# Tender specification for ultra performance liquid chromatograph with tandem mass spectrometer (triple quadrupole) and accessories

| Sl. No. | | TENDER REQUIREMENT |
|---|---|---|
| i. | **Make** | **Please specify** |
| ii. | **Model** | **Please specify** |
| iii. | **Year of Manufacture** | **Please specify** |
| iv. | **Country of Origin** | **Please specify** |
| v. | **Scope of Application** | A High-end Sensitive benchtop LC-MS/MS system for quantitative compliance analysis against international regulatory requirements (EU/US-FDA/Japan), mainly targeting<br>1. Mycotoxins<br>2. Veterinary anti-biotic residues<br>3. Pesticide multi-residue screening<br>4. PFAS<br>In food and environmental matrices along with an UPLC/UHPLC and other accessories with user-friendly software.<br>The system is targeted for a routine High-throughput laboratory (Sample throughput 50 - 100 per day) |
| 1. | **LC-MS/MS Technical Specifications** | Documentary evidence must be furnished to support the claims of meeting the below technical specifications. |
| 1.1 | **Ion Source** | a. Both ESI and APCI should be available |
| | | **b.** Ability to switch between ESI and APCI without venting the system |
| 1.1.1 | **Electrospray Ionization Source – ESI** | **a.** Desolvation temperature – 500 ºC or better |
| | | b. Flow rate – 5 µL/min to 2 mL/min |
| | | c. Specify additional features available to minimize matrix effect and maintenance |
| 1.1.2 | **Atmospheric Pressure Chemical Ionization - APCI** | **a.** Desolvation temperature - 500 ºC or better |
| | | **b.** Flow rate – 0.1 to 2 mL/min or better |
| 1.2 | **Quadrupole Mass Analyzer** | |

<table>
<tr><th>Sl. No.</th><th></th><th>TENDER REQUIREMENT</th></tr>
<tr><td>1.2.1</td><td>Mass Stability:</td><td>0.1 Da over 24 hours</td></tr>
<tr><td>1.2.3</td><td>Dynamic Range:</td><td>Should be 6 orders of magnitude or better</td></tr>
<tr><td>1.2.4</td><td>Sensitivity #</td><td>Note: The below sensitivity and IDL must be mentioned in the product specification sheet published from the date of launch of the quoted model or should be supported with chromatographic evidence generated in one of the principal’s demo laboratories. No revised S/N specification will be accepted. Any deviation will lead to disqualification.</td></tr>
<tr><td rowspan="5">1.2.4.1</td><td rowspan="5">ESI Sensitivity</td><td>a. Sensitivity of the instruments: In ESI +ve : 1 pg/µL of Reserpine, sensitivity should be 1,000,000:1 or better</td></tr>
<tr><td>b. Sensitivity of the instruments: In ESI -ve : 1 pg/µL of Chloramphenicol sensitivity should be 1,000,000:1 or better</td></tr>
<tr><td>c. IDL ESI+ve for reserpine should be ≤ 0.25 fg</td></tr>
<tr><td>d. IDL ESI-ve for chloramphenicol should be ≤0.25 fg</td></tr>
<tr><td>e. Should be able to demonstrate the following Limit of Quantification/Determination* #
<table>
<tr><td>Aflatoxin B1 in Infant food</td><td>0.1</td><td>ppb</td></tr>
<tr><td>Aflatoxin M1 in milk ♣</td><td>0.05</td><td>ppb</td></tr>
<tr><td>Acrylamide monomer in drinking water (WHO regulations)</td><td>0.1</td><td>ppb</td></tr>
<tr><td>Glyphosate in drinking water ♣</td><td>0.1</td><td>ppb</td></tr>
<tr><td>EU 20 individual PFAS in drinking water</td><td>0.1</td><td>ppb</td></tr>
<tr><td>Nitrofuran metabolites in poultry</td><td>0.5</td><td>ppb</td></tr>
<tr><td>Malachite green in shrimp</td><td>1</td><td>ppb</td></tr>
</table>
*The successful bidder should be able to at least meet five out of seven including the analytes marked with ♣ mark.</td></tr>
<tr><td>1.2.4.2</td><td>APCI Sensitivity</td><td>a. Sensitivity of the instruments: In APCI +ve : 200 fg/µL of Reserpine sensitivity should be 100,000:1 or better</td></tr>
<tr><td>1.3</td><td>Interface & Ion guide</td><td>a. The interface should maintain the cleanliness of ion optics and be capable of handling large batches of complex samples. Documentary evidence should be provided for the technology used to maintain cleanliness.<br>b. Cleaning of the source should be done without venting the system and facility to the vacuum interlock.</td></tr>
<tr><td rowspan="2">1.4</td><td>Quadrupole Analyzer:</td><td>a. Mass Range - The quadrupole mass range 5 – 2000 m/z or better.</td></tr>
<tr><td>b. Mass Resolution #</td><td>i. Reserpine - Resolution should be up to ≤0.25 Da FWMH for better selectivity across the entire mass range</td></tr>
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| | | **ii.** Chloramphenicol - Resolution should be ≤0.25 Da FWMH for better selectivity across the entire mass range |
| | **c. MRM** | i. Minimum MRM dwell time 1 ms or better. If the dwell time is not available in a broacher, the basic required details should be provided to calculate the dwell time. |
| | | ii. MRM Transition acquisition rate ≥500/ sec, with no loss in sensitivity for co-eluting components at any point in time |
| | d. **Polarity Switching Time** | +ve / -ve polarity switching time within the source should be 5 ms or better |
| | **e. Scan Speed** | Should have a scan speed of 12,000 amu per sec or better. |
| | **f. Selectivity #** | I. The system should have a facility to identify and confirm the contaminants in residue level with a method other than MRM/ion ratio (Product ion scan). Provide documentary evidence. |
| | | II. The system should have an open architecture/ open source spectral libraries which facilitate the mass spectral comparison in mycotoxins, veterinary antibiotic residues, and pesticide residue analysis. (Users should have the ability to add new records to the library) |
| | | III. Ability to identify known-unknown compounds (compounds having previous MS full scan data published in reputed mass spectral databases/NIST/own developed libraries) by mass spectral matches. |
| | **g. Tuning/ Operation Modes** | **The following scan modes should be available**<br>MS/ Full scanning<br>i. Selected ion monitoring/recording (SIM/SIR)<br>ii. Product ion scanning<br>iii. Precursor ion scanning<br>iv. Neutral loss/gain scanning<br>v. Multiple reaction monitoring (MRM)<br>vi. Simultaneous full scan and MRM with enhanced resolution (ER) |
| 1.5 | **Collision Cell** | **i.** Specify additional features to minimize cross-talk (Provide Literature) |

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| | | ii. Specify gas/s requirements |
| 1.6 | **Detector** | i. An electron multiplier or a photomultiplier detector having a linear range mentioned in 1.2.3 is preferred |
| | | ii. Specify the life time of the detector under standard operations. |
| 1.7 | **Vacuum System** | i. Should have minimum maintenance and utility<br>ii. Noise level should be lower than the recommended for a standard laboratory of 60 dBA<br>iii. Vacuum readbacks can be monitored. Document evidence should be provided. |
| 1.8 | **Gas Control** | a. All gases must be controlled by the software. |
| | | b. **Gas generators** with inbuilt compressors of the latest model of a reputed brand compatible with the LC MSMS model/make should be quoted, capable of supplying Nitrogen/zero gas (dry air) with the required purity, pressure, and flow rate as required for the LC-MS/MS instrument should be provided. It should be complete, with all necessary accessories. Documentary evidence should be provided |
| | | c. Generator with an inbuilt compressor should be provided. Noise level should be lower than the recommended for a standard laboratory of 55 dBA as given in 1991 HVAC Applications Handbook or a noise cut cover should be provided to reduce the noise level less than 55dBA. |
| | | d. Collision Gas: The instrument may use argon or nitrogen gas as a collision gas. If a separate gas other than nitrogen is used, a separate filled gas cylinder and essential accessories (including a regulator) should be provided. |
| 2.0 | **Ultra-Performance Liquid Chromatography System/Ultra High-Performance Liquid Chromatography System** | a. The UHPLC system and the MS should be able to be controlled individually by software. |
| | | **b.** There should be some provision for a mobile phase monitoring facility to measure the volume of liquid remaining in each mobile phase bottle in real-time. |

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| 2.1 | **Pump** | 1. High-pressure quaternary Gradient mixing pumps should be available. |
| | | 2. Vacuum degassing for all channels. |
| | | 3. Operating flow range should be 0.001- 3.000 mL/min or better with 1 µL increments. |
| | | 4. Capability to handle pressure range upto 15000 psi or better |
| | | 5. Flow precision ≤ 0.1 % RSD at constant temperature or better. |
| | | 6. Flow accuracy ± 1% or better. |
| | | 7. Gradient concentration accuracy ± 0.15% or better |
| | | 8. Usable solvent types should include both organic and aqueous solutions and it should work at full scale of pH range of 1 to 14. |
| | | 9. Pressure pulsation < 2 % amplitude |
| 2.2 | **Autosampler** | 1. 100 or better vial positions in sample tray (2mL vial size) |
| | | 2. Injection volume is programmable from 0.1 to 100 µL |
| | | 3. A separate loop for injection volume of 1000 µL should be provided. |
| | | 4. The carryover must be ≤ 0.002% with caffeine or better. |
| | | 5. Injection volume accuracy ≤ 1% or better |
| | | 6. Operating temperature range: 4°C to 40°C |
| | | 7. The injector should have the facility to do programmable injection |
| 2.3 | **Column Oven** | 1. Room/Ambient temperature -10 °C to 80 °C with 1°C increment |
| | | 2. Temperature accuracy better than ±1°C. |
| | | 3. Temperature stability better than ±0.1°C |
| | | 4. Column capacity: 2 x 50 mm length (L) column and 2 x 100 mm L column or 2 x 250 mm L column |
| | | 5. Column switching valve should be available to manage at least two columns or any other similar technology for unattended changing of columns |
| 3 | **Accessories** | |
| | | 1. Mass spec consumables:<br>**i.** Electrode/ ESI and APCI capillaries (Qty 5 each) |

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| | | ii. Two consumable kits for mass spec, including roughing pump oil 4 L<br>( If the vendor is giving a dry pump then quote 2 PM kits for a dry roughing pump) |
| | | iii. Compatible PEEK tubing (2 m) and PEEK ferrules (10 Nos) /SS ferrules (4 Nos) |
| | | 1. Compatible LC columns - **QUOTE SEPARATLY**<br>i. C18 (3.0×50) mm 2.6 µm -02 nos |
| | | ii. C18 (3.0×50 mm 4.6 µm -02 nos |
| | | iii. C18 (100 x 2.1mm) 2.6 µm -02 nos |
| | | iv. C18 (3.0×150 mm) 3 µm -02 nos |
| | | v. HILLIC (3.0×50) mm 4.6 µm -02 nos |
| | | vi. HILLIC (3.0×100) mm 4.6 µm -02 nos |
| | | vii. Analytical column to analyze highly polar analytes (3 u, 3.0 ×50 mm) – 02 nos |
| | | 3. UPLC consumables required for PM for two years |
| | | 4. Four solvent reservoir bottles. |
| | | 5. Two replacement consumable kits (service kits) for the nitrogen generator |
| 4 | | **System Controller and Operating System**<br>1. Software must be a multitasking type. It must acquire and process the data simultaneously. |
| | | 2. The availability of a facility to export mass spectrometric data to mzML/ vendor-neutral XML data format would be an added advantage. |
| | | 3. Application manager software must be able to perform automated full scan, SIM/SIR or MRM data acquisition, peak integration, calibration, quantification, and QC calculations. Provide documentary evidence. |
| | | 4. The quantification method editor must be viewable in a page view or spreadsheet. |
| | | 5. Perform alternating positive/negative scans in one run. |
| | | 6. Automated quantitation and reporting of acquired samples. |
| | | 7. Mention the availability of the ability of online data processing while being acquired. |

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| | | 8. Remote diagnostics that can perform instrument diagnostics, monitor all operating and electrical parameters and allow remote tuning capability in real-time. |
| | | 9. The workstation must be able to control the MS, and acquire, store, process and reproduce the data by the same computer. |
| | | 10. Provision to **install the data processing licenced software in an additional 4 nos of PCs free of charge** (only the software) |
| | | 11. The workstation computer should comply with the following specifications and it **should be factory tested or principal verified.**<br>I. Branded Intel at least Core i7 Processor with a minimum of 3.2 GHz Processor speed, 16 GB RAM, 1TB SSD/NVME, CD/DVD RW with a separate graphics card that can support multiple displays with preloaded latest possible version of Windows OS. Monitor with 23.5" for Instrument operation and Data Acquisition. |
| | | II. Separate Branded Intel at least Core i7 Processor with a minimum of 3.2 GHz Processor speed, 16 GB RAM, 1TB SSD/NVME, CD/DVD RW with a separate graphics card that can support multiple displays with preloaded latest possible version of Windows OS. Monitor with 23.5" for data processing. |
| | | 12. Two external hard drives with a minimum capacity of 4 TB each. |
| | | 13. A branded networkable laserjet duplex printer should be provided. |
| 5 | | **Power Requirements**<br>1. 230 V, 50 Hz |
| | | 2. A suitable online UPS of 10 kVA capacity with at least 10 minutes backup for the complete system should be provided. |
| 6 | | **Manufacturer's Warranty ****<br>1. 2-year comprehensive manufacturer's warranty of the total system, including the N2 gas generator and PCs, which will be effective after satisfactory installation, commissioning, and acceptance by ITI. |
| | | 2. Quote separately for a one-year extended warranty |
| | | 3. **Free of cost** upgradation of software within the first five years after the commission to the latest version (if applicable) |

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<tr><td></td><td></td><td>4. Provide a service agreement after the warranty period.
<table>
<tr><th>Years from the date of Purchase</th><th>Terms and Conditions</th><th>Service Charges without consumables (LKR)</th></tr>
<tr><td>3rd Year</td><td>Specify</td><td></td></tr>
<tr><td>4th Year</td><td>If different from the previous year, specify</td><td></td></tr>
<tr><td>5th Year</td><td>do</td><td></td></tr>
<tr><td>6th Year</td><td>do</td><td></td></tr>
<tr><td>7th Year</td><td>do</td><td></td></tr>
</table></td></tr>
<tr><td>7</td><td>Pre-installation/site planning requirement</td><td>Complete technical details of pre-installation requirements should be furnished along with the technical bid.<br>Please provide a separate quotation for a compatible table suitable for the LC-MS/MS system. The bidder is required to visit the site to assess and identify an appropriate location for placing the table.</td></tr>
<tr><td>8</td><td>Installation/ Commissioning **</td><td>1. Installation - Complete interfacing of the system with its subsystems and commissioning is to be carried out by the vendor’s factory-trained engineers nominated by the principals/local service provider, followed by a demonstration of the system’s performance. Documentary evidence for the training, along with the CV, should be provided along with the bid.</td></tr>
<tr><td></td><td></td><td>2. Unlimited breakdown calls on service/application support, by the engineers should be attended to immediately within 24-48 hrs without fail upon receiving official communication from ITI.</td></tr>
<tr><td></td><td></td><td>3. The details of the available engineers and application specialists trained for the same brand (name and contact details) must be provided in the technical bid. Documentary evidence for the training, along with the CV should be provided</td></tr>
<tr><td></td><td></td><td>4. The vendor should be committed to giving at least 10 years of technical support after the warranty period.</td></tr>
<tr><td></td><td></td><td>5. The commissioning of the system should be carried out within two weeks after the installation. The plan should be submitted with the tender.</td></tr>
<tr><td></td><td></td><td>6. During commissioning, the supplier should demonstrate the system performance for all specified scan modes given in 1.4 g by analyzing the below compounds (8.7.i to 8.7. ix) and a summary report should be submitted to the laboratory with relevant data immediately after commissioning the system. Documentary evidence for the below analysis should be provided with the bid.</td></tr>
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| | | 7. The list of compounds and matrices in which the performance should be demonstrated,<br>**i.** Aflatoxin B1, B2, G1, and G2 **(LOD should be 1 µg/kg in matrix) in black pepper** |
| | | ii. Aflatoxin M1 in **cheese (LOD should be less than 0.05 µg/kg in matrix)** |
| | | iii. Eight Nitrofuran and respective metabolites **(LOD should be less than 0.5 µg/kg in matrix)** in poultry meat samples |
| | | **iv.** Screening of at least **700 Pesticide residues in a single run with polarity switching (instrument detection limit should be 0.5 ppb in the matrix- Black Tea)** Δ |
| | | v. **Glyphosate in Green Tea with online derivatization (LOD should be 0.01 mg/kg in matrix)** Δ |
| | | **vi. DCD and melamine in milk powder from a single method (LOD should be less than 0.5 mg/kg for melamine and 0.05 mg/kg for DCD)** Δ |
| | | **vii. Analysis of MCPA, 2,4 D in water from 2 different analytical columns by using the column switching facility** Δ |
| | | **viii. PFAS in drinking water** Δ |
| | | **ix. An unknown sample will be provided and the compound identification should be completed during the commissioning.** Δ |
| | | 8. The relevant literature supporting the above claims should be provided |
| | | 9. The bidder should be able to demonstrate at least seven from 8.7.i to 8.7.ix including analyses marked with Δ |
| | | 10. Specific accessories (PFAS kit etc.) and other consumables such as reagents, columns, CRMs required for this purpose have to be provided by the supplier |
| 9 | **Instrument Training**** | 1. Once the installation is completed by the service engineer, basic introductory training - Users of the equipment should be provided with a **minimum of one week of training on instrument & software operation, method development, optimization, and troubleshooting** by **an application engineer/scientist from the principals** |
| | | 2. Further, **an application engineer/ scientist from the principals should be available for another three weeks at ITI to support the staff on method development and validation** for Aflatoxins, veterinary antibiotic residues, pesticide residues, and PFAS in different matrices. |

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| | | 3. Advanced application training – An advanced **overseas application training** should be provided at the site of principal's laboratory **after four months from the commissioning** for **three analysts of ITI.** |
| | | 4. Further application support is required during the warranty period, **free of cost at the site of installation** as & **when required within 24 to 72 h,** including instrument & software operation, method development, optimization, troubleshooting etc. The above conditions should specifically be mentioned in the technical bid. |
| 10 | **Tender Essential Requirements**** | i. The vendor must also quote all the accessories for the smooth functioning of systems. |
| | | ii. The vendor must highlight the desired specifications in their technical brochure sheets, give references for all specifications, and mention compliance with proposed specifications. |
| | | iii. Suppliers must provide active local support |
| | | iv. In the case of a major breakdown, **the supplier should make the replacement of the required spare parts worth up to LKR 2.0 M on credit basis up to 30 days**.<br>v. This credit **facility should be provided up to 7 years** after the warranty. In a major breakdown, the accepted maximum instrument downtime should be less than three weeks. |
| | | vi. The warranty shall commence only upon successful completion of the commissioning and acceptance of the system by ITI. |
| | | vii. The instruments should be provided with the necessary toolkits and start-up kits. |
| | | viii. ITI will keep 30% of the total until the vendor successfully completes the installation (8.1), commissioning ((8.7), and training of ITI staff (9). |

# Key evaluation criteria

** An agreement for the terms and conditions marked with ** should be provided on company letterhead with approval along with the bid.

*** The successful bidder,

1. Should essentially comply with all the key evaluation criteria highlighted with # mark
2. Should be the lowest responsive offer

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