

# **Final & Frozen Specification**

## **TECHNICAL SPECIFICATIONS OF MICRO RAMAN SPECTROMETER**

Integrated Micro Raman Spectrometers should have high stability research grade confocal compound microscope, transfer and filtering optics, an achromatic spectrograph equipped with gratings, multichannel detector, laser, motorized stage and relevant software and computer platforms with the following specifications. The system should be mirror/lens based and direct-coupled system.

1. **Spectrometer**: A large focal length ( $\geq 250$  mm), Czerny-Turner type achromatic spectrograph should be equipped with reflective/refractive optics and with the following specifications;
  - a. Spectral Range: 200nm–2100 nm or better
  - b. Raman range:  $50\text{cm}^{-1}$ - $4000\text{cm}^{-1}$  or better (from  $50\text{cm}^{-1}$  for 532, 633 and 785 nm lasers, for 325 nm laser from  $150\text{cm}^{-1}$  to  $4000\text{cm}^{-1}$  or better)
  - c. Spectral resolution:  $< 0.5\text{cm}^{-1}$  or better
  - d. Spatial Resolution: A lateral resolution should be better than 0.5micron and an axial resolution typically should be better than 1.5 microns with a 100X objective in the visible range.
  - e. Gratings: holographic 2400 & 1200 gr/mm or 2400 gr/mm (for UV), 1800 and 600 gr/mm to be mounted on a motorized turret driven by software, to vary spectral resolution. The gratings should be quickly and easily interchangeable without realignment.
  - f. Interface: USB/RS-232
  - g. Power supply: 220-230 VAC, single phase
  
2. **Entrance optics assembly**:
  - a. A filter wheel with neutral density filters of at least 9 positions (%) for varying the laser power on samples to be provided and it should be controlled by software. Or it should be a continuous power control for 0 to 100 % of the laser power by software command
  - b. Laser line filters
  
  - c. An adjustable kinematic rejection filter mount to allow fine tuning of the filter operation angle for low frequency cut-off adjustment and easy and quick exchange of excitation wavelength.
  
3. **Confocal Microscope with high stability**:
  - a. It should have removable bottom stage
  - b. An internal white light illuminator
  - c. Objective turret with following plan-achromatic objectives:
    1. 5X visible, NA = 0.1
    2. 10X visible, NA = 0.25
    3. 100X visible, NA = 0.9
    4. 40X NUV objective, NA = 0.50, WD =  $\sim 1$  mm (for UV Laser)
    5. 50X LWD visible objective, NA = 0.50 WD =  $\sim 8$ mm

- d. High grade Colour video camera should be provided for viewing the sample under white light illumination and to simultaneously visualize the laser spot. Switching between video and Raman mode is to be automated.

**4. Confocal coupling optics between the microscope and the spectrometer:**

Software controlled continuously adjustable confocal pinhole from several microns to 1mm, or a pre-aligned true confocal pinhole should be provided

**5. Automated Microscope Stage for Mapping**

Motorized XY (X = 75 mm - Y = 50 mm) and motorized Z device stage to be controlled by software. XY specifications: accuracy  $\pm 3 \mu\text{m}$ ; resolution (minimum step size)=100 nm or better. Z specifications: resolution (minimum step size) = 0.01 micron. It should include positioning joystick, an external controller, software package and Raman autofocus capability. The setup should be fully automated with automatic calibration using silicon/neon light. Motorized XYZ stage should come with high speed Raman mapping mode for fast mapping applications.

**6. Backward alignment control system:**

It should allow the visual control of the optical alignment of the laser from the sample to the detector

**7. CCD Detector:**

- a. Spectral Range: 200 nm to 1050 nm or better
- b. Cooling Type: Peltier cooled to -60 deg C or better
- c. Pixel Format: Minimum 1024x256
- d. Pixel Size: 26x26 microns
- e. Chip size: Minimum 1 inch for maximum wavelength coverage and fast spectral measurement
- f. Quantum efficiency > 30 % (visible and IR wavelengths)
- g. Interface: USB/RS-232.

**8. Lasers:**

- a) 325nm He-Cd Laser with minimum output power of 15 mW or more
- b) 532nm DPSS laser, power 100 mw or more
- c) 785nm Diode laser 100 mW or more
- d) He-Ne laser 633nm power >15mw

**9. Powermeter** should be provided to cover all the laser wavelengths

**10. UPS:** Suitable online UPS (6 kV/ more or better) for at least 30 min back up with necessary input output cable, 3 phase input isolation transformer

**11. Optical bench:** Suitable optical Bench (vibration control) to place Raman spectrometer

**12. Liquid Cell:** Liquid cell (UV-Vis-NIR macro cuvette cell (10x10 cell with cap) and cell holder for doing Raman measurement from corrosive liquids /fuming/turbid samples with required necessary optical arrangements.

**13. Computer and software:**

- a. Software should be compatible with Windows based operating system and should be supplied with computer dongle permitting the control of the instrument, data acquisition, and data manipulation including Raman mapping and storage option. The software should have advanced chemo-metric and Macro programming capabilities.
- b. A computer/operating system with latest configuration should be provided with monitor for operating the instrument and data analysis.
- c. Also a good quality projector (display resolution 1000 p more , full HD, more than 3000 lumens, LCD display) for displaying and image analysis on big screen
- d. A suitable computer (in addition to the main operating system) with a latest processor at least i7 or above, 16GB RAM, 1 TB hard disk, LED 24” monitor, mouse etc. and one branded color printer with upto 600x600 dpi. and necessary software should be provided to processes the data by users

**14. Warranty:** Three years on the system, one year on Laser

**15. Installation & Training:** To be included , training for operating the system, two years (twice in each year)

**16. Vendor** should provide minimum 5 installations in India and submit performance certificates (at least two) for the system by the vendor in last 5 years.

**A DETAILED COMPLIANCE STATEMENT AGAINST ABOVE MENTIONED TECHNICAL SPECIFICATION SHOULD BE ENCLOSED IN THE BID.**