Our 2 Part E-Tender No. IPR/TPT/TN/ET/F/18-19/53 dated 22-02-2019 for Supply, Installation and Commissioning of Scanning Raman Spectrophotometer

SECTION - C

TECHNICAL SPECIFICATIONS OF STORES AND DRAWINGS.

Technical Specifications for Supply, Installation and Commissioning of Scanning Raman Spectrophotometer

INSTITUTE FOR PLASMA RESEARCH
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TECHNICAL SPECIFICATIONS FOR SCANNING RAMAN SPECTROPHOTOMETER

The scanning Raman spectrophotometer will be used for acquiring the Raman spectra and Raman mapping of various molecules deposited on the developed nano patterned surfaces with metal nanoparticles using the concept of Surface Enhanced Raman Scattering (SERS). Various complex molecules like pesticides, glucose, biomolecules, food samples, thin films, etc. will be analysed for various sensing applications and the distribution of different molecules in complex molecular system like blood, saliva will be obtained using Raman mapping for detailed analysis.

Sr. No.	Description	Requirements
1	**Spectrometer:**	
1.1	Focal length	≥ 250mm
1.2	Spectral range	50cm^{-1} to 3500 cm^{-1} or better
1.3	Spectral resolution (FWHM)	≤ 0.5 cm^{-1}
1.4	Gratings	2400 gr/mm and 1200 gr/mm
1.5	Grating stage	Encoded feedback controlled grating stage for quick alignment
1.6	Scan to scan repeatability	≤ 0.05 cm^{-1}
1.7	Spatial resolution (lateral)	≤ 1 µm
1.8	Spatial resolution (axial)	≤ 2 µm
1.9	Edge filter	50cm^{-1} for 532nm and 785nm
1.10	Rayleigh filter	Automated Rayleigh line rejection filter
1.11	Spectral acquisition	Should be able to collect spectra of entire wavelength range (50cm^{-1} to 3500cm^{-1}) in one single acquisition without any step or stitches maintaining high spectral resolution.
1.12	System mounting	Kinematic system baseplate for spectrometer, microscope and lasers.
2	**Lasers:**	
2.1	Wavelength	532nm and 785 nm
2.2	Power	50mW for 532nm and 300mW for 785nm
2.3	Laser power levels	Minimum 16 power levels using motorized neutral density filters from 0.05% to 100%.
2.4	Laser line width	≤ 1 MHz
2.5	Filters	Plasma line rejection filters for 532 nm and 785 nm lasers
2.6	Laser spot size (d)	1 µm ≤ d ≤ 300 µm
2.7	Laser coupling	Laser should be directly coupled to microscope and spectrometer
3	**Microscope**	
3.1	Light source	White light with reflected light illumination
3.2	Objectives	5X, 20X, 100X, Long Working Distance (LWD) 50 X
3.3	Confocal depth resolution	≤ 2 µm for 100X objective
3.4	Other mandatory features	Binocular head with eyepieces
		Colour video camera
		Microscope enclosure
4	**Transfer Stage**	
4.1	Stage type	Automated XYZ mapping stage.
4.2	Travel range	X=100mm, Y= 50mm, Z=20mm or better.
4.3	Step size	XY ≤ 0.1 µm and Z ≤ 20 nm.
5	**Detector**	
5.1	Type	Peltier cooled CCD; fully automated multi-channel detectors
5.2	Operating temperature	~ -70°C
5.3	Pixel size	1024x256 or higher
5.4	Digital Resolution	≥ 16 bit
5.5	Imaging speed	≥ 1000 spectra per second

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6	**Computer**	Provide the suitable compatible computer along with the system for the hardware-software interface and all the required system operations along with application software.
7	**Automation**	
7.1	Automation	Raman system should be fully automatic
7.2		Real time automated dynamic focusing for both Raman spectra acquisition and white light video viewing modes with data collection speed better than 20 spectra per second and maintaining Raman focus automatically on sample moving in z direction
7.3		Automated Rayleigh filter changeover assembly.
7.4		Automated Rayleigh line rejection filter for both 532 nm and 785 nm laser.
7.5		Automated alignment and optimization of input laser power.
7.6		Auto switching and auto aligning of laser
7.7		Adjustable confocal facility with motorized slit and automated signal optimization.
7.8		Automated interchanging of gratings
7.9		Self-validation using built-in Silicon reference sample
7.10		Built in self-calibration and intensity correction using internal Neon.
7.11		Motorized switching between laser and white light sample images
7.12		System should be capable in real time dynamic imaging for any laser in visible and near IR.
7.13		System should be field upgradable in future with any laser from deep UV to 1064 nm.
8	**Software**	
8.1	Software	1. Data acquisition software with fully integrated data analysis and presentation. 2. Image capture software for white light image display and capture. 3. XYZ stage control software. 4. Software for real time automated live focusing. 5. Raman mapping and Raman image generation software. 6. Software for high resolution Raman imaging 7. Fast imaging software with imaging speed of 1000spectra/second or better. 8. Software for Raman spectra analysis. 9. Software upgradation should be provided time to time
8.2	Additional software licence	At least for 4 additional offline work-stations.
8.3	Data bases	Spectral data base for polymeric material, inorganic material, Biochemical (to include vitamins, resins, starches, glycerides, fatty acids, sugars, carbohydrates, proteins and peptides), pesticides (to include insecticides, herbicides, algaecides, fungicides).
9	**Test report required for dispatch clearance**	The following test reports has to be submitted and to be approved by IPR before dispatching the system. 1. Neon lines to show claimed resolutions 2. Silicon Raman line with two wavelengths for checking accuracy. 3. Third and fourth order Raman Spectra of Silicon for throughput with both the wavelengths. 4. Reproducibility of neon /silicon Raman lines with two wavelengths. Raman spectra of silicon (520 cm^{-1}) to be

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		recorded at least 20 times, after each time moving to 3000 cm^{-1} or so. Data to be fitted to find the reproducibility. 5. 50 cm^{-1} edge for both filter with both wavelengths to be demonstrated. 6. 532 nm laser linewidth to be tested using Raman spectra of Sapphire to match with reported FWHM.
10	**Delivery time**	Within 12 weeks from the receipt of purchase order.
11	**Installation**	The system should be successfully installed at FCIPT campus of IPR by the vendor.
12	**Acceptance at IPR**	The system will be accepted only after successful installation and performance check with following tests at FCIPT campus of IPR. 1. All the tests mentioned in 11 has to be re-verified at FCIPT campus of IPR after installation. 2. Raman spectra of CaF2/Water/ Graphite/ Glucose using both the lasers. 3. Raman spectra of crystal violet on silicon substrate with and without nanoparticles using both the lasers. 4. Raman mapping of Crystal Violet on Silicon substrate (10mmx10mm) with nanoparticles using both the lasers. 5. Raman spectra and mapping of pesticides on silicon using both the lasers. 6. Raman mapping of Teflon samples with real time automated dynamic focusing using both the lasers.
13	**Training**	Minimum three days of training should be given by authorized person from the company at FCIPT campus of IPR after successful installation.
14	**Operational manual**	Vendor should provide detailed operational manual along with the product.
15	**Warranty**	Minimum 1 year warranty for all the parts from the date of installation and acceptance.
16	**Optional spare parts**	Kindly quote for important spare parts as optional items.
17	**Extended Warranty (optional)**	Kindly quote for extended warranty for additional two years.

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COMPLIANCE FORM FOR SCANNING RAMAN SPECTROPHOTOMETER

Sr. No.	Description	IPR Requirements	Vendor's Specifications
1	**Spectrometer:**		
1.1	Focal length	≥ 250mm	
1.2	Spectral range	50cm^{-1} to 3500 cm^{-1} or better	
1.3	Spectral resolution (FWHM)	≤ 0.5 cm^{-1}	
1.4	Gratings	2400 gr/mm and 1200 gr/mm	
1.5	Grating stage	Encoded feedback controlled grating stage for quick alignment	
1.6	Scan to scan repeatability	≤ 0.05 cm^{-1}	
1.7	Spatial resolution (lateral)	≤ 1 µm	
1.8	Spatial resolution (axial)	≤ 2 µm	
1.9	Edge filter	50cm^{-1} for 532nm and 785nm	
1.10	Rayleigh filter	Automated Rayleigh line rejection filter	
1.11	Spectral acquisition	Should be able to collect spectra of entire wavelength range (50cm^{-1} to 3500cm^{-1}) in one single acquisition without any step or stitches maintaining high spectral resolution.	
1.12	System mounting	Kinematic system baseplate for spectrometer, microscope and lasers.	
2	**Lasers:**		
2.1	Wavelength	532nm and 785 nm	
2.2	Power	50mW for 532nm and 300mW for 785nm	
2.3	Laser power levels	Minimum 16 power levels using motorized neutral density filters from 0.05% to 100%.	
2.4	Laser line width	≤ 1 MHz	
2.5	Filters	Plasma line rejection filters for 532 nm and 785 nm lasers	
2.6	Laser spot size (d)	1 µm ≤ d ≤ 300 µm	
2.7	Laser coupling	Laser should be directly coupled to microscope and spectrometer	
3	**Microscope**		
3.1	Light source	White light with reflected light illumination	
3.2	Objectives	5X, 20X, 100X, Long Working Distance (LWD) 50 X	
3.3	Confocal depth resolution	≤ 2 µm for 100X objective	
3.4	Other mandatory features	Binocular head with eyepieces	
		Colour video camera	
		Microscope enclosure	
4	**Transfer Stage**		
4.1	Stage type	Automated XYZ mapping stage.	
4.2	Travel range	X=100mm, Y= 50mm, Z=20mm or better.	
4.3	Step size	XY ≤ 0.1 µm and Z ≤ 20 nm.	
5	**Detector**		
5.1	Type	Peltier cooled CCD; fully automated multi-channel detectors	
5.2	Operating temperature	~ -70°C	
5.3	Pixel size	1024x256 or higher	
5.4	Digital Resolution	≥ 16 bit	
5.5	Imaging speed	≥ 1000 spectra per second	

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6	**Computer**	Provide the suitable compatible computer along with the system for the hardware-software interface and all the required system operations along with application software.	
7	**Automation**		
7.1	Automation	Raman system should be fully automatic	
7.2		Real time automated dynamic focusing for both Raman spectra acquisition and white light video viewing modes with data collection speed better than 20 spectra per second and maintaining Raman focus automatically on sample moving in z direction	
7.3		Automated Rayleigh filter changeover assembly.	
7.4		Automated Rayleigh line rejection filter for both 532 nm and 785 nm laser.	
7.5		Automated alignment and optimization of input laser power.	
7.6		Auto switching and auto aligning of laser	
7.7		Adjustable confocal facility with motorized slit and automated signal optimization.	
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8	**Software**		
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8.2	Additional software licence	At least for 4 additional offline work-stations.	

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17	**Extended Warranty (optional)**	Kindly quote for extended warranty for additional two years.	

Authorized Signatory
Official Seal

Date