

PART 2

REQUIREMENT SPECIFICATIONS

1. SCOPE OF TENDER

The scope of this tender is for the Supply, Delivery, Installation, Commissioning, and maintenance of one unit of high performance liquid chromatograph mass spectrometer (the "Equipment") to the Department of Biological Sciences, National University of Singapore

The Equipment shall be delivered to: National University of Singapore, Centre for Life Sciences, 28 Medical Drive #03-03 Singapore 117456. The Contractor shall be fully responsible for all transport required (including costs and expenses thereof) for the delivery of the Equipment to the NUS' designated site.

2. TECHNICAL SPECIFICATIONS

i) The system must be an Ultra high-performance liquid chromatography (UHPLC) coupled to a tandem triple quadrupole mass spectrometer (MS/MS). The necessary modules will include:

1. Binary Solvent Delivery System for Micro, Semi-Micro, Analytical flowrates
2. Degasser
3. Auto-Injector
4. Column Oven
5. Mass Spectrometer
6. Acquisition System and software
7. Data Analysis software

More in detail:

ii) The UHPLC system should have the following specifications:

- a flow rate between 0.0001 to 10 ml/min in 0.1 μ l/min step.
- a maximum pump pressure compatible with running UHPLC analysis method. The maximum pressure setting range should not be less than 130 MPa at <3 ml/min flowrate.
- the standard gradient mixer should have delay volume of 20 μ l.
- it should employ valves that allow stable delivery of non-polar organic solvents.
- sample injection volume should be between 0.1 μ l to at least 20 μ l.
- It must be capable of very fast injection time of <10sec/sample, faster injection speed is preferred
- Flow line rinse capability both before and after sampling
- Temperature setting range of autosampler should be from 4 to 40°C
- Injection volume accuracy must be below 1%
- the column oven should be forced-air-circulation type for uniform temperature distribution
- The temperature range of the oven should be ambient to 85°C
- Temperature control precision should be $\pm 0.1^\circ\text{C}$
- Capable of complex temperature programming in linear and step programs
- It should be able to handle up to 3 x 30 cm columns

iii) The mass spectrometer should have the following specifications:

- The system must be equipped with Atmospheric Pressure Ionisation (API) Probes
- One set of ESI (Electro spray Ionisation)
- Nitrogen must be used as Nebuliser gas and the consumption of Nitrogen should not be more than 25 L/mins

- APCI (Atmospheric Pressure Chemical Ionisation) interface must be available as an option.
 - ESI source must be capable to handle flow rate 0.001 to 2mL/min.
 - An Extra syringe pump must be available for direct infusion of sample.
 - Dual ionization source (ESI and APCI) interface must be available as an option.
 - The ionization probes switching should be simple and tool free
 - The cleaning and maintenance of ion source should be simple and preferably without breaking the vacuum.
 - The mass analyser must consist of 2, high standard Quadrupoles and one collision cell.
 - Mass range should be from m/z 2 to 2000 at least
 - The mass spectrometer must be able to perform fast scanning for achieving high speed data acquisition for accurate and precise quantitation over 2-4 seconds narrow UHPLC peaks. The scan speed should not be less than 30,000 amu/sec. higher scan speed is preferred.
 - Detection of Positive/Negative ions should be user-selectable and the switching time between positive and negative polarity must be fast to analyze large number of compounds with both positive and negative polarities in single run. The polarity switching time should be less than 20 msec, lower switching time is preferred.
 - Resolution should be below 0.7 u.
 - Mass Measurement Accuracy, the accuracy must be less than +/- 0.1 u
 - MS-MS capability must be available via Collision Induced Dissociation (CID).
 - The collision cell must be capable of performing high speed MRM analysis with lowest possible dwell time and pause time to ensure fast acquisition of MRM. Dwell time and pause time must be below 1 msec, lower is preferred.
 - Should be able to measure 500 MRM in one Second, more is preferred.
 - Software controlled flow switching valve for diverting the flow to waste, must be available
- iv) The Control and software should have the following specifications:
- System must come with at least 10 licenses for offline data analysis software.
 - Single software platform must be provided for all the modules of LC and MS
 - It should cover instrument control, qualitative and quantitative processing, report creation, self-diagnosis and auto-tuning
 - An Instrument Interface optimization software feature should be available
 - MSMS Acquisition mode must have various modes: MRM, Product ion scan, Precursor ion scan and Neutral ion scan.
 - Each mode of acquisition should have at least 1000 events.
 - Auto-tuning with sensitivity and resolution optimization for both positive ion and negative ion modes should be standard.
 - Method file should be capable to save all analysis parameters, data processing parameters and report format.
 - The data need to be compatible with conversion to other formats. Spread Sheet software and word-processing software can be readily employed to provide data in tables or graphs through industry standard protocols
 - Software must have its own log files for complete audit trail. When possible, the vendor should provide method packages providing readymade methods for LC and MS parameters for various applications

3. OTHER REQUIREMENTS

3.1 Utilities Requirement

Utilities requirement for the system should be specified in detail in the tender submission. The tenderer is required to be accurate and specific in specifying all the equipment consumption and emission ratings (for example, electrical input current rating, water supply, compressed air supply, exhaust ratings, etc., where applicable).

3.2 Safety Requirements

At all times in its performance of the works described above, the Contractor shall comply with all safety rules and regulations stipulated by the relevant authorities as well as and in accordance with industry best practices. At all times in its performance of the works described above, the Contractor shall possess and maintain (and shall ensure all its employees or contractors performing the works shall possess) all relevant certificates and permits required under law for its performance of the works described in above, including any certificates or legal documents required by NUS. Tenderers are to submit all relevant certificates and permits required under law as part of tender submission, and during the period of the Contract, shall provide copies of such certificates at NUS' request from time to time.

3.3 Factory Acceptance Test (FAT)

- a) The Tenderer should provide as part of its tender submission the factory acceptance test protocol as recommended by the manufacturer so as to demonstrate full compliance to the Specifications. NUS reserves the right to amend the protocol as it deems necessary. The Tenderer agrees to perform the acceptance test as agreed, to the satisfaction of NUS.
- b) Factory Test Acceptance Test Criteria. The factory acceptance test shall include, but not limited to:
 - i. All the parameters routinely tested by the manufacturer
As an example: Sensitivity, Positive ESI, the measured signal-to-noise ratio [RMS] obtained from the chromatogram monitoring the transition m/z 609 to m/z 195 on injection of 1 pg of Reserpine should be more than or equal to 1,500,000:1, based on a 1- μ L injection of a 1 pg/ μ L Reserpine solution in 70:30 Acetonitrile/Water (no additives), at a flow rate of 400 μ L/min in MRM mode.
 - Sensitivity, negative ESI, the measured signal-to-noise ratio [RMS] obtained from the chromatogram monitoring the transition m/z 321 to m/z 152 on injection of 1 pg of Chloramphenicol should be more than or equal to 1,500,000:1, based on a 1- μ L injection of a 1 pg/ μ L Chloramphenicol solution in 70:30 Acetonitrile/Water (no additives), at a flow rate of 400 μ L/min in MRM mode.

3.4 Price

- a) Pricing shall include freight and insurance to the delivery location.
- b) All software to enable the proper functioning and use of the system to meet the requirements of NUS will be supplied together with the equipment. The license fees for all software shall be included within the Contract price. Contractor and/or its software licensor shall grant and NUS shall have the perpetual right

and licence to use the software and such right and license shall be transferable upon the transfer or sale of the system.

3.5 Export and Import licenses

Export / Import licenses if required, should be clearly indicated.

The Tenderer shall provide any export/import licenses to NUS as may be required. The Tenderer shall make its own arrangements regarding import and export licenses, custom and import duties and all related matters from their manufacturing/production origination to the NUS designated site.

3.6 Site Preparation

The Tenderer shall provide in its tender submission the information with regard to the dimensions and weights of the various component parts of the system as well as any specific site or environmental requirements. Within one month of the award of tender, the Contractor shall supply to NUS such information and assistance as may be necessary to enable NUS to conduct site preparation for the installation of the system.

3.7 Installation, Commissioning and Training

a) Installation

Equipment should be installed without disruption to normal operations. The Contractor shall warrant that upon its delivery and installation, each item of the system shall be in good working order and will conform to the Requirement Specifications and the Contractor's official published specifications. The Contractor shall provide all tools and equipment necessary for the installation of the system at no additional charge.

b) Commissioning

Equipment commissioning should be carried out for full functionality of hardware, software and process.

c) Training

Training should be carried out after the commissioning of the equipment for at least 4 personnel. The training should cover software and hardware operation, as well as the standard maintenance requirements.

3.8 Site Acceptance Test (SAT)

- a) The Site Acceptance Test is to be inspected by 1 personnel from NUS.
- b) The Tenderer should provide as part of its tender submission the Site Acceptance Test protocol as recommended by the manufacturer so as to demonstrate full compliance to Specifications. NUS reserves the right to amend the protocol as it deems necessary. The Tenderer agrees to perform the acceptance test as agreed, to the satisfaction of NUS.
- c) Site Acceptance Test Criteria. The site acceptance test shall include, but not limited to:
 - i. All the parameters routinely tested by the manufacturer

For example: Sensitivity, Positive ESI, the measured signal-to-noise ratio [RMS] obtained from the chromatogram monitoring the transition m/z 609 to m/z 195 on injection of 1 pg of Reserpine should be more than or equal to 1,500,000:1, based on a 1- μ L injection of a 1 pg/ μ L Reserpine solution in 70:30 Acetonitrile/Water (no additives), at a flow rate of 400 μ L/min in MRM mode.

- Sensitivity, negative ESI, the measured signal-to-noise ratio [RMS] obtained from the chromatogram monitoring the transition m/z 321 to m/z 152 on injection of 1 pg of Chloramphenicol should be more than or equal to 1,500,000:1, based on a 1- μ L injection of a 1 pg/ μ L Chloramphenicol solution in 70:30 Acetonitrile/Water (no additives), at a flow rate of 400 μ L/min in MRM mode.

3.9 Documentation

- a) Three (3) sets of operation and maintenance service manuals in English should be provided.
- b) One (1) set of Factory Acceptance Test report in English (softcopy) shall be submitted within 60 working days upon satisfactory completion of factory acceptance test.
- c) One (1) set of Site Acceptance Test report in English (hardcopy and softcopy) shall be submitted within 7 working days upon satisfactory completion of site acceptance test.

3.10 Support and Maintenance

- a) The Tenderer should provide on-time support for system maintenance, software and hardware troubleshooting. "On-time support" refers to response/help within 24 hours after NUS calls or email; or, if actual physical support at NUS's site is required, it is attendance within 3 business days if system fails to be back into operation with remote support.
- b) Tenderers shall ensure availability of critical spare parts and consumables for at least 5 years. A list of recommended preventive maintenance guidelines shall be provided as part of the tender documentation. Back up equipment support for testing must be available at the supplier's facility during equipment breakdown

3.11 Warranty

The system should have a minimum 12 months on-site comprehensive warranty. The warranty shall include unlimited service calls, all cost of repairs, including but not limited to spare parts, consumables, labour, transport and accommodation. The warranty period shall commence upon satisfactory completion of the Site Acceptance Tests.

3.12 Track Record

Tenderers shall provide track records and references of past projects for similar system installations in the past 3 years.

For clarifications on technical specifications listed herein, tenderers may contact:

Name : Dr Peter Benke
Email : bchdpi@nus.edu.sg

EVALUATION CRITERIA

The following criteria will be used in the evaluation of this tender.

1. Critical Criteria:

Tenderers must satisfy the following critical criteria before their tender proposal will be further evaluated:

- a) Tenderers shall not be debarred from participating in NUS tenders or after the closing date of the tender

2. Other Criteria:

Tenders shall be evaluated based on a Price versus Quality matrix of 40% (Price) to 60% (Quality).

Tender Evaluation Criteria		
Price	Cost Competitiveness	40%
Quality	Level of Compliance with Technical Specifications (Section 2)	40%
	Level of Compliance with Other Requirements (Section 3.1 to 3.11)	15%
	Possess a valid registration certificate with the appropriate Government Registration Authority (EPU/LAB/30 and/or EPU/LTE/10, S5 or higher), or equivalent	3%
	Track record (Section 3.12)	2%
	Total	100%