सत्यमेव जयते

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TECHNICAL SPECIFICATIONS FOR 128 Slice Dual Energy CT Scan Machine:

- State of Art, Latest version with most recent upgraded software available with OEM for 128 Slice Dual Energy CT Scan Machine to be quoted.
- The system should be BIS or US FDA or European CE approved.
- Only the latest machines matching the specifications given below must be quoted by OEM only.
- The quoted model should be with iterative reconstruction technology for dose reduction and should be launched in RSNA in last 5 year.
- Older machines/Models and Re-furbished gold seal machines will not be considered.
- Participating OEM must have minimum Three installations in the Government institutions (Hospitals/Medical Colleges) in last three years.
- The equipment should be able to do following procedures, inter-alia:-

I. Contrast Media Tracking.

II. CT Angiography.

III. CT Pulmonary Angiography.

IV. CT Fluoroscopy for Biopsy

V. Advances 3D analysis.

VI. Dynamic cerebral perfusion mapping & Lungs perfusion.

VII. Head CT.

VIII. Thoracic CT.

IX. Abdominal CT including CT Enterography.

X. Pelvic CT.

XI. Skeletal CT.

XII. Interventional CT.

XIII. Cardiac CT.

XIV. Virtual Bronchoscopy, virtual colonoscopy and virtual endoscopy.

General Points:-

- The equipment should be software and platform protected for the entire life time of the equipment.
- All software upgrades should be done free of cost by the OEM/bidder within one month of issue of new upgrade from Principal OEM.
- Even during the warranty period, the desired uptime of 98% of 365 days will be ensured. In case the downtime exceed the 2% limit, extension of the warranty period will be twice the Excess downtime period.
- Bid/Tender should include a clause that availability of Spares/Reagents/ consumables/accessories etc shall be ensured by the bidder for complete lifespan of the equipment or 10 years (whichever is more).

TECHNICAL SPECIFICATIONS: -

A. GANTRY

1. The system should be in position to perform 128 slices per rotation for general, cardiac and vascular applications and generating true isotropic volume acquisition and sub millimeter resolution.
2. Should incorporate low Voltage Slip Rings.
3. Minimum scan time for a 360º rotation should be less than or equal to 0.35 sec. (350 mili sec.)
4. Should have tilt of at least 30 degree or more on either side and remote tilt should be available as standard.
5. Gantry should be provided with remote control and user control panels on either side for positioning of the patient.
6. The sub millimeter slice @0.63 mm or less in 64 row 128 slice acquisitions should be available.
7. Should have 3D positioning laser lights.
8. The scan FOV in acquisition mode be at least 500 mm with intermediate steps for scanning different anatomic legions.
9. Gantry aperture should be at least 70 cm in diameter.
10. Machine should be capable of continuous spiral scans of minimum 100s.
11. Integrated Display Panel - Gantry front showing current scan parameters such as kV, mA, ECG trace etc. for easy set up for ECG gated studies.

B. X-Ray Generator

1. Should be compact and in-built in the gantry.
2. Should be high frequency with power output having at least 70 kW output or more to support continuous and sustained operation.

C. X-Ray Tube

1. Tube Voltage: 80-140 KV or better.
2. The mA range available should be between 20 to 800 or more for all applications and modes, with increment steps of not more than 10mA.
3. The system should have mechanism for real time mA modulation for both Z-axis and Angular dose modulation
4. The X-ray tube should be dual focus with heat storage capacity of 7 MHU or more with effective storage of at least 25 MHU OR alternatively the tube should be with a very high heat dissipation rate (Direct Anode Cooling Technology or equivalent, facts to be supported by Data sheet).
5. Peak heat dissipation rate of anode should be at least 1000 KHU/min.
6. X-ray tube cooler unit should be inside the gantry Focal spots, and type of X-ray tube should be specified as per IEC Recommendations
7. Filter and beam limiting devices should be quoted as standard and must be duly specified

D. DETECTORS

1. These should be of solid state type
2. The System should have at least 64 Physical Rows of detector or more with capability of generating at least 128 slices or more per rotation with 1:1 pitch and slice acquisition of 0.63 mm or lower for all modes.
3. The detector shall be large area detector with Z axis coverage of 38 mm or more at 1:1 pitch.
4. The detector should not require frequent calibration.
5. Pitch should be freely selectable between 0.5-1.5 or more.

E. PATIENT TABLE

1. Carbon fibre floating table top with width at least 40 cm.
2. Should be able to bear 200 kg or more
3. Table speed: Horizontal–Upto 150 mm or more/sec.
4. The Minimum table-top height should not be more than 50cm from the floor level for patient loading and for easy transport of trauma patients.
5. The vertical range should be at least 35cm (max height minus min height)
6. Scan range: should have at least 160 cm metal free scannable range.
7. Facility of positioning aid for horizontal iso-centric positioning of the patient.
8. Remote up/down, forward/backward of the Patient Couch should be standard.
9. Reproducing accuracy of the table positioning should be ±0.25mm.

F. AXIAL/HELICAL SCANNING

1. The system offered should have continuous Spiral Capability of at least 100 seconds or more and single continuous "spiral on time" should be minimum 100 sec or more.
2. The range of Spiral scanning in Z axis Direction should be 160 cm or more.
3. Pitch should be freely selectable in auto and manual mode with a range of at least 0.5-1.5.
4. Image Reconstruction:

a) Recon Speed : Minimum 25 images/sec for axial, helical scans.
b) Recon Matrix: 512x512
c) Real time display speed : 35fps or better.

5. Image Quality:

a) High contrast spatial resolution (standard) for entire width of the detector : it should be not less than 17 lines pair per cm or better maximum at 0% MTF X-Y axis for beam collimation not less than 38cm on Catphan Phantom.
b) Low-contrast resolution : The low contrast resolution for CATPHAN should be at least 5mm at 3 HU with 10mm slice on 20cm Catphan Phantom. Please

mention the dose at which the resolution is achieved.

c) Spatial Resolution : lesser than or equal to 0.33mm

6. The system should have bolus triggered or chase scanning capability.
7. Specify contrast resolution of the system.
8. Should be possible to interrupt acquisition manually once the desired anatomy is obtained.

G. SCANNING Parameters

a) Cardiac imaging : The quoted system should be able to generate image with single or multi sector reconstruction for patients with heart rates ranging between 60-100/min. and with temporal resolution of 150ms or better for single sector recon and 44ms or better with multi sector reconstruction will be preferred.

b) METAL ARTIFACT REDUCTION
Iterative reconstruction based single exposure metal artifact reduction: (iMAR/SmartMAR/OMAR/SEMAR) or equivalent should be offered as standard for orthopedic & Neuro imaging.

c) SEQUENTIAL DUAL ENERGY
Sequential Dual Energy Scan : Simple sequential dual energy for renal stone characterization, gout, metal artifact removal

H. Below Applications are to be included in standard package

a) Automatic multimodality & multivendor radiation dose tracking (dose watch or equivalent) : A web-based dose management solution that captures, tracks, and reports radiation dose directly from the medical device, multi-modality and vendor agnostic. It should do cumulative dose tracking across the health system to assess radiation dose delivered to patients undergoing a variety of imaging procedures. One should deliver the right dose by detecting the causes of excessive radiation and producing sharp and focused diagnostic images with lower exposure.

b) Segmentation : Automatic segmentation capability

c) Colonoscopy & bronchoscopy flythrough: Colonography Noninvasive evaluation of the entire colon. Stool tagging & Removal. 3D and dissection views.

d) Cardiac : Complete cardiac processing tools with LV, RV, Tree View, 3D segmentation, EF, curvilinear vessel view with quantification of narrowing & obstruction.

e) ECG Gating : Prospective ECG trigger facility.

f) ECG Gating : Retrospective ECG gated facility

g) ECG Gating : Facility for ECG editing for removing irregular or ectopic beat.

h) Calcium Scoring : Complete calcium scoring application.

i) Complete Liver segmentation (automated) : Pre-processing for complete liver Segmentation and Semi-automated segmentation of arterial, portal venous, and venous vascular and bile ducts tree with analysis.
j) Multi time point compare with WHO & RECIST : Should be offered as standard.
k) Fusion/registration : Should be standard.
l) Body & Brain perfusion : Should be standard on Console & workstation

I. USER'S INTERFACE

Patient Communication System: An integrated intercom and automated patient instruction system (API) should be provided in Hindi, English and regional language.

J. DATA ACQUISITION SYSTEM

1. System should have minimum 64 rows of detector capable of generating 128 slices or more with latest detector technology with at least 38mm Coverage.
2. Mention minimum acquired slice thickness in Axial & Helical mode after reconstruction.
3. Acquisition of cardiac images with ECG gating (prospective & retrospective) should be Possible
4. Step and shoot technique during cardiac scanning for dose reduction, or a similar alternative technology should be available.
5. System should be capable of contrast based & non contrast based acquisition/applications.

K. Computer and Operator Console

1. The Computer offered should be the Latest Multi-tasking Processors and a menu driven loading Platform.
2. Two large minimum 19 inches high resolution medical grade LCD/TFT monitors with a display on 1024 x 1024 or better.
3. The reconstruction matrix should be at least 512 x 512.
4. The display matrix should be at least 1024 x 1024.
5. It should have facility to store at least 4,00,000 Images at 512 x 512 matrix.
6. DICOM facility to send, store, print, receive, Query/Retrieve, MWM, MPPS etc should be standard.
7. It should be capable of receiving DICOM work list.
8. PC Based connectivity should be standard for easy transfer of Images & Report. The image transfer from main console to workstation should be automatic and immediate.
9. Filming & Printing should be possible. Archiving options CD-R/DVD should be possible.

L. SOFTWARE AND/ OR STANDARD OF COMMUNICATION (WHERE EVER REQUIRED

1. A multimodality client server architecture-based solution with minimum concurrent 40000 slices rendering capacity (Intellispace Portal 6/ Dexux-AW server 2/ Syngo Via 30A etc), with at least 128 GB RAM or more with storage of minimum 10TB with CPU having latest technological specifications - i7 or higher.

2. SERVER HARDWARE: Hardware : CPU: Dual Xeon Processor V3 Processor or better RAM: 64GB or better Graphics: dedicated Nvidia or better OS: Windows server 2010 / Linux Storage Capacity: 10TB usable on 10k rpm Hard Drive after RAID-5 Dual Power Supply, Dual SD Card, RAID-5/6 Support ESXi – Standard Edition 6.0 or above Archive Application – FDA Approved Archive Application from the same OEM who is providing the Modality. Zero Foot Print Application - Application viewing images on Tablet & Mobile which is FDA approved from the same OEM who is providing the Modality.

3. The equipment should have following client hardware specification:
   a) 3 numbers Workstations with 3 concurrent licences for all basic applications and all should be concurrently capable of advanced applications : core i7 processor or better, 32 GB RAM or more , 2TB hard drive, DVD Writing with high resolution monitor of minimum 2 MP resolution, keyboard& mouse. Necessary cabling for connecting these workstations and viewing station has to be done by the successful bidder. Please quote unit price for additional user (license) as an optional item.
   b) A reputed Anti-Virus Solution should be in place for the equipment in toto duly covering the life span of the equipment.
   c) DICOM 3.0 Compliant and PACS, HIS and RIS Interface ready.
   d) Graphics : dedicated 2GB or better.
4. Basic capabilities (Minimum 3 concurrent users for all applications)
5. 2-D, including image zoom and pan, windowing, image manipulations, distance, angle, Anatomical Registration and mirroring; and advanced bone correction.
6. Bone mineral analysis to measure bone density in one or multiple time points (console/workstation).
7. 4D Dynamic Scanning like Jog Mode/Volume Helical Shuttle/4D Flex scan techniques with Minimum 8 cm coverage or more

8. A monitor and foot paddle to be provided inside the gantry for Fluoroscopy/Continuous CT Guided biopsy.
9. System should have iterative metal artifact reduction technique for imaging of challenging areas like spine implants, pacemakers, dental fillings and neuro coils.
10. It should be possible to carry out hard copy film archiving and soft copy archiving on a CD/DVD at each workstation. Multi session archiving on CD/DVD should be available.

Following post processing softwares should be available:-

i. Multi planar reconstruction (MPR).

ii. Minimum and Maximum intensity projection.

iii. 3D Volume rendering.

iv. 3D SSD (Shaded Surface Display).

v. Advance Vessel Analysis with plaque visualization.

vi. Auto Bone Removal.

vii. Volume measurement.

viii. Lung Nodule analysis & Quantitative analysis of Pulmonary emphysema.

ix. Liver lesion analysis & liver fat quantification.

x. Colonography.

xi. Perfusion CT (Whole body including brain).

xii. Image Fusion of CT, MR & PET Data.

xiii. Neuro DSA.

xiv. Coronary tree analysis: automated 3D processing of coronary arteries, calcium scoring, stent analysis, LV analysis, TAVI application.

xv. Multi-modality automatic tumour tracking & Automatic measurements in RECIST, WHO, Volume & Choi criteria calculation.

xvi. Virtual endoscopy & colonoscopy.
xvii. Brain & body Perfusion CT.
xviii. Liver analysis software, auto segmentation and volumetry.
Xviv. Image fusion of CT, MR & PET data

DOSE REDUCTION TECHNIQUES:

a) Pre-patient collimation : There should be pre-patient collimation to reduce unnecessary dose to the patient
b) Advanced Iterative Reconstruction : Iterative reconstruction with model observer method, with noise, object & physics modelling technology for

all imaging protocols including brain (ADMIRE/ASiR-V/IMR/FIRST)

c) Cardiac scanning : Step and shoot technique during cardiac scanning for dose reduction, or a similar alternative technology should be available

d) Organ Dose modulation : Advanced dose limiting for critical organs using ODM / xCARE or equivalent should be offered as standard

e) 3D Dose Modulation : tube current modulation along Z-axis for different patient size and organs should be offered as standard

f) Pediatric & infant Imaging protocols : Low dose protocols must be provided

M. IMAGE EVALUATION TOOLS

1. Parallel evaluation of multiple ROI in circle, irregular and polygonal forms.
2. Statistical evaluation for area/volume, S.D., Mean, Min/Max and histogram.
3. Distance and angle measurement, freely selectable positioning of co-ordinate system, grid and image annotation
4. Automatic patient positioning for one touch quick patient positioning for pre selected clinical protocol.
5. Latest Iterative Reconstruction Technique available with manufacturer to be quoted as standard
6. Low dose protocols for pediatric scanning.

N. ACCESSORIES

* *All Deans/MSs are advised to evaluate the in-house equipment status and modify/revise the number and requirement of accessories as mentioned below and procurement to be done at respect Hospitals/Medical Colleges separately as per DOP while ensuring generic specifications following Public Procurement and CVC guidelines.*

1. Dry chemistry camera with resolution of 500 dpi or more. It should be digital DICOM3.0 compliant. iv. The system must have at least three onlinefilm sizes, and should be capable to print on any of the 8x10,10x12,12x14,14x14,14x17 sizes.

2. The system should be freely configurable by the user, to use any of the above-mentioned size. The camera should be networked to other equipment's installed in the department, as specified at the time of installation.

3. Dual Head Pressure Injector of reputed make with 100 sets of Syringes & 200 sets of tubings. Specify the make of Injector.

4. Modular drug trolley: Minimum 2 drawers with dividers suitably designed for keeping medicines, Minimum3 Multipurpose drawers, Equipped with Waste bin, needle disposable container, file cassette & guardrails, Equipped with lock key system, swivel noise less castor with brakes.

5. Multi Para monitor 10-inchmonitor, ECG, SPO2,NIBPmodule of a reputed make for monitoring vitals.

6. Ultra thin X-Ray Film illuminator using LED Lamps. Suitable for viewing three14"x17": Five nos.

7. UPS with half an hour back up to run the entire CT system including Computers, Dry chemistry camera, Work Stations etc

8. One set of standard patient positioning accessories and restraining devices.

9. Two collapsible wheel chair with rubberized swivel wheels.

10. Lead glass (as per the AERB guidelines for the equipment): minimum size 200 x100 cm.

11. Premium ultra-light lead aprons:4.

12. Thyroid collars:2.

13. Gonadal shields: (2 each) male and female patients(4)

14. Lead Gloves - 02 pair; Lead glass goggles - 02 No.

15. Patient monitor camera for patient visualization within the gantry from console room.

16. CD/DVD writing facility with 1000 compatible DVDs.

17. Two external storage SSD of at least 5 TB to be provided for storage of cases.

18. Three desktop PC (i7 with 8GB RAM , 1TB HDD,21" monitor, keyboard mouse and UPS) to be provided for reporting purposes.

19. Three high quality black and white laser printer to be provided for reporting purposes

O. CERTIFICATIONS, Installations

1. Offered model should be BIS or USFDA or European CE approved. Copy of certifications should be submitted with bid.
2. Manufacturer and Supplier should have ISO 13485 certification for quality standards.
3. Electrical safety conforms to the standards for electrical safety IEC 60601-1-General requirements(or equivalent BIS Standard).
4. Shall meet internationally recognized standard for Electromagnetic Compatibility(EMI/EMC). for electromedical equipment 60601-1-2
5. Certified to be complaint with IEC 60601-1-3, IEC 61010-2-44 or equivalent BIS standard
6. AERB type approved.
7. The system should be AERB type approved and the copy of E-LORA listing should be submitted along with bid.
8. Regular QA according to AERB norms will be responsibility of bidder during warranty and CMC period.
9. Bidder should have proven track record in Central/State government/PSU and should have at least 3 installations of the same system during the last three years with satisfactory performance report from the HOD of the User department of Institution. Also company and model name of the unit offered should be clearly mentioned.
10. Application engineer to undertake workstation and application training for technician and radiologist on site for at least 4-8 weeks post installation.

P. WARRANTY & CMC

1. Five year comprehensive on-site warranty of the entire system(spares and labour) including X-ray tube, civil, electrical and air conditioning works and all accessories (including dry chemistry camera, UPS etc).
2. The post warranty (after 5 years) CMC should be comprehensive (repair and/ or replacement) + labor + spares for the complete system which includes all the accessories supplied such as UPS, Generator, AC, etc.(Including batteries for UPS).This shall be taken for price comparison to determine L1.
3. Principal and India counterpart. The principals should be responsible for any lacuna or deficit in service or supply. Supplier /principal company should attach minimum 03 installation of CT scan system and after sales service experience minimum 5 years to ensure Service support.
4. All items in the supply order should be supplied during the time of installation. No Exceptions will be allowed.
5. Software updates (where hardware upgrades are not required) like new

application package etc. should be provided with in one month after release worldwide (any country, viz, North America /Europe/ Germany etc).

6. In case, the same is not provided in time, the parent company should undertake the responsibility to implement the same. This is to make sure that the machine stays updated with similar product for the lifetime of the equipment.

Q. User's care, Cleaning, Disinfection & Sterility issues

Disinfection: Parts of the Device that are designed to come into contact with the patient or the operator should either be capable of easy disinfection or be protected by a single use/disposable cover. Sterilization not required

The quotation of turn key work will be given separately beside the Equipment quotation. However, total cost of the Equipment along with CMC quotes and Turnkey quotes shall be evaluated for calculation of L1.

SITE MODIFICATION – MS/Deans are hereby directed to get all infrastructural additions/modifications/changes proposed by the vendor (as per submitted site plan) in the existing building of the Hospital as per DOP of SR works and the same should be coordinated with respective Regional Directors.

R. SCOPE OF MS/DEAN

1. Power for Air Conditioning and space requirement for installation will be provided by the hospital for coordinated planning and execution of the work.
2. Site preparation should be time bound and completed before shipment of the equipment and time to installation of the machine after arrival should not be more than four weeks (total time 90 days)
3. Cost of site modification work for given area as per user site will be considered for ranking purposes for evaluation of bid.
4. SCOPE OF TURNKEY
    a) Turnkey would include dismantling and disposal of redundant fixtures and execution of all necessary civil, electrical, plumbing and air conditioning work at site
    b) Turnkey Specifications of CT scan unit is to be installed on turnkey basis
    c) The layout plan and other site requirements are to be finalized in consultation with Head of Department (Radiology) and

PMD/Engineering department of the concerned site.

d) The supplier shall he required to undertake all the pre-installation, site preparation work in the area as per the layout plan.
e) The bidder will inspect the site for feasibility before tendering and submit the layout plan for approval by the HOD.
f) The CT complex will comprise of various rooms like CT Examination room, console room, reporting room, changing room, electrical equipment and UPS room and any other required room for CT facility. The site work will be as per approved plan.
g) During construction, modifications can be permitted by the user department of the hospital for more efficient utilization of space and resources.
h) All AERB requirements shall be complied with Site Preparation Work.
i) All items to be used should he of very good quality and are to be used only after the approval is granted by the department or other relevant hospital authorities. In case the same is not done, the vendor shall have to dismantle the existing material and Carry out fresh work at his own cost.
j) Rates of the following components of turnkey project should be quoted with system.
   I. Civil
   II. Electrical
   III. Public health (water supply) and fittings),if any
   IV. Furniture and other items
   V. Miscellaneous

Civil WORK:

Dismantling and reconstruction of walls, floor & ceiling of CT complex if required to be carried out by vendor. A Concrete bed at CT equipment area should be provided in CT examination room. Necessary, trenches, cable tray and channels would be provided at required location for system

Flooring: All rooms should have(60x60 cm)size floor tiles Console and reporting room should have wall tiles (60x60cm) till false ceiling. The examination room should have wall tiles (60x60cm) till false ceiling on all sides. Gypsum false ceiling in Examination room and metallic grid ceiling in

all other rooms Examination room should be provided with outer cove and cove light on the false ceiling Door leading to CT examination room will be lead lined doors as per AERB recommendations. All other doors in the CT Centre will be anodized aluminum partly glazed doors. Picture light should be provided at the center of the ceiling inside gantry room.

Electrical Works

a. The firm shall be required to specify the total load requirements for the entire equipment, the air conditioning units, room lighting and for the accessories if any. The load will be provided by the institute to the distribution panel. The distribution's panel should have switch gear of reputed makes and shall be provided by the vendor. (Any specific requirement of any kind if required shall be the responsibility of the tendering firm)
b. The electrical work will include wiring, different lights and main switch fittings. The electrical work shall also include the following:
c. Wiring-The wires shall be of copper of different capacity as per the load and should be renowned make
d. General lights– LED lights 1x36 watts in all rooms of reputed make.
e. The underground cables supplying the electricity load should be of reputed make
f. Main switchgears fuse units should be reputed make
g. Four nos. of earthing to be provided along with the machine

Air conditioning system:

a. Multi-split Package air conditioning system should be provided for CT area including equipment/examination room, reading room and control room where the temperature of the equipment is 21+/-2degree. The control unit should be wired and fixed on wall in examination and console room.
b. Minimum 15 Ton AC with temperature control. (10TRworking+5TR standby) make (reputed). The outdoor units of AC should have grill coverings to prevent theft and damage.

Fire fighting

1. Fire detection system to be provided in the area using photo electric smoke detector and heat detector son the ceiling and will be connected to the main panel of the center as per the requirement of IS/BIS/ national/ international code.
2. Minimum 2.0 kg of portable Carbon dioxide (CO_2) and other clean agents containing fire extinguishers) to be provided at suitable locations for firefighting in CT room and reading room

FURNITURE AND OTHER ITEMS:

1. All furniture items to be of reputed make.
2. Premium executive office Chairs: 6 Nos.
3. Storage Almirah: 4Nos
4. Workstation table for all workstations
5. Large office table -2 Nos.
6. Basic furniture for reporting room to be provided.

Buy Back:

Buyback option where applicable may be duly evaluated.

DOCUMENTATION

1. Should provide 2 sets(hard copy and soft copy) of:
2. User, technical and maintenance manuals should be supplied in english/Hindi language along with machine diagrams;
3. List of equipment and procedures required for local calibration and routine maintenance;
4. Service and operation manuals(original and Copy) to be provided;
5. Advanced maintenance tasks documentation;
6. Certificate of calibration and inspection,
7. Satisfactory certificate for any existing installation from government hospital

SERVICE SUPPORT CONTACT DETAILS (HIERARCHY WISE; INCLUDING A TOLL FREE/LANDLINE NUMBER): Contact details of manufacturer, supplier and local service agent to be provided; Any Contract(AMC/CMC/add-hoc) to be declared by the manufacturer.

RECOMMENDATIONS OR WARNINGS:- Any warning sign would be adequately displayed.

ENVIRONMENTAL SPECIFICATIONS

a) Temperature and Relative humidity ranges to be maintained as per prescribed standards.
b) Air conditioning load: the heat load calculations and maintaining the desired temperature and humidity in toto shall be the responsibility of the bidder.