

REQUIREMENT SPECIFICATIONS

Supply, Delivery, Installation and Commissioning

of

Two (2) Units of Ultra High Performance Liquid Chromatograph
Triple Quadrupole Mass Spectrometer Systems (UHPLC/MS/MS)

to

Veterinary Public Health Laboratories,
Agri-Food & Veterinary Authority of Singapore
10 Perahu Road
Singapore 718837

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A. GENERAL INFORMATION

The two (2) units of Ultra High Performance Liquid Chromatograph – Triple Quadrupole Mass Spectrometer System (UHPLC/MS/MS) should each comprise of the following components:

1. Sample introduction system
2. Column oven
3. Solvent delivery system
4. Solvent degasser
5. Triple quadrupole mass spectrometer system
6. Computer system for hardware control and data handling
7. Printer

B. REQUIREMENT SPECIFICATIONS

The tender specifications for the equipment are listed below. Please note that the **critical requirement specifications are marked by double asterisk (**)**

REQUIREMENT SPECIFICATIONS	
The system must be able to operate at 220/240 volt, 50/60 Hz**	
1. SAMPLE INTRODUCTION SYSTEM	
-	Should be well-plate type to enable short injection cycle time for running UHPLC
-	Handles at least 100 samples in standard 1.5 or 2 ml vials
-	Expandable and programmable to accommodate to ≥ 2 standard size of 96-well plates
-	Priority sample capability
-	Random access to individual samples
-	Programmable needle wash with multi-choice of solvents
-	Carryover should be $<0.005\%$
-	Programmable injection volume from 0-100 μl in 0.1 μl steps
-	Injection Precision: at least 0.5% RSD from 5-100 μl and at least 1% RSD from 1-5 μl
-	Injection accuracy: at least 1% from 5-100 μL
-	Must have a thermostating module to control the temperature of the sample vials (should be settable within 4 °C to 35 °C)**
-	Programmable needle height control with up to at least 0.1 mm increments**
-	Must be compatible with high system pressure up to 1200 bar**
2. COLUMN OVEN	
-	Temperature range: 10 °C above ambient to 80 °C in 0.1°C steps
-	Temperature stability: ± 0.05 °C for flow rates between 0.2 and 2 ml/min
-	Temperature set point accuracy: ± 0.8 °C
-	Heat-up rate: within 5 min from ambient to 40 °C
-	Can house at least 3 columns with built-in column switching valves**
-	Should be able to handle column length from 10-250 mm

3. SOLVENT DELIVERY SYSTEM

- High performance binary gradient pump system with switching valves to at least accommodate 4 solvent channels
- Pressure pulsation should be <2% amplitude or <5 bar, whichever is greater for 1ml/min flow rate**
- Able to run in two modes: in standard delay volume mode for normal HPLC and low delay volume mode for fast HPLC, without upgrading any hardware
- Operating settable flow rate 0.001 – 2 ml/min in 0.001 ml/min increments
- Flow accuracy: $\pm 1.0\%$ RSD or 10 $\mu\text{l}/\text{min}$, whichever is greater
- Flow precision: $\leq 0.075\%$ RSD or ≤ 0.01 min SD, whichever is greater (from 0.2-2 ml/min)
- Compositional accuracy: $\pm 0.5\%$ RSD
- Compositional precision: $\leq 0.15\%$ RSD at flow rate of 1 ml/min
- Ultra high pressure up to 1200 bar for flow rates up to 2 ml/min**
- Lowest delay volume down to <75 μl **
- Equipped with a leak sensor which will send feedback to software when leaks are detected and pump will stop
- Supplied with at least four 1-L amber bottles and four 1-L clear bottles, complete with 4 inlet filters and 4 caps with inlet holes and plugs (1 set/unit)
- Flow path should be able to handle solvent pH range from 2-12

4. SOLVENT DEGASSER

- On-line vacuum type
- Maximum flow rate: 2 ml/min per channel
- Internal volume per channel should not be more than 0.5 ml
- Should have at least 2 independent channels
- Error status should be fed back to system software

5. TRIPLE QUADRUPOLE MASS SPECTROMETER SYSTEM

a. General

- Minimum mass range : 10-2000 amu
- Scan speed at least 10,000 amu/sec**
- Mass stability ± 0.1 amu over 24 hrs**
- Uses high purity nitrogen for collision purpose
- Has an integrated divert valve to switch the LC flow to waste during void volume elution, gradient end-point and any other portion of analytical run
- Source elements can be removed for cleaning without breaking vacuum
- Fully automated optimization of ion optics and mass axis calibration
- Positive/Negative polarity switching must be less than 35 ms, in continuous mode during LC/MS and LC/MS/MS runs**
- Delivered with 2 syringes and syringe pump for direct infusion and split infusion at flow from 2–100 $\mu\text{l/min}$.
- To provide T- union for split infusion (2 per unit)
- Delivered with necessary tubing, adaptors, connectors and tools for enabling the above functions

b. Electrospray Ionisation (ESI) Source

- Compatible with liquid flow rates of 5 $\mu\text{l/min}$ to 3 ml/min without splitting
- Source temperature: 400°C or higher
- Full gradient capability from 100% aqueous to 100% organic
- Sensitivity: 1 pg reserpine injected on column with S/N>150000:1 for positive mode**
- Sensitivity: 1 pg of chloramphenicol injected on column with S/N>150000:1 for negative mode

c. Mass Analyzers

- Allows the following data acquisition modes: Full scan MS, selected ion for both Q1 and Q3 product ion scan, precursor scan, neutral loss/gain scan, multiple reaction monitoring (MRM), scheduled MRM, MS² scan and MRM³ scan.
- Minimum dwell time of 1 ms**
- Linear Quadrupole mass analyser that is able to concentrate ions effectively and to acquire the mass spectrum for confirmation of unknown compounds at a higher confidence level**

d. Mass Detector

- Has off-axis electron multiplier detector
- Detector operates in both positive and negative ion modes
- At least six orders of magnitude for linearity

e. Vacuum System

- The high vacuum must be maintained by turbo-molecular pump. This pump should be backed by mechanical (rough) pump**
- Must be delivered with enclosure to reduce the noise level of the mechanical pump**

6. COMPUTER SYSTEM FOR HARD WARE CONTROL AND DATA HANDLING

a. Hardware

- Minimally equivalent to performance of Pentium Intel Core i7- 6700 processor (2.80GHz)
- At least 16 GB DDR3 SDRAM
- At least 2 GB graphics card
- At least 1 TB hard disk + one external 1 TB hard disk
- At least 23" wide full HD LED monitor
- Resolution : at least 1920 x 1080
- DVD +/- R/RW SuperMulti Drive
- Optical mouse with scroll wheel
- Min 6 USB ports, at least 3 in front
- Pre-installed MS Windows 10 or newer version
- Pre-installed Microsoft Office 2016 comprising Word, Excel and PowerPoint
- Latest antivirus software

b. System control and data handling software

- Must be able to provide fully integrated control for both the ultra-high performance liquid chromatograph (UHPLC) and the triple quadrupole mass spectrometer (MS/MS) systems**
- Has on-line help for instrument control programs as well as user manual in PDF file format
- Capable of tuning for electrospray (ESI) in positive and negative ion modes
- Automatic mass calibration routines
- Zoom scan capability for achieving higher mass resolution
- Automatic determination of MRM transitions for easy method development**
- Dynamic/Scheduled MRM function with automatic maximization of dwell time for multi-component analysis**
- The setting parameters of data acquisition and processing for existing/remaining compounds should not be affected by the addition or deletion of compounds**

7. PRINTER

- Monochrome laser printer
- Printing resolution: at least 1200x1200dpi
- Printing speed: At least 50 ppm in black
- Allow automatic duplex printing, with at least 36spm
- Capacity of input tray: at least 500 A4-size sheets
- Capacity of output tray: at least 250 sheets
- Must be supplied with 6 sets of black toner cartridges (3 sets/unit)**

8. OTHER REQUIREMENTS

a. Trade-In

- Tenderers to quote for trade-in value of the following HPLC-MS system:

I. Shimadzu Prominence LC with the following modules:

- System controller : CBM-20A
- Solvent delivery unit: LC-20AD
- Auto-sampler: SIL-20AC
- Degasser: DGU-20A₃
- Diode Array Detector: SPD-M20A

II. Shimadzu Mass Spectrometer: LCMS-2010EV

b. User Training

- Comprehensive training must be provided by the competent application chemist for all users(at least 4 users per unit) on the principle, operation and maintenance of the proposed systems**

c. Application databases/libraries

- Tenderers to provide and install pre-established application databases/libraries coming with both retention time and MRM information for every entry of dyes & food additives and mycotoxins & marine biotoxins.
- If no pre-established library, technical support must be provided to create the library in the customer's system. The rights of this library will belong to AVA use only**

d. Application and technical Support

- Tenderers must provide labour and logistic support to re-locate two existing HPLC systems within each laboratory in order to make way for the 2 new LC-MSMS instruments**
- Tenderers must provide 4 start-up columns per LCMSMS system, which are compatible with the installed libraries/databases**
- Set up the full methods based on the libraries/databases loaded onto the new systems
- Set up the running conditions for existing and new test methods as requested by AVA**
- Tenderers must have a local technical support team consisting of service engineers and application chemists to provide equipment maintenance and trouble-shooting services**
- Tenderers must migrate the existing methods to the new system, ensure the methods are running properly**
- Tenderers must provide application support to set up new application for dyes, food additives, marine biotoxins and other foodborne toxins including sample preparation for processed food and seafood samples within 6 months of commission**

C OTHER TENDER INFORMATION

1. AVA reserves the rights to award the tender in whole or in parts to different tenderers.
2. Under Section D – Schedule of Prices, Tenderer should provide the trade-in value for one HPLC-MS system.
3. Tenderers to state in their tender submission the length of the warranty of the whole system, which shall commence from the date of system commissioning.
4. Interested Tenderers are required to collect test samples from AVA for testing on their offered UHPLC/MS/MS system **within the first 5 working days of tender publication.**
5. Interested tenderers are to arrange for collection of samples during office hours with the following:
 - For S/N 1: Allan Phua Yi Hao at 67952808 (allan_phua@ava.gov.sg)
 - For S/N 2: Lock-Lee Seow Lian at 67952816 (lock-lee_seow_lian@ava.gov.sg)
or
Jaramy Teo at 6795 2816 (Jaramy_teo@ava.gov.sg)
6. Instruction on the required tests as well as information on sample matrices, indicative lists of dyes/food additives and marine biotoxins in the spiked samples and standard mixtures will be provided on the day of sample collection.
7. All Tenderers must provide both summary report and a detailed report that covers the test methods, the extracted ion chromatograms, calibration curves, and the application libraries used (if any) together with their tender proposal in GeBIZ.

Note: AVA reserves the right to reject tenderers who do not participate in the evaluation sample test or fail to submit the test reports for all the evaluation samples.

8. Contact person
 - For S/N 1: Allan Phua Yi Hao at 67952808 (allan_phua@ava.gov.sg)
 - For S/N 2: Lock-Lee Seow Lian at 67952816 (lock-lee_seow_lian@ava.gov.sg)
or
Jaramy Teo at 6795 2816 (Jaramy_teo@ava.gov.sg)

D SCHEDULE OF PRICES

NOTE:

- It is compulsory for tenderers to fill in the prices for the two UHPLC/MS/MS systems and trade-in value of one HPLC-MS system.
- Prices quoted shall be deemed all inclusive and firm to fulfil the requirement stated in the Requirement Specifications and that additional claims on grounds of omission shall not be entertained.
- AVA reserves the rights to award in parts or in whole.

UHPLC/MS/MS System Tender Price

S/N	Item	Quantity	Price (S\$) [Excluding GST] Price to be entered in GeBIZ
1	Ultra High Performance Liquid Chromatograph /Triple Quadrupole Mass Spectrometer (UHPLC/MS/MS) for testing of <i>dyes and food additives</i>	1 unit	\$ <u>459,093.20</u> [For S/N 1 in GeBIZ]
2	Ultra High Performance Liquid Chromatograph /Triple Quadrupole Mass Spectrometer (UHPLC/MS/MS) for testing of <i>marine biotoxins and mycotoxins</i>	1 unit	\$ <u>459,093.20</u> [For S/N 2 in GeBIZ]

Trade-in Value of HPLC-MS System

Item	Quantity	Trade-in Value (S\$) [Excluding GST]
High Performance Liquid Chromatograph-Mass Spectrometer (HPLC-MS)	1 unit	\$ <u>0.00</u>

E WARRANTY AND SERVICE/ MAINTENANCE CONTRACT

Please note that the **critical requirement specifications are marked by double asterisk (**)**

1. Tenderers are to provide minimum 3 year warranty including all parts and labour.
2. Tenderers must provide one preventive maintenance (PM) service per year with preventive maintenance kit during the warranty period**
3. Tenderers must provide quarterly thorough clean-up of MS spectrometer, inclusive of tuning and calibration of MS during the warranty period**
4. Tenderers must furnish hereunder the rate for the service/maintenance contract as specified below. They must also attach a sample copy of the types of service/maintenance contracts that they normally offer to their customers**
 - Comprehensive maintenance inclusive of all necessary components (e.g. transport, labour, etc) **including** system replacement parts and consumables.
 - Annual preventive maintenance (PM) visit with PM kit supplied
 - Quarterly thorough clean-up of Mass Spectrometer (MS), inclusive of tuning and calibration of Mass Spectrometer (MS)
 - Unlimited breakdown calls
 - Respond to any calls within 1 working day from time of request
 - Replacement of parts within 5 working days from time of request
 - Including parts and repair services for the associated computer and printer
 - For instances that the associated computer and printer is faulty and parts are obsolete/no longer available, the tenderer is responsible to provide the replacement at no additional cost to AVA during the 7 years' coverage.

Item	Year 1	Year 2	Year 3	Tenderer is to quote the comprehensive maintenance for Year 4 to Year 7 [Excluding GST]			
				Year 4	Year 5	Year 6	Year 7
Ultra High Performance Liquid Chromatograph / Triple Quadrupole Mass Spectrometer (UHPLC/MS/MS) (per unit)	Warranty inclusive of at least one PM with PM kit provided. (labour, parts and materials included)	Warranty inclusive of at least one PM with PM kit provided. (labour, parts and materials included)	Warranty inclusive of at least one PM with PM kit provided. (labour, parts and materials included)	\$_32,483.00____	\$_32,483.00____	\$_34195.00____	\$_34195.00____

F SCHEDULE OF SYSTEMS ALREADY INSTALLED BY TENDERER

The tenderer shall furnish in the table below the particulars of the high performance liquid chromatograph- triple quadrupole mass spectrometer systems already installed by them in Singapore.

Details of systems installed		Clients' Details		
Model	Date of Installation	Company Name	Contact Person	Contact Details (Telephone / E-mail)
Xevo TQ-S Micro	15/10/2016	Nanyang Technology University	Provide upon request during evaluation phase.	Provide upon request during evaluation phase.
Xevo TQ-S	6/2/2012	Health Science Authority	Provide upon request during evaluation phase.	Provide upon request during evaluation phase.
Xevo TQD-S X2 (2 systems)	18/9/2014	Lee Kong Chian, Sch Of Medicine	Provide upon request during evaluation phase.	Provide upon request during evaluation phase.
Xevo TQD-S	1/11/2010	MSD	Provide upon request during evaluation phase.	Provide upon request during evaluation phase.
Xevo TQD-S	4/4/2012	BTI	Provide upon request during evaluation phase.	Provide upon request during evaluation phase.
Xevo TQD	30/3/2015	Tuv SUD PSB	Provide upon request during evaluation phase.	Provide upon request during evaluation phase.

G EVALUATION CRITERIA

Critical Criteria

1. Tenderer must be registered under Supply Head:
 - EPU/LAB/30 (Laboratory Equipment and Accessories) with a financial grade of S5 and above; OR
 - EPU/LTE/10 (Laboratory Testing and Survey Equipment) with a financial grade of S5 and above
2. Submission of evaluation samples test reports
3. Full compliance to critical requirement specifications. Tenderer is to complete the Compliance Table as set out in Section H.

Other Criteria

Tenderers who meet the above critical criteria shall be further evaluated against the following criteria:

S/N	CRITERIA	WEIGHTAGE
i	Performance in the testing of evaluation samples	40%
ii	Ability to meet non-critical specifications. Otherwise AVA will consider the proposal which best meets the requirements while remaining technically acceptable. Tenderer is to complete the Compliance Table as set out in Section H.	30%
iii	Price competitiveness	30%
TOTAL		100%

H. COMPLIANCE TABLE

Tenderer is to complete the compliance table to the Requirement Specifications as indicated below. If there is any variation to the specifications, the tenderer must state the variations in the “Remarks” column clearly. Published brochures and/ or certified technical specifications from manufacturer are to be provided in tender submission to substantiate claims on compliance with tender specifications. If relevant data are not available, please state non-compliance.

NOTE: The critical requirement specifications are marked by double asterisk (**)

S/N	Requirement Specifications	Compliance to Specifications (Y/N)	Remarks
1	The system must be able to operate at 220/240 volt, 50/60 Hz**	Y	
SAMPLE INTRODUCTION SYSTEM			
2	Should be well-plate type to enable short injection cycle time for running UHPLC	Y	
3	Handles at least 100 samples in standard 1.5 or 2ml vials	Y	
4	Expandable and programmable to accommodate to ≥ 2 standard size of 96-well plates	Y	
5	Priority sample capability	Y	
6	Random access to individual samples	Y	
7	Programmable needle wash with multi-choice of solvents	Y	
8	Carryover should be $<0.005\%$	Y	
9	Programmable injection volume from 0-100 μl in 0.1 μl steps	Y	
10	Injection Precision: at least 0.5% RSD from 5-100 μl and at least 1% RSD from 1-5 μl	Y	
11	Injection accuracy: at least 1% from 5-100 μL	Y	
12	Must have a thermostating module to control the temperature of the sample vials (should be settable within 4 $^{\circ}\text{C}$ to 35 $^{\circ}\text{C}$)**	Y	4.0 to 40.0 $^{\circ}\text{C}$
13	Programmable needle height control with up to at least 0.1 mm increments**	Y	
14	Must be compatible with high system pressure up to 1200 bar**	Y	$>1200\text{bar}$
COLUMN OVEN			
15	Temperature range: 10 $^{\circ}\text{C}$ above ambient to 80 $^{\circ}\text{C}$ in 0.1 $^{\circ}\text{C}$ steps	Y	10 $^{\circ}\text{C}$ to 90 $^{\circ}\text{C}$
16	Temperature stability: $\pm 0.05^{\circ}\text{C}$ for flow rates between 0.2 and 2ml/min	Y	
17	Temperature set point accuracy: $\pm 0.8^{\circ}\text{C}$	Y	$\pm 0.5^{\circ}\text{C}$

NOTE: The critical requirement specifications are marked by double asterisk (**)

S/N	Requirement Specifications	Compliance to Specifications (Y/N)	Remarks
18	Heat-up rate: within 5 min from ambient to 40°C	Y	
19	Can house at least 3 columns with built-in column switching valves**	Y	
20	Should be able to handle column length from 10-250 mm	Y	
SOLVENT DELIVERY SYSTEM			
21	High performance binary gradient pump system with switching valves to at least accommodate 4 solvent channels	Y	
22	Pressure pulsation should be < 2% amplitude or < 5 bar, whichever is greater for 1ml/min flow rate**	Y	
23	Able to run in two modes: in standard delay volume mode for normal HPLC and low delay volume mode for fast HPLC, without upgrading any hardware	N	
24	Operating settable flow rate 0.001 – 2ml/min in 0.001 ml/min increments	Y	
25	Flow accuracy: $\pm 1.0\%$ RSD or 10ul/min, whichever is greater	Y	
26	Flow precision: $\leq 0.075\%$ RSD or ≤ 0.01 min SD, whichever is greater (from 0.2-2ml/min)	Y	
27	Compositional accuracy: $\pm 0.5\%$ RSD	Y	
28	Compositional precision: $\leq 0.15\%$ RSD at flow rate of 1 ml/min	Y	
29	Ultra high pressure up to 1200 bar for flow rates up to 2ml/min**	Y	
30	Lowest delay volume down to <75 μ l**	Y	
31	Equipped with a leak sensor which will send feedback to software when leaks are detected and pump will stop	Y	
32	Supplied with at least four 1-L amber bottles and four 1-L clear bottles, complete with 4 inlet filters and 4 caps with inlet holes and plugs (1 set/unit)	Y	
33	Flow path should be able to handle solvent pH range from 2-12	Y	
SOLVENT DEGASSER			
34	On-line vacuum type	Y	
35	Maximum flow rate: 2 ml/min per channel	Y	
36	Internal volume per channel should not be more than 0.5ml	Y	

NOTE: The critical requirement specifications are marked by double asterisk (**)

S/N	Requirement Specifications	Compliance to Specifications (Y/N)	Remarks
37	Should have at least 2 independent channels	Y	
38	Error status should be fed back to system software	Y	
TRIPLE QUADRUPOLE MASS SPECTROMETER SYSTEM			
a) General			
39	Minimum mass range: 10-2000 amu	Y	0-2048 amu
40	Scan speed at least 10,000 amu/sec**	Y	20,000 amu/sec
41	Mass stability ± 0.1 amu over 24 hrs**	Y	
42	Uses high purity nitrogen for collision purpose	N	Argon gas
43	Has an integrated divert valve to switch the LC flow to waste during void volume elution, gradient end-point and any other portion of analytical runFesi	Y	
44	Source elements can be removed for cleaning without breaking vacuum	Y	
45	Fully automated optimization of ion optics and mass axis calibration	Y	
46	Positive/Negative polarity switching must be less than 35 ms, in continuous mode during LC/MS and LC/MS/MS runs**	Y	Less than 15ms
47	Delivered with 2 syringes and syringe pump for direct infusion and split infusion at flow from 2-100 μ l/min	N	Internal syringe pump for infusion.
48	To provide T- union for split infusion (2 per unit)	N	No using T-union but micro splitter.
49	Delivered with necessary tubing, adaptors, connectors and tools for enabling the above functions	Y	
b) Electrospray Ionisation (ESI) Source			
50	Compatible with liquid flow rates of 5 μ l/min to 3ml/min without splitting	Y	
51	Source temperatures: 400°C or higher	Y	650 °C (Desolvation Temp)
52	Full gradient capability from 100% aqueous to 100% organic	Y	
53	Sensitivity: 1 pg reserpine injected on column with S/N >150000:1 for positive mode**	Y	>500,000
54	Sensitivity: 1 pg of chloramphenicol injected on column with S/N>150000:1 for negative mode	Y	>500,000
c) Mass Analyzers			

55	Allows the following data acquisition modes: Full scan MS, selected ion for both Q1 and Q3 product ion scan, precursor scan, neutral loss/gain scan, multiple reaction monitoring (MRM), scheduled MRM, MS ² scan and MRM ³ scan	Y	
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NOTE: The critical requirement specifications are marked by double asterisk ()**

S/N	Requirement Specifications	Compliance to Specifications (Y/N)	Remarks
56	Minimum dwell time of 1ms**	Y	
57	Linear Quadrupole mass analyser that is able to concentrate ions effectively and to acquire the mass spectrum for confirmation of unknown compounds at a higher confidence level**	N	
d) Mass Detector			
58	Has off-axis electron multiplier detector	Y	
59	Detector operates in both positive and negative ion modes	Y	
60	At least six orders of magnitude for linearity	Y	
e) Vacuum System			
61	The high vacuum must be maintained by turbo molecular pump. This pump should be backed by mechanical (rough) pump**	Y	
62	Must be delivered with enclosure to reduce the noise level of the mechanical pump**	Y	
COMPUTER SYSTEM FOR HARD WARE CONTROL AND DATA HANDLING			
a) Hardware			
63	Minimally equivalent to performance of Pentium Intel Core i7- 6700 processor (2.80GHz)	Y	
64	At least 16GB DDR3 SDRAM	Y	
65	At least 2 GB graphics card	Y	
66	At least 1 TB hard disk + one external 1TB hard disk	Y	
67	At least 23" wide full HD LED monitor	Y	
68	Resolution: at least 1920 x 1080	Y	
69	DVD +/- R/RW SuperMulti Drive	Y	
70	Optical mouse with scroll wheel	Y	
71	Min 6 USB ports, at least 3 in front	Y	
72	Pre-installed MS Windows 10 or newer version	Y	
73	Pre-installed Microsoft Office 2016 comprising Word, Excel and PowerPoint	Y	
74	Latest antivirus software	Y	
b) System control and data handling software			
75	Must be able to provide fully integrated control for both ultra-high performance liquid chromatograph (UHPLC) and triple quadrupole	Y	

	mass spectrometer (MS/MS) systems**		
76	Has on-line help for instrument control programs as well as user manual in PDF file format	Y	
77	Capable of tuning for electrospray (ESI) in positive and negative ion modes	Y	

NOTE: The critical requirement specifications are marked by double asterisk ()**

S/N	Requirement Specifications	Compliance to Specifications (Y/N)	Remarks
78	Automatic mass calibration routines	Y	
79	Zoom scan capability for achieving higher mass resolution	Y	
80	Automatic determination of MRM transitions for easy method development**	Y	
81	Dynamic/Scheduled MRM function with automatic maximization of dwell time for multi-component analysis**	N	PIC
82	The setting parameters of data acquisition and processing for existing/remaining compounds should not be affected by the addition or deletion of compounds**	N	

PRINTER

83	Monochrome laser printer	Y	
84	Printing resolution: at least 1200x1200dpi	Y	
85	Printing speed: At least 50 ppm in black	Y	
86	Allow automatic duplex printing, with at least 36spm	Y	
87	Capacity of input tray: at least 500 A4-size sheets	Y	
88	Capacity of output tray: at least 250 sheets	Y	
89	Must be supplied with 6 sets of black toner cartridges (3 sets/unit)**	Y	

OTHER REQUIREMENTS

a) Trade-In

90	Quote for trade-in value of the following HPLC-MS system: I. Shimadzu Prominence LC with the following modules: ▪ System controller: CBM-20A ▪ Solvent delivery unit: LC-20AD ▪ Auto-sampler: SIL-20AC ▪ Degasser: DGU-20A₃ ▪ Diode Array Detector: SPD-M20A II. Shimadzu Mass Spectrometer: LCMS-2010EV	N	
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b) User Training

91	Comprehensive training must be provided by the competent application chemist for all users (at least 4 users per unit) on the principle, operation and maintenance of the proposed systems**	Y	
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NOTE: The critical requirement specifications are marked by double asterisk ()**

S/N	Requirement Specifications	Compliance to Specifications (Y/N)	Remarks
c) Application Databases/Libraries			
92	Provide and install pre-established application databases/libraries coming with both retention time and MRM information for every entry of dyes & food additives and mycotoxins & marine biotoxins	Y	
93	If no pre-established library, technical support must be provided to create the library in the customer's system. The rights of this library will belong to AVA use only**	Y	
d) Application and Technical Support			
94	Must provide labour and logistic support to re-locate two existing HPLC systems within each laboratory in order to make way for the 2 new LC-MSMS instruments**	Y	
95	Must provide 4 start-up columns per LCMSMS system, which are compatible with the installed libraries/databases**	Y	
96	Set up the full methods based on the libraries/databases loaded onto the new systems**	Y	
97	Set up the running conditions for existing and new test methods as requested by AVA**	Y	
98	Must have a local technical support team consisting of service engineers and application chemists to provide equipment maintenance and trouble-shooting services**	Y	
99	Must migrate the existing methods to the new system, ensure the methods are running properly**	Y	
100	Must provide application support to set up new application for dyes, food additives, marine biotoxins and other foodborne toxins including sample preparation for processed food and seafood samples within 6 months of commission**	Y	
WARRANTY AND SERVICE/MAINTENANCE CONTRACT			
101	Provide minimum 3 year warranty including all	Y	

	parts and labour		
102	Must provide one preventive maintenance (PM) service per year with PM kit during the warranty period**	Y	

NOTE: The critical requirement specifications are marked by double asterisk ()**

S/N	Requirement Specifications	Compliance to Specifications (Y/N)	Remarks
103	Must provide quarterly thorough clean-up of MS spectrometer, inclusive of tuning and calibration of MS during the warranty period**	Y	
104	Must furnish the rate for the service/maintenance contract as specified and attach a sample copy of the types of service/maintenance contracts offered to customers**	Y	
105	Inclusive of all necessary components (e.g. transport, labour, etc) including system replacement parts and consumables.	Y	