PVMS OF ONCOLOGY

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Clinical Specialty	Oncology
Generic Name	**Fluoroscopy Mini C-Arm**
Clinical Purpose	**Fluoroscopy** is a study of moving body structures--similar to an X-ray "movie." A continuous X-ray beam is passed through the body part being examined. The beam is transmitted to a TV-like monitor so that the body part and its motion can be seen in detail.

TECHNICAL SPECIFICATIONS

X-ray Source:

- Grounded Anode X-ray Tube
- 7.5 W High Frequency
- **Maximum Output:** 0.1 mA @75 kVp
- **Focal Spot Size:** 0.045 mm
- **Tube kVp Range**: 40 to 75 kVp (max)
- **Beam Current:** 0.020 to 0.100 mA•

Image Receptor:

- CMOS Flat Detector
- Dual Mode - Full and Limited
- 75 Micron Pixel Array
- 2k x 1.5k Resolution
- **Full Field:** 5.7" x 4.5" (14.5 x 11.5 cm)
- **Limited Field:** 4.4" Square (11 cm)
- **Limited Field:** Reduced Dose Mode

Detector Rotation:

- Full +/- 90 Degree Rotation
- Auto Tracking Collimation

Touch-Screen Monitor:

- HD 1600 x 1200 Display
- 20" LCD Flat Panel
- Extendable with 350° Swivel
- Digital DICOM Compliant

Monitor Image:

- 16 bit Image Processing
- 1k x 1k

Power Failure Protection:

- Images Software Protected

X-ray Control Modes:

- Auto IQ Mode
- Auto Mode
- Manual Mode

C-arm:

- **Depth**: 20" (50.6 cm)
- **Free Space**: 14" (36 cm)
- **Orbital Rotation:** 120°
- **Horizontal Travel**: 23°
- **Vertical Travel**: 23" (58 cm)
- **Pivot Rotation:** 380°
- **Panning Motion**: 320°

Image Storage:

- Permanent Hard Drive
- 8,000 Images Capacity

Removable Data Storage:

- USB Port
- CD/DVD-RAM Drive

Operating System:

- Microsoft® Windows XP

Image Acquisition:

- 30 Frames/sec (max)
- Cine Video Recording

Imaging Modes:

- Snapshot - Single Shot
- Continuous - Fluoroscopy
- Digital Recorded Fluoro (Cine)
- Frame Averaging:
- Ultra/Auto

- High/Med/ Low/ Off
- Selectable & Configurable

Radiation Report:

- DAP (Dose Area Product)
- Paper Print and DICOM Send

Laser Alignment Light:

- On-off or 60 sec Timed
- IEC Class 1C

Imaging Features:

- Automated Image Processing
- Auto Real-Time Noise Reduction
- Auto Edge Enhancement
- Auto-Dose Control
- Magnify-Zoom-Pan
- Brightness/Contrast Control
- Physician Preference Configurable

Footswitch Options:

- Wired Triple Function Footswitch
- Wireless Triple Function Infrared
- Configurable Save/Tag

Printer Option

- Small Format Thermal Printer
- Large B/W Hybrid Graphic Printer
- Multi-format Prints

DICOM Option:

- Modality Worklist
- Print
- Store
- Storage Commitment

Connectivity:

- Ethernet Wired
- Wireless (Optional)

Dimensions:

- **H**: 66" (168 cm)
- **W**: 28" (71 cm)
- **D:** 32" (81 cm)

Space Allocation:

- 5' x 6.6' (1.5 m x 2 m)
- **Door Size:** 30" Minimum

Power Requirements:

- 100, 120, 220, 240 VAC Selectable

Clinical Specialty	Oncology
Generic Name	**COBALT 60 TELETHERAPY UNIT**
Clinical Purpose	A description of the essential clinical or other objective/s associated with the device's utilization, e.g. anesthesia units (allow the anesthetist to) dispense a mixture of gases and vapors and vary the proportions thereof to control a patient's level of consciousness and/or analgesia during surgical procedures.

TECHNICAL SPECIFICATIONS

COBALT SOURCE HEAD:

- Should be of cast steel shell/ lead with tungsten shield.
- Depleted uranium is not acceptable.
- Should hold a radioactive source up to 15,000 curies.
- **Regulatory compliance**: Unit must be USA FDA approved and should meet NCRP # 102 and ICRU # 18 safety standards and manufactured in Japan / USA / Europe.

COBALT SOURCE:

- **Capacity:** 175 to 200 cGymm (Rmm) or better
- **Size:** 2 cm or less
- **Activity**: 8000-12000 Curies
- **Drawer Mechanism:** Pneumatically driven linear source drawer
- **Head Leakage:** 2 m R/hr at a distance of 1 meter

BEAM STOPPER CONFIGURATION:

- Should attenuate 99 % of the primary beam & include a standard optical back pointer.

HEAD ROTATION:

- Swiveled manual rotation ± 180° in either direction from the iso-center

COLLIMATOR:

- Manual adjustable divergent collimator assembly with fixed tungsten definer & leaves.
- **Basic source to diaphragm distance:** 45cm with trimmer set

FIELD LIGHT AND OPTICAL DISTANCE INDICATOR

ACCESSORY MOUNTING PADS

- Two magnetic pads on the collimator for mounting of Mechanical distance indicator and mechanical back pointer.

GANTRY:

- Should be capable of continuous rotation both in the clockwise and anti-clockwise with two speeds.

MAINFRAME:

- Should have Gantry, Air Compressor & Air Storage Reservoir and Electrical Distribution Panel.

CONTROLS & INDICATORS:

- **HAND CONTROL:** Unit should provide full functions of the machine.
- CONSOLE CONTROL
- Should provide complete operational facilities including Emergency interlocking systems.

HEAD MOUNTED CONTROL:

Should have the following control and indicators

- Beam “on & off” indicators lights
- “Off shield” light
- Source position indicator

MAIN FRAME & GANTRY CONTROLS:

Should have following

- One emergency stop button located on both side of the main frame.
- Audible alarm/Source movement indicator

Optical back pointer

Mechanical treatment distance indicator, 80 cm SSD

SAFETY & PROTECTITIVE INTERLOCAKS

Full Range of Safety & Interlock devices must be provided including:

- Emergency stop switches
- 'OFF SHIELD" Interlock
- Treatment room door interlock
- Low air pressure interlock
- Wedge Filter / Tray verification interlock
- Unexpected Motion Enable Interlock

TREATMENT TABLE:

Should have motorized vertical motion with max speed of 2.25cm/sec from the hand control

Table positions:

- Vertical 2cm above – 37cm below Isocenter
- Longitudinal 0 - 70 cm
- Lateral 20 cm at either side
- Iso center rotation - min ± 90°
- Top rotation - min ± 180°

ACCESSORIES:

Collimator extension wedge filter rail – 45 cm Collimator extension wedge filter rails – 55 cm Wedge filter set (3 wedges) 30º - 45 cm SSD	Single wedge large field 45 cm SSD Beam physics data included: 15º - 45 cm SSD 30º - 45 cm SSD

30º - 55 cm SSD 45º - 45 cm SSD 45º - 55 cm SSD 60º - 45 cm SSD 60º - 55 cm SSD	45º - 45 cm SSD

DUAL TIMER

BEAM SHAPPING ACCESSORIES:

- Beam shaping rails (3 sizes --- short, medium & long)
- Beam shaping kit should consist of
  1. Lead blocks-set of 20 pieces. Thickness should be minimum 5 cm
  2. Plain Plexiglas tray for variable positioning of blocks on tray
  3. Slotted Plexiglas tray

BREAST TREATMENT DEVICE:

Should include

- Half field block led shielding for field sizes upto 10 x 20 cm
- Collimator extension wedge filter rails
- Breast bridge for tangential field

18. MECHANICAL TREATMENT DISTANCE INDICATOR

19. MECHANICAL BACK POINTER

20. LASER POSITIONING – SYSTEM: 3 LASERS

21. TUNGSTEN TRIMMER BARS 55cm SSD

22. BEAM PHYSICS DATA

1. Isodose curve tables for all field size
2. Depth dose percentage table.

23. SEPARATE RADIATION LEAKAGE MONITORING ROOM ALARM

24. DOCUMENTS

- Operator manual (English)
- Service manual (English)

25. CASSETTE HOLDER

26. CASSETTE 14' X 17'

27. CCTV AND INTERCOM FACILITY

28. ACCESSORIES
Dosimeter for primary beam, former type. vcc

Clinical Specialty	Oncology and Treatment therapy
Generic Name	**HYPERTHERMIA SYSTEM**
Clinical Purpose	The Hyperthermia system is used to deliver therapeutic heating to cancerous tumors by the use of radiofrequency (RF) energy. During a treatment the cancerous tumor is heated to 40 and 45 ˚C. Hyperthermia damages cells in solid tumors.

TECHNICAL SPECIFICATIONS

RF Power Delivery Subsystem:

- Solid state amplifier with 4 channel independent phase and amplitude adjustment capability.
- Maximum power output of 0 to 500 watts per channel.
- Phase accuracy within a 10 degree tolerance
- Computer automatically monitors and controls forwards and reflected power phase, and power on each channel.
- Optimized treatment settings are calculated through the use of treatment planning software tools provided with the system.

Thermometry Subsystem:

- Non-perturbing, electromagnetically insensitive, temperature sensor with an accuracy of ±0.2°C over a range of 25 to 52 °C
- Automated positioning system allows the operator to map the sensor along the length of the catheter in order to determine the temperature profile.
- Precise calibration reference sensor is accurate to ±0.05°C over a range of 0 to 60°C.

Computer Control System:

- User friendly, intuitive, color graphic interphase.

- Step-by-step guide for setup and treatment procedure
- Icon selectable adjustment of the treatment parameters.
- Tabs allow operator to easily switch between screen displays.
- Closed loop feedback system provides automatic monitoring and control of treatment parameters, including power output , frequency, amplitude and phase, tissue temperatures, core temperature and treatment time.
- System automatically records, displays, and print patient treatment data.
- Control of power and tissue temperature to within ±0.1°C.
- Data regarding temperatures, RF power level and RF power control updated 2 seconds.
- Control algorithms smoothly adjust heating and cooling rates.
- The system control the applied power level in accordance with operator inputs and automatically adjust the level of power to maintain the operator selected temperature throughout the treatment.
- The computer automatically performs numerous safety checks to ensure proper operation of the system and ensure safety for the patient and the operator.

Applicator and Patient Support System:

- Optimized power coupling.
- Optimized patient comforts.
- Water system automatically fills the bolus and control the bolus water temperature.
- Fabric sling comfortably supports patient inside the applicator.
- Easy patient access and handling.
- Quick drain capability allows fast access to the patient-15 seconds for patient access and 30 second for complete drain.

Applicator subsystem

Sigma Ellipse

- Sigma Ellipse is an elliptically shaped plastic shell used to support the same components used in the Sigma 60. The Sigma Ellipse provides improved comfort for smaller size patients.

Sigma 60

The Sigma 60 uses a cylindrical shaped plastic shell to support the 8 radiating dipoles

- Advanced annular phased array principles create a central focusing of energy, which significantly overcomes the penetration losses of the energy radiated into the body.
- Phased array applicators allow the operator to shape the heating pattern to the targeted treatment area and achieve selective power targeting at depth for treatment of deep tumors.
- Dipoles are covered by a thin dielectric layer to prevent contact with the bolus

water.

- Water filled bolus dielectrically loads the individual antennas and provides an energy-confining medium that directs the RF energy into the body.
- Quick and easy patient setup.
- Plastic shell provides a clear view of the patient's surface to allow visual verification of the applicator positioning and to facilitate monitoring of any skin color changes, which would be indicative of surface hot spots.

Site Planning:

A standard hyperthermia treatment area consists of

- RF shield enclosed treatment room
- The operator room
- Small technical room

Treatment Room:

- The treatment room is equipped with electromagnetic shielding and typically requires floor space of 142.5 square feet.

Operator Room:

- Operator room requires floor space of 78 square feet and an observation window looking into the treatment room.

Technical Room:

- Technical room of 34 square feet is required for installation of the amplifier.

Clinical Specialty	Oncology
Generic Name	**LARGE BORE OPENING CT SIMULATOR SPECIFICATIONS**
Clinical Purpose	A description of the essential clinical or other objective/s associated with the device's utilization, e.g. anesthesia units (allow the anesthetist to) dispense a mixture of gases and vapors and vary the proportions thereof to control a patient's level of consciousness and/or analgesia during surgical procedures.

TECHNICAL SPECIFICATIONS

GANTRY:

- **Gantry bore:** 85cm
- Minimum gantry rotation speed of 0.5 sec for 16 slices per 360 degree rotation.
- System is able to acquire helical spiral scan.
- Field of view is 70cm.
- Extended Field of View above 80cm.
- **Minimum slice thickness for 16 slices**: 0.6mm.

TUBE:

- Heat storage capacity of 7.5 MHU.
- Generator output of 600mA.

GENERATOR & DETECTOR:

- High frequency type. Maximum power of 70kW.
- Dose reduction hardware/software.
- Calculate patient dose in milli-Gray before axial acquisition.
- Low contrast delectability (LCD) calculated on a catphan CT phantom of 4mm resolution with a CT Number of 3 HU (0.3%) contrast difference.
- Scan length of 1.8 meters of helical or axial scans in a single acquisition.

TABLE:

- Single acquisition scan range of 1.6 m.
- Scans with 0.25 mm accuracy on a 205 kg patient.

CONSOLE COMPUTER:

- System architecture and operating system based on latest technology.
- Multitasking and parallel processing CPU system.
- 200 GB of storage space.
- Capable of storing 3600 raw data files rotation.
- Image reconstruction at 22 images per second.
- Console monitor of color 19” TFT type.
- DVD-R

ADDITIONAL WORKSTATION:

- High-speed links to the operator console on DICOM network.
- System architecture and operating system is based on latest Dual Xeon processor of 2.6GHz with 512 cache.
- One Hi-resolution LCD/TFT screen of 18 inch or more.
- CD / DVD writer

- DICOM viewer with universal PC display capability (licensed).
- Color laser printer, A4 size, high resolution.

SOFTWARES:

- Full color volume rendering 3D both at console and workstation including Coronary Angiography.
- True isotropic volume acquisition both at console and workstation.
- CT Angio both at console and workstation including Coronary Angiography.
- Vessel stenosis analysis at workstation.
- 3D surface rendering both at console and workstation
- Curved planer reformation at console.
- Contrast media based synchronizing software at console.
- Bone mineral density with phantom at console.
- Virtual endoscopy / colonoscopy / bronchoscopy at workstation.
- Head perfusion both at console and workstation.
- Dental CT at workstation / console.
- Calcium scoring (coronary) with ECG gating and capability for prospective and retrospective reconstruction complete cardiac phase editing and function analysis.
- Pediatric scanning package.
- Plaque analysis software for differentiating between hard and soft plaque automatically.

NOTE: Console and workstation are capable of independent working.

DICOM 3 Capability:

- DICOM 3 Capability for Send, Receive, Archive, Retrieve and Print.

QUALITY AND SAFETY STANDARDS:

- MDD (CE) compliance.
- FDA 510 K approval.

POWER REQUIREMENT:

- Three phase with line voltage of 220 V, 50Hz.
- Multi slice CT Fluoroscopy with real time imaging and display of 8 frames/sec with required hardware / software. One high resolution in room LCD monitor of 15 inches on mobile base / ceiling suspended.
- Lungs nodules software.

ACCESSORIES:

- DICOM compatible Dry Laser/Thermal camera, multi size up to 14” x 17”.

- Emerson / Rielo On line sine wave UPS for whole system with a back up of 10 minutes on full load.
- Protection devices (Lead aprons 04 with hangers, Lead Gloves 04 pairs, 0.5 mm Pb. Equivalent light weight)
- Lead glass for control room 5x3 feet 0.5 mm Pb. Equivalent.
- Dual head programmable Power injector with flow/volume and temp control capable of simultaneous injection of both contrast and saline. Mounted on mobile base with 100 syringes of 150 ml capacity and connecting tubes
- Standard set of phantoms for calibration of CT.

Clinical Specialty	Oncology
Generic Name	**RADIOGRAPHIC / FLUOROSCOPIC SIMULATOR**
Clinical Purpose	A description of the essential clinical or other objective/s associated with the device's utilization, e.g. anesthesia units (allow the anesthetist to) dispense a mixture of gases and vapors and vary the proportions thereof to control a patient's level of consciousness and/or analgesia during surgical procedures.

TECHNICAL SPECIFICATIONS

GENERATOR

- 50 KW or more high frequency
- Radiographic KVP range of 40 – 150 KVP or better
- Fluoroscopic KVP fange of 40 – 125 KVP or better
- MAS range .5 to 1000; anatomical or better
- Programs and technique selections of KVP, KVP /MAS / time

X-RAY TUBE

- 400 KHU
- Focal spots .6 x .6 and 1.0 x 1.0
- Target angle 14º

DIGITAL IMAGE AQUISITION SYSTEM

- 12 inch tri field Image Intensifier
- Coverage: 12" / 9" / 6" diameters
- Automatic "S" Distortion Correction
- 1024 X 1024 Digital video camera
- One High resolution monochrome video monitor
- Digital image processing computer

FILM CASSETTE HOLDER

- Manual rotation of + 90º
- Film size 35 cm x 43 cm,
- Anti collision touch guard
- X-ray field size 1 x 1 cm to 55 x 55 cm at 100 cm sad
- Source to skin optical distance indicator 60
- cm to 200 cm
- 8:1 Ratio Grid

FIELD WIRES:

- Asymmetrical and symmetrical mode
- Field size of 2 x 2 to 45 x 45 cm at 100 cm SAD

CUSTOMIZED BLOCKING TRAY HOLDER:

- Should be Manufactured to match the department's treatment machine

PEDESTAL AND MOTORIZED GANTRY:

- Variable source to axis distance of 80 to 120 cm
- Isocenter height 126 cm (+ 5mm)

PATIENT SUPPORT ASSEMBLY

Motorized with free float in lateral and longitudinal direction

- Motorized lift with a 220 kg capacity
- Tabletop of carbon fiber with the transmission equivalence of 1.0 mm aluminum
- Indexing Table Top with accessory bar for precisepatient set up

SIMULATOR INFORMATION DISPLAY MONITOR:

- Two should be provided, one local (17" flat panel or technical equivalent) and one remote
  (17" flat panel or technical equivalent)

CONTROL SYSTEM:

Windows operating system

- Local area network connection (LAN) should be included
- Built-in SIM-NT calibration software
- International control symbols

THREE ALIGNMENT LASERS:

- (Solid state diode type) 2 lateral, 1 sagittal

OPERATOR CONTROLS:

One - Control Room Operator Console

- One – Operator Hand Pendant tethered to the couch in patient area, re-connectable to either side of the couch for operator convenience

Clinical Specialty	Oncology
Generic Name	**DIGITAL RADIOTHERAPY SIMULATOR**
Clinical Purpose	A fluoroscopic digital simulator is required for radiation oncology to perform all kind of conventional simulations and marking of radiotherapy patients

Technical Specification

Mechanical:

- Motorized gantry with isocentric design

Gantry rotation: ≥ ± 180 deg for SAD ≤ 100 cm

- Isocentric height above floor level ≤ 135 cm
- Isocentric maximal sphere ≥ 2 mm diameter
- Hand held control of parameters inside room
- X-ray tube and housing with rotating anode
- X-ray beam collimated by motorized diaphragm with both local and remote control
- Asymmetric collimators simulation
- Field defined by wires, independent of the x-ray beam diaphragm, motorized with both local and remote control
- Projection of the wires shall be ≤ 2.5 mm at the isocentric
- Collimators rotation ≥ ± 180 degree
- Optical distance indicator range SAD ± 20 cm
- Maximum field size at the isocentric ≥ 40 cm x 40cm
- Minimal field size at the isocentric ≤ 0.5 cm x 0.5 cm
- Field size symmetry better than ± 3 %
- Light radiation field congruence ≤ 2 mm
- Transparent shadow tray
- Radiographic Cassette holder for port filming
- Anti-Collision mechanical sensor

Couch Table:

- X-ray transparent Carbon Fiber table top
- Isocentric rotation ≥ ± 90 degree
- Patient lateral motion range ≥ ± 20 cm
- Motorized vertical movement, with minimum height ≤ 80 cm, and not less than 40 cm below isocentre, and at least up to 3 cm above the isocentre
- Longitudinal range ≥ 70 cm
- Table top sag ≤ than 5 mm with a patient of 80 kg

Laser Marking System:

- Fixed wall mounted red laser alignment system for patient marking

Lead Glass:

- 100 cm x 150cm or more with lead equivalent to meet the PNRA radiation safety equipments

QA Devices/Software:

- All necessary QA devices/software to perform daily/monthly QA checks

Main Control Console:

- Movement and light controls should be provided together with the appropriate x-ray control switches gantry, collimator, image receptor, and couch etc.

X-ray Generator:

- Fluoroscopy/radiography high frequency generator
- **Radiography:** 40-150 kVp and 10-600 mAs, Fluroscopy: 50-125 kVp and upto 15 mA

Un-Interrupted Power Supply (UPS):

- UPS Compatible with the system for ten minutes back up time.(Emersion,Riello,G.E,APC)

Imaging System:

- Solid state amorphous silicon flat panel image receptor size ≥ 38 cm x 28 cm
- Digital work station
- Digital fluoroscopic imaging

- Digital static (filmless) imaging
- Image processing Software
- Image Import / Export
- MLC Planning
- DICOM compatibility, DICOM compliance statement should be provided.
- Latest computer systems with LED monitors, printer and other peripherals

Safety Compliance:

- Compliance with safety requirements in the International Basic Safety Standards for Protection against Ionizing Radiation and The International Electro-technical Commission Standards (IEC)

Accompanying Documents and Software:

- The accompanying document shall comply with BSS and IEC standards. The performance specifications and operating and maintenance instructions shall be provided in English language. The users are primarily radiographers and radiation oncologists but also physicists and maintenance personnel may use the equipment.
- The documents/software etc shall include:
- Performance specifications.
- Operating instructions and manual
- Preventive maintenance instructions and service manual
- Any other software, if needed by the user/maintenance personnel and any up-gradation with all added features should be provided free of cost for warranty period.
- Mandatory optional (Price to be quoted separately)
- Construction of Bunker 900sq.ft for its Installation and commissioning with Shielding will be the responsibility of the firm, as per satisfaction of the end-user.

Note:

Training: One Doctors foreign training for one week, One Physicist and two technologist local training for two weeks.
Warranty: Five years unconditional warranty including all type of spare parts by the manufacturer.

Clinical Specialty	Oncology
Generic Name	**DIGITAL RADIOTHERAPY SIMULATOR**
Clinical Purpose	A fluoroscopic digital simulator is required for radiation oncology to perform all kind of conventional simulations and marking of radiotherapy patients
Technical Specification	

Mechanical:

- Motorized gantry with isocentric design

Gantry rotation: ≥ ± 180 deg for SAD ≤ 100 cm

- Isocentric height above floor level ≤ 135 cm
- Isocentric maximal sphere ≥ 2 mm diameter
- Hand held control of parameters inside room
- X-ray tube and housing with rotating anode
- X-ray beam collimated by motorized diaphragm with both local and remote control
- Asymmetric collimators simulation
- Field defined by wires, independent of the x-ray beam diaphragm, motorized with both local and remote control
- Projection of the wires shall be ≤ 2.5 mm at the isocentric
- Collimators rotation ≥ ± 180 degree
- Optical distance indicator range SAD ± 20 cm
- Maximum field size at the isocentric ≥ 40 cm x 40cm
- Minimal field size at the isocentric ≤ 0.5 cm x 0.5 cm
- Field size symmetry better than ± 3 %
- Light radiation field congruence ≤ 2 mm
- Transparent shadow tray
- Radiographic Cassette holder for port filming
- Anti-Collision mechanical sensor

Couch Table:

- X-ray transparent Carbon Fiber table top
- Isocentric rotation ≥ ± 90 degree
- Patient lateral motion range ≥ ± 20 cm
- Motorized vertical movement, with minimum height ≤ 80 cm, and not less than 40 cm below isocentre, and at least up to 3 cm above the isocentre
- Longitudinal range ≥ 70 cm
- Table top sag ≤ than 5 mm with a patient of 80 kg

Laser Marking System:

- Fixed wall mounted red laser alignment system for patient marking

Lead Glass:

- 100 cm x 150cm or more with lead equivalent to meet the PNRA radiation safety equipments

QA Devices/Software:

- All necessary QA devices/software to perform daily/monthly QA checks

Main Control Console:

- Movement and light controls should be provided together with the appropriate x-ray control switches gantry, collimator, image receptor, and couch etc.

X-ray Generator:

- Fluoroscopy/radiography high frequency generator
- **Radiography:** 40-150 kVp and 10-600 mAs, Fluroscopy: 50-125 kVp and upto 15 mA

Un-Interrupted Power Supply (UPS):

- UPS Compatible with the system for ten minutes back up time.(Emersion,Riello,G.E,APC)

Imaging System:

- Solid state amorphous silicon flat panel image receptor size ≥ 38 cm x 28 cm
- Digital work station
- Digital fluoroscopic imaging
- Digital static (filmless) imaging
- Image processing Software
- Image Import / Export
- MLC Planning
- DICOM compatibility, DICOM compliance statement should be provided.
- Latest computer systems with LED monitors, printer and other peripherals

Safety Compliance:

- Compliance with safety requirements in the International Basic Safety Standards for Protection against Ionizing Radiation and The International Electro-technical Commission Standards (IEC)

Accompanying Documents and Software:

- The accompanying document shall comply with BSS and IEC standards. The performance specifications and operating and maintenance instructions shall be provided in English language. The users are primarily radiographers and radiation oncologists but also physicists and maintenance personnel may use the

equipment.

- The documents/software etc shall include:
- Performance specifications.
- Operating instructions and manual
- Preventive maintenance instructions and service manual
- Any other software, if needed by the user/maintenance personnel and any up-gradation with all added features should be provided free of cost for warranty period.
- Mandatory optional (Price to be quoted separately)
- Construction of Bunker 900sq.ft for its Installation and commissioning with Shielding will be the responsibility of the firm, as per satisfaction of the end-user.

Note:

Training: One Doctors foreign training for one week, One Physicist and two technologist local training for two weeks.
Warranty: Five years unconditional warranty including all type of spare parts by the manufacturer.

Clinical Specialty	Oncology
Generic Name	**DEEP X-RAY THERAPY SYSTEM**
Clinical Purpose	A description of the essential clinical or other objective/s associated with the device's utilization, e.g. anesthesia units (allow the anesthetist to) dispense a mixture of gases and vapors and vary the proportions thereof to control a patient's level of consciousness and/or analgesia during surgical procedures.

TECHNICAL SPECIFICATIONS

1. <u>X-RAY BEAM:</u>
The system consisting of a metal ceramic 300kV X-ray tube designed for medical applications.

The tube must be a bi-polar ceramic X-ray tube of advanced metal ceramic design with integrated high voltage receptacles and cooling system. It should be enclosed in a ray-proof housing with fittings for oil hose connections.

X-ray Tube Output Limits<u>:</u>

Voltage:	40 - 300 kV
Current:	0 - 30 mA
Power:	400 – 3200W for designated stability

X-ray Tube Specification:

Focal spot size:	8 mm
Target material:	Tungsten
Inherent filtration:	2 mm + 1 mm Be
Tube power continuous:	3200W
Rating continuous:	320kVP/10.0mA
Field coverage total:	40°
Anode angle:	30°

2. CONTROL SYSTEM:

The X-ray control system, comprising of a PC driven interface with an X-ray control pod and a control Unit. The system should be supplied in either dose or time configuration, both come equipped with dual microprocessor architecture to enable independent back up timer safety mechanisms.

3. THE DOSIMETRY SYSTEM:

The open ion chamber to be positioned within the sub-tube assembly below the treatment filter, changes in temperature and pressure should be applied automatically. A reference calibration to be conducted for each clinical filter (energy) using a nominated
reference applicator.
For non-reference applicators a timed exposure to be performed to calculate the coefficient
factor due to the difference in the applicator top plates on the electrometer reading. These
applicator factors to be stored and applied when the filter applicator combination is selected for clinical exposures.

Dose Rate Stability:

The exposure should be terminated if the kV and mA output values deviate by more than ±3%of the full scale value. The output from the X-ray tube should be continuously monitored.

Reproducibility (as IEC 60601-2-8):

The reproducibility of the dosimetry system for each energy should be less than or equal to 1%.

Linearity (as IEC 60601-2-8):

The linearity of the dosimetry system should be better than ± 1% or 1MU

4. TREATMENT FILTERS & APPLICATORS.

The system should use a binary encoding system to recognize treatment filters and applicators.

Filters:

System should have up to ten filters, nine clinical filter and one “warm-up” filter. The warm-up filter constructed of 6mm of lead. The nine clinical filters constructed in accordance with the half value layers defined by the department.

Each filter holder should be uniquely identified in the sub tube assembly.
The system should have a HVL of up to 3mm of copper.

Each filter constructed from a maximum of three materials, up to a physical maximum of 3mm.

The standard set of clinical filters to be supplied with the system is listed below:

Filter	1	2	3	4	5	6	7	8	9
kV	60	80	100	120	150	180	200	250	300
HVL 1 (mm)	1.5Al	2.5Al	3.0Al	5.0Al	6.0Al	0.5Cu	1.0 Cu	2.0 Cu	3.0 Cu
Added Filtration (mm)	1.0Al	2.0Al	2.0Al	0.5 Al 0.45 Cu	1.0 Al 0.10 Cu	1.5 Al 0.15 Cu	1.0 Al 0.45 Cu	1.0 Al 1.10 Cu	1.5 Al 0.25 Cu 0.50sn

The standard set of applicators to be supplied with the system should have the following aperture sizes and to be supplied at two FSD's:

30cm FSD Open applicators
- 3cm diameter
- 4cm diameter
- 5cm diameter
- 10cm diameter

50cm FSD Closed applicators
- 4cm x 4cm
- 6cm x 6cm
- 8cm x 8cm
- 10cm x 10cm
- 15cm x 15cm
- 20cm x 20cm

5. RADIATION SAFETY:

The system should be designed to deliver radiation for clinical purposes. The system to be installed within a treatment room, with an appropriate level of radiation protection.

Leakage Radiation
The leakage radiation from the X-ray tube assembly should comply with IEC60601-2-8

Safety System
The control system monitors the safety interlock system and should interrupt or inhibit an
exposure if the interlock relay has not been satisfied. A visual interlock message should be
displayed on the monitor.

6. TREATMENT HEAD MOVEMENTS:

The system should be mounted on either a ceiling suspended X-ray tube support system or
a floor stand X-ray tube support system.

7. THE X-RAY GENERATOR & HEAT EXCHANGE EQUIPMENT:

The X-ray Generator
The system should include a 3kW or more high voltage generator.

Specifications

Output Power:	3200W
Ripple:	High frequency and line frequency total ripple
Voltage & Current Stability:	Short term – 0.05% / hour of set value Long term – 0.1% / hour of set value
Voltage & Current Reproducibility:	0.1%
Voltage & Current Accuracy:	2% & 1%

Reproducibility and Linearity of the generator to be assured by a direct output measurement with independent mA and kV control circuitry.

Heat Exchange Equipment
There should be two types of closed circuit oil cooler that could be used with the system.

1. An oil to air cooler, the oil should be cooled via a heat exchanged / radiator system
in which the oil cooling is assisted by a thermostatically controlled fan.

2. Water-cooled oil cooler whereby the oil is cooled through a heat exchanger by a thermostatically controlled 'lost water' system

Clinical Specialty	Oncology
Generic Name	**DOSIMETER BEAM SCANNING SYSTEM**
Clinical Purpose	A description of the essential clinical or other objective/s associated with the device's utilization, e.g. anesthesia units (allow the anesthetist to) dispense a mixture of gases and vapors and vary the proportions thereof to control a patient's level of consciousness and/or analgesia during surgical procedures.

TECHNICAL SPECIFICATIONS

Water Phantom:

- **Volume minimum**: 450 x 450 x 410 mm.
- **Wall thickness:**At least 20 mm or more
- Phantom should include Electromechanically lifting carriage with adjustment provision, water reservoir (mini.200L water) and pump.
- Phantom shall have provision to hold 0.6 cc Former type chamber.

Electrometer:

- Dual channel for relative dosimetry with variable power supply

Chamber:

- 0.6 / 0.65 cc scanning chambers with water proof sleeves with valid calibration certificate.
- Chamber extension cable should be minimum 100 ft. or more.

High Precision Reference Class Electrometer:

- Portable single channel Electrometer for measurement of absorbed dose.

Solid Water Equivalent Phantom:

- It is made up of slabs of different thickness. This phantom should be used for electron and photon dosimetry. It should be free of contamination and air buffers.

Complete Detector Array System:

- Linear array (for motorized or Dynamic wedges)
- 2D array (For IMRT Plan verification) system for QC of dynamic MLCs.

Laptop:

- Min. Core-i 5, 1 Gb graphic card, 4 Gb RAM and 500 Gb HD with installed software for radiation dosimetry according to international dosimetry protocols

Software:

- It should support TG51 and TRS398 protocols. It should be provided to convert measured data in the format required for beam data configuration of supplied TPS (Eclipse). Software should be able to output data in worksheet format.

Documents:

- User manuals for electrometer, phantom, service manuals

Trainings:

- User & Technical training

- Mandatory optional (Price to be quoted separately)
- Construction of Bunker 600sq.ft for its Installation and commissioning with Shielding will be the responsibility of the firm, as per satisfaction of the end-user.

Note:

Training : One Doctors training for one week, One Physicist and two technologist local training for two weeks.
Warranty: Five years unconditional warranty including all type of spare parts by the manufacturer.

Clinical Specialty	Oncology
Generic Name	**TREATMENT PLANNING SYSTEM**
Clinical Purpose	A description of the essential clinical or other objective/s associated with the device's utilization, e.g. anesthesia units (allow the anesthetist to) dispense a mixture of gases and vapors and vary the proportions thereof to control a patient's level of consciousness and/or analgesia during surgical procedures.

TECHNICAL SPECIFICATIONS

The Radiotherapy Treatment Planning System should be based on advanced computer system having latest hardware and software to perform all kinds of 3D Teletherapy and Virtual Simulation.
One server for Data Base Management integrated with the Planning Terminals. TPS with two Work Stations (two Calculation Licenses) should be provided for Conventional Photons, Electrons, 3D CRT and Inverse Planning (DICOM -3RT Interface to Network with Simulator, CT scanner, Dosimetry System with Flat-Bed Scanner) with at least one license that includes IMRT. It should include Fusion and Registration Software, Virtual Simulation Software and Beam Modeling Software. Also it should have real time DRR / DCR Functionality, and Plan Approval Facility and should provide Multiple Algorithms (Monte carlo, etc). A minimum of 3 Contouring Licenses / Work Stations should be included.

Clinical Specialty	Anesthesia and Ventilation
Generic Name	**NETWORKING**
Clinical Purpose	A description of the essential clinical or other objective/s associated with the

	device's utilization, e.g. anesthesia units (allow the anesthetist to) dispense a mixture of gases and vapors and vary the proportions thereof to control a patient's level of consciousness and/or analgesia during surgical procedures.

TECHNICAL SPECIFICATIONS

THE RECORD & VERIFICATION SYSTEM MUST BE BASED ON CLIENT/SERVER ARCHITECTURE TO PROVIDE

- A common relational database management system that integrates medical and business records
- A common user interface for data entry and viewing in a variety of applications
- A standard communication path for interfacing to other database systems.
- Considering the critical nature and volume of procedures, the software must provide high reliability, and should offer the highest quality performance.

The Oncology information management/record and verify system shall assist in the integration of radiotherapy patient data throughout the entire department. It shall also record and verify treatment parameters of patients undergoing treatment on the Linac.

ONCOLOGY INFORMATION SYSTEM COMPLETE WITH NETWORKING, RECORD & VERIFY SYSTEM

- Transfer of all parameters from Simulator & Treatment Planning System to the Linear Accelerator for automatic treatment setup & delivery should be provided.
- Transfer of Fluoroscopy images from Simulator to Portal Imaging System for comparison should be provided.
- Transfer & Execution of MLC Position Parameters for normal treatment & IMRT treatment including Step & Shoot & Dynamic techniques from Treatment Planning System should be provided.

Should be Networked with Existing Network System and all required interfaces should be provided.

Warranty: Five years unconditional warranty including all type of spare parts.