



Ref No. INST/12(121)/2018-Pur

Date: 31/12/2018

CORRIGENDUM

Reference to NIT no. INST/12(121)/2018-Pur published in national newspapers on 07/09/2018 for purchase of equipment: **ICP-MS WITH ACCESSORIES**. Below mentioned technical points may be read and corrected as per following:-

S.No.	INST Specifications	Revised Specifications
1	General Specifications: point 3 • The Instrument should be supplied with dedicated gas line for collision gas and two separate reaction gas and capable of handling > 99.999% purity reactive gases (pure NH ₃ /H ₂ /O ₂ /CH ₄) and premix gases with Mass Flow controller to avoid cross contamination for better precision. Dedicated gas line for NH ₃ must be offered.	Instrument should be supplied with dedicated gas line for collision gas and reaction gas. Instrument should be capable of handling <99.999% purity reactive gases or mixture of gases with dedicated mass flow controller to avoid cross contamination for better precision.
2	Ion Focusing System and Mass Analyzer: point 3 • Abundance sensitivity shall be Low <1x10 ⁻⁶ , High Mass < 5x10 ⁻⁷	• Abundance sensitivity shall be High mass < 5x 10 ⁻⁷ or < 0.5 ppm at m-1 (m= 238U) or abundance sensitivity should be < 0.5 ppm
3	Collision and reaction cell: point 1 • Collision, reaction cell. Dedicated gas line for collision and two reaction gas lines with software controlled MFC should be quoted H ₂ /O ₂ /CH ₄ /Ammonia or premix	• Collision, reaction cell. Dedicated gas line for collision and reaction gas lines with software controlled MFC should be quoted for H ₂ , O ₂ , CH ₄ , ammonia or premix gas.
4	General request	We also request you to please extend the due date by further 15 days from the date of issuing another corrigendum towards amendments in specifications.

- Page 1, General specification, point 3: Instrument should be supplied with dedicated gas lines for collision gas and reaction gases. In collision mode, it should be able to handle more than > 99.999% pure gases like He. However, in reaction mode, system should be provided with dedicated gas line for ammonia (pure or premix form) along with separate dedicated gas line for pure or premix form of H₂/O₂/CH₄ (as per system requirement). All the gas lines should have separate mass flow controller to avoid cross contamination for better precision.
- **Page 3, COLLISION AND REACTION CELL, point 1:** Dedicated collision and two reaction gas lines (one line should be dedicated for ammonia (pure or premix form) and other line for pure or premix gas of H₂/O₂/CH₄) with software controlled MFC should be quoted for all the gas lines as per system requirements.
- Regarding S.No. 4, request for extension of bid for 15 days, committee recommended additional 21 days extension for tender submission.

Apart from above, minor additional changes in Page 5, **Consumables for ICPMS:** “standard shield Torch (05 Set) with Platinum shield” has been recommended.



INSTITUTE OF NANO SCIENCE AND TECHNOLOGY, MOHALI

(An autonomous Research Institute of Department of Science and Technology,

Government of India)

Habitat Centre, Sec-64, Phase X, Mohali – 160062, PUNJAB

Phone No: 0172 – 2210073/74/75, Fax No: 0172 – 2210074

Website: www.inst.ac.in

FINAL REVISED TECHNICAL SPECIFICATION OF INDUCTIVELY COUPLED PLASMA MASS SPECTROMETER (ICP-MS) WILL BE AS FOLLOWS:-

GENERAL SPECIFICATIONS

- Minimum sample intake for analysis of maximum elements with very high sensitivity and resolution. Measurement techniques for qualitative as well as quantitative analysis for trace/ultra-trace elements from ppt to ppm level.
- Measurement techniques for qualitative as well as quantitative analysis for trace/ultra-trace elements from ppt to ppm level. Detection level should be less than 10 ppt or preferably lower.
- Instrument should be supplied with dedicated gas lines for collision gas and reaction gases. In collision mode, it should be able to handle more than > 99.999% pure gases like He. However, in reaction mode, system should be provided with dedicated gas line for ammonia (pure or premix form) along with separate dedicated gas line for pure or premix form of H₂/O₂/CH₄ (as per system requirement). All the gas lines should have separate mass flow controller to avoid cross contamination for better precision.
- The system should be able to analyze the samples of TDS up to 20% or better using software controlled accessory (Aerosol/ Prepfast) to handle high TDS matrix controlled by system without any manual preconditioning.
- System should be operative in standard, reaction and collision cell mode with high mass resolution and minimum background rate. System should have least background noise and signal preferably below 1 cps.
- Universal cone interface for best sensitivity for high matrix & high sensitivity (as well as low matrix samples) without changing any hardware in the interface to achieve full sensitivity and detection limit as per best capability of instrument guaranteed performance.
- The system should be software controlled and GLP/GMP compliance, fully automated, computer controlled with auto-sampler for environmental (with 150 or more sample capacity) Autosampler should be provided with complete sealed /covered enclosure and duct setup to remove all corrosive gases. 2000 sample vials must be provided. The alignment should be automatic and computer controlled.
- Instrument should have chiller with coolant circulating device for plasma.
- Computer controlled, all solid state 27-40 Or suitable MHz ICP-MS source with output power 500 – 1600 watts.
- Computer controlled Mass Flow Controllers for the nebulizer, coolant and auxiliary Argon gas lines.

SAMPLE INTRODUCTION SYSTEM

- Sample introduction system should be composed of nebulizer and spray chamber that provides means of getting samples into the instrument.
- Dedicated HF kit must be offered with separate injector, nebulizer, torch, spray chamber, tubing set and one set of Platinum cones.
- A quartz ICP torch should be demountable, rugged and easy to maintain.

ICP TORCH & RF COIL

- Should be able to generate argon plasma which serves as source of the ICP-MS.
- Quartz ICP torch should be short, rugged and easy to maintain and operation in hot screen mode must provide increase in sensitivity for all types of elements without affecting the mean background count rate.
- A Peltier cooled spray chamber is must which can work atleast from -5 °C to +20 °C.



INSTITUTE OF NANO SCIENCE AND TECHNOLOGY, MOHALI

(An autonomous Research Institute of Department of Science and Technology,
Government of India)

Habitat Centre, Sec-64, Phase X, Mohali – 160062, PUNJAB

Phone No: 0172 – 2210073/74/75, Fax No: 0172 – 2210074

Website: www.inst.ac.in

-
- ICP torch position adjustable in x, y, z planes under computer control.

ICP-MS INTERFACE

- Should be able to link the atmospheric pressure to the high vacuum mass spectrometer.
- The sampling and skimmer cones should provide high transmission and minimize condensation of sample matrix in the cone orifice or better.
- **Detection Limit ng/L (ppt):** Li or Be (low mass) < 0.5; In or Y (mid mass) < 0.25, U or Bi Or Ti (High Mass): 0.25 or better.
- **Sensitivity Mcps/ppm:** Li Or Be (Low mass): >6 Mcps/ppm, Y or In (mid mass): >100 Mcps/ppm & Ti Or U (Hi mass): >40.
- **Oxide ratio:** 1.5-2.5% or better (instrument with oxide ratio <1.5% will be preferable).

ION FOCUSING SYSTEM AND MASS ANALYSER

- The instrument should be able to remove argon and other molecular/polyatomic background species.
- A high-performance quadrupole mass analyzer, mass range of the analyzer should be approx. 5 to 260 amu or suitable range.
- Abundance sensitivity shall be Low mass < 1×10^{-6} , High mass < 5×10^{-7} .
- Mass stability should be at least 0.05u/8 hours.
- The vendor should provide certificate of analysis, showing detection limits, of representative low, medium and high mass elements with methodology.

DETECTOR

- Counts individual ions exiting the quadrupole.
- True Linear Dynamic Range: 10 orders or more.

VACUUM SYSTEM

- The spectrometer shall include an integral highly efficient turbo molecular pump.
- The capacity of the pumping system ensuring a high quality mass spectrum with good peak shapes and excellent abundances sensitivity.
- The capacity of the pumping system shall enable the use of gases like Helium (He), Hydrogen (H₂) etc. in order to maximize instrument reliability and operator safety.
- Vacuum system capable to reach operating vacuum from atmosphere in less than 30 minutes or better.
- Should provide high vacuum for ion optics, quadrupole and detector.
- The spectrometer shall include an integral highly efficient turbo molecular pump.
- The capacity of the pumping system ensuring a high-quality mass spectrum with good peak shapes and excellent abundances sensitivity.
- The capacity of the pumping system shall enable the use of gases like Helium, Hydrogen, etc in order to maximize instrument reliability and operator safety.
- Vacuum system capable to reach operating vacuum from atmosphere.

COLLISION AND REACTION CELL

- Dedicated collision and two reaction gas lines (one line should be dedicated for ammonia



INSTITUTE OF NANO SCIENCE AND TECHNOLOGY, MOHALI

(An autonomous Research Institute of Department of Science and Technology,
Government of India)

Habitat Centre, Sec-64, Phase X, Mohali – 160062, PUNJAB

Phone No: 0172 – 2210073/74/75, Fax No: 0172 – 2210074

Website: www.inst.ac.in

(pure or premix form) and other line for pure or premix gas) with software controlled MFC should be quoted for all the gas lines as per system requirements.

- Provision of prevention of clogging and minimization of signal drift.
- The instrument should be capable of removing all polyatomic, isobaric and doubly charged interference.
- System should have mass shift or mass filter or suitable mode to comply all the national and international regulation.

DATA HANDLING AND SYSTEM CONTROLLER

- That controls all aspects of instrument control and data handling to obtain final concentration results.
- Software diagnostics shall be provided to enable the electronic error file to interrogate locally or remotely via a modem link.
- Provision of prevention of clogging and minimization of signal drift.
- Computer controlled, all solid state 27/40 Or suitable MHz ICP-MS source with output power 500 – 1600 watts.
- Three computer controlled Mass Flow Controllers for the nebulizer, coolant and auxiliary Argon gas lines.
- Quadrupole Assembly with preferably best stability and resolution.

SOFTWARE

- Full remote diagnostics software to be included in the standard software package.
- Auto tuning to enable the instrument to be used with consistent and reproducible day-to-day performance, independent of the operator. The software must be capable of running performance reports prior to acquiring data.
- Matrix specific databases to provide preferred polyatomic interference selection following user entry or measurement of matrix elements, databases will also include interface correction equations.
- Mixed scanning and peak hopping within a single acquisition shall be allowed enabling mixed calibrations such as - quantitative via external calibration/semi-quantitative, standard additions/ semi-quantitative.
- Interference corrections should be available in all measurements modes to correct for polyatomic interferences. Elements required for interference correction should be added automatically to element menu. Equations should be user editable.
- Provision for external drift correction, with and without internal standards shall be included.
- Communication with all accessories shall be bi-directional such that if either the ICP-MS or accessory fails the other device will stop the procedure and the instrument will return to a failsafe state.
- Original software with five licenses should be quoted.
- Upgradation of software should be done for the next ten years without any additional cost.



Microwave digestion system

- Should have installed power of 2000 watts or greater. Must have a microwave power output of at least 1800 watts or greater, delivered from 2 magnetrons for homogeneous heating to ensure equal product yields. Power control in increments of 2 watt or better.
- Microwave system must deliver unpulsed microwave energy output over the whole power range of 1800 watts or greater for precise reaction control.
- Rotor System must be capable of processing 8 or more reaction vessels simultaneously.

Must have simultaneous active pressure measurement and control on all vessel positions via 8 individual pressure sensors and pressure increase rate control for precise reaction control and highest safety during operation and wireless transmission of data to system electronics.

- Cavity volume must be more than 60 liters or more to accommodate various accessories. System must have built-in high performance vessel cooling system. The airflow must be variable and controlled by system software.
- Should have IR temperature sensors for remote non-invasive measurement & control of temperature for individual vessel. To ensure user safety during handling, vessels must be cooled inside the oven. Removal of hot, pressurized vessels and the use of external cooling devices like water bath, chiller, etc. are not acceptable.
- Reaction vessel must have reliable metal safety disks for overpressure protection. Operation via self-venting is not acceptable to prevent contamination and escape of volatile elements at high temperatures.
- System must have built in control & screen graphic display for all routine operations. It should have possibility of connection with an external PC to view the process.
- Vessel Specifications (Qty. 08 or more):
Volume: 100 ml or more.
Operating Pressure: 60 bar (870 psi) or more.

Max Operation Temperature: 260 deg C or more at 60 bar pressure.

Max. Temperature and Pressure: 310 deg C or more and 140 bar or more.

- Program memory: 190 or more programs. Data file memory: Should have an in- built application library for tested methods like EPA 3015. Graphic display of all individual sample temperatures and pressure in real time.
- There must not be any electronic plugs/sockets inside the oven cavity to prevent corrosion and damage to the pressure or temperature sensors in presence of acid vapors at high temperature/ pressure conditions.
- Machine with upgradation possibility of solvent extraction and drying rotor would be preferable.
- ICP MS grade nitric acid (10 bottles of 2.5 L) should be provided with system.
- Three years consumables to be provided.

- **Local items:** Gas cylinders - Argon (06 Nos), He gas cylinder (01 No), NH₃ gas cylinder (02 No), H₂ (02 nos), CH₄ (02 nos), Oxygen gas cylinder (02 No) and other reaction gas cylinder as per system requirement (01 No), Regulators for all the above mentioned gases, Gas purification panels with fittings for supplied gases, 04 stage manual manifold for Argon gas, Regulators, Fume hood/Exhaust, tuning solution. 20 KVA or Compatible capacity online UPS system with 60 min backup of reputed make may be given for ICPMS & MDS, Suitable Table for ICPMS to withstand with 1 ton weight (Granite Slab 5 Feet Length, SS



INSTITUTE OF NANO SCIENCE AND TECHNOLOGY, MOHALI

(An autonomous Research Institute of Department of Science and Technology,
Government of India)

Habitat Centre, Sec-64, Phase X, Mohali – 160062, PUNJAB

Phone No: 0172 – 2210073/74/75, Fax No: 0172 – 2210074

Website: www.inst.ac.in

chases and cabinets, 1.5 ton All weather AC (02 Nos) & necessary chemicals for 1000 sample analysis (Nitric acid, Sulphuric acid, Hydrogen Peroxide). **PC & Printer:** Branded/OEM recommended configured PC with colored Laser Printer along with one off line computer with same configuration.

- **Consumables for ICPMS:** Ni sampler and Skimmer cone for high sensitivity and high matrix/TDS (03 sets), EMT detector (01 no.), Standard Injector (03 nos.), Oil Element /Mist Filter (03 Set), work coil assembly (01 no.), standard Spray chamber (03 Set), **standard shield Torch (05 Set) with Platinum shield**, Peristaltic pump tubing for drain Pk/12 (08 set), Peristaltic pump tubing for ISTD Pk/12 (08 Set), Pump oil -01 Ltr (5 sets), Screw, Spacer & O-ring for cell (06 Set), Tubing for drainage (06 set), RF coil (04 Set), Platinum Sample and skimmer cone for high sensitivity and high matrix/TDS (02 Set), cone cleaning detergent (3 gallon), Swab-cotton tipped both ends (200 Nos, 10 sets) and Alumina powder (05 set).
- **Certified standard:** Multi-element EPA/water (02 Sets of 500 ml), 1000 µg/mL Fe, K, Ca, Na, Mg and 10 µg/mL Ag, Au, Pt, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, W, Pb, Sb, Se, Tl, V, Zn, Th, Li, F, S, Sr, Bi, La, Ti, Ta, Y, etc. Tuning solution kits should be supplied.

Warranty, Reinstallation & Service requirements

- Vendor should have at least 20 Installations of the above equipment in Reputed Government Labs.
- Installation at the desired place of the institute.
- At least two or more services/ maintenance visits should be provided by the company per year.
- Pre-Installation Requirement for operation of the ICP-MS must be clearly mentioned in the Offer.
- In case of fault, time required by the company to solve the problem or Time of nonworking of instrument due to non-availability of service/ Service Engineer will not be counted in the warranty period.
- Five years complete comprehensive warranty with spares and consumables included from the date of installation. The other party/ local items supplied (for eg., microwave digester, gas regulators, computer, UPS, etc.,) along with the instruments have same warranty period like the main instrument.
- **Annual Maintenance Contract (AMC)** Apart from warranty, AMC amount should be quoted for additional 2 years after the warranty period.
- **Service Support** Vendor should provide service engineer's details. Company should provide the on-site service within 5 day's time after the intimation from the users.
- **Reinstallation requirements:** The instrument should be transported and reinstalled at free-of-cost when the researchers will move to the permanent INST new campus.

Qualification

The vendor should perform installment qualification as well as operational qualification in all three modes to demonstrate the instrument specification and instrument capability of removing interferences using all reactive gases mentioned in the tender document.

Future upgradation possibilities:

The system to be easily upgraded with Liquid Chromatography (LC) and Ion Chromatography (IC) in the future.

Installation reports and references of end users using similar configuration should be attached.



Optional

Software Application Add-on Modules for single cell analysis in biological samples

System should be computer controlled to handle Nano and single cell applications.

- Single cell metal & nanoparticle ICP-MS application module with dedicated torch, nebulizer spray chamber and micro autosampling upto 50 μ L facility without rupturing the cells.

The above application module should have following features:

- Multi-element determination in single cell.
- Multi analyte determination for nanoparticle in sample.
- Measuring metal analyte concentration as an average value in cell extraction.
- Single cell population for homogeneity studies.
- Single cell analysis injected individually, for understanding the detailed elemental profiles of cell clusters & individual cell.
- Measuring multiple-elements within the same batch and calculate the amount of analytes in the cells automatically.
- Multi-element scanning in single cell analysis to acquire high-dimensional parameters of cell components tagged by antibodies which contain rare metals.
- The software should be capable for single cell nanoparticle analysis, metal concentration, mass distribution etc. Time resolved spectroscopy along with 0.1 ms dwell time or less with zero offset or suitable settling time & 100 μ s or better integration time.

Others:

- Autosampler Vials 5000 sets, ion lenses (05 Set), sealed torch (05 set) & EMT (01 Set); Standard Injector (03), Spray Chamber for Single Cell Application (03 Set), Shield Torch (04 Set), Ion Lenses (04 Set) RF coil (if consumable)(04 Set), Ni slimmer and sampler cone (05 qty each), ICPMS Autosampler complete tubing set sample intake, rinse & drain (02 set each), Auto sampler Injection Syringe/needle (02 set) with 1000 Vials and Mass Flow controllers.

Further, Last date and time for submission of bid has been extended till 24/01/2018 upto 2.00PM. Bids received within due date and time will be opened on same day at 3.00PM. Other specifications and Terms and conditions of the tender are remain unchanged.

Sd/-
C.F.A.O