



Republic of the Philippines
Department of Health
Regional Office No. XI
SOUTHERN PHILIPPINES MEDICAL CENTER
J.P. Laurel Avenue, Davao City



TECHNICAL SPECIFICATIONS

Whole Body 1.5 Tesla Magnetic Resonance Imaging System

(Name of Project)

Instructions:

Bidders must state in the column under **Statement of Compliance** the word either “Comply” or “Not Comply” against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of “Comply” must be supported by evidence in a Bidders Bid and cross-referenced to that evidence. Evidence shall be in the form of manufacturer’s un-amended sales literature, unconditional statements of specification and compliance issued by the manufacturer, samples, independent test data etc., as appropriate. A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the Bid under evaluation liable for rejection. A statement either in the Bidders statement of compliance or the supporting evidence that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bidder or supplier liable for prosecution subject to the provisions of **ITB** Clause 3.1(a) (ii) and/or **GCC** Clause 2.1(a) (ii).

Bidder may submit offer which provides for superior specifications and /or better terms and conditions to the government at no extra cost. However, these shall not be given any bonus, credit or premium in the bid evaluation

Prepared by Technical Working Group

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<i>Item</i>	<i>Procuring Entity's Specification</i>	<i>Bidder's Specification as Technical Offer</i>	<i>Statement of Compliance</i>
<u>Whole Body 1.5 CHANNELS Magnetic Resonance Imaging System</u>	<p><i>I. General Description</i></p> <p>The supplier shall supply and commission one (1) units of a brand new and latest model of a Whole Body 1.5 Tesla (or above) Magnetic Resonance Imaging System</p> <p>The MRI system can be utilized fully for breast, and other body examinations with stable and high homogeneity superconducting magnet, high performance gradient and digital radiofrequency system with matching multichannel coils.</p> <p>The MRI system can be used for wide range of diagnostic procedure in both adults and children. It can also be used in the guidance of interventional procedures.</p> <p><i>II. Gantry and Magnetic System</i></p> <p>The magnet should be a 1.5 Tesla (or above) active shielded superconducting.</p> <p>The homogeneity of the magnetic field shall be less than 1.5 ppm at 40 cm DSV and its field stability should be less than 0.1 ppm/hr. The supplier should specify the number of plane plot used for measurement and the number of measurement point per plane.</p>		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>The cooling system for the superconducting should be liquid Helium only with zero boil off rate and guaranteed helium refill every 10 years as maximum.</p> <p>The magnet bore should be wide up to 60 cm (or wider) with flared opening to accommodate bulk patient, provide comfort and avoid claustrophobia.</p> <p>The magnet length should be short as possible and should be less than 160 cm. The gantry or system length (cover to cover) should not be more than 175 cm.</p> <p>The magnetic tunnel should have better illumination, ventilation and music system</p> <p>The front panel of the gantry should display the identity of selected coil, table position and other physiological parameters selected. This feature of the gantry is optional; the supplier may or may not offer this item).</p> <p><i>III. Shim System and Shielding</i></p> <p>The shim system of the MRI must be of high performance, highly stable with global and localized automated shimming for high homogeneity magnetic field for imaging. The shim type include both passive and active. Passive shimming during installation. With active shielding technology</p>		

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(continuation) <u>Whole</u> <u>Body 1.5</u> <u>Tesla</u> <u>Magnetic</u> <u>Resonance</u> <u>Imaging</u> <u>System</u>	<p>Must have shielding system integrated into the magnet for external interference.</p> <p>IV. Gradient System</p> <p>The system must be actively shielded whole body gradient system with each axis having independently a slew rate of at least 120 T/m/s and a peak amplitude of at least 33 mT/m.</p> <p>The system should have efficient and adequate eddy current compensation</p> <p>It must have effective cooling system for gradient coil and power supply.</p> <p>Gradient duty cycle must be 100%</p> <p>Minimum FOV of 5 mm or less and Maximum FOV up to 500 mm or greater</p> <p>Capable of slice thickness in 2D up to 200 mm or higher. Minimum thickness in 2D should be less than 1 mm.</p>		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>Measurement matrix can be up to 1024 x 1024 or higher in 2D and 3D</p> <p>Supplier to provide accessories to reduce noise in fast and EPI mode in the magnet</p> <p>There must be mechanism or safety measures to avoid peripheral nerve stimulation by high gradient stimulation.</p> <p><i>V. RF System</i></p> <p>The RF system should be fully digital and optical system. It must be broad band capable of EPI and support MR Spectroscopy</p> <p>The RF amplifier must be solid state type</p> <p>The transmitter bandwidth must be 500 KHz or wider</p> <p>The RF system should have multiple independent RF receiving channels</p> <p>The number of available channels in the system coil should be 32 channels or more and pre-amplifiers. All multi-channel coils should have built in pre-amplification to ensure high SNR</p>		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>The system should have hardware to support quadrature phase array and flexi coils</p> <p>The system should be compatible with parallel imaging technique</p> <p>The system should have technology that can allow to combine different coils together to produce longer coverage or to image head to foot coverage with just one set-up for faster workflow The system allow remote selection of coil and / or coil elements</p> <p>Coil tuning, impedance matching, RF power parameter and pre-amplification, gain adjustment must be fully computer automated and optimized for each patient</p> <p>VI. RF Coils</p> <p>The supplier must provide the one (1) piece for each dedicated multichannel RF receiver coils as enumerated.</p> <p>The multichannel coils should have the following capabilities for dedicated purposes.</p> <ul style="list-style-type: none">- Coil can be selected from console.- Coil should be capable of parallel acquisition technique		

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(continuation)	VII. Patient Table and Handling		
<u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>The patient table should be fully motorized, computer controlled movements in vertical and horizontal directions.</p> <p>Horizontal movement, and ventilation can be controlled from the console.</p> <p>Provided with hand held alarm for patient</p> <p>There should be light localizer for patient positioning</p> <p>Allow remote table movement. The technologist can adjust the table speed using the speed mode button</p> <p>Allow feet first examination for some procedures such as liver, upper abdomen, pelvis, colonography and cardiac studies.</p>		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p><i>IX. Radiologist Workstation</i></p> <p>The Radiologist Workstation must be Identical in performance as main measurement console and having same user interface (controllable from the keyboard and mouse facility) with evaluation capabilities like MIP, MPR, surface reconstruction, spectral analysis etc.</p> <p>6 megapixels 30 inch medical grade branded monitor and 18"or larger LCD/LED/TFT colour monitor. (The end user will choose the brand that will be appropriate in SPMC Radiology set-up)</p> <p>The image format must conform to ACR-NEMA format; standard- DICOM 3 or newer versions.</p> <p>Workstation to be provided with a workstation table and two numbers of ergonomically designed operator chair.</p> <p><i>XI. Image Acquisition and Display</i></p> <p>Acquisition of next sequence must be possible while the image for last sequence is being reconstructed.</p> <p>Automatic display of reconstructed images.</p>		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>Flow artifact compensation.</p> <p>Presentation slabs – a number of re-locatable saturation bands can be placed either inside or outside the region of interest.</p> <p>Fat saturation techniques, frequency selective RF pulses to suppress fat signals in the measured image FOV.</p> <p>Magnetization transfer saturation: Off resonance RF pulses to suppress signals from stationary tissue in FOV phase contrast capability in 2D and 3D mode.</p> <p>Image intensity correction.</p> <p>Breathe hold acquisition.</p> <p>Free breathing acquisition (2D, 3D).</p> <p>Should have an EPI mode capable of</p> <p>a. Data acquisition in all three standard planes (axial, sagittal, coronal, oblique and double oblique planes).</p> <p>b. Matrix 128 X 128, 256 X 256 acquisition capabilities in single shot EPI acquisition time.</p>		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>Software and hardware for functional imaging is standard.</p> <p>The pulse sequences stated below or equivalent sequences by the different manufactures should be available.</p> <p>The following basic pulse sequences shall be available:</p> <ol style="list-style-type: none">1. Spin Echo (SE) – Multi slice single echo, multi slice multi echo with minimum TR and TE. SE with symmetrical and asymmetrical echo intervals.2. Inversion Recovery (IR) including short TI – modified IRSE, FLAIR, DIR (Double Inversion Recovery).3. MT with FLAIR STIR (Short Tau Inversion Recovery) SPIR.4. Gradient Echo with transverse gradient/RF spoiling and transverse gradient re-phasing e.g. GRASS etc. 3D gradient echo with shortest TR and TE, free choice of flip angle selection while maintaining SNR. <p>Dynamic study for pre and post contrast scans time intensity studies (wash in and wash out) and Kinetics</p>		

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<i>(continuation)</i> <u>Whole</u> <u>Body 1.5</u> <u>Tesla</u> <u>Magnetic</u> <u>Resonance</u> <u>Imaging</u> <u>System</u>	2. 2D TOF, 3D TOF, TOF overlapping sequence. 3. 2D/3D phase contrast with and without gating and magnetization transfer saturation. 4. Bolus tracking software package must be provided. 5. Sequences for breath hold Angiography with contrast enhancement should be offered. 6. Sequence package for diffusion study in organ like brain, Kidney, muscle, heart etc. 7. Perfusion study in organ system like Kidney, Muscle, Heart etc. and evaluation package for brain calculating CBV, CBF, MTT, Perfusion MAP etc. Give maximum B values available (Should be possible on main console in real time). 8. Flow quantification in vessel and CSF, hepatobiliary system. 9. Optimized breath hold sequences for abdominal studies including Angiograms. 10. Internal Ear Imaging.		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>11. MR cholangiography, MR Pancreatogram; MR Urography, specialized sequences and processing to perform MRCP.</p> <p>12. MR Ventriculography and Cisternography.</p> <p>13. Flow quantification package for CSF with dynamic CSF flow imaging at aqua duct and spinal canal.</p> <p>14. Pulmonary 2D/3D MRA sequences.</p> <p>15. Navigator technique for collection of functional imaging data.</p> <p>16. Artefact reducing software (for example, reducing CSF flow artefacts in FLAIR 2D/3D imaging).</p> <p><i>XIII. Post Processing and Evaluation Software</i></p> <p>3D multi planer reconstruction (MPR) in any arbitrary plane including curved planes with freely selectable slice thickness and slice increments in matrix 256 X 256 X 128.</p>		

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<i>(continuation)</i> <u>Whole</u> <u>Body 1.5</u> <u>Tesla</u> <u>Magnetic</u> <u>Resonance</u> <u>Imaging</u> <u>System</u>	3D surface reconstruction and evaluation of a reconstructed image with minimum time. Shaded surface display MIP in 2D and 3D mode. Targeted/segmental MIP in any orthogonal axis with minimum processing time and capable of displaying in cine mode. Thick maximum intensity projection Perfusion image analysis and evaluation with time intensity graph and other statistical parameters. Stitching capabilities. Flow quantification and evaluation for vascular flow (high and low) CSF flow, bladder out let. Image statistics – measurement of distance, area, volume angle, SD, mean, image addition, subtraction, multiplication, division, interpolation, segmentation, threshold, histogram, ROC. Evaluation feature like, Zoom, rotation, scroll, roaming, image synthesis, multipoint T1 T2 calculation (more than 3), Window stretching, text dialogues, graphics, storing, searching, archiving, recalling.		

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<i>(continuation)</i> <u>Whole</u> <u>Body 1.5</u> <u>Tesla</u> <u>Magnetic</u> <u>Resonance</u> <u>Imaging</u> <u>System</u>	<p>Perfusion analysis should have the capability to calculate color display of MTT, CBV and CBF. At least included in the radiologist workstation</p> <p>Quantification of the CSF flow data should be included in the radiologist console</p> <p>Post processing of data sets for colour overlay of functional and anatomical data to be real time</p> <p>Processing of 2D/3D CSI (Chemical Shift Imaging) with parametric metabolic mapping</p> <p>Diffusion weighted imaging with multi-shot segmented EPI techniques</p> <p>XIV. Spectroscopy</p> <p>System should have necessary hardware to perform Spectroscopy</p> <p>Water suppression facility.</p> <p>Capability for single voxel and multi voxel spectroscopy acquisition.</p> <p>STEAM, PRESS, CSI, STEAM with CSI, PRESS with CSI with different TR/TE.</p>		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	Simultaneous multivoxel acquisition with CSI capabilities. Multi slice MRS with fat and water suppression using SE and EPI techniques. Post processing should include FFT, base line correction automatic phase correction, curve fitting, metabolite image and spectral mapping, correlation, quantification of metabolites etc. Spectroscopic mapping. Sequences for metabolite mapping. Minimum VOXEL size for 1H (head coil) - to be mentioned. Simultaneous display and evaluation of image spectroscopy data. <i>XV. DICOM and Other Standards / Protocols</i> DICOM standard services for storage, query and retrieve, storage commitment, print management, and media storage.		

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<i>(continuation)</i>	<i>XVI. Other Features and Capabilities</i>		
<u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>ECG Trigger including one set of patient lead wires, one fiber optic peripheral gating probe EPI. Physiological synchronization; displaying and triggering of ECG, pulse, respiration and external triggering sources on main console.</p> <p>Peripheral pulse trigger by synchronizing data acquisition to pulse blood flow Respiratory trigger by synchronizing data acquisition with respiratory motion</p> <p>Allow trigger input from patient monitor, pulse oximeter, and other trigger sources</p> <p>Automatically perform QA procedure on a daily basis (SNR, Uniformity, Slice thickness, Contrast, geometric distortion and resolution) or performance evaluation package.</p> <p>Breast imaging capability should have protocols for high resolution 2D and 3D imaging covering both breasts simultaneously. It should have protocols breast biopsies procedures like wire localization and fine needle / vacuum biopsies.</p> <p>Provide tractography, a 3D modeling technique used to visually represent neural tracts using data collected by DWI.</p>		

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<i>(continuation)</i>	<i>XVII. Other Standard Accessories</i>		
<u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	MR compatible pressure injector of a reputed firm with control from console.		
	Fully digital, double head for contrast and saline with disposable syringes of 50 -50ml.		
	A minimum of 200 numbers of syringes with connectors to be supplied along with the equipment.		
	MR compatible anesthesia equipment with Boyle's apparatus.		
	MR compatible servo ventilator and infusion pump.		
	MR compatible wall mounted suction adapter		
	MR compatible wall mounted oxygen regulator with flow meter		
	MR compatible patient monitor with pulse-oximeter.		
	MR compatible stethoscope— 2 numbers.		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	MR compatible ECG machine and BP apparatus MR compatible IV stand– 2 numbers. MR compatible trolley with adjustable height System should be capable for networking – network port. Three ergonomically designed chairs for consoles. Suitable UPS for the complete system capable more than 10 minutes backup. Personal computer with colour laser printer and scanner of the latest technology Test phantoms should be provided to calibrate and measure system performance as per the latest international guidelines. Physiological signals display & ECG, Pulse, Resp. Sensors for patient monitoring A CCTV system to observe the patient		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	MR compatible fire distinguisher MR compatible wheelchair – 1pc MR compatible sliding board and slide sheet <i>XVIII. Other Requirements:</i> The MR system shall have a warranty for at least two (2) years (parts and service) including helium refill and accessories The supplier should provide the necessary room shielding and RF door screen to minimize the RF and magnetic field interference to a minimum level. The MRI must be compatible and can be integrated with the PACS / RIS of the hospital. A software and hardware interface for a PACS connection to other modalities must be included.		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>The supplier must upgrade the host computer hardware and software as and when they upgrade to the prevailing industry standards free of cost. Any Software upgrade packages in the supplied system, within 5 years from date of supply must be done free of cost and included as standard.</p> <p>MR system should be upgradable to higher performance gradient to provide faster imaging.</p> <p>The supplier must provide medical grade disc publisher (CD / DVD)</p> <p>Safety requirement should meet internationally approved guidelines.</p> <p>Training of the hospital staff must be provided as follows:</p> <ol style="list-style-type: none">1. Offsite Training in MRI for four (4) radiologists for a period not less than 4 weeks in a reputed institution. Two of which must be conducted abroad.2. Training in quality assurance for a Physicist should be provided.3. Training for two (2) technologists for a period not less than two weeks each in a reputed institution in abroad and two (2) weeks on site training by application specialist.		

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<i>(continuation)</i> <u>Whole Body 1.5 Tesla Magnetic Resonance Imaging System</u>	<p>4. All expenses during training should be the responsibility of the supplier.</p> <p>There shall be no separate licensing fee for the use of software (software by the bidder or third party) supplied by the bidder.</p> <p>All equipment provided shall be of current production, new and of first rate quality.</p> <p>Remote diagnostic capabilities must include the ability to remotely connect the system on a regular basis to retrieve information about the system and to correct any software problems.</p> <p>It is the responsibility of the bidder to provide all items required but erroneously mentioned or omitted above for the full commissioning of the equipment.</p> <p>Civil works and Interior finish in all aspect to remodel the proposed room and meet the installation and operating requirement of the hospital shall be the responsibility of the supplier. The finishing works would include re-painting of rooms, construct false ceiling, lay anti-static flooring. The end user shall choose the colors for repainting and ceiling design.</p> <p>Supply and Installation of the Air Conditioning units of suitable tonnage on the gantry and console room.</p>		

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<i>(continuation)</i> <u>Whole Body</u> <u>1.5 Tesla</u> <u>Magnetic</u> <u>Resonance</u> <u>Imaging</u> <u>System</u>	<p>The bidder/supplier must be the exclusive distributor of the MRI unit in the Philippines.</p> <p>The brand of MRI being offered by the supplier must be in the local market for at least ten (10) years. The supplier must specify at least one (1) installation in the Philippines indicating the name of facility, its address and date of installation as proof.</p> <p>All equipment and other materials needed for the delivery and installation, commissioning of the MRI unit shall be the sole responsibility of the supplier and at no cost to the government.</p> <p>MRI system should be DICOM conforming in all parameters with no additional requirement of license for connectivity to any PACS/HIS/Radiotherapy Treatment Planning system stations. The MRI systems also conform with HL7 and Internet Protocol Suite.</p> <p>The bidder/supplier shall provide the following MRI books within 60 days upon delivery of the equipment:</p> <p>1. Body MRI by Evan S. Siegelman, 1st Edition</p>		

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<i>(continuation)</i> <u>Whole Body</u> <u>1.5 Tesla</u> <u>Magnetic</u> <u>Resonance</u> <u>Imaging</u> <u>System</u>	<ol style="list-style-type: none">2. Clinical MR Spectroscopy: Techniques and Applications by Peter B. Parker, et al3. Clinical Cardiac MRI by Jan Bogaert, et al, 2nd edition4. Duke Review of MRI Principles, Case Review Series by Wells Mangrum, et al 1st edition5. Clinical MRI of the Abdomen, Why, How, When Gourtsoyiannis Nicholas C. (Ed); Springer Verlag 20116. Diffusion Weighted MR Imaging, Applications in the Body Koh, Dow-Mu; Thoeny, Harriet C. (Eds; Springer 20107. MRI of the Gastrointestinal Tract (Medical Radiology / Diagnostic Imaging) Stoker, Jaap (Ed); Springer Verlag 20108. Specialty Imaging: Breast MRI- A Comprehensive Imaging Guide Johansen-Berg Heidi, Behrens Timothy E.J. Editors.9. Diffusion MRI: from quantitative measurement to in-vivo neuroanatomy Elsevier; 2009, Oishi Kenichi, Faria Andreia V., Zijl Peter C.M., Mori Susumu10. MRI Atlas of Human White Matter, Elsevier; 201011. Gastrointestinal Radiology, Gore, Levin, Lauffer		

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<i>(continuation)</i> <u>Whole Body</u> <u>1.5 Tesla</u> <u>Magnetic</u> <u>Resonance</u> <u>Imaging</u> <u>System</u>	Other terms & conditions of acceptability: 1. The equipment must be a BRAND NEW unit and under warranty including spare parts for at least 2 years. Supplier must bind itself to conduct preventive maintenance on a quarterly basis at its own expense (including labor and cost of spare parts in compliance) with SPMC ISO and CQI Standards. 2. Cost of damages on the existing facility that will be incurred during delivery and installation of all equipment will be shouldered by the supplier. 3. Supplier must comply with the following conditions: a. Submit Certificate of Training of the Company Engineer / Technical Personnel and Product Specialist issued by the Principal or Manufacturer. b. Provide company response within 24 – 48 hours in case of technical problems or equipment breakdown. c. In case of machine downtime, the supplier is given three (3) days for remedial action (repair and or replacement of spare parts). On the 4th day, if the unit is not operational, a penalty shall be imposed equivalent to 1/10 of one-percent (1%) of the cost of the unperformed portion for everyday of delay until the actual delivery or performance.		

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The Bidder may submit offer which provides for superior specifications and/or better terms and conditions to the government at no extra cost. However, these shall not be given any bonus, credit or premium in the bid evaluation.

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