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PRE-BID MEETING NOTICE

The department of Nuclear Medicine is scheduled to conduct Pre-Bid meetings of following equipment on the dates and time mentioned below:

Sl. No	Name of Equipment	Date	Time	Venue
1.	Robotic PET/CT Guided Biopsy System	10.08.2026	02:00 PM to 03:00 PM	e-Tumor Board Room Telemedicine Department
2.	Digital PET/CT Scanner (128 Slice)	10.08.2026	03:00 PM onward	e-Tumor Board Room Telemedicine Department
3.	Radiation Monitoring System of Cyclotron facility	11.08.2026	03:00 PM onward	e-Tumor Board Room Telemedicine Department

Considering the highly specialized, rapidly evolving, technology-intensive, and globally dynamic nature of above equipment, and in order to ensure transparency, fairness, wider and healthy competition, optimal technical standardization, and formulation of clinically relevant technical specifications, a Pre-Bid Meeting is being convened on the above scheduled date and time.

The objective of the pre-bid meeting is to obtain complete stakeholder participation from Manufacturers/Authorized Importers/Indian Subsidiaries/OEM representatives regarding technical inputs and suggestions of currently available as well as globally emerging technologies and associated infrastructure requirements.

The draft of tentative technical specifications, in line with the broad institutional requirements, are available for perusal on the Institute website: https://sgpgims.org.in/

All Manufacturers/Authorized Importers/Indian Subsidiaries/OEM representatives are requested to participate in the aforesaid pre-bid meeting as per the scheduled date and time with complete technical details of their current and emerging line of products to facilitate formulation of final technical specifications in accordance with the latest state-of-the-art technology available globally and in the best interest of patient care, academics, training and institutional growth and submit your technical inputs & suggestion regarding the draft of tentative technical specifications latest by 09.08.2026 (upto 04:00 PM) with a line of confirmation for participation on email: nuclearmedicinesgpgi@gmail.com.

Advt. No.:-I/ / JDMM/2026-27 **Director**

Technical Specifications-DRAFT

TREATMENT PLANNING AND ROBOTIC NAVIGATION SYSTEM for PET-CT GUIDED INTERVENTIONS (With Buy-Back)

1. The Planning and Robotic Navigation System

1. Should assist physicians in performing PET-CT Guided Interventions like Biopsy, Pain care, Seed placement, Drainage & Ablation etc.
2. Should be able to work with **any** DICOM Compliant PET CT scanners.
3. Should be able to support commonly available interventional instruments like biopsy needles, pain management needles and electrodes and should work with commonly available ablation devices.
4. Should have the facility to receive and register prior and current images
5. Should have post processing tools like segmentation, 3D reconstruction and MPR of tumor and other vital structures
6. Should have tools to help clinicians mark vital structures and organs that should be spared from needle and injury during procedure
7. Should have facility to create a library of devices along with their characteristics like needle throw, exposure etc.
8. Should help the physician to develop a treatment plan based on prior and current images - to achieve complete margin coverage of multiple tumors using multiple electrodes. The planning software must explicitly support multi-probe synergistic and overlapping ablation zone modeling tailored to specific physics profiles. The plan should at least cover the ablation modality, the model of ablation device, the dimension of the electrodes, and the number of electrodes to be used, power/temperature and time settings, trajectory, sequence of placement, overlapping ablation volume if needed
9. Should allow for creation and comparison of up to 3 such plans as needed before execution
10. Should allow for oblique angle visualization of electrode trajectory in multiplanar view during planning
11. Should allow the physician to register offline plan developed on prior images, with real-time images
12. Should have a facility to alert the user during planning, for possible collision of a needle with another needle or with identified vital organs.
13. Should create the sequence of needle placement to avoid collision
14. Should be able to drive the integrated Robotic arm to automatically align an instrument guide for advancement of instrument by the physician as planned and sequenced above for multiple needles – without the need for additional external feedback from tracking devices or using CT fluoroscopy. Should execute automated robotic alignment using native PET/CT coordinate registration without requiring continuous CT fluoroscopy or line-of-sight optical tracking for alignment, while utilizing integrated software algorithms or patient immobilization devices to manage respiratory and target motion

15. Should have tools to monitor patient related movement and also to control patient movement during procedure
16. Systems with additional advanced features, such as AI-assisted target segmentation, deformable image registration, augmented reality visualization, or electromagnetic/optical tracking, may be offered, provided all essential specifications are met.
17. Should have a tool to register intra-procedural images to verify device placement and estimation of coverage.
18. Should have the ability to visualize post intervention field coverage in 2D and 3D
19. Should have a comprehensive reporting package with an ability to automatically document all key parameters and selected procedure images.
20. Ensure the software can handle registration using **both** the high-resolution CT structural data and the high-contrast PET metabolic data (especially for targets that are completely iso-attenuating on regular CT, such as specific liver metastases or recurrent pelvic lesions visualized via FAPI or PSMA PET
21. The integrated workstation shall include medical-grade workstation, high-performance processor, minimum 32 GB RAM, SSD storage ≥1 TB, dedicated graphics processor, dual medical displays (minimum 24"), windows/Linux platform as recommended by manufacturer.
22. Safety Features: The system shall include emergency stop, collision prevention, robot locking mechanism, sterility maintenance and electrical safety compliance.
23. The bidder shall provide user manual, service manual, preventive maintenance schedule, calibration certificates, acceptance test documents and other relevant documents.
24. The planning and Robotic Navigation system should be CE and FDA cleared.

General Terms and Conditions

1. The planning and Robotic Navigation system should be supplied with 5 years comprehensive warranty, and 5 years CMC after end of warranty period (or as per institute policy). All software upgrades, patches, and license renewals are included free of cost during the entire 10-year period.
2. In the event of replacement or upgradation of the department PET/CT scanner during the lifetime of the robotic system, vendor shall carry out commissioning of the robotic system with the new PET/CT scanner, free of cost.
3. Onsite technical training and service support to be provided for at least 20 procedures covering various types following installation of the equipment
4. At least 3 units of the quoted Robotic Navigation system should have been working satisfactorily for at least one year in a reputed public institution in India or private tertiary care institution. It requires submission of a standard **User Satisfaction Certificate** signed by the Head of the Department/ Institution.
5. Consumables (needle bushes, guides, gauge, equipment drape, touchpad drape, needle stabilizer) should be provided for first 100 patients and the price of consumables (needle bushes, guides, gauge, equipment drape, touchpad drape, needle stabilizer) be freezed for next 05 years.

	Digital Positron Emission Tomography / Computed Tomography (PET/CT)
1.	**Technical Specification**
i	A latest technology Digital Positron Emission Tomography system with integrated 128-slices OR more spiral CT scanner, for commissioning by the vendor **WITH BUY BACK.**
ii	The system should be US-FDA/ CE-European with 4 digit notified body number / BIS certified.
iii	Scope of the work: The bidder shall be responsible for supply, installation, and commissioning of the PET/CT.
iv	The bidder may visit the site and check the proposed area allocated for the installation of equipment is in line with the requirement. A certificate should be attached so that the space is adequate for the installation of the quoted systems.
v	The final price comparison of rates for awarding the contract will be made after adding price of all the components (price of the PET/CT including accessories & CMC and turn key part).
vi	The radiation equipment offered against this tender shall duly conform to the prescribed international/national standards and norms of radiation safety. Type approval certificate/NOC from AERB, Mumbai for the quoted model MUST be attached with the technical bid or else the bid will be summarily rejected.
vii	All the QA / acceptance tests as per NEMA and AERB need to be carried out by company engineers in the presence of Nuclear Medicine Physicist of the department. A detailed report needs to be submitted for onwards transmission to AERB to get the license for operation of the equipment as stated in the NIT. All the required phantoms for QA tests and radioactive sources will need to be arranged by the vendor. The Company will also arrange such phantoms and radioactive sources during periodical QA tests as well at their own costs.
viii	The tenders along with all the commitments, claims, specifications, guarantee, warrantee etc. pertaining to the equipment, it should be submitted directly by the Original Equipment Manufacturer (also referred to as Vendors or Suppliers), who shall be wholly and solely responsible for all the statements/commitments in this connection.
2	**General:**
i	A latest technology whole body Positron Emission Tomography system with integrated spiral CT scanner having 128-slices OR more capability of reconstruction, designed for providing volume measurements of metabolic and physiological processes using positron emitters, as well as for producing accurate structural and anatomical fusion images and making attenuation maps for CT based attenuation correction.
ii	The system should have capability for simultaneous data acquisition, processing, image reconstruction & analysis and fusion of PET with CT images.
iii	The system should operate 220 (± 10) or 440V (± 20) V A/C, 50 HZ
iv	All the Application, Operating and Service Manuals in English language in duplicates should be provided by the vendor at the time of handing over the machine. At least one of these manual sets to be provided in computer readable format, preferably as Word/ PDF for Windows format document.

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Technical Specifications of Digital PET/CT Scanner and its accessories - DRAFT

3	**Gantry and PET Detector:**
i	Gantry should have integrated PET & CT hardware.
ii	The patient gantry aperture size should be ≥ 70 cm and uniform for both PET and CT
iii	The PET scanner should employ non-hygroscopic high light yield (80%) and low decay time Lutetium based crystals (LSO/LYSO) coupled with SiPM for detecting 511 KeV gamma photons in coincidence
iv	The scanner must have a continuous ring of detectors without any gaps
v	Ring diameter should be ≥ 70 cm
vi	PET crystal 4 x 4 mm or smaller and thickness should be ≥ 20 mm
vii	The transverse field of view should be ≥ 65 cm
viii	The geometric PET axial field of view (FOV) must be ≥ 24 cm.
ix	Gantry and table control should be available on both sides of gantry.
x	The scanner must have low power laser lines orthogonally mounted on the gantry for patients alignment and auto-contouring. The laser should be mounted in such a way that the patient can be positioned form either side of the gantry and the patient's bed.
xi	Efficient Gantry cooling system for continuous running of the machine
4	**CT Specifications**
i	Multi detector CT having capability of generating/reconstruction 64 transverse cross sectional slices simultaneously in one rotation.
ii	Multiple pitch factor settings should be available and freely selectable by the user.
iii	Rotation time should be ≤ 0.35 sec for 360 degree.
iv	Image slice thickness should be from ≤ 1 mm to 10 mm and freely selectable
v	Low contrast resolution should be at least ≤ 5 mm @ 0.3% with 20 cm CATPHAN phantom
vi	High contrast resolution should be 15.0 lp/cm or better at 0% MTF OR 2% MTF
vii	Microprocessor controlled high frequency ≥ 70 kW or more x-ray generator
viii	Tube Voltage range should be between 80 - 140 kV
ix	Anode heat storage capacity of 5.0 MHU or more
x	Tube Current of 20-500 mA
xi	Automatic self-testing system
xii	Laser alignment light should control the iso-centric position of the patient in all planes
xiii	Filters / Collimators and other specific features to reduce radiation dose to the patient (with separate adult and pediatric protocols)
xiv	CT iterative reconstruction and metal artifact reduction should offer as a standard feature.

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5	**Patient Bed:**
i	Precision bed with low attenuation carbon fiber pallet and minimum sag of the patient table top.
ii	It should be able to bear ≥200 kg or more patient weight.
iii	A digital readout of the horizontal and vertical position of the bed must exist and must be located near the aperture controls for the bed to provide ease in positioning
iv	The horizontal motion of the patient bed must be electrically motorized and computer controlled with an independent operator control option as well. Operator controls accessible from both sides of the patient must be provided for both horizontal and vertical movements.
v	Full body horizontal length should be ≥ 170 cm to cover the whole-body imaging (Head to Feet) in a single go
vi	The table height should be good enough to unload the stretcher and wheelchair patients without footrest.
vii	A Digital readout of the horizontal and vertical position of the bed must exist and must be located near the aperture controls for the bed to provide ease in positioning
viii	A flat panel for radiotherapy planning should also be provided.
ix	Low attenuation ergonomic head holder, pediatric pallet / restrain, knee-leg support and other accessory pallets
6	**PET Performance Specifications:**
i	All specifications must comply with NEMA Standards Publication NU2-2018 or latest performance measurements without altering instrument parameters. QC Software to measure these parameters must be available in the system.
ii	PET/CT should have functionality to reconstruct the PET images based on time of flight reconstruction for better lesion detectability
iii	Axial & Transverse spatial resolution at 1 cm & 10 cm from the central axis of the gantry should ≤ 4.5 mm FWHM.
iv	Timing Resolution should be ≤ 250 psec, lesser is the better by using SiPM detectors.
v	System NEMA sensitivity must be ≥ 15 cps/KBq at center
vi	System ToF effective sensitivity must be ≥ 120.0 cps/KBq at center
vii	System energy resolution should be ≤ 10.0 %
viii	3-D scatter fraction should be ≤ 40%
ix	NEMA Peak NECR should be ≥ 120 kcps
x	ToF effective peak NECR should be ≥ 1,200 Kcps
xi	Additional features that help to enhance the NEMA spatial resolution values must be offered as a standard.
7	**Data Acquisition and Reconstruction Workstations:**
i	One high performance multi-tasking Acquisition Workstation independent of main processing unit. The workstation should have a minimum 1TB storage, high processor speed, and high resolution (1024 x

	1024 or more) antiglare flat panel Dual LCD monitor of minimum 19" size. The workstation should be of latest specifications at the time of shipment.
ii	*Acquisition Protocols*: The acquisition program should support pre-programmed scan protocols with acquisition and reconstruction parameters and patient's information with simple, dynamic editing of parameters. These parameters would include all information necessary to acquire data on the PET scanner (e.g., scan duration, patient information, bed motion), as well as information necessary for reconstruction.
iii	*Whole Body Acquisition:* Multi bed acquisitions (e.g. for the purpose of whole-body oncology studies) should advance the bed from one position to the next automatically.
iv	List Mode Acquisition for cardiac studies should also be available as standard feature.
v	*ECG Gating* should be part of the offer and is to be provided with necessary hardware and software.
vi	Intercom with user programmable patient instruction system
vii	Ultralow dose CT protocols should be available for hybrid PET/CT protocols. Same PET CT protocol should be usable for Contrast CT in single acquisition.
viii	CT based attenuation correction
ix	*Reconstruction*: PET data acquisition and image reconstruction should be concurrent process i.e.; image reconstruction should simultaneously start for the acquired image while acquisition is still in process.
x	Fully 3-D speedy iterative reconstruction with scatter correction, OSEM technique, High definition (HD) and Time-of-flight reconstruction algorithms must be standard features.
xi	Reconstruction time: At least 25 frames/sec
xii	Advanced 3-D Volume rendering with 3-D fusion, Model/Image based 3-D scatter correction,
xiii	Low dose iterative reconstruction algorithm should also be provided
xiv	*Pixel Size*: The User should have the option to specify the pixel size for reconstruction. The reconstruction program should support reconstruction in image sizes of at least 256 x 256 or higher.
xv	*Scatter Correction*: Scatter correction must be provided based on scan of the actual patient whose scan is being corrected and processed automatically.
xvi	The system should offer multi-parametric imaging functionality.
xvii	System management software for computerized calibration, quality control for all scanner performance parameters, diagnostics.
xviii	Data editing facility for acquired data
xix	Latest DICOM based networking and compatible software for both PET & advanced CT applications.
xx	Facility of DVD & CD writing and image transferring to processing workstation.

xxi	Please offer Wholebody (head to toe) with continouse bed movement option as an optional
xxii	The system shall be capable of functioning as CT independently as well.
8	**Processing Workstation and Clinical Application Software:**
i	Two nos. of high-performance multi-tasking post processing independent workstations to be provided each having minimum 16 GB RAM, minimum 512 MB graphic card, minimum 1 TB storage, Optical Mouse, Key-board and Medical grade - anti-glare flat panel-2 MP monitors of at least 19" size. It should also have CD/DVD combo drive with writer facility along with USB port for data transfer. The graphical user inter-face (GUI) should be identical to that of the acquisition unit. Both Workstations should have concurrent licenses for all the software. Both workstations should have multimodality viewing capability for smooth workflow in department. **OR** Latest technology Client-server architecture two nos. of client- workstations to be provided. Server: minimum 96 GB RAM, and minimum 2TB storage and should be provided with single floating license for all software. Client: Optical Mouse, Key-board and Medical grade - anti-glare flat panel-2 MP monitors of at least 19"size. It should also have CD/DVD combo drive with writer facility along with USB port for data transfer. The graphical user inter-face (GUI) should be identical to that of the acquisition unit. Both workstations should have multimodality viewing capability for smooth workflow in department.
ii	Communications - Ethernet with TCP/IP protocols and DICOM-3.0 or latest networking of all possible equipment in the facility with their peripherals, seamless connectivity to acquisition station and image server.
iii	Image comparison software for review with longitudinal evaluation of baseline-follow up studies using PERCIST. – 2 concurrent licenses
iv	Fusion software for PET/CT/MRI/SPECT data, including imported data and provision for multiple phases in 3-D demonstration.
v	Computer aided diagnosis software with quantification ability for neurological applications including assessment of dementia by measuring relative SUV - 1 floating license
vi	Complete PET cardiac package with ECG gated studies (prospective and retrospective tagging) and ECG gated dose modulation - 1 floating license
vii	Cardiac PET viability review application software. Should have single floating license in case of client server-based solution or should be available on both workstations in case of independent standalone workstations solution.
viii	PET DICOM 3.0 or higher version facilities for clinical applications must be implemented. It should have the ability to import MR /CT DICOM Data
ix	Provision to make DICOM/ PDF/ JPEG /AVI /MPEG digital output.
x	On site remote service diagnostic facility with Wi-Fi enabled broadband internet connection
xi	All future software updates during warranty and CMC period shall be free of cost
xii	Latest advanced CT radiation dose reduction technology and software that should offer higher speed image reconstruction.
9	**Accessories**

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Technical Specifications of Digital PET/CT Scanner and its accessories - DRAFT

i	3D Dosimetry Software – 1
ii	Full system UPS with 15-30 min backup -1
iii	Lead Glass 120 cm x 100 cm – 1
iv	Dual Head Pressure Injector – 1
v	PET Dose Calibrator – 1
Vi	Digital Pocket Dosimeter– 4
vii	Survey Meter cum Contamination Monitor – 1
viii	L-Bench (511 KeV) -1
ix	Interlocking Lead Bricks – 100
x	Lead Lined Waste Bin (511 KeV) – 2
xi	Tungsten Syringe Shield – 2
xii	PET Syringe Shield Carrier – 2
xiii	Decontamination Kit– 2
xiv	Color Laser Jet Paper Printer -1
xv	Tungsten Storage Pot for vial (511 KeV) – 1
xvi	Lead Apron – 1
xvii	^{68}Ge- Rod Source – 1
xviii	^{68}Ge- Cylindrical Phantom – 1
xix	Jasczczk phantom – 1
xx	Air conditioning system (split ACs) for PET/CT scanner room, console and UPS room – 6 (2 Ton each)
xxi	Dehumidifier – 2
xxii	Computer system with laser jet printer for preparing PET/CT reports - 1
xxiii	Revolving chairs (adjustable height, hand rest etc.) – 3
xxiv	Storage almirahs – 2

Technical Specification (PET/CT Accessories)

S.N.	Name of items	Quantity

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1	Advanced 3D Voxel Based Dosimetry System	1
2	UPS System for Digital PET/CT Scanner	1
3	Lead Glass Window	1
4	Dual Head Pressure Injector	1
5	PET Dose Calibrator	1
6	Digital Pocket Dosimeter	4
7	Survey Meter cum Contamination Monitor	1
8	L-Bench (511 KeV)	1
9	Interlocking Lead Bricks	100
10	Lead lined waste bin (511 KeV)	2
11	Tungsten Syringe shield	2
12	Decontamination kit	2
13	Color Laser Jet Paper Printer	1
14	Tungsten Storage Pot for vial (511 KeV)	1
15	Lead Apron	1
16	^{68}Ge Rod Source	1
17	^{68}Ge Cylindrical Phantom	1
18	Hand, Foot and Clothes Contamination Monitor	2

1. Advanced 3D Voxel Based Dosimetry System

i. The bidder shall supply, install, and commission advanced 3D voxel-based dosimetry software for Nuclear Medicine capable of performing patient-specific dosimetry for diagnostic and therapeutic radionuclide procedures. The software shall support dosimetry for SPECT/CT and PET/CT studies and comply with current recommendations of MIRD, EANM, SNMMI, and ICRU.

ii. General Requirements: The software shall be a commercially available, clinically validated product. It shall be FDA-cleared and/or CE-marked as a medical device. The software shall have been installed in at least 50 Nuclear Medicine/PET centers worldwide. The software shall support both clinical routine use and research applications. Latest released version at the time of installation shall be supplied.

iii. Image Import: The software shall support direct import of DICOM CT, PET, SPECT, SPECT/CT, PET/CT, MRI (optional), RT Structure, RT Dose, RT Plan. The software shall accept images from scanners manufactured by different vendors.

iv. Multi-Time Point Dosimetry: The software shall support one-point dosimetry, two-point dosimetry, three-point dosimetry, four or more time-point dosimetry, and flexible imaging schedules, retrospective and prospective studies.

v. Registration: Software shall provide automatic rigid registration, automatic deformable image registration, hybrid registration, manual refinement, landmark registration, CT-based registration, multi-modality registration; registration accuracy shall be visually verifiable.

vi. Segmentation: Software shall provide automatic organ segmentation, deep learning/AI-assisted segmentation, atlas-based segmentation, threshold-based segmentation, PET-based segmentation, CT-based segmentation, manual contour editing, boolean contour operations, supported organs shall include liver, kidneys, spleen, lungs, salivary glands, bone marrow, urinary bladder, tumors, lymph nodes, and custom structures.

vii. Quantification: Software shall perform SUV calculations, activity concentration, absolute activity estimation, recovery coefficient correction, partial volume correction, dead-time correction (where applicable), decay correction, cross-calibration correction.

viii. Voxel-Based Dosimetry: The software shall provide true 3D voxel-level dosimetry, voxel S-value convolution, dose kernel convolution, local deposition method, monte Carlo–based dose calculation or equivalent advanced dose engine, patient-specific density correction using CT, non-uniform activity distribution handling.

ix. Time Activity Curve Analysis: Software shall support automatic TAC generation, mono-exponential fitting, bi-exponential fitting, tri-exponential fitting, trapezoidal integration, curve fitting quality indicators, manual editing of fitted curves.

x. Dose Calculation: Software shall calculate absorbed dose (Gy), dose rate, cumulated activity, residence time, organ dose, tumor dose, voxel dose maps.

xi. Supported radionuclides shall include, but not be limited to Lu-177, Y-90, I-131, I-124, Cu-64, Sm-153, Ho-166, Re-186, Re-188, Ac-225, Pb-212, Cu-67, Tb-161, F-18, Ga-68, Zr-89, 99mTc. The software shall allow addition of new radionuclides through manufacturer-supported updates.

xii. Dose Volume Analysis: Software shall generate Dose Volume Histograms (DVH), Cumulative DVH, Differential DVH, Dose statistics, Mean dose, Maximum dose, Minimum dose, D50, D95, Vx parameters, Equivalent Uniform Dose (EUD), Biologically Effective Dose (BED), where applicable

xiii. Biological Modeling: Software shall support BED calculations, EQD2 calculations, Tumor control probability (TCP) models (if available), Normal tissue complication probability (NTCP) models (if available), Radiobiological modelling for molecular radiotherapy

xiv. Visualization: The software shall provide multiplanar reconstruction, fused PET/CT and SPECT/CT display, 3D rendering, dose color wash, isodose display, dose overlay on CT, interactive voxel interrogation, slice synchronization.

xv. Reporting: Automatic report generation including patient demographics, imaging protocol, organ activities, time activity curves, dose maps, DVHs, organ absorbed doses, tumor/lesion absorbed doses, graphical summaries, export to PDF and DICOM SR (where supported)

xvi. Artificial Intelligence: Software should include AI-assisted segmentation, automated workflow guidance, automated contour propagation, automated organ recognition, smart quality assurance tools.

xvii. Workflow: The software shall provide automated dosimetry workflow, batch processing, template-based protocols, user-defined protocols, multi-user environment, audit trail, role-based user access.

xviii. Connectivity: Software shall support DICOM, DICOM Storage, DICOM Query/Retrieve, DICOM Structured Report, HL7 (preferred), PACS integration, Hospital Information System integration, Nuclear Medicine Information System integration

xix. Validation: Software shall have published peer-reviewed validation for clinical dosimetry and compliance with internationally accepted methodologies.

xx. Workstation: The bidder shall supply a dedicated high-performance workstation including latest multi-core processor, minimum 64 GB RAM, dedicated professional GPU (minimum 8 GB VRAM), SSD storage ≥2 TB, dual 27-inch high-resolution medical-grade monitors (minimum 2560 × 1440), windows 11 professional or latest supported operating system, keyboard, mouse, UPS, laser jet printer (capable to print the dosimetry reports) and networking accessories.

xxi. License: Perpetual license with unlimited patient studies, No restriction on the number of radionuclides or dosimetry calculations, Software updates for minimum 5 years, free upgrades to newer versions released during the warranty period.

xxii. Training: The supplier shall provide on-site installation, clinical application training, Nuclear Medicine Physicist training, dosimetry protocol optimization, and minimum 10 days of onsite application training.

xxiii. Warranty & Support: Warranty of 5 years followed by CMC of 5 years covering software, workstation, updates, bug fixes, and application support, remote support and online troubleshooting, Availability of annual maintenance contract after warranty.

xxiv. Documentation: The bidder shall provide original manufacturer's product literature, point-by-point compliance statement, CE/FDA certification, evidence of clinical installations, and list of peer-reviewed publications supporting the software, user manuals and application guides.

xxv. Preferred Features: AI-assisted organ segmentation using deep learning, deformable dose accumulation across serial studies, Monte Carlo–based voxel dosimetry, multi-cycle therapy planning and cumulative dose tracking, Native support for Lu-177, Ac-225, Tb-161, Pb-212, and alpha-emitter dosimetry, Kidney and salivary gland dosimetry templates, personalized treatment planning with projected dose for future therapy cycles, cloud-enabled collaboration (optional, with appropriate cybersecurity safeguards), DICOM RT export for integration with external treatment planning systems.

Technical Specifications of Digital PET/CT Scanner and its accessories - DRAFT

2. UPS System for Digital PET/CT Scanner (quantity=1)

i. The bidder shall supply, install, test, commission and demonstrate a complete Online UPS System with battery bank, maintenance bypass arrangement, monitoring accessories and all associated hardware required for uninterrupted operation of the Digital PET/CT scanner.

ii. The UPS shall provide continuous, regulated and conditioned electrical power to the complete PET/CT system during mains power failure, voltage fluctuations, surges, harmonics and transient disturbances without interruption to scanner operation at full rated load. The power back up should be at least between 15 to 30 minutes.

iii. The quoted system shall be compatible with the offered Digital PET/CT scanner and shall be supported by the OEM of the PET/CT system.

iv. Supplied with all accessories required for complete installation.

v. It should be compatible with DG power supply.

vi. Designed for future expansion wherever applicable.

vii. Capacity: Minimum 100 kVA (or as recommended by PET/CT OEM for the offered system)

viii. Noise Level: Less than 65 dB at one metre distance

ix. Battery Bank: The UPS shall be supplied with a complete Lithium-ion battery bank.

x. Battery design life shall be: Minimum 10 years or as per manufacturer's specification for Lithium-ion batteries.

xi. The UPS system should have facility of manual maintenance bypass, external maintenance bypass panel, and automatic synchronization with bypass supply. The bypass arrangement shall permit maintenance without interruption of power to the PET/CT scanner.

xii. Display: Colour LCD display, touch screen (preferred), event log, alarm history, battery status, input/output voltage, load indication, remaining backup time, fault diagnostics

xiii. Protection Features: The UPS shall provide protection against under voltage, over voltage, frequency variation, phase reversal, phase imbalance, overload, short circuit, earth fault, battery reverse polarity, battery deep discharge, over temperature

xiv. The bidder shall provide complete UPS system, battery bank, battery rack/cabinet, input/output cables, earthing accessories, copper bus bars wherever required, interconnecting cables, civil works required for installation, commissioning, functional testing, integration with PET/CT scanner

xv. No additional item required for successful installation shall be quoted separately.

xvi. Environmental Conditions: Operating Temperature 0°C to +40°C, Relative Humidity 20–95%

xvii. Warranty: The bidder shall provide minimum five 10 years comprehensive warranty on UPS. Preventive maintenance during warranty, unlimited breakdown visits.

xviii. The UPS shall demonstrate uninterrupted operation of the PET/CT scanner for not less than 30 minutes under full operating load or the duration specified by the PET/CT OEM.

xix. Service Support: The bidder shall have Service centre in India, factory-trained engineers, availability of spare parts for minimum 10 years, telephone and online support, emergency response within 24 hours, breakdown rectification within 48 hours.

xx. Training shall be provided to engineers, medical physicists, and technical staff so that they could handle in any emergency situations.

3. Lead Glass Window (quantity =1)

i. The bidder shall supply, install, test and commission a 120 cm x 100 cm lead glass viewing window for use in the PET/CT facility. The lead glass shall provide adequate radiation protection while allowing clear visual observation of the patient and PET/CT gantry from the control room.

ii. The lead equivalent of the window should be ≥ 3mm or as per AERB guidelines.

iii. It should be marked with manufacturer details and shielding equivalence.

4. Dual Head Pressure Injector (quantity=1)

i. The bidder shall supply, install, test and commission one Dual Head Programmable Contrast Media Injection System for administration of iodinated contrast media and saline during CT acquisition of a Digital PET/CT scanner.

ii. The injector shall be capable of delivering precisely controlled contrast and saline injections for routine PET/CT examinations.

iii. The offered injector shall be the latest available model and shall be fully compatible with the offered PET/CT scanner.

iv. The system shall include dual-head injector, mobile pedestal, integrated control console, touch-screen user interface, injector head, power supply and battery, all mounting accessories, patient connection accessories, syringes, disposable tubing, user manuals, software.

v.

Syringe Capacity	:	200 mL contrast syringe and 200 mL saline syringe
Injection Flow Rate	:	0.1–10.0 mL/sec
Flow Rate Increment	:	0.1 mL/sec or finer
Injection Volume	:	1–180 mL for each syringe
Volume Increment	:	1 mL or finer
Injection Pressure	:	Programmable
Maximum Injection Pressure:		Minimum ≥300 psi
Pressure Display	:	Real-time
Pressure Limit	:	User programmable
Injection Accuracy	:	±2% or better
Injection Delay	:	Programmable
Saline Flush	:	Fully programmable
Multi-phase Injection	:	Minimum 3 programmable phases

Protocol Storage	:	Minimum 10 protocols
KVO (Keep Vein Open)	:	Available
Air Detection	:	Automatic
Extravasation Detection	:	Preferred
Automatic Stop	:	On pressure limit or fault
Emergency Stop	:	Dedicated emergency stop button

vi. The injector head shall be motor-driven, rotate for easy patient positioning, permit easy loading of syringes, have automatic syringe recognition, include syringe locking mechanism, and have LED status indication.

vii. The injector shall have colour LCD touch screen, ≥10-inch display preferred, graphical protocol programming, real-time injection monitoring, pressure curve display, flow rate display, volume display, and remaining volume indication.

viii. The bidder shall supply contrast syringes, saline syringes, high-pressure tubing, patient lines, filling accessories, disposable accessories. The injector shall preferably accept universally available consumables or OEM consumables approved for the system.

ix. The software shall provide protocol management, user-defined protocols, injection history, patient database, automatic calculation of injection duration, pressure graph, flow graph, system diagnostics self-test during start-up.

x. There should be software updates during warranty; preventive maintenance at least two visits per year and unlimited breakdown visits.

xi. The bidder shall provide complete installation, functional testing, and calibration, integration with PET/CT scanner, user training, operator manuals and service manuals.

5. PET Dose Calibrator (quantity=1)

i. The bidder shall supply, install, test, commission and demonstrate one PET Dose Calibrator suitable for accurate measurement of the activity of PET radionuclides used in Nuclear Medicine and shall comply with applicable national and international standards.

ii. The offered equipment shall be a current production model with proven clinical performance.

iii. The complete system shall consist of digital dose calibrator console, high-pressure ionization chamber, lead (50 mm lead equivalent) rings to shield the chamber, well liner, sample dipper, source holder, vial holder, syringe holder, power supply, calibration sources required for acceptance testing and all accessories necessary for routine operation.

iv. The ionization chamber shall have the following minimum specifications:

Type	:	High-pressure sealed well-type ionization chamber
Filling Gas	:	Argon or equivalent inert gas
Operating Pressure	:	High-pressure sealed chamber
Detector Geometry	:	Deep well geometry suitable for syringes and vials

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Chamber Construction	:	Robust, corrosion-resistant metal chamber
Well Depth	:	Minimum 24 cm
Well Diameter	:	Suitable for standard syringes and multidose vials
Leakage	:	Negligible under normal operating conditions

v. The dose calibrator shall accurately measure F-18, Ga-68, C-11, N-13, O-15, Zr-89, Cu-64, I-124 other PET radionuclides through user calibration factors and Cs-137 radionuclide for quality control purposes.

vi. Measurement Range: 1 μCi to 6 Ci

vii. Accuracy and Performance

Measurement Accuracy	:	±2% or better
Linearity	:	±2% over the full measurement range
Repeatability	:	±1%
Precision	:	Better than ±1%
Geometry Correction	:	Available
Background Subtraction	:	Available
Zero Adjustment	:	Automatic

viii. Display Unit: The system shall have large color LCD display, high-contrast digital display, touchscreen, measurement mode indication, nuclide selection display

ix. Radionuclide Library: The system shall include factory-programmed radionuclide library, minimum 50 radionuclides preloaded, user-definable radionuclides, editable calibration numbers, and user memory.

x. The instrument shall provide activity measurement, background subtraction/ correction, automatic zero calibration

xi. Units of Measurement: The calibrator shall display readings in μCi or mCi

xii. Electrical Requirements: 230 V ±10%, 50 Hz, suitable for Indian power conditions.

xiii. Environmental Conditions: Operating Temperature: 10–40°C, Humidity:20–90%

xiv. Warranty and Comprehensive Maintenance: The bidder shall provide 5 years warranty followed by 5 years comprehensive maintenance, free preventive maintenance during warranty, unlimited breakdown visits, software updates during warranty, and availability of spare parts for at least ten (10) years.

6. Digital Pocket Dosimeter (quantity=4)

i. Purpose: To measure personnel radiation exposure

ii. Radiation type: beta and gamma radiation

iii. Detector: Semiconductor detector (silicon)

iv. Energy detection range: 48 KeV – 3 MeV beta and gamma radiation

v. Measurement range: 1 μSv – 1 Sv

vi. Display: 4 digit 7 segment LCD/ LED
vii. Design: Light weight with compact size and easy to fit in pocket, simple operation, ABS body
viii. Read-out Accuracy: Within ±15% for 137Cs
ix. Alarm: audio-visual type
x. Battery: Lithium (long life)
xi. Environment: The instrument will be able to withstand temperature upto 40 °C and relative humidity upto 90% in radiation areas.

7. Survey Meter cum Contamination Monitor (quantity=1)

i. Purpose: To measure exposure rate (µSv/h or mR/h) and contamination level (cpm/cps)
ii. Radiation type: Capable to measure alpha, beta and gamma (50 KeV – 3 MeV) radiation from commonly used radioisotopes in nuclear medicine
iii. Detector: GM type , halogen quenched
iv. Accuracy: ±10% from referenced 137Cs source from factory
v. Averaging period: Display should update not more than 3 sec
vi. Display: LCD/LED display with illumination
vii. Alarm: Audio and visual settable
viii. Power supply: Battery operated
ix. Dose rate range: 0.1 µSv/h to 1000 µSv/h
x. Count rate range: 1-20,000 cps
xi. Features: hand held, compact, portable type
xii. Environment: The instrument will be able to withstand temperature upto 400C and relative humidity upto 90% in radiation areas.

8. L-Bench (511 KeV) (quantity=1)

i. The bidder shall supply, install, radiation leakage test and commission one L-shaped PET Lead Bench for safe handling, dispensing and quality control of PET radiopharmaceuticals in the PET Radiopharmacy.
ii. The L-bench shall provide adequate radiation shielding against 511 keV annihilation photons generated during handling of PET radionuclides.
iii. It should be throughout made up of 50 mm of lead equivalent. It should be encased into stainless steel (SS 304).
iv. Dimensions of L-Bench: Base plate - 24" x 18", Vertical plate – height 24" x 15", Inclined plate inclination = 45 deg.
v. The viewing glass window shall have 50 mm lead equivalent fitted inside inclined plate of L-Bench. The density of lead glass should be ≥5.2 gm/cc. The optical transmission should be ≥85%. It should be scratch resistant, bubble free and no optical distortion. The dimension of lead glass window should be 10"x 10".

9. Interlocking Lead Bricks (quantity=100)

i. Made up of pure virgin high quality lead

ii. The bidder shall provide 80 interlocking lead bricks (20 straight lead bricks: length=100 mm, thickness=50 mm, height=100 mm; 10 curved (L type) lead bricks: length=100mm, thickness=50 mm, height=100 mm)

10. Lead lined waste bin (511 KeV) (quantity=2)

i. It should be made up of lead encased with stainless steel (SS 304) to keep radioactive wastes like needles, syringes, gloves generated during injection of PET radioisotopes

ii. The thickness of bin should be 50 mm of lead equivalent (throughout). There should not be any leakage of radiation from anywhere.

iii. The internal dimensions of the lead bin will be - height = 20", length = 15", breadth =15"

iv. The top of the lead bin should have a sliding window (50 mm of lead equivalent) for putting the radioactive wastes. Its dimension should be 6"x6". There should not be radiation leakage from the gaps.

v. The bin should be fixed over strong wheels for easy movement from one place to another.

11. Tungsten Syringe shield (quantity=2)

i. PET Syringe Shield shall be specifically designed for handling and injection of high-energy PET radionuclides (FDG etc.) emitting 511 keV annihilation photons.

ii. The shield shall provide maximum radiation protection to the operator's fingers and hands while allowing safe visualization of the syringe contents.

iii. The system shall be CE/FDA approved.

iv. Shielding Material: Shield body shall be manufactured from high-density tungsten alloy i.e. $\geq$17.0 g/cm^3. Shielding thickness shall be minimum $\geq$8 mm. The shielding shall provide minimum 85% attenuation of 511 keV photons from F-18.

v. Viewing Window: Shall have an integrated high-density lead glass viewing window. Lead glass density shall be minimum 5.2 g/cm^3. Viewing window shall permit easy visualization of syringe graduations, radiopharmaceutical volume and air bubbles.

vi. Locking Mechanism: Secure thumb-screw or quick-lock mechanism. Syringe shall remain firmly fixed during dispensing. Easy one-hand operation. Quick loading and unloading to reduce hand exposure.

vii. Construction: Corrosion-resistant finish. Smooth surface for easy decontamination. Resistant to alcohol and commonly used disinfectants. Rounded edges to avoid glove damage. It should accommodate the standard sized 2 ml and 5 ml syringes.

12. Decontamination kit (quantity=2)

i. The Decontamination Kit shall be a complete, ready-to-use emergency kit designed for the safe management of accidental radioactive contamination involving unsealed radionuclides used in Nuclear

Medicine, PET/CT, and Radiopharmacy. The kit shall comply with the recommendations of the Atomic Energy Regulatory Board (AERB).

ii. General Requirements: The kit shall be portable, lightweight, durable, and suitable for emergency response. All items shall be packed in a sturdy, clearly labelled carrying case with radiation warning symbol.

iii. Carrying Case: High-impact ABS plastic or equivalent. Chemical-resistant and waterproof. Portable with carrying handle. Clearly labelled "Radiation Decontamination Kit" with radiation trefoil symbol.

iv. Contents of the Kit: Personal Protective Equipment (PPE), Disposable nitrile gloves (minimum 20 pairs), Disposable shoe covers (minimum 10 pairs), Disposable head caps (minimum 10), Disposable face masks (minimum 10), Disposable protective gowns (minimum 5), Protective safety goggles (minimum 2), Disposable sleeve covers (minimum 5 pairs), Absorbent paper towels, High-absorbency absorbent pads, Spill control absorbent sheets, Absorbent pillows or granules for liquid spills, Disposable wipes, Cotton gauze pads, Cotton swabs

v. Cleaning Agents: mild detergent solution, decontamination solution suitable for radioactive contamination, spray bottles, surface cleaning solution, skin decontamination soap, hand cleaning solution. Cleaning solutions shall not damage stainless steel, epoxy surfaces, lead shielding, acrylic, or laboratory furniture.

vi. Waste Collection Accessories: Radioactive waste bags (yellow) with radiation symbol, Biohazard waste bags, Disposable plastic bags, Waste sealing ties, Radioactive waste labels, Contaminated clothing bags

vii. Handling Accessories: Plastic forceps, Stainless steel forceps, Long-handled tweezers, Plastic scoop, Dust pan, Small brush, Plastic scraper, Scissors, Measurement Accessories, Permanent marker, Waterproof labels, Warning tags, Waterproof notepad, Adhesive tape, Barrier tape (Radiation Area), Radiation warning stickers

13. Color Laser Jet Paper Printer (quantity=1)

i. The Color LaserJet Printer shall be a high-performance network printer suitable for printing PET/CT images, fused images, MIP images, reports, dosimetry charts, graphs, and other clinical documents generated from a Digital PET/CT workstation, PACS, and Nuclear Medicine Information System (NMIS). The printer shall be designed for heavy-duty hospital use with excellent colour accuracy, high resolution, and low operating cost.

ii. Print Resolution shall be minimum 1200 × 1200 dpi.

iii. The printer shall support: A4, A5, A6, Letter, Legal size glossy paper

iv. Display: Colour touchscreen LCD, Minimum 4-inch display.

v. The printer driver shall support printing from PDF, JPEG, TIFF, PNG, BMP, DICOM images exported through workstation software

vi. Power supply: 220–240 VAC, 50 Hz

vii. The system shall be supplied with Power cable, USB cable, Ethernet cable, Starter toner cartridges, Installation software, User manual, Printer drivers, Dust cover

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14. Tungsten Storage Pot for vial (511 KeV) (quantity=1)

i. The Tungsten Storage Pot shall be designed for safe storage of vial containing ^{18}F-FDG, and dose dispensing of F-18 FDG from the vial. The storage pot shall provide adequate shielding against 511 KeV annihilation photons while allowing safe retrieval of the vial and minimizing occupational radiation exposure.

ii. The unit shall be suitable for use in PET dose dispensing areas, and PET/CT injection rooms.

iii. The shielding assembly shall be robust, portable, and easy to decontaminate.

iv. Shielding Material: The shielding body shall be manufactured from high-density tungsten alloy. Tungsten density shall be ≥17.0 g/cm^3. Shielding thickness shall be ≥ 25 mm on all sides. The shielding shall provide >95% attenuation of 511 keV photons from F-18. The shielding shall be seamless or precision-machined to eliminate radiation leakage through joints.

v. Construction: One-piece tungsten body with removable lid. Heavy-duty stainless steel (SS304) outer protective casing (preferred). Corrosion-resistant construction. Smooth, polished internal cavity for easy insertion and removal of vials. Rounded edges to facilitate cleaning and safe handling. Stable flat base to prevent accidental tipping. It should have a handle to move from one place to another as a unit.

vi. Lid: Removable or hinged tungsten lid. Lid shall completely cover the storage cavity. The lid should have a hole in between to insert needle into the vial to withdraw the activity to minimize the radiation exposure to hand and fingers of occupational workers. Easy one-hand operation preferred.

vii. Vial Compatibility: The storage pot shall accommodate standard multidose PET radiopharmaceutical vials, including 10 mL, 20 mL and 30 mL vials or equivalent standard pharmaceutical glass vials supplied by commercial PET radiopharmaceutical manufacturers.

viii. Internal Dimensions: Internal cavity shall permit easy placement and removal of the vial without excessive clearance. The cavity shall securely hold the vial in the vertical position. Shock-absorbing insert to minimize risk of vial breakage.

15. Lead Apron

i. The Lead Apron shall provide radiation protection to personnel from X-rays while staying with the patient in the PET/CT scanner room during CT scan.

ii. The apron shall be intended for radiation protection against scattered X-rays in the energy range of 40–150 kVp.

iii. It shall be suitable for routine use by radiation workers or patient attendants.

iv. The apron shall comply with the recommendations of the Atomic Energy Regulatory Board (AERB) and applicable IEC/IS standards for protective devices.

v. Shielding Material: The radiation shielding material shall be Lead, or Lead-composite, or Lead-free composite (bismuth, antimony, tungsten, or equivalent high-attenuation materials). The shielding material

shall be homogeneous and free from cracks, voids, or defects. The shielding material shall provide equivalent attenuation as specified below.

Front protection: Minimum 0.50 mm Pb equivalent at 100 kVp.

Back protection: Minimum 0.25 mm Pb equivalent (for wrap-around type) or 0.50 mm Pb equivalent for full-coverage models.

vi. Apron Design: Wrap-around apron. The design shall ensure maximum protection with uniform weight distribution.

vii. Size Availability: Free size

viii. Weight: The apron shall be lightweight and ergonomically designed.

ix. Outer Cover Material: Durable nylon, polyurethane-coated fabric, vinyl, PVC-coated fabric, or equivalent, waterproof and stain-resistant, resistant to disinfectants and cleaning agents used in hospitals, tear-resistant and abrasion-resistant, smooth, non-porous finish.

x. Inner Lining: Soft, breathable fabric, sweat-resistant, comfortable for prolonged use, easy to clean.

xi. Fastening System: Adjustable hook-and-loop (Velcro) fasteners and/or quick-release buckle system.

xii. Secure fit with adjustable waist and shoulder straps.

xiii. Easy to wear and remove.

xiv. Storage: The apron shall be suitable for hanging on standard apron racks without damage. The supplier shall provide one heavy-duty apron hanger and mobile apron storage rack.

16. ^{68}Ge Rod Source (quantity=1)

i. The Germanium-68 (Ge-68) Rod Source shall be intended for routine quality control (QC), normalization, calibration, and performance evaluation of a Digital PET/CT scanner. The source shall be suitable for daily and periodic PET quality assurance procedures as recommended by the manufacturer and international guidelines (NEMA/IAEA).

ii. The source shall contain sealed Ge-68 radioactivity. It shall be suitable for quality control of modern digital TOF PET/CT scanners.

iii. Source Characteristics: Radionuclide- Ge-68 sealed source, half-life ~ 271 days. Initial activity- As recommended by the PET/CT manufacturer for QC procedures (typically 70–100 MBq, or equivalent). Source shall provide uniform activity distribution along its active length.

iv. Physical Specifications: Cylindrical rod-type source compatible with the supplied PET/CT scanner QC holder. Encapsulated in stainless steel, titanium, or equivalent corrosion-resistant material. Rugged, waterproof, and resistant to routine decontamination procedures. Clearly marked with radionuclide, activity, serial number, calibration date, and expiry date.

v. Shall provide stable count rate and uniform response throughout its service life. Compatible with the scanner manufacturer's QC software and acquisition protocols.

vi. A radiation shielding device should be provided with the source for its storage to prevent any radiation exposure to the personnel.

vii. The successful bidder shall supply the required Ge-68 cylindrical phantom and Ge-68 rod source(s) along with valid manufacturer's calibration certificates, traceable to a nationally or internationally accredited standards laboratory, at the time of installation and whenever replacement is required during the warranty and Comprehensive Maintenance Contract (CMC) period. The bidder shall replace these radioactive sources upon expiry or when their activity becomes unsuitable for quality control, and shall arrange for the safe collection, transportation, and disposal/return of the disused Ge-68 sources in accordance with applicable AERB regulations and all other statutory requirements, at no additional cost to the purchaser.

17. Ge-68 Cylindrical Phantom (quantity=1)

i. The Ge-68 Cylindrical Phantom shall be designed for daily quality control (QC), calibration verification, detector normalization, and performance evaluation of a Digital PET/CT scanner. The phantom shall provide a uniform source distribution for routine PET quality assurance in accordance with the manufacturer's recommendations and internationally accepted standards.

ii. The phantom shall incorporate a sealed Germanium-68/Gallium-68 (Ge-68/Ga-68) cylindrical source.

iii. It shall be specifically designed for use with digital Time-of-Flight (TOF) PET/CT scanners.

iv. The phantom shall be maintenance-free and reusable throughout its useful life.

v. The phantom shall be compatible with the daily QC protocols of the offered PET/CT scanner.

vi. Radioactive Source: Sealed Ge-68/Ga-68 radioactivity, half-life- ~271 days. Initial activity- As recommended by the PET/CT manufacturer for daily QC (typically 100–250 MBq, or equivalent). Activity shall be calibrated and certified at the time of supply.

vii. Phantom Design: Cylindrical phantom with homogeneous activity distribution. Constructed from durable acrylic (PMMA), polycarbonate, or equivalent low-attenuation material.

viii. Suitable dimensions for the PET/CT scanner's daily QC holder or gantry positioning system.

ix. Clearly engraved with radionuclide, activity, serial number, calibration date, and expiry date.

x. The successful bidder shall supply the required Ge-68 cylindrical phantom and Ge-68 rod source(s) along with valid manufacturer's calibration certificates, traceable to a nationally or internationally accredited standards laboratory, at the time of installation and whenever replacement is required during the warranty and Comprehensive Maintenance Contract (CMC) period. The bidder shall replace these radioactive sources upon expiry or when their activity becomes unsuitable for quality control, and shall arrange for the safe collection, transportation, and disposal/return of the disused Ge-68 sources in accordance with applicable AERB regulations and all other statutory requirements, at no additional cost to the purchaser.

18. Hand, Foot and Clothes Contamination Monitor (quantity=2)

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Technical Specifications of Digital PET/CT Scanner and its accessories - DRAFT

i. Purpose: To detect any contamination of extremities and clothes upon leaving the radioactive work area.

ii. Operation: Users compatibility through stand on a designated foot platform and placing hands into dedicated detector slots.

iii. Description: PC-based measuring electronics, user-friendly interface, large-area colour touch display and audio interface, hand probe detachable for clothing measurement, short measurement time, wheels and handle for easy transport of the machine, easy to decontaminate

iv. Radiation Type: Capable to detect and measure α, β and γ radiations simultaneously, without change of detectors.

v. Detector: Dual-phosphor (ZnS(Ag)+plastic detector, phoswich-type; 8 detectors (4 for hands for simultaneous measurement of the palm and the back of the hand and 4 for feet); the left-hand or right-hand detector should serve as a clothing probe

vi. Memory: Permanent data memory for >100 entries

vii. Display: Readable LED display

viii. Environment: The instrument will be able to withstand temperature upto 40 0C and relative humidity upto 90% in radiation areas.

S.N.	Name of item	Qty.	Specifications
1	**Centralized Radiation Monitoring System (with Buy-back) for medical cyclotron facility**	1	• Purpose: To monitor radiation (gamma and neutron) level of the entire cyclotron facility like cyclotron vault, cyclotron operating room, PET radiopharmacy, PET QC Lab, exhaust air system, stack, through integrated online computer system and personalized radiation monitoring equipment. • The system should be comprises of the following instruments/ monitors: Gamma Area Monitor (fixed type) : Quantity = 5 Neutron Monitor (fixed type) : Quantity = 3 Stack Monitor (fixed type) : Quantity = 2 • All the above mentioned ten (10) monitoring systems will be connected through integrated computer system to monitor radiation level of the entire facility during bombardment, radiopharmaceutical productions and its quality control. • All monitors/instruments should have their own display system. There should be provision of real time graphical representation of radiation level for trend analysis. • It should be easy to operate. • UPS and printer to be provided with the computer system. • Separate specifications of all the monitoring systems/ instruments are as follows: <u>Gamma Area Monitor (fixed type) (quantity=5)</u> • Radiation type: Capable to measure gamma radiation • Detector type: Geiger-Mueller (GM) type • Measurement range: 1μSv/h to 10 mSv/h • Energy detection range: 48 KeV – 1 MeV • Linearity: Reading within 10% of the true value • Response time: < 3 seconds to 90% of final step change value • Construction: Compact and wall mounting, built as a single unit • Alarm: audio-visual type, it should beep with light (green/ yellow/red) signal at the set threshold radiation level. The intensity of sound should increase with the increase in radiation level. • Display: Digital type, at least 4 digit LED display, display units should be μSv/h or mR/h, large display so that the readings could be seen from long distances • Radiation interlock: Two of the gamma area monitors will be fixed inside the vault that should have radiation interlock facility with existing door. The vault door should not open in case of exposure level is above the set level (as per AERB guidelines) • Power Supply: AC 110-230 VAC, 50-60 Hz • Environment: The instrument will be able to withstand temperature upto 40 ^{0}C and relative humidity upto 90% in radiation areas. <u>Neutron Monitor (fixed type) (quantity=3)</u>

- Radiation type: Capable to measure neutron flux
- Detector type: ^{3}He proportional detector
- Moderator: At least nine inch diameter polyethylene sphere
- Measurement Range: (0-10) mSv/hr
- Energy Detection Range: Thermal energy to 12 MeV (within ± 10% with respect to Am-Be)
- Sensitivity: >100 cpm per mrem/hr for AmBe radioisotope
- Linearity: Reading within 10% of true value
- Response time: < 3 seconds to 90% of final step change value
- Construction: Compact and wall mounting, built as a single unit
- Display: Digital type, at least 4 digit LED display, display units should be as µSv/h or mR/h, large readable display so that the readings could be seen from long distances
- Alarm: Audio-visual type, it should beep with light (green/ yellow/red) signal at the set threshold radiation level. The intensity of sound should increase with the increase in radiation level.
- Power Supply: AC 110-230 VAC, 50-60 Hz
- Environment: The instrument should be able to withstand temperature upto $40^{0}C$ and relative humidity upto 90% in radiation areas.

Stack Monitor (fixed type) (quantity=2)

- Purpose: Capable to measure radioactive gases released from medical cyclotron and PET radiopharmacy lab through the exhaust systems on stack.
- Radiation type: Capable to measure gamma radiation
- Energy detection range: 70 KeV – 1 MeV
- Detector: NaI(Tl) scintillator detector (for measurement of total activity release) and GM type gas filled detector (for measurement of exposure rate) ; aluminium or non-rust casing
- Measurement range: 0-50,000 cps; 0.05 $\mu Ci/m^3$ to 150 mCi/m^3
- Sensitivity: For ^{18}F and ^{137}Cs radioisotopes it should be ≥300 $cpm/Bq/cm^2$
- Linearity: Reading within 10% of true value
- Response time: < 3 seconds to 90% of final step change value
- Alarm: Audio-visual alarm facility with the assembly
- Key Features:
  - Provision for multi-channel/energy-windowed gamma spectroscopy to distinguish various radioisotopes released during the bombardment process.
  - Provision of Flow Meter to measure the real time flow rate of radioactive gases from the exhaust system
- Capable to provide full reporting on released concentration and amounts of radioactivity in the computer system connected to it.
- Automatic calculation of the total activity for selected time interval
- Detector to be fitted with the exhaust system on stack and connected through integrated monitoring system
- Provision for storage of data in the computer memory connected to it.
- Display: Digital type, at least 4 digit LED display, display units should be in µSv/h or mR/h, large display so that the readings could be seen from long distances

			• Environment: The instrument will be able to withstand temperature upto 40^0C and relative humidity upto 90% in radiation areas.
2	**Gun Monitor**	1	• Measurement Range: 1 µSv/hr to 1 Sv/hr (0.1 mR/hr to 100 R/hr) • Detector: Gas-filled (ionization chamber) type • Radiation Type: Capable to measure beta and gamma (20 KeV – 3 MeV) radiation. There should be provision of sliding window for beta measurement. • Ion Chamber Volume: 300 cm^3 • Power supply: Battery operated (preferably in built Li-ion battery or replaceable Li-ion battery) • Display: Digital type, LED backlight • Portability: Compact, lightweight and easy to use in one-hand operation. • Casing: High impact ABS • Accuracy (^{137}Cs): ±10% of reading within measuring range • Environment: The instrument will be able to withstand temperature upto 40^0 C and relative humidity upto 90% in radiation areas.
3	**Survey Meter cum Contamination Monitor**	4	• Purpose: To measure both the exposure rate (µSv/h or mR/h) and contamination level (cpm/cps) • Radiation type: Capable to measure alpha, beta and gamma (50 KeV – 3 MeV) radiation from commonly used radioisotopes in nuclear medicine • Detector: GM type , halogen quenched • Accuracy: ±10% from referenced ^{137}Cs source from factory • Averaging period: Display should update not more than 3 sec • Display: LED type • Alarm: Audio and visual settable • Power supply: Battery operated (preferably in built Li-ion battery or replaceable Li-ion battery, if available) • Dose rate range: 0.1 µSv/h to 10 mSv/h • Count rate range: 1-20,000 cps • Features: hand held, compact, portable type, movable beta-attenuation slide/window enabling to separate beta and gamma exposure-rate readings • Environment: The instrument will be able to withstand temperature upto 40^0C and relative humidity upto 90% in radiation areas.
4	**Alpha-Beta Survey Meter**	1	• Should be capable of measuring radiations emitted from alpha and beta emitting radioisotopes like- ^{177}Lu, ^{225}Ac etc. • Detectors: alpha-beta scintillation ,ZnS (Ag) or gas proportional or plastic scintillator with photo multiplier tube • Measurement range: 0-100 kcps, 0-999 mSv/h • Design: durable, light weight • Power supply: Battery operated,(preferably, in built Li-ion battery or replaceable Li-ion battery) • Display: LED backlight, digital, 4 digit readable display • Environment: The instrument will be able to withstand temperature upto 40^0C and relative humidity upto 90% in radiation areas.
5	**Pocket Dosimeter**	10	• Purpose: To measure personnel radiation exposure • Radiation type: beta and gamma radiation

			• Detector: Semiconductor detector (silicon) • Energy detection range: 48 KeV – 3 MeV beta and gamma radiation • Measurement range: 1 µSv – 1 Sv • Display: 4 digit 7 segment LED • Design: Light weight with compact size and easy to fit in pocket, simple operation, ABS body • Read-out Accuracy: Within ±15% for ^{137}Cs • Alarm: Audio-visual type • Battery: Lithium (long life) • Environment: The instrument will be able to withstand temperature upto 40 ^{0}C and relative humidity upto 90% in radiation areas.
6	**L-Bench (^{99m}Tc)**	3	• Lead equivalent: 3 mm of lead equivalent (throughout) • Material: Lead, Stainless steel (SS 304) encasing • Body Dimension: o Base plate: Internal dimension – length =15", breadth= 12.00" o Base Boundary: Height (excluding base thickness) = 4.5" o Vertical plate – Height (touching ground) = 12" o Inclined plate: Projection = 12", Inclination = 45 deg. from horizontal plane • Glass window : o Density = 5.2 gm/cc o Dimension = 10"x 10" o Lead equivalent = 3 mm of lead equivalent
7	**L-Bench (^{177}Lu)**	1	• Lead equivalent: 6 mm of lead equivalent (throughout) • Material: Lead, stainless steel (SS 304) encasing • Body Dimension: o Base plate: Internal dimension – length =15", breadth= 12.00" o Base Boundary: Height (excluding base thickness) = 4.5" o Vertical plate – Height (touching ground) = 12" o Inclined plate: Projection = 12", Inclination = 45 deg. from horizontal plane • Glass window : o Density = 5.2 gm/cc o Dimension = 10"x 10" o Lead equivalent = 6 mm of lead equivalent
8	**Lead Waste Bin (^{99m}Tc)**	5	• Material: Made up of lead encased with stainless steel (SS 304) • Lead equivalent: 3 mm of lead equivalent (throughout) • Body Dimension: Height = 16", Length (Internal) = 12", Breadth (Internal) =12" • Key Feature: Foot operated leaded cover, completely radiation leak proof from all directions
9	**Lead Waste Bin (^{131}I)**	2	• Material: Made up of lead encased with stainless steel (SS 304) • Lead equivalent: 30 mm of lead equivalent (throughout) • Body Dimension: Height = 20", Length (Internal) = 13", Breadth (Internal) =13" • Key features: Sliding lead window (dimension=7"x7"), over heavy duty

			caster load wheels for easy movement, completely radiation leak proof from all directions including lead cover and sliding lead window
10	**Lead Waste Bin (^{18}F)**	3	• Material: Made up of lead encased with stainless steel (SS 304) • Lead equivalent: 50 mm of lead equivalent (throughout) • Body Dimension: Height = 20", Length (Internal) = 13", Breadth (Internal) =13" • Sliding window dimension: 7"x7" • Key features: Over strong wheels for easy movement, completely radiation leak proof from all directions
11	**Lead Single Syringe Carrier (Pig)**	6	• 6 mm lead on all sides (including the cap) • Aluminium/ power coated • Suitable for 2 ml and 5 ml fully loaded syringe • Easy to lock and unlock
12	**Moly Assay Canister**	1	• Purpose: To measure molybdenum breakthrough from eluent of ^{99}Mo-^{99m}Tc generator • Material: Made up of lead encased with stainless steel (SS 304) • Lead equivalent: A minimum of 6 mm lead equivalent throughout • Dimensions: o Overall height (including wire handle): approx.10 inches o Canister diameter: 2 inches o Canister height: 3.5 inches • Key Features: Designed to accommodate all size vials of 30 ml commonly used
13	**Lead Bricks**	250	• Material: Made up of pure virgin high quality lead with Lead quality certification from standard organization as recommended by the AERB • Lead equivalent: 50 mm of lead equivalent • Dimension: o Straight lead bricks: length=100 mm, thickness=50 mm, height=100 mm o Curved (L type) lead bricks: length=100mm, thickness=50 mm, height=100 mm • Key Features: Interlocking type, will furnished the design by the department as per the need.
14	**Air Sampler**	1	• Purpose: To collect radioactive air sample (aerosols) from a hot lab/ fume hood, lab etc. to measure radioactivity concentration in the air • Key Features: • Continuous or pre-defined sampling interval or air volume • Powerful vacuum pump with asynchronous induction motor • Flow rate and flow volume measurement and logging • Automatic pump power adjustment to keep constant flow rate despite rising blockage of used filter • Adjustable for various filter types • High-volume air sampling in a very short time • Long lifetime, high reliability • Low operating costs • Continuous operations • Constant airflow through the filter

			• Pump power regulation, depending on filter clogging • Ease of use • Flow rate: 5-140 m^3/h • Pump Drive: AC motor • Maximum noise level: ≤65 dB at 140 m^3/h • Display: LCD/ LED type • Display data: Real time flow rate (in m^3/h), temperature and pressure, total sampled volume of the gas medium, total running time, sampled volume within the START-STOP interval • Power Supply: 230V, 50 Hz • Environment: The instrument will be able to withstand temperature upto 40 ^0C and relative humidity upto 80% in radiation areas.
15	**CCTV Cameras**	8	• Purpose: To monitor the entire cyclotron facility • Camera: ≥4MP, high resolution, night vision • DVR: ≥1 TB capacity • Monitor: ≥ 24 inches (3 units with integration to all the cameras in real time)
16	**PACS system**	1	Enclosed seperately

16. PACS Data Storage System for Nuclear Medicine Department

(i) General Requirements

- The system shall be a latest generation enterprise-grade PACS archive and storage solution designed for Nuclear Medicine, PET/CT, PET/MR, SPECT/CT, Gamma Camera and other DICOM modalities.
- The offered system shall provide centralized storage, archival, retrieval and distribution of DICOM medical images and associated reports.
- The system shall support continuous operation (24×7×365).

(ii) Storage Capacity

- Minimum usable online storage ≥100 TB RAID protected
- System shall be expandable up to ≥1 Petabyte without replacing existing hardware
- Expansion shall be modular
- Expansion shall not require database migration

(iii) Storage Architecture

- The offered system shall include PACS, RAID protection, Hot swappable drives, SSD cache, Enterprise HDD, Automatic storage management
- Supported RAID: RAID 6 or better, RAID DP or equivalent, Erasure Coding (acceptable)

(iv) Data Protection

- System shall provide, redundant power supply, redundant controllers, dual power inputs, automatic failover, hot spare disks, online rebuild, self-healing file system (preferred)

(v) Performance

- The archive shall support concurrent storage from minimum 20 modalities, simultaneous retrieval by minimum 30 users, automatic load balancing, background indexing automatic compression

(vi) Database

- The system shall include enterprise-grade database.
- Supported databases include PostgreSQL, Oracle, Microsoft SQL, Equivalent enterprise database
- The software license shall be perpetual (lifetime) and shall not require any annual renewal or recurring subscription fees. The license shall remain valid for the entire useful life of the equipment and shall include all standard software modules supplied with the system.
- No separate licensing shall be required.

(vii) Compression

- Support shall include lossless compression
- Original images shall always remain recoverable

(viii) Data Integrity

- The system shall support automatic checksum verification, bit error detection, data integrity verification, automatic corruption detection

(ix) Security

- The system shall comply with user authentication, role-based access, LDAP/Active directory, password policy, audit trail, HTTPS, TLS encryption, data encryption at rest (preferred)

(x) Backup

- The solution shall support, automatic scheduled backup, incremental backup, full backup, online backup, tape backup (optional), cloud backup (optional), NAS backup, backup verification

(xi) Disaster Recovery

- System shall support remote replication, synchronous or asynchronous replication, secondary archive, automatic failover (preferred), and disaster recovery restoration

(xii) Archive Management

- The system shall provide automatic archive, automatic purge policy, user-defined retention, long-term archive, automatic migration between storage tiers

(xiii) Viewing Support

- Compatible with Diagnostic workstations, Review workstations, Web viewers, Mobile viewers, Remote reporting

(xiv) Network

- Minimum Dual 25 Gigabit Ethernet, Preferred 100 Gigabit Ethernet
- Compatible with IPv4, IPv6

(xv) Operating System

- Support Linux Enterprise, Windows Server, Appliance-based operating system

(xvi) Search

- Search shall include Patient Name, UHID, Accession Number, Date, Study UID, Modality, Referring Physician, Study Description

(xvii) Vendor Neutral Archive (Preferred)

- The archive should function as Vendor Neutral Archive (VNA).
- It shall support multi-vendor modalities, standard DICOM, migration from existing PACS, non-proprietary image storage

(xviii) Artificial Intelligence Readiness

- The system should support, AI integration, DICOM routing, AI server connectivity, Third-party applications

(xix) Reporting Integration

- The PACS shall support structured reporting, voice recognition interface, PDF reports, electronic signatures

(xx) Power

- Dual redundant power supplies 230 V AC ±10%, 50 Hz

(xxi) Environmental

- Operating temperature: 18–27°C
- Operating humidity 20–80%

(xxii) The vendor shall supply user manual, administrator manual, service manual, DICOM conformance statement and other related documents

(xxiii) The vendor shall provide onsite training covering PACS administrator, Nuclear Medicine physicians, Nuclear Medical physicists, Technologists, IT personnel

(xxiv) Warranty and Comprehensive Maintenance:

- Ten years as per institute policy (5 years warranty + 5 years CMC)

(xxv) Acceptance Criteria

The system shall be considered acceptable only after successful demonstration of:

- DICOM connectivity with PET/CT, SPECT/CT, Gamma Camera, CT, and MRI
- Successful storage and retrieval of at least 1,000 DICOM studies without data corruption
- Simultaneous retrieval by minimum 30 users with no system failure
- Demonstration of RAID redundancy and hot-swappable disk functionality
- Successful backup and restoration of archived studies
- Successful integration with HIS/RIS (where applicable)
- Verification of audit logs, user authentication, and role-based access control
- Submission of DICOM conformance statement and all relevant compliance documentation

General Terms and Conditions

(i) Warranty & Maintenance (CMC): 5+5 years (5 years warranty thereafter 5 years comprehensive maintenance) or as per institute policy

(ii) Supplementary Radiation Safety & Regulatory Compliance Clauses

- AERB Type Approval & Registration: All monitoring equipment, survey meters, and pocket dosimeters must possess valid AERB Type Approval / Registration certificates or conform to AERB safety codes, if any.
- Factory Calibration & Recalibration Commitments: All radiation survey instruments and fixed monitors should be factory calibrated and must be delivered with valid calibration certificates. The supplier shall undertake periodic re-calibration of all portable and fixed radiation survey equipment once every 2 years (or as mandated by AERB) from NABL/ AERB-accredited calibration laboratory throughout the 5-year Warranty and 5-year CMC period (or as per institute policy) and all its cost will lay with the supplier.
- Resolution of Inspection Non-Compliances (NCs): The vendor shall be legally bound to rectify any technical or radiation-safety Non-Compliances (NCs) pointed out by AERB regulatory inspectors regarding the supplied instruments, stack monitors or interlocking systems within 30 days of notification at no extra expense to the institute.