Notice Inviting Open Tender for:
Supply, Installation, Commissioning & Training of an Inductively Coupled Plasma Mass Spectrometry Facility for Determination Elemental Concentration and Isotope Ratio At the Indian Institute of Science, Bangalore

(Tender from Domestic Vendor and Suppliers)
Bids are invited from domestic OEM / authorized distributor of domestic OEM

(Last date of Submission April 08, 2022)

Date: March 18, 2022

Dear Sir/Madam:

Please send your tender documents valid for 180 days from the actual date of opening the technical bid, for the supply of equipment described below. Your documents/quotation should clearly indicate the terms and conditions of the quotations, delivery schedule, entry tax, payment terms, warranty coverage etc. The tender should be submitted in two separate sealed envelopes – one containing the "Technical bid" and other containing the "Commercial bid", both of which should be duly signed and must reach the undersigned on or before 17:00 hours April 08, 2022. Please provide your contact details so that we can get in touch with you and set-up appointments for opening the bids.

Mailing Address:

The Chairman,
Prof. Binod Sreenivasan
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Indian Institute of Science,
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Bangalore 560012,
Karnataka, India.
Attention: Dr. Sambuddha Misra and Prof. Ramananda Chakrabarti

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SECTION 2 – Eligibility Criteria:

With respect to this tender, the rules laid out by the Government of India in order No. P-45021/2/2017-PP (BE-II) issued by the Public Procurement Section, Department of Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, dated 16th September 2020, will be followed. Per this order, only Class-I and Class-II local suppliers as defined below are eligible to participate in this open domestic tender. Non-local suppliers are ineligible to participate in this tender.

Relevant definitions as per Government of India order:

- Class-I local supplier - a supplier or service provider, whose goods, services or works offered for procurement, has local content equal to or more than 50%
- Class-II local supplier - a supplier or service provider, whose goods, services or works offered for procurement, has local content more than 20% but less than 50%.
- Non-local supplier - a supplier or service provider, whose goods, services or works offered for procurement, has local content less than 20%.
- Local content – the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all custom duties) as a proportion of the total value, in percent.

Only Local Suppliers are eligible to participate in the bid. The bidders must go through the Government of India order stated above and follow all the rules and regulations therein. The covering letter Should clearly indicate whether the vendor is a Class I or class II local supplier failing which the vendor will automatically be disqualified.

SECTION 3 – Technical Specifications:

SECTION 3.A. Multi Collection Inductively Coupled Plasma Mass Spectrometer:

These specifications are for a magnetic sector MC-ICP-MS for determination of elemental isotope ratio in liquid samples through direct nebulization, and in solid samples by in-situ laser ablation. This magnetic sector instrument should be capable of measuring the isotopic abundance of select elements (as tabulated below) with high precision and accuracy. The instrument should either utilize physical resolution or chemical resolution for separation of isobaric inferences (viz. $^{40}Ar^{16}O$ from ^{56}Fe and $^{40}Ar^{1}H$ from ^{41}K). The utilization of the instrument will not be restricted to the measurement scheme below, but research and development of new isotope systematics, determination techniques, and analytical methodology. Bidders are requested to highlight additional features of their instrument that would enable the users at IISc to utilize the instrument to establish cutting-edge isotope analyses methods. Following are some of the isotope systematics we intend to measure, both in solution and Laser Ablation mode:

ISOTOPE SYSTEMATICS OF PRIMARY INTEREST	
Systematics	**Masses to be measured**
U-Th Series Dating	228, 229, 230, 232, 234, 235, 238
Pb Geochronology (with Hg and Bi)	202, 204, 205, 206, 207, 208, 209
Hf Isotopes	180, 179, 178, 177, 176, 175, 174, 173, 172, 171
Sm-Nd Isotopes (with Ce)	140, 142, 143, 144, 145, 146, 147, 148, 150
Ba Isotopes (with Xe)	131, 134, 135, 136, 137, 138
Mo Isotopes	100, 99, 98, 97, 96, 95, 94, 92
Sr Isotopes (with Rb and Kr)	83, 84, 85, 86, 87, 88
Cu Isotopes	63, 65
Zn Isotopes (with Ni)	62, 63, 64, 65, 66, 67, 68, 70
Ni Isotopes (With Fe)	56, 58, 60, 61, 62
Fe Isotopes (with Cr and Ni)	52, 53, 54, 56, 57, 58, 60
Cr Isotopes (with Ti)	49, 50, 51, 52, 53, 54, 56
Ca Isotopes	42, 43, 44, 46, 48 (and if possible, mass 40)
K Isotopes	39, 41 (and if possible, mass 40)
Si Isotopes	28, 29, 30
Mg Isotopes	24, 25, 26
B Isotopes	10, 11
Li Isotopes	6, 7

I. Description for Instrument(s) Capable of Elemental Isotope Ratio Determination:

This specification describes any mass spectrometer, preferably a magnetic sector kind that is equipped with inductively coupled plasma (ICP) ion source and capable of measuring isotopic ratios and / or abundances of multiple elements in solid and liquid samples. The instrument should be equipped with an electrostatic analyser (ESA) for focussing the ions on energy as part of a double focussing system or provided with some means for reducing the spread in ion energy of the focused ion beam. The mass spectrometer must have more than one detector. The Faraday detectors array should permit dynamic and static multi-collector analysis of isotopes across the mass spectrum (4 to 310 amu), employing both multiple ion-counting devices and multiple-Faraday cups used either exclusively or together. **If the mass spectrometer has fixed dispersion, the multiple collectors should be externally adjustable for movement along the focal plane; if the detectors are fixed position simultaneous ion current measurements may be achieved via electrostatic zoom optics.** The collector system must permit the egress of the axial or near-axial ion beam in order for the beam to be recorded by a high sensitivity detector and amplifier. Sample introduction to the plasma source shall be via nebulizer and pumped spray chamber, desolvation or hydride generation nebulizer system in the case of liquids and be via laser ablation in the case of solids. Further, the sample introduction system should have a means of removing waste solutions, via a peristaltic

pumping system or other. The mass spectrometer should be equipped with high resolution features to permit the measurement of 'interference' free isotopes of elements such as iron and silicon. The mass resolution settings should allow for low (m/Δm ~ 400), medium (m/Δm ~ 6000) and high (m/Δm ~ 8000) resolution analyses. Appropriate figures of merit for chemical resolution should be provided for collision cell equipped mass spectrometer.

II. ICP-MS sample introduction setup:

Sample introduction system for solution mode should have standard & complete nebulizer system including:

1. **Peristaltic pump (sixteen rotor)** with software controlled variable uptake speed
2. **Self-aspirating PFA nebulizers** with provision for sample flow rates of 35, 50, 100 and 200 microliters/minute with and without PEEK/Teflon reinforced sample uptake tube.
3. **Desolvating nebulizer** for isotope ratio measurement with integrated gas and temperature controllers. At least one each of a desolvating nebulizer with and without membrane option should be quoted.
4. **Spray chambers** (one each of cyclonic, Scott-type, and double pass) of quartz and PFA make that are compatible to the instrument should be quoted.
5. **Micro-cyclonic spray chamber** (Quartz & PFA) with low internal volume.
6. **Hydride generator** for determination of elements with high ionization potential
7. **Auto sampler:** A compact auto sampler with small footprint, short sample path (essential for smaller sample size) and a protective cover to prevent sample contamination. It should have dual flowing rinse stations, which can operate in gas displacement or peristaltic-pump mode. It should have at least 48 sample holders and should be compatible with sample volumes as low as 500µL and up to 22ml. Other options of sample rack configuration, if any, should be quoted separately. The operational voltage should be 240VAC (50Hz). It should be compatible and integrated with instrument software.
8. **The plasma torch** should be of the standard Fassel design mounted horizontally. The torch position should be under remote control in the x, y and z axes ensuring rapid and reproducible optimization of the plasma position; a viewing port shall be provided that allows direct observation of the plasma torch. A demountable torch will be preferred.
9. The Injectors should be made of quartz, platinum, and sapphire.
10. **The Mass Flow controllers of ICP torch and nebulizer gas supplies** should permit tuning for optimum stability and precision; there should be the capacity to add at least two additional flow controllers (e.g., for helium, nitrogen, or argon). Preferably 5 MFCs (plasma, auxiliary, sample, additional-1, and additional-2) should be present. One of these MFCs could be a micro-flow MFC for N2 or He introduction.

III. ICP-Source:

1. The ICP-Source should NOT be air cooled.
2. The inductively coupled plasma ion source shall be a high efficiency source incorporating a field-proven solid state RF generator with a stability of better than 1% and an automatic RF matching network ensuring low reflected RF power at all times.
3. Automated software-controlled alignment facility of plasma torch with X-Y-Z movement for optimal positioning for maximum analyte signal sensitivity.
4. ICP source should be compatible with alternate sample introduction system that is commercially available (laser ablation)

IV. Ion Extraction Interface

Standard and high sensitivity combination of outer sampler cone and an inner skimmer cone should be provided for maximum sensitivity, stability, and precision. The interface should come equipped with high efficiency ion transmission features for improved sensitivity.

V. Magnet and Mass Analyzers (applicable primarily for isotope ratio determination)

1. The mass spectrometer should be capable of scanning mass: charge ratio ($^{m}/_{z}$) from 4 up to 310 along the axis.
2. **Mass Analyzer:** Double focusing-type Mass Analyzers consisting of electrostatic analyzer (ESA) and electromagnetic analyzer providing high resolution capability for obtaining flat-top peaks for various

isotopes. Highly stable ESA with fluctuations not exceeding ±15ppm.

3. **Magnet:** Should preferably be a low hysteresis laminated magnet with efficient temperature control and compensation to achieve stable high resolution. The magnet power supply shall be controlled via field regulation. Capabilities shall include scanning of the magnet field via computer, both up and down at selected speed and step size, over a narrow mass region (less than 1 mass unit) as well as over the entire mass range from masses 4 to 310 amu. Scanning can be done using the high voltage and magnetic field, with variable speed and mass range window, both up- and down-mass. The mass position ($^{m}/_{z}$) readings shall be automatically calculated using latest mass calibration and displayed on the computer monitor with milli-mass resolution. Furthermore, the mass spectrometer shall be capable of operating at reduced accelerating voltage. Seller should specify magnet settling time for normal peak jump operation the magnet over a mass range of 10, 50 and 100 amu. Seller should specify drift in Hall probe or field probe sensor noise and drift over a 1-hour period.
4. **Minimum required mass resolution:** Physical and / or chemical resolving power (at 10% valley definition) as the ratio (M/ΔM) of the instrument should be selectable at least in three categories - Standard (low), Medium and High. Resolution as a function of relative ion transmission should be as follows:

Resolution	M/ΔM	Ion transmission (relative)
Standard (low)	≥400	100%
Medium	≥4000	≥10%
High	≥8000	≥5%

Equivalent figure of merit for mass spectrometer utilizing chemical resolution should be specified.

5. **Resolving Power:** The instrument should be able to achieve high resolution with resolving power of >8000 (e.g., mass ^{56}Fe, which can resolve the molecular interference from ArO isotopes with demonstrated flat-top peak). The specification should clearly mention the relative transmission for various resolving powers.
6. **Chemical Resolution:** For sector field mass spectrometers utilizing chemical resolution (collision reaction cell) a potential list of gases to be utilized in collision and / or reaction mode operation should be provided. A standard set of MFCs for these gases should be included in the quotation.
7. **Stability:** The instrument shall have a system stability, which is measured as peak stability, including drift of magnetic field and electric field < 50 ppm/hr (Measured at Nd mass range).

VI. Detector specifications (applicable primarily for isotope ratio determination)

1. A minimum of nine (9) Faraday cups (FC) and an axial ion counting devices in the detector block with necessary electronics and amplifiers should be part of the mass spectrometer. A suitable combination of Faraday Cups and Ion Counting devices should be provided to cater the needs of simultaneous collection of ions of different masses required in a wide range of applications of isotope systematics as tabulated above. The ion optical system shall consist of a sector magnet with an "extended geometry" configuration. The ion optics must provide for magnetic field focussing of the ion beam in the vertical ("Z") direction as well as in the plane of curvature. The magnet, flight tube and collector array shall be adequate for the simultaneous mass range of 17% (i.e., ^{202}Hg to ^{238}U or ^{6}Li to ^{7}Li). The positions of the off-axis collectors should be adjustable to allow for a range of possible mass separations, unless this can be achieved by use of an electrostatic zoom lens. Where collector positions are movable, multi-collector positioning should be achieved via computer control including in situ position read-back and the precision of cup movements should be < 10um.
2. **Faraday cups:** Dynamic Detection Range of ≥50V when fitted with 10^{11} Ω resister; Noise levels: ≤ 20 μV at 4 second integration time or better; Detection Signal Decay: ≤10 ppm after 2 seconds or better
3. **Amplifiers and resistors:** The instrument should have both 10^{11} and 10^{13} Ω resistors (or equivalent), including gain calibration ability. Additional options like Daly Detectors in addition to or instead of 1013 Ω resistors are welcome as long as there is demonstrated ability to determine ion beam sizes smaller 100mV with a 2σ precision comparable to that of 10^{13} Ω resistors.
4. The seller should specify the noise of these amplifiers at integration times of 5 seconds or less. Using 10^{-11} ohm and 10^{-13} ohm amplifiers should generate dynamic ranges of at least 0.5 and 50V, respectively.

Seller should specify the respective noise on these amplifiers. The amplifiers shall be enclosed in a controlled environment of ±0.01°C. A current source shall be provided for automatically calibrating the inter-channel gain factors. Sellers should specific the maximum noise level of the head amplifiers over a 5 second integration time including resistor and amplifier input noise

5. There should be provision that any combination of faraday cup and amplifier can be selected on a routine basis through software, or there should be provision for enough Faraday Cups and amplifiers that multiple isotope systematics over a dynamic concentration range can be determined. Faraday cups and associated amplifier system should have minimum calibration error (cup bias). Configuration with higher dynamic range of signal measurement will be preferred. All the amplifiers for the Faraday detector should preferably be placed in an evacuated and temperature-controlled enclosure to ensure their performance independent of external environment.
6. The seller should be able to perform mass calibration, ion counter efficiency and gain calibration from the operating software. The seller should also specify amplifier calibration stability within a 24-hour period.
7. Electron Multiplier: The Seller sensitivity detection system (electron multiplier): sellers should specify the linearity, dark noise, peak flatness (over 200ppm) and the relative stability of the counting efficiency in a 1-hour period. Additionally, the Seller should specify the relative counting efficiency (in %) of secondary electron multiplier (SEM) at their optimal operating voltage (which should also be defined).

VII. Abundance sensitivity:

1. Abundance sensitivity should be ≥ 5ppm (without any application of retardation / RPQ / WARP filters) and should be such it can be improved to 500 ppb or better by applying retardation filter without losing a significant amount of transmission.
2. Retardation/deceleration filters: To improve the abundance sensitivity for analysis of certain isotope systematics (viz. Isotopes of U: 237U w.r.t. 238U mass should be within 5ppm).

VIII. Vacuum System

1. The vacuum pumping systems MUST be able to achieve vacuum levels of: (i) ≤ 2×10-8 mbar in the collector area and (ii) ≤ 10-7 mbar in the electrostatic analyzer area. The following are the vacuum specifications:
    i. Expansion chamber (between cones): <4 mbar
    ii. Extraction region: $<10^{-3}$ mbar
    iii. ESA region: $<10^{-7}$ mbar
    iv. Analyser region: $<2 \times 10^{-8}$ mbar during operation
    v. Analyser region: $<5 \times 10^{-9}$ mbar ultimate pressure
2. Isolation valves should be placed and operable by the software and manually to ensure minimum vacuum loss during accidental power loss or scheduled maintenance.

IX. Electronic Components:

All electronic modules necessary for full operation shall be provided; they shall be mounted in the instrument or in auxiliary rackmounts. State-of-the-art solid-state control electronics shall be used throughout. Electronic boards, or their components, where applicable should be readily replaceable in the event of failure. Vacuum gauges and display devices to monitor all pumps in the system shall be provided and mounted in a position easily readable from the front of the instrument. The source and analyzer pressures shall be measured independently. A display of important instrumental parameters shall be provided on the video display of the computer, including turbo and ion pump status. Software should also incorporate a "status OK" display for pressures and pump speeds/temperatures.

X. Computer and Software:

1. **Operating Computer:** The instrument(s) should come with a dedicated computer system with the latest available configuration, and a secondary hard-drive, is integrated in the CPU, that duplicates the operation hard-drive in real time. The computer system must include a dual layer DVD writer with double layer capability for archiving, a minimum eight number of USB ports, and wireless network cards. The computer system should be supplied with a twin monitor (27" LED screen each).

2. **Printer:** A laser color printer with USB as well as ethernet connectivity; Automatic Duplex printing (both side printing); 1200 X 1200 print quality or better should be supplied.
3. **Software:** The operational software should be capable fully integrated operation of the mass spectrometer and the sample inlet systems. It should also support other peripheral systems (such as third-party laser ablation, peri-pumps, and auto-sampler). Software upgrades should be supported for at least for 10 years at no additional cost.

XI. INSTRUMENT PERFORMANCE GUARANTEE:

The quotation MUST include full performance figures of merit of the instrument, including sensitivity, accuracy and precision for short- and long-term analyses of standard solutions of Li, B, Sr, Nd, Pb, and U. Following are a select few performance guidelines that the supplier must guarantee to demonstrate on the proposed machine.

1. The sensitivity, accuracy, and precision, determined on standards recognized by the geochemical community / high purity ICP-MS concentration standards, of isotope determination performed at 200 ppb or less concentration should be demonstrated for the following:
    i. **$^{238}U/^{235}U$ (± 50 ppm, 2σ)**
    ii. **$^{206}Pb/^{204}Pb$ (± 0.15%, 2σ)**
    iii. **$^{143}Nd/^{144}Nd$ (± 50 ppm, 2σ)**
    iv. **$^{87}Sr/^{86}Sr$ (± 50 ppm, 2σ)**
2. The sensitivity, accuracy and precision, determined on standards recognized by the geochemical community / high purity ICP-MS concentration standards, of isotope determination performed at 10 ppb or less concentration should be demonstrated for the following:
    i. **$\delta^{11}B$ (± 0.25‰, 2σ)**
    ii. **$\delta^{7}Li$ (± 0.35‰, 2σ)**
3. The tender should include the best sensitivity, internal precision (2σ), and external precision (2σ) for the elements listed below in the format tabulated below from any representative instrument. The values for the parameter can be quoted from published results in any recognized peer reviewed journal or from a factory instrument with an undertaking from the company. For reporting of the sensitivity, the exact sample introduction setup should be mentioned, and for internal- and external precision the exact number of ratios determined (cycle / block) and the number analyses averaged (n) should be quoted. The total mass of analyte consumed per analyses and detector / amplifier utilized must be mentioned. **The Elements of Interest are Li, B, Mg, Si, K, Ca, Cr, Fe, Sr, Nd, Hf, Pb, and U.** If more than one instrument is part of the quotation, then the elemental sensitivity for each instrument should be quoted separately. If any instrument is to be primarily utilized for elemental abundance determination (part B of the tender), then the internal and external precision for isotope ratio determination need not be quoted. Demonstrated ability to resolve plasma-based interferences, through utilization of physical or chemical mass resolution, should be part of the performance report.

Element	Isotope Ratio	Front-end Configuration	Sensitivity (V/ppm)	Analyte Mass per Analysis (ng)	Analysis Protocol	Internal Precision (2σ)	External Precision (2σ)

4. **Instrument Performance:** Quotation should include full specification of mass spectrometer performance, including both internal and external precision in measurement for most of the isotope systems mentioned above. The service engineer should carry out various performance parameters of the instrument(s) according to those mentioned in the brochure and/or quoted in the technical bid submitted by the vendor, whichever is better both at factory before delivery and at IISc after delivery. Towards this the supplier should provide test certificates.The quotation should contain clear, unambiguous statements of expected routine performance of the various sample introduction systems in combination with the mass spectrometers. It should state the overall precisions derived from analyses of multiple replicate samples of standard materials, with a clear indication of any effects in relation to sample size.

X. Accessories and Spares:

The offer should include all the required accessories/ spares/ consumables for seamless performance of the system and its peripherals. A list of spares and consumables should be provided.

XI. ADDITIONAL REQUIREMENTS:

1. List of the installations in India with contact details of scientist / individual in-charge.
2. The technical specifications listed above are a minimum indicative. The ease of operation and maintenance, the ability to integrate latest technology, and after sales service facilities are some of the key factors in the evaluation process.
3. **The details, credentials, and experience of individuals who are factory trained service engineers of the quoted model of mass spectrometer and is currently on roll in India or at the nearest service hub should be submitted with the offered quotation.**
4. Quotation should include all cost including logistics required to complete the installation at IISc.
5. The Vendor should certify and confirm availability of spares, service support and, both hardware and software upgradation for at least 10 years from the year of installation.
6. Any equipment of component procured locally and supplied with the instrument should be quoted in Indian Rupees.
7. List of select user laboratories of an instrument of similar configuration and scientific application must be provided with the contact details (e-mail) of the person-in-charge of the instrument, model and date of installation.
8. IISc may opt for demonstration of any technical specifications and performance of the quoted model, at any available user site in India or at the factory / preferred demonstration site for the company, as a part of technical evaluation.

XII. Training

After the successful installation of the mass spectrometer and its peripherals, selected personnel from IISc should be provided with hands-on and in-depth training on the operation, maintenance and application of the instrument by factory engineer. The cost of an on-site training session should be part of the quotation.

XIII. Warranty (to be quoted as a separate item)

Supplier should provide comprehensive onsite warranty (including parts and labor) for 5 years (60 months), to be executed in a 1-year (manufacturer warranty) + 4-year (extended warranty) fashion, including all locally supplied items after successful installation of the system. The supplier should also quote for annual service maintenance contract (breakdown visits and two preventative service visits) for the next five years after the warranty period.

XV. Pre-installation Guideline

A comprehensive guideline/list of requirements for site preparation, installation of pre-installation infrastructure with their specifications is to be provided by the manufacturer.

XVI. Installation:

The complete installation of the supplied INSTRUMENT system should be carried out by the factory engineer. All the expenses including travel, accommodation etc. towards this should be included in the quote. It is the responsibility of the vendor to ensure that all of the required accessories and ancillary items are included in the quotation for carrying out the installation, standardization, optimization and calibration of the instrument. The supplied system should be complete in itself in all respect to take up the sample analysis at the IISc premises.

SECTION 3.B. Single Collection Inductively Coupled Plasma Mass Spectrometer:

These specifications are for a SC-ICP-MS (sector field / single quadrupole / triple quadrupole) for determination of elemental concentration in liquid samples through direct nebulization, and in solid samples by in-situ laser ablation.

I. Sample introduction system:

1. The sample introduction system should have significantly low dead volume (quick washout) with option for low uptake rate (100 micro-l/min or lower) sample introduction.
2. The sample introduction system, torch, lenses, and cones should be easily accessible for maintenance
3. A Quartz demountable torch with the option of a quartz, sapphire, and platinum injector should be available
4. The system should be provided with Peltier-cooled spray chamber, which can operate over a temperature range of -5°C to + 20°C or higher.
5. The system should have demonstrated ability of analyzing samples of high total dissolved solid (TDS) concentration (approximately 10% TDS or more).
6. There should be computer-controlled precise torch movement in X-Y-Z directions

II. Ion Source and RF Plasma:

1. The ICPMS must have computer-controlled RF generator operating at 27 MHz
2. There should be demonstrated ability of instrument operation over the range of forward plasma power of 600W to 1500W for periods ≥ 18 hrs at a stretch.
3. The RF Generator & Coil should preferably be water cooled

III. Ion Extraction / Plasma Interface:

1. The instrument should have water-cooled plasma-interface that is maintained under high vacuum and is equipped with standard and high-performance Nickel and / or Platinum based sample and skimmer cones to suit multiple applications.
2. The cones/interface should be easily demountable with automated / computer-controlled torch movement in X-Y-Z directions, and to allow for easily cleaning and replacement.
3. Lens /cones system should be outside the vacuum system to minimize down time

IV. Ion focusing system

1. Off - Axis ion focusing system capable of removing all neutrals & photons from the ion path with minimal physical damage to the optics.

V. Quadrupole system

1. The mass spectrometer should have true hyperbolic profile rods for best ion transmission and resolution tuning.
2. The system should include in tandem quadrupole and collision cell (quadrupole / hexapole / octapole) system.
3. **Preference would be given to a triple quadrupole / mass filter arrangement of one quadrupole before the collision/reaction cell and the second one after the CRC.**
4. The first Quadrupole must have unit mass filtering capability.

VI. Sector Field Configuration:

1. **Magnet:** Should preferably be a low hysteresis laminated magnet with preferable temperature control and compensation to achieve stable high resolution. The magnet power supply shall be controlled via field regulation. Capabilities shall include scanning of the magnet field via computer, both up and down over the entire mass range from masses 4 to 310 amu. The mass position ($^{m}/_{z}$) readings shall be automatically calculated using latest mass calibration and displayed on the computer monitor with milli-mass resolution. Furthermore, the mass spectrometer shall be capable of operating at reduced accelerating voltage. Seller should specify magnet settling time for normal peak jump operation the magnet over a mass range of 10, 50 and 100 amu.

2. **Minimum required mass resolution:** The physical resolving power (at 10% valley definition) as the ratio (M/ΔM) of the instrument should be selectable at least in three categories: Standard (low), Medium and High. Resolution as a function of relative ion transmission should be as follows:

Resolution	M/ΔM	Ion transmission (relative)
Standard (low)	≥300	100%
Medium	≥2500	≥10%
High	≥8000	≥5%

Equivalent figure of merit for mass spectrometer utilizing chemical resolution should be specified.

VII. Ion Detector

1. The ion detector must be discrete dynode electron multiplier with analogue and digital mode of operation. It should be capable of having **10 to 11 orders** of linear dynamic range.

VIII. Performance

1. The instrument should preferably have mass Sensitivity (Mcps/ppm) as follows:
   i. Li (7)> 100
   ii. Y (89) > 400
   iii. Tl (205 > 250
2. Elemental Detection Limit (pptr) should preferably be:
   i. Be: 0.1 pptr
   ii. In: 0.05 pptr
   iii. U: 0.05 pptr
3. Oxide ratio of CeO/Ce: ≤ 2% is desirable
4. Ba++ to Ba ratio or Ce++ to Ce ratio should be <2% or better
5. Short Term Stability ≤2% RSD or better
6. Long Term Stability <3% RSD or better
7. Mass Stability < ± 0.025 u per day
8. Background (electronic noise): ≤0.5 cps @ masses 9 and 238 (amu) is desirable
9. Abundance sensitivity of 133Cs: $1x10^{-10}$ (L, H) or better is desirable

IX. Cell Technology

1. System should have a collision and reaction cell to remove polyatomic & isobaric interferences.
2. There should be separate gas lines and mass flow controllers for the collision & reaction gases. The gas flows should be controllable by instrument software.
3. Collision /reaction cell should have separate gas lines for He, H_2, NH_3, O_2 and/or other gases like: CH4, C2H2, C2H6, C3H4, C3H8, CH3F etc.

X. Quadrupole analyzer

1. **The mass range should be from 3 to 275 amu or more**
2. The dwell time should be as short as 100 μsec for fastest settling
3. Scan speed should be >3000 amu/s
4. The analyzer must have the ability to discretely control the resolution of selected mass regions dynamically without affecting the overall nominal resolution of the system.

XI. Vacuum system

1. The instrument should be provided with **high-capacity roughing pump** and specific Turbo Pumps
2. There should be provision for automated vacuum reading at the low and high vacuum ends of the MS.

XII. Computer and Software

1. Operating Computer: The instrument(s) should come with dedicated computer system(s) with the latest configuration, and a secondary hard-drive which is integrated in the CPU and duplicates the operation

hard-drive in real time. The computer system should be supplied with twin monitors.
2. Printer: A laser color printer should be supplied.
3. Software: The operational software should be capable fully integrated operation of the mass spectrometer and the sample introduction systems. It should also support other peripheral systems (such as third-party laser ablation, peri-pumps, and auto sampler). Software upgrades should be supported for at least for 10 years at no additional cost.

XIII. Accessories and Spares:

The offer should include all the required accessories/ spares/ consumables for seamless performance of the system and its peripherals. A list of spares and consumables should be provided.

XIV. ADDITIONAL REQUIREMENTS:

1. List of the installations in India with contact details of scientist / individual in-charge.
2. The technical specifications listed above are a minimum indicative. The ease of operation and maintenance, the ability to integrate latest technology, and after sales service facilities are some of the key factors in the evaluation process.
3. **The details, credentials, and experience of individuals who are factory trained service engineers of the quoted model of mass spectrometer and is currently on roll in India or at the nearest service hub should be submitted with the offered quotation.**
4. Quotation should include all cost including logistics required to complete the installation at IISc.
5. The Vendor should certify and confirm availability of spares, service support and, both hardware and software upgradation for at least 10 years from the year of installation.
6. Any equipment of component procured locally and supplied with the instrument should be quoted in Indian Rupees.
7. List of select user laboratories of an instrument of similar configuration and scientific application must be provided with the contact details (e-mail) of the person-in-charge of the instrument, model, and date of installation.
8. IISc may opt for demonstration of any technical specifications and performance of the quoted model, at any available user site in India or at the factory / preferred demonstration site for the company, as a part of technical evaluation.

XV. Training:

After the successful installation of the mass spectrometer and its peripherals, selected personnel from IISc should be provided with hands-on and in-depth training on the operation, maintenance, and application of the instrument by factory engineer. The cost of an on-site training session should be part of the quotation.

XVI. Warranty (to be quoted as a separate item):

Supplier should provide comprehensive onsite warranty (including parts and labor) for 5 years (60 months), to be executed in a 1-year (manufacturer warranty) + 4-year (extended warranty) fashion, including all locally supplied items after successful installation of the system. The supplier should also quote for annual service maintenance contract (breakdown visits and two preventative service visits) for the next five years after the warranty period.

XVII. Pre-installation Guideline:

A comprehensive guideline/list of requirements for site preparation, installation of pre-installation infrastructure with their specifications is to be provided by the manufacturer.

XVIII. Installation:

The complete installation of the supplied INSTRUMENT system should be carried out by the factory engineer. All the expenses including travel, accommodation etc. towards this should be included in the quote. It is the responsibility of the vendor to ensure that all the required accessories and ancillary items are included in the quotation for carrying out the installation, standardization, optimization, and calibration of the instrument. The supplied system should be complete in all respect to take up the sample analysis at the IISc premises.

SECTION 4 – Terms and Conditions:

1. The tender document should be in English and be submitted in **two bid system, i.e., Technical Bid, and Commercial Bid in two sealed envelopes with commercial or technical bid clearly indicated on the envelope.** These two sealed envelopes should be placed within a larger envelope and "ICPMS Bid – Sambuddha Misra, Centre for Earth Sciences, IISc" should be written on the outer envelope.
2. The primary interest of the Centre is in the establishment of an isotope ratio and concentration determination facility. **Only those quotations that contains a MC-ICP-MS will be considered.** Standalone quotations for SC-ICP-MS will **NOT** be considered. However, vendor(s) specializing in SC-ICP-MS are allowed to quote for their SC-ICP-MS in collaboration with a MC-ICP-MS manufacturer. **In all cases, the pricing for the instrument(s) as a stand-alone purchase and as a bundle-purchase should be clearly indicated in the financial bid.** IISc, Bangalore reserves the right to purchase either or both instrument(s) from the same vendor.
3. The technical bid must include all details of technical specifications of the instrument along with commercial terms and conditions masking only the price component. Bill of materials, brochures, technical datasheets, and any other document may be enclosed to help the evaluation of the technical bid. Please also include warranty terms and any other information on upgradation terms/extra accessories in the technical bid.
4. The technical bid must clearly state the specifications of the main instrument (A) along with the accompanying standard items and all other details including the warranty terms (B-I) as specified in section 3 of this document.
5. The commercial bid must include the base price of the instrument delivered in place and all components including controller accessories plus any additional GST component.
6. The commercial bid must indicate detailed component-wise and itemized price breakup and must include optional items/accessories.
7. Bidder should have well established own establishment. Enclose Company Registration Certificate, PAN, 3 years of audited balance sheets and turnover.
8. **The covering letter in the technical bid should clearly mention whether the vendor is a Class I or Class II local supplier, failing which the vendor will be automatically disqualified.**
9. In the technical bid include the complete details all components of the main instrument and the accessories as to whether they are sourced locally or foreign made/imported along with the manufacturer and sourcing details.
10. The 'Class-I local supplier/Class-II local supplier' is required to indicate the percentage of local-content and provide self-certification that the item offered meets the local content requirement for 'Class-I local supplier/Class-II local supplier' as the case may be. They shall also give details of the location(s) at which the local value addition is made.
11. The vendor should provide detailed cost breakup for the Indian and foreign content of the bid in the commercial bid proving their status as a Class I or Class II local supplier. Vendors who do not provide such justification in the commercial bid will be automatically disqualified.
12. In case if there are any imported/foreign made components, the commercial bid must indicate procurement price from the manufacturer and any import duties incurred. IISc will not be responsible for any import duties.
13. The vendor should have a good track record of having previously supplied similar equipment in India or elsewhere in the world (Please furnish complete details including names and contact addresses). Reference letters may be sought by the committee to arrive at the decision.
14. The vendor should have qualified technical service personnel for the instrument based in Bengaluru.
15. Bidder should have executed at least three order of similar instrument in India in the last 2 years. (Please provide copy of purchase orders and details).
16. The bidder should provide a list of national and international publication resulting from the data of the instrument.
17. The Bidder should not be currently blacklisted by any institution, bank in India or abroad (Please provide self-declaration).
18. No advance payment will be made, the payment will be made after delivery and installation of equipment.

19. Agency commission (not encouraged) if any should be clearly mentioned and detailed in the commercial bid.
20. The lead time for the delivery of the equipment should be less than two months from the date of receipt of purchase order and must be mentioned in the technical bid.
21. If the equipment or any parts/accessories are found to be defective, they must be replaced or rectified at the cost of the supplier within 30 days from the date of receipt of written communication from us. If there is any delay in replacement or rectification, the warranty period needs to be extended by a year and/or face a penalty equal to the valuation of the equipment.
22. The technical bid will be opened first and evaluated.
23. Bidders meeting the required criteria as stated in Sections 2 and 3, of this document as well as the terms and conditions shall only be considered for Commercial Bid opening. Further, agencies not furnishing the documentary evidence as required will not be considered.
24. Following the opening of technical bid, a presentation may be sought from the bidder.
25. During the warranty period, the bidder shall be fully responsible for the manufacturer's warranty in respect of proper design, quality, and workmanship of all the systems supplied. If there is any delay in replacement or rectification, the warranty period needs to be extended by a year and/or face a penalty equal to the valuation of the equipment.
26. During the warranty period, the bidder shall attend to all the hardware problems on site and shall replace the defective parts at no extra cost to the purchaser.
27. The Engineers of the parent manufacturer or bidding firm must install, demonstrate, and provide the training on the instrument and for LA-ICPMS application for a minimum of two days at IISc, Bangalore without additional cost.
28. The bids should be valid for at least 90 days from the last date of submission of the quotation.
29. The price should be quoted in INR only. The cost should be inclusive of delivery till the IISc campus. Price offer must be on FOR-IISc Bangalore basis. Please note that IISc being a DSIR recognized research institution under GST notification no. 47/2017 and the item(s) under this procurement is required for research purposes only, is eligible for reduced GST (5%). Please also include any available educational discounts in the commercial bid. IISc may issue the GST Exemption Certificate upon a formal request from the vendor along with a copy of invoice.
30. The decision of the purchase committee will be final.
31. IISc, Bangalore reserves the right to accept or reject any bid and to annul the bidding process and reject all bids at any time to award of construct without thereby incurring any liability of the affected bidder or bidders.
32. Tender documents that do not satisfy the "Terms and Conditions" listed herein will be disqualified.
33. The tender documents should be sent to the following address no later than 08/04/2022 5:00 PM IST.

    The Chairman,
    Prof. Binod Sreenivasan
    Centre for Earth Sciences
    Indian Institute of Science,
    Malleshwaram,
    Bangalore 560012,
    Karnataka, India.
    Attention: Dr. Sambuddha Misra and Prof. Ramananda Chakrabarti