**Tеchnical Specifications - Medical Imaging Equipment – Lot 1**

1. **Multislice CT Scanner for cardiovascular procedures for Institute for cardiovascular diseases “Dedinje”**

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| **Line Number** | **Specifications Required** | **Specification offered** | **Location in technical specification (datasheet) or original producer statement** |
| **1.** | **GANTRY** | | |
| 1.1. | Aperture, minimum 70 cm |  |  |
| 1.2. | Full rotation shortest time (3600), no longer than 0.28 sec |  |  |
| **2.** | **PATIENT TABLE** | | |
| 2.1. | Minimum scannable range - 175cm or more |  |  |
| 2.2. | Maximum load capacity - 204 kg or more |  |  |
| 2.3. | Table length - 240 cm or more |  |  |
| **3.** | **GENERATOR** | | |
| 3.1. | Maximum power - 100 kW or more |  |  |
| 3.2. | Maximum intensity of current - 740 mA or more |  |  |
| 3.3. | Maximum voltage - 135 kV or more |  |  |
| **4.** | **X-RAY TUBE** | | |
| 4.1. | Anode effective heat capacity - 5,5 MHU and more, with anode cooling rate of 1370 kHU/min or more, or equivalent that allows continuous work without waiting for tube cooling |  |  |
| 4.2. | Number of focal spots, two or more |  |  |
| 4.3. | Helical (spiral) scanning (exposure) time - 60s or more |  |  |
| **5.** | **DETECTOR SYSTEM** | | |
| 5.1. | Total number of detector rows - 128 or more |  |  |
| 5.2. | State of the art Detector technology (Gemstone Clarity, Stellar, Matrix array, Nanopanel Prism or equivalent) |  |  |
| **6.** | **ACQUISITION PARAMETERS** | | |
| 6.1. | Number of acquired slices - 256 or more |  |  |
| 6.2. | Scan field of view - 50 cm |  |  |
| 6.3. | Ability of choosing different range diameters of scanning |  |  |
| 6.4. | Full rotation time, (360 degrees), 0,28 second or faster |  |  |
| 6.5. | Retrospective and prospective ECG triggered scan acquisition |  |  |
| 6.6. | Adaptive ”pitch” with ECG triggering combination during arteriography and coronography |  |  |
| 6.7. | System must be with state of the art iterative reconstruction software for dose reduction ( at least 50%), maintaining picture quality and clarity (Safire, Iris, Aidr 3D, iDose, ASIR- V, ADMIRE, VEO or equivalent) |  |  |
| **7.** | **OPERATING CONSOLE** | | |
| 7.1. | Flat screen color monitor with minimum 1,3 MP or more ; minimum 19” (48 cm) or more; resolution 1,280 x 1,024 or more |  |  |
| 7.2. | „DICOM“ state of the art protocols: DICOM Print, DICOM Storage, DICOM Modality Worklist |  |  |
| 7.3. | Automatic „Filming mode“ |  |  |
| 7.4. | CT angiography with analyzes |  |  |
| 7.5. | Dynamic bolus tracking program, with precise scanning time assessment and manual activation according automatic bolus detection |  |  |
| 7.6. | Cardiological acquisition program with algorithm for temporal resolution improvement |  |  |
| 7.7. | RAM capacity on operator console - 8 GB or more |  |  |
| 7.8. | Total system storage capacity – 520000 lossless image compressed or non-compressed, 512 X512 matrix |  |  |
| 7.9. | High or ultra-high resolution scanning for lung examination |  |  |
| 7.10. | Reconstruction speed 40 images/ second, or more, and 20 images/ second, or more, in reduction dose options |  |  |
| 7.11. | Artifacts reduction Software (technology) due to cardiac motions or coronary arteries motions during cardiac acquisitions or advanced superfast scanning technology or equivalent |  |  |
| 7.12. | Real time VRT, MPR, 3D imaging, cardiac view, volume rendering or equivalent |  |  |
| 7.13. | Ultra High Spatial resolution - min. 24 lp/cm or more |  |  |
| 7.14. | Artifact reduction technology due to orthopedic implants, iodine or bones… Metal Artifacts Reduction or equivalent |  |  |
| 7.15. | Dynamic brain perfusion studies software with low-dose CTA |  |  |
| 7.16. | Myocardial perfusion and stress perfusion, Quantitative dynamique acquisition mode |  |  |
| **8.** | **DIGNOSTIC TOOLS ON SERVER** | | |
| 8.1. | CT scanner advanced visualization system with integrated data base server (compatible with different CT manufacturer) with:   * at least 4 (four) workstations * with contemporary users that can simultaneously access to different applications (described under point 8.) * with flow of processing of at least 15000 images/sec, or more * in client - server architecture * with minimum 4 license, or more, for web access |  |  |
| 8.2. | Server storage hardware of 4Tb, or more |  |  |
| 8.3. | Hardware configuration for 4 (four) diagnostic workstations:  - brand name PC Windows base,  - 1 Tb memory ,  - Intel Core i5 (or more) processor,  - 8Gb RAM, or more  - 2 (two) diagnostic DICOM compatible monitors, minimum 2 Mp resolution, or more and screen diagonal minimum 21,3 inch, or more |  |  |
| 8.4. | Advanced Cardiological Software; state of the art technology |  |  |
| 8.5. | Advanced Vascular Analyzis Software; state of the art technology |  |  |
| 8.6. | Aorta Analyzes Software Package; TAVI, TEVAR, EVAR … preparing for intervention; state of the art technology |  |  |
| 8.7. | 4D CTA of brain with DSA and perfusion ; state of the art technology |  |  |
| 8.8. | Advanced Myocardial Perfusion Software ; state of the art technology |  |  |
| 8.9. | Advanced Abdominal Parenchymal Organs Perfusion Software ; state of the art technology |  |  |
| 8.10 | Willis hexagon analyzes, state of the art technology; on operating console or workstation |  |  |
| 8.11. | CT virtual endoscopy of larynx or bronchi; on operating console or workstation |  |  |
| 8.12. | - DICOM functions: SEND, Query/Retrieve, PRINT, storage. Image reception in DICOM format. DICOM Get work list (HIS/RIS)  - Disc burning of study with viewer on CD or  - DICOM adapter for integration with other modalities |  |  |
| **9.** | **ADDITIONAL EQUIPMENT** | | |
| 9.1. | Double Syringe Contrast Injector:   * opportunity for mixture of contrast and * workstation * two pistons   RIS/ PACS compatible. |  |  |
| 9.2. | DICOM color printer on photo paper or X-ray gray scale film |  |  |
| **10.** | **OTHER REQUIREMENTS FOR BIDDER** | | |
| 10.1 | Warranty period on complete system 12 Months |  |  |
| 10.2 | Free of charge software upgrading during warranty period |  |  |
| 10.3 | To make location project based on space and room project where system will be installed |  |  |
| 10.4 | Installation of the offered system- “Turnkey” project (preparation of existing CT facilities- technical room, examination room and control room. HV cable from HV substation to technical room has to be provided by Beneficiaries). |  |  |
| 10.5 | 10 days on site training for staff (doctors and technicians) who will work on the system. Training has to be done by certified Application specialist |  |  |
| 10.6 | Education in Institution with high volume workflow of cardiovascular patients that undergo MDCT cardiovascular diagnostic on similar CT that as offered ; three weeks (or more) duration for 2 radiologists and two technicians |  |  |
| 10.7 | Operator manual (in Serbian and English) and Service manual (in English) |  |  |
| 10.8 | Service personel response time in warranty period: max 24 hours |  |  |
| 10.9 | System “Up-time” during warranty period has to be minimum 95% of working days |  |  |
| 10.10 | Spare parts available min. 7 years from the moment of system delivery |  |  |

1. **Digital angiography system for cardio-vascular diagnostic and interventional procedures Institute for cardiovascular diseases “Dedinje”**

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| --- | --- | --- | --- |
| **Line Number** | **Specifications Required** | **Specification offered** | **Location in technical specification (datasheet) or original producer statement** |
| **1.** | **C-ARM** | | |
| 1.1. | Floor or ceiling mounted C-arm; easily handling; providing all kind of interventional procedures with cranial-caudal and lateral angulations and projections |  |  |
| 1.2. | Must to provide movement of detector panel with SID in range of 95-115 or more |  |  |
| 1.3. | Must provide easy operator access to the patient by both side of patient and using femoral, radial or brachial approach in the same procedures (palm to palm) without movement or rotation of patient off table.  Must provide longitudinal head to toe coverage just by motorized C-arm or table movement without table or patient rotation |  |  |
| 1.4. | All controls C-arm, table or acquisition must be tableside. All handling stick must be above panel of control unit |  |  |
| 1.5. | C-arm position memorizing controlled by tableside control unit. |  |  |
| 1.6. | Memorizing of parameters of C-arm like cranial-caudal or lateral angulations, SID… |  |  |
| 1.7. | Automatic C-arm positioning based on reference image |  |  |
| 1.8. | Software protection of C-arm to patient collision |  |  |
| **2.** | **PATIENT TABLE** | | |
| 2.1. | Floor mounted |  |  |
| 2.2. | Motorized up and down movement with lowest position on 80 cm or less |  |  |
| 2.3. | Floating tabletop of radio transparent material, length of table 260 cm or more, width of table 50 cm or more but not to wide in order to avoid collision with C- arm lateral angulations. To provide stepping DSA table movement. „Metal free“ area of table to be 200 cm or more, in length  There must be cranial-caudal tilt |  |  |
| 2.4. | Table rotation +/- 90 degrees around vertical axis |  |  |
| 2.5. | Maximal loading of table 240 kg or more |  |  |
| 2.6. | Tableside control unit must have:   1. Table blockage and releasing; 2. Motorized C-arm movement 3. Motorized vertical table movement |  |  |
| 2.7. | Regarding function tableside control unit must have:   * Image adjustment * Roadmapping adjustment (superimposition) * Collimation adjustment * Changing field of view, image magnifying * Level of fluoroscopy choice * Acquisition choice * Stenosis analyzes (QCA,QVA) * LV analyzes (LVA,) * Stent visualization improvement * Management of functions from diagnostic workstation |  |  |
| 2.8. | Necessary additional equipment for table:   1. Removable hand support 2. Radiolucent table top for comfortable patient 3. Both table side metal rails for additional stands and protection montage for comfortable patient lying on the table 4. Acquisition foot pedal, 5. Table extension up to 300 cm length if there is no default table length of 300 cm |  |  |
| **3.** | **HV GENERATOR** | | |
| 3.1. | High frequency microprocessor inverter controlled generator |  |  |
| 3.2. | Generator power of 100 kW or more |  |  |
| 3.3. | Tube heating protection |  |  |
| 3.4. | Continues imaging of tube rest capacity |  |  |
| **4.** | **X-RAY TUBE AND COLLIMATION** | | |
| 4.1. | Number of focus, two or more |  |  |
| 4.2. | The smallest focus size to be 0,4 mm or less |  |  |
| 4.3. | Minimal Heat capacity to be 2,4 MHU or more |  |  |
| 4.4. | To be equipped with manual rectangle blends |  |  |
| 4.5. | To be equipped with semitransparent blends movable independently of rectangle blends |  |  |
| 4.6. | To be equipped with Cu filters |  |  |
| 4.7. | To be equipped with virtual collimation on last hold image.  To be equipped with grid-switch or flat emitter technology or equivalent dose reduction technology for pulse fluoroscopy |  |  |
| **5.** | **FLAT PANEL DETECTOR** | | |
| 5.1. | Detector size 295 mm (or more up to 305 mm) x 395 mm or more , rotatable |  |  |
| 5.2. | Pixel size to be 200 µm or less |  |  |
| 5.3. | DQE, 70% or less on 0 Lp/mm |  |  |
| 5.4. | Number of field of views – 5 or more |  |  |
| 5.5. | Digitalization depth ( gray scale level) 12 bits or more |  |  |
| 5.6. | Removable greed against scattered radiation |  |  |
| 5.7. | Acquisition matrix 2000x1500 (approximately), with highest acquisition speed of 30 fps |  |  |
| 5.8. | Synchronized rotation of detector and collimation regardless C-arm position |  |  |
| **6.** | **DIGITAL SYSTEM** | | |
| 6.1. | Digital pulsed fluoroscopy; three speed (or more) choice opportunity: 7.5 (or less), 15 (or 10) and 30 fps |  |  |
| 6.2. | LIH (Last Image Hold) |  |  |
| 6.3. | Fluoroscopy sequence archiving in DICOM format and system (Fluoro Loop or equivalent); prospective and retrospective |  |  |
| 6.4. | Digital acquisition; three speed (or more) choice opportunity: 7.5(or less), 15 (or 10) and 30 fps |  |  |
| 6.5. | Vessel analyze (QCA, QVA) |  |  |
| 6.6. | LV analyze (LVA) |  |  |
| 6.7. | Coronary stent advanced visualization |  |  |
| 6.8. | Digital subtraction visualization (DSA) with highest speed of 6 fps (or more) in matrix of 2000x1500 (approximately) for vascular studies |  |  |
| 6.9. | Road mapping (RM) with automatic ‘’pixel shift’’ correction and superimposition of live fluoroscopic image and reference image in real time. LIH RM and DSA RM with changeable superimposition and tableside command |  |  |
| 6.10. | Bolus chase or stepping technique for DSA single injection acquisition |  |  |
| 6.11. | 3D rotational angiography for high contrast studies of peripheral vessels with immediate overview in operating room |  |  |
| 6.12. | State of the art Low dose protocol |  |  |
| 6.13. | Acquisition console with two diagnostic monitors of 19 inch (or more) ; number of pixels 1,3 MP ( or more), in control room, for demographic data entry and real time image |  |  |
| 6.14. | System capacity to be 50 000 (or more) images in 2000x1500 (approximately) matrix; 12 bits; with antivirus integrated system protection and data protection |  |  |
| 6.15. | CD and DVD image archiving device in DICOM system with automatic burning of DICOM viewer |  |  |
| 6.16. | Networking, connecting, archiving according DICOM 3.0 protocol:  DICOM Storage  DICOM Storage Commitment  DICOM Query/Retrieve  DICOM Modality Worklist  DICOM Radiation Dose Structured Report |  |  |
| 6.17. | Ceil mounted carrier of monitor and monitor of 56 inch (or more) diagonal in operating room; available for imaging of different formats and modalities from different sources (angio-suite, hemodynamic system , ultrasound, IVUS, CT, MR etc.) such as:  1. real time image,  2. reference image,  3. different diagnostic sources images: CT, MR etc) , real time available imaging (US, TTE , TEE, IVUS, FFR, OCT, OFDI…) by adequate technique  4. Additional reserve 19 inch monitor; integrated or free mounted, according to manufacturer; in case of malfunction of primary monitor.  5. Number of entry ports: 8 or more.  6. Monitor must have opportunity to be positioned symmetrically at both side of patient table. |  |  |
| 6.18. | Bidirectional interphone communication system between angio-suite and control room |  |  |
| 6.19. | Cone beam CT or equivalent |  |  |
| **7.** | **DIAGNOSTIC WORKSTATION WITH ADVANCED 3D VISUALISATION** | | |
| 7.1. | Independent or integrated workstation with advanced tools for interventional procedures analyzes with imaging ability on big monitor in angio-suite |  |  |
| 7.2. | One or more diagnostic monitors in control room of 19 inch (or more) and with 1,3 MP (or more) |  |  |
| 7.3. | Different diagnostic sources imaging studies showing |  |  |
| 7.4. | 3D visualization of coronary and vascular structures, high contrast by rotational angiography acquisition with ability to be shown in control room |  |  |
| 7.5. | Advanced stent visualization; on acquisition console or on workstation |  |  |
| 7.6. | 3D roadmaping and MR/CT roadmap: Overlapping of live fluoroscopic image with 3D model of vessel acquired by 3D rotational angiography or by CT or MRI angiography with immediate show on big display in angio-suite (6.18). |  |  |
| 7.7. | CD and DVD device for image archiving in DICOM format and with automatic burning of DICOM viewer |  |  |
| 7.8. | Networking, connecting, archiving according DICOM 3.0 protocol:  DICOM Storage  DICOM Storage Commitment  DICOM Query/Retrieve  DICOM Modality Worklist  DICOM Radiation Dose Structured Report |  |  |
| **8.** | **ADDITIONAL EQUIPMENT** | | |
| 8.1. | Radiation protection: ceiling mounted protection glass; lead ribbons table mounted: below and above table flat |  |  |
| 8.2. | Ceiling mounted LED light, intensity of 50.000 Lux or more |  |  |
| 8.3. | Electric power distribution box |  |  |
| 8.4. | Contrast injector with changeable flow real time control; volume of syringe 150 ml or more, with air detection and transducer compatible; mounted on patient table |  |  |
| 8.5. | Hemodynamic measurement system |  |  |
| 8.5.1. | Full hemodynamic monitoring with recording and data base with color laser printer, integrated with big display in angio-suite |  |  |
| 8.5.2. | CD and DVD archiving device. |  |  |
| 8.5.3. | System must have:   * 12 channels ECG * Invasive Blood pressure (IBP) measurement, 4 ports * SpO2 * CO (Cardiac Output) * Non invasive blood pressure (NBP) measurement |  |  |
| 8.5.4. | Automatic measurement of valve area, pull-back pressure, shunt measurement, |  |  |
| 8.5.5. | One monitor or more, in control room, diagonal 19 inch or more, enabled showing on big display in angio-suite |  |  |
| 8.5.6. | Networking, connecting, archiving according DICOM 3.0 protocol:  DICOM Modality Worklist  DICOM MPPS |  |  |
| 8.5.7. | FFR, iFR (or equivalent) enabled image on control room monitor, compatible with FFR catheters of all producers (St.Jude, VOLCANO,ACIST…) |  |  |
| 8.6. | Integrated FFR, iFR (or equivalent), integrated OCT (or equivalent) on system in angio-suite.  Real time angio-optical coregistration.  Integrated in patient table. |  |  |
| 8.7. | IVUS integrated system in angio-suite. |  |  |
| **9.** | **OTHER REQUIREMENTS FOR BIDDER** | | |
| 9.1. | Warranty period on complete system 12 Months |  |  |
| 9.2. | To make location project based on space and room project where system will be installed |  |  |
| 9.3. | Installation of the offered system- “Turnkey” project (preparation of existing angio facilities- technical room, examination room and control room. HV cable from HV substation to technical room has to be provided by Beneficiaries). |  |  |
| 9.4. | 10 days on site training for staff (doctors and technicians) who will work on the system. Training has to be done by certified Application specialist |  |  |
| 9.5. | Operator manual (in Serbian and English) and Service manual (in English) |  |  |
| 9.6. | Service personel response time in warranty period: max 24 hours |  |  |
| 9.7. | System “Up-time” during warranty period has to be minimum 95% of working days |  |  |
| 9.8. | Spare parts available min. 7 years from the moment of system delivery. |  |  |