PONDICHERRY UNIVERSITY
CENTRAL INSTRUMENTATION FACILITY

Expression of interest (EOI) document for supply of sophisticated analytical instruments

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1. Preamble

Pondicherry University is inviting expression of interest (EOI) from reputed manufacturers / vendors / their authorised dealers / representatives in India for the supply, installation, commissioning and testing of sophisticated analytical equipments at the Central Instrumentation Facility and also to provide operational and maintenance training on these equipments.

The purpose of this document is NOT to provide detailed specifications for bidding, but to provide the interested manufactures/suppliers, an overview of the scope and requirements of the equipments to be commissioned in the Pondicherry University.

2. Scope of Work under Expression of Interest

The scope of work under the said EOI will be supply, installation, commissioning, testing and provision of staff training for operation and maintenance of the complete systems of the following equipments.

1. High resolution Transmission Electron Microscope (HRTEM) Facility with sample preparation equipments
2. Isotope Ratio Mass spectrometer (IRMS) based Stable Isotope Facility with sample preparation equipments
3. Physical Properties Measurement System (PPMS)
4. Ultrafast Laser System
5. Laser confocal Raman Spectrometer with Microscope attachment

Fabrication of all the components required such as vacuum systems, purge gas systems, pressured air / gas or liquid circulating systems etc., will be the responsibility of the vendor.

The scope of this EOI is to identify potential original suppliers for the above mentioned equipments who have successfully executed similar jobs in reputed universities, IITs and R&D institutions. The vendors must qualify as per the eligibility criteria mentioned in Section-5 of this document.

3. Required Test Facilities

The individual instrument / equipment system should be tested and proved for its specifications and features using suitable standards as per norms and conditions laid down by the Pondicherry University to the satisfaction of the user.

4. Schedule and Duration of Work

The scope of work explained in this EOI, will be supplied in more details in the tender document. The expected period for delivery of the equipment is less than 3 months from the date of placing purchase order and one month thereafter for completing the installation in all respects. The duration mentioned and agreed upon is required to be followed by the supplier in a strict manner. Any delay in the process will attract penalty to be paid by the supplier.

5. Eligibility Criteria

Technical Requirement:

- The vendor should have proven track records of supplying adequate number of similar sophisticated equipments to reputed universities, IITs and R&D institutions within the past three years.
- The vendor shall have in-house or access to equipment facilities similar to that is to be supplied and should be able to arrange for site visits for carrying out testing on standards and samples to verify the technical specifications and performance of the equipment by a committee constituted for this purpose by the Pondicherry University.
- The vendor should have adequately factory trained and skilled manpower to carry out the installation, commissioning, testing and application support with regard to the equipment supplied.
- The vendor should have factory trained and skilled manpower for periodic maintenance and prompt service support for breakdown calls in India, preferably, at a close location to Pondicherry University.
- The vendor should give training in routine operation and maintenance of the equipment / facilities to personnel of Pondicherry University.

6. Standard conditions

1. Annexure – I (Tables 1 and 2) should be filled, duly signed and submitted along with all the valid supporting documents while submitting the EOI. If the EOI is submitted without valid documents or received without proof of eligibility criteria, the quote will be summarily rejected.

2. The EOI shall be submitted along with a covering letter of Expression of Interest, Vendor Information Form as contained in Annexure-I duly filled with the requested information / responses as per this EOI with all accompanying documents duly signed by personnel authorized by the interested parties. The designation and authority of the signatory shall be stated.

3. Proof of attachment will be considered only if the documents are found valid with respect to the requirements specified in various sections of this EOI.

4. Those who do not meet with the eligibility criteria need not submit EOI.

5. The Registrar, Pondicherry University reserves the right to accept or reject any response in full or part thereof without assigning any reason thereof.

6. Request for the extension of due date will not be considered.

7. Late / Delayed proposals will not be accepted.

8. The brief technical description / features of the equipments / facilities proposed to be established are given in Annexure- II.

9. Further details and technical specification will be included in tender document which will be supplied to the shortlisted parties of this EOI. Hence, queries regarding further technical details will not be entertained during this process of EOI.

7. Roadmap to finalize the Vendor for Supply of Equipments / Facilities

1. Following is indicative roadmap that will be followed to obtain EOI proposals for finalizing the vendor to supply the equipments / facilities listed in this EOI document.

2. This notice is for invitation of EOI proposal for contract for supply, installation, testing of equipment / facilities at Pondicherry University and this is **NOT** the tender.

3. The scope of work involved is mentioned in Section – 2.

4. Essential eligibility criteria are in Section-5 (EOI proposals received from the vendors satisfying these essential eligibility criteria will only be considered for further evaluation).

5. Vendor will submit EOI proposal with all necessary supporting documents as mentioned in Annexure-1.

6. Vendors, whose EOI proposals are found suitable, shall be called at Pondicherry University and asked to make a presentation for their EOI proposals. The presentation should cover the following points:
   a) Vendor's overall profile.
   b) Vendor's manpower availability for installation of equipments / facilities at Pondicherry University.
   c) Vendor's work experience in similar nature jobs, list of projects executed in India, few of which can be discussed in detail. Some important journal publication using their instruments may be included.
   d) Understanding of overall scope of work & technologies involved and their approach towards successful execution of projects of this nature.
   e) Critical areas identified in the scope, if any and proposed solutions.
   f) Capability and financial abilities to undertake this type and magnitude of work contract.
   g) Codes and standards regularly followed in manufacturing, assembly, and installation of the sophisticated analytical equipment / facility covered in the EOI
   h) Details of quality policy and program, testing and inspection facilities.
   i) Project planning and execution strategy, with specific emphasis on time schedule
   j) Records for last three years in terms of projected and actual delivery schedule of similar equipment supplied in India.

7) Pondicherry University reserves the right to incorporate the suggestions made by the vendors in their proposal, during the presentations and meeting at its sole discretion in final tender document.

8) Final selection of EOI proposals for award of tender documents shall be made based on submitted documents, presentations and discussions. This assessment shall be done considering (a) Available manpower and infrastructure, (b) Understanding of scope of work presented during presentations and discussions, (c) Earlier experience of doing such jobs and in successful execution of similar projects, assignments in terms of costs, quality and schedule.

9) The vendors, whose EOI proposals are accepted by Pondicherry University, will be given an opportunity for pre-bid discussion on technical specifications and scope of work. A final tender document will be prepared by taking into account the feedback of vendors.

10) Final tender document shall be in two parts. **Part-A** containing detailed technical specifications of the equipment and deliverables, work plan and time scheduling of installation, testing, operational and maintenance training of personnel and commercial terms and conditions and **Part-B** containing price bid format.

11) Those who receive tender documents shall submit the responses in two parts. Detailed procedure for submission of technical proposal including commercial terms and conditions (Part-A) and price bid (Part-B) shall be mentioned in our tender document.

12) Initially technical proposals including commercial terms and conditions (Part – A) shall be opened.

13) Pondicherry University will evaluate the technical proposals received and shortlist them after scrutinizing their contents for the suitability as specified in tender document.

14) Those, whose proposals (Technical proposals – Part A) are short listed based on the scrutiny, shall be called for further discussion for technical content of the proposals in more details and to clarify commercial terms of Pondicherry University.

15) Pondicherry University shall shortlist these proposals further based on the outcome of the technical discussions held during meeting. This short listing shall be based on vendor's presentations informing about their past experience, technical specifications and delivery schedule given in our tender document. If needed technical bid can be revised based on the outcome of these meetings along-with their price bids.

16) Price bid (Part-B) of only short listed vendors will be opened.

17) Based on the price bid, Pondicherry University shall award a contract for the supply and installation of equipments and facilities covering the details mentioned in tender documents and finally agreed during techno-commercial meeting.

18) Pondicherry University reserves right to procure all or some of the equipments or none of the equipments given in the EOI

Annexure I

Table 1. Vendor's Details

Name of the Vendor		
Address of the Vendor		
Name of the Indian Dealer		
Address of the Dealer		
Key persons to be contacted		
Senior Management	Name	
	Contact Phone Numbers	
	Fax	
	email	
	Address	
Sales Department	Name	
	Contact Phone Numbers	
	Fax	
	email	
	Address	
Service Department	Name	
	Contact Phone Numbers	
	Fax	
	email	
	Address	

Table 2. Vendor's Performance details

Sl. No.	List of information to be furnished with documentary proof to determine the eligibility of the vendor	Vendors Response	Proof of documents attached
1	Total number of installations of similar equipment facility in India installed during past three years. Give contact details of person in-charge of the equipment along with email and telephone numbers		
2	Total number of installations of similar equipment facility in abroad installed during past three years. Give contact details of person in-charge of the equipment along with email and telephone numbers		
3	Time taken for supply of equipments/facilities in the past two years in India. Attach necessary proof.		
4	Time taken for installation and commissioning of equipments/facilities in the past two years in India. Attach necessary proof.		
5	Factory trained service engineers available in India		
6	Normal time taken to attend to service request or to solve problems with equipment		
7	Access to the equipment similar to that is to be supplied for carrying out testing on standards and samples to verify the technical specifications and performance by a committee constituted by the Pondicherry University		
8	Comprehensive warranty for three years to be provided		
9	Support for site preparation, supply of standards and calibration material and other accessories for installation and operation of the equipment facility.		
10	Customer satisfaction reports on equipments supplied during past three years		

Annexure II

Brief description about specifications and features of equipments listed in the EOI.

1. **High resolution Transmission Electron Microscope (HRTEM) Facility with sample preparation equipments**

State of the art 300 kV **Transmission electron microscope** with automated features and manual overrides for use by departments related to material science and biology for teaching and research.

A. Basic Unit :

1. **High-voltage generation system:** A high-voltage system that is capable of generating a maximum potential of 300 kV stable with a reasonable precision, continuously adjustable in fixed stages. The voltage generation system should also generate a stable 200 kV and 100 kV operating voltages as per the user requirement.

2. **Electron source:** W / LaB_6 / Field Emission electron source with a provision for easy replacement with interchangeable pre-centred filament. The parameters such as gun conditions and alignment data should be stored in the attached computer for a possible recall at a later stage.

3. **Vacuum system:** Should provide automated, clean and dry vacuum pumping systems. Also should provide the cold-trap with a liquid nitrogen Dewar for trapping the contaminants near the specimen.

4. **Electromagnetic lenses and deflectors:** Electromagnetic lenses and deflectors for controlling the electron beam for alignment and stigmation.
    a. Should be pre-aligned at 300 kV, 200 kV and 100 kV.
    b. Should also provide a provision for storage and retrieval of the above parameters.
    c. The lens system (especially the objective lens) should result in a point resolution of better than 0.1 nm.
    d. The magnification of the scope should cover the range 100 X – 1,500,000 X or higher.
    e. Should support beam deflectors to accommodate the standard 'low dosage methods' to prevent extensive radiation damage to biological samples.

5. **Image/Data display:** A retractable viewing screen (of at least 150 mm diameter) coated with cathodoluminescent material and a small retractable screen for critical focusing. A binocular (10X or higher) capable of independent focusing adjustment for each eyepiece should also be supplied for viewing the magnified view of the small screen.

6. **Imaging system:** CCD based imaging device for real-time viewing and recording of images shall be provided.
    a. Resolution of the CCD should be 2K x 2K or better.
    b. The CCD camera should have high sensitivity, resolution, excellent S/N ratio and speed as needed in biological and materials science applications.
    c. Should be supplied with image acquisition software with advanced image processing and analyzing features.
    d. Should support automated collection of data.
    e. Should provide the images in all popular image formats (apart from jpeg).

7. **Specimen holder and Goniometer:** Side-entry specimen holders should be provided for standard 3 mm TEM grids.
    a. A standard single-tilt holder and a double-tilt holder should be provided.
    b. Facility for cryo-transfer for life sciences.
    A 5-axis goniometer specimen stage should allow orientation of the specimen on three translation axes (x, y, z) and two tilt axes (α, β).
    a. Read out and display along the translation axes (x, y, z) and tilt axes (α, β) should be available.
    b. Storage and recall of (x, y), (x, y, z) and (x, y, z, α, β) positions should be possible.
    c. Specimen drift rate must be minimum (less than 0.5 nm/min).

8. **EDS:**
    Liquid nitrogen cooled EDS detector and other types of detectors for elemental analysis should be attached to the column. The EDS detector should be supplied with necessary acquisition and analysis software along with computer interface.

9. **Computer Environment:** Computer system (including hardware and software) for the operation, monitoring, control, data acquisition, storage and retrieval for the TEM and all its attachments and accessories should be provided.
    a. The system should be capable of acquisition, display and processing of images.
    b. The microscope should be capable of storing setting for multiple users with master administration capability.
    c. All software should be licensed for the main computer and additional stand-alone licenses should also be quoted for later up-gradation.

10. **Essential Accessories:**
    Essential accessories such as chilled water re-circulator, power stabilizers, UPS (optional) must be included in the quotation separately.

11. Standards and spares:

a. One set of standards should be provided.
b. Complete set of spares, tools, and accessories required for trouble free operation for a period of three years from the date of installation assuming continuous use of the scope to be quoted separately.

12. Manuals: Complete list of documentation (in English) for the entire system and accessories including but not limited to user manuals, application notes, maintenance manuals and circuit diagrams required for routine use and maintenance should be provided.

Sample preparation accessories for TEM facility

1. For Biological samples:

a. Carbon coating system with glow discharge facility.

A glowdischarger with a carbon coating system with vacuum pump. The discharge area should allow to accommodate atleast one standard microscope slide. The carbon evaporator attachment should be equipped with thickness monitor to monitor the thickness of the carbon film.

b. Vitrobot (Cryosystem for freezing the biological samples)

Computer controlled and fully automated with a provision to save individual user settings.

- Should have capability to work at an ambient temperature ranging between 18 – 35 ^{o}C.
- Maintain various humidity levels (including 100 %).
- Ultrasonic controlled humidification.

c. Ultramicrotome (for preparing thin sections of biological samples).

A semi-automated microtome for making thin sections of biological samples with the following specifications

Section thickness should range between 0.5 – 99 µm in steps of 1 µm.

- Coarse specimen advance: 1 – 99 µm (adjustable).
- Touch key operated trimming, forward & rewind.
- Suitable for both universal microtome knife and disposable blade.

2. For Materials science sample

- Diamond cutter
- Polishing machine
- Dimpler
- Ion-polishing machine (PIPS)
- Plasma cleaner

2. Isotope Ratio Mass spectrometer (IRMS) based Stable Isotope Facility with sample preparation equipments

Pondicherry University aims to establish the state-of-the-art facilities for isotopic measurements of carbon ($\delta^{13}C$), oxygen, $\delta^{18}O$), hydrogen (δD), sulfur ($\delta^{34}S$) and nitrogen ($\delta^{15}N$) isotopes ratios of a variety of geological and biological samples. The samples analyzed to be would be water, organic samples, carbonates, sulfates, sulfides and silicates.

It is desired to establish an isotope ratio mass spectrometer facility with provisions for high precision (dual inlet) and high throughput (continuous flow) measurements for automated isotope measurements. Peripherals are required for combustion, pyrolysis and equilibration methods of isotope analysis. Provision for compound specific isotope analysis and CHNS analyzer is also required.

Analysis with dual inlet provision should provide precision (in ‰, external, 1-sigma) better than 0.04 ($\delta^{13}C$ of carbonate) 0.08 ($\delta^{18}O$ of carbonate); better than 0.05 ($\delta^{18}O$ of water) and 1.0 (δD of water). Dual inlet analysis should be capable of producing high resolution isotopic data of a very small amount of carbonate shells.

In continuous flow mode of analysis, $\delta^{13}C$ and $\delta^{15}N$ analysis should be of precision (in ‰, external, 1-sigma) better than 0.1 and 0.15, respectively; by pyrolysis, $\delta^{18}O$ of organic sample should be of precision better than 0.3; for water samples precision should be better than 0.15 (for $\delta^{18}O$) and 2.0 (for δD). Precision for carbonate should be better than 0.12 (for $\delta^{13}C$) and 0.15 (for $\delta^{18}O$).

It is desirable to perform ‘clumped isotope’ analysis of carbon dioxide.

3. Physical properties measurement system (PPMS)

Fully automated, complete and computer controlled **cryogen-free** Physical Properties Measurement system operational in wide range of temperature and magnetic fields. The instrument should be multi-functional and capable of performing a broad range of measurements, including magnetic, electric, magneto-electric transport, and thermal transport (thermal conductivity and thermoelectric power) on bulk, thin-film and nano-particle based organic, inorganic and biological systems.

Detailed specifications of the physical properties measurement system are as follows:

(1) Basic unit

System should be fully cryogen-free, i.e. no requirement of liquid Helium.

Temperature control:

a. Accuracy: ± 1% and sweeping rate 0.01 to 10K/min irrespective of the magnitude of applied magnetic field.
b. Temperature stability: ±0.2 % or better

Superconducting magnet:

a. Field uniformity ±0.01% over the sample space.
b. Highly stable, low-noise bi-polar power supply with over voltage protection & indication.
c. Field control modes: Persistent and Driven (Oscillating, No Overshoot and fast settle).

(2) Measurement options

(A) Electrical transport

a. 4-wire resistivity measurement, Hall Effect, I-V characteristics and critical current of superconductors.
b. AC current: µA to mA range with frequency range 1 Hz to 1 kHz or more.
c. Absolute accuracy: 0.2% or better
d. Dielectric measurement in the frequency range of 1 Hz - 10 MHz

(B) A.C. Susceptibility

a. AC Frequency Range: 10 Hz – 10 kHz or more
b. AC Field Amplitude: few mOe to few Oe
c. AC Sensitivity better than 2 x 10^{-8} emu
d. DC sensitivity: better than 2.5 x 10^{-5} emu

(C) DC Magnetization

a. Sensitivity better than 10^{-6} emu
b. Accuracy: 0.5 % or better
c. Sample oscillation amplitude: Range 0.1 to 5 mm
d. VSM sample holders for powder, bulk (polycrystalline and single crystalline samples), thin-films and liquid samples.

(D) Ultra low field setting

a. Residual Field: less than 0.1 Oe
b. Residual Field Uniformity: ± 0.1 Oe or better

(E) Electro-magnetic transport (Magneto-resistance, I-V curves)

Input Voltage Range: In the order of few Volts (bipolar) at 1X gain
Current Input Range: In the order of nA (bipolar)
Current Source Specifications: nA to mA range continuous operation
Frequency Range: DC, and 0.1Hz to 200 Hz AC
Resistance Specifications: 0.1% or better
Resistivity Range: μΩ to GΩ

(F) Thermal transport

a. Thermal conductance measurement accuracy ± 5 % or better
b. Typical accuracy of the Seebeck coefficient: ± 5 % or better
c. Approximate range: 1μV/K to 1 V/K or wider
d. AC resistivity option (specification matching that of electrical transport)

(3) Data acquisition and analysis

Licensed windows based operating software and State-of-the-art computer control system compatible with the measurement options and a heavy duty printer must be included in the basic unit. The software should be able to run the various measurement options automatically and in different modes.

(4) Vacuum pump and vacuum fittings

Vacuum pumps and fittings essential for the uninterrupted functioning of the instrument and its various measurements options must be included.

(5) Other accessories: Chiller unit (if necessary), UPS, separate sample holders should be included in the basic unit.

(6) Multi-functional probe for extending measurement capabilities of the PPMS by allowing easily add hardware such as external electrical leads to customize your experiment (e.g., dielectric measurement using LCZ meter). This probe should incorporate the PPMS sample space electrical connections and can utilize the electro-transport accessories.

4. Ultrafast Laser Systems

The proposed ultrafast laser systems should comprise of the following items with provision should be there at every stage of the system to take a portion of the beam to carry out studies. The overall configuration could be in one box or it could be in different closed modules Detailed Specifications for each of the above items are given below.

1) Seed Pump CW Laser DPSS

Wavelength	532nm
Spatial Mode	TEM_{00}
Beam Diameter	(at $1/e^2$ points) 2.5mm Typical
Polarization	100:1, vertical
Power Stability	< ±1%
Noise	< 0.04% rms or better
Operating Voltage	220VAC/50Hz

Necessary water chiller for the above laser be supplied depending on the heat load factor and the cooling requirement of the above laser.

2) High Power Ultrafast Ti:Sapphire Oscillators(femtosecond-picosecond)

Dual platform of femtosecond and picosecond configuration with necessary conversion kit from one operation to other operation.

Noise	<0.1 (%)
Stability	<3 (%)
Spatial mode	TEM00
Polarization	Horizontal

The setup should includes all the control electronics for Mode Locked laser head along-with the necessary purging unit to enable work in IR

3) Pump laser for regenerative amplifier

Q-Switched, intracavity doubled Nd:YLF Green Pump Lasers for Pumping Regenerative ampfilier with double pulse option.

Wavelength (nm)	527/532nm
Pulse-to-Pulse Energy Stability	<1 (% rms)
Operating Voltage	220V @50Hz (VAC)

4) Regenerative Ti:Sapphire Amplifiers

(Including the stretcher and compressor)

Center Wavelength	800 (nm) (nominal)
Tunable range	750 to 840nm
Contrast Ratio	
Pre-pulse	>1000:1
Post-pulse	>100:1
Energy Stability	<0.75% (rms)
Spatial Mode	TEM_{00}
	M^2 <1.35
Polarization	linear, horizontal

5) Optical Parametric Amplifier

Computer Control ultrafast optical amplifier to extend

Tunable range	290nm to 11 microns
Pulse width	Typical 100fs
Energy per pulse	Tens of micro-joule per pulse over the tunable range Please indicate different modules/package which will cover the entire range

6) Single Shot Autocorrelator

Detector Type*	PMT for Low intensity signals Photodiode or CCD array for high intensity signals
Output	Should be available to Display on Oscilloscope and through interface card onto the Computer (Serial/DAC Card/IEEE/USB)

*Both should be interchangeable depending upon the experiment

7) Pulse Picker

For use with **femto-second and picoseconds** pluses from mode-locked laser and or Amplifier systems

Repetition rate	1 KHz to 5MHz (nominal range)
Wavelength Range	500 nm to 3 micron (maybe covered using one or more module)
Input Power	(to be compatible with output from Ti Sapphire Oscillator mentioned in Sl 2 above

8) Spectrum Analyzer

Spectrum Analyzer for measuring bandwidth of laser pulses and its peak position

Wavelength Range	200nm to 110nm
Resolution	0.03nm
Output	Display on the Oscilloscope and should be capable of interfacing with the Computer along-with Windows based control software Fiber Optic coupled spectrometer for remote measurement

9) Laser Power Meter

Laser Power Meter to measure the average power of the laser pulses

Type	Analog/Digital Meter
Range	10nW to 30W
Wavelength Range	200nm to 20 microns
Sensor Type	1) Silicon Photodiode for Low power range (with appropriate Neutral Density filter 3.0OD) 2) Thermopile Sensor head for High power measurement
Threshold Densities	power densities of 20kW/cm^2 or 300mJ.cm^2 of 50nS Pulses
Output	Analog/Digital Meter Display and Analog Output (Voltage level in range of 10V)

10) IR Viewer

IR Viewer to see IR Beam for alignment of component in laser systems

Wavelength	350nm to 2000nm
Focus Range	Typically from 1m to infinity
Resolution	30 lines/mm or better
Field of View	30^0(Typical)

11) Research grade optical vibration isolation table (for mounting lLaser systems)

Dimension	12ft x 4ftx1ft with 6 active isolators of 23.5” height
Table Top	Ferromagnetic stainless steel 3/18 in thick with M6 holes on 25mm grid)
Core design	Trussed honeycomb core design

12) Research grade table for setting up experiments

Dimension	6ft x 4ftx 1ft with 4 active isolators each of 23.5” height
Table Top	Ferromagnetic stainless steel 3/18 in thick with M6 holes on 25mm grid)
Core design	Trussed honeycomb core design

13) Air compressor to float research table in Sl. No. 10 and Sl. No. 11

Operating Voltage 220VAC 50 HZ

14) Necessary water chiller for the above laser be supplied depending on the heatload factor and the cooling requirement of the above laser

15) Other essential accessories

1) Beam Dumpers or Blockers
2) Laser Safety Goggles covering most of the range and to used while working with the Ultrafast laser systems
3) Beam routing kit to shield the beam as it passes from one System to other

16) Optical components to setup experiments

All the below mentioned optical components are to be used with femto-second pulses hence the required components should introduce as minimum dispersion as possible to minimize broadening of laser pulses.

a. High damage threshold broad band mirror (200nm to 2Micron) with high reflectivity
b. Beam splitters (50:50),(80:20),(70:30)
c. Broad band half wave plate VIS and near IR
d. Broad band quarter wave plate VIS and near IR
e. Linear polarizer- quartz type
f. Rotational Mount with 0.5^0 degree accuracy
g. Computer controlled motorized rotational stage with resolution of 0.02^0 for half wave plate along with the controller
h. Computer controlled motorized linear travel of 10 cm with0.01micron resolution stage 2 for half wave plate along with the controllers
i. Mechanical mounts, post and post holders for the above mentioned optical elements from Sl. No. (a to e)

j.

5. Laser confocal Raman Spectrometer with Microscope attachment

Dispersive laser Raman Spectroscopy system with confocal Raman/optical microscopy and dual laser excitation switchable between 532 nm and 780 nm laser modules for microscopic and macro analysis of solid and liquid samples of minerals, inorganic and organic substances.

1. Laser : 532 nm (green) and 780 nm (NIR) laser modules with high spatial resolution (1 micron or better) along with laser switcher kit.

2. Raman Spectrometer : Automated confocal aperture and alignment optics. Integrated and automated calibration source. Optical/Raman microscope with brightfield/darkfield transmitted and reflective light illumination. Apochromat objectives 10x, 20x. Long working distance apochromat objectives 50X, 100 X. Automated laser attenuation filter. High precision motorised microscope stage with resolution 0.1 micron or better. Focus control with auto focus capability. USB colour camera. 180 degree refractive backscatter configuration. Sample holder accessory kit. Rayleigh rejection Filter for 532 nm and 780 nm.

3. Sample Chamber: Basic spectrometer frame to support sampling through Raman Spectrometer. Macro Sampling spectrometer frame to support sampling through dedicated macro sampling compartments.

4. Computer Hardware & Software : State of the art computer system with latest Intel CPU and highest available clock speed and cache memory. 1 Parallel and 2 serial ports and 4 USB ports, DDR 8 GB RAM, Graphics card with 1 GB memory, 1 TB Hard Disk Drive. A removable HDD with 250 GB capacity for data storage and transfer. One 21" LCD/TFT monitors. Blue Ray DVD/CD R/W drive. 600 dpi laser colour printer. Authentic and compatible windows operating system.

Software for standard operation of Raman spectrometer including auto-exposure, auto-focus, auto fluorescence correction,

Software to support data processing including baseline correction (automatic and manual), smooth, blank and straight line, first and second derivative, curve fitting, spectral math, subtract (manual and automatic), Spectral search with high-resolution library generation, customizable information fields, single or multi-region search, libraries management, Spectral peak picking and annotation, Spectral statistical analysis, Peak analysis tools.

Raman library having extensive database of minerals, inorganic and organic substances. Software and accessories for quantitative determination of molecular species (CO2, methane, nitrogen, oxygen, hydrogen etc).

Microscopy software including automated data collection, processing and mapping.