Principes du Cone Beam CT

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UNIVERSITÉ DE STRASBOURG

XXXXème CONGRÈS ANNUEL de la Société Française de NeuroRadiologie
4-6 avril 2013
Paris Centre de conférence Marriott Rive Gauche
www.sfnr.net Nouveau lieu

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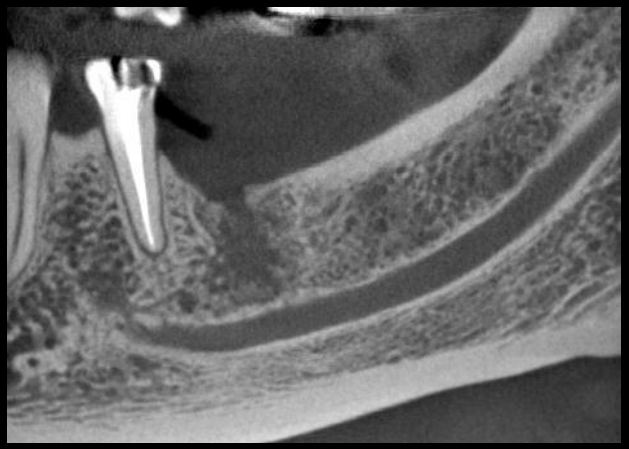
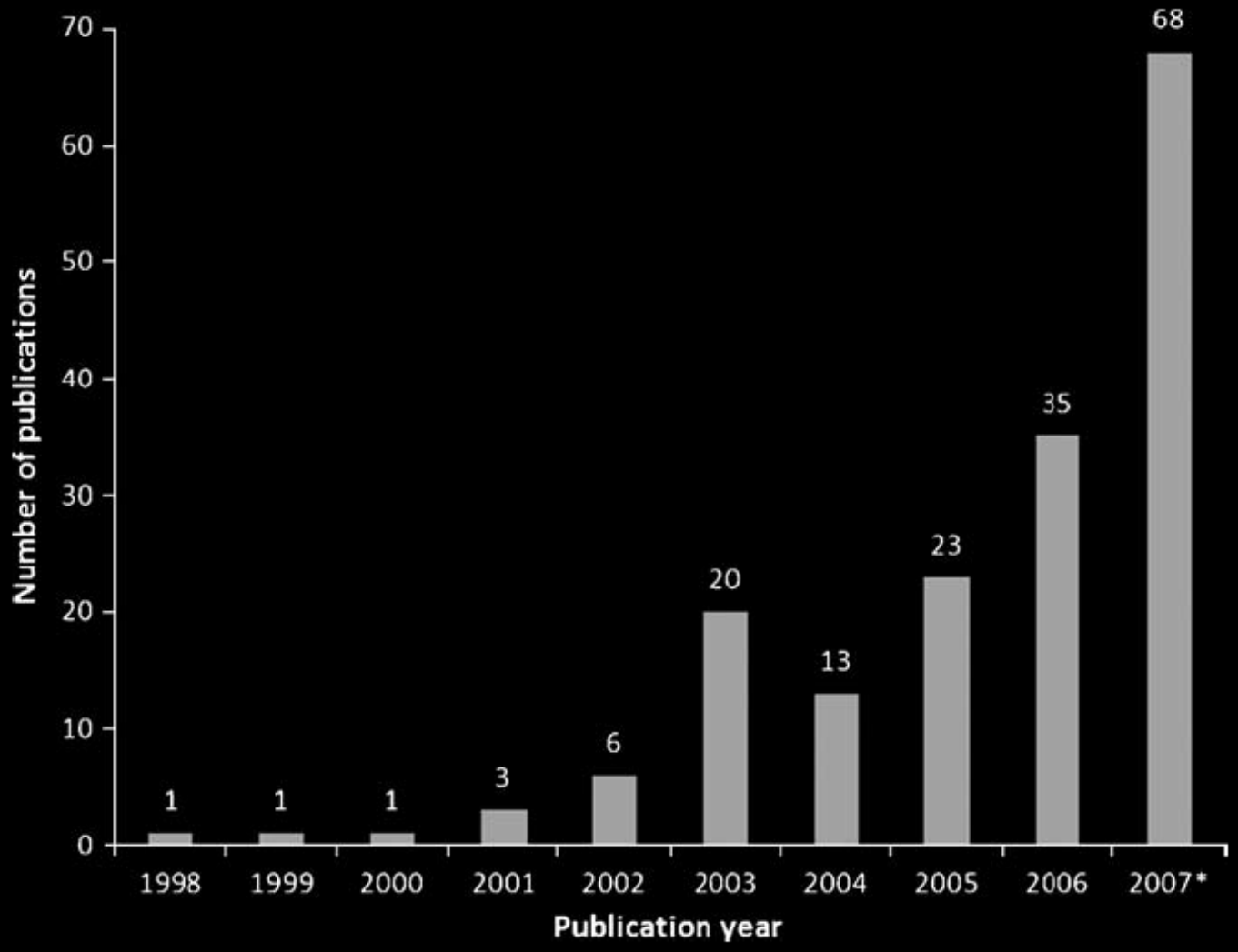
Cone Beam Computed Tomography (CBCT)

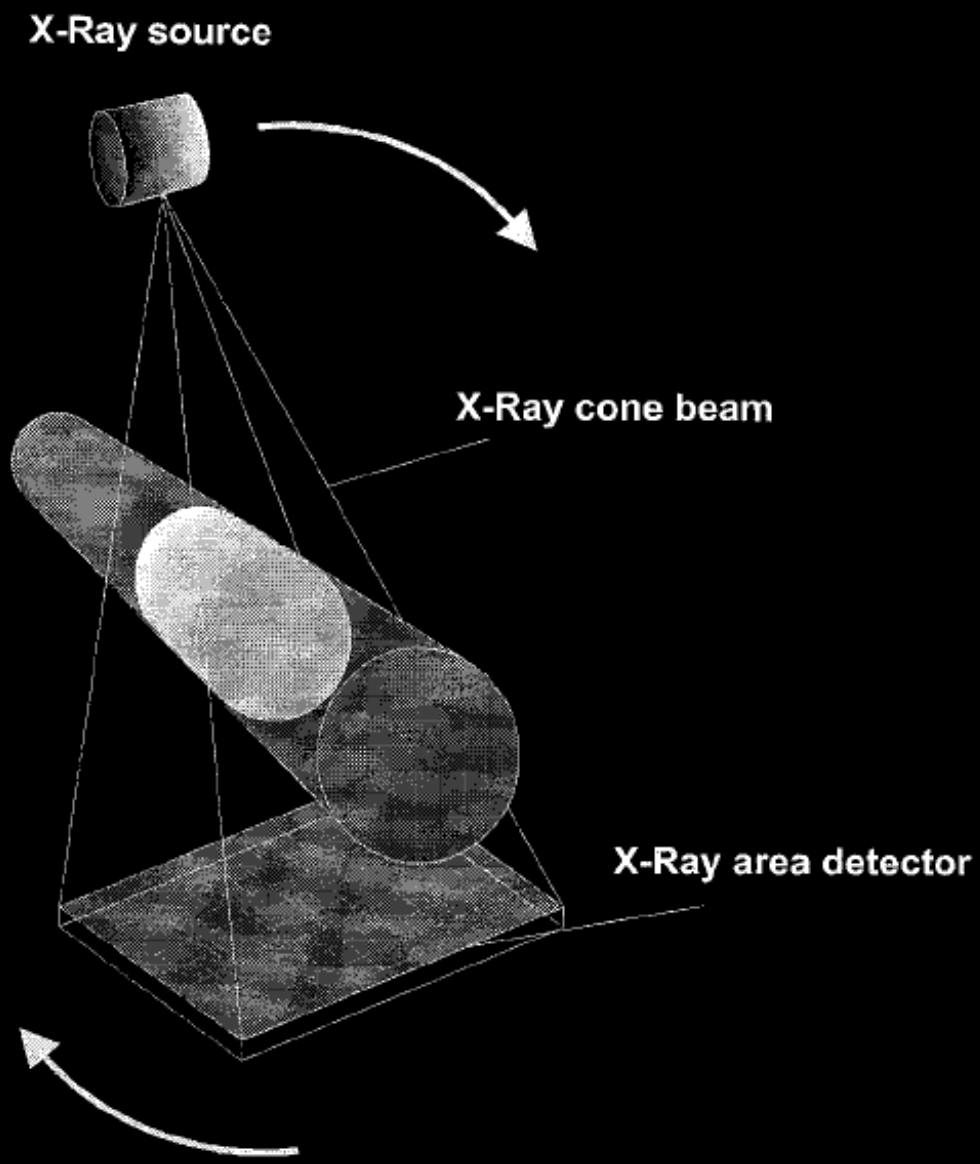


CBCT in dento-maxillofacial region

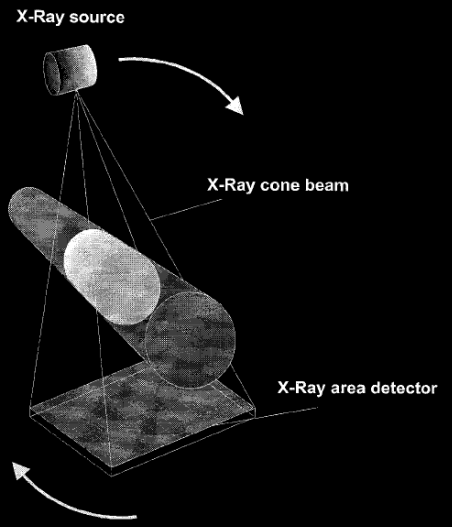


(De Vos et al, 2009)

Physical principles in CBCT



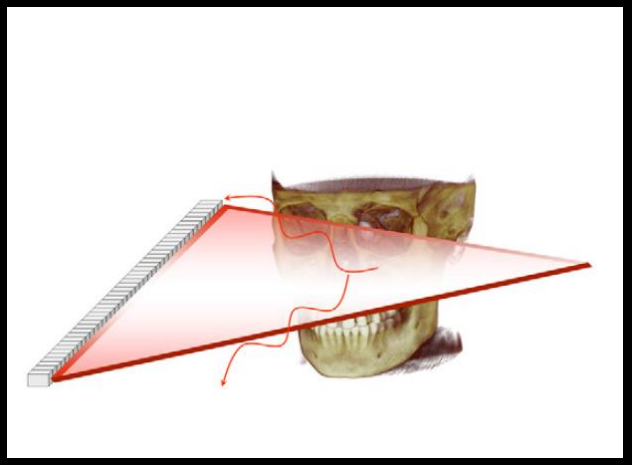
CENTI - Ateliers de Radiologie Vasculaire (SFICV 2011)

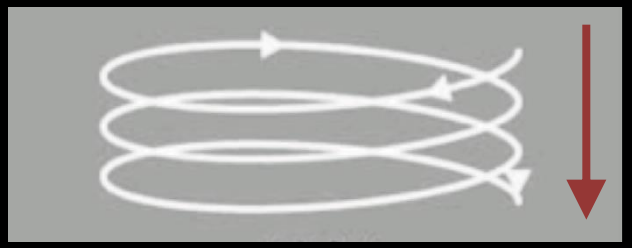


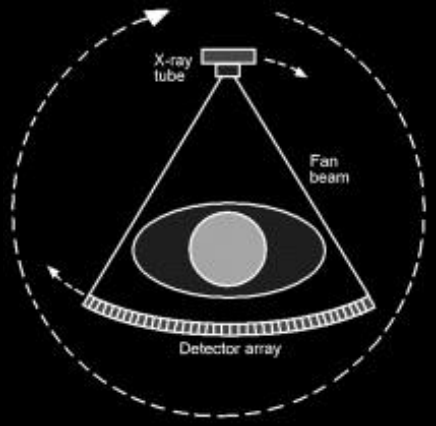
CB-Like

Images Dr M Greget

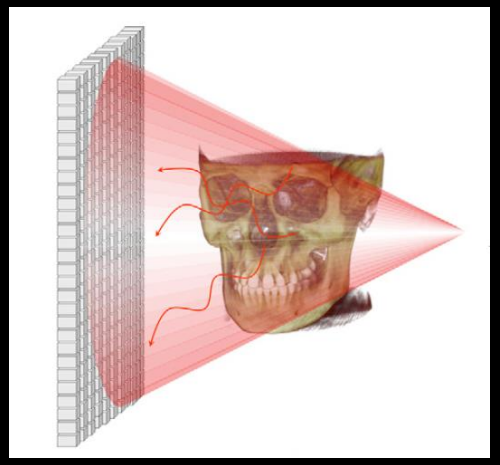
MSCT

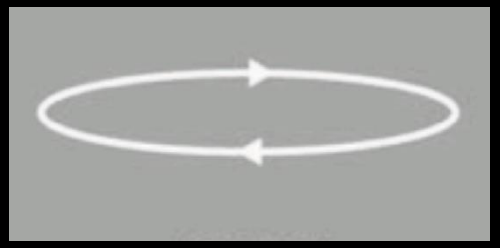


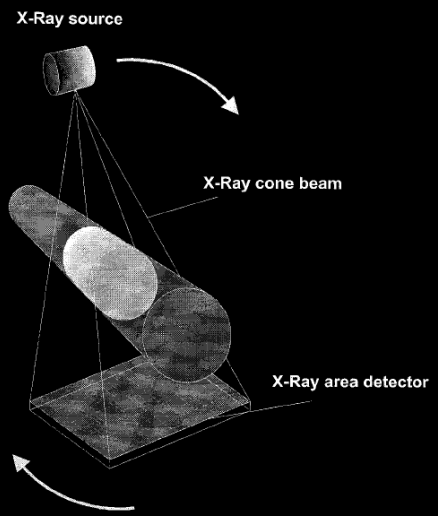



X-ray tube
Fan beam
Detector array

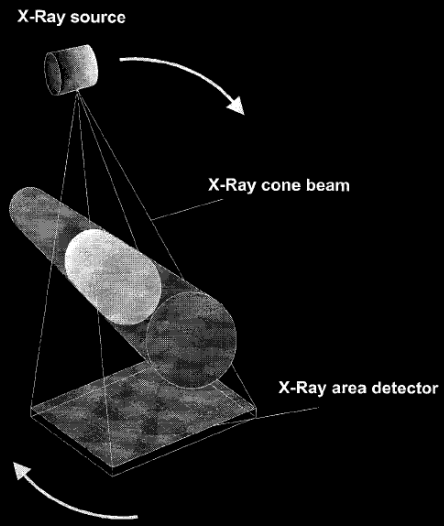
CBCT

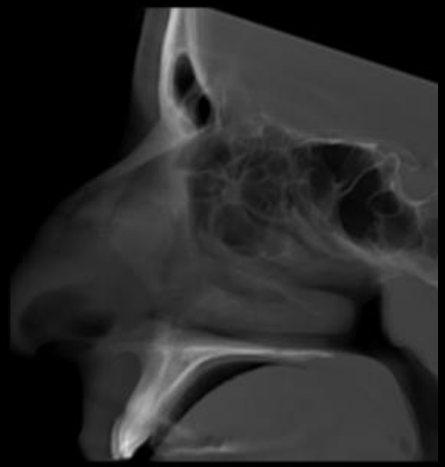


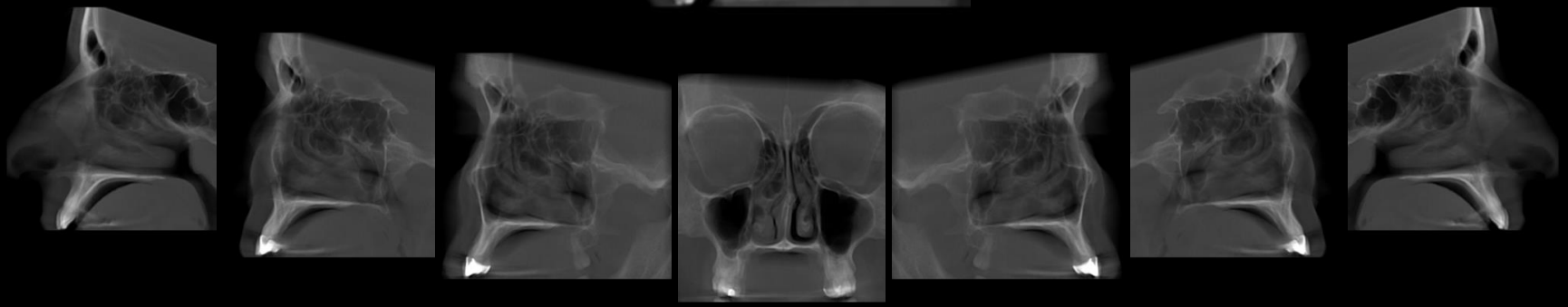



X-Ray source
X-Ray cone beam
X-Ray area detector

CBCT





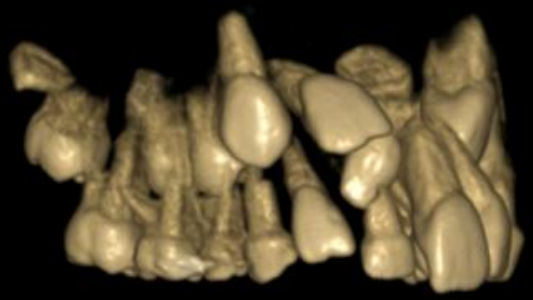


Reconstructions

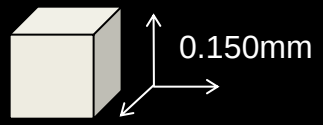
Secondary Reconstructions

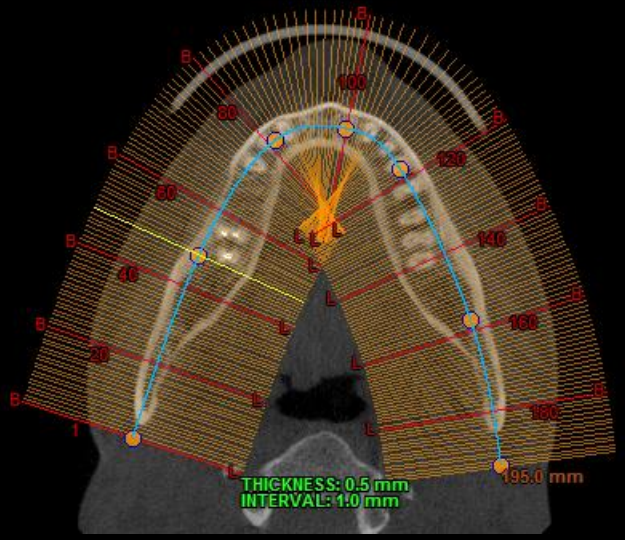
voxel

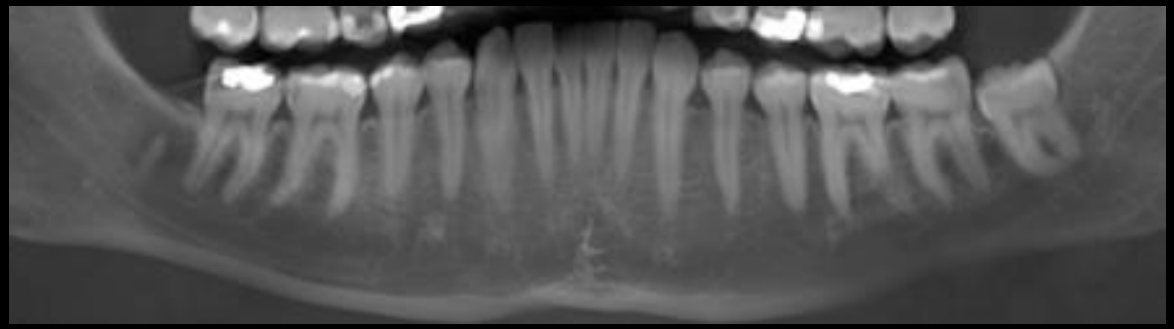
Rétro- reconstructions



voxel







Responsabilité médicale
Dans la réalisation des actes radiologiques

- Réalisation de l'acte radiologique (praticien réalisateur)

⇨ acte médical de réalisation ⇒ possibilité de délégation à un auxiliaire qualifié

⇨ engage la responsabilité du praticien réalisateur

⇨ droit de contrôle sur la prescription

⇨ compte rendu obligatoire

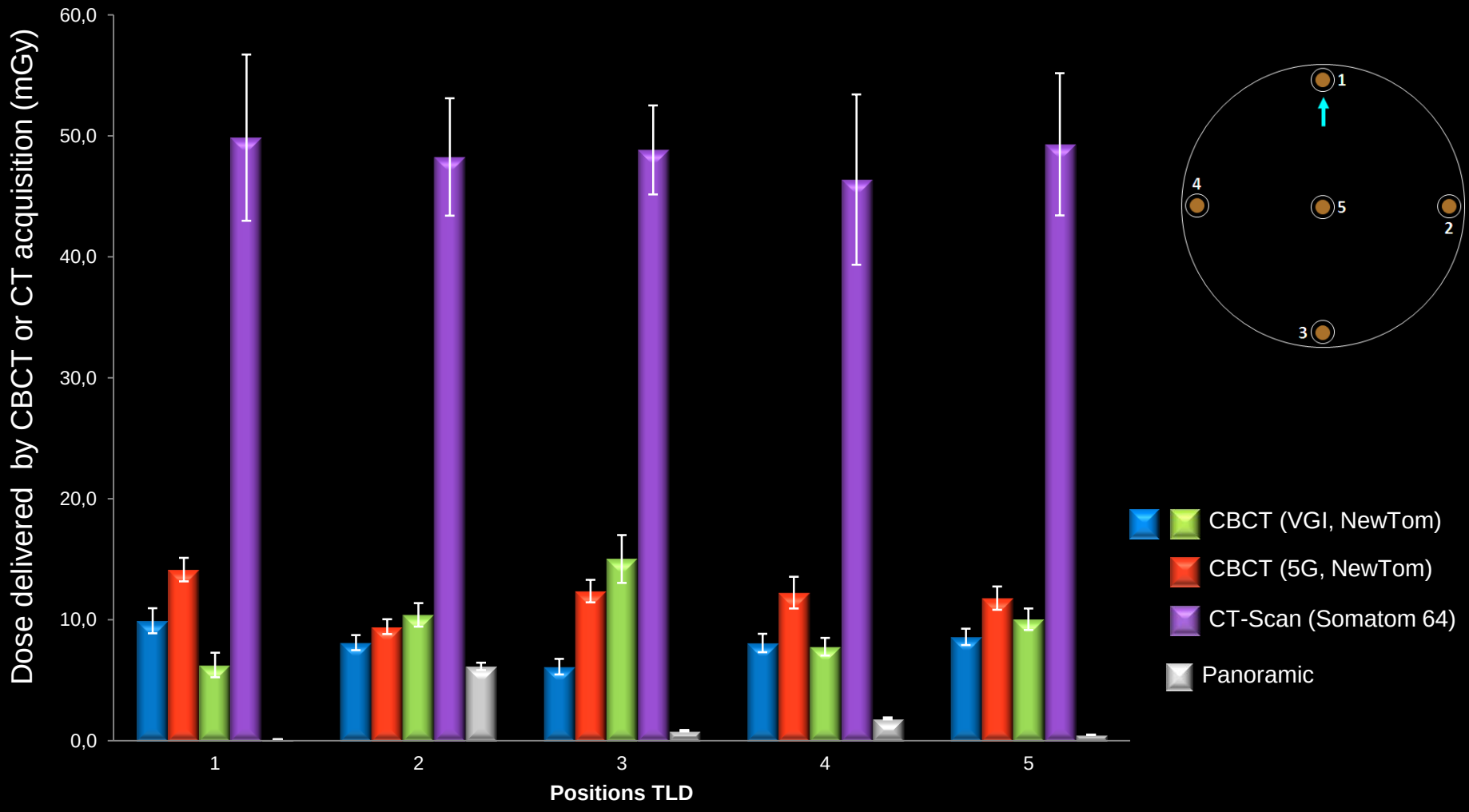
→ informations relatives à la justification de l'acte (indication)

→ procédures et opérations réalisées

→ INTERPRETATION

→ informations utiles à l'estimation de la dose (*Arrêté du 22/09/06*)

CT vs CBCT: dosimetric aspects

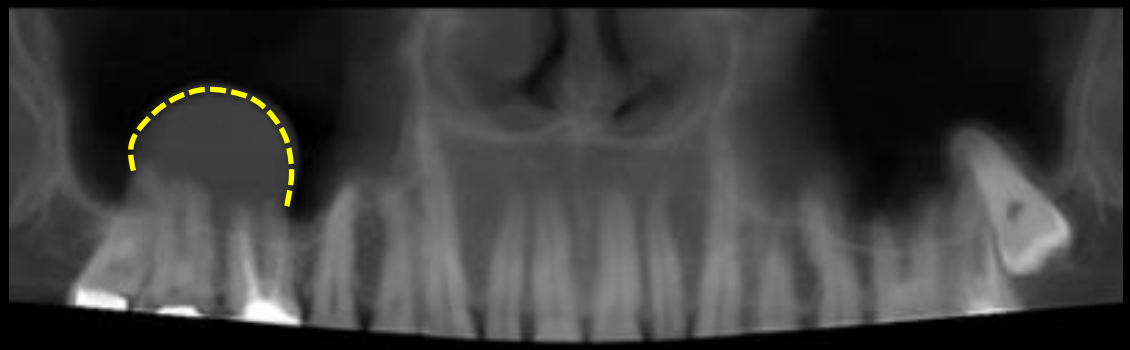


Pr M Schmittbuhl, Montreal

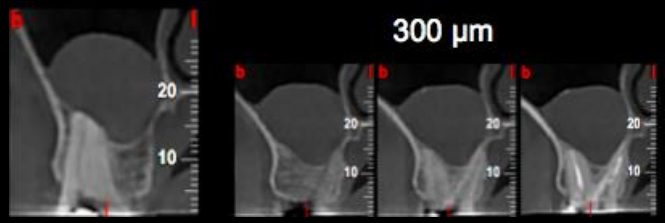
Principe ALARA

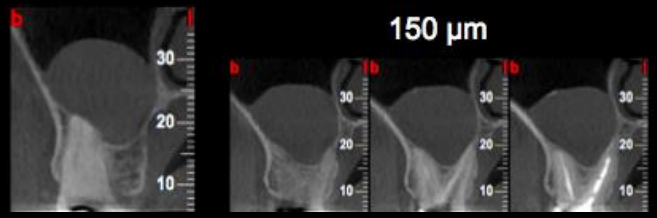
« As Low As Reasonably Achievable »

KAD

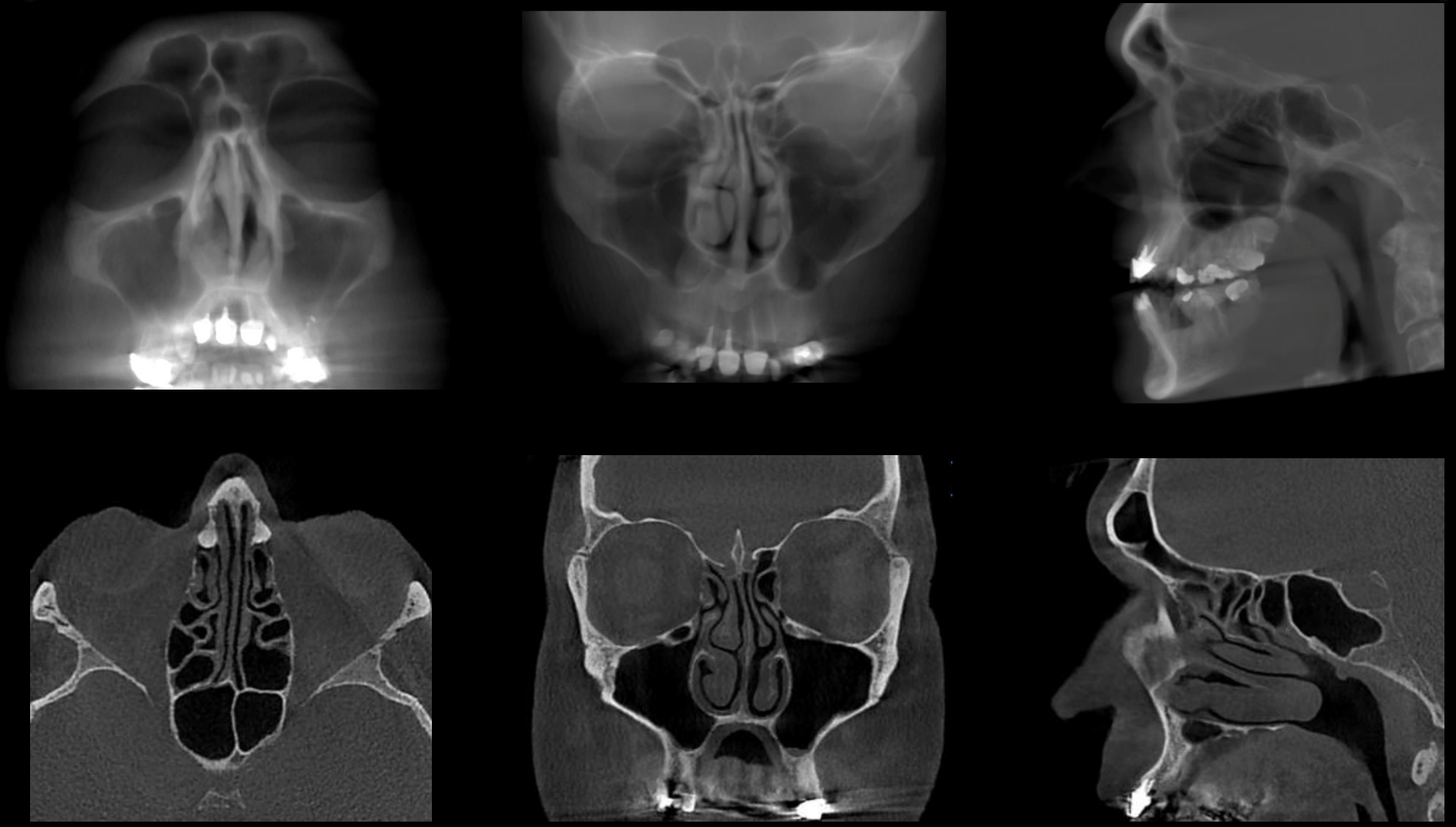


CBCT ?





900-1500 mGy.cm^2

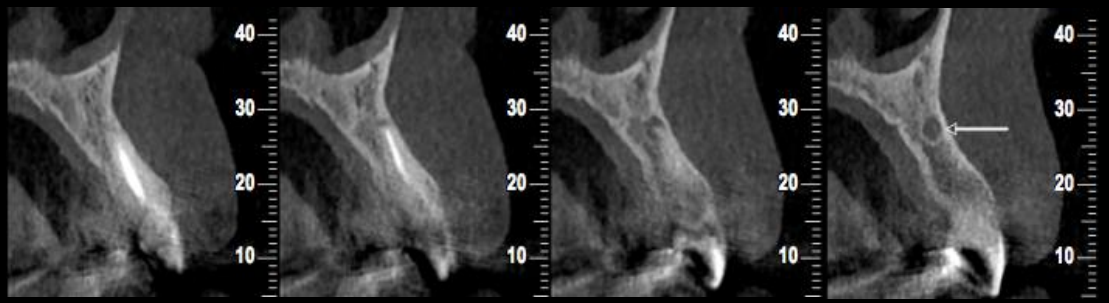


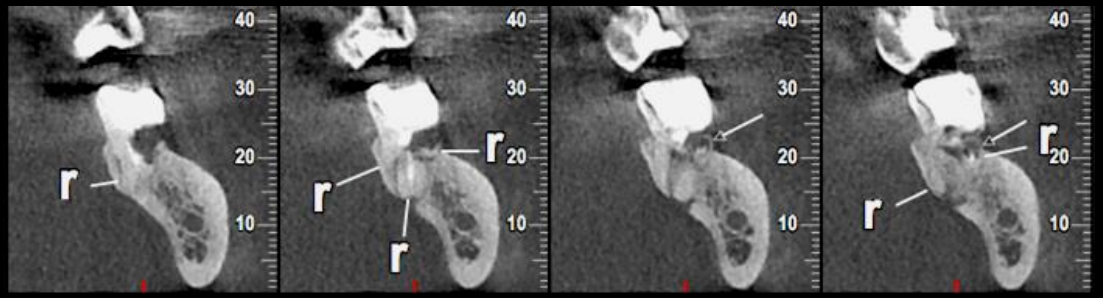
1200-1700 mGy.cm^2

≈ 200 mGy.cm²

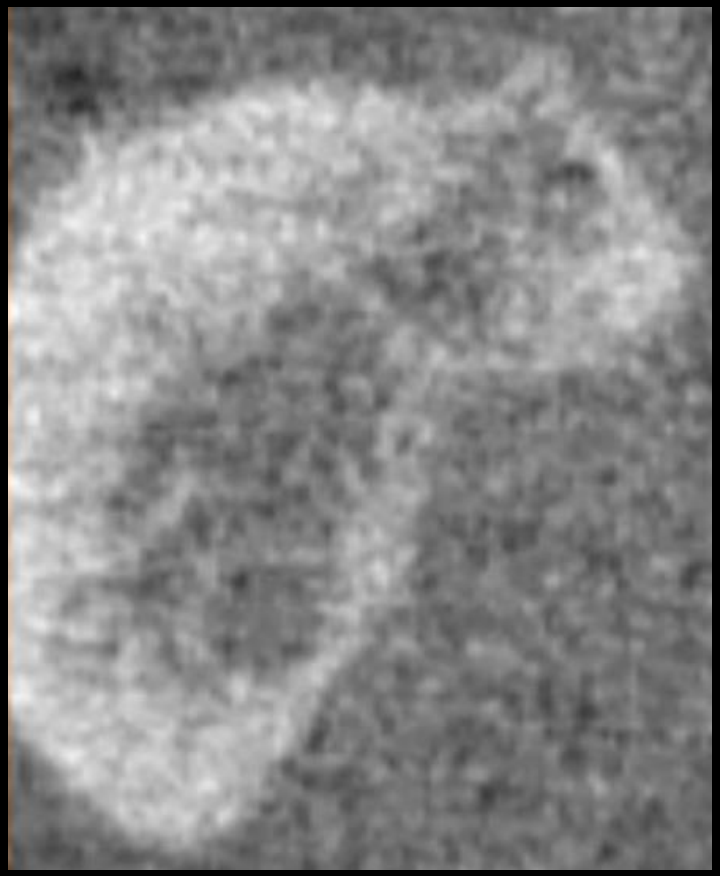
Rétro-reconstructions

150 µm

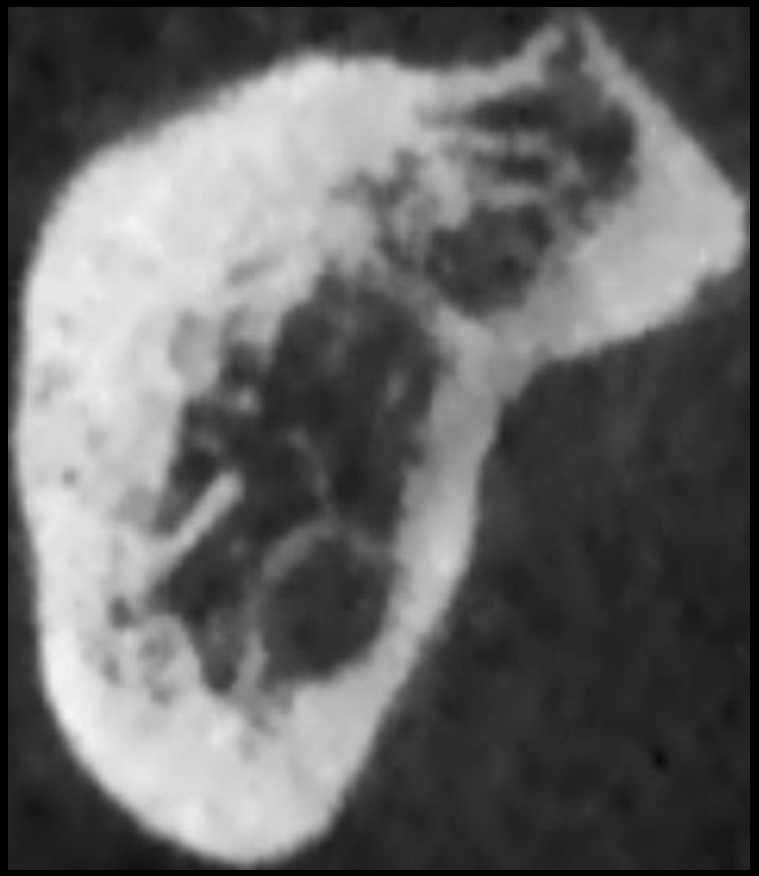




Résolution spatiale



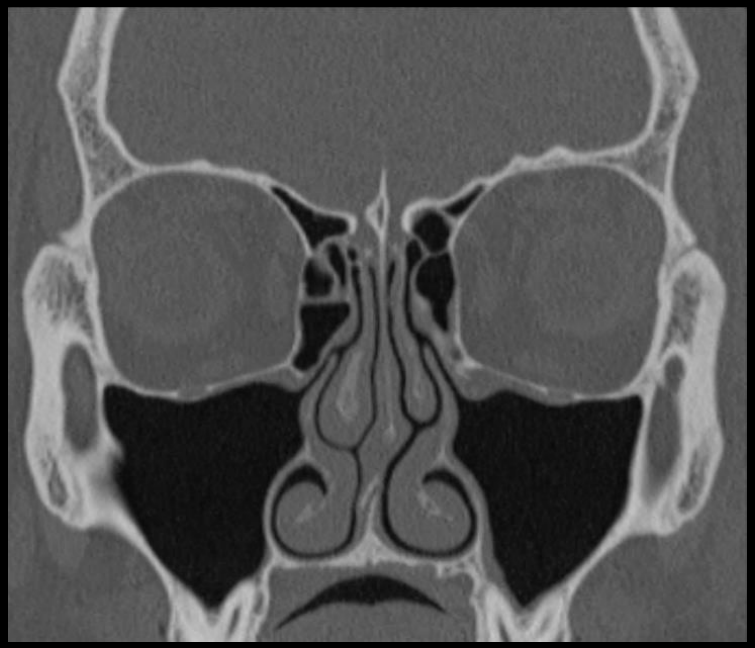
3G-hi-hi 6inch

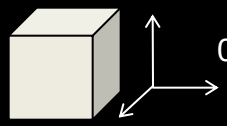


VGI hi-res-zoom

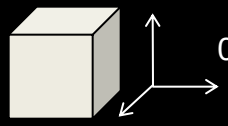
NewTom

MSCT





CBCT



CBCT

MSCT

250µm

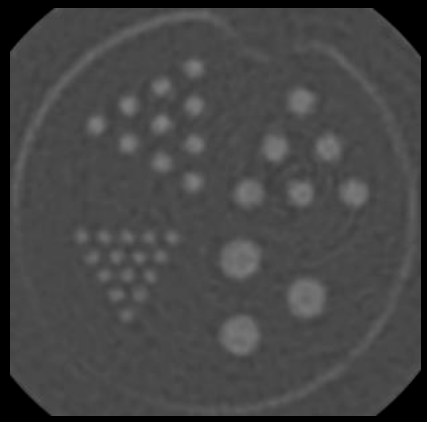
150µm

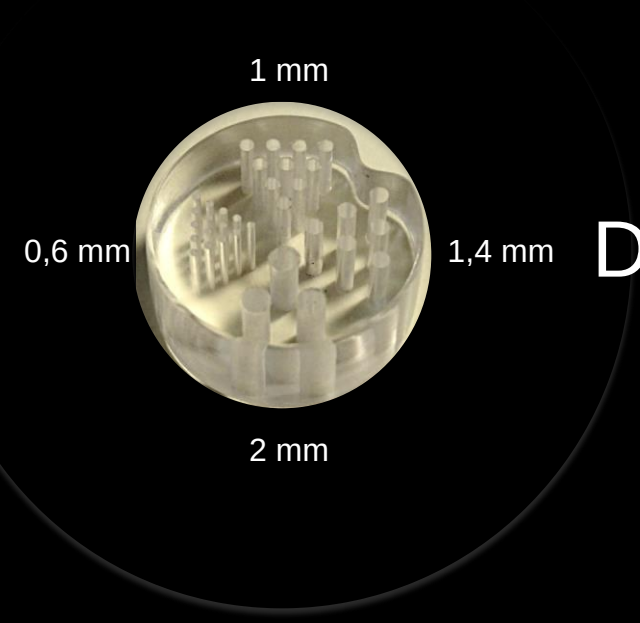
600µm

Sinus

150µm

400µm





Denta

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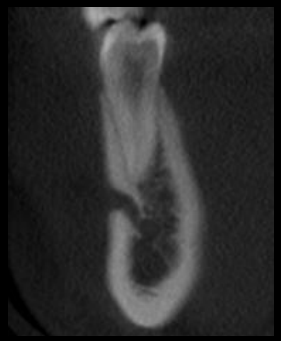
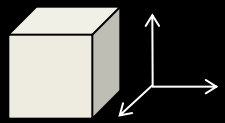


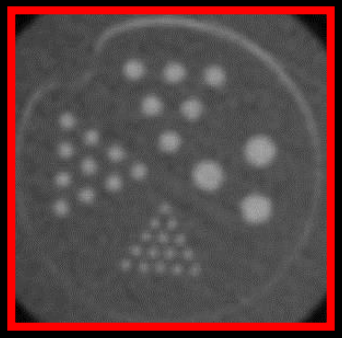
Mars 2010

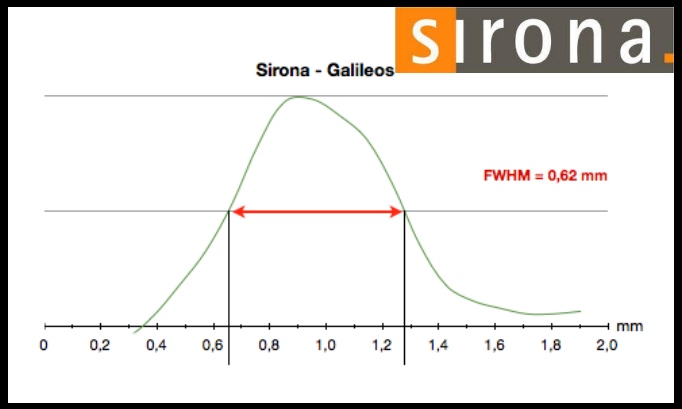
Novembre 2010

Résolution spatiale

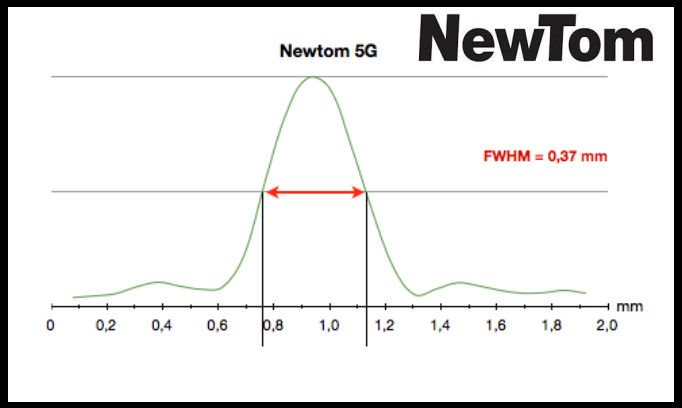


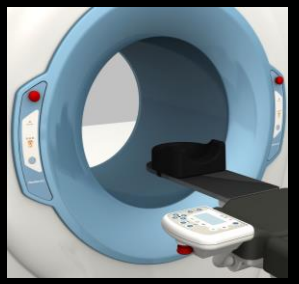
300µm



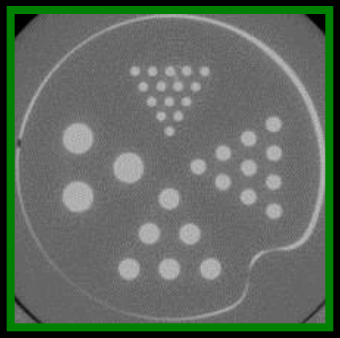


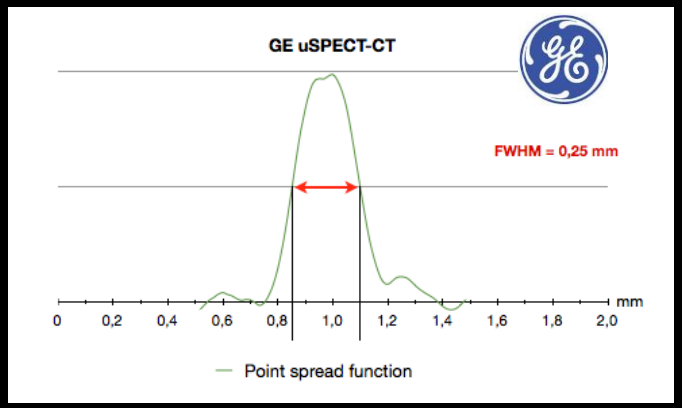
150µm



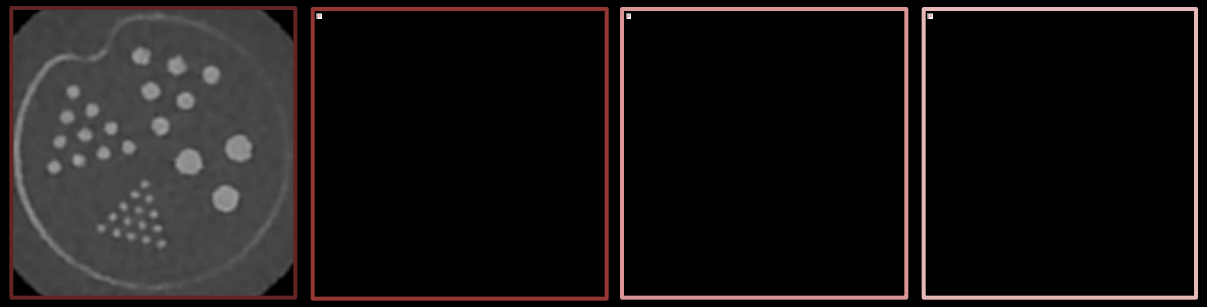


100µm





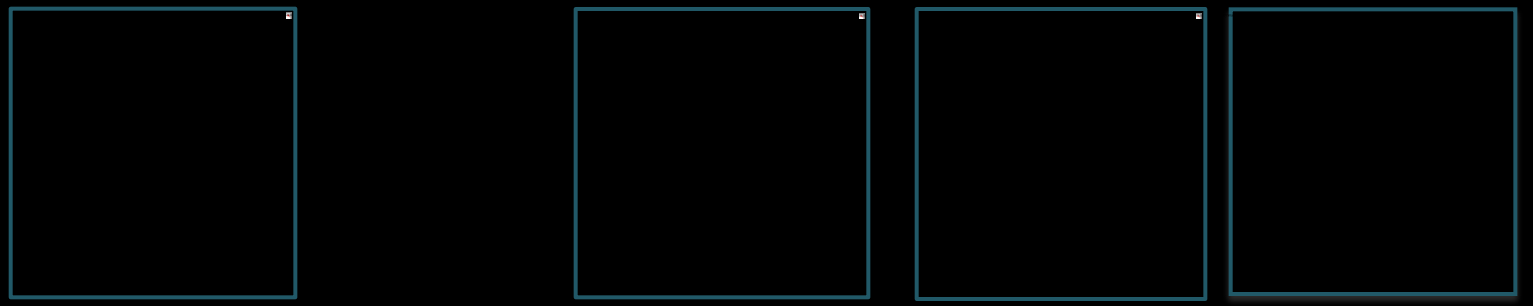
Rétroreconstructions CBCT



150µm 125µm 100µm 75µm

NewTom

125µm 80µm 50µm 20µm



MORITA

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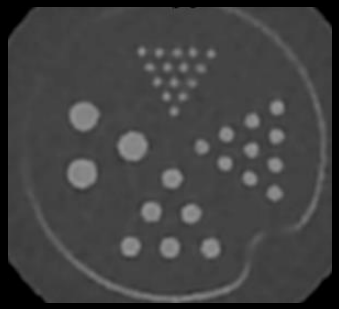
Model [Manufacturer (website)]	Field of View (H x D, in mm)			Voxel Size (μm)
	Maxillofacial	Dentoalveolar	Limited	
3D Accuitomo - XYZ Slice View Tomo[a]			30 × 40	125
3D Accuitomo FPD[a]		60 × 60	40 × 40	125
3D Accuitomo 80[a]		80 × 80; 60 × 60	40 × 40	80–160
3D Accuitomo 170[a]	120 × 170: 100 × 140	100 × 100: 80 × 80:	40 × 40	80–250
Galileos Comfort[c]	150 × 150 × 150			150, 300
Galileos Compact[c]	120 × 150 × 150			300
i-CAT Classic[e]	130 × 160; 200 × 160	80 × 160; 60 × 160; 60 × 80		120–400
i-CAT Next Generation[e]	170 × 230; 130 × 160	80 × 80	Height (1 mm step) from 20–130 × 160.	125–400
ILUMA LFOV[f]	142 × 211			90–400
ILUMA SFOV[f]		96 × 108		90–400
Kavo 3D eXam[g]	170 × 230; 130 × 160	80 × 80	Height adjustable	125–400
Kavo 3D eXam i[g]		80 × 80; 80 × 140	Height down to 40.	125–400
KODAK 9000 3D[b]			37.5 × 50; 37.5 × 90 × 70	76–200
KODAK 9500 3D[b]	184 × 206	90 × 150		200, 300
NewTom 3G[i]	Sphere 200(D)/150(D)	Sphere 100(D)		200–400
NewTomVGi/ VGi Flex[i]	150 × 150; 120 × 150	80 × 120; 80 × 80; 60 × 60		75–300
NewTom 5G[i]	160 × 180; 120 × 150	80 × 120; 80 × 80; 60 × 60		75–300
Orthophos XG 3D[c]		80 × 80		100, 200
Picasso-Trio[j]		70 × 120		200
PreXion 3D[k]		75 × 81	52 × 56	200
ProMax 3D[l]	130 × 140 × 105	80 × 80; 68 × 68;	80 × 40; 68 × 34; 50 × 80; 50 × 40; 42 × 68; 42 × 34	100–400
ProMax 3D Mid[l]	160 × 160; 160 × 90	90 × 160; 90 × 90; 75 × 75; 70 × 70; 60 × 60	50 × 160; 50 × 90; 42 × 75; 50 × 70; 42 × 60; 70 × 40; 60 × 34; 50 × 40; 42 × 34	100–600
ProMax 3D Max[l]	260 × 230; 160 × 230; 160 × 130; 136 × 110; 130 × 130; 130 × 100	110 × 110; 110 × 85; 90 × 130; 75 × 110; 90 × 100; 75 × 85	55 × 130; 50 × 110; 55 × 100; 50 × 85; 55 × 50; 50 × 42	100–600
ProMax 3Ds[l]	130 × 90 × 60		80 × 50; 68 × 42; 50 × 50; 42 × 42	100, 200
Scanora 3D/ENT[m]	130 × 145	75 × 145; 75 × 100; 60 × 60		133–350

Résolution spatiale

150µm

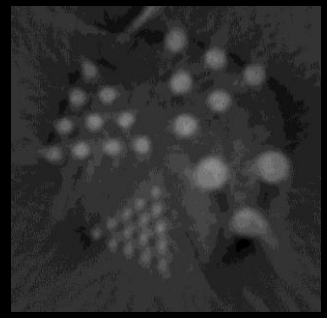


150µm

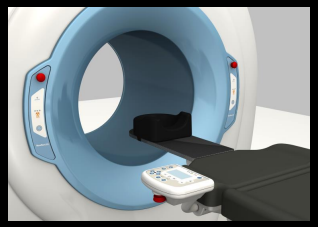
125µm

300µm

320µm



100µm



5G

NewTom

VGi

NewTom

MORITA

sirona

PLANMECA

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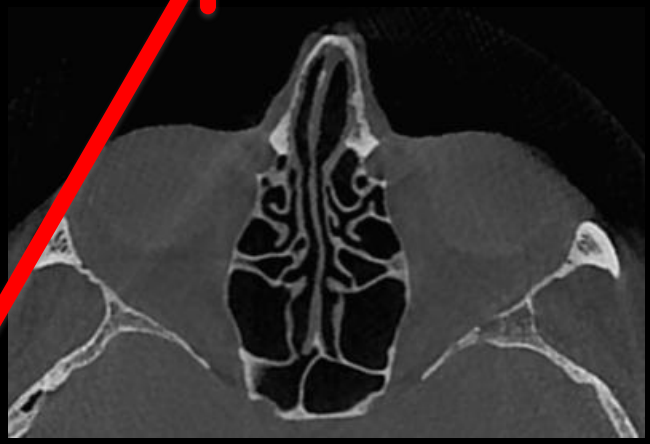
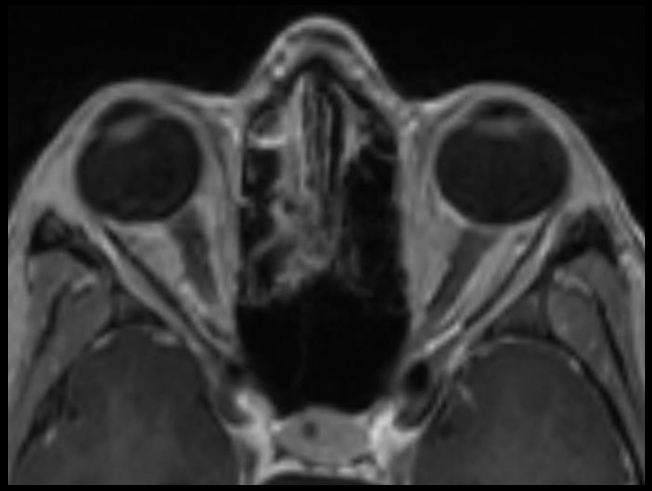
Résolution en Contraste

TDM

CBCT



IRM



Résolution Temporelle

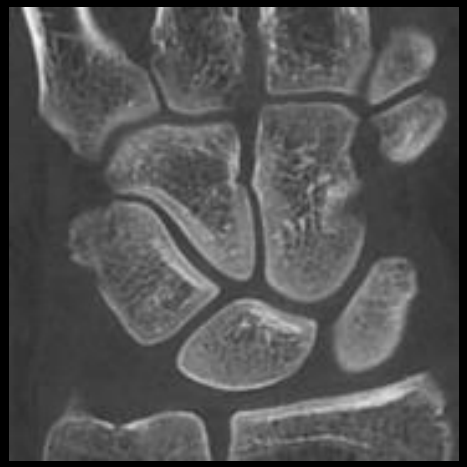
CT-Scan

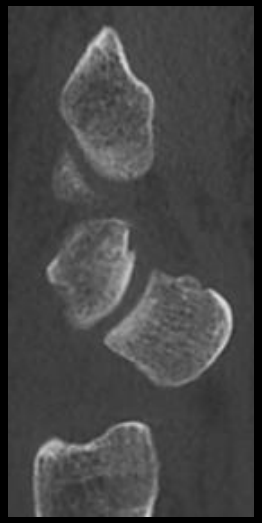
10 - 15 s

CBCT

18 - 26 s

Perspectives





Perspectives

Take Home Message

Faible coût en dose

4 x plus que le standard (OTP,…)

10 x moins que le CT-Scan

Résolution Spatiale +++

CBCT > CT-Scan > IRM

Artefacts métalliques

CBCT > CT-Scan

Résolution en Contraste - - -

CBCT < CT-Scan < IRM

Résolution Temporelle - - -

CBCT < CT-Scan > IRM