



भारतीय उष्णदेशीय मौसम विज्ञान संस्थान  
(पृथ्वी विज्ञान मंत्रालय, भारत सरकार का एक स्वायत्त संस्थान)  
डॉ. होमी भाभा मार्ग पाषाण, पुणे- ४११ ००८

**INDIAN INSTITUTE OF TROPICAL METEOROLOGY**  
(An Autonomous Institute of the Ministry of Earth Sciences, Govt. of India)  
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सं. पीएस/125/44/2025

दिनांक - 19 फरवरी 2026

सेवा में / To,

**विषय-** थर्मल डिऑर्षन यूनिट और सैंपलिंग स्टेशन के साथ हाई-रिज़ॉल्यूशन गैस क्रोमेटोग्राफ मास स्पेक्ट्रोमीटर की आपूर्ति, स्थापना और कमीशनिंग मात्रा 02 सेट्स की खरिद के संदर्भ में।  
**Sub - Supply, Installation & Commissioning of High-Resolution Gas Chromatograph Mass Spectrometer with Thermal Desorption unit and Sampling Station Qty. 02 sets**

**संदर्भ - इस संस्थान का दिनांक 16/01/2026 समसंख्यक निविदा जांचपत्र**

**Ref - This Institute's Tender enquiry of even number dated 16/01/2026**

प्रिय महोदय/ Dear Sirs,

यह संस्थान उपरोक्त विषयानुसार सामग्री की खरिद करना चाहता है। इसलिए इच्छुक बोलीदाताओं से अनुरोध है कि अपनी तकनीकी तथा कीमत बोली निम्नलिखित निर्देशानुसार प्रस्तुत करें।

This Institute wishes to procure goods as per subject cited above. Therefore, interested bidders are requested to submit their Technical and Price bids as per the instructions given below;

बोली प्रस्तुत करने की अंतिम तिथि दि. 13 फरवरी, 2026 से 26 फरवरी, 2026 को 1500 बजे तक बढ़ाई जाती है।  
The last date of submission of bids is extended from 13<sup>th</sup> Feb, 2026 to 26<sup>th</sup> Feb, 2026 upto 1500 hrs.

तकनीकी बोली उसी दिन 1530 बजे ऑनलाइन पद्धती द्वारा खोली जाएगी।

Technical Bids will be opened on the same day at 1530 hrs. through online mode only.

तकनीकी विशिष्टीकरण और अन्य सभी विनिमय एवं शर्तें अपरिवर्तित रहेंगी।

Technical specifications and all other terms and conditions will remain unchanged.

बोलीदाता जो उपर्युक्त निविदा में भाग लेना चाहते हैं, उन्हें वेब पोर्टल <https://moes.ewizard.in> पर उपलब्ध सूचना के अनुसार पंजीकृत करना होगा।

Bidders willing to participate for the above tender, has to get registered themselves on web portal <https://moes.ewizard.in> as per the instruction available at there.

धन्यवाद / Thanking you.

(श्रीमति योगिता कड / Smt. Yogita Kad)

प्रशासनिक अधिकारी / Administrative Officer

कृते निदेशक / for Director

ईमेल /e-mail : [psu.iitm@tropmet.res.in](mailto:psu.iitm@tropmet.res.in)



**INDIAN INSTITUTE OF TROPICAL METEOROLOGY, PUNE**

**Minutes of the Technical Evaluation Committee (TEC) meeting held on 04.02.2026**

The Director, IITM Pune, has constituted a technical evaluation committee (TEC) for processing proposals related to the “Aerosols, chemistry, Cloud Lightning & electricity” Instruments Vide No. Comm./2025/68 date 04 Aug 2025. The primary mandate of the committee was to finalize specifications for various instruments and to evaluate the technical bids received. Accordingly, TEC meeting was convened online on 4 February 2026 at 5:00 PM to finalize the specification and to evaluate the technical bid for various instruments. The following are the TEC committee members:

Shri P.E. Raj and Dr. Kaushar Ali were contacted but were unavailable during the time of the meeting. Therefore, we proceeded with the Chairman and other members of the committee. At the commencement of the proceedings, the Indenting Officers extended a warm welcome to the Chairman and Committee Members. Following, the Chairman invited the respective Indenting Officers to present the technical specifications for the instrument under consideration.

Reference to Pre-Bid Meeting: The Committee noted that a Pre-Bid Meeting was held on 22 January 2026, wherein prospective bidders raised technical and operational queries related to the **High-Resolution Gas Chromatograph Mass Spectrometer (HRGCMS), Qty. 02 nos.**

All queries received during the pre-bid meeting were examined in detail by the Indenting Division, and addressed through scientifically justified clarifications and revisions, wherever required.

The final revised technical specifications, incorporating the outcomes of the pre-bid meeting dated 22 Jan 2026, were placed before the TEC for consideration.

Scientific justification for:

- i. Clarification about of concentration and number of standards
- ii. No. of sampling stations
- iii. Delivery related to gaseous standards

Summary of bidder queries and IITM's responses

Committee Deliberations and Decisions

HRGCMS: After detailed deliberation, the Committee observed that the technical specifications finalized after the pre-bid meeting dated 22 January 2026 are:

**Item 1: High Resolution Gas Chromatograph Mass Spectrometer (HRGCMS)**

<b>Tender Specification</b>	<b>Existing Technical Specification mentioned in the Tender</b>	<b>Queries from bidders</b>	<b>IITM Response</b>
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Point 1 (pg no 67) Requirements of Mass Spectrometer	A high resolution Q-TOF MS	Request to add Electrostatic Orbital Trap; so as to make the specs more open and general	Changes have been made: "A high resolution mass spectrophotometer/ electrostatic orbital trap"
Point 18- (pg no 69)- thermal Desorption	VDA-278 Method	Request you to remove the VDA -278 method as it is related to vehicle interior cabin air quality	The method has been removed.
Point 19 – TD Field Sampling	Sampling stations around 20 TD tube capacity for field sampling	Request you to confirm the quantity of sampling station required	One Sampling station with a >20 TD tube capacity for field sampling.
Pont 19- Some Major targeted compounds	Major PAH compounds	Request you to provide the concentration of the PAH std mixture required	Added: "PAH mixture having concentration ~2000ppm."
	List of PCDDs, List of PCDFs	Request you to give the range of concentrations & the relevant EPA method. Also, whether labelled standards are required	Added: "EPA TO 9A method (PCDD and PCDFs), require concentration of 500 ppm or higher."  Yes, labelled standards are to be provided.
	List of PCBs	Request you to provide the concentration range for PCBs	Added "Calibration standard concentration ~1000ppm or higher"
Point 12- Pg no76- Specific Requirement if any	25) 1,3 Butadiene standard in gas form	Gas standards supply will require special permission and shipment mode. Request you to provide the necessary relevant documents during shipment. Also, there will be a delay in shipment by 5-6 months for gaseous standards.	Gas Cylinder delivery: No change as per tender.
<b>Not a Query from bidder</b>	The concentration of calibration standard and EPA method was not mentioned earlier.		Now mentioned in tech specs section 7(20): Volatile Organic Compounds (conc. 2000 ppm).
<b>Not a Query from bidder</b>	The upper limit of the analytical balance was earlier 410 g.		Now mentioned in tech specs section 7(22-3): Analytical Microbalance Maximum Capacity: 200 g

<b>Not a Query from bidder</b>	The list of calibration standards under consumables have been updated for more focused objectives.		Details of Calibration standards to be added for 5 years consumables: Consumables have been updated in Section 12 of Tech Specs.
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**Item 2: High Resolution Gas Chromatograph Mass Spectrometer (HRGCMS)**

<b>Tender Specification</b>	<b>Amendment /clarification Request</b>	<b>Remarks</b>	<b>Response</b>
Point 21- TD Field sampling	Sampling stations around 30 TD tube capacity for field sampling	Please specify the number of sampling stations required	The number of sampling station required will be 1, however the number of TD tube to be supplied is 100 Qty.
Point 22 Some major Targeted compounds	List of VOCs (alkane, alkene, aromatics), SOA Tracer compounds, Major PAH compounds	Please specify the concentration required for the standards. The gaseous stds of VOC are restricted items and the shipment will be delayed by 5-6 months.	Fos the gaseous standards the concentration should be ~100 ppm and for the liquid standards the concentration should be ~2000 ppm.  Gas Cylinder delivery: No change as pertender.

The meeting ended with thanks to the chair.

Technical Specification for

**Supply, Installation & Commissioning of High Resolution Gas Chromatograph Mass Spectrometer with Thermal Desorption unit and sampling station (HR- GC-MS with TD and sampling stations) Qty. - 1 Set**

**High Resolution Gas Chromatograph Mass Spectrometer with Thermal Desorption unit (GC MS MS with TD) and Sampling station**

1.	<b>Name of the Instrument</b>	High Resolution Gas Chromatograph Mass Spectrometer with Thermal Desorption unit (GC MS MS with TD) and sampling station		
3.	<b>Quantity</b>	01 nos.		
5.	<b>Purpose of the instrument</b>	The instrument will estimate organic components (PAHs, PCBs, VOCs etc) in particulate matter for source apportionment studies.		
6.	<b>Brief details about instrument</b>	Premium quantitative and qualitative performance with the fast-scanning features in the High resolution GC MS		
7.	<b>Technical specifications including accessories</b>	1	Requirement of Mass Spectrophotometer	<ul style="list-style-type: none"> <li>• A high resolution Benchtop system.</li> <li>• A high resolution Mass spectrophotometer/ electrostatic orbital trap</li> <li>• GC-MS/MS system utilizing a Quadrupole Mass Filter consisting of a segmented mass filter, providing variable and step-less precursor isolation width selection from 0.4 Da to full mass range.</li> <li>• Accelerated Collisional cell for generating fragment spectra</li> <li>• It must be capable of real-time data acquisition and data processing, enabling a high spectrum repetition rate.</li> <li>• It must be able to finish Auto Tune and mass calibration within 2 min.</li> <li>• It must not need liquid cooling.</li> <li>• It requires no external gases except nitrogen for electron ionization operation.</li> </ul>
		2	Mass Resolution	<ul style="list-style-type: none"> <li>• Maximum resolution should be 60,000 (FWHM) at m/z 200 for all scan modes and both polarities.</li> <li>• Maximum resolution of 50,000 (FWHM) at m/z 272 for all scan modes and both polarities</li> </ul>
		3	Scan speed of MS	The scan speed should be 40 scans per second (R=7,500 at m/z 200) in Full MS Scan mode.

		4	Mass Accuracy	<ul style="list-style-type: none"> <li>• &lt;3 ppm RMS with external calibration over 24 h</li> <li>• &lt;1ppm RMS with internal calibration over 24 h</li> </ul>
		5	Dynamic Range	<p>dynamic range of greater than 5000:1 within one spectrum (single transient acquisition)</p> <ul style="list-style-type: none"> <li>• &gt;10<sup>6</sup> analytical dynamic range</li> </ul>
		6	Mass Range	Mass range of 30 - 3000 Da
		7	Polarity Switching	Positive and negative chemical ionization during successive scans.
		8	Ion Source	<ul style="list-style-type: none"> <li>• The mass spectrometer must include sources capable of electron ionization (EI), positive ion chemical ionization and negative ion chemical ionization.</li> <li>• The user of the mass spectrometer must be able to remove all MS parts that require routine cleaning without venting manifold.</li> <li>• The mass spectrometer must be able to change from a dedicated electron ionization source to a dedicated chemical ionization source within two minutes without venting manifold.</li> <li>• The user must be able to isolate the vacuum in the source region from the transferline to enable the column to be changed without venting the instrument.</li> <li>• The mass spectrometer must be compatible with a commercially available direct exposure probe (DEP) and direct insertion probe (DIP) that allows for the introduction of the sample directly into the ion source without first passing through a column.</li> </ul>
		9	Ion Optics and Mass Analyzer	<p>The mass spectrometer must have a RF only quadrupole device with axial field for most robust operation and highest transmission</p> <p>The mass spectrometer must have a segmented Hyperbolic Quad mass filter, enabling it to select a variable and step-less precursor isolation width from 0.4 to 50 u .</p>
		10	Vacuum System	<p>The mass spectrometer must have no more than one turbo molecular pump</p> <p>The mass spectrometer must have a differentially pumped vacuum system with pressures ranging from 5 to 5e-10 mbar in the mass analyzer</p> <p>The mass spectrometer must have a high-vacuum aluminum manifold</p>
		11	Detection System	Mass spectra must be detected by an image current detection system or Photo Multiplier device
		12	GC user Interface	The touch screen of the GC provides all needed data, including all temperature and pressure/flow parameters, type of carrier gas,

		carrier gas column pressure, flow rates, split flow, detector gas flow rates and all detector parameters
13	SSL Injector (Qty-2)	<ul style="list-style-type: none"> <li>• The SSL injector should easily installable by user without any special tool.</li> <li>• Maximum Temperature: 400 °C</li> <li>• Split Ratio: up to 12500:1</li> <li>• Pressure Range: 0-1000 kPa (0-145 PSI)</li> <li>• Total Flow Setting: Control of split flow in 1 mL/min from 0 to 1250 mL/min</li> <li>• Purge flow from 0 to 50 mL/min</li> <li>• Split ratio should be 1:7000 or better</li> </ul>
14	PTV inlet	<ul style="list-style-type: none"> <li>• Flexibility of a standard split/split less inlet, combined with temperature programmable capabilities also allow for large volume injection facility to support cool injections also.</li> <li>• Split Ratio should be 1:6000 or better</li> <li>• Temperature control: <ul style="list-style-type: none"> <li>• Air cooling (to ambient +10 °C with oven temperature &lt; 50 °C)/forced cooling</li> </ul> </li> <li>• Temperature programming of up to 3 or more ramps at up to 850°C/min. Maximum temperature: 450 °C.</li> <li>• Injection modes: <ul style="list-style-type: none"> <li>• Hot or cold split/split less- Pulsed split/split less - Solvent vent- Direct TD and liquid sampler injection using the same inlet without physical replacement</li> </ul> </li> <li>• Suitable for all kind of capillary Columns</li> </ul>
15	Autosampler	<p>The autosampler should be an XYZ-based autosampler and should be able to do liquid injections and should Headspace and SPME Arrow injections capabilities</p> <p>It should have more than 150 vials capacity for a 2 ml sample vial capacity and 60 vial or more capacity for headspace and SPME modes</p>
16	EI full MS	<ul style="list-style-type: none"> <li>• 1 µL of 100 fg/µL octafluoronaphthalene (OFN) will produce a minimum signal-to-noise of 10,000:1 at a minimum resolution of 50,000 (FWHM) and a mass error of less than 1 part per million (ppm) while scanning from m/z 50 to m/z 300.</li> <li>• The area precision of eight sequential injections of 1 µL, 10 fg/µL OFN will result in an instrument detection limit (IDL) of 6 fg or less (OFN) derived at the 99% confidence level.</li> </ul>
17	PCI of MS	1 µL of 10 pg/µL benzophenone (BZP) will produce a minimum signal-to-noise of 150:1 while scanning from m/z 80 to m/z 230.
18	Thermal Desorption (TD)	<ul style="list-style-type: none"> <li>• 100 tube capacity for TD for analysis</li> <li>• Rapid set-up of methods using pre-programmed parameters for: (a) standard methods including US EPA TO-17, US EPA 325 and PAH analysis; (b)</li> </ul>

			<p>conditioning methods for popular sorbent tubes and focusing traps.</p> <ul style="list-style-type: none"> <li>• One or two integrated mass flow controllers (MFCs) for electronic control of split and/or desorb flows.</li> <li>• TD tubes can be easily connected serially for longer time sampling if needed. Some tubes are to be blank.</li> <li>• Lower temperature range for trap: -30°C to 50°C and also adjustable in 1°C increments. Temperature limits are user-settable within the stated range.</li> <li>• Uniform electrical cooling applied over full 60 mm length of sorbent bed. It should be compatible with any GC-MS system of international repute in software and hardware and have desorption.</li> <li>• Primary (tube) desorption oven temperature range &lt; 40°C to 400°C and adjustable in 1°C increments.</li> <li>• Desorption time range: 0 to 600.0 min and adjustable in 0.1 min increments.</li> <li>• Trap can be packed with between one and four sorbents.</li> <li>• Backflush desorption ensures quantitative retention and release of wide boiling range samples.</li> <li>• The interface line length should be minimum length to facilitate most efficient transfer of analyte and not to have cold spots in the line.</li> <li>• Stringent leak testing of all tubes before desorption/re- collection.</li> <li>• Pre-purge of air to vent and automated water management.</li> <li>• Backflush desorption of the focusing trap.</li> <li>• Robust tube sealing.</li> <li>• Quantitative sample re-collection for validation of recovery.</li> <li>• The TD quote should include single field collection pump and tube and also multiple (3 or above) tube station with pump. The type and number will be decided on PO.</li> <li>• The TD system quote should be complete with clean-up accessories for the tube after sampling for reuse.</li> <li>• All the necessary items for field campaigns i.e. sampling/Injection/ Internal / Extractor standards for TD (SVOCS and VOCs) should be quoted separately.</li> </ul>
	19	TD field Sampling	<ul style="list-style-type: none"> <li>• One Sampling station with &gt;20 TD tube capacity for field sampling.</li> <li>• It should have options for sequential and parallel sampling.</li> <li>• The TD tube should have short term and long term cap for necessary storage and transportation from the field to lab for analysis purpose without compromising the quality.</li> </ul>
	19	Some major Targeted compounds	<p>Major PAH Compounds:</p> <p>PAH mixture having concentration ~2000ppm. Acenaphthylene(C10H8)</p> <ul style="list-style-type: none"> <li>• Benzo(b) fluoranthene (C20H12)</li> <li>• Acenaphthene(C10H8)</li> </ul>

- Benzo(k) fluoranthene(C20H12)
- Fluorene(C10H8)
- Coronene (C24H12)
- Naphthalene (C10H8)
- Benzo(e) pyrene (C20H12)
- Phenanthrene (C14H10)
- Benzo(a) pyrene (C20H12)
- Anthracene (C14H10)
- Dibenzo(ah) anthracenes(C22H14)
- Chrysene (C18H12)
- Indeno(ed) pyrene (C22H12)
- Benzo(a) anthracene (C18H12)

List of PCDDs and PCDFs

- EPA TO 9A method (PCDD and PCDFs), require concentration of 500 ppm or higher..2,3,7,8 – TCDD
- 1,2,3,7,8 – PCDD
- 1,2,3,6,7,8 - HCDD
- 1,2,3,7,8,9 - HCDD
- 1,2,3,4,6,7,8 – HCDD
- Octa – CDD

List of PCDFs

- 2,3,7,8 - TCDF
- 1,2,3,7,8 – PCDF
- 1,2,3,4,7,8 – HCDF
- 1,2,3,6,7,8 – HCDF
- 2,3,4,6,7,8 – HCDF
- 1,2,3,4,6,7,8 – HCDF
- Octa – CDF

List of PCBs

- Calibration standard concentration ~1000ppm or higher.PCB-BZ 77 3,3',4,4'-Tetrachlorobiphenyl
- PCB-BZ 126 3,3',4,4',5-Pentachlorobiphenyl
- PCB-BZ 169 3,3',4,4',5,5'-Hexachlorobiphenyl
- PCB-BZ 105 2,3,3',4,4',-Pentachlorobiphenyl
- PCB-BZ 118 2,3',4,4',5-Pentachlorobiphenyl
- PCB-BZ 128 2,2',3,3',4,4'-Hexachlorobiphenyl
- PCB-BZ 138 2,2',3,4,4',5'-Hexachlorobiphenyl
- PCB-BZ 156 2,3,3',4,4',5-Hexachlorobiphenyl
- PCB-BZ 170 2,2',3,3',4,4',5-Heptachlorobiphenyl
- PCB-BZ 18 2,2',5-Trichlorobiphenyl
- PCB-BZ 44 2,2',3,5'-Tetrachlorobiphenyl
- PCB-BZ 49 2,2',4,5'-Tetrachlorobiphenyl
- PCB-BZ 52 2,2',5,5',-Tetrachlorobiphenyl
- PCB-BZ 70 2,3',4',5-Tetrachlorobiphenyl
- PCB-BZ 74 2,4,4',5-Tetrachlorobiphenyl
- PCB-BZ 151 2,2',3,5,5',6-Hexachlorobiphenyl
- PCB-BZ 177 2,2',3,3',4',5,6-Heptachlorobiphenyl

		<ul style="list-style-type: none"> <li>• PCB-BZ 187 2,2',3,4',5,5',6-Heptachlorobiphenyl</li> <li>• PCB-BZ 207 2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl</li> </ul> <p>Also VOC quantifications:</p> <p>Volatile Organic Compounds (conc. 2000 ppm).</p>
20	Desktop and Printer along with software requirement	<ul style="list-style-type: none"> <li>• Software Qualitative and quantitative analysis with fast evaluation completion of scan (full scan and library search). The mass spectrometer data system must have facility of retention time- locking module for analyzing target compounds in complex matrices. Original software CD / DVD. Should have multiple libraries including NIST.</li> <li>• There should be searchable environmental sample analysis method (readily available cookbook type) with thrust air/particulate samples. The software should have facility for method saving facility and controls to cut down gas usage while the system is not in operation. It should have preferably pictorial illustrations of equipment functions/parts etc.</li> <li>• The hardware provided should support large enough visualization for smooth multiple screen views and report generation in true color print media.</li> <li>• A single software compatible with both GC HR MS and TD system.</li> </ul>
21	Require Power backup (UPS and batteries)	Require power back up system along with the whole instrument set up.
22	Lab set up and Accessories require for the sample preparation and standard calibration	<ul style="list-style-type: none"> <li>• Inclusion of required lab set up (working table, vibration free tables, Fume hood and umbrella exhaust system for organic extraction processes, sample preparation and storage systems, Air Conditions, fume hood etc for the sample preparation technique) for GC HR MS, TD and extraction unit.</li> <li>• Include require gas purification panels for both GC HRMS, TD and Extraction unit tubing manifolds etc.</li> </ul>
1	Benchtop Refrigerated Centrifuge	<p><b>Benchtop Refrigerated Centrifuge</b></p> <ul style="list-style-type: none"> <li>• 15,000 rpm - Rotor: Swing-out and angle rotor with aerosol-tight lids. Temperature Range: -10C to +40C.</li> <li>• Digital programmable controls Safety features: imbalance detection, lid lock.</li> <li>• The Centrifuge should have 15 ml and 50 ml tube capacity.</li> <li>• Fixed-angle rotor RCF (Relative Centrifugal Force) of over 25,000 x g and swinging bucket rotor RCF of over 7,000 x g.</li> </ul>
2	Solvent Extraction unit	<ul style="list-style-type: none"> <li>• Precise sample extraction unit for the high resolution MS analysis.</li> <li>• Maximum capacity for solvent extraction unit can be &gt;10 in number.</li> </ul>

		<ul style="list-style-type: none"> <li>• It can optimized to use the precise amount of solvent needed for the specified sample cell volume, making cell clean-up efficient and accurate.</li> <li>• It should have an user friendly interface</li> </ul>
3.	Analytical Microbalance	<ul style="list-style-type: none"> <li>• Analytical Microbalance</li> </ul> <p>Maximum Capacity: 200 g</p> <p>Readability: 0.1 mg</p> <p>Repeatability, typical: 0.06 mg</p> <p>Minimum Weight (U=1%, k=2), typical 12 mg</p> <ul style="list-style-type: none"> <li>• Settling Time: 2 s</li> <li>• Adjustment Internal / proFACT Advanced</li> <li>• Interfaces: Bluetooth (optional)</li> <li>• Ethernet (LAN)</li> <li>• RS232 (integrated/optional)</li> <li>• USB-A (to device)</li> <li>• USB-B (to device)</li> <li>• Display</li> <li>• 7" colour TFT touchscreen</li> <li>• User Management</li> <li>• Unlimited Amount of Users</li> <li>• User Rights</li> <li>• Legal for Trade</li> <li>• Yes</li> <li>• Minimum Weight (USP, 0.1%, typical)</li> <li>• 120 mg</li> <li>• Linearity ±</li> <li>• 0.2 mg</li> <li>• Weighing Pan Dimensions (WxD)</li> <li>• 90 mm x 90 mm</li> <li>• Dimensions (HxWxD)</li> <li>• 368 mm x 214 mm x 411 mm</li> <li>• Terminal size</li> <li>• 7 inch</li> <li>• Compliance Options</li> <li>• Data Integrity</li> <li>• Log history (21 CFR Part 11 Compliant)</li> <li>• Log history (Basic Metadata)</li> <li>• Password protectionis required for calibration standard preparation</li> </ul> <ul style="list-style-type: none"> <li>• Include set up for the weighing balance (Dehumidifier AC etc)</li> </ul>
4	Other Accessory Instruments	<p><b>A. UV-VIS spectrophotometer (Dual channel)</b></p> <ul style="list-style-type: none"> <li>• Optical System: Double beam with dual photodiode detectors</li> <li>• Wavelength Range: 190–1100 nm</li> <li>• Wavelength Accuracy: ±0.3 nm</li> <li>• Wavelength Reproducibility: ±0.1 nm</li> <li>• Bandwidth: ≤1 nm (fixed or variable)</li> <li>• Photometric Accuracy: ±0.002 Abs at 1.0 Abs</li> <li>• Photometric Range: -4 to +4 Abs</li> <li>• Scan Speed: ≥3000 nm/min</li> </ul>

			<ul style="list-style-type: none"> <li>• Kinetics Mode: Time interval adjustable (<math>\geq 1</math> s), 30–90 min range</li> <li>• Sample Compartment: Thermostatted cuvette holder (15–60°C)</li> <li>• Sample Volume: Compatible with 1.5 mL – 3 mL assays</li> <li>• Light Source: Deuterium and Tungsten-Halogen</li> <li>• Noise Level: &lt;0.0001 Abs at 500 nm</li> <li>• Stray Light: &lt;0.05% at 220 nm and 340 nm</li> <li>• Software: Windows-based system with DTT/AA kinetic module</li> <li>• Interface: USB, LAN, Printer support</li> <li>• Output Formats: Absorbance vs. time, CSV, PDF, and image formats</li> <li>• Accessories: 10 quartz cuvettes (1 cm path), micro-volume cell (optional), validation kit</li> </ul> <p><b>B. Microwave Digestion System</b></p> <ul style="list-style-type: none"> <li>• Vessels: PTFE/TFM, minimum 812 vessels</li> <li>• Temperature: Up to 300C; Pressure: 100 bar</li> <li>• Sensors: Contactless IR temperature + optical pressure control</li> <li>• Suitable for nitric acid, HF, and aqua regia digestion</li> <li>• Software: Multi-step programmable digestion sequences</li> <li>• Safety: Interlock, pressure release, exhaust scrubber</li> <li>• Include consumables for 5 years</li> </ul> <p><b>C. Filtration Unit</b></p> <ul style="list-style-type: none"> <li>• Setup: Vacuum-assisted or pressurized system</li> <li>• Compatibility: 0.45 m and 0.22 m PTFE, nylon filters</li> <li>• Holders for 25 mm and 47 mm filters</li> <li>• Built-in waste collection and backflush system</li> <li>• Include consumables for 5 years.</li> </ul> <p><b>D. Ultrasonic Bath/Sonicator</b></p> <ul style="list-style-type: none"> <li>• Frequency: 3545 kHz</li> <li>• Capacity: 3 liters</li> <li>• Timer: 199 minutes adjustable</li> <li>• Temperature Control: Ambient to 80C</li> <li>• Tank Material: Stainless steel</li> <li>• Accessories: Lid, drain valve, sample holders for air filters and leachates, including desktops</li> </ul> <p><b>E. Water purification System</b></p> <ul style="list-style-type: none"> <li>• Parameter</li> <li>    <math>\geq</math> L/min distribution flow rate (from POD)</li> <li>    <math>\geq</math> L/min product water instant delivery rate</li> </ul> <p>18.0 kg operating weight (39.7 lb)</p>
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			<p>300 L/day max. usage</p> <ul style="list-style-type: none"> <li>Resistivity 18.2 MΩ-cm, 25°C (Product Water)</li> <li>Storage Capacity 40 L.</li> <li>Total organic carbon (TOC) residue ≤5 ppb (Product Water)</li> <li>Output product water quality: type 1 water (18.2 MΩ-cm)</li> <li>Conductivity: 0.055 μS/cm at 25 °C (Ultrapure Water)</li> <li>include consumables filters for next 5 years.</li> </ul>
		23 Other Consumables to be provided	<ul style="list-style-type: none"> <li>All consumables should be calculated as 400 – 600 samples per year for PAH, PCB VOCs.</li> <li>Cannister for VOC's gaseous sampling (Capacity 20-25).</li> <li>Glass goods require analysis and solvent extractor units.</li> <li>Consumables in chemicals for the sample preparation using extraction unit and analysis.</li> <li>Auto pipettes for standard and sample preparation (Variation volume)</li> <li>Filter papers (Teflon, Quartz, Glass fibre in different diameters and make for sampling of 1000 samples per annum)</li> <li>Sample analysis vials with septa (1ml), volumetric flasks (10ml, 100ml, 500 ml, 1L, 2 L) and sample extractor storing vials (10 ml)</li> <li>High quality organic solvents (n hexane, methanol, Ethyl acetate, acetonitrile etc.)</li> </ul>
		25 Regarding Instrument Installation and commissioning of the instrument	<ul style="list-style-type: none"> <li>Instrument installation, commissioning followed by hardware and software training for both GC HRMS and TD.</li> <li>Application training for the solvent extraction unit, TD tube field sampling followed by GC HR MS analysis should be responsibility of the vendor.</li> </ul>
		26 Installation and commission location	Pune IITM Campus.
9.	Installation, Testing of equipment and calibration, details of training, etc.	2–3 week site training for both GC HR MS and TD. All SOPs are to be made for each type of analytes.	
10.	Warranty	1 year warranty + 1 Year Extended warranty	
11.	Post Warranty Services - Extended Warranty, Annual Maintenance Contract (AMC),	<ul style="list-style-type: none"> <li>OMC starting from the 3<sup>rd</sup> year up to 5<sup>th</sup> year.</li> </ul>	

	<p><b>Comprehensive Annual Maintenance Contract (CAMC), Operations Maintenance Contract (OMC) etc.</b></p>	<ul style="list-style-type: none"> <li>The operator is required for the sample preparation and analysis for 1<sup>st</sup> to 5th year</li> </ul>
<p>12.</p>	<p><b>Specific requirement, if any</b></p>	<p>Consumables for 5 years</p> <ul style="list-style-type: none"> <li>Vials (2ml capacity) /septas/caps for liquid autosampler-</li> <li>Vials /septas/caps for headspace vials</li> <li>Septas for injector ports</li> <li>AS syringes – 10ul</li> <li>Ferrules and nuts</li> <li>Liners &amp; seals for injector ports for SSL &amp; PTV</li> <li>Column nuts for SSL &amp; PTV</li> <li>Vacuum Pump oil</li> <li>MS filaments</li> <li>Cimper &amp; decrimper for HS vials</li> <li>Split Line &amp; Carrier line filter</li> <li>GC capillary column – 5% Phenyl Methyl Polysiloxane or equivalent, 30 mts, 0.25 mm id, 0.25 um film</li> <li>Deactivated glass wool</li> <li>Ceramic column cutter</li> <li>Replacement triple trap for Carrier gas</li> <li>Aluminium Oxide for cleaning</li> <li>Calibration compound FC 43</li> </ul> <p>Procurement of consumables up to 5 years for 1000 samples per annum (filter papers) in parts each year.</p> <p>Details of Calibration standards to be added for 5 years consumables</p> <p>i. Calibration Standard Kits And Samples with NIST certification*</p> <p>1) NIST calibration standard for EPA TO 13 A, PAH Standard Mix standard and CRM having concentration ~2000ppm</p> <p>2)NIST calibration standard for the method EPA TO 9 A (PCDD and PCDFs), require concentration of 500 ppm or higher. Labelled standards are to be provided</p> <p>3) NIST calibration standard for EPA method TO 4A and 10 A for PCB analysis. Calibration standard concentration ~1000ppm or better.</p> <p>4)NIST calibration standard for EPA method TO 17 for Volatile Organic Compounds (conc. 2mg/mL)</p> <p>5) 1,3 butadiene standard is in the gaseous form, This may be made available in a suitable canister along with suitable injector syringes (4 standard volumes) (vendor can mention the delayed delivery for the same)</p> <p>6) EPA 604 Phenol Compounds Mix 11 Components in Methanol 1mL.</p> <p>7) EPA TO11/standard mix for Formaldehyde, Acetaldehyde and Acetone in Acetonitrile 1 mL.</p> <p>8/) Calibration and installation of tuning standards shall be performed for all the above-mentioned analytical standards on instruments to ensure accurate and reliable operation.</p>

**High Resolution Gas Chromatograph Mass Spectrometer with Thermal Desorption unit (GC MS MS with TD) for online and offline analysis capabilities with Sampling station**

1.	<b>Name of the Instrument</b>	High Resolution Gas Chromatograph Mass Spectrometer with Thermal Desorption unit (GC MS MS with TD) and sampling station						
2.	<b>Indenting officer and Designation</b>	Subrata Mukherjee Scientist D						
3.	<b>Quantity</b>	01 nos.						
4.	<b>Vertical(s) of Mission Mausam to which the instrument belongs</b>	Mission Mausam / ARTs						
5.	<b>Purpose of the instrument</b>	The instrument will estimate organic components (PAHs, PCBs, VOCs etc) in particulate matter for source apportionment and SOA tracer analysis studies.						
6.	<b>Brief details about instrument</b>	Premium quantitative and qualitative performance with the fast-scanning features in the High resolution GC MS						
7.	<b>Technical specifications including accessories</b>	<table border="1"> <tr> <td>1</td> <td>General</td> <td> <ul style="list-style-type: none"> <li>• A high-resolution system.</li> <li>• A high resolution Q-TOF / electrostatic orbital trap</li> <li>• GC-MS/MS system utilizing a Quadrupole Mass Filter consisting of a segmented mass filter, providing variable and step-less precursor isolation width selection from 0.4 Da to full mass range.</li> <li>• Accelerated Collisional cell for generating fragment spectra</li> <li>• Hybrid configuration delivering high resolution and accurate masses for modes of operation.</li> <li>• It must be capable of real-time data acquisition and data processing, enabling a high spectrum repetition rate.</li> <li>• It must be able to perform parallel filling and detection to increase duty cycle</li> <li>• It must be able to finish Auto Tune and mass calibration within 2 min.</li> <li>• It must not need liquid cooling.</li> <li>• No external gases, except nitrogen for electron ionization operation.</li> </ul> </td> </tr> <tr> <td>2</td> <td>Mass Resolution</td> <td> <ul style="list-style-type: none"> <li>• Maximum resolution should be 60,000 (FWHM) at m/z 200 for all scan modes and</li> </ul> </td> </tr> </table>	1	General	<ul style="list-style-type: none"> <li>• A high-resolution system.</li> <li>• A high resolution Q-TOF / electrostatic orbital trap</li> <li>• GC-MS/MS system utilizing a Quadrupole Mass Filter consisting of a segmented mass filter, providing variable and step-less precursor isolation width selection from 0.4 Da to full mass range.</li> <li>• Accelerated Collisional cell for generating fragment spectra</li> <li>• Hybrid configuration delivering high resolution and accurate masses for modes of operation.</li> <li>• It must be capable of real-time data acquisition and data processing, enabling a high spectrum repetition rate.</li> <li>• It must be able to perform parallel filling and detection to increase duty cycle</li> <li>• It must be able to finish Auto Tune and mass calibration within 2 min.</li> <li>• It must not need liquid cooling.</li> <li>• No external gases, except nitrogen for electron ionization operation.</li> </ul>	2	Mass Resolution	<ul style="list-style-type: none"> <li>• Maximum resolution should be 60,000 (FWHM) at m/z 200 for all scan modes and</li> </ul>
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2	Mass Resolution	<ul style="list-style-type: none"> <li>• Maximum resolution should be 60,000 (FWHM) at m/z 200 for all scan modes and</li> </ul>						

		<ul style="list-style-type: none"> <li>both polarities.</li> <li>Maximum resolution of 50,000 (FWHM) at <math>m/z</math> 272 for all scan modes and both polarities</li> </ul>
3	Scan speed of MS	The scan speed should be 40 scans per second ( $R=7,500$ at $m/z$ 200) in Full MS Scan mode.
4	Mass Accuracy	<ul style="list-style-type: none"> <li>&lt;3 ppm RMS with external calibration over 24 h without any kind of mass recalibration</li> <li>&lt;1ppm RMS with internal calibration over 24 h</li> </ul>
6	Mass Range	Mass range of 30 - 2000 Da or better
7	Polarity Switching	Positive and negative chemical ionization during successive scans.
8	Scan Functions	<ul style="list-style-type: none"> <li>The mass spectrometer must be capable of Full MS, Selected Ion Monitoring (SIM) and MS/MS experiments</li> <li>It must be capable of Timed SIM and Timed MS/MS experiments, where SIM or MS/MS events with different time windows are allowed to overlap in time.</li> <li>Must acquire and display multiplexed SIM mass spectra of at least 20 simultaneously detected precursor ions or better.</li> <li>Must be capable of data-dependent MS/MS experiments, where MS/MS events are scheduled on-the-fly during the acquisition by the instrument firmware based on full scan or SIM data being acquired.</li> </ul>
9	Ion Source	<ul style="list-style-type: none"> <li>The mass spectrometer must include sources capable of electron ionization (EI), positive ion chemical ionization and negative ion chemical ionization.</li> <li>The user of the mass spectrometer must be able to remove all MS parts that require routine cleaning without venting manifold.</li> <li>The mass spectrometer must be able to change from a dedicated electron ionization source to a dedicated chemical ionization source within two minutes without venting manifold.</li> <li>The user must be able to isolate the vacuum in the source region from the transfer line to enable the column to be changed without venting the instrument.</li> <li>The mass spectrometer must be compatible with a commercially available direct exposure probe (DEP) and direct insertion probe (DIP) that allows for the introduction of the sample directly into the ion source without first passing through a column.</li> </ul>
10	Ion Optics and Mass Analyzer	<ul style="list-style-type: none"> <li>It must have a segmented Hyperbolic Quad mass filter, enabling it to select a variable and step-less precursor isolation width from 0.4 to 50 u.</li> <li>The mass spectrometer must have an electrostatic orbital trap or a TOF as its mass analyzing device</li> </ul>
11	Vacuum System	<p>The mass spectrometer must have no more than one turbo molecular pump.</p> <p>The mass spectrometer must have a differentially pumped vacuum system with pressures ranging from 5 to 5e-10 mbar in the mass analyzer</p>

		The mass spectrometer must have a high-vacuum aluminum manifold
12	Detection System	Mass spectra must be detected by an image current detection system or Photo Multiplier device
13	GC user Interface	The touch screen of the GC must provide easy accessibility and all needed data, including all temperature and pressure/flow parameters, type of carrier gas, carrier gas column pressure, flow rates, split flow, detector gas flow rates and all detector parameters
14	GC Oven	<ul style="list-style-type: none"> <li>The column oven should have an operating range of -99°C to 450°C using the optional sub ambient oven accessory (with liquid nitrogen or liquid CO<sub>2</sub> as coolant).</li> <li>Heat-up time from 50°C to 450°C within 4 minutes (230 VAC version)</li> <li>Cool-down time from 450°C to 50°C in less than 4 minutes</li> <li>The heating rate should be 120 deg.c/min or better with more than 26 ramps and plateaus.</li> <li>The oven temperature stability is within 0.01 °C/ every °C of actual temperature</li> <li>The oven mainframe must include all the necessary electrical and gas connections for injectors and detectors without the use of tubing and wires to obstruct the oven top.</li> </ul>
15	SSL Injector (Qty-2)	<ul style="list-style-type: none"> <li>The SSL injector should easily installable by user without any special tool.</li> <li>Maximum Temperature: 400 °C</li> <li>Split Ratio: up to 12500:1</li> <li>Pressure Range: 0-1000 kPa (0-145 PSI)</li> <li>Total Flow Setting: Control of split flow in 1 mL/min from 0 to 1250 mL/min</li> <li>Purge flow from 0 to 50 mL/min</li> </ul>
16	PTV inlet	<ul style="list-style-type: none"> <li>Flexibility of a standard split/split less inlet, combined with temperature programmable capabilities also allow for large volume injection facility to support cool injections also.</li> <li>Split Ratio should be 1:6000 or better</li> <li>Temperature control:</li> <li>Air cooling (to ambient +10 °C with oven temperature &lt; 50 °C)/forced cooling</li> <li>Maximum temperature: 450 °C.</li> <li>Injection modes:</li> <li>Hot or cold split/split less- Pulsed split/split less - Solvent vent- Direct TD and liquid sampler injection using the same inlet without physical replacement</li> <li>Suitable for all kind of capillary Columns</li> </ul>
17	liquid Autosampler	The autosampler should be an XYZ-based autosampler and should be able to do liquid injections and should headspace and SPME Arrow injections capabilities It should have more than 100 vials capacity for a 2 ml sample vial capacity.
19	PCI of MS	1 µL of 10 pg/µL benzophenone (BZP) will produce a minimum signal-to-noise of 150:1 while scanning from m/z 80 to m/z 230.

		<p>20 Thermal Desorption (TD) Online &amp; Offline monitoring of VOCs</p>	<ul style="list-style-type: none"> <li>• System should multi-channel module that connects to the TD unit and which allows analysis of whole-air and gas samples collected using canisters and Tedlar bags, as well as continuous monitoring of air or gas streams.</li> <li>• The system should be a dedicated system for analysis of trace-level components.</li> <li>- Sample volumes: 5 mL upwards.</li> <li>- Sample channels: minimum 4. Should be upgradeable to 17 channels with an accessory</li> <li>• The system should comply with the US EPA Method TO-15 for canister-based analysis of air.</li> <li>• The system should have Cryogen-free operation and low gas consumption for robust operation and high uptime.</li> <li>• The system should have Internal standard addition capability, allowing either a precise aliquot (via a 1 mL loop) or a metered volume (5–500 mL) of gaseous standard to be added to the focusing trap before sampling.</li> <li>• The system should have electronic mass flow control for sample and split flows.</li> <li>• The system should have heated, inert internal sample flow paths to eliminate the risk of condensation and carryover.</li> <li>• It should be Compatible with gas-phase samples ranging in pressure from below atmospheric to 50 psig.</li> <li>• It should also have a Tube desorption capability in compliance with US EPA Method TO-17 and other standard methods.</li> <li>• It should have water management option using an empty trap to remove water from humid air streams prior to analyte focusing, allowing simultaneous analysis of ultra-volatiles, polar species, oxygenates and pinenes.</li> <li>• 100 tube capacity for TD auto sampler for analysis</li> <li>• If the sample is at low (&lt;10 psi) pressure, a pump should be supplied to draw the gas-phase sample through the system.</li> <li>• It should allow Automated, unattended sequencing of tube, on-line and canister/bag samples</li> </ul>
		<p>21 TD field Sampling</p>	<ul style="list-style-type: none"> <li>• Sampling station around 30 TD tube capacities for field sampling. Number of tubes supplied to be 100 qty.</li> <li>• It should have options for sequential and parallel sampling.</li> <li>• The TD tube should have short term and long term cap for necessary storage and transportation from the field to lab for analysis purpose without compromising the quality.</li> </ul>
		<p>22 Some major Targeted compounds</p>	<p>List of VOCs (alkane, alkene, aromatics)</p> <ul style="list-style-type: none"> <li>• 2,2,4 Trimethylpentane</li> <li>• 2,3,4 Trimethylpentane</li> </ul>

			<ul style="list-style-type: none"> <li>• 3-Methylhexane</li> <li>• Cyclohexane</li> <li>• n-Butane</li> <li>• n-Decane</li> <li>• n-Dodecane</li> <li>• n-Hexane</li> <li>• n-Octane</li> <li>• Cyclopentane</li> <li>• 1-Butene</li> <li>• 1-Pentene</li> <li>• Ethylene</li> <li>• Isoprene</li> <li>• Propylene</li> <li>• o-2-Hexene</li> <li>• t-2-Butene</li> <li>• 1,3,6-Trimethylbenzene</li> <li>• 1,2,3-Trimethylbenzene</li> <li>• Benzene</li> <li>• m-Diethylbenzene</li> <li>• n-Propylbenzene</li> <li>• o-Ethyltoluene</li> <li>• p-Diethylbenzene</li> <li>• p-Ethyltoluene</li> <li>• Styrene</li> <li>• Toluene</li> </ul> <p>Some SOA tracer compounds:</p> <ul style="list-style-type: none"> <li>• Phenol</li> <li>• Cresol</li> <li>• m Cresol</li> <li>• p Cresol</li> <li>• 4 Ethylphenol</li> <li>• 4 Methoxyphenol (Mequinol)</li> <li>• Vanillin</li> <li>• Syringol (2,6 Dimethoxyphenol)</li> <li>• Indole</li> <li>• 3 Methylindole</li> <li>• Quinoline</li> <li>• Isoquinoline</li> <li>• Methylpyridine isomers</li> <li>• Guaiacol</li> <li>• Catechol</li> <li>• Pinonic acid</li> <li>• pinonal</li> </ul> <p>Major PAH Compounds:</p> <ul style="list-style-type: none"> <li>• Acenaphthylene(C10H8)</li> <li>• Benzo(b) fluoranthene (C20H12)</li> <li>• Acenaphthene(C10H8)</li> <li>• Benzo(k) fluoranthene(C20H12)</li> <li>• Fluorene(C10H8)</li> <li>• Coronene (C24H12)</li> <li>• Naphthalene (C10H8)</li> <li>• Benzo(e) pyrene (C20H12)</li> <li>• Phenanthrene (C14H10)</li> <li>• Benzo(a) pyrene (C20H12)</li> <li>• Anthracene (C14H10)</li> <li>• Dibenzo(ah) anthracenes(C22H14)</li> <li>• Chrysene (C18H12)</li> <li>• Indeno(cd) pyrene (C22H12)</li> <li>• Benzo(a) anthracene (C18H12)</li> </ul>
23	Desktop along with		• Software Qualitative and quantitative

		<p>software requirement</p>	<p>analysis with fast evaluation completion of scan (full scan and library search). The mass spectrometer data system must have facility of retention time- locking module for analyzing target compounds in complex matrices. Original software CD / DVD. Should have multiple libraries including NIST and there should be provision to add other important libraries available globally.</p> <ul style="list-style-type: none"> <li>• There should be searchable environmental sample analysis method (readily available cook book type) with thrust air/particulate samples. The software should have facility for method saving facility and controls to cut down gas usage while the system is not in operation. It should have preferably pictorial illustrations of equipment functions/parts etc.</li> <li>• The hardware provided should support large enough visualization for smooth multiple screen views.</li> <li>• A single software compatible with both GC HR MS and TD system.</li> </ul>
	<p>25</p>	<p>Other Consumables to be provided</p>	<ul style="list-style-type: none"> <li>• Vials ( 2ml capacity) /septas/caps for liquid autosampler- 300 nos</li> <li>• Vials /septas/caps for headspace vials-200 nos</li> <li>• Septas for injector ports- 100</li> <li>• AS syringes – 10ul – qty-5</li> <li>• Ferrules-20</li> <li>• Liners &amp; seals for injector ports- 10 each for SSL &amp; PTV</li> <li>• Column nuts- 5 each for SSL &amp; PTV</li> <li>• Vacuum Pump oil- 5 litre</li> <li>• MS filaments- 4 filaments</li> <li>• Cimper &amp; decrimper for HS vials- one each</li> <li>• Split Line &amp; Carrier line filter- 1 each</li> <li>• GC capillary column – 5% Phenyl Methyl Polysiloxane or equivalent, 30 mts, 0.25 mm id, 0.25 um film- qty-2</li> <li>• Deactivated glass wool-qty-10 gms</li> <li>• Ceramic column cutter- qty -2</li> <li>• Replacement triple trap for Carrier gas</li> <li>• Aluminium Oxide for cleaning</li> <li>• Calibration compound FC 43</li> </ul>
	<p>26</p>	<p>Regarding Instrument Installation and commissioning of the instrument</p>	<ul style="list-style-type: none"> <li>• Instrument installation, commissioning followed by hardware and software training for both GC HRMS, field sampling and online/ offline mode of operation for TD system.</li> </ul>
	<p>27</p>	<p>Installation and commission location</p>	<p>HACPL, Mahabaleshwar</p>
	<p>28</p>	<p>Warranty and post-warranty service</p>	<p>1-year standard warranty with 1 year extended warranty and 3 years of OMC after the standard warranty. Operator should be placed at the time of installations.</p>