

# TECHNICAL & GENERAL SPECIFICATIONS OF RADIOTHERAPY CONVENTIONAL SIMULATOR FOR USE AT RADIATION ONCOLOGY DEPARTMENT, RIMS

## A. Technical Specification

<b>Gantry</b>	
Gantry Rotation	: $\pm 185^\circ$ with FAD 80 to 100cm
Rotation Speed	: 0.15 to 1.0rpm
Iso-center height	: 126 cm from floor
Stand Mounted Gantry with a mechanical iso-center of sphere 0.1 cm	
<b>Focus – Axis distance</b>	
Variable Focus-Axis distance from 80 cm to 100 cm	
Automatic stops at 80 cm to 100 cm	
Position Accuracy is 0.1 cm	
Readout Resolution is 0.1 cm	
<b>Collimator:</b>	
Collimator Rotation	: $\pm 100^\circ$
Digital Accuracy	: $\pm 0.5^\circ$
Digital Resolution	: $0.1^\circ$
<b>Jaw Field Size – Asymmetric</b>	
Field Size	: 1 cm $\times$ 1 cm to 50 cm at Fad 100 cm
Over Travel	: 20 cm
Pairing of field delineators and blades from the keypad	
Detector tracking mode through blades from the keypad	
<b>Wire Delineator Field Size – Asymmetric</b>	
Field Size	: 2 cm $\times$ 2 cm to 48 cm $\times$ 48 cm at FAD 100 cm
Over Travel	: 18 cm
<b>Couch:</b>	
Computer controlled Couch is a flat radio-lucent carbon fiber couch top used to support the patient and move the patient through the rotating gantry .The position of the couch movement is displayed on the in-room monitor(s) and control console also.	
Longitudinal	- 90 cm
Lateral	- 40 cm ( $\pm 20$ cm )
Vertical	- 90 cm ( From floor 68 to 158cm )
Isocentric Rotation	- $\pm 95^\circ$ rotation.
Maximum couch lift capacity of the table is 225 Kgs of ULD	
<b>Imager Movements:</b>	
Vertical Range	: 42 cm from -8 to -50 cm
Longitudinal motion	: $\pm 15$ cm
Lateral motion	: $\pm 15$ cm
Positional Accuracy	: $\pm 0.1$ cm
Digital Resolution	: 0.1 cm
Imager auto-centering option provided for selecting from the keypad	

N. Kishore SPM

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**X-ray specifications:**

Microprocessor Controlled High Frequency Generator.  
Automatic Switch Between Large Focus & Small Focus.  
Output Power of 45 KW.

**Radiography:**

- kV Range : 40-150kV
- mA Range : 10-500mA
- ms value : 0.4 to 250mAs

**Fluoroscopy:**

- Frame rate : 9 fps
- kV Range : 40-125Kv
- mA Range : 10-50ma
- ms value : 1-5ms

Voltage: 380 – 480V AC, 50/60 Hz  
Parameter display kV, mA, ms, mAs  
Overload thermal protections: NT starting  
Safety Interlocks

**X-ray Tube:**

Nominal focal spot	0.4 / 0.8
Nominal Voltage	150kV
Anode angle	14°
Heat storage capacity	450KJ (600 KHU)
Anode speed	3000 – 9000 rpm
Target material	Tungsten Rhenium Molybdenum Graphite
Nominal anode input power	15 kW / 45 kW

**Image Capture:**

Amorphous Silicon based image detector with solid state Cesium Iodide scintillating material.

Active area	43 cm x 43 cm
Pixel Size	148µm
Pixel Matrix	2880x2880, 1440x1440, 1024x1024
Frame rate	13 fps, 9 fps, 6 fps, 3fps.
Spatial resolution	2.5lp / mm
A / d conversion	16 bits


**❖ Digital Workstation:**

The control Console allows the acquisition, and display of live fluoroscopy distortion free images from the simulator.

- Ability to control pan and zoom (zoom two or more images by the same amount simultaneously)
- Image enhancement, image annotation
- Single / multiple format image viewing
- Control movement to move field wires, blades, collimator and Couch movement from the image

**❖ Hardware Components:**

- One number of 19-inch monitor in treatment room;

*N. Kulkarni SPM*  
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<ul style="list-style-type: none"> <li>• One number of 24-inch monitor and one of 19-inch monitor along with PCs in the control console.</li> <li>• Laser jet Printer</li> </ul>
<p><b>Safety Systems:</b></p> <p>Two emergencies stop Switches on either side of the couch.  One switch at the control console.  One switch on the door of treatment room.</p> <p><b>Collision Avoidance Systems:</b></p> <ul style="list-style-type: none"> <li>• Hardware and Software Enabled Anti-collision to prevent collisions involving Imager with patient, couch top or floor.</li> </ul> <p>Collimator with anything in the way.</p>
80 KVA UPS with 15 minutes' backup
<p><b>Mandatory Accessories:</b></p> <p>Laser patient alignment system (Green) – 2 cross lasers and one sagittal laser  Cross wire with radio opaque material 80 cm, and plain.</p>
<p><b>Calibration Tools:</b></p> <ul style="list-style-type: none"> <li>• Aluminium filters – 24mm, 18mm, 12mm, 6mm</li> </ul>

**B. General Specification**

<p><b>SCOPE OF TURNKEY JOBS FOR INSTALLATION OF RADIOTHERAPY CONVENTIONAL SIMULATOR</b></p> <p>The area included in the scope of turnkey for installation of the machine Unit will include existing bunkers which required modification as per AERB guidelines.  Please supply the following details:(a) Electrical load requirement of the conventional simulator (b) Heat dissipation and requirement of additional air-conditioning, (c) General electrical load and complete wiring diagrams and panel drawing (d) Detail layout drawing.</p>
<p><b>Civil Works</b></p> <p>The existing already constructed bunkers for installation of the machine need to be modified as per available AERB approved room plan.</p> <p>Needs demolition of the existing floors.  Elevation of floor level by 4"</p> <p>Flooring to be done with double glazed vitrified non-skid tiles (2x2 feet) proper grouting, only in the bunker, control console area, Passage,</p> <p>False ceiling – Powder coated metallic false ceiling in bunker and control console area.</p> <p>Vitrified wall tiles (properly supported and fixed) up to false ceiling height in the bunker and control console area.</p> <p>Plumbing work has to be carried out as per requirement. The waste pipes and accessories should be of centrifugal cast iron of <i>ISI</i> mark. All water pipes shall be of galvanized iron of <i>TATA</i> make and fitting should be of make SVW/UF/UNIK. The grating shall be brass chrome plated. All CP fitting shall be of JAGUAR/ESSCO.</p> <p>Fire protection with fire alarm system is to be installed.</p>

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**Electrical Work**

The electrical work include: electrical, networking and telephone wiring, providing light fitting, switches, sockets, MCB-DB, ELCB, MCD etc.

Earthing with copper plate is to be provided as per requirement.

Necessary Electrical points for the unit and its accessories and room lighting is to be provided.

The institute will provide the required electrical POWER. The electrical panel if any and its distribution needs to be included in the quote.

Required networking points and required switch (if any)

All light provided will be of LED type for adequate illumination.

**Air Conditioning**

Installation of air conditioners of appropriate capacity (tonnage) for the machine bunker, Control console area.

Air-conditioning with 5 years warranty from date of first patient treatment.

Suitable /split AC with Eco-friendly model and power saving options.

**Furnishing**

Provision of work top and overhead wall cabinets in Control console area, Storage of accessories and manuals.

Overhead wall cabinets in the bunkers for storage of accessories and manuals.

**ENVIRONMENTAL FACTORS:**

Electrical requirements to be specified. Site visit a must before submitting the BID.

All AERB Clearance and Environmental clearances to be arranged with local authorities. Institute will provide all the documentations.

Air Conditioning and monitoring of Temperature; Relative Humidity and Air changes (to specify no. per hour) to be installed.

All other regulatory clearance will be coordinated by the supplier.

Shall meet IEC-60601-1-2:2001(Or Equivalent BIS) General Requirements of Safety for Electromagnetic Compatibility or should comply with 89/366/EEC; EMC- directive.

The unit shall be capable of being operating in ambient temperature of 20-30 deg C and relative humidity has less than 70%.

Should be FDA / CE / AERB approved product.

**POWER SUPPLY:**

Power input to be 80 KVA/UPS as appropriate fitted with Indian plug.

UPS of suitable rating with voltage regulation and spike protection and spike protection backup not less than 30 minutes.

Emergency light to be provided in treatment room and console area.

Shall comply with AERB guidelines.

Electrical safety conforms to standards for electrical safety IEC-60601-1 General Requirements.

**TRAINING:**

Training: 1 Radiation Oncologist, 1 Medical Physicist in a well equipped clinical radiotherapy department in bigger centre for at least 1 week.

On site Training and demonstration of different clinical application to all concerned staff for two weeks.

**DOCUMENTATION:**

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User/ Technical/Maintenance manuals to be supplied in English.
List of important spare parts and accessories with their part number and costing.
Log book with instruction for daily, weekly, monthly and quarterly maintenance checklist.
Expectation / requirement of the service engineer/company from the institution should be clearly spelt out.
<b>WARRANTY:</b>
Complete ON-site Warranty from the Manufacturer for 5 years (standard 1 year + extended 4 years) to be included. (Conditional Warranty, i.e. labor + parts is not acceptable). The User will Custom and Excise Duty Exemption certificate for duty exemption to the maximum extent as permitted by Government of India for Academic and Research institute. The warranty will be for simulator machine including batteries and all other accessories. Five years warranty to be commenced from first patient treated as per AERB norms. CMC year-wise for simulator machines, UPS, Battery and other accessories for next 5 years after warranty.
<b>CMC:</b>
After the warranty period, Comprehensive Maintenance Contract with taxes(as applicable) which will include all spare parts and other accessories of the system including local items (as applicable) to be quoted. The suppliers should provide comprehensive maintenance contract inclusive of Custom duty and all taxes after the warranty period (i.e. years 6 to 10 inclusive).

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