

**Government of India
Atomic Energy Regulatory Board
Radiological Safety Division
Niyamak Bhavan, Anushaktinagar,
Mumbai-400094**

PERIODIC QUALITY ASSURANCE TEST REPORT FOR COMPUTED TOMOGRAPHY EQUIPMENT

(Periodic Quality Assurance shall be carried out at least once in two years and also after any repairs having radiation safety implications.)

A. DETAILS OF THE DIAGNOSTIC X-RAY EQUIPMENT

| | | |
|---|--|--|
| 1 | Name of the Institution and City | |
| 2 | Type of Equipment | |
| 3 | Model Name | |
| 4 | Name of the Manufacturer | |
| 5 | Name(s) of Person(s) testing the equipment and Name of Supplier/Service Agency | |
| 6 | Date and Duration of the Tests | |

B. SUMMARY OF MECHANICAL SAFETY PERFORMANCE TESTS REPORT

| Sr. No. | Parameters Tested | Specific Value | Measured Value | Tolerance | Remarks |
|---------|------------------------------|----------------|----------------|-----------|---------|
| 1. | Alignment of Table to Gantry | | | ± 5 mm | |
| 2. | Accuracy of Gantry Tilt | | | ± 2° | |
| 3. | Table Indexing Accuracy | | | ± 1.0 mm | |

C. SUMMARY OF RADIATION SAFETY PERFORMANCE TEST REPORT

| Sr. No. | Parameter Tested | Specific Value | Measured Value | Tolerance | Remarks |
|---------|--------------------------------------|----------------|----------------|--|---------|
| 1. | Slice Thickness (mm) | | | For Slice Thickness a. Less than 1 mm b. 1 mm to 2 mm c. Above 2 mm 0.5 mm ± 50% ±1 mm | |
| 2. | Accuracy of Operating Potential (kV) | | | ±2 kV | |

| | | | | | |
|-----|--|--|--|--|--|
| 3. | Total Filtration | | | 1.5 mm Al for kV ≤ 70 2.0 mm Al for kV ≤ 100 2.5 mm Al for kV > 100 | |
| 4. | Accuracy of Timer | | | Percentage Error < 10 % | |
| 5. | Linearity of Radiation Output (mA/ mAs Linearity) | | | CoL < 0.1 | |
| 6. | Reproducibility of Radiation Output | | | CoV < 0.05 | |
| 7. | Radiation Dose Test [Weighted Computed Tomography Dose Index (CTDI _w) for Head and Body Phantom] | | | ± 20 % of Stated Values | |
| 8. | Low Contrast Resolution | | | As per Technical Specifications Or 5.0 mm at 1% contrast | |
| 9. | High Contrast Resolution | | | As per Technical Specifications Or 3.12 lp/cm | |
| 10. | Radiation Leakage Level from X-ray Tube Housing (Measurement at maximum kVp and corresponding mA) | | | < 1mGy in one hour | |

I hereby undertake that all the information provided above is correct and in accordance with the detailed Quality Assurance Report enclosed herewith.

Place:
Date:

Signature:
Name of the Service Engineer:
Name of Supplier/Service Agency:
Seal of Supplier/Service Agency:

#Signature of Institution's Representative:
Name of Institution:
Seal of the Institution:

Quality Assurance Tests Report shall be signed by Institution's Representative and duly stamped by the User's Institution.

Part-I MECHANICAL SAFETY TESTS FOR COMPUTED TOMOGRAPHY EQUIPMENT

A.1 Alignment of Table to Gantry

Result :
Tolerance : ± 5 mm

A.2. Accuracy of Gantry Tilt

Exposure Parameters : kVp: mAs:
Actual Gantry Tilt :
Measured Gantry Tilt :
Result :
Tolerance : ± 2°

A.3. Table Indexing Accuracy

Initial table position :
Load on couch :
Exposure parameters : kVp: mAs: Slice thickness:
Applied table increments :

| | | | | | |
|--|------|------|------|------|------|
| Table position from reference position | 1 cm | 2 cm | 3 cm | 4 cm | 5 cm |
| Measured | | | | | |

Tolerance : ± 1.0 mm

PART-II RADIATION SAFETY TESTS OF COMPUTED TOMOGRAPHY EQUIPMENT

1. Slice Thickness / Radiation Profile Width:

Exposure Parameters: kVp: mAs:

| Applied Slice Thickness (mm) | Measured Density Profile Width (FWHM) | Tolerance | |
|------------------------------|---------------------------------------|---------------------|--------|
| | | For slice thickness | |
| | | a. Less than 1 mm | 0.5 mm |
| | | b. 1 mm to 2 mm | ± 50% |
| | | c. Above 2 mm | ±1 mm |

2. Accuracy of Operating Potential:

| Set kV | mA station I | mA station II | mA station III | Average kVp |
|--------|--------------|---------------|----------------|-------------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Tolerance : ± 2 kVp

3. Total Filtration

Total Filtration (measurement at maximum kVp):

Tolerance: 1.5 mm Al for kV ≤ 70, 2.0 mm Al for kV ≤ 100, 2.5 mm Al for kV > 100

4. Accuracy of Timer :

| Set Time | Observed Time | Percentage Error |
|----------|---------------|------------------|
| | | |
| | | |
| | | |

Tolerance: Percent Error = $|\text{Observed value} - \text{Exact Value}| / \text{Exact value} * 100 < 10 \%$

5. Linearity of Radiation Output (Measurement of mA / mAs linearity)

Operating Parameters: kVp: Slice Thickness:

| Radiation Output (μGy or mR) | | | | μGy/mAs or mR/mAs (X) |
|------------------------------|---|----|-----|-----------------------|
| mA / mAs | I | II | III | |
| | | | | |
| | | | | |
| | | | | |

$$\text{Coefficient of Linearity (CoL)} = \frac{X_{\max} - X_{\min}}{X_{\max} + X_{\min}}$$

Tolerance: $\text{CoL} < 0.1$

6. Reproducibility of Radiation Output

Operating Parameters : mAs:

Slice Thickness:

| Operating Potential (kVp) | Radiation Output (μGy or mR) | | | | | Mean (X) | CoV |
|---------------------------|--|---|---|---|---|----------|-----|
| | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

$$\text{Coefficient of Variation (CoV)} = X^{-1} [\sum (X_i - X)^2 / n - 1]^{1/2}$$

Tolerance: $\text{CoV} < 0.05$

7. Radiation Dose Test

Measurement of Weighted Computed Tomography Dose Index (CTDI_w)

Use pencil ionization chamber connected to a suitable electrometer, in conjunction with a head/body phantom. Measure the dose in the axial and peripheral cavities of the phantom for the techniques specified by the manufacturer.

Operating Parameters: kVp:

mAs:

Slice Thickness:

Result:

Head

Body

Axial dose : ----- mGy/mAs -----mGy/mAs

Peripheral dose : ----- mGy/mAs -----mGy/mAs

: ----- mGy/mAs -----mGy/mAs

: -----mGy/mAs -----mGy/mAs

: -----m Gy/mAs -----mGy/mAs

Peripheral dose (Mean): -----mGy/mAs -----mGy/mAs

CTDI_c : ----- mGy/mAs -----mGy/mAs

CTDI_{p (mean)} : ----- mGy/mAs -----mGy/mAs

$$\text{Weighted CTDI (CTDI}_w) = 1/3 \text{CTDI}_c + 2/3 \text{CTDI}_p$$

Workload = 500 mA-min in one hour for measurement of tube housing leakage

$$\text{Max leakage} = \frac{500 \text{ mA-min in one hour} \times \text{Max radiation leakage level (mR/hr)}}{60 \times \text{mA used for measurement}}$$

Maximum radiation leakage from tube at 1m = ----- mR in one hour

Result: Maximum radiation leakage at 1 meter from the focus of CT Tube is mGy in one hour.

Recommended upper limit: Radiation leakage at 1 meter from the focus of CT tube should not exceed 1mGy in one hour (115 mR in one hour).

11. Details of Radiation Protection Survey of the Installation

Date of radiation protection survey:

Whether radiation survey meter used for the survey has valid calibration certificate: Yes/No

Phantom: CTDI Body Phantom

Workload of the CT facility: ----- mA-min/week

Exposure Setting:-

Applied Voltage (kV):

Tube Current (mA):

Exposure Time(s):

| Location | Measured radiation level (mR/hr) |
|-------------------------------------|----------------------------------|
| Control Console (Operator Position) | |
| Outside Patient Entrance Door | |
| Behind Windows (if applicable) | |
| Patient Waiting Area | |

$$\text{Maximum Radiation level/week (mR/wk.)} = \frac{\text{----- mA-min/week} \times \text{Max radiation level (mR/hr)}}{60 \times \text{mA used for measurement}}$$

Permissible limit

For location of Radiation Worker: 20 mSv in a year (40 mR/week)

For Location of Member of Public: 1 mSv in a year (2 mR/week)