

PART 2

REQUIREMENT SPECIFICATIONS

A. SCOPE OF TENDER

The scope of this tender is for the Supply, Deliver, Installation, and Commissioning of 1 unit of a high-throughput separation LC system for mass spectrometry analysis.

B. TECHNICAL SPECIFICATIONS

1. Functional Specifications

- 1.1 The LC shall have the ability to function as a high-performance liquid chromatography system delivering analytical flow rates down to 1 $\mu\text{L}/\text{min}$ and lower.
- 1.2 It shall be able to accept samples on disposable trap columns and elute directly off of them, so as to minimize manual sample handling and associated sample loss and maximize sample prep flexibility.
- 1.3 It shall have the ability to transfer the prepared gradient into a storage loop at high flow rate, prior to loading it to an analytical column at the analysis flow rate, so as to minimize overhead and maximize use of the mass spectrometer.
- 1.4 It shall be equipped for high-throughput purposes, ability to store multiple (at least four to six) 96-well sample/tip racks.
- 1.5 It shall demonstrate ability to only do partial elution from trap columns to leave impurities on the trap columns, minimizing carry over.
- 1.6 It shall be equipped with optimized, characterized methods to enable short gradients with minimal overhead time. Overhead on a 21min gradient should not exceed 3 min, to have a total 24 min run-time allowing for analysis of 200 samples/day.
- 1.7 It shall come with at least 20 boxes of 96-tips rack of disposable, purification C18 trap column
- 1.8 It shall come with 3x C18 analytical columns in various length which are compatible with the optimized methods.
- 1.9 It shall come with the interface software, connections and fittings for connection to the existing high-resolution mass spectrometers.

2. Hardware Specifications

- 2.1 It shall come with 2 ranges of pumps, i.e. low pressure pump and high pressure pump. Low pressure pump pressure range shall reach 240 bar. High pressure pump pressure range shall reach 520 bar.
- 2.2 High pressure pump flow range shall be between 100 nL/min to 5000 nL/min .
- 2.3 Low pressure pump flow range shall be between 100 nL/min to 80 $\mu\text{L}/\text{min}$.
- 2.4 Retention time reproducibility shall have standard deviation less than 6 seconds.
- 2.5 It shall demonstrate low carry over, <0.05% total TIC, 1 μg HeLa digest, and 0.1% total TIC 1 μg digested plasma (whole).
- 2.6 It shall be equipped with the following valves:
 - 1x 6-port valve, 10,000 PSI (High Pressure pump valve)
 - 1x 6-port valve, 10,000 PSI (Loop valve)

- 1x 12-port valve, 5,000 PSI (Low Pressure pump valve)
- 2.7 Sample tray format shall accommodate up to 6 boxes of 96 tips.

C. OTHER REQUIREMENTS

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).

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. Factory Acceptance Test (FAT)

- a) Testing of the equipment shall take place within the delivery time in order to formally ascertain conformity with requirement specifications. The procedure must be properly documented and recorded and a copy of the report must be provided.
- b) Factory Test Acceptance Test Criteria. The factory acceptance test shall include, but not limited to:
 - i. System function & leak tests

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.

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.

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.

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

The supplier shall provide appropriate on-site training after installation of the system by adequately skilled application specialist who can provide both technical and application support for our required assays.

8. Site Acceptance Test (SAT)

- a) The Site Acceptance Test is to be inspected by personnel from the Quantitative Proteomics Core at CSI.
- b) Testing of the equipment shall take place in order to formally ascertain the conformity with requirement specifications. The procedure must be properly documented and recorded and a copy of the report must be provided.
- c) Site Acceptance Test Criteria. The site acceptance test shall include, but not limited to:
 - i. System function and leak tests
 - ii. LC-MS/MS test with HeLa digest (MS system is available on-site)

9. Documentation

- a) The full documentation related to the system shall include detailed technical specifications of all components, maintenance and service guidelines, and a comprehensive user manual covering all operational aspects of the system, including error messages and their handling. The documentation (both hard and PDF copy) shall be provided in clear English.

- b) One (1) set of Factory Acceptance Test report in English (softcopy) shall be submitted within 7 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 days upon satisfactory completion of site acceptance test.

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 48 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 7 years. A list of recommended preventive maintenance guidelines shall be provided as part of the tender documentation.

11. Warranty

The system should have a minimum 12 months on-site comprehensive warranty. The warranty shall include 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.

12. Comprehensive Maintenance Contract (Option)

- a) Tenderer shall quote for an optional comprehensive maintenance contract of three (3) years (inclusive of labour, parts, shipping costs of parts etc.) to be renewed on an annual basis.
 - i. Year 1 – Commence from end of warranty period of 12 months. This option shall be exercisable by NUS no later than 2 weeks before the warranty period expires.
 - ii. Year 2 - Commence from end of Year 1 maintenance contract. This option shall be exercisable by NUS no later than 2 weeks before the Year 1 maintenance contract expires.
 - iii. Year 3 - Commence from end of Year 2 maintenance contract. This option shall be exercisable by NUS no later than 2 weeks before the Year 2 maintenance contract expires.
- b) If any of the services performed is found to be deficient, the Tenderer shall, at its own cost and expense (including transportation costs), at the written notification of NUS, re-perform the same, within 7 days, which shall commence from the said notification and end upon the acceptance of the re-performed services.
- c) Any checks or repairs should be made on-site by a qualified and trained engineer.
- d) The Tenderer shall inform NUS on the repairs required before proceeding with the repairs.

- e) Service reports should be provided after the servicing or repair has been completed.

13. Track Record

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

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

2. Other Criteria:

- (a) Competitive Pricing (30%)
- (b) Compliance with Requirement Specifications (30%)
- (c) Quality of Proposal – Ability to exceed requirements in accordance with NUS' needs (20%)
- (d) Track record (10%)
- (e) Ability to meet delivery schedule (5%)
- (f) Possess a valid registration certificate with the appropriate Government Registration Authority (5%)
 - Supply Head Reference: EPU/LTE/10; Financial Limit: S3 or higher; or
 - Supply Head Reference: EPU/LAB/30; Financial Limit: S3 or higher