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Detailed Technical Specifications for High Resolution MALDI_TOF

Mass Spectrometer

IIT Bombay is planning to establish High resolution Mass spectrometry facility for state of art MALDI-TOF/TOF with suitable accessories for the analysis of Polymers, oligosaccharides, Metabolites, Peptides, Proteins, Glycan, Oligonucleotides and lipids from synthetic and natural origin. Below mentioned specifications are desirable

General Specifications:

- The system should have high resolution, high mass accuracy and high sensitivity MALDI-TOF/TOF system with suitable accessories to fulfil the analysis requirement for characterising variety of synthetic and natural products.
- The complete platform with accessories should support analysis/detection of Polymers, oligomers, Metabolites, Nucleic acids, lipids, glycan, Proteins and Peptides and provided with corresponding informatics pipeline for identification.
- The platform should include modules viz., Ionization/Detection module and Informatics/Analysis module.
- All the systems should be supplied with necessary accessories and it should be supplied as a ready to operate platform.
- The platform should be supplied along with a suitable power back up for uninterrupted power supply at least for one hour

1) Ionization/Detection module:

Ionization and Detection module should contain systems to detect and analyse Polymers, oligosaccharides, Metabolites, Peptides, Proteins, Glycan, Oligonucleotides and lipids from synthetic and natural origin. Module should contain MALDI-TOF-TOF with suitable accessories for efficient analysis of the above compounds.

High Resolution MALDI -TOF/TOF with accessories

Sr.No	Specification	Requirements
1.	Application capability	i. Synthetic and natural polymer characterisation. ii. Lipids and small molecules analysis iii. Nucleic acids, glycan and glycoproteins characterisation. iv. Complete Molecular Characterization of unknown synthetic compounds synthesised in lab. v. Proteins and Peptides
2.	Ionisation: A. Ionisation method B. Ionisation Modes upon software selection C. Laser D. Laser pulse rate E. Laser repetition rate F. Laser energy G. Laser life H. Ion extraction by software controlled feature I. Variable ion extraction energy for positive and negative modes for efficient ion extraction process	Matrix Assisted Laser Desorption Ionisation Positive and Negative It should be Solid state laser type or equivalent 3ns or better 1000 Hz or better for carrying out all the applications mentioned herewith 100µJ or better Laser life should be 3.5 billion Shots or at least 8 years and it should be covered under warranty. Pulsed extraction by automatic mass calibrated variable delay and/or continuous extraction process is preferable to achieve wide mass resolution +20kV/-20kV or better extraction potential
3.	Mass analyser: A. Analyser technology B. Reflectron Design C. Modes of operation	Time of flight(TOF/ReflectronTOF is vital) for supporting the wideand uncompromised application chemistries.The System should be equipped with a Laser for source cleaning purpose. Suitably designed Reflectron able to compensate the energy spread of all product ions, focussing throughout entire product ion mass range without any reacceleration process of ions after LID and HE-CID is vital for structural analysis of natural and synthetic molecules. Reflectron design with Gridless two stage ion mirror is desired. Linear, Reflectron and MS/MS under

	<p>D. Ion-gate resolution</p> <p>E. Mass range</p> <p>F. Precursor Ion selection</p> <p>G. Flight tube Drift Length & Design</p> <p>H. MS/MS fragmentation</p> <p>I. Mass Resolution (FWHM).</p> <p>J. Mass Sensitivity</p> <p>K. Mass accuracy</p>	<p>software selection.</p> <p>400FWHM or better</p> <p>Linear mode - 400kDa or better Reflectron mode - 70kDa or better</p> <p>Standard through software selection</p> <p>Linear path length -1.1mtr or better Reflectron path length - 1.9mtr or better</p> <p>System capable of Metastable ion decay and HE-CID acquisition with True 20keV High energy collision cell meant for single collision events and a differential pumping system with minimalized ions transmission loss is preferable. The MALDI-TOF/TOF system contains a Collision Cell/CID Cell with a true precursor ion selection module High-resolution Pre-Cursor Ion Selector for true MS/MS of complex sample mixtures with high efficiency and sensitivity of Collision process delivers MS/MS spectra mainly consisting of a-, b-, y- and i-ion.</p> <p>Linear - 5000 or Better Linear High mass - 50 or Better @ 66kDa Reflectron - 20000 or Better @ 3.6kDa Reflectron High mass - >1000 or Better @ 12kDa MS/MS - Isotopic resolution and fragment ions measurable range should be less than 100 Da or better.</p> <p>Linear: 500 femtomole or better for Protein 500 attomole or better for Peptide Reflectron: 300 attomole or better MS/MS: 5 femtomole or better</p> <p>Linear - <50ppm or better with internal calibration Reflectron - <2ppm or better with internal calibration MS/MS - <100ppm or better with external calibration</p>
4.	<p>Data system, software and workstation:</p> <p>A. Instrumentation control</p>	<p>Single point software for all kind of analysis workflows with multi user intervention feature is preferable and should be capable of automated instrument control, data</p>

	B. Software features	<p>acquisition, evaluation, integration, and reporting.</p> <ol style="list-style-type: none"> i. Dedicated Application Software for a) Proteins & Peptide, Glycan characterization b) Polymer analysis c) Lipid analysis d) Oligonucleotides and e)small molecules should be provided. ii. System software's should able to connect automatic data processing features for Proteomics applications. iii. Software should have theoretical mass calculator function for untargeted analysis strategies. iv. Software should possess Low Mass analysis scan functionality to enhance low mass and immonium fragment ions aiding best MS/MS interpretation of isobaric molecules. v. Software should facilitate sweet spot analysis and rastering feature for automated analysis. vi. The system must have flexibility and uncompromised linear mode performance for oligonucleotide analysis. vii. Specialized software feature to determine Molecular mass, End group analysis, co-polymer study and impurities. viii. Real-time System status information is needed. ix. Direct and easy data transfer to popular word processing programs such as Excel, MS word, Power point etc. x. Customizable reports, calibration routines, system logging, early maintenance feedback and diagnostic feature.
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2) **Informatics Module:**

System should be supplied with suitable original and licensed analysis software with compatible Workstation. It should have required hardware and softwares for instrument control, data acquisition and data processing. Branded PC/workstation (Dell/HP/IBM etc.) i7 processor or server processor, 16GB RAM, 3 TB Hard Drive, with 24 inch monitor, color laser printer. Additional workstation should be provided for offline data processing.

- While system should be provided with perpetual licenses for Polymers and oligonucleotides, glycomics and lipidomics analysis, it should support access to other robust software.

3) Other essential items to provide with the supply of instrument:

- Calibration standards required to cover a period of 5 years to be included with system
- MALDI Matrixes for analysis of Proteins/Peptides, Glycans, Polymers, Lipids, Organometallic complexes, Oligonucleotides and Small molecules should be provided.
- MALDI target plates (384 well): 3 Nos. for running various applications
- The supplier should also provide a suitable online UPS with at least 1 hour backup
- Collision Gas: Helium gas cylinder with appropriate pressure regulator and tubing with panel (if required) should be provided along with the system.
- The supplier must provide an application oriented training for the users on the operation of instrument for 1 week and support analysis of our samples if required.
- A complete operation manual shall be supplied listing all the capabilities and operations of the instrument.
- The vendor should have at least one system installed in India and provide a few MALDI-TOF and MALDI-TOF/TOF installation references within India and overseas

4) Warranty and support:

- Comprehensive Warranty for period of 5 years for the complete system viz., MALDI-TOF/TOF, UPS and Computer workstation should be offered from the date of supply. IIT Bombay should not have to spend any charges towards any service or replacement of any spares towards MALDI-TOF/TOF system during this warranty period.
- Should have a good after sales service/technical support capable of reaching our site at short notice. Visits towards breakdown calls by service/application support engineers should be attended within 72 hours. Technical as well as Application support for department shall be provided as & when required without any additional cost. Also contact details of Service Engineers and Application Specialists shall be provided
- The vendor should provide online service/application support within 24hrs time and check the system during any issue or if support required.
- Free training for operations and maintenance of the spectrometer at the time of installation and subsequent periodic training (two times/year) during the warranty period. Service engineer should visit 2 times a year for annual maintenance of the system during the warranty period.
- Software upgrades should be free of cost under the 5 years warranty period.

5) Other terms and clauses:

Vendor should provide relevant literature and application notes of proposed instrument along with list of installations among academic institutes in India as well as overseas