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. <u>SUMMARY OF MECHANICAL SAFETY PERFORMANCE TESTS REPORT</u>

Sr. No.	Parameters Tested	Specific Value	Measured Value	Tolerance	Remarks
1.	Alignment of Table to Gantry			± 5 mm	
2.	Accuracy of Gantry Tilt			$\pm 2^0$	
3.	Table Indexing Accuracy			± 1.0 mm	

C. SUMMARY OF RADIATION SAFETY PERFORMANCE TEST REPORT

Sr. No.	Parameter Tested	Specific Value	Measured Value	Tolera	ince	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 k	V	

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

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	$:\pm 2^0$				
A.3.	Table Indexing Accu	iracy				
	Initial table position		:			
	Load on couch		:			
	Exposure parameters		:	kVp:	mAs:	Slice thickness:
	Applied table increme	ents	:			

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

Tolerance $:\pm 1.0 \text{ mm}$

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)	Toleranc	e
		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 $: \pm 2 \text{ kVp}$

3. Total Filtration

Total Filtration (measurement at maximum kVp):

Tolerance: 1.5 mm Al for $kV \le 70$, 2.0 mm Al for $kV \le 100$, 2.5 mm Al for kV > 100

4. Accuracy of Timer :

Set Time	Observed Time	Percentage Error

Tolerance: Percent Error = |Observed value - Exact Value| / Exact value * 100 < 10 %

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

Operating Parameters: kVp:

Slice Thickness:

	Radiatio	µGy/mAs or mR/mAs		
mA /	Ι	II	III	(X)
mAs				

Coefficient of Linearity (CoL) = $\begin{array}{c} X_{max} - X_{min} \\ ------ \\ X_{max} + X_{min} \end{array}$

Tolerance: CoL< 0.1

6. Reproducibility of Radiation Output

Operating Parameters : mAs:

Slice Thickness:

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

Coefficient of Variation (CoV) = $X^{-1} \left[\sum (Xi - X)^2 / n - 1 \right]^{\frac{1}{2}}$

Tolerance: CoV < 0.05

7. Radiation Dose Test Measurement of Weighted Computed Tomography Dose Index (CTDIw)

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 Parame	eters: kVp:	mAs: Slice Thickness:		
Result:	Head		<u>Body</u>	
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 () CTDI _c	Mean):mGy/mAs		mGy/mAs mGy/mAs	
CTDI _{p (mean)}	: mGy/mAs		mGy/mAs	

Weighted CTDI (CTDI_w) = 1/3 CTDI_c + 2/3 CTDIp

C		mGy/mAs for H mGy/mAs for I		1			
Т		20% of the quoted valu 40% of the quoted valu	·				
8.	Low Contrast Resolution						
	Phantom: C	CT Imaging Phantom					
	Operating I Result:	Parameters : kVp: Window v	mAs: vidth:	Slice Thickness:			
	Low contrast resolution: mm at % contrast difference						
	Tolerance	: As per Technical Or 5.0 mm at 1% co 2.5 mm at 0.5 % c	ntrast differend				
		2.5 mm at 0.5 70 C	contrast annoice	mee (expected)			
0	High Cont	rest Resolution					
9.	-	rast Resolution					
9.	Phantom: (CT Imaging Phantom					
9.	Phantom: (mAs:	Slice Thickness:			
9.	Phantom: (CT Imaging Phantom		Slice Thickness: Use high resolution algorithm.			
9.	Phantom: (Operating H Result :	CT Imaging Phantom Parameters : kVp: Window wi	dth:				
9.	Phantom: O Operating F Result : Size of the	CT Imaging Phantom Parameters : kVp: Window wi smallest resolvable bar As per Technical spec Or At 10% contrast diffe resolvable should be	dth: /hole pattern: cification rence the size $1.6 \text{ mm} (\approx 3.12)$	Use high resolution algorithm. mm (lp/cm) of the bar/hole pattern that could be 2 lp/cm).			
9.	Phantom: O Operating F Result : Size of the	CT Imaging Phantom Parameters : kVp: Window wi smallest resolvable bar As per Technical spec Or At 10% contrast diffe	dth: /hole pattern: cification rence the size $1.6 \text{ mm} (\approx 3.12)$	Use high resolution algorithm. mm (lp/cm) of the bar/hole pattern that could be 2 lp/cm).			
	Phantom: 0 Operating H Result : Size of the Tolerance:	CT Imaging Phantom Parameters : kVp: Window wi smallest resolvable bar As per Technical spec Or At 10% contrast diffe resolvable should be	dth: /hole pattern: cification rence the size 1.6 mm (≈ 3.12 st resolution: 0	Use high resolution algorithm. mm (lp/cm) of the bar/hole pattern that could be 2 lp/cm). 0.8 mm (≈ 6.25 lp/cm)			

(Use maximum kV available in the CT unit for leakage measurement)

Radiation Leakage Level (mR/hr)				
Front	Back	Left	Right	

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

Max leakage = <u>500 mA-min in one hour X ----Max radiation leakage level (mR/hr)</u> 60 X -----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	

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)