

# Cone Beam Computed Tomography

March 6, 2008

# Cone-beam Units



NewTom 3G by AFP



Galileos by Sirona



Mercuray by Hitachi



I-CAT by ISI



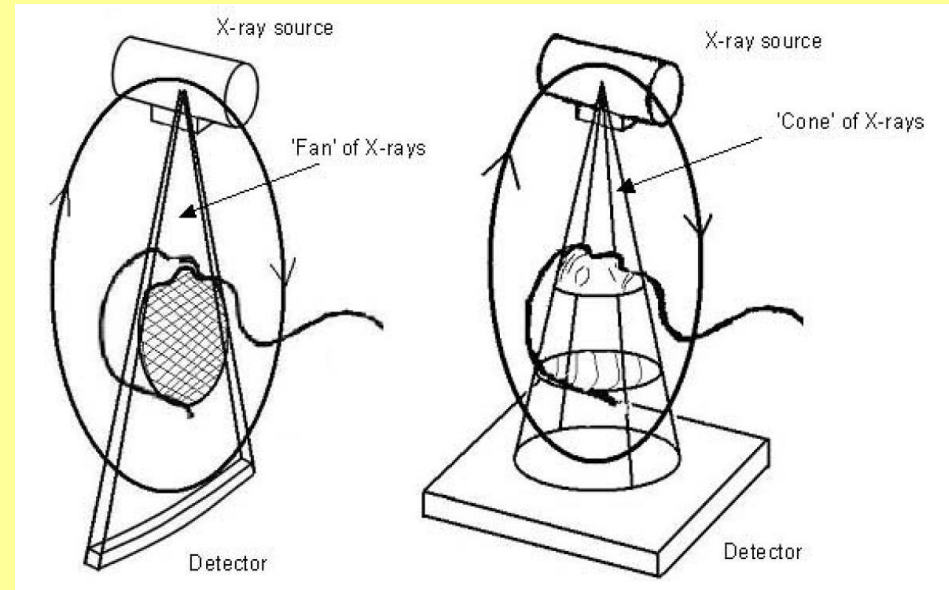
3D Accuitomo  
by J. Morita



Iluma by IMTEC

# How CBCT Works

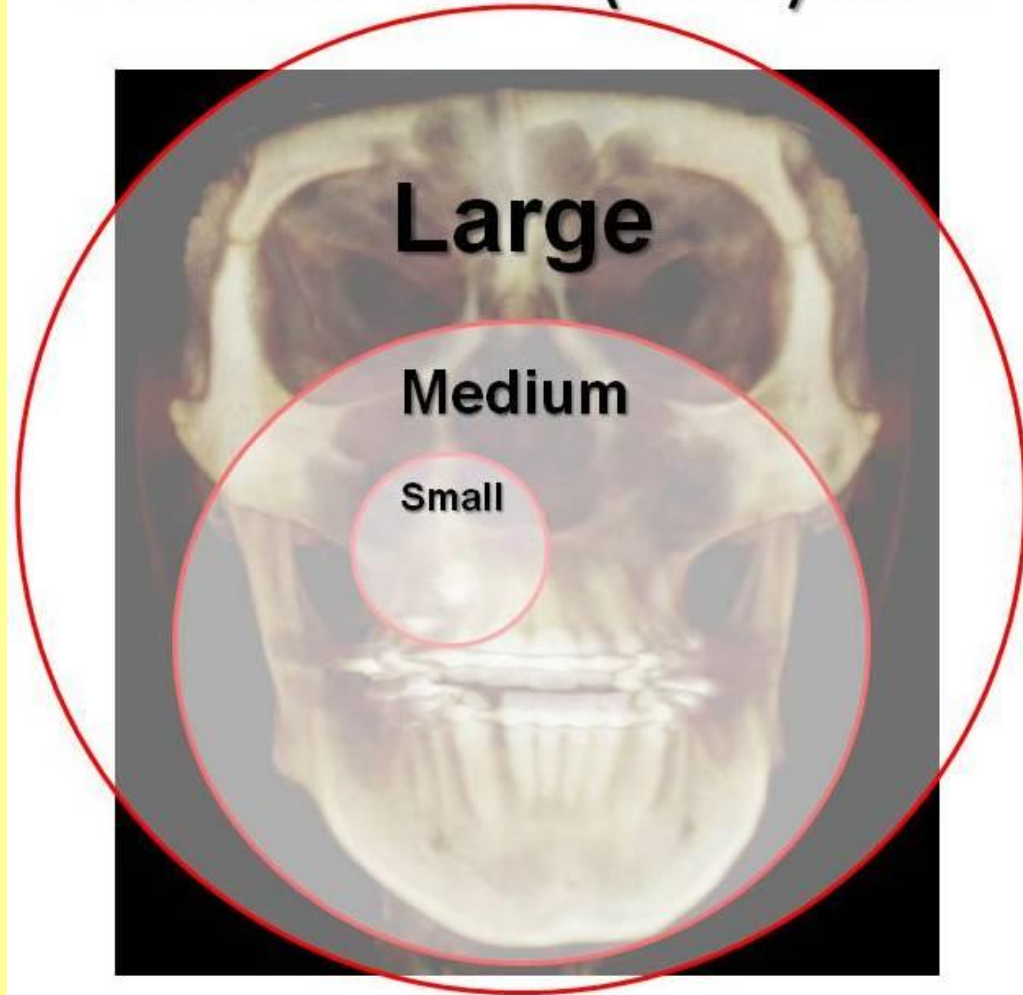
- Similar to current CT technology
- Uses cone shaped x-ray beam
- 2-D flat panel detector
- Gives volumetric data through multiple Rotations with a difference of 1 degree angle between rotations until it produces 3 dimensional image , where we can give different slices in any Direction , Axial , Horizontal , sagital



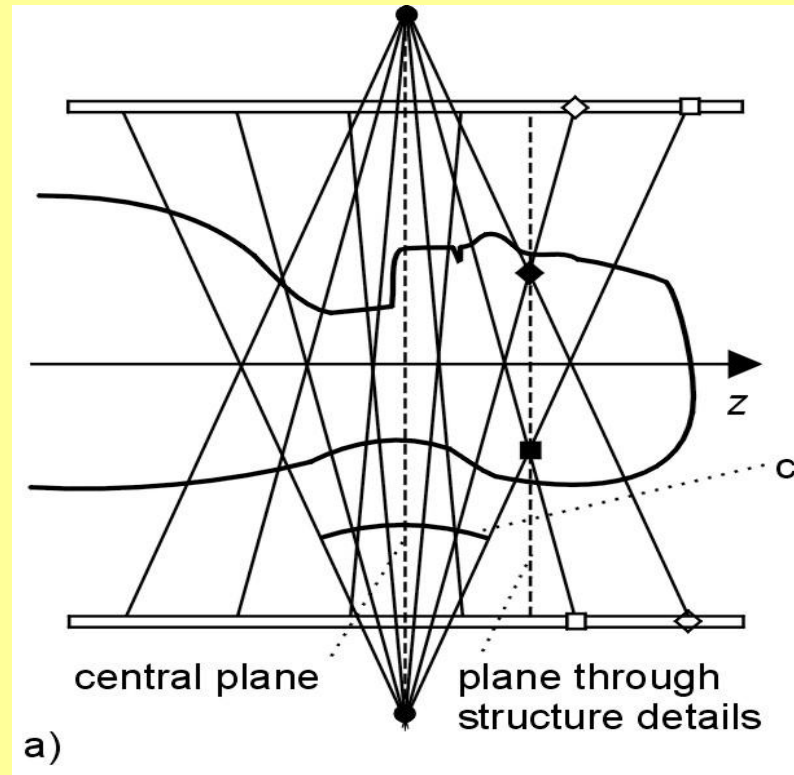
# How CBCT Works

- field of view (FOV)
- The scanner's FOV determines how much of the patient's anatomy you will be able to visualize. ✓

## Field of View (FOV) Size



# How Cone Beam CT Works



- X-rays are used more efficiently
- Cone beam can acquire hundreds of slices per one rotation

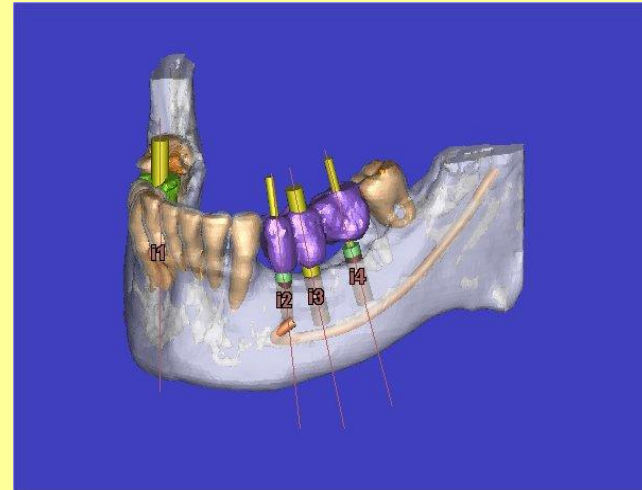
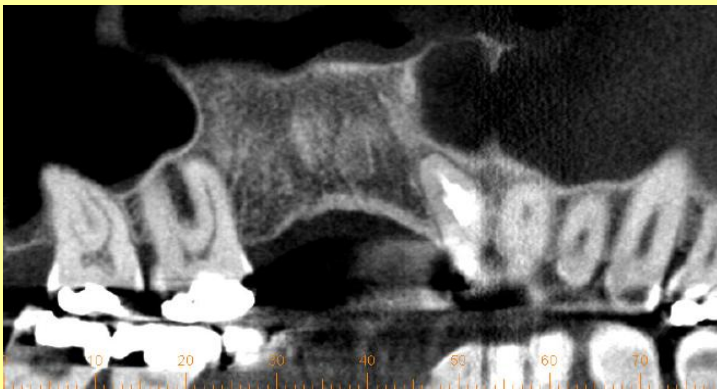
# Dental Applications

Broad acceptance in dentistry last five years

- Orthodontic treatment planning
- Dental implants
- Temporomandibular joints for osseous degenerative changes
- Evaluation of wisdom teeth vs. mandibular nerve
- Disease

# Applications of CBCT (con't)

- Conventional CT diagnosis at 1/5 the dose
- Tumor detection
- Airway visualization





## As an example of Cone Beam 3-D Imaging System

- **3-D volumetric images**
- **True anatomic measurements**
- **Fast Scan Time**
- **Low Radiation**
- **Higher resolution for all views**





# Advantages in Dental Imaging

- Lower dose than helical CT
- Compact design
- Superior images to conventional 2 dimensional projections
- Low cost
- Low heat load

## Dose:

Panoramic: 6-20  $\mu\text{Sv}$

CBCT: 20-70  $\mu\text{Sv}$

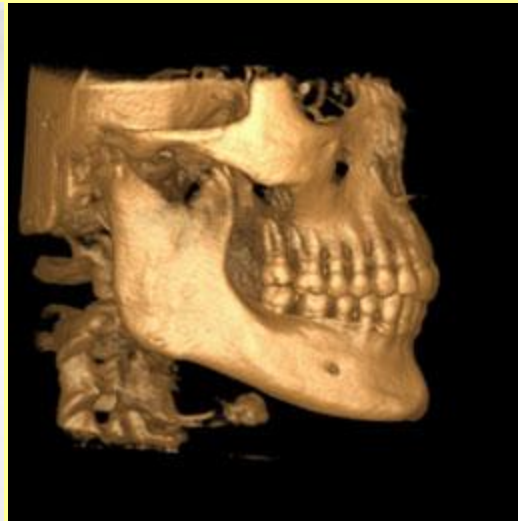
Conventional CT: 314  $\mu\text{Sv}$



# CBCT vs. Panoramic



The i-Cat CBCT



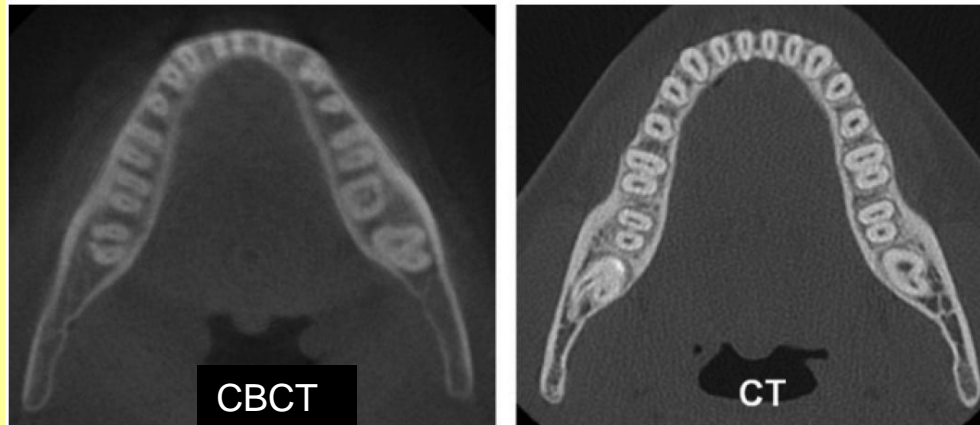
Cephalometric CBCT  
image



Cephalometric  
conventional image

# Shortcomings

- Metal artifacts?
- Worse low contrast detectability
- Long scan times = motion artifacts
- Slightly Inferior quality to conventional CT



Periodontal ligament spaces easily recognizable in the dental CT but not satisfactory in the CBCT

# Cephalometric Analysis



# Conclusions

- CBCT offers less dose than conventional CT
- CBCT offers superior images and diagnosis to conventional machines
- More practical than a conventional CT

