIHATAN 2  
CAWANGAN KEJURUTERAAN ELEKTRIK, JKR



SKOP PERALATAN  
PERUBATAN  
(DENTAL)

X-RAY UNIT DENTAL  
PANORAMIC  
ORTHOPANTHOMOGRAPH  
(OPG)

CONE BEAM COMPUTED  
TOMOGRAPHY (CBCT)

X-RAY UNIT INTRAORAL W  
FILM/DIGITAL EXPORE  
(INTRA-ORAL)



**X-RAY UNIT DENTAL  
PANORAMIC (OPG)  
DICOM 3.0  
COMPATIBLE**



# X-RAY UNIT DENTAL PANORAMIC (OPG) DICOM 3.0 COMPATIBLE

## ORTHOPANTOMOGRAPH 3D

\* Platform is a premium quality solution for Panoramic & Cephalometric

### Complete versatility

- ❖ Designed as a true 2-in-1 system
- ❖ Low Dose Technology
- ❖ Automatically Obtaining The Most Optimum Panoramic Image Layer with ORTHOfocus
- ❖ Upgradable to 3D in the future
- ❖ Touch Panel Simple And Clear Operation



# MAIN BENEFITS

## Panoramic

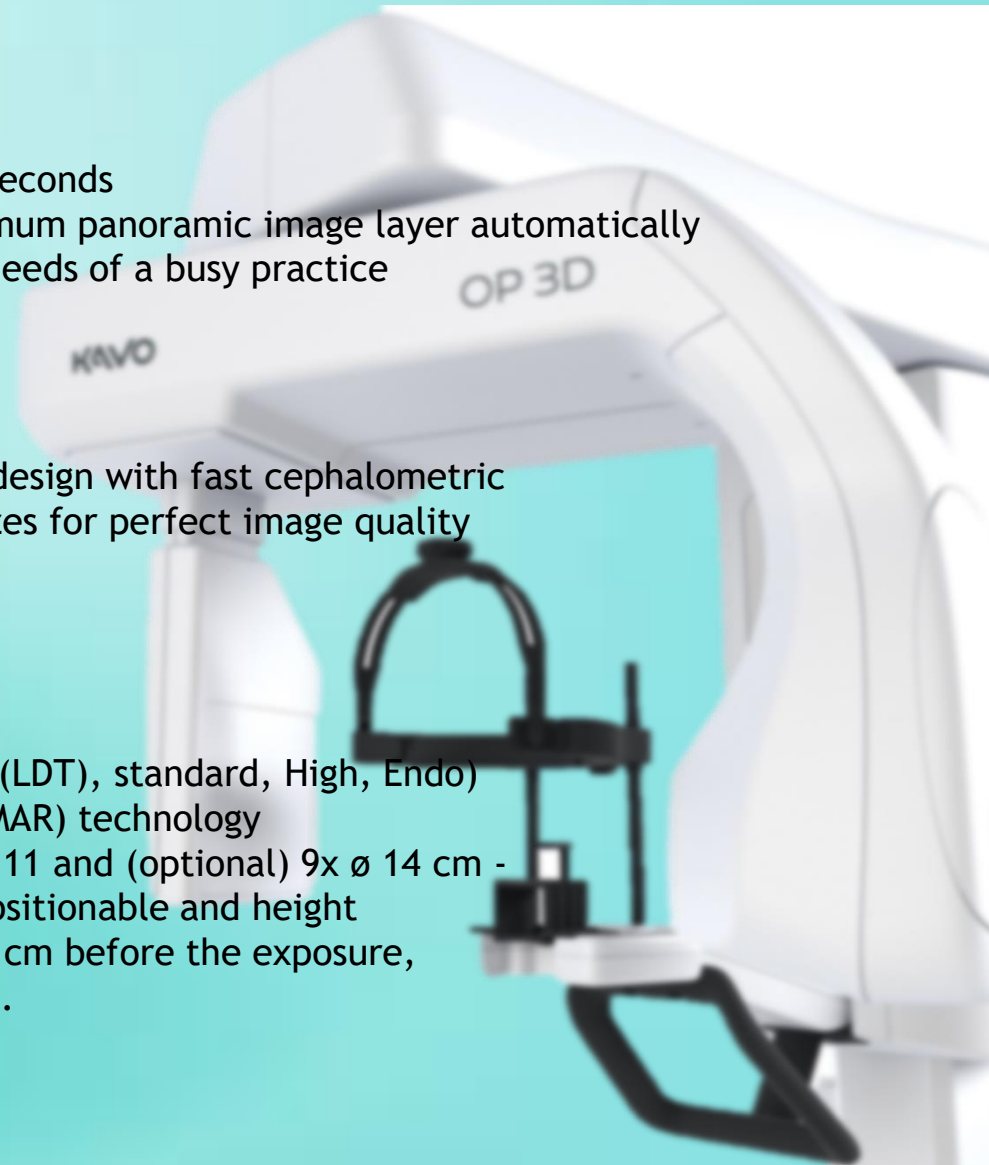
- ❑ Fast Scan - 2D panoramic imaging in just 9 seconds
- ❑ ORTHOfocus features for providing the optimum panoramic image layer automatically
- ❑ Panoramic programs for covering the daily needs of a busy practice

## Cephalometric

- ❑ Innovative and patented ORTHOceph Plus design with fast cephalometric imaging scan times and adjustable field sizes for perfect image quality with minimal dose

## 3D

- ❑ 4 resolutions for 3D (Low Dose Technology (LDT), standard, High, Endo) combined with Metal Artefact Reduction (MAR) technology
- ❑ 4 predefined volumes: 5x ø 5, 6x ø 9, 9x ø 11 and (optional) 9x ø 14 cm - SMARTVIEW™ 2.0 the volumes are freely positionable and height adjustable in 5 mm steps between 5 and 9 cm before the exposure, leading up to 36 possible FOV sizes in total.



# PANORAMIC FEATURES



## Panoramic images with automatically selected optimum layer - ORTHOfocus

- ❑ **Programs to fit your clinical needs:** Standard, paediatric and segmented panoramics along with bitewing and lateral-programs are included to cover the panoramic imaging needs of a busy practice.
- ❑ With the ORTHOfocus feature, the optimum panoramic image layer is automatically obtained, enabling forgiving patient positioning. The result is consistent image quality every time.



**9-second scan time:** The standard panoramic program provides a clear definition of the dental anatomy, including TMJs — in only 9 seconds.

**The results:** highly diagnostic images due to fewer movement artefacts as well as a lower dose to the patient.



# CEPHALOMETRIC FEATURES

## Cephalometric imaging for all your clinical needs

- ❑ The innovative, patented ORTHOceph takes cephalometric imaging workflow to a new level.
- ❑ The OPG provides all needed protocols such as lateral and paediatric lateral projections with adjustable field widths, posterior-anterior (PA) projections and carpus (carpus holder is optional) imaging – with fast scan times and a minimal dose.
- ❑ All combined with an intuitive graphical user interface and automated sensor movements to enable smooth workflows.



## QUICKcompose feature: fast image review

Available for panoramic, cephalometric and 3D modalities, the QUICKcompose feature offers a quick preview of the captured image, allowing a timely evaluation. The image appears on the graphical user interface automatically as soon as the scan is completed.

# 3D FEATURES



## Four predefined 3D volume diameters plus the possibility to customise the volume size

- The four predefined field of view(FOVs) are based on true clinical needs and adjustable in height.
- FOV 5x ø 5 with its endo resolution is optimised for single-tooth and localised diagnostics. FOV 6x ø 9 offers the capability of scanning either the lower or upper jaw, whereas FOV 9x ø 11 combines both.
- With the largest FOV 9x ø 14, TMJs can be conducted.
- Metal Artefact Reduction (MAR): To provide optimum image quality, the Metal Artefact Reduction (MAR) is activated with all FOV sizes and resolutions of the KaVo OP 3D.
- MAR is optimised to assist in all cases ranging from endodontics and implants planning to maxillofacial imaging.

### 5x ø 5 cm

#### Local diagnostics

- Planning of individual implants
- Wisdom tooth extractions
- Impacted teeth
- With endo resolution for highly precise illustration of the canals and the periodontal structures



### 6x ø 9 cm

#### Covers the complete lower or upper jaw

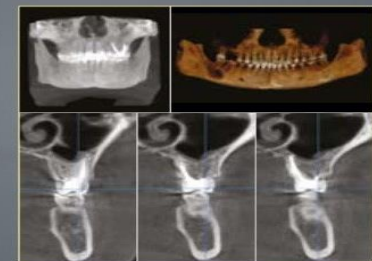
- Planning of multiple implants in one jaw
- Surgical templates and direct link to 3D navigated surgery\*



### 9x ø 11 cm

#### Covers the entire dentition, including lower and upper jaw, as well as a portion of the maxillary sinus

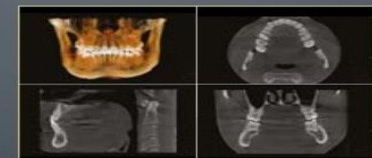
- Planning of multiple implants in both jaws
- Surgical templates and direct link to 3D navigated surgery\*
- Sinus analysis in children



### 9x ø 14 cm

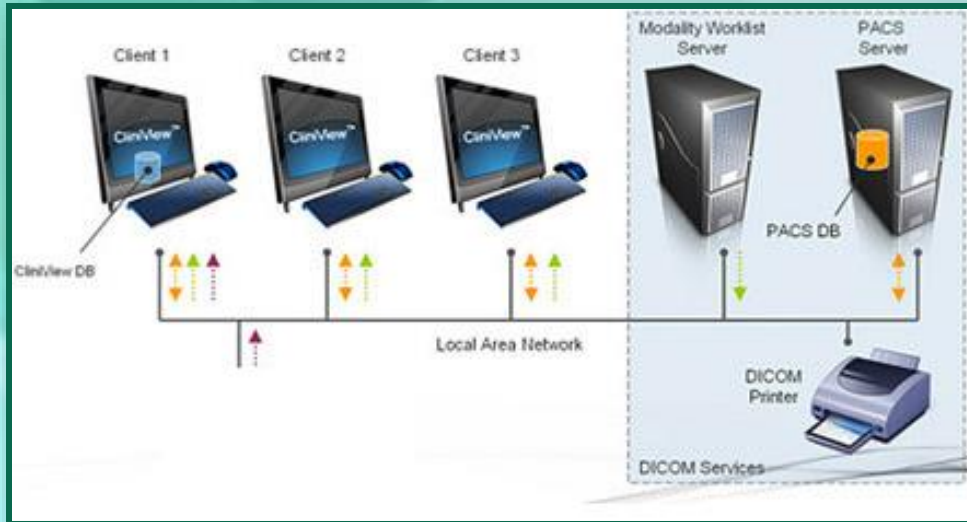
#### Illustration of the whole craniofacial area

- Illustration of the sinus maxillaries
- TMJ diagnostics



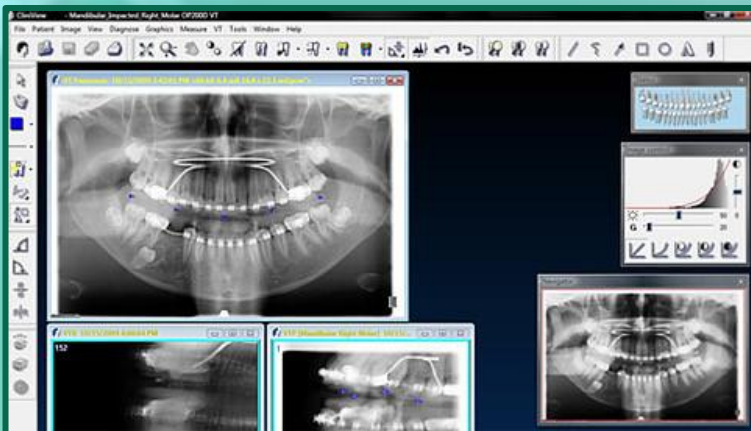
\* Provided by 3D planning SW or DTX Studio™

# X-RAY UNIT DENTAL PANORAMIC (OPG) DICOM 3.0 COMPATIBLE



## User-friendly X-ray software with powerful functions

- ❑ Masterful and clearly laid out displaying of image data
- ❑ All image data in one software
- ❑ Structured Query Language (SQL) database for highest security
- ❑ Perfect integration in the dental surgery
- ❑ ClinView is a user-friendly software package with powerful functions for digital recording and viewing as well as for the printing and saving of images, including a large number of specific dental image processing tools









# X-RAY UNIT DENTAL PANORAMIC (OPG)

## SPECIFICATION

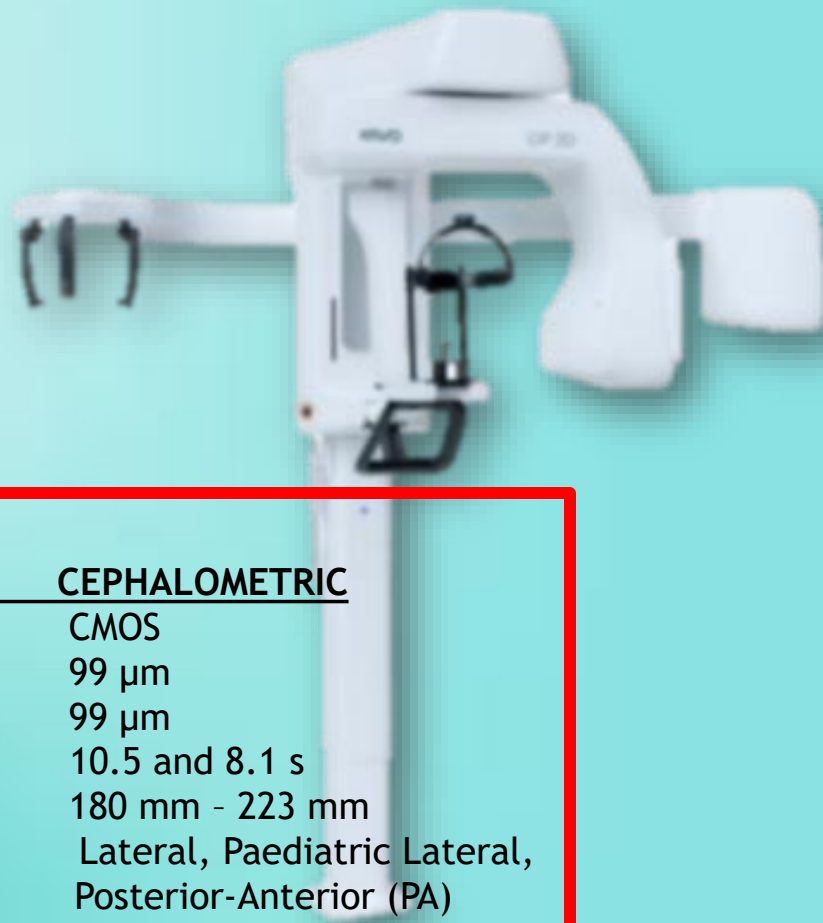
### 3D FUNCTIONALITIES

- **Field of View(FOV)** - Adaptable exposure time, dosage and diagnosable area to the specific need.
- **Resolution** - Endo, high res, Standard, Low Dose.
- **Area of exposure - Freely positionable.**
- **SMARTVIEW** - Scout image to see before what will be recorded later in 3D.
- **Adjust** high of volume in 5mm steps.
- **Quick preview** of the captured image, allowing for timely evaluation.
- **Reduced artifacts** caused by metallic structures in the X-ray volumes
- **Low Dose Technology / Quickscan.**

	OP 2D*	OP 3D*	OP 3D Pro	OP 3D Vision
				
<b>Summary</b>				
Imaging Capabilities	2D*	2D, 3D, Ceph*	2D, 3D, Ceph	2D, 3D
Upgrade paths <i>A device growing with your needs</i>	-	2D → 3D* 2D or 3D → Ceph*	2D → 3D 2D or 3D → Ceph	3D FoV upgrades: V8 > V10 > V17 (max height)
Patient Position	Standing	Standing	Standing	Seated
Fields of View <i>Adaptable exposure time, dosage and diagnosable area to the specific need</i>	-	5 to 9 x Ø 5 5 to 9 x Ø 9 5 to 9 x Ø 11 optional: 5 to 9 x Ø 14	5 x Ø 5 (6 x Ø 4) 6 x Ø 8 8 x Ø 8 8 x Ø 15 Optional: 13 x Ø 15	V8: 5 x Ø 8, 8 x Ø 8 V10: all of V8 + 4 x Ø 16, 6 x Ø 16 8 x Ø 16, 10 x Ø 16 V17: all of V10 + 11 x Ø 16, 13 x Ø 16 17 x Ø 23
Software	CLINIVIEW, VixWin	CLINIVIEW, VixWin, OnDemand3D, InVivo	CLINIVIEW, VixWin, OnDemand3D, InVivo	SmartScan Studio, InVivo, OnDemand3D
Low Dose Technology <i>Optimised quality in 3D X-ray images with a lower dose of radiation</i>	-	✓	✓	✓

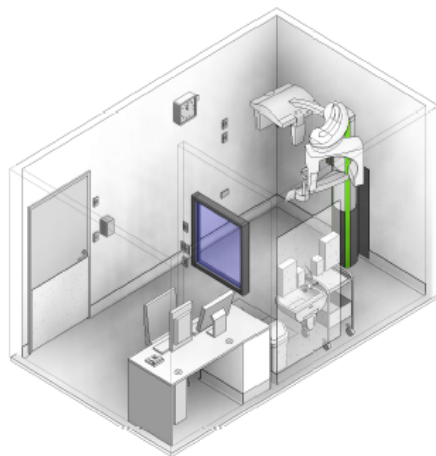
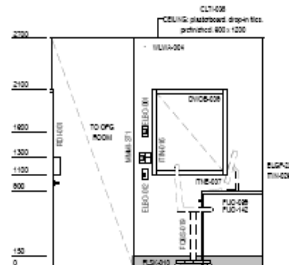
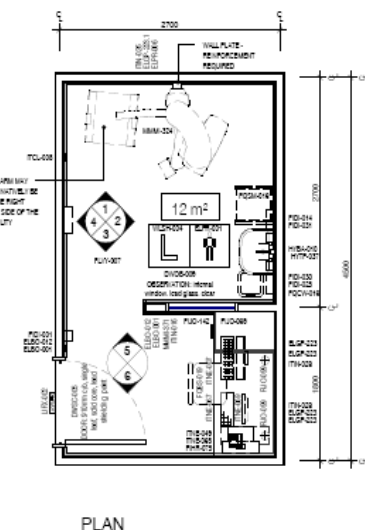
# X-RAY UNIT DENTAL PANORAMIC (OPG) DICOM 3.0 COMPATIBLE

Focal Spot : 0.5 mm, IEC 336  
Tube Voltage : 57 - 90 kV  
Tube Current : 3.2 - 16 mA  
HU Capacity : 35 kJ, 49 000 HU  
Min. Total Filtration : 3.2 mm Al  
Wheelchair accessible : Yes

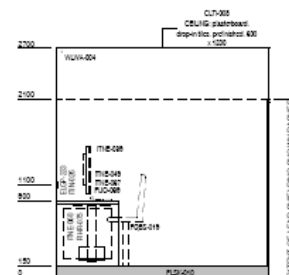


<u>2D</u>	<u>PANORAMIC</u>	<u>CEPHALOMETRIC</u>
Image Detector	: CMOS	CMOS
Sensor Pixel Size	: 99 µm	99 µm
Image Pixel Size	: 99 µm	99 µm
Scan Time	: 9 s	10.5 and 8.1 s
Image Field Height	: 147 mm	180 mm - 223 mm
Imaging programs	: Standard, Segmented, Pediatrics, Lat TMJ, Bitewing	Lateral, Paediatric Lateral, Posterior-Anterior (PA)
DICOM Support	: Yes	

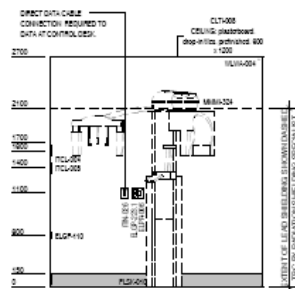
SAMPLE	OPG ROOM
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25
26	26
27	27
28	28
29	29
30	30
31	31
32	32
33	33
34	34
35	35
36	36
37	37
38	38
39	39
40	40
41	41
42	42
43	43
44	44
45	45
46	46
47	47
48	48
49	49
50	50
51	51
52	52
53	53
54	54
55	55
56	56
57	57
58	58
59	59
60	60
61	61
62	62
63	63
64	64
65	65
66	66
67	67
68	68
69	69
70	70
71	71
72	72
73	73
74	74
75	75
76	76
77	77
78	78
79	79
80	80
81	81
82	82
83	83
84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

[illegible][illegible]

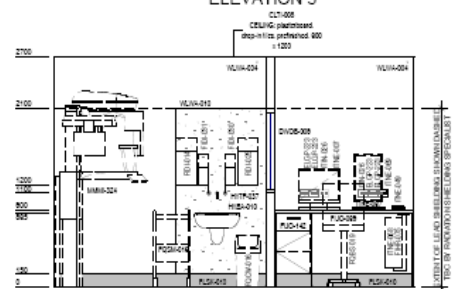
ELEVATION 5



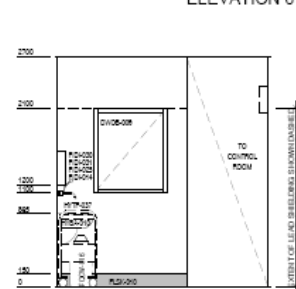
ELEVATION 6



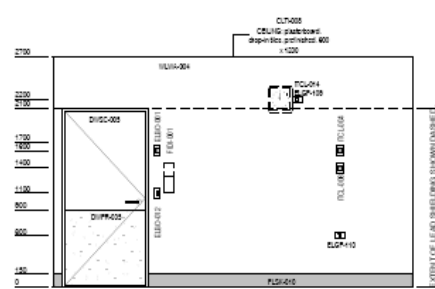
ELEVATION 1



ELEVATION 2

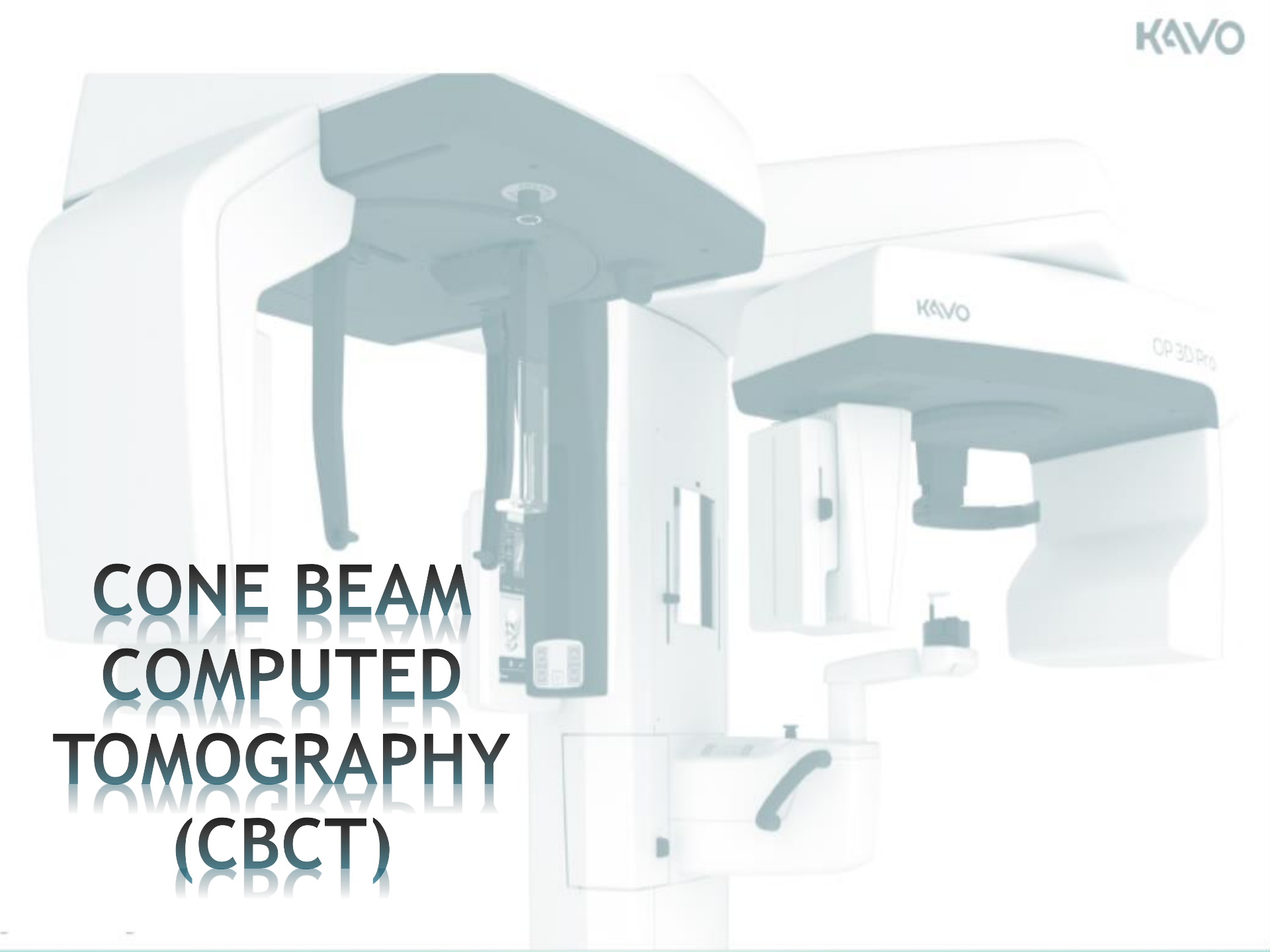


ELEVATION 3



ELEVATION 4

	REV	DESCRIPTION	DATE		SCALE	RLS Room Code	REV
	1	First Issue			1 : 50 @ A3		

A large, white and grey KAVO OP 3D Pro cone beam computed tomography (CBCT) machine. The machine has a large, dark grey, angular gantry that can rotate. A vertical column supports the gantry. A patient's head would be positioned in the center of the gantry. The machine is mounted on a base with various adjustment levers and a control panel. The KAVO logo and 'OP 3D Pro' model name are visible on the side of the gantry.

# CONE BEAM COMPUTED TOMOGRAPHY (CBCT)

# CONE BEAM COMPUTED TOMOGRAPHY - CBCT ?

KAVO



OP 2D - fulfils basic panoramic imaging needs



OP 3D\* - designed for efficiency



OP 3D Pro - demanding customers looking for automation and versatility



OP 3D Vision

General dentistry

Endodontics

Implantology

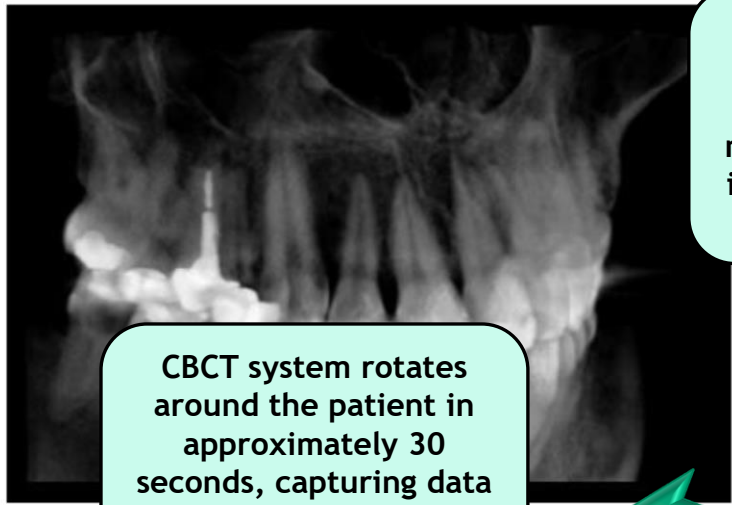
Maxillofacial Surgery

Orthodontics

ENT\*



# CONE BEAM COMPUTED TOMOGRAPHY - CBCT ?

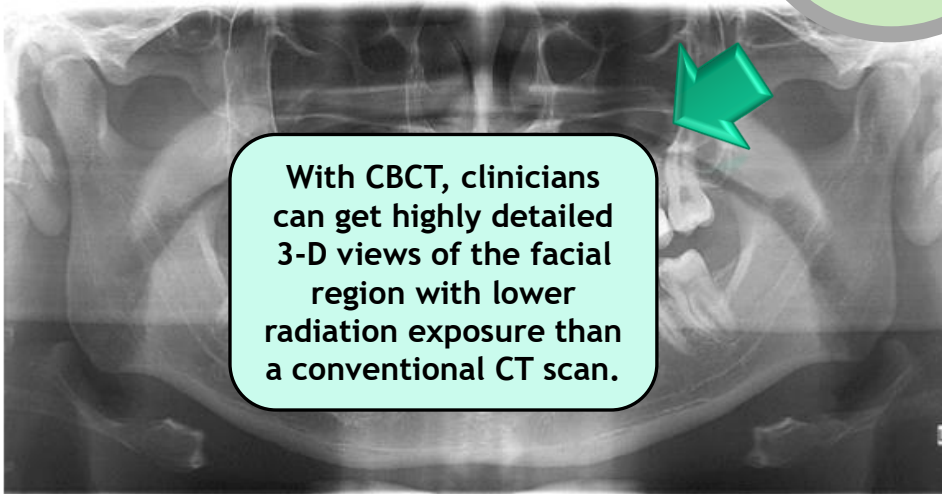


CBCT system rotates around the patient in approximately 30 seconds, capturing data using cone-shaped x-ray beam.

Used to take three dimensional (3-D) images of teeth, maxillary sinus, nerve pathways, and bone in the maxillofacial region with a single scan.



Used when regular two dimensional (2-D) dental x-rays are not sufficient.



With CBCT, clinicians can get highly detailed 3-D views of the facial region with lower radiation exposure than a conventional CT scan.

With CBCT, may help with the diagnosis, treatment planning and evaluation of certain conditions.

# MAIN BENEFITS

## \* Complete versatility

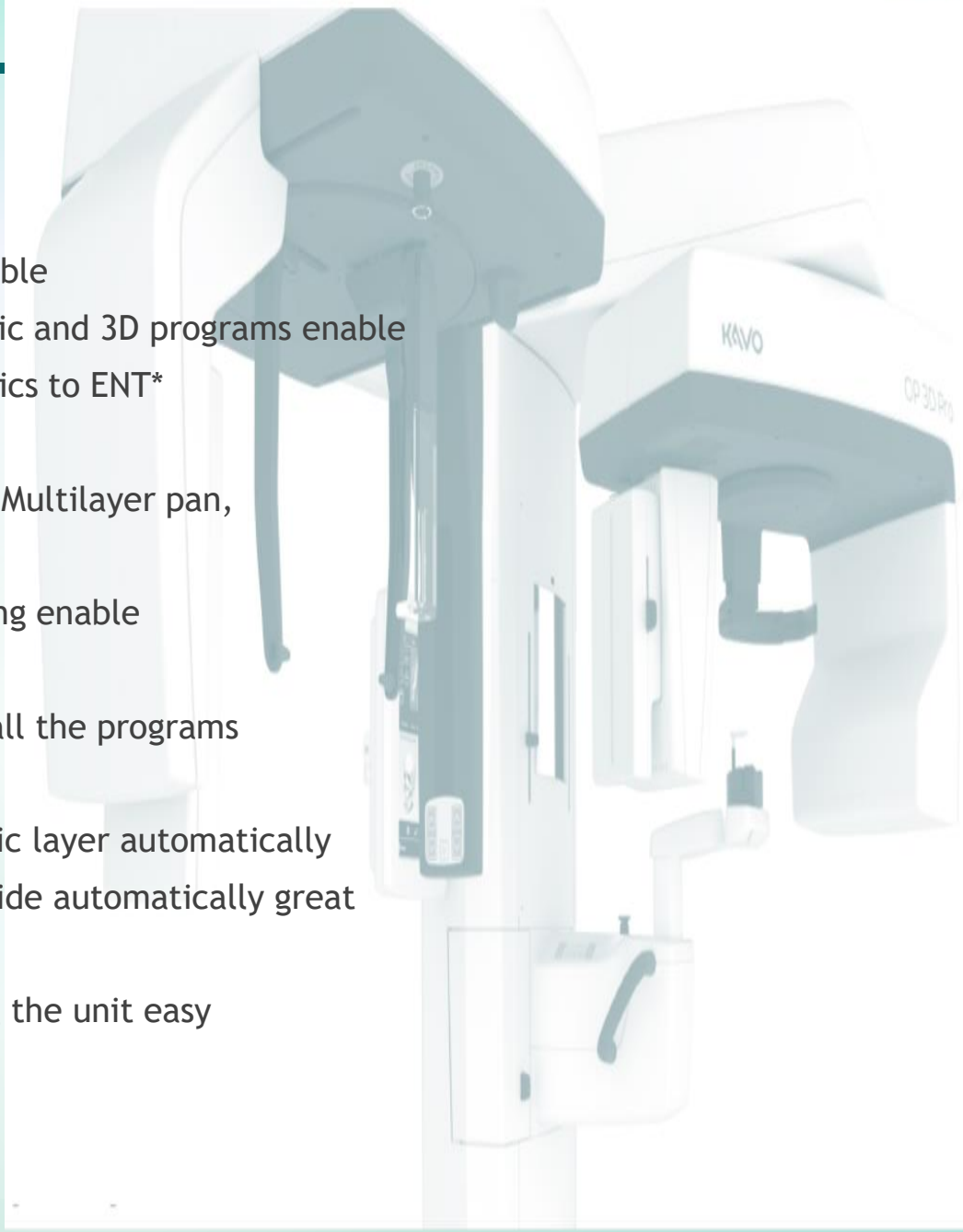
- Designed as a true 3-in-1 system
- All modalities available / upgradeable
- Variety of panoramic, cephalometric and 3D programs enable treatment planning from endodontics to ENT\*

## \* Perfection brings confidence

- Advanced panoramic programs, e.g Multilayer pan, Ortho Zone for demanding users
- SMARTVIEW with free FOV positioning enable confident and precise 3D imaging
- Optimized imaging parameters for all the programs





## \* Pure Performance

- ORTHOfocus provides best panoramic layer automatically
- 2D/3D Automatic Dose Control provide automatically great images with more consistency
- Intuitive user-interface makes using the unit easy



## 3D FUNCTIONALITIES

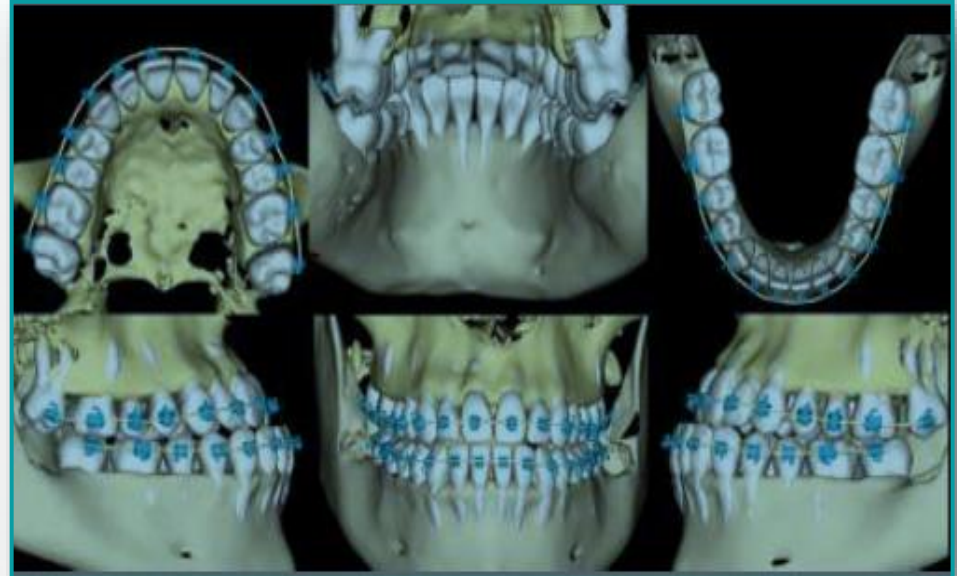
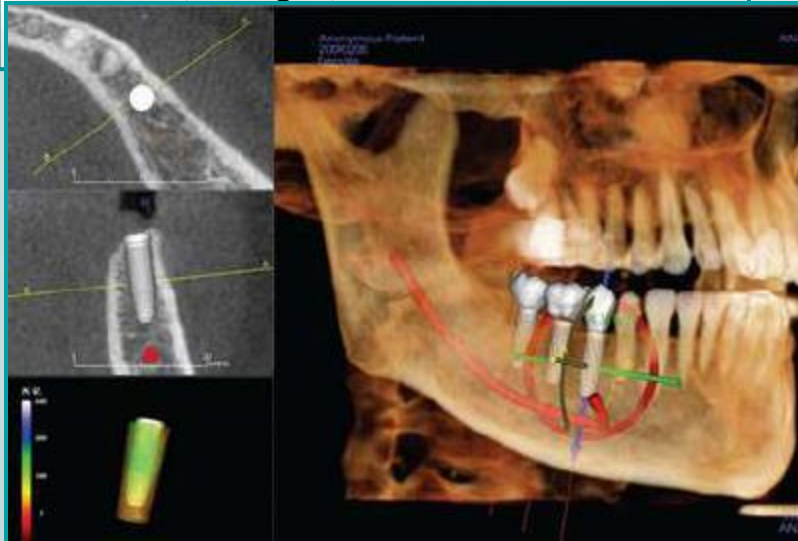
- **Field of View** - Adaptable exposure time, dosage and diagnosable area to the specific need.
- **Selectable resolution.**
- **Area of exposure - Freely positionable.**
- **SMARTVIEW** - Scout image to see before what will be recorded later in 3D.
- **Automatic Dose Control.**
- **Reduced artifacts caused by metallic structures in the X-ray volumes**
- **Low Dose Technology / Quickscan.**

	OP 2D*	OP 3D*	OP 3D Pro	OP 3D Vision
				
<b>Summary</b>				
Imaging Capabilities	2D*	2D, 3D, Ceph*	2D, 3D, Ceph	2D, 3D
Upgrade paths <i>A device growing with your needs</i>	-	2D → 3D* 2D or 3D → Ceph*	2D → 3D 2D or 3D → Ceph	3D FoV upgrades: V8 > V10 > V17 (max height)
Patient Position	Standing	Standing	Standing	Seated
Fields of View <i>Adaptable exposure time, dosage and diagnosable area to the specific need</i>	-	5 to 9 x Ø 5 5 to 9 x Ø 9 5 to 9 x Ø 11 optional: 5 to 9 x Ø 14	5 x Ø 5 (6 x Ø 4) 6 x Ø 8 8 x Ø 8 8 x Ø 15 Optional: 13 x Ø 15	V8: 5 x Ø 8, 8 x Ø 8 V10: all of V8 + 4 x Ø 16, 6 x Ø 16 8 x Ø 16, 10 x Ø 16 V17: all of V10 + 11 x Ø 16, 13 x Ø 16 17 x Ø 23
Software	CLINIVIEW, VixWin	CLINIVIEW, VixWin, OnDemand3D, InVivo	CLINIVIEW, VixWin, OnDemand3D, InVivo	SmartScan Studio, InVivo, OnDemand3D
Low Dose Technology <i>Optimised quality in 3D X-ray images with a lower dose of radiation</i>	-	✓	✓	✓

# CBCT | USE IN DENTISTRY

## IMPLANTOLOGY AND PROSTHODONTICS

- To assess the quantity and quality of bone in edentulous ridges and implant cases.
- Implant site evaluation, accurate measurements, accurate planning of implant in relation to vital structures, surgical guide.
- Computerized Prosthesis.
- Crown, bridges, dentures etc

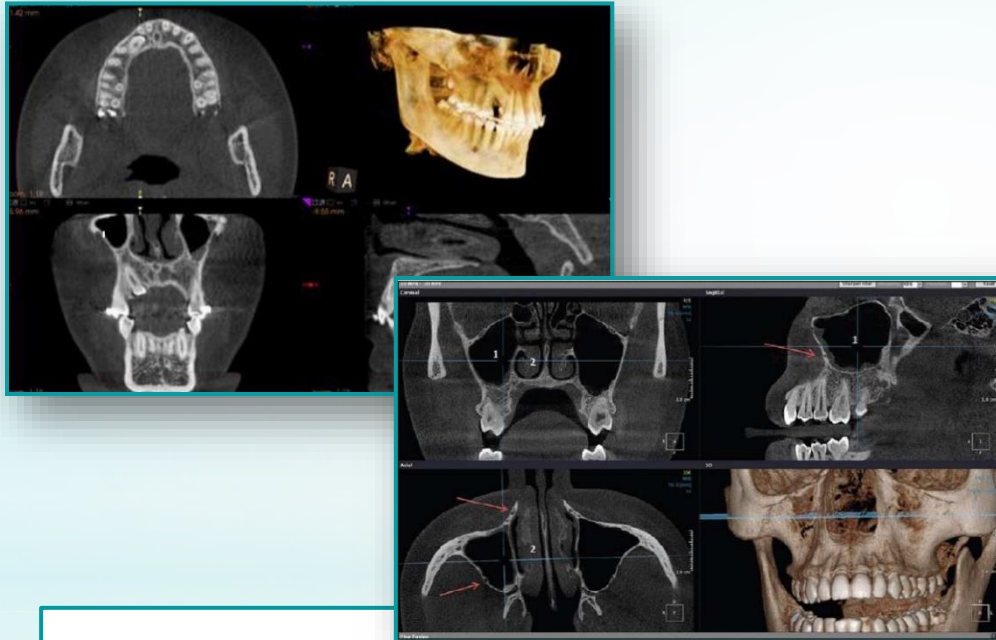


- Orthodontics can be use CBCT images
- Complete hard tissue examination and record, type of dentition present, Arch size, arch shape, symmetry of arches.
- Number, size of teeth, shape of teeth.
- Braces, Invisalign etc

## ORTHODONTICS



# CBCT | USE IN DENTISTRY (CONT's)



- CBCT enables the analysis of jaw pathology, the assessment of impacted teeth, supernumerary teeth and their relation to vital structures.  
The assessment of bone grafts.
- It is also helpful in analysing and assessing paranasal sinuses.
- Tooth auto transplants and etc.

## PERIODONTICS

- Speciality focusing in the inflammatory disease.
- CBCT can be used in assessing a detailed morphologic description of the bone.
- Measuring of bony defects, furcation involvement & lingual defects.



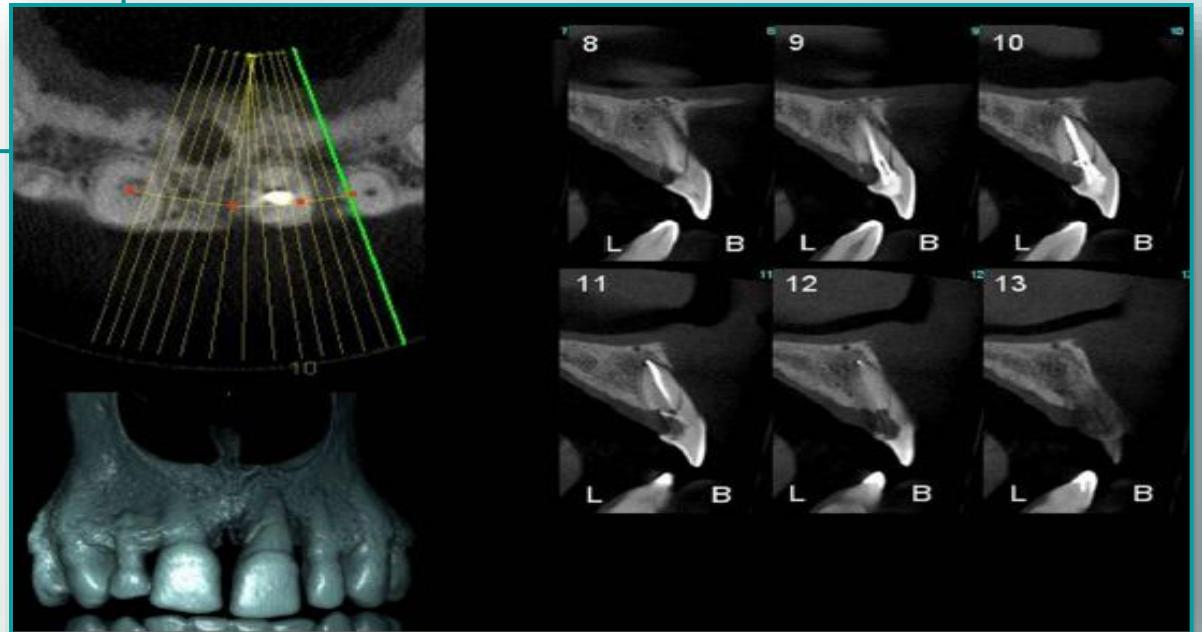
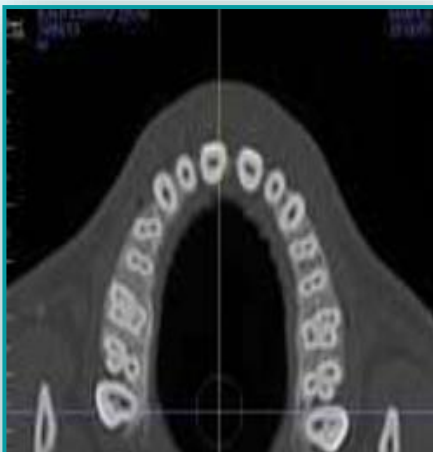
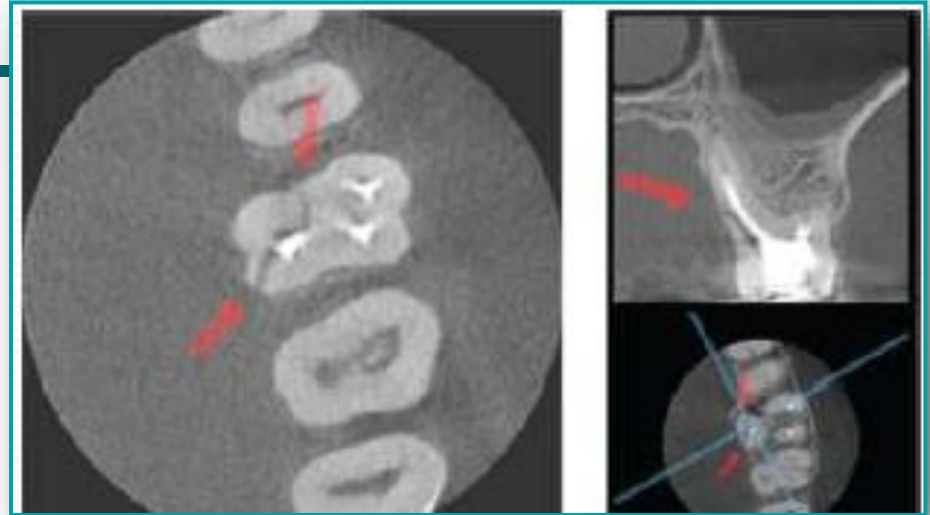
## ORAL AND MAXILLOFACIAL SURGERY



# CBCT | USE IN DENTISTRY (CONT'S)

## ENDODONTICS

- CBCT is a very useful tool in diagnosing apical lesions.
- Crown morphology, pulp chamber, proximal caries.
- Root morphology, number of root canals, course and direction of canals, accessory canals, root resorption, root fractures.
- Obturation, filling, under and overfilling, sinus problems.



# CBCT | CONFIGURATIONS

OP 3D Pro: 5 field-of-views



FOV: 5x5, 6x8, 8x8, 8x15, 13x15  
Pan: Advanced panoramic programs  
Ceph: Right or left sided

3D indications: Zygomatic Implants, OSA, Airway, TMJ, Wisdom Teeth, Implants, Endo

FOV [h x w, cm]	Resolution	Voxel size [ $\mu$ m]	Default mA	Scan/ Exposure time [s]	Reconstruction time* [minutes]
5 x 5	LDT	280	3.2	11 / 1.2	< 0.5
	Standard	200	8	11 / 2.3	0,5
	High	125	6.3	17.4 / 6.1	1
	ENDO	85	6.3	17.4 / 8.7	3
6 x 8	LDT	320	3.2	11 / 1.2	< 1
	Standard	300	8	11 / 2.3	1
	High	200	6.3	17.4 / 6.1	1,5
8 x 8	LDT	320	3.2	11 / 1.2	< 1
	Standard	300	8	11 / 2.3	1
	High	200	6.3	17.4 / 6.1	1,5
8 x 15	LDT	400	3.2	21.1 / 2.3	1,5
	Standard	350	8	29.5/4.5	2,5
	High	250	6.3	33.3/8.1	4,5
13 x 15	LDT	420	3.2	42.2 / 4.5	2
	Standard	380	5	38.2 / 8.1	2,5
	High	320	8	38.2/ 8.1	3,5

# CBCT | ADVANTAGES & DISADVANTAGES (PROS & CONS)

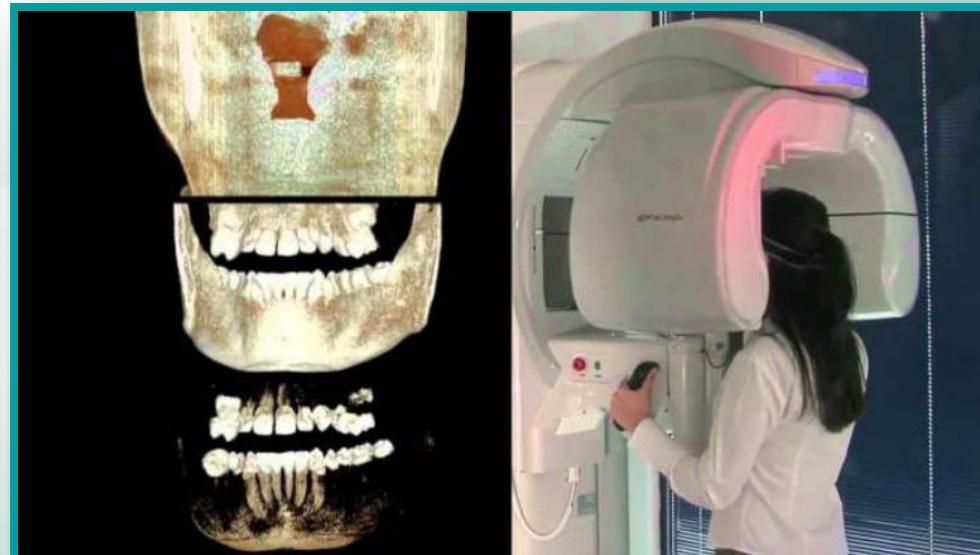


## PROS

- \* Rapid scan time
- \* Beam limitation
- \* Image accuracy
- \* Economical comfortable and safe
- \* Reduction in patient radiation dose when compared to medical CT (10 times less)

## CONS

- \* Scatter
- \* Motion artifacts due to increased scan time
- \* Poor contrast resolution, thus soft tissue cannot be reviewed



# X-RAY UNIT INTRAORAL W FILM / DIGITAL EXPOSURE



# Intraoral X-ray Unit

---

**Provides easy and precise positioning, a simple easy-to-use procedure, and high-quality, high-resolution images.**

- Optimal images for all diagnostics needs variable kV and mA.
- Quick and easy-to-use pre-programmed quick settings, practical design.
- Digital-ready.
- Integrates cleanly.
- Perfect workflow.
- Versatile installation options.



## Optimal Images for all diagnostic needs

- ❑ The **freely selectable exposure parameters** (50 - 70 kV, 2 - 8 mA, and exposure time) maximize the diagnostic value of intraoral radiography. The focal spot size of the X-ray tube is 0.4mm , which ensure **optimal resolution and clear images.**



### INTRAORAL X-RAY



The high-frequency of the constant potential X-ray generator provides significant advantages:

- ❑ **Reduced radiation** dose by up to 25% when compared to conventional AC generations.
- ❑ **Quality, uniform image contrast.**
- ❑ **Improved reliability and prolonged lifespan** of the X-ray tube.

**Reduces radiation**

## Ergonomic design for easy imaging

- ❑ The unique design of the X-ray tube head makes aiming exceptional easy and precise.
- ❑ The steady arm **provides smooth and precise movements**, ensuring drift-free accurate positioning of the lightweight tube head.

## INTRAORAL X-RAY



The imaging parameters are selected from the intuitive control panel which is can be **manually adjusted** if needed for adults and children. Also can save into quick setting memory according to the selected exposure region and the diagnostic need:

- ❑ Periodical imaging
- ❑ Upper and lower occlusal plane imaging
- ❑ Bitewing imaging
- ❑ Endodontic imaging

**Quick settings with intuitive operation**



## Easy imaging mode selection and self-diagnostic system

- ❑ A smart control for maintaining constant darkness of radiographs whenever imaging conditions change.
- ❑ The unit's self-diagnostic control system monitors all functions and displays error messages in the case of abnormal operations; this assists in the correct use of the units and speeds up technical services.

- ❑ After the exposure, the images are displayed on the screen within seconds, dramatically shortening the time needed for an intraoral X-ray examination when compared to imaging plates or conventional film.

## Full mouth series customization and support

### INTRAORAL X-RAY

- ❑ Integrated-control electronics and a magnetic connector for intraoral sensors; this ensures that the sensor is always in the right place and within easy reach.
- ❑ All the components of the imaging system - the sensor, the control box, and the PC - can be optimally placed in the treatment environment.

## Integrated control electronics for digital sensors



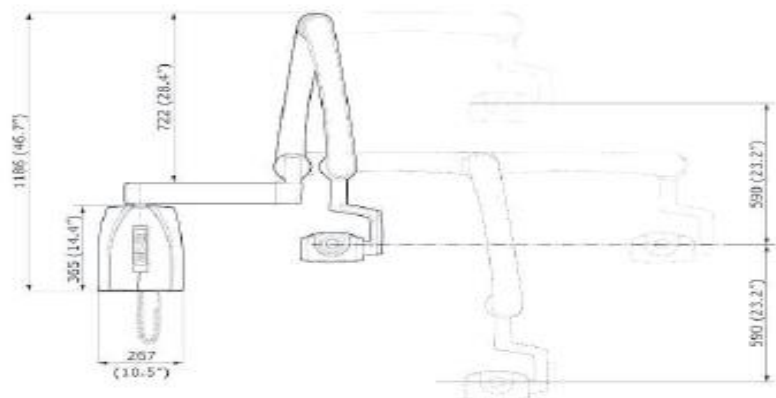
# INTRAORAL TECHNICAL SPECIFICATIONS

Generator	Constant potential, microprocessor controlled, operating frequency 66 kHz
X-ray tube	Toshiba D-041SB
Focal spot size	0.4 mm according to IEC 60336
Cone diameter	60 mm (2.36 in.) Rectangular 33 x 43 mm (1.30 x 1.69 in.)
Max. symmetrical radiation field	Ø60 mm at SSD 200 mm Ø60 mm at SSD 300 mm according to IEC 806
Total filtration	min. 2.5 mm Al equivalent at 70 kV according to IEC 60522
Anode voltage	7 mA: 50, 52, 55, 57, 60 kV, $\pm 2$ kV 2–6 mA: 50, 52, 55, 57, 60, 63, 66, 70 kV, $\pm 2$ kV
Exposure times	0.01–2 sec. $\pm(5\% + 0.001 \text{ sec.})$ , 24 steps
SSD (Source-Skin Distance) Standard/Long	200 mm (8 in.)/300 mm (12 in.)
Mains voltage	100 V~/110-115 V~/220-240 V~, 50/60 Hz
Duty cycle	1:30, automatic control
Electrical classification	Class I Type B
Weight	total 29 kg (64 lbs) tube head with standard cone 4.2 kg (9.3 lbs) tube head with long cone 4.5 kg (10 lbs)
Color	White (RAL 9016)

	Size 0	Size 1	Size 2
Sensor type	CMOS with Scintillator	CMOS with Scintillator	CMOS with Scintillator
Sensor Size	33.6 x 23.4 mm (1.33 x .92 in.)	39.7 x 25.1 mm (1.56 x 0.99 in.)	44.1 x 30.4 mm (1.76 x 1.2 in.)
Active Area	25.5 x 18.9 mm (1.0 x 0.74 in.)	31.5 x 20.7 mm (1.24 x 0.81 in.)	36 x 26.1 mm (1.42 x 1.03 in.)
Physical pixel size	15 $\mu\text{m}$ x 15 $\mu\text{m}$		
Theoretical Resolution	33 lp/mm		
Resolution	17 lp/mm		
Pixel size	30 $\mu\text{m}$		
Interface	USB or Ethernet		

# INTRAORAL

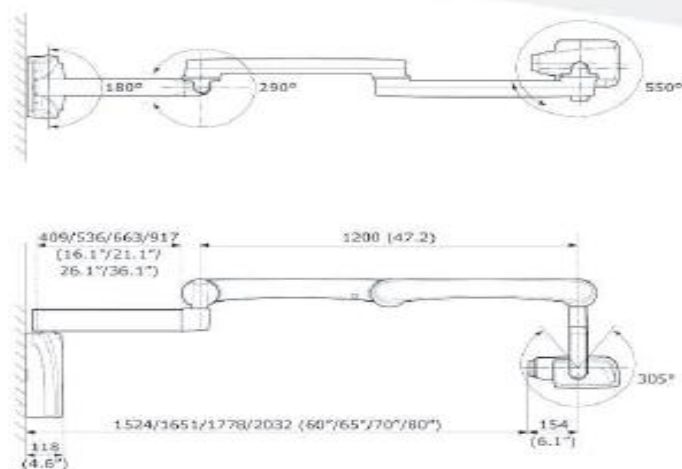
## Dimensions



## Mounting height from floor:

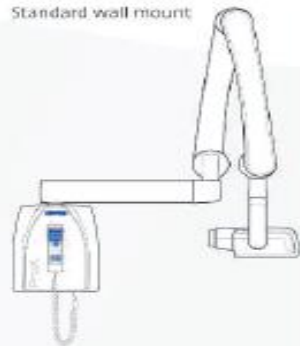
Recommended: 990 mm (39")

Minimum Requirement: 790 mm (31")



## Installation options

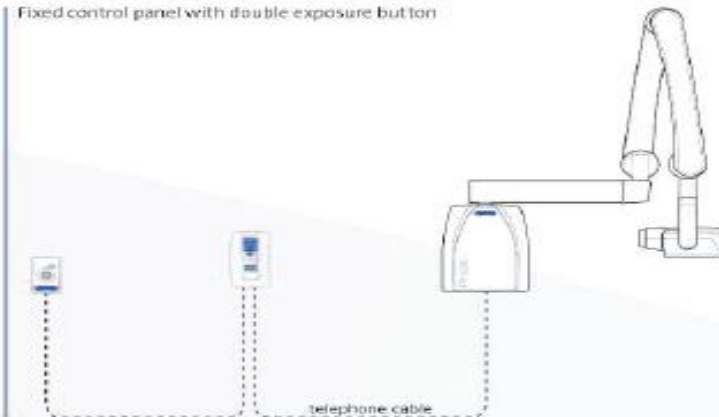
### Standard wall mount



### Remote-control panel

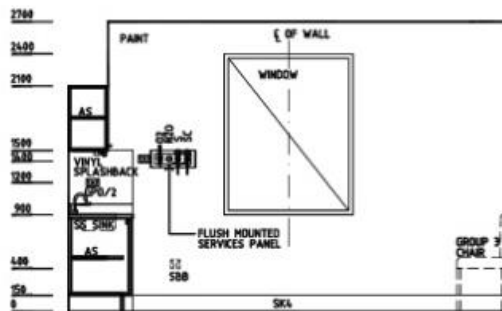


### Fixed control panel with double exposure button

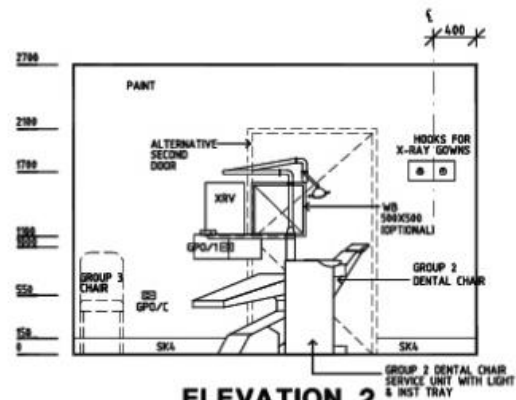




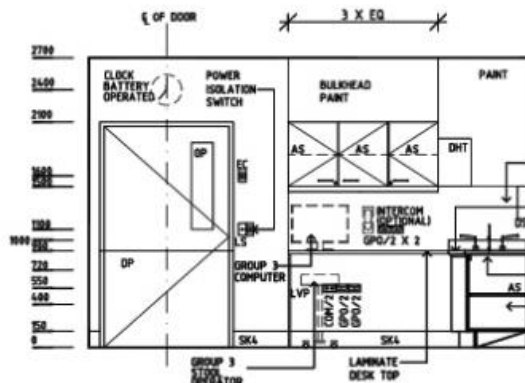
# INTRAORAL ROOM



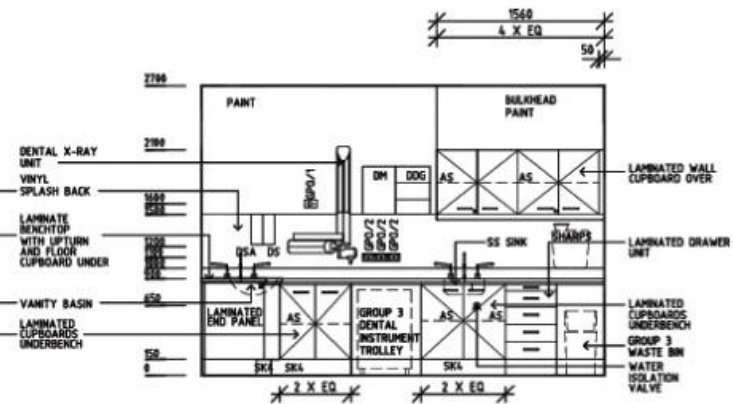
**ELEVATION 1**



**ELEVATION 2**



**ELEVATION 3**



**ELEVATION 4**



*Thank You*