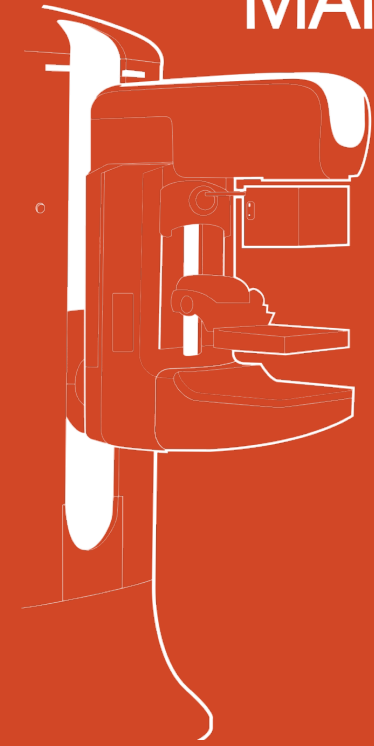


MAMMO



Mammography



Leeds Test Objects
medical imaging phantoms



TOR MAS / MAX



TOR MAS includes:

- TOR MAS phantom
- attenuator stack
- magnifier

TOR MAX includes:

- TOR MAX phantom
- attenuator stack
- magnifier

TOR MAS / MAX

Phantom Positioning:

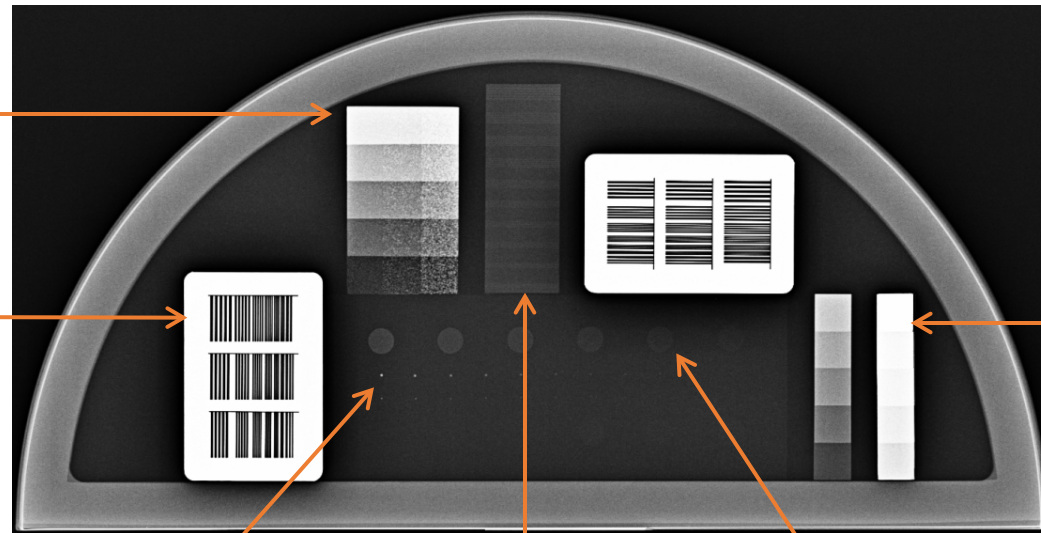
- use a 3.5cm attenuator stack as standard
- place assembly on the breast platform with the straight edge at the chest wall

Exposure Conditions:

- refer to user manual (for routine QC, obtain a test image at 28kVp under AEC)
- Same each time



TOR MAX



micro-particle
step wedge

high-contrast
resolution gratings
(26 groups from 1-
20LP/mm)

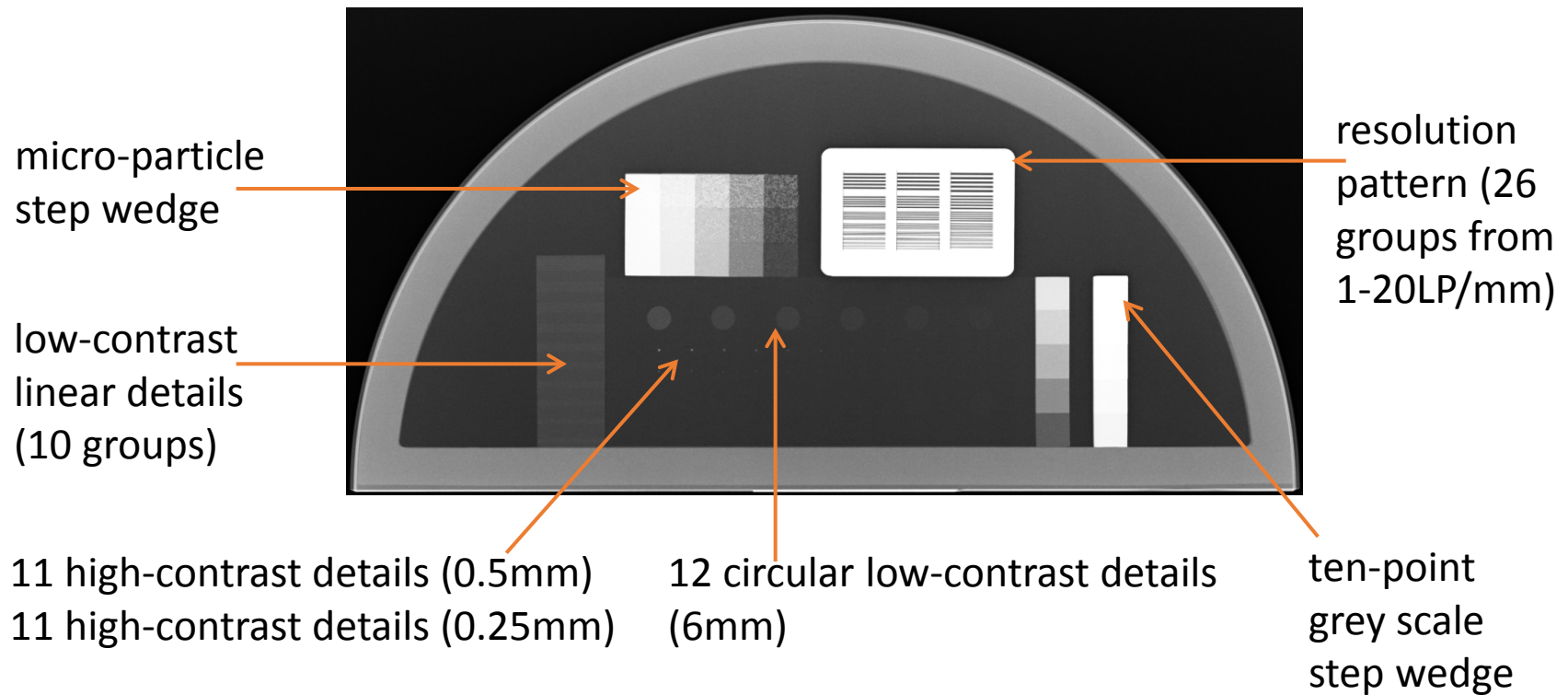
11 high-contrast details (0.5mm)
11 high-contrast details (0.25mm)

low-contrast linear
details (10 groups)

12 circular low-contrast
details (6mm)

ten-point
grey scale
step wedge

TOR MAS





TOR MAS / MAX

Actions:

- perform the tests at acceptance to establish a baseline
- continue to perform the tests on a routine basis
- repeat any test(s) that failed to verify the result
- refer to common protocol
- in the UK - IPEM Report 89 and NHSBSP pub 604-3 :2009

TOR MAM



TOR MAM includes:

- TOR MAM phantom
- attenuator stack
- magnifier

TOR MAM

Phantom Positioning:

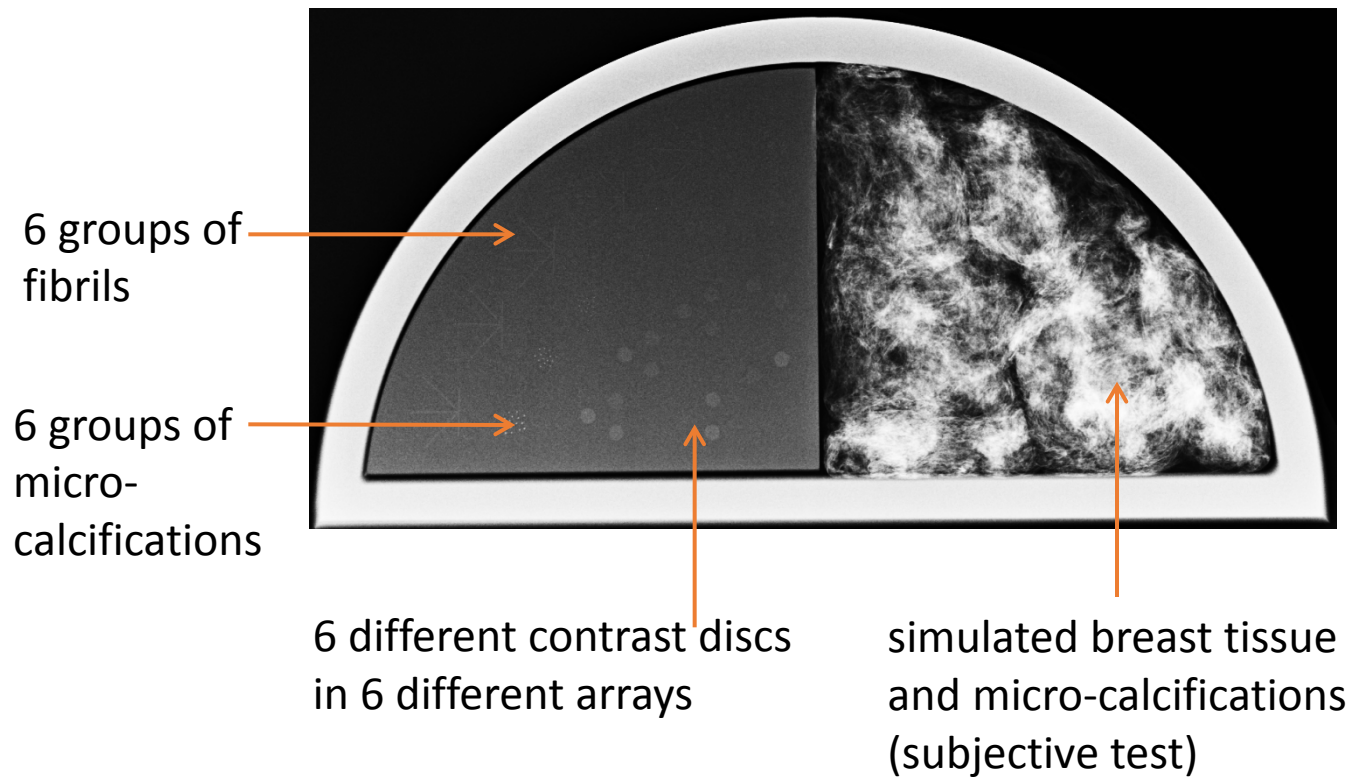
- place TOR MAM on top of a 3cm high stack (equivalent to 4.5cm 'standard' breast)
- place the straight edge of the assembly at the chest wall edge of the breast platform

Exposure Conditions:

- refer to user manual (for routine quality control, obtain a test image at 28kVp under AEC) or recommended clinical setting



TOR MAM





TOR MAM

Actions:

- repeat any test(s) that failed to verify the result
- refer to common protocol
- in the UK - IPEM Report 89 and NHSBSP pub 604-3 :2009



PIXMAM



PMMA plates with a dimensional tolerance of $\pm 0.1\text{mm}$
(1pc) 300 x 240 x 20mm (including encapsulated 20x20mm 99.99% Al foil)
(2pc) 300 x 240 x 20mm
(1pc) 300 x 240 x 10mm
(1pc) 300 x 240 x 5mm

PIXMAM

Phantom Positioning :

- place the phantom on the breast platform

Exposure Conditions:

- refer to user manual
- typically carried out at the recommended clinical setting





Test procedures are laid down in the NHSBSP Report 0604 version 3:2009

PIXMAM enables the following tests:

- uniformity
- artefacts
- SNR
- CNR
- AEC checks



PIXMAM

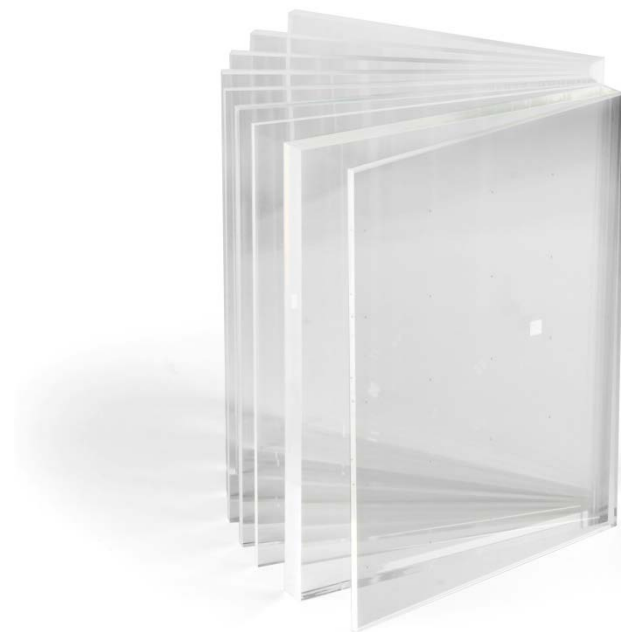
Actions:

- refer to common protocol
- for example in Europe – EUREF 4th edition of the European Guidelines for Quality Assurance in Breast Cancer Screening and Diagnosis
- in the UK - NHSBSP pub 604-3 :2009
- in the UK - NHSBSP pub 702-1 :2007

PIXMAM-3D



Additional 5mm PMMA plate with embedded 1.0mm dia Al spheres



PIXMAM-3D



Allows the user to measure Z-resolution in breast tomosynthesis systems.

Set up as for FFDM

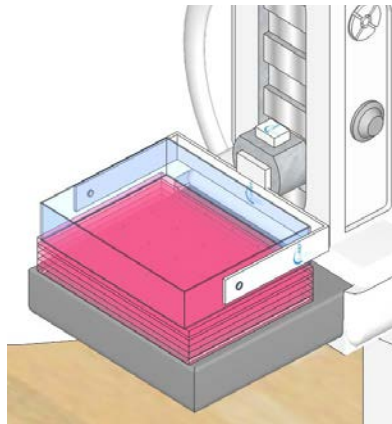
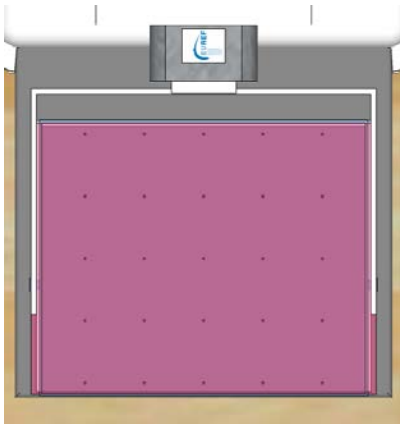
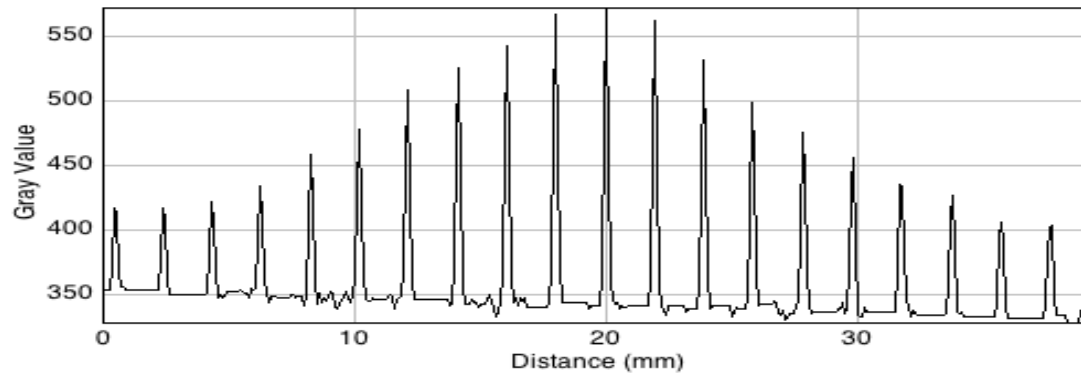
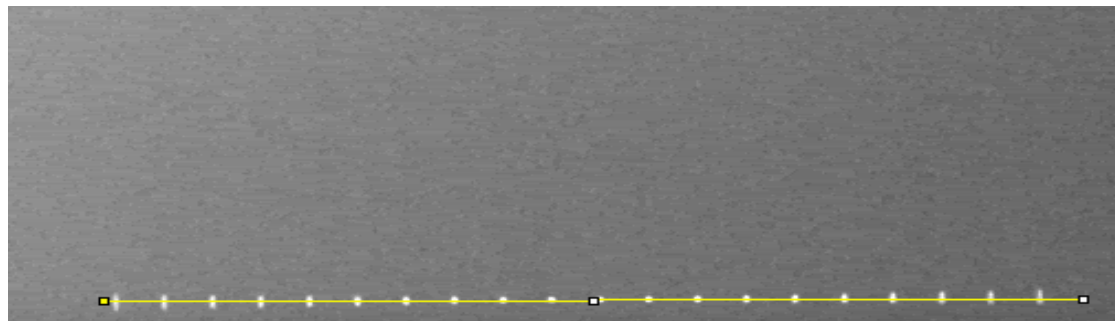


Image dataset acquired by tomosynthesis

Re-sliced to coronal slices

PIXMAM-3D

Draw a profile through the line of spheres, check FWHM. This is proportional to the slice thickness



DMAM 2



DMAM 2 includes:

- Threshold contrast phantom
- MTF phantom
- PIXMAM attenuator stack
- radiopaque mesh (400micron)
- radiopaque grid
- collimation rulers and screens
- aluminium filter
- EPE spacers
- stainless steel plate (1mm)

DMAM 2

Phantom Positioning:

- place each of the test phantoms on the breast platform

Exposure Conditions:

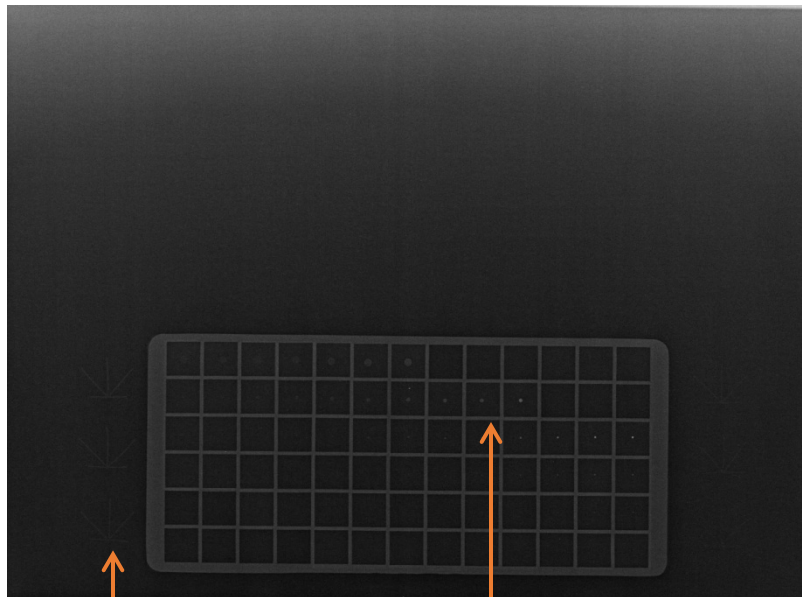
- refer to user manual
- generally the clinical exposure settings are selected



DMAM 2

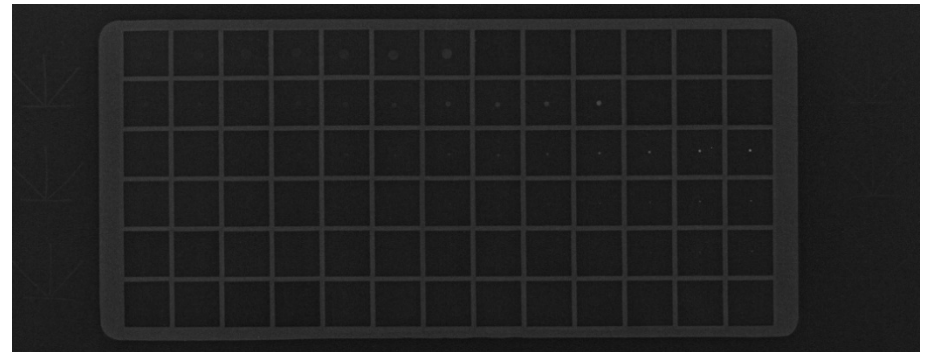


Threshold contrast phantom

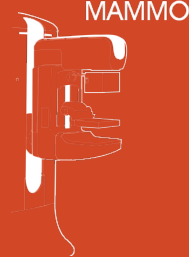


6 groups of
fibrils

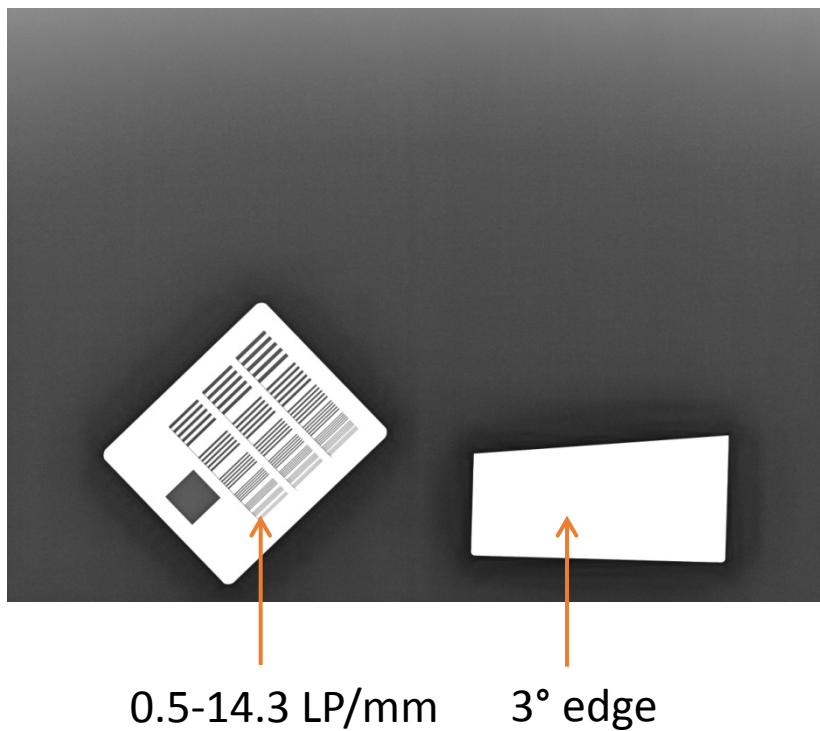
63 contrast details
in 6 sizes



DMAM 2



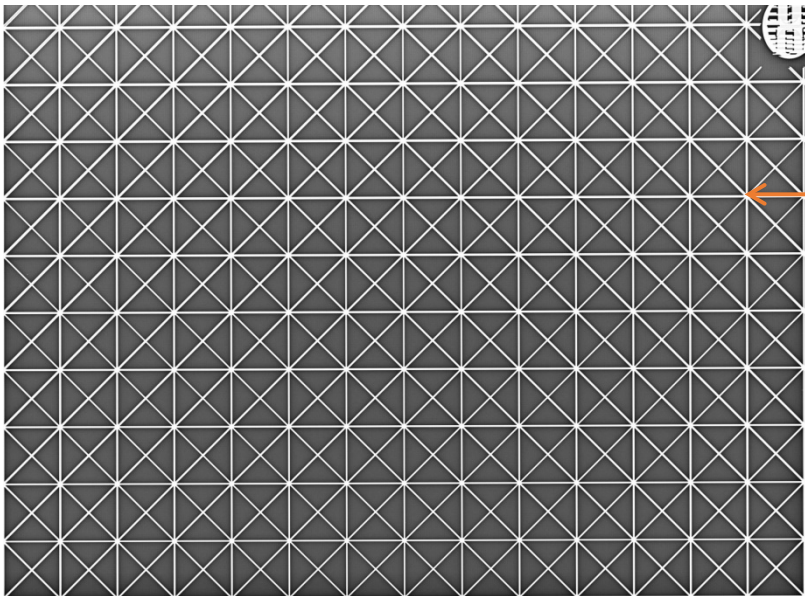
MTF phantom



DMAM 2



Geometric Distortion - radiopaque grid

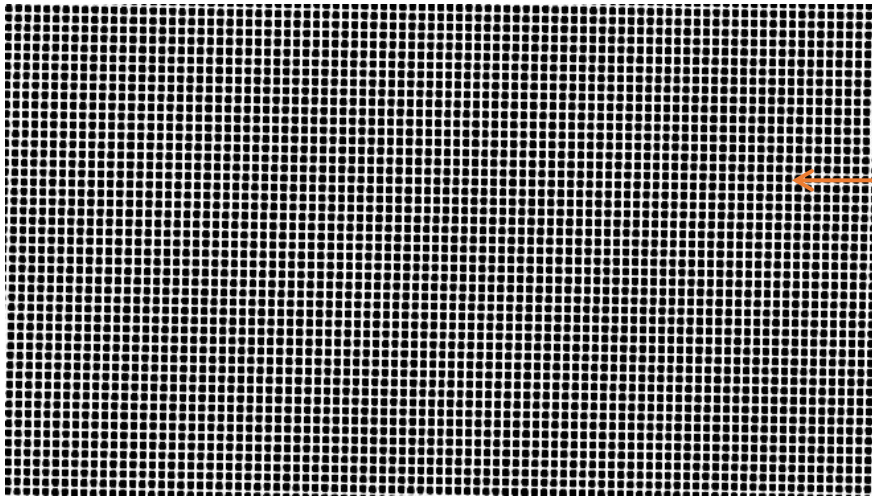


horizontal, vertical and
diagonal lines covering an
area 300 x 240mm

DMAM 2



Homogeneity, Artefact Evaluation - radiopaque mesh



← precision test mesh



DMAM 2

Actions:

- repeat any test(s) that failed to verify the result
- refer to common protocol
- EUREF Protocol "*European Protocol for the Quality control of the physical and technical aspects of mammography screening*". The user must obtain a copy of this protocol (EUREF website www.euref.org)
- IAEA Protocol "Human Health Series 17 – Quality Assurance Programme for Digital Mammography". The user must obtain a copy of this protocol (IAEA website http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1482_web.pdf)

COARTO



COARTO includes:

COARTO breast
compression scale
(maximum measurement
of 300N or 30kg)

compressible rubber block
(to protect the bucky and
compression device)

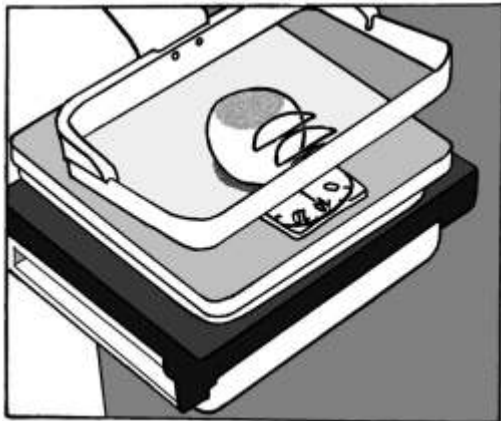
Breast compression:

application of a compression force to the breast during image acquisition

Compression is important for image quality because it:

- immobilises the breast, which limits motion artefacts
- reduces breast thickness, which limits scatter effects
- makes breast thickness approximately uniform, which reduces geometrical unsharpness

COARTO allows testing of the breast compression device

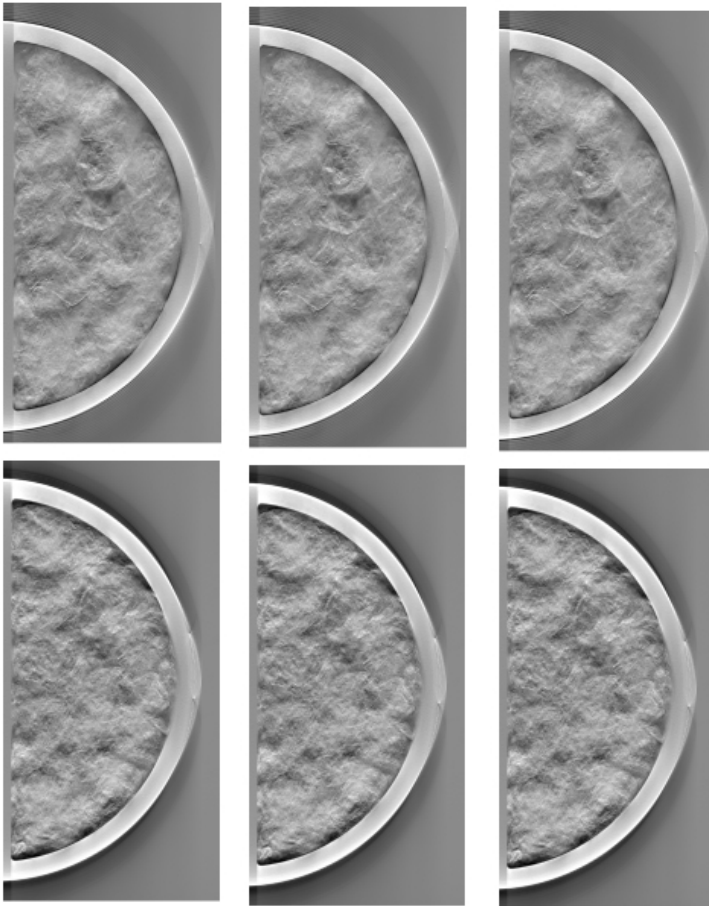


measured value on COARTO must correspond with the compression force indicated on the mammography console

the applied compression force must be maintained over a period of 1 minute

COARTO meets the IPEM Report 89 (UK) and EUREF (Europe) protocols

VOXMAM



VOXMAM breast tomosynthesis phantom includes:

- Breast mimicking phantom
- Protective case

Phantom Positioning:

- place the test phantom on the breast platform

Exposure conditions:

- refer to user manual
- generally the clinical exposure settings are selected



VOXMAM



Simulated breast tissue structure

110 mm radius
40mm height

Contains four groups of micro-calcifications

Every phantom has a **unique** structure, therefore not suited to comparison with other VOXMAM units. Ideal for R&D.

DENTAL

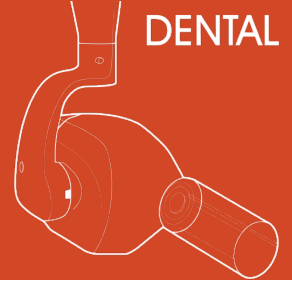
Dental



Leeds Test Objects
medical imaging phantoms



TOR DEN Digital +



TOR DEN Digital + includes:

- Phantom
- Tripod

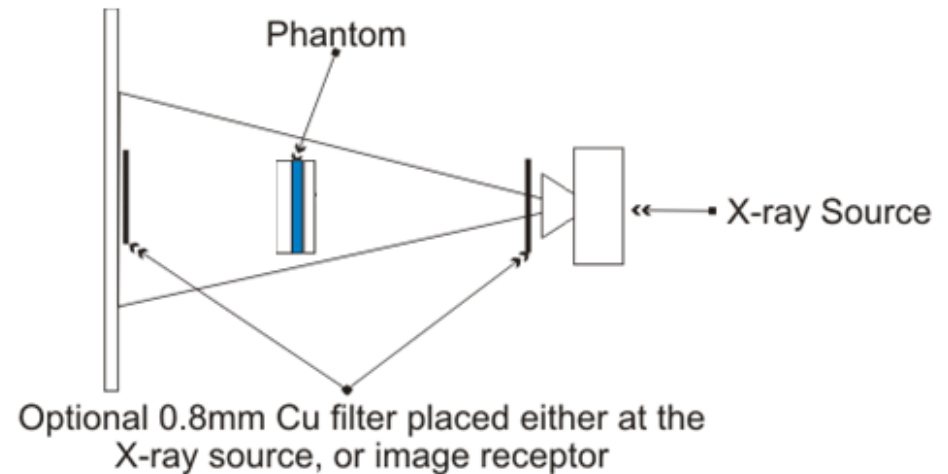
TOR DEN Digital +



Phantom Positioning:

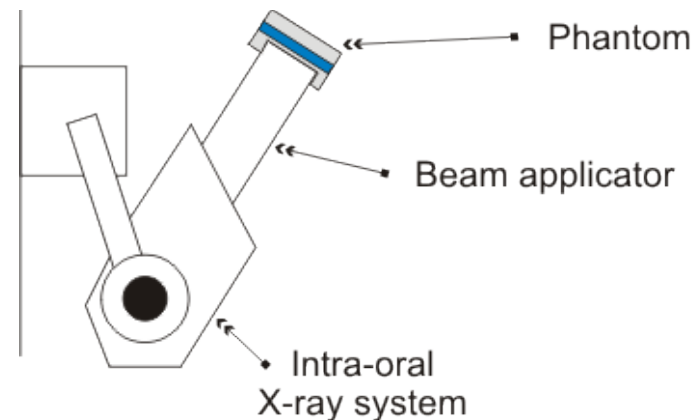
Panoramic systems (OPG):

- fix phantom onto tripod
- position central to the field of view



Intra-oral system:

- Position onto end of beam applicator
- Position detector into phantom
- If detector is small, reverse phantom to image other test details



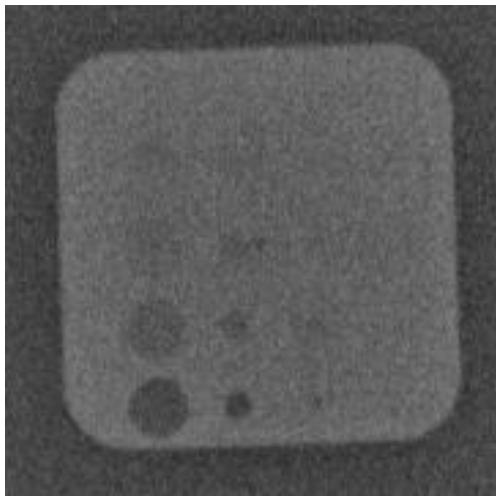
Exposure Conditions:

- Refer to User Manual
- Same each time

TOR DEN Digital +

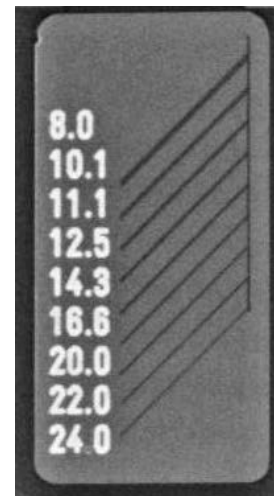


Contrast Resolution



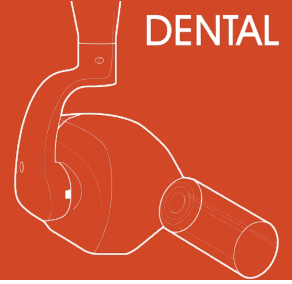
series of circular details of
varying diameter and contrast
- sensitive for dental systems

Limiting Spatial Resolution



8 to 24 LP/mm
- sensitive enough for all
current clinical dental systems

TOR DEN Digital +



Actions:

- Repeat any test(s) that failed to verify the result
- Refer to common protocol
- e.g. IEC 61223-3-4 Evaluation and routine testing in medical imaging departments; Part 3-4: Acceptance tests Imaging performance of dental X-ray equipment

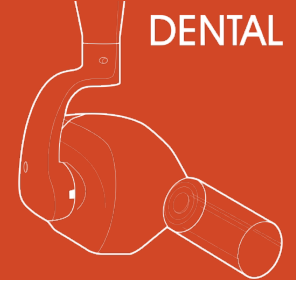
TO PAN



TO PAN includes:

- Phantom
- Tripod

TO PAN



Phantom Positioning:

- Fix phantom onto tripod
- Position central to the field of view

Phantom goes here

Tripod goes here

Exposure Conditions:

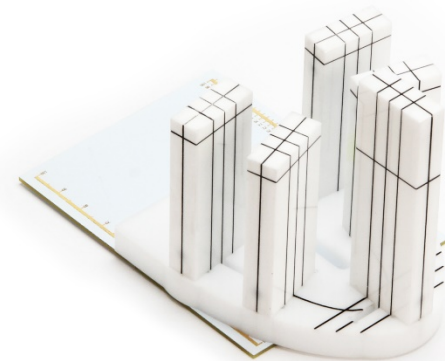
- Refer to user manual
- Same each time



TO PAN



Determination of focal trough

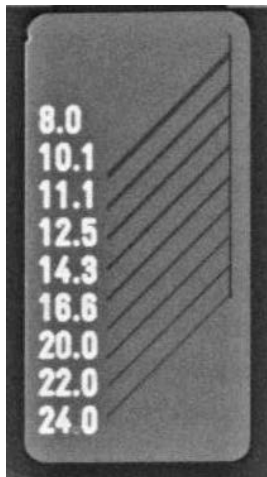


Correct
patient
position

TO PAN

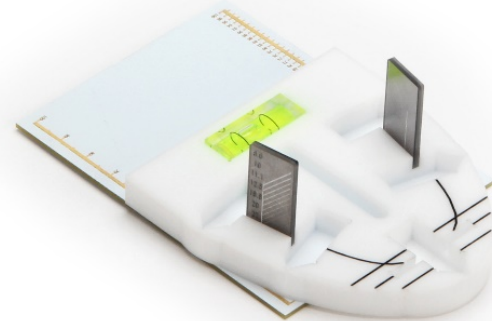


Limiting Spatial Resolution

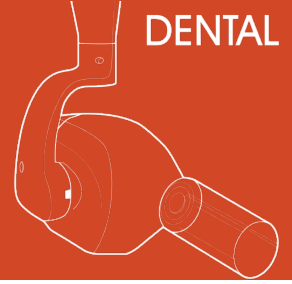


8 to 24 LP/mm

- sensitive enough for all current clinical dental systems



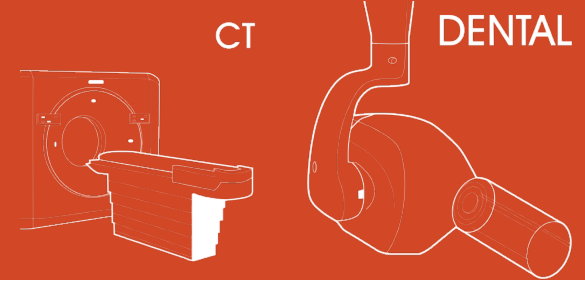
TO PAN



Actions:

- Repeat any test(s) that failed to verify the result
- Refer to common protocol

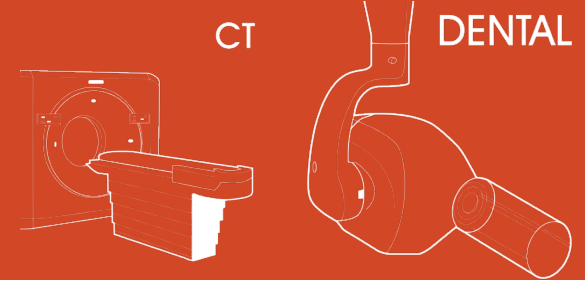
SedentexCT IQ



SEDENTEXCT IQ includes:

- PMMA housing
- Various test inserts (commissioning/acceptance)
- Lid
- Tripod

SedentexCT IQ



Phantom Positioning:

- Screw onto tripod
- Use alignment markers
- Reproducible positioning

Phantom goes here

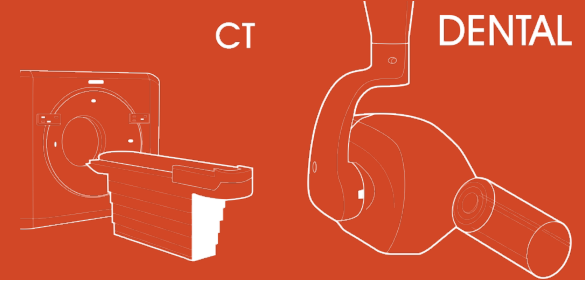
Tripod goes here

Exposure Conditions:

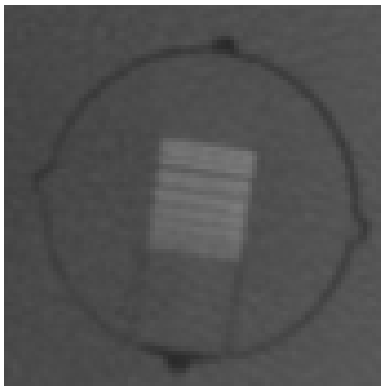
- Refer to user manual for details



SedentexCT IQ

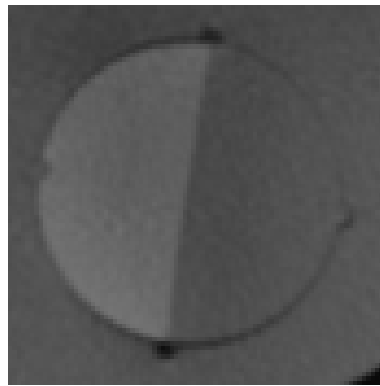


3D spatial resolution test pattern



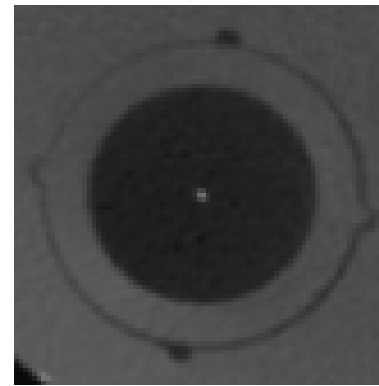
7 groups of
discs between
1.0-5.0 LP/mm
2 orientations for
3-D

Line spread function (ESF)



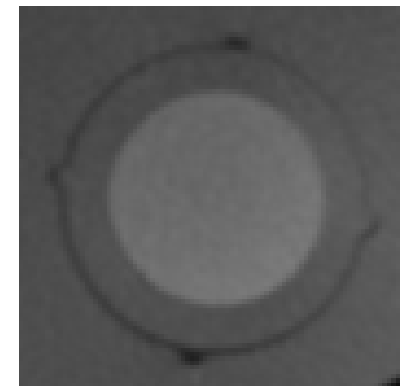
Straight edge
between two
different
contrast regions

Point spread function (PSF)



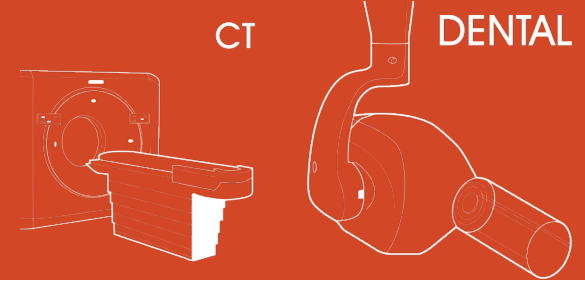
0.25mm
diameter
high contrast
wire

Pixel intensity Value (PIV)

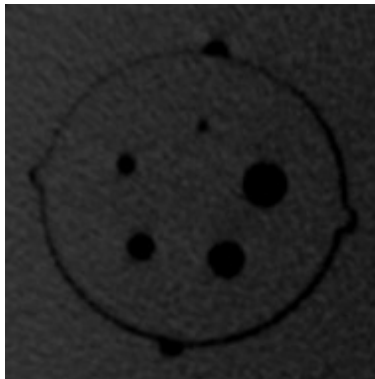
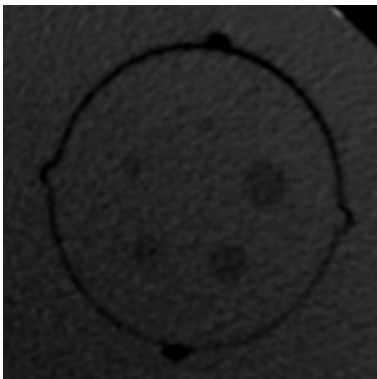
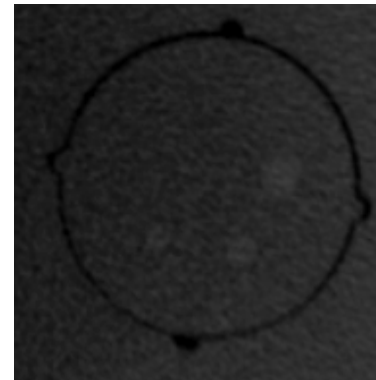
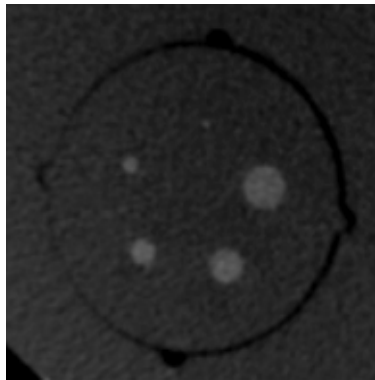
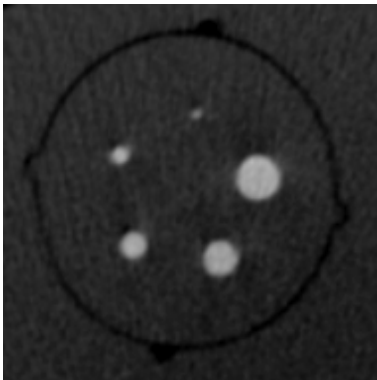


5 discs of various CT
number - checking
reproducibility
(mean and standard
deviation)

SedentexCT IQ



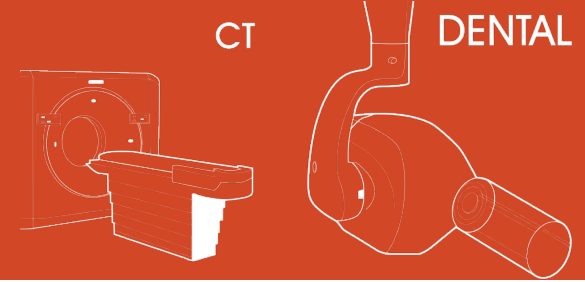
Contrast resolution



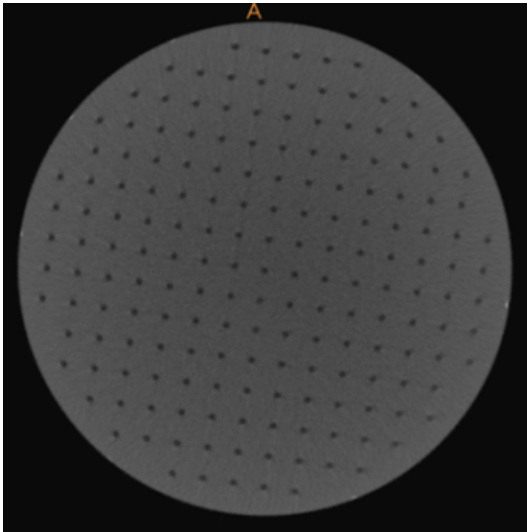
25 circular contrast details
arranged in groups of 5;
1-5mm diameter

Imaged to test the phantom;
clinical conditions would
show less resolved details

SedentexCT IQ

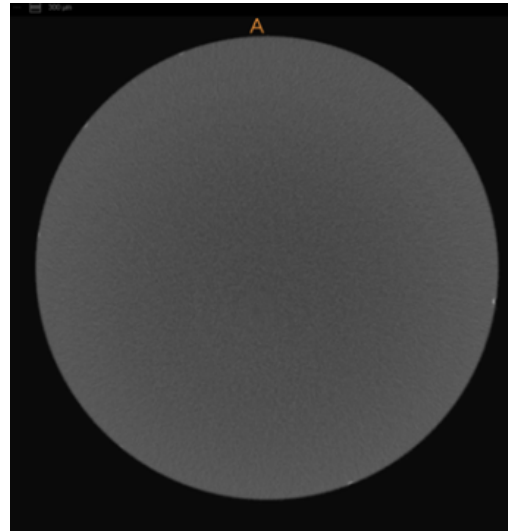


Geometric Distortion



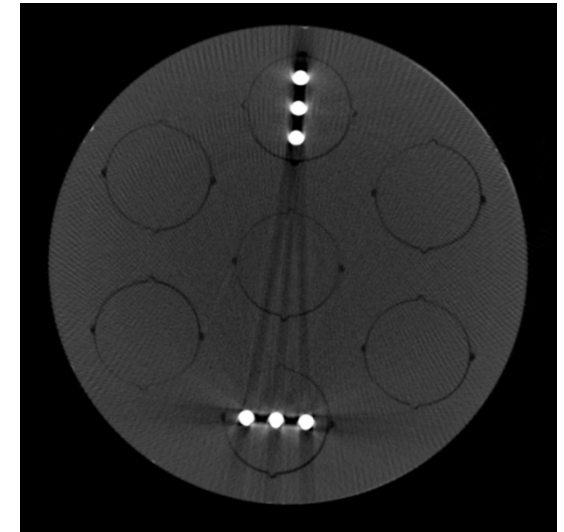
Grid of 3mm holes at fixed pitch

Homogeneity & Noise



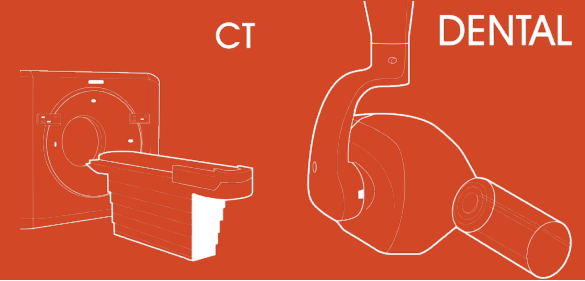
Blank volume (3-D)

Artefact Evaluation



High contrast rods

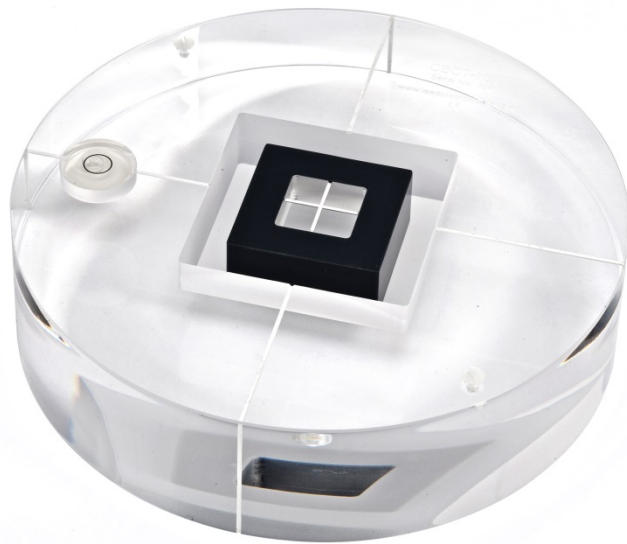
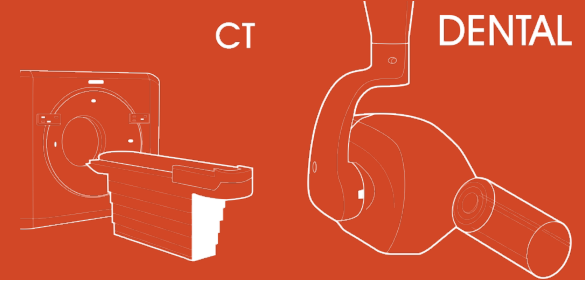
SedentexCT IQ



Actions

- Repeat any test(s) that fail to verify the result
- Refer to common protocol (SEDENTEX-CT Guidelines)
- <http://www.sedentexct.eu/>

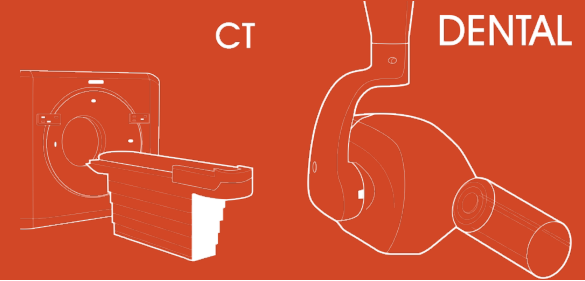
CBCT-161



CBCT-161 includes:

- Phantom
- Protective bag
- Tripod

CBCT-161



Phantom Positioning:

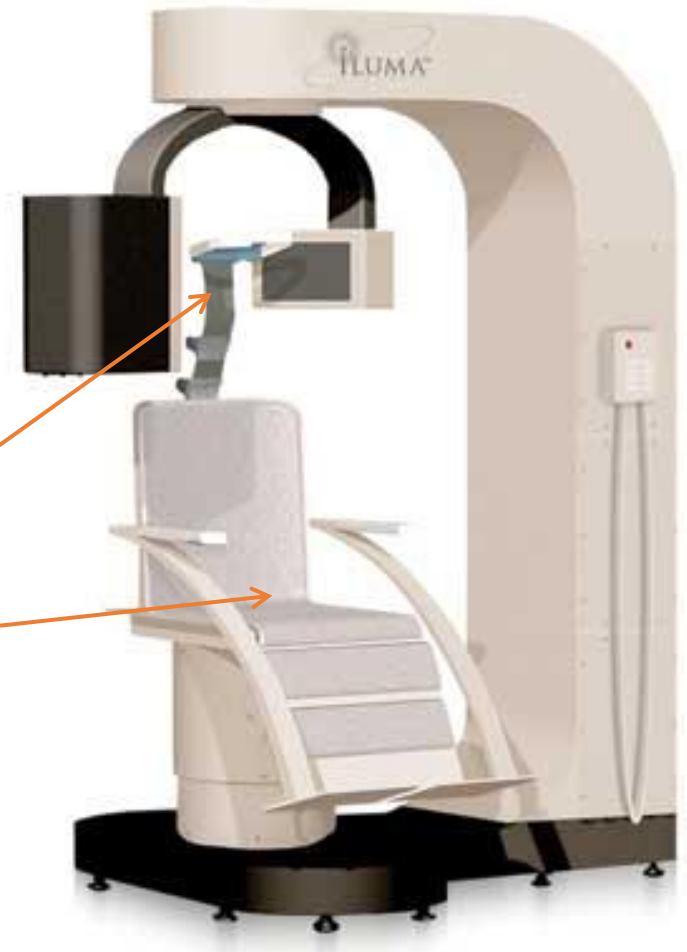
- Screw onto tripod
- Use alignment markers
 - Reproducible positioning
 - Phantom must be level

Phantom goes here

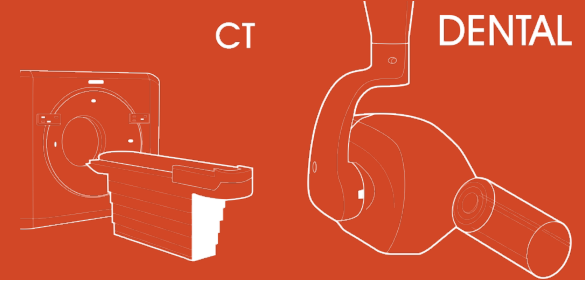
Tripod goes here

Exposure Conditions:

- Refer to User Manual for details
- Same each time, and same as for acceptance

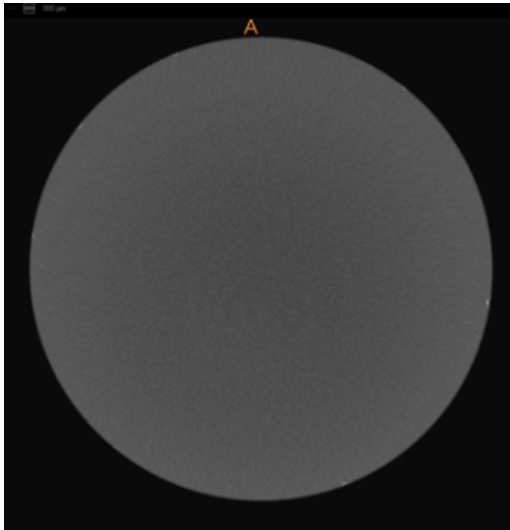


CBCT-161

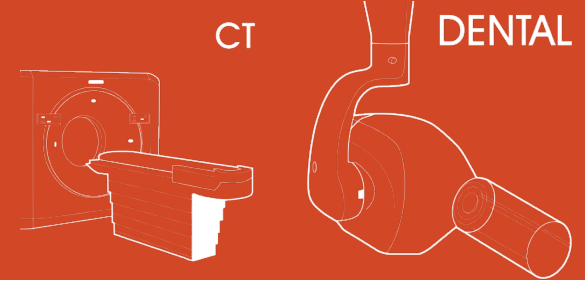


Noise / Uniformity

Using the uniform PMMA section

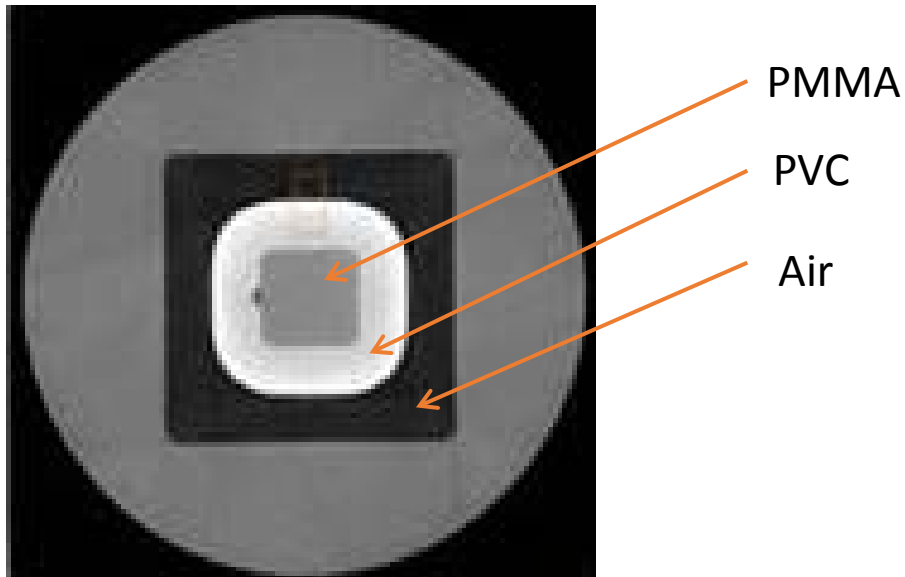


CBCT-161

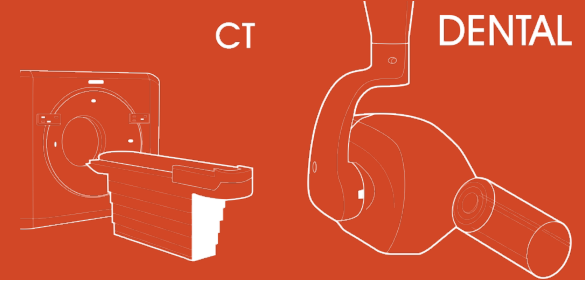


Pixel Intensity Value (PIV) Linearity (analagous to CT#)

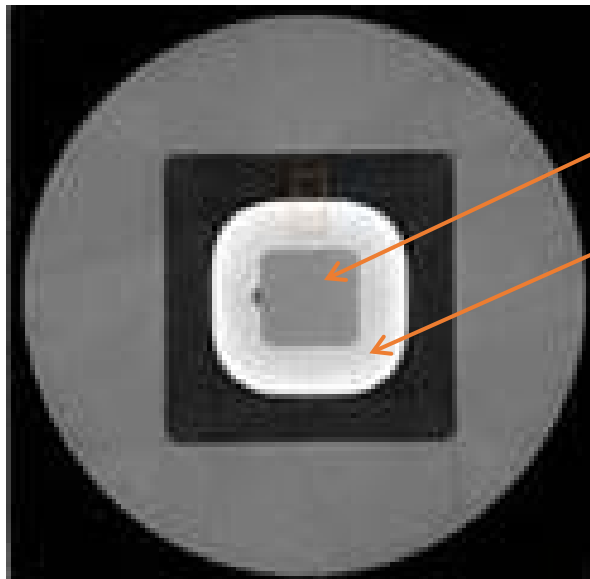
Using the PIV of the three different materials present; PTFE, PMMA, Air



CBCT-161



Contrast to Noise ratio (CNR)



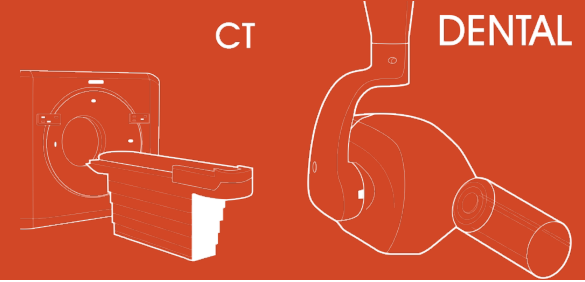
PMMA

PVC

- Draw ROI-1 encompassing PMMA only
- Draw ROI-2 encompassing PVC only
- Record the mean (M1) and standard deviation (SD) of the pixel value in ROI 1.
- Record the mean (M2) of the pixel value in ROI 2.

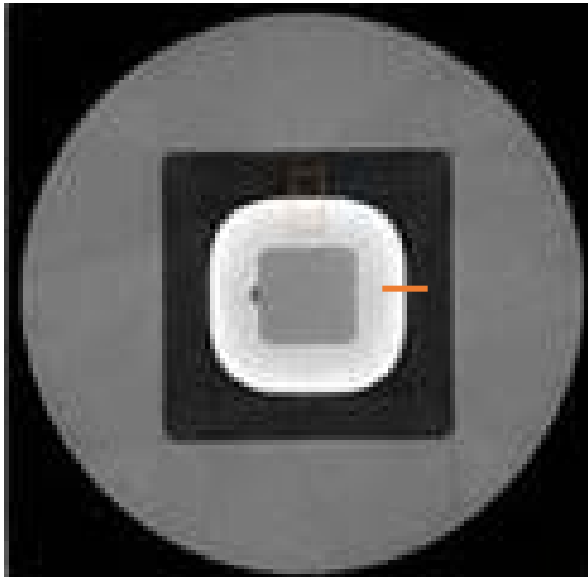
$$\text{CNR} = (M1 - M2)/SD$$

CBCT-161

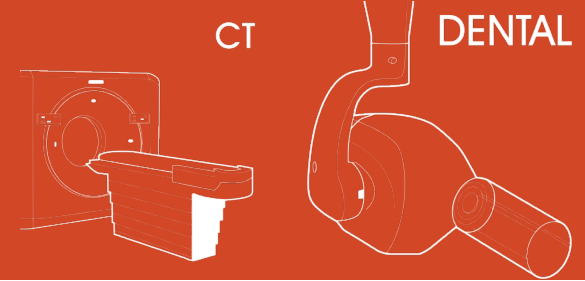


MTF

Using the PTFE to Air interface to create LSF



CBCT-161



Actions:

- Repeat any test(s) that fail to verify the result
- Refer to common protocol
- e.g. SEDENTEX-CT Guidelines www.sedentext.eu