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REGISTRATION FOR OPERATION OF MEDICAL DIAGNOSTIC X-RAY EQUIPMENT

In exercise of powers conferred under Section 16 and 17 as applicable of Atomic Energy Act, 1962 read in conjunction with Rule (3) of the Atomic Energy (Radiation Protection) Rules {AE(RP)R}, 2004, the Atomic Energy Regulatory Board (AERB) hereby issues Registration in favour of DR. ANUPAM PHILLIP to operate the following diagnostic radiology equipment located at NURMAHAL ROAD, VPO BILGA JALANDHAR, PUNJAB-144036 for Medical Diagnosis purposes.

Type of Equipment	Manufacturer	Model	Equipment Id
Radiography (Fixed)	M/s. Allengers Medical Systems Limited, India	Allengers-325 (Fixed)	G-XR-144067

The MEDICAL SUPERINTENDENT, BILGA GENERAL HOSPITAL, JALANDHAR and DR. ANUPAM PHILLIP are hereby identified as the Employer and licensee respectively, for the purpose of assigning the responsibilities specified in the Atomic Energy (Radiation Protection) Rules, 2004, in respect of radiation protection of workers, public and environment because of operation of the above equipment.

The Employer and Licensee are responsible for,

- I. Ensuring compliance with the relevant provisions of the
 - i. Atomic Energy Act, 1962
 - ii. Atomic Energy (Radiation Protection) Rules, 2004;
 - iii. AERB Safety Code (AERB/SC/Med-2), 2001, Amendment 2012, and the revisions thereof
 - iv. All applicable Safety Codes, Guides issued by AERB for the above practice and regulatory documents issued by AERB from time to time.
 - v. Directives issued by Competent Authority from time to time.
- II. Ensuring compliance with terms and conditions stated overleaf.

Note:

This Registration is issued ONLY from the RADIATION SAFETY VIEW POINT. All other clearances shall be obtained from concerned state/central/local authorities as applicable.

Dr. P. K. Dash Sharma
Head, RSD

DR. ANUPAM PHILLIP, MEDICAL SUPERINTENDENT
BILGA GENERAL HOSPITAL
NURMAHAL ROAD, VPO BILGA
JALANDHAR, PUNJAB-144036

CC: MEDICAL SUPERINTENDENT, BILGA GENERAL HOSPITAL, JALANDHAR

Note: This document is also available at www.aerb.gov.in/elora



परमाणु ऊर्जा नियामक परिषद्, नियामक भवन, अणुशक्तिनगर, मुंबई 400094 (महाराष्ट्र)
Atomic Energy Regulatory Board, Niyamak Bhavan, Anushaktinagar, Mumbai 400094 (Maharashtra)

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

(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	Bilga General Hospital, Nurmahal Road, VPO, Bilga, Jalandhar, Punjab - 144036
2	Type of Equipment	Radiography (Fixed)
3	Model Name	Allengers – 325 (Fixed)
4	Serial Number	2k110730510-X
5	Name of the Manufacturer	M/s. Allengers Medical Systems Ltd, Chandigarh
6	Name(s) of Person(s) testing the equipment and Name of Supplier/Service Agency	Rishav Sharma B.N Medical Solutions – Ludhiana
7	Dates and Duration of the Tests	28-05-2021 2 hr
8	AERB Authorization Number	17-AFSXE-178007

NEXT QA DUE: 28-05-2023



B. SUMMARY OF RADIATION SAFETY PERFORMANCE TEST REPORT:

Allengers - 325 (fixed)

0

Sr. No.	Parameters tested	Specified values	Measured values	Tolerance	Remarks
1	Correspondence between x-ray field and image reception area	0%	2.00%	$ c_1 + c_2 + d_1 + d_2 \leq 4\% \text{ of FFD}$	pass
2	Central Beam alignment		$< 1.5^\circ$	$< 1.5^\circ$	Pass
3	Accuracy of Operating Potential	60 71 80	57.47 67.00 77.41	$\pm 5 \text{ kV}$	pass
4	mA Linearity	< 0.1	0.038	Coefficient of Linearity < 0.1	Pass
5	Timer Linearity	< 0.1		Coefficient of Linearity < 0.1	NA
6	Accuracy of irradiation time	0.20 0.4 0.8	-4.00 -4.00 -1.13	$\leq \pm (10 \%)$	Pass
7	Reproducibility of radiation output	60 70	0.0043 0.0073	$\text{CoV} \leq 0.05$	Pass
8	Total Filtration		T.F 2.8 mm of Al HVL 2.6 mm of Al	For Less than 70 Min. Total Filtration 1.5 mm Al For $70 < \text{kVp} \leq 100$ Min. Total Filtration 2.0 mm Al For $\text{kVp} > 100$ Min. Total Filtration 2.5 mm Al	pass
9	Exposure Rate at Tabletop			Without AEC Mode: $\leq 5 \text{ cGy/min}$ With AEC Mode: $\leq 10 \text{ cGy/min}$	NA
10	Low contrast resolution			3.0 mm hole should be visible	NA
11	Spatial resolution			1.5 lp/mm should be visible	NA
12	On -Position Radiation Leakage level from X-Ray tube housing measured at 100 kV at 50 mA		0.0067 mGy	$< 1 \text{ mGy in one hour}$	Pass



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

Place: Bilga.

Date: 28/05/2021.

Name of the Service Engineer:

Er. Rishav Sharma.

Name of the Supplier/
Service Agency:

B.N Medical Solutions - Ludhiana

Signature:

BN MEDICAL SOLUTIONS

232, Block-A, Rishi Nagar, Civil Lines,
Near Kali Mata Mandir, Ludhiana-141001 (Pb.)
Tel. : 98887-14999, 0161-5001899
e-mail : bnmedicalsolutions@gmail.com



Signature of institution's representative:

Name of institution:

Seal/ Stamp of Institution:



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

1 CONGRUENCE OF RADIATION & OPTICAL FIELD

Operating parameters :

Distance : 100 cm, kV : 50 , mAs : 10 (mA = 50 , s = 0.2)

a. Shift in the edges of the radiation field

X=	0.5 CM	0.5 % of TFD
X'=	1 CM	1 % of TFD
Y=	0 CM	0 % of TFD
Y'=	0.5 CM	0.5 % of TFD

Tolerance : 2% of TFD

b. Difference in the dimensions of the radiation and optical fields

X + X'	1.5 CM	1.5 % of TFD
Y + Y'	0.5 CM	0.5 % of TFD

Tolerance : 3% of TFD

c. Difference between sums of lengths and widths of optical and radiation fields

X + X' + Y + Y' 2 2 2 % of TFD

Tolerance : 4% of TFD

2 Central Beam Alignment

Observe the images of the two steel balls on the radiograph and evaluate tilt in the central beam.

Tilt in the Central Beam is : < 1.5 °
Tolerance : Tilt < 1.5 °



3 FOCAL SPOT SIZE

Distance : 60 cm, kV : 50 , mAs : 10 - (mA = 50 , s = 0.2)

(non-screen film technique)

Large focal spot size:	2 mm	X	2 mm	(Stated)
	2 mm	X	2 mm	(Observed)
Small focal spot size:	1 mm	X	1 mm	(Stated)
	1 mm	X	1 mm	(Observed)

Tolerance :

1. $+0.5f$ for $f < 0.8\text{mm}$

2. $+0.4 f$ for $0.8 \leq f \leq 1.5 \text{ mm}$

3. $+0.3 f$ for $f > 1.5 \text{ mm}$

4 TIMER CHECK

kV: 60 mA:50

Set Time	Observed Time	% Error
0.20	0.192	-4.00 %
0.40	0.384	-4.00 %
0.80	0.791	-1.13 %

Tolerance : Tolerance : $\pm 10\%$

5 ACCELERATING VOLTAGE

Operating parameters : Distance : 100 cm

Applied kVp	Measured kVp			Average kVp
	mA Station-1	mA Station-2	mA Station-2	
	50	100	200	
60	59.27	59.43	61.39	57.47
71	67.93	68.74	68.67	67.00
80	76.31	75.57	75.61	77.41

Tolerance : $\pm 5 \text{ kVa}$



6 LINEARITY OF mA/mAs LOADING STATION

Operating parameters : Distance : 100 cm, kV : 60

Time : 0.20 Sec

mA Range	Out put in mGy			Average	mGy/mAs (X)
	1	2	3		
50	0.262	0.262	0.265	0.263	0.001
100	0.567	0.568	0.569	0.568	0.001
200	1.049	1.051	1.053	1.051	0.001

$$\text{Coefficient of linearity} = \frac{X_{\max} - X_{\min}}{X_{\max} + X_{\min}} = 0.038$$

Tolerance: <0.1

7 OUTPUT CONSISTANCY

Operating parameters : Distance : 100 cm

Applied kV	mAs	Output in mGy					Ave- rage
		1	2	3	4	5	
60	50	0.262	0.262	0.264	0.261	0.263	0.262
71	50	0.359	0.359	0.356	0.353	0.355	0.356

$$\text{Coefficient of variation} = \left[\frac{\sum (X_i - \bar{X})^2 / n - 1}{\bar{X}} \right]^{1/2}$$

0.0043 for 60 kV
0.0073 for 70 kV

CoV ≤ 0.05



8 TOTAL FILTRATION

Operating parameters : Focus to detector distance :

kV

80 mA

50

Added filter (mm Al)	Output			% transmission
	1	2	Average	
0				
1				
2				
3				
4				
5				
6				
Table top				

Total filtration 2.8 mm of Al measured direct by QA tool

HVT

2.6 mm of Al

1.5 mm Al for kV <70

2.0 mm Al for kV £ 100

2.5 mm Al for kV > 100

Aluminium equivalence of the table top is -----mm of Al at 100 kV.

Recommended upper limit: Al equivalence of table top £ 1.0 mm at 100 kV.



9 PERFORMANCE OF THE IMAGE INTENSIFIER

a Details of the II tube:

1 Name and address of the manufacturer:

2 Make, model and format of the II tube:

3 Make and model of the X-ray tube used for testing the II tube:

b Low Contrast Sensitivity:

Diameter of the smallest size hole clearly seen on the monitor:--

Recommended performance standard:

Hole of 1/8" diameter must be clearly seen.

c High Contrast Sensitivity

Bar strips of frequency -----resolved on the monitor.

Recommended Performance Standard:

Bar strips of 1.5 lp/mm must be resolved.

d Exposure rate at table top

----- R/min at -----(maximum) and ----- (maximum)

Recommended upper limit:

Exposure rate at table top ≤ 5.7 R/min at focus to table top distance -----cm.
< 10 R/min (for AEC mode) at -----cm

[focus to table top distance shall not be less than 30 cm.]



10 TUBE HOUSING LEAKAGE

Operating parameters :

Applied voltage : kv (Maximum) (minimum)
 mAs 100 mA 50
 50 Sec 1

Location (at 1.0 m from the focus)	Exposure level (mR/h)				
	Anode	Cathode	Front	Back	Top
Tube	11.63	8.42	12.74	9.85	1.63
Collimator	10.58	7.69	11.06	8.72	0

Work load = 180 mAmin in one hr

Max leakage = $\frac{180 \text{ mAmin in 1 hr} \times 12.74 \text{ Max leakage mR/h}}{60 \times 50 \text{ mA used for measurement}}$

Maximum radiation leakage from tube = 0.7644 mR in one hour

Result : Maximum radiation leakage at 1 meter from the focus for workload of 180
 mAmin in one Hr = 0.0067 mGy

Recommended upper limit:

Leakage radiation level at 1 meter from the focus should be $\leq 115 \text{ mR in one hour}$.



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

Yes

Equipment Setting:-

Applied Current (mA): 50

Applied Voltage (kV): 100

Exposure time(s): 1

Workload: 1850

Provide the measured maximum radiation levels (mR/hr) at different locations

Location	Max. Radiation level (mR/hr)
Control console(Operator Position)	0.147
Outside patient entrance door	0.096
Behind Windows (if applicable)	NA
Patient Waiting Area	0.027

Maximum Radiation level/week (mR/wk) = $\frac{1850 \text{ mAmin/week} \times 0.147 \text{ mR/hr}}{60 \times 50 \text{ mA}}$

= 0.0906 mR/Week

