



INTERNATIONAL ATOMIC ENERGY AGENCY  
UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION



# INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS

34100 TRIESTE (ITALY) - P.O.B. 586 - MIRAMARE - STRADA COSTIERA 11 - TELEPHONE: 2240-1  
CABLE: CENTRATOM - TELEX 460392-1

SMR.300/51

College on Medical Physics  
(10 October - 4 November 1988)

Exercise N. 10: CT Quality Assurance

M. DE DENARO

Servizio di Fisica Sanitaria, Ospedale Maggiore, Trieste, Italy

\*\* These notes are intended for internal distribution only

# EXERCISE N° 10

CT QUALITY ASSURANCE

# DEMONSTRATIVE PROTOCOL

Date .....

Operator .....

Phantom : RMI HEAD/BODY PHANTOM

COMMENT :

## HEAD CONFIGURATION

|                  |   |   |   |
|------------------|---|---|---|
|                  |   | 1 |   |
| Insert positions | 4 | 2 | 5 |
|                  |   | 3 |   |

## BODY CONFIGURATION

|        |   |    |    |
|--------|---|----|----|
|        |   | 6  |    |
|        |   | 7  |    |
| 11, 12 | 8 | 13 | 14 |
|        |   | 9  |    |
|        |   | 10 |    |

# CONTRAST SCALE

Edge/contrast scale insert into the position n. ....

Modality : .....

Kv : .....

mA : .....

slice thickness : .....

F.O.V. : .....

.  
.  
.

CT# (A) = .....

CT# (B) = .....

SD = .....

SD = .....

$$CS = \frac{\Delta \mu / \mu_{H_2O}}{CT\#(B) - CT\#(A)} = \frac{0.092^{(*)}}{\dots\dots\dots} = \dots\dots\dots$$

CT Scale factor = 1 / CS = .....

(\*) Data from RMI

# SPATIAL UNIFORMITY + NOISE

Plain inserts in all positions

Modality : .....

Kv : .....

mA : .....

slice thickness : .....

F.O.V. : .....

.  
.
   
.

Position      ROI dimension  
                 ( n. pixels)

|   |       |             |            |
|---|-------|-------------|------------|
| 1 | ..... | CT# = ..... | SD = ..... |
| 2 | ..... | CT# = ..... | SD = ..... |
| 3 | ..... | CT# = ..... | SD = ..... |
| 4 | ..... | CT# = ..... | SD = ..... |
| 5 | ..... | CT# = ..... | SD = ..... |

$$SU = \frac{CT\#(MAX) - CT\#(MIN)}{CT \text{ scale factor}} \times 100 \% = \frac{.....}{.....} = ..... \%$$

$$NOISE = \frac{SD}{CT \text{ scale factor}} \times 100 \%$$

Position :

|   |               |   |
|---|---------------|---|
| 1 | NOISE = ..... | % |
| 2 | NOISE = ..... | % |
| 3 | NOISE = ..... | % |
| 4 | NOISE = ..... | % |
| 5 | NOISE = ..... | % |

## HIGH CONTRAST SPATIAL RESOLUTION

High contrast resolution insert into position n. ....

Modality : .....

Kv : .....

mA : .....

slice thickness : .....

F.O.V. : .....

.  
.  
.

Window width .....

Window level .....

Zoom factor .....

NUMBER OF ROWS RESOLVED : .....

RESOLUTION = ..... mm

## LOW CONTRAST DETECTABILITY

Modality : .....  
Kv : .....  
mA : .....  
slice thickness : .....  
F.O.V. : .....

Low contrast insert 013A (0.6 %) into the position n. ....

Window width .....  
Window level .....  
Zoom factor .....  
Nominal contrast 0.6 %  
Actual contrast .....  
Distance from display .....  
Light in the room ( ON / OFF ) .....

DETECTABILITY = ..... mm

---

Low contrast insert 013B (0.3 %) into the position n. ....

Window width .....  
Window level .....  
Zoom factor .....  
Nominal contrast 0.3 %  
Actual contrast .....  
Distance from display .....  
Light in the room ( ON / OFF ) .....

DETECTABILITY = ..... mm

## SLICE THICKNESS

Alluminium ramp into the position n. ....

Modality : .....

Kv : .....

mA : .....

slice thickness : .....

F.O.V. : .....

.  
.  
.

CT# (A) = .....

CT# (B) = .....

SD = .....

SD = .....

$$\text{HALF MAXIMUM} = \frac{\text{CT\#(B)} - \text{CT\#(A)}}{2} = \dots\dots\dots$$

Set the window width to the smallest value (black-white) and the level value to HALF MAXIMUM.

DISTANCE = ..... mm

SLICE THICKNESS = Distance/2 = ..... mm

# APPENDIX

# POSITIONING THE PHANTOM

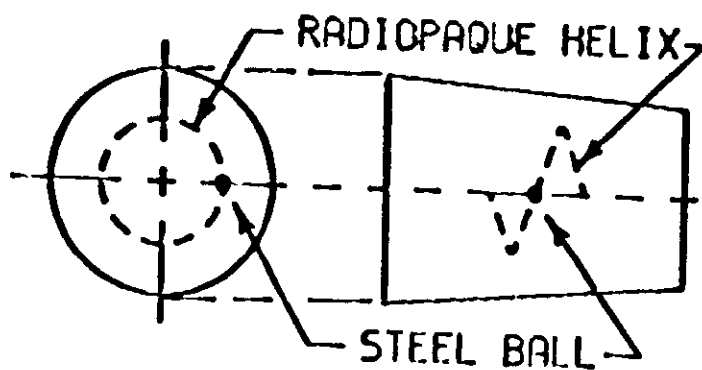
THE POSITION AND THE ANGULATION OF THE PHANTOM WITH RESPECT TO THE SCAN PLANE CAN BE DETERMINED BY USING THE FOUR HELIX INSERT.

THE FRACTION OF THE CIRCLE THAT IS IMAGED IS DETERMINED BY THE SLICE WIDTH.

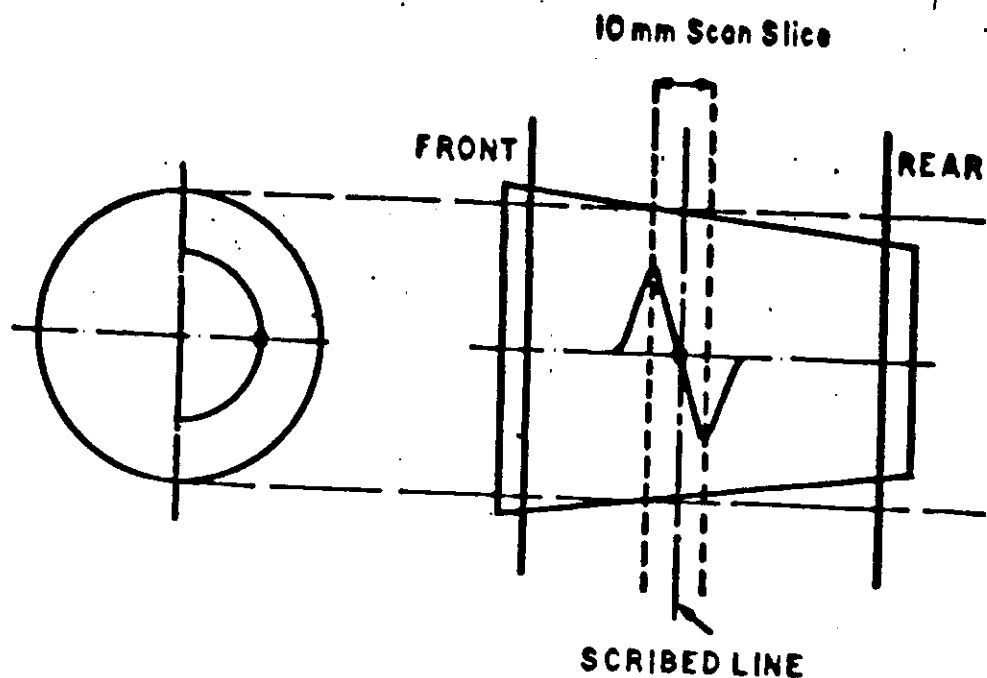
18 DEGREE OF ARC IS DISPLAYED FOR EACH MM OF SLICE WIDTH.

EXAMPLE :

A 180 DEGREE DISPLAYED ARC, OR  $\frac{1}{2}$  OF A FULL CIRCLE, INDICATES A 10 MM WIDTH.



# PROPERLY CENTERED



## HORIZONTAL TILT

## VERTICAL TILT

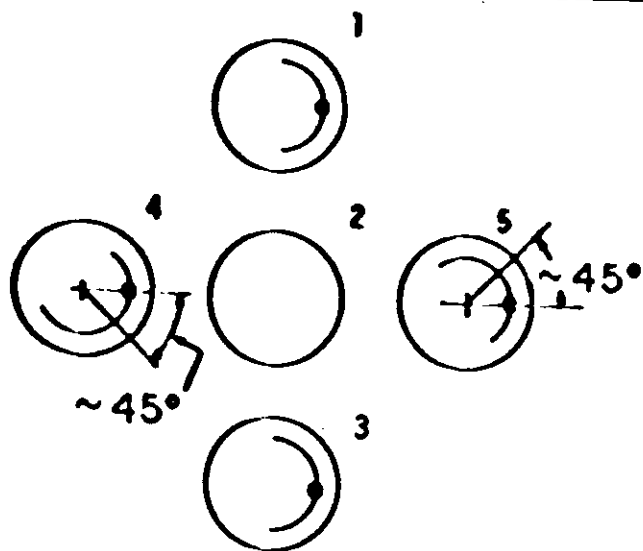


Fig. A

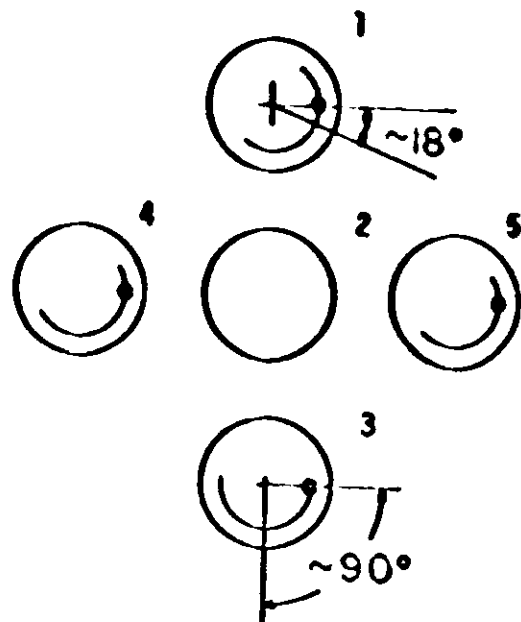


Fig. B

