

वी.पी.कोइराला स्वास्थ्य विज्ञान प्रतिष्ठान धरानको
कोटेशन माग गरिएको सूचना ।
(सूचना प्रकाशित मिति: २०८१।०५।३१)

यस प्रतिष्ठानलाई आवश्यक संलग्न स्पेशिफिकेशन बमोजिमको High-End 1.5 Tesla MRI Machine बोलपत्रको माध्यमबाट खरिद गर्नुपर्ने भएकोले ईजाजत प्राप्त प्रतिष्ठानमा सुचिकृत फर्म, संस्था, कम्पनीबाट अद्यावधिक फर्म दर्ता प्रमाणपत्र, मु.अ.कर दर्ता प्रमाणपत्र, आ.व. २०७९/०८० को कर चुक्ताको प्रमाणपत्र, Manufacturer's Authorization Letter, ब्रोसर तथा क्याटलगरहरू संलग्न गरी यो सूचना प्रकाशित मितिले ७ (सात) दिन भित्र कोटेशन पेश गर्नुहुन सुचित गरिन्छ । माग गरिएको कोटेशन तोकिएको म्यादभित्र प्रतिष्ठानको दर्ता, चलानी फाँटमा दर्ता गर्नुहुन वा quotation.procurement@bpkihs.edu मा email मार्फत पेश गर्नुपर्नेछ ।

SN.	Product Name	Qty.	Unit	Description/Brand
1	High-End 1.5 Tesla MRI Machine	1	Set	As per attached Specification (10 Pages)

PROPOSED TECHNICAL SPECIFICATIONS OF HIGH-END 1.5 TESLA MRI MACHINE

S.N.	Purchaser's Required Specifications	Bidder's Offer/ Statement of Compliance
1.	GENERAL	
	a. Manufacturer: Specify	
	b. Brand: Specify	
	c. Model: Specify	
	d. Country of Origin: Specify	
	e. Year of launch: Specify	
	f. Description: New 1.5Tesla MRI system for whole body imaging with superconducting magnet, high performance gradients and Digital Radio Frequency system. Refurbished or pre-owned system will not be accepted, Date of Unit manufacturing must be latest.	
	g. The quoted model must be of latest technology and must be loaded with all required functions and applications.	
	h. It should be both US FDA and European CE approved.	
	i. It shall be installed on a turnkey basis as described below under turnkey works.	
	j. The Bidder should provide committed compliance sheet duly signed for each parameters of specification.	
2.	MAGNET	
	a. 1.5 Tesla active shielded super conductive magnet.	
	b. It should have 70 cm or more patient bore diameter across the tunnel.	
	c. Magnet length should be less than 180 cm.	
	d. Facility for quick shutdown of the magnet in case of emergency should be available in both console and MRI room.	
	e. It should be well ventilated and illuminated with facility of 2-way intercom for communication with the patient.	
	f. Homogeneity:	
	i. Best homogeneity possible should be offered.	
	ii. The guaranteed homogeneity of the magnet at 40 DSV should be less or equal to 0.75 ppm.	
	g. Magnet Cooling System	
	i. It should have minimum helium consumption rate or zero boil off technology. Please specify the helium consumption rate.	
	ii. Helium level monitoring device should be provided.	
	iii. Mention the helium tank capacity and helium refill interval.	
	iv. The helium should be refilled by vendor/ company during the warranty and CMC period.	
	v. Maintenance and replacement of the Cold Head should be done by the vendor/company during the warranty and CMC period.	
	h. Shim System	
	i. It should have high performance and highly stable shim system with global and localized manual & automated shimming for high homogeneity magnetic field for	

	imaging and spectroscopy.	
	ii. Auto shim should be available to shim the magnet with patient in position. Specify the time for shimming.	
	iii. Mention the number of shim coil.	
3.	GRADIENT SYSTEM	
	a. Actively shielded gradient system in X, Y, Z planes.	
	b. The gradient should be actively shielded with each axis having simultaneous slew rate of at least 200 T/m/s or more at peak amplitude of 44 mT/m or more at maximum FOV. The slew rate of at least 200 T/m/s at 44 mT should be available in each axis independently for over all better duty cycle performance of the gradient.	
	c. It should have 100% duty cycle for full FOV.	
	d. The FOV in X, Y and Z axis should be 50 cm or more.	
	e. Effective cooling system for gradient coil and power supply should be available. The system should have efficient and adequate provision for eddy current compensation.	
4.	RADIOFREQUENCY (RF) SYSTEM	
	a. RF Transmit Technology	
	i. Latest RF transmit system should be offered to improve RF uniformity and signal homogeneity and to reduce patient induced in-homogeneities.	
	ii. Mention the number of RF amplifier.	
	b. RF Transmitter	
	i. It should be a fully digital RF System capable of transmitting power of at least 16 KW or more. Please specify and justify the technology. Please mention the RF power in KW.	
	ii. Specify maximum transmitter RF power available.	
	c. RF Receiver	
	i. Optical / Digital RF receiver system with / high efficient RF receiver system / or its equivalent located on the magnet inside the shielded active room.	
	ii. It should have 64 or more RF receiver channels or should be channel independent system. Please mention the bandwidth of each receiver channel in MHz.	
	iii. It should have necessary hardware to support quadrature phased array and flex coils.	
	iv. It should support Parallel Acquisition Technique (PAT) in both 2D&3D examination of whole body parts with a factor of a least 4. Mention the highest available PAT factor.	
	v. It should allow remote selection of coils and / or coil elements.	
5.	RF COILS	
	The main body coil integrated to the magnet should be Quadrature / Circular Polarized (CP). In addition to this following coils must be provided.	
	a. Head Neck Coil (20 channels or more) for ultrafast high resolution imaging and routine imaging of head, neck, cervical spine, paranasal sinuses, orbit, etc.	
	b. Spine Array/Matrix Coil (32 channels or more) for thoracic, lumbo-sacral &coccyx spine Imaging. It should be possible to image entire spine without repositioning the patient.	

	c. Body Array/ Matrix Coil (32 channels or more) for abdomen, pelvis, Hip, MRCP, cardiac imaging and peripheral imaging in a single scannable FOV of 50 cm coverage.	
	d. Multipurpose flex coils: A single multipurpose adjustable flex coil or non adjustable flex coil 3 in number (small, medium & large) should be provided which must cover TMJ, small & large joints, ear / eye, clavicle sternum, upper & lower extremities, scrotum testis, etc. Highest available channels should be offered.	
	e. Dedicated Bilateral Breast Coil of 7 channels or more number of channels with biopsy compatibility.	
	f. Dedicated Shoulder Coil of 12 channels or more number of channels.	
	g. Dedicated Knee Coil of 12 channels or more number of channels.	
	h. The system should continuously monitor the RF coils used during scanning to detect failure modes. RF coils should not require either set up time or coil tuning; multi coil connection for up to 2 or more coils simultaneous scanning without patient repositioning i.e. like 4GTIM / GEM / d-Stream coil combination or equivalent should be provided as standard.	
	i. Bidder must mention the total number of coils offered.	
	j. The bidder must provide suitable coil storage carts for storage and keeping of all supplied coils.	
6.	Patient Table	
	a. It should be completely fully motorized with computer controlled movements in vertical and horizontal directions.	
	b. MRI compatible cushion for Head, Neck, Spine, Knee, Ankle, Hip etc. and all other patient comfort accessories should be provided.	
	c. Position accuracy shall be high in all scannable range.	
	d. Two-way intercom for communication with the patient should be available.	
	e. There should be a hand held alarm or auto alarm system for patients.	
	f. CCTV system with LCD/LED display to observe the patients should be offered.	
	g. Light localizer for patient positioning.	
	h. Patient load bearing capacity should be 200 kg or more. Please specify the load bearing capacity of the table.	
	i. The table should have facility for manual traction in case of emergency.	
	j. All parts of the table should be protected from liquid spill.	
	k. Integrated music entertainment system for patient shall be available.	
	l. Specify the table movement coverage of patient in cm without patient repositioning.	
7.	Measurement System	
	a. Largest Field of View should be at least 50 cm in all three axis.	
	b. The measurement matrix should be from 128x128 to 1024x1024. Please specify the highest matrix available.	
	c. Minimum 2D slice thickness should be equal to or less than 0.5mm.	
	d. Minimum 3D slice thickness should be equal to or less than 0.1mm.	
8.	Host Computer and Array Processors(Operator Console) Workstation	
	a. Latest state-of-art computer system with sufficient RAM (32 GB or more)and computational speed to match the single shot Echo Planar Imaging (EPI), interactive angiogram, multi-planar 3D reconstruction, surface rendering and	

	dynamic imaging, vascular imaging/angiography, etc. and adequate storage for images and other applications. The main host computer should have at least a 19" or more high resolution Medical Grade LED/TFT color monitor with 1024 x 1024 matrix display.	
	b. Necessary image processor for ultra-fast image reconstruction capable of performing real-time image reconstruction should be provided. Please specify reconstruction speed in images per second for full FOV 256 matrix.	
	c. Total hard disk memory to be sufficient to store at least 6, 00,000 images of 256x256 matrix data size.	
	d. Medical Grade Monitor: 19" or more TFT/LED monitor with enhanced graphics accelerator.	
	e. It should be capable of data acquisition, all calculations and post processing for all the applications.	
	f. The system should have DVD/CD/flash drive facility for writing of images, spectra and raw data along with the necessary software for reading the images & spectra on DVD/CD/Flash drive and storing.	
	g. It should have facility and controls for music system for the patient in the magnet room along with music system set with two way communications.	
	h. There should be a provision of retrieval of the reconstruction data in a user friendly manner.	
	i. The system should be DICOM compatible to enable networking with PACS through RIS/HIS. Latest version of DICOM connectivity should be provided.	
9.	Additional workstations: Server based Multimodality client workstation: Multimodality workstation with hardware and software from OEM - Original Equipment Manufacturer & the same user interface as of main console is required for 3 client concurrently (No floating license should be offered) with all basic & advance functions and applications.	
	a. Workstations with Medical Grade Color TFT/LED display (19" or more) with evaluation capabilities for all the basic and advanced applications. Total three number of additional workstation to be provided.	
	b. Hardware Server: The server should have image storage capacity of at least 250 thousand with at least inbuilt hard disk of 120 GB, and at least 16 GB RAM, latest window, and at least 8-core 2.5GHz CPU. 19" or more TFT/LCD monitor with self playing DVD/CD archiving facility.	
	c. Post-processing for all basic and advanced applications/packages.	
	d. Filming should also be possible from all the workstations.	
10.	Networking: a. It should be DICOM ready to enable networking with PACS through RIS/HIS. b. The system should be compatible for fusion imaging with other imaging modalities.	
11.	Printing solutions: a. Film Printer: State-of-Art, DICOM compatible Dry Laser Camera with integrated processor, of resolution more than 500 dpi, capable of printing images up to 1024x1024 matrix size or higher in various formats without loss of resolution for filming from main console & workstations. It should have at least three film size and should be capable to print of any of the 8x10, 10x12, 14x14 and 14x17 inch	

	size film.	
	b. Color Paper Printer: Color Printer for printing of color CSI/Perfusion/BOLD maps & images on A4 size paper.	
	c. The System should also be compatible with other existing film printer available in the Radiology Department.	
12.	Data Acquisition/Pulse Sequences/Processing	
	a. The system should have basic sequences package with Spin Echo, Inversion Recovery, and Fast Spin Echo with high number of echoes.	
	b. Spin echo (SE): multi-slice single echo, multi-slice multi echo, SE with symmetrical and asymmetrical echo intervals and fast spin echo. MT-SE imaging sequence.	
	c. Inversion recovery (IR): FLAIR, STIR, DIR, SPIR/SPAIR or equivalent.	
	d. Gradient echo (GE): transverse gradient/Rf spoiling, transverse gradient re-phasing, 3D gradient echo with shortest TR & TE. Free choice of flip angle selection while maintaining SNR.	
	e. 2D & 3D modes with T1, T2 and PDimages.	
	f. Single Slice, multiple single slice, multiple slice, multiple stacks, radial stack and 3D acquisitions for all applications.	
	g. Single and multi-shot EPI imaging techniques with high number of echoes (256 or more).	
	h. The system should be capable of 2D and 3D acquisitions in conventional, fast & ultra-fast spin echo and gradient echo modes so that real-time images can be observed if needed.	
	i. Half Fourier or other techniques to reduce scan acquisition time while maintaining adequate SNR. Half Fourier acquisition capabilities should be available with/without diffusion gradients and in combination with fast spin echo.	
	j. Fat suppression for high quality images (STIR, DIR, SPIR or equivalent).	
	k. Facility for dynamic acquisition (pre and post contrast scans and time intensity studies).	
	l. Applications to acquire motion artifact free images/ images with reduced motion artifacts.	
	m. Gating: physiological signals like ECG, pulse, respiratory.	
	n. Artifact reduction/imaging enhancement/ image filtering/ image subtraction/ addition/ multiplication/division techniques.	
	o. Flow artifact compensation technique.	
	p. Re-locatable saturation band for placement on either side of ROI.	
	q. Fat saturation techniques: frequency selective RF pulses to suppress fat signals in the measured image FOV. ROI selective (regional) fat suppression should also be given.	
	r. Magnetization transfer saturation: Off resonance RF pulses to suppress signals from stationary tissue in FOV.	
	s. Image intensity correction.	
	t. Breathe hold acquisition.	
	u. EPI mode: EPI optimized sequences (with and without fat suppression).	
	v. Neuro-Imaging	
	i. All T1 (2D, 3D), T2 (2D, 3D), IR (2D, 3D), Dual IR (2D, 3D) sequences.	

ii.	2D&3D sequences for inner ear and internal auditory canal imaging.	
iii.	Sequence for visualization of fine structures like cranial nerves. Mention the sequences offered.	
iv.	Dynamic imaging of pituitary gland using appropriate sequence.	
v.	The system should have seizure protocol software.	
vi.	SWI: Sequences for susceptibility imaging.	
vii.	Sequences for imaging of whole spine with fusion software.	
viii.	Superimposition on NeuroTractography geometry and tensor diffusion field on both functional BOLD mapping and 3D anatomical image.	
ix.	System should have MRventriculography, Cisternography, myelography imaging appropriate sequences / protocol.	
w.	Angiography	
i.	2D/3D TOF, 2D/3D Phase Contrast (with and without gating), magnetization transfer saturation, black blood and white blood angiography.	
ii.	Moving table angiography should be offered. Provision of seamless angio-imaging covering from arch of aorta to dorsalis pedis in one injection with high resolution and high SNR.	
iii.	Contrast bolus tracking software package with automatic bolus detection.	
iv.	Sequences for breath hold angiography with contrast enhancement.	
v.	Sequences for time resolved angiography with contrast kinetics 4DTraks / Twist/ Tricks XV.	
vi.	ECG triggered non-contrast angiography like Native / Trance and B-trance / Enhance sequence.	
x.	Cardiac Package: A comprehensive & latest cardiac package should be offered as standard.	
y.	Diffusion / DTI & Perfusion: A comprehensive and latest Diffusion / DTI and Perfusion package should be offered as standard.	
z.	Body Imaging:	
i.	Flow quantification in vessels, CSF and hepatobiliary system. Flow quantification packages for CSF with dynamic CSF flow imaging, aqueduct and spinal canal.	
ii.	Fly-through facility with flow analysis including display of various velocity values.	
iii.	Optimized breath hold sequences for abdominal studies including angiogram.	
iv.	MR Cholangiography and Pancreatography: Specialized sequences and processing to perform MRCP.	
v.	Pulmonary 2D/3D MRA sequence.	
vi.	MR urography, sialography and enteroclysis/enterography.	
vii.	Technique to acquire four different images in single acquisition (in-phase, out-of-phase, water only, and fat only).	
viii.	Susceptibility artifact correction techniques for optimum image quality.	
aa.	Musculoskeletal Imaging	
i.	High resolution imaging for cartilage and musculoskeletal imaging.	
ii.	Cartilage colored mapping sequences for early detection of osteoarthritis. High resolution imaging for cartilage and musculoskeletal imaging with parametric maps of T1, T2, T2*.	

	iii. MR conditional metal artifact reduction software must be offered as standard.	
	bb. Prostate imaging: Comprehensive package for prostate imaging including dynamic contrast imaging.	
	cc. Breast imaging: Comprehensive package for breast imaging with dynamic contrast imaging.	
	dd. Motion correction	
	i. Sequences for motion correction in uncooperative patients/ children.	
	ii. Sequence with ultra-short TE.	
	iii. Sequence for nullifying CSF pulsation artifacts.	
	iv. Sequence enabling prospective motion correction in quick time and in real time during fMRI.	
	ee. MR Spectroscopy: Comprehensive package MR Spectroscopy should be provided as standard.	
	ff. MPR	
	i. Multi-planar reconstruction (MPR) in any arbitrary plane including curved planes with freely selectable slice thickness and slice increments.	
	ii. Surface Reconstruction and evaluation on reconstructed images with minimum time.	
	iii. MIP displaying in cine mode, 2D and 3D mode, targeted/ segmented MIP in any orthogonal axis.	
	gg. BOLD Analysis: Comprehensive package for evaluation of functional images (functional MRI) with appropriate statistical algorithms, color display and overlay on base anatomical images.	
13.	Safety features	
	a. The magnet system should include an Emergency Ramp Down unit (ERDU) in both MRI room and console room for fast reduction of the magnetic field. Specify the Ramp Down time.	
	b. The magnet should have quench bands that contain the fringe fields to a specified value in the event of a magnet quench.	
	c. Real time SAR calculation should be performed by software to ensure that RF power levels comply with regulatory guidelines and are displayed on each image.	
	d. The system should have manual override of the motor drive for quick removal of the patients from the magnet bore.	
	e. Temperature sensor (inbuilt) for magnet refrigeration efficiency.	
	f. Electrical safety and electromagnetic compatibility for biomedical equipment should be guaranteed.	
14.	Standard MRI Accessories:	
	a. Imaging phantoms for regular QA/QC studies.	
	b. Water chillers for Cold Head/Gradients.	
	c. MRI compatible patient shifting trolley: 1 piece.	
	d. MRI Compatible wheel chair: 1 piece.	
	e. MRI Compatible IV Fluid stand: 1 piece.	
	f. Hand held metal detectors: 2 pieces.	
	g. Metal detector door: one.	
	h. Coil storage cart/coil cabinets.	

	i. MRI compatible storage carts and wall mounted cabinets.	
	j. A MRI Compatible dual syringe power head Pressure Injector with 50 sets of syringes& tubing.	
	k. Suction & Oxygen pipeline connected to main central manifold pipeline and backup manifold to be provided inside the RF enclosure.	
	l. UPS: Suitable and Compatible Online UPS for entire MRI system including console and workstation with at least 30 minutes back up.	
	m. MRI compatible firefighting system:- Fire Detectors and four or more fire extinguishers.	
	n. MRI compatible audio system and noise-reducing stereo headphones.	
	o. HVAC system for UPS, Console, Technical and RF Room and Reporting Room.	
	p. Patient Weighing Scale/ machine: 2 pieces.	
	q. Ergonomically designed chairs for consoles: 8 pieces.	
	r. Patient preparation bed / couch with foldable bed side screen and locker.	
	s. Two LED based view boxed with adjustable illumination to view 3 films of 14" * 17" in each view box.	
	t. MRI compatible pulse oximeter: 2 pcs.	
15.	Suitable RF Enclosure The system must be supplied with RF cabin with RF room shielding, RF Door screen, and interiors for the same should be carried out suitably. It should be supplied from the same principle manufacturing company preferably or should provide manufacturing company details along with other details. a. The system should be supplied with the RF cabin; cladding and interiors for the same with sound reduction system. Please specify the maximum sound reduction in dB. b. All the shielding requirements of the room will have to be done by the supplier. c. Installation of all the HVAC system along with humidification and dehumidification control should be done by the supplier. d. Patient comfort kit including following and other as per standards should be supplied by the supplier. - Noise guard head set for adult, children and neonatal. - Non magnetic prism glass. - Ear Phones.	
16.	Heat Dissipation: The system should have efficient heat dissipation and cooling mechanism.	
17.	Standard and Certification: The system should be both US FDA and European CE approved product. Certificate of the same must be attached in the tender documents.	
18.	Warranty a. Three Years of Comprehensive Warranty of complete MRI system along with all equipment and accessories including UPS& HVAC system which must include services as well as spare parts, coils, helium refill etc. b. Must quote frozen rate for CMC period of 7 years after the completion of warranty period which should not exceed more than 5% of the bid cost annually. CMC must cover spare parts, accessories, coil, helium refill, UPS, HVAC system etc and service along with stationed service engineer. CMC price will be taken in consideration during financial bid evaluation for machine 10 years evaluation.	

	c. Warranty should start from the day of complete satisfactory installation of equipment.	
	d. 95% uptime warranty must be provided. If downtime is more than 5%, penalty of double the downtime would be added to the warranty.	
	e. Attach a complete list of spare parts which would be provided with the equipment.	
	f. During the warranty period supplier must ensure planned preventive maintenance (PPM) at least 4 times in a year along with corrective/breakdown maintenance whenever required.	
	g. The vendor and manufacturing company should guarantee the service and spare support for 10 years of the whole system including Helium, coil, Cold head and all accessories.	
19.	Power Supply	
	a. Power input should be compatible with power supply at BPKIHS, Dharan, Nepal.	
	b. Resettable over current breaker shall be fitted for protection.	
20.	Environmental Factor: The unit should be capable of operating continuously in ambient environment of BPKIHS, Dharan, Nepal.	
21.	Personnel: A factory trained service engineer must be stationed in Dharan for prompt service and the engineer must be technically sound in application and post processing. The factory training certificate of person for both service and processing must be attached with the tender document, failure to do so the bid may be technically disqualified.	
22.	Installation, Inspection and Commissioning	
	a. Certificate of calibration and inspection from factory.	
	b. Inspection to verify the compliance of offered equipment as per specification will be conducted by technical team appointed by the BPKIHS.	
	c. Should provide all product catalogues.	
	d. Log book with instruction for daily, weekly, monthly and quarterly maintenance checklist. The job description of the hospital technical staffs and company service engineer should be clearly spelt out.	
	e. The compliance statement must be filled strictly under heading given in the specification. Each parameters of specification corroborated in the compliance statement must give the page number where it is listed in the original technical data sheet along with soft copy. And the same should be highlighted.	
23.	Documents/Training	
	a. User and service (Technical /Maintenance) manual to be provided in English.	
	b. Onsite operational training till the familiarity of the system for at least 4 continuous months and then multiple times when required during the warranty period.	
	c. Two Radiologists and Two Technician/Technologist should be provided minimum 15 days training for each in a reputed center in clinical and technical aspect respectively. All the expenses should be borne by the company.	
	d. Minimum Two Technical Staff/Engineer must be provided with the advance level service training at principal company's reputed training center at bidder's own cost for minimum two weeks.	
	e. During the time of technical evaluation if required, the bidder must arrange for a physical demonstration of the quoted product at its own expenses for at least two	

	people.	
	f. The bidder must have supplied at least two superconducting 1.5 / 3T MRI systems in Nepal. Appreciation letters from the hospital / center should be submitted along with the bid document. Failure to do so will lead to the disqualification of bid.	
24	Works to be done under Turnkey Project	
	a. Under this turnkey project all required civil related works such as RF shielding, Magnetic shielding, painting, required furniture etc except MRI building construction must be done by the bidder. The bidder must have to send their technical team before pre-bid meeting of the tender to visit the site and finalize the site. Once the site is finalized the bidder must have to provide their layout / diagram of the MRI building along with electrical load which should be as per standard guideline and as per rules and regulations of NEPAL. The building design and layout diagram must include a Magnet room, reporting room, console room, patient waiting area, patient preparation room, doctor's room, technical person room, UPS room etc as per standard guidelines.	
	b. BPKIHS will only provide building as per bidder provided drawing, layout and dimension. The bidder has to do all aspects of works including electrical, civil, computer and biomedical engineering inside the MRI building for complete installation of the system and make it functional. The bidder will hand over the key after complete installation, calibration, testing and then final inspection will be done by the technical team appointed by BPKIHS.	

Note:

- a. This proposed technical specification is not targeted to any particular company or model/ brand of the machine.
- b. If any application / software / technology words or terminology are specific to any company then they can quote equivalent application / software / technology.