Sr No. 165 / Reference No. : 174 (NEW)

Detailed Description of Item: Direct Energy Deposition (DED) Manufacturing Technology

Detailed Technical Specifications:

SL	Description	Specifications
1	General Features	a) The machine should be able to build small 3D-parts in metal using metal powder and wire deposition. b) The machine should be able to deposit within a controlled atmosphere to reduce contamination. c) The machine should be able to change material or adjust composition as per programmed instructions. d) Should be capable of additive deposition of alloys of: Ni,Al,Ti,Co,Fe,W & Cu or more.
2	Laser	a) Ytterbium Fiber Laser (Should be from very reputed manufacturer with global presence in multi kilo-Watt power Yb-fiber laser market for more than 10 years). b) Must be a diode laser c) Maximum laser power: 0.6 kW . d) Total laser power must be divided into 3 independent laser source units. f) Wavelength 1070 nm+/-10 nm g) Operating mode: Continuous/Pulse h) Power tunability: 10~100% or better i) Out power instability: < ±2% for 8 hours of continuous operation
3	Deposition Head	a) Highly Compact Monolithic Deposition Head. b) Device must have 3-axis kinematics capability to move the deposition head. b) Multiple 3 off-axis independent lasers and on-axis material feeds. c) Must be capable of simultaneous multi-powder (2) and multi-wire (2) deposition. d) Hot wire feed capability {preheating depositing wire/powder. e) Must have provision for diffusion of commonly used inert gases (argon, C02, N2,He) in the build chamber. f) The deposition nozzle should be able to provide continuous flow for all the range of metallic alloys. g) Minimum feature size should be mentioned. Desirable minimum feature size is 800 microns or smaller. A thin wall thickness can be

		taken as minimum feature size. h) Optics and nozzles should be capable of both fine deposition and bulk deposition. i) Nozzle should be suitable for continuous powder deposition for at least 10 hours without any need to stop.
4	Build chamber	Build volume: 150 x 200 x 450 mm. Temperature controlled build plate. (Max. Temp) Atmosphere control with fume extraction. (Min O2)
5	Powder feeders	a) Powder Feeder Type: Rotating disc type b) Feed Rate Control: Option to control feed rate externally as well as via CNC codes. c) There should be option for changing carrier gas flow rate and it should be able to controlled externally or by CNC codes. d) It should have 2 Hopper of 1.5 liter capacity each or more. e) Powder flow rate (mass flow rate): 1 - 30gm/min or more (per hopper) (For steel or Ni or Ti-6Al-4V alloy)
6	Wire Feeder	a) Must be capable of simultaneous multi-wire (2) deposition and can be changed by programming. b) Hot wire feed capability {preheating depositing wire, Temperature}. c) Should be capable of long and uninterrupted wire supply. d) Feed rate?
7	User Interface and accessibility	The machine functionality should be accessible by: a) A simple and user friendly interface (touch screen) accessible on the machine. b) A tablet or computer through a local wireless network or via an Ethernet connection. c) Or a Computer connected directly to the machine. d) All255 functionalities should be controllable by CNC codes (M-codes).
		a) Custom designed software to allow easy access to process parameters. This should have the following features: # Option for uploading/import of standard CAD files (.stp file format). # There should not be any restriction on file size.

8	Software	# Software should be able to generate sliced layers # Option for user defined build strategy as well as tool path sequencing strategy # Build processor to generate process theme. It should have option to change build parameters and create user defined build strategy and process theme. # Generation of program and AM operation # Software license without any time limit and with all the updates for at least next 3 years. # All Software should be provided in CD/DVD/Pen drive also (As a backup in case of any failure) OR supplied through cloud sharing platforms/websites
9	Control system	Appropriate control system for part manufacturing
10	Material Processing Capability	a) The machine should be capable of producing additive parts using wire and powder form the following alloys: # Inconel # Steel and iron alloys # Aluminum alloys (Aerospace grade) # Titanium alloy (Aerospace grade) # Cobalt alloys (Aerospace grade) # Copper alloys # Tungsten alloys b) Submit list of all the suitable materials for which process parameters and build data/parameters will be supplied. It must include SS316, Inconel 718, Inconel 625, Ti-6Al-4V and AlSi10Mg. c) Wire size: commercially available welding wires (0.8mm to 1.2 mm) d) Powder size: 45um to 90um e) Machine should have minimum two wire feeds and 2 powder feeders. f) There should not be any restrictions on use of powders and wires from external sources. Qualification / suitability criteria for the

		powders and wires should be provided. g) There should not be any restrictions in changing process parameters for process optimization.
11	Material Recipes	Large Volume, Small Volume & Thin Wall Recipes for the above alloy system.
12	Feedback Control system	a) Process control Closed-loop: laser, wire and powder modulation based on process in-situ feedback. b) External input to control the process should be provided.
13	Monitoring devices	a)In-situ temperature monitoring for melt pool. b)Continuous build chamber oxygen monitoring
14	Accessories	a) Two k300 spools b)Process chiller: Active water-cooled, process interlocked for - Cooling deposition head - Cooling laser source units c) Laser personnel safety (eye-ware, etc) (Quantity) d) Metal Powder safe vacuum cleaners. e) Powder sieving (Powder recovery) system should be quoted as optional. f) Powder and Wire storage canisters g) Nitrogen/Argon cylinders
15	Warranty/Guarantee	a) The system must be under guarantee / guarantee for a period of minimum three years (un-conditional warranty) from the date of its satisfactory installation, commissioning, and demonstration against all manufacturing defects. If the system is found to be defective during this period, the whole equipment or part thereof will have to be repaired/replaced by the supplier free of cost to IIT Bombay. During the guarantee / warranty period, the downtime of the equipment will be recorded with the details of date and type of complaint/fault. The vendor should attend it and make the equipment operational within reasonable and stipulated time. The downtime more than the stipulated time after reporting the complaint/fault will be added to calculate cumulative downtime. The guarantee/warranty period will be extended

		automatically by this cumulative downtime. However, if the items are under guarantee/warranty for a period of more than three years, it may be specifically mentioned in the quotation. In case the supplier fails to rectify the defects and equipment is not put to proper function to our satisfaction, the supplier will replace the whole equipment to our satisfaction or purchase amount of the equipment will be refunded by supplier to IIT Bombay. b) In case of breakdown during Guarantee/warranty period, a competent service engineer of the supplier should make as many visits as are required to rectify the problem and replace the faulty parts, without any liability of costa)Total comprehensive warranty for 3 years from the date of installation. These should include: - System Online & Telephone Support - Limited Application Online & Telephone Support - Software Updates & System Field Change Orders - One Preventative Maintenance Visit by the manufacturer and four visits by Indian Agent, per annum. -Software maintenance and version updates for 5 years.
16	Others	a) CAD models of the Machine to be used with CAM. b) Standard spare kit and tool kit should be provided with the supplied system
17	Pre dispatch inspection	a) IIT BOMBAY selected components have to be built as a part of technical bid. The sample component must be manufactured in the same machine in presence of IIT BOMBAY researchers. The generated sample will be used for technical qualification. Sample will be analyzed for geometrical accuracies, surface roughness and Oxygen content in the build. The generated samples will be bench marked against the sample supplied with the technical bid. The sample quality should be on par with the sample submitted with technical bid. b) Demonstrate the operation of the system as per OEM standards c) Demonstrate functionality of all peripheral equipment and software as per OEM standards d) Demonstrate quality of build in entire build area as per OEM standards e) Certificate of conformance of the machine suiting IIT BOMBAY specification from your quality department need to be produced before dispatch of the machine

18	Training	Suitable training to enable safe, efficient operation and maintenance of the machine. The training must include: ➢Machine operation, system handling ➢Application development with design and build rules ➢Build optimizations and process knowledge. ➢Detailed software training for basic and advance operations ➢Preventive maintenance training for unscheduled and specialized maintenance requirements, troubleshooting etc ➢Process development using non-standard powders ➢Handling of post-processing equipment for powder recovery and other accessories ➢Material development training.
19	Installation	b) Installation and commissioning of the machine to be done by the supplier at IIT Bombay and proving out of the machine and demonstration of all the features is to be carried out by the supplier at IIT Bombay c) The layout, pre-installation requirements and foundation drawing of the offered machine and all the peripheral equipment should be enclosed with the Technical offer. d) Installation and set-up of the System includes Travel & Living Expenses.
20	Inspection	a) IITB selected components have to be built. The sample component must be manufactured in the same machine in presence of IITB personnel. b) Demonstrate the operation of the system as per specification c) Demonstrate functionality of all peripheral equipment and sub-systems as per specifications d) Demonstrate quality of build in entire build area e) Safety compliance f) Demonstration of all the safety interlocks as per International safety standard

22	Safety	a) Entire machine should be as per International / European safety standards (EN ISO12100:2010 and EN60204-1) during entire operation with respect to radiation safety, powder safety, electrical safety, laser safety. b) It should have necessary protective enclosures, all safety accessories and safety interlocks. The Supplier should comply with all Safety features and incorporate all safety for controls and operator while in operation from possible damages and injury. c) Automatic machine shutoff/warnings in the event of malfunctioning beyond pre-set limits. d) X-ray radiation leakage should be well within limits mentioned in international safety standard table 1.0 of AWS C7.1-2004 OR EC Directive 96/29 EurAtom
23	Documentation	The following documents in English Language to be provided to IIT BOMBAY: a) User manual, operation manual and maintenance manual (for mechanical, electrical) of the entire system and sub-systems. b) Maintenance manual- shall cover detailed system configuration with the help of sketches. The safety instructions, maintenance schedule, preventive maintenance schedule with possible errors and troubleshooting to be provided. c) Standard operating procedure (SOP) d) Original software licenses for all the software included in the supply e) Calibration certificates as per OEM standard of all the artifacts. Reference standard used for the same shall be provided to IIT BOMBAY. f) All the data and results of testing of the entire system at manufacturer’s site as well as at IIT BOMBAY shall be properly documented and supplied to IIT BOMBAY g) Certificate for general compliance with standard, safety and protection

Sr. No. 166 / Reference No: 175 (NEW)

Detailed Item Description : FTIR based gas analyser system using ZnSe optics and transmission and ATR facility.

TECHNICAL SPECIFICATIONS :

ALPHA II -Transmittance FT-IR Spectrometer with Universal QuickSnap Sampling Module

ALPHA II is a very compact FT-IR spectrometer for quick, easy and reliable IR-analysis. The design of its hard- and software is highly integrated for an intuitive and comfortable operation. All spectrometer components are built for continuous availability and a long life-time. Bruker's permanently aligned Rock-solid interferometer and the reliable diode laser guarantee an accurate and precise data acquisition. Due to the CenterGlow IR-source technology and a temperature controlled DTGS detector the ALPHA II provides a constantly high performance, independent from ambient temperature and for many years. The need for maintenance is minimized and running costs are kept very low due to the long life-time of the relevant components like interferometer, IR-source and laser.

The ALPHA II -Transmittance includes the Universal QuickSnap sampling module that allows performing the FT-IR-analysis of solids, liquids and gases in transmittance. A sample compartment with standard holder allows the use of various transmission cells for liquid and gaseous samples.

A wide range of Quick Snap sampling modules is available for the ALPHA II, providing a perfectly matching measurement setup for a large variety of samples and applications. With the push of a button, the exchange of the sampling modules is performed quickly and easily. The Perma Sure function automatically recognizes each change of the setup and performs a quick self-test ensuring a proper instrument performance. Suitable measurement settings for the used configuration are automatically loaded. The Performance Guard continuously monitors the spectrometer electronics as well as optical and mechanical components to permanently assure the correct functioning of the complete instrument.

OPUS provides the right software user interface for the most efficient FTIR-analysis. From the measurement via evaluation to the final analysis report the user is guided in few steps through the analytical workflow. Therefore, ALPHA II is easily operated even by spectroscopic inexperienced personnel. Powerful but easy to use functions for verifying and identifying IR-spectra and performing quantitative analysis are included in the software.

System specifications:

- Compact ALPHA II FT-IR spectrometer with universal sampling compartment
- Robust metal housing
- Small footprint: 22x30cm (including sampling module)

- Weight: approx. 7kg

- Spectral range: 350-8,000cm-1

- Spectral resolution: better than 2cm-1; option: better than 0.75cm-1

- Rock Solid interferometer: gold mirrors, high throughput, permanent alignment, long life time

>10 years

- Diode laser, high wavenumber accuracy and precision, long life time >10 years

- IR-Source: CenterGlow technology for

Continuously optimized light flux, long life-time > 5 years.

- Detector: DTGS, temperature-controlled, high stability against external temperature changes

- Sealed and desiccated optics

- Internal validation unit (IVU) with reference standards for automated instrument tests of every ALPHA II setup and every measurement mode - Automated instrument tests for operational and performance qualification (OQ; PQ)

- Easy exchange of ALPHA QuickSnap sampling modules

- PermaSure: Automatic recognition and individual calibration of QuickSnap modules and ATR-crystal plates, automatic performance test and load of appropriate measurement parameters when changing the configuration

- Performance Guard: continuous monitoring of all spectrometer components, performance and humidity.

- Validated OPUS/IR software, prepared to work fully compliant to GLP and GMP regulations

- Software-wizard for IR-spectroscopic quality control. Guides the operator through the complete analysis procedure from measurement, via spectrum evaluation to the final generation of the report

- Universal QuickSnap sampling module with sample compartment

- 2x3" standard sample mount

- 2x3" holder for 13mm pellets

- Sample compartment cover Included:

- BPAD BRUKER ATR Polymer Spectra Library, 234 spectra (of 117 polymers) recorded with diamond and germanium-ATR technique.

- Desiccant

- Set of tools

Extension of the ALPHA base spectrometer

Extension of the ALPHA base spectrometer for operation in regions with high humidity. Use of ZnSe for all IR light-transmissive optical components including the beam splitter.

Usable spectral range to 6,000-500cm-1

Eco ATR, ZnSe, 1 bounce

The ALPHA Eco ATR is a single reflection ATR sampling module that allows you to analyse most solids and liquids without any sample preparation. It is equipped with a versatile high throughput ZnSe ATR crystal for solids and liquids, pH ranges from pH4 to pH8. The ATR crystal is protected against damage by a slip clutch pressure applicator. The ALPHA's QuickSnap (TM) sampling modules offer complete sampling flexibility. QuickSnap (TM) modules are easily exchanged without the use of tools and all sampling modules are automatically recognized by the ALPHA FT-IR spectrometer. Specifications:

- One reflection ZnSe crystal
- Spectral range: 500-7,500cm-1
- Slip Clutch pressure applicator
- Working distance (max. sample height): >20mm - Perfect for analysis of large samples: appr. 350° free working area around crystal
- Easy cleaning due to 360° rotation of pressure applicator
- Exchangeable ATR crystal plate with electronic recognition
- Easy exchange of ALPHA QuickSnap (TM) sampling modules with automatic recognition, performance test and automatic load of measurement parameters.

Stainless steel gas cell with 7cm path length for the ALPHA-T spectrometer

Allows the measurement of gases and gaseous mixtures by transmission IR- spectroscopy. It can be applied for studies under flow or static conditions at ambient temperature.

Specifications:

- Transmission gas cell
- 7cm path length
- Body and inlet from improved corrosion resistant chrome-nickel steel alloy AISI 316Ti
- Viton O-rings sealing
- Flow through or static operation
- Swagelok-connectors 1/8" at in and outlet port - Maximum pressure 25 psi (2 bar)

- Various window materials available

Required:

- Two 25x2 mm windows (F164-x)

- ALPHA FT-IR Spectrometer with universal sampling module (A230/D) Options:

- 1015476 Valve for gas cell

- 2x 1017568 Kalrez O-ring

- 2x F164-3 CaF2 window, 25x2mm

- 2x F164-5 KBr window, 25x2mm

- 2x F164-11 ZnSe window, 25x2mm

IR sampling kit for transmission analysis

This standard IR sample preparation kit contains tools and materials for the preparation of liquids and solids for transmission measurement. A demountable transmission cell is provided for measurements of liquid samples and mulls. A mortar with pestle and Nujol is provided for mull making of solid samples. Sample holders allowing placement of films, pellets and mulls in the spectrometer sample compartment are provided. Included

Liquids sampling:

- Demountable transmission cell (OmniCell) - KBr windows (pair), rectangular, for liquid cell

- CaF2 windows (pair), rectangular for liquid cell - KBr windows (pair), circular 25mm diameter for mull cell

- Teflon spacer set with ten rectangular

Spacers/ thickness:

0.05mm; 0.1mm; 0.2mm; 0.5mm; 1mm

- Luer syringe, 2ml Solid sampling:

- Teflon spacers (5 pcs), circular, thickness 0.1mm for mull cell

- KBr Powder, 50g

- Nujol, 25ml

- Magnetic film holder

- Stainless steel micro spatula

- Mortar (diameter 40mm) and pestle

- Sample cards for films and pellets (10pcs)

Sadtler Select vapour phase library

485 spectra, Sadtler, PN: 422800

Data have to be downloaded from Sadtler webpage by customer. For this download a data system with internet connection is required. Customer has further to register online for this library (may be done via smart phone).

USB stick with data from Sadtler libraries

Only available in combination with a library from Sadtler.

Sr. No. 167 / Reference No: 176 (NEW)

Detailed Item Description : SPARK PLASMA SINTERING FURNACE

The requirement is of a **spark plasma sintering (SPS)** or **field assisted sintering technique (FAST)**, which can be used to obtain near-theoretical densification of difficult-to-sinter ceramic and metallic materials, as well as allow diffusion bonding, by simultaneous applications of heat, uniaxial pressure and pulsed direct current. Further detailing of the (mandatory) required specifications are provided in the following.

- Sintering pressure: 100 kN (or up to 60 MPa) for graphite dies having diameter up to 50 mm, facilitated by vertical axis hydraulic pressure system.
- Maximum temperature: up to 2500 ° C.
- Two-way temperature detection system: radiation thermometer system (for temperatures above 600 ° C, with capability of detecting up to at least 2800 ^{o}C) and K-type thermocouple (for lower temperatures; but capable of precise measurement up to 1000 ^{o}C).
- Water-cooled sintering electrodes.
- DC Pulse Generator; with on time pulse duration of approximately ~3-330 ms and off time pulse duration of ~3-30 ms at 50 Hz.
- Output current up to 5000 A and output voltage up to 10 V.
- Operation and control feasibility: Manual with volume and Automatic with PID Digital Programmable Temperature Controller.
- Precise positioning of pyrometer (and thermocouple) for detecting temperature at hole created on surface of die is strongly desired.
- Sintering atmosphere: possibility of using inert gas, vacuum and air.

- Rotary pump based exhaust system is needed, such that evacuation can be done from atmospheric pressure to ~10^{-2} Torr in a maximum of ~10 min.
- Needed stainless steel vacuum chamber, with provision of a water-cooled jacket.
- A cooling water circulation system (chiller) with cooling capacity of above 15 kW.
- Vacuum/sintering chamber should have quartz glass viewing windows, with protection plates.
- Vacuum limit: up to 6 x 10^{-3} Pa, with a diffusion pump for the exhaust system.
- Vacuum meters: pirani pressure gauge, plus-minus bourdon pressure gauge.
- PID digital programming for temperature and pressure control.
- Z-axis displacement meter, with a least count of 0.01 mm
- Data acquisition system to record SPS current, voltage, temperature, pressure, vacuum and displacement throughout the cycle.
- Safety measures such as overcurrent detection, water temperature and flowrate detection, overcurrent protection, emergency stop button and warning alarm system.
- Most of the operations, programming and display (such as control/setting of power supply, vacuum, pressure, temperature, temperature and displays of vacuum, temperature, pressure, current, voltage, displacement, warning etc.) should be facilitated by touch panel and digital display.
- It should be possible to view most of the above data and sintering related data (such as, temperature, pressure, displacement, current, voltage, vacuum etc.), in real time, on a PC via USB connectivity.

Sr No. 168 / Reference No. : 177 (NEW)

Detailed Description of Item: Single Photon Counting Module

Photon counting electronics, Optical fibre and soft wares should be included

Detection wavelength range: 400 – 800 nm

Photon Detection Efficiency (PDE) : >70% at 550 nm.

Active area (diameter) at minimum PDE: 200-500 μm

>10 Mcps dynamic range before saturation

Both gated and free running output modes should be allowed

Time jitter: <350 ps

Case operating temperature:

FC fiber adapter, C mount bracket

Suitable power supply.

Dark count: 250 counts/sec

Dead-time: <250 ns

Sr No. 169 / Reference No. : 178 (NEW)

Detailed Description of Item: Integrated characterization system for 2D materials and nanocavities

- Complete confocal system with inverted microscope body, and multichannel detection unit

- Turn-key diode laser for excitation wiht 532 nm

- Two truly parallel detection channels using application-optimized detection with SPADs

- Time-Correlated-Single Photon Counting (TCSPC)

Excitation:

1. Mainframe for PC controlled 8-channel diode laser driver

- power supply, μ-controller, USB connector

and safety interlock

- 1 slot for oscillator module

- 8 slots for laser driver modules

- operation software for Windows

2. Laser driver module for picosecond pulses

- cw operation of suited laser heads (LDH-D Series)

- 6 internal repetition rates (2.5 to 80 MHz)

- external trigger input
- synchronisation output
- 2 gating inputs

3. Oscillator / burst generator / sequencer

- 8 signal outputs incl. ps fine delay
- 763 Hz to 80 MHz internal repetition rate
- external trigger input
- synchronisation output

4. Laser head for picosecond pulses

- 531 ± 3 nm, spectral width <1 nm, approx. 2 mW at 40 MHz
- output: polarization maintaining single mode fibre, FC/APC connector, approx. 4 m length, Inox

5. Filter set (standard) for 532 nm excitation consisting of:

- 1 dualband dichroic filter (25.5 mm x 36 mm rectangular)
- 1 fluorescence longpass filter (25 mm circular)

6. Compact fibre coupling for a single LDH-laser head

- single mode fibre coupler
- incl. variable attenuator
- incl. mounting baseplate
- optimized for the wavelength range 370 nm - 600 nm

Microscope & accessories:

1. Research grade inverted microscope:

- inverted microscope body Olympus IX 73
- transmission illumination with manual

condensor unit incl. power supply (widefield-
epi-illumination on request)
- manual fluorescence filter cube revolver
- binocular including one of two eyepieces
with a cross hair
- special right side port for confocal optics

2. power supply for microscope halogen lamp (India compatible)
2. Standard objective set:

- PL 20 x PlanAchromat objective, NA = 0.4
- PL 40 x PlanAchromat objective, NA = 0.65

4. Special high-end objective 100 x 0.90 (air)

- Similar to MPLFLN 100 x PlanFluorit objective, NA = 0.90,
air spaced
- working distance 1.0 mm
- without glass coverslip correction

5. Widefield illumination

- 120 W metal halide burner and iris aperture
- lamp control, 1.5 m liquid light guide, collimator adapter
and lamp
- fluorescence condensor

6. filter cube

- for widefield epifluorescence imaging
- contains excitation, beamsplitting and
detection filters
- suitable for the above microscope

7. Monochrome camera

- 1 inch 2048x2048 Pixel CMOS sensor

- Global shutter, C-Mount, enhanced NIR

sensitivity, glas filter

- Adapter for left side port on above microscope

Coupling and fluorescence detection:

1. excitation unit:

- apochromatic corrected collimation (4 x 0.16)

for fibre output

- holder for laser clean up filter (for 25 mm and

1 inch diameter optics)

- shutter

- relative power meter via photo diode including beamsplitting optics

2. basic confocal unit:

- exchangeable holder for dichroic beamsplitter (for 25.5 x 36 mm rectangular optics)

- beam displacer unit

- 4 position filter wheel (including attenuator)

- adjustable holder for exchangeable pinholes (30 µm, 50 µm, 75 µm, 100 µm, 150 µm, 300 µm)

3. beam diagnostics:

- CCD camera including imaging optics and variable attenuator to monitor backscattered excitation light

4. external exit port at position MPA2

- beamsplitter with filterslider (2 exchangeable optics

+ 1 empty slot), pre-equipped with a high reflective mirror

and a 50/50 beamsplitter plate

(each 25.5 x 36 mm rectangular)

- incl. beamsteering to output port

5. Fibre connector for exit port

- achromatic focusing optics

- for multi mode fibre cable with FC/APC connector

- fibre included

6. Opto-Mechanics for detector 1

- light tight filter holder (for 25 mm and

1 inch diameter optics)

- light tight shutter

7. opto-mechanics for detector 2

- beamsplitter with filterslider (2 exchangeable optics

+ 1 empty slot), pre-equipped with a high reflective mirror and a 50/50 beamsplitter plate

(each 25.5 x 36 mm rectangular)

- light tight filter holder (for 25 mm and 1 inch diameter optics)

- light tight shutter

8. Single Photon Counting Module (SPAD): **2 pcs**

- red sensitive SPAD

- incl. x-y adjustable focussing optics and mounting material

- pre-adjusted and tested

Electronics and software

1. Microscope controller

- rolling 19" rack

- incl. power supply for imaging unit and detectors

- hosts several electronics components

- acts as a stand

2. TCSPC PC plugin board for the PCIe bus

- independent channels with 25 ps temporal resolution

suited for 1 sync & 2 detectors or for 3 detectors

- histogramming with 32768 time bins and 32 bit depth

- incl. data acquisition software for Windows, time tagging of all

events (incl. imaging) and 3 SMA signal cables (1.8m length)

3. Host PC system: (this can be supplied by IITB customer. In case of special requirements, please mention in the quote itself)

- installed and tested software (to be supplied by vendor)

- must be optimized for high data throughput

Accessories:

1. Imaging unit accessories

- Adjustment tools for beam alignment

- Toolkit

- Test Sample

2. Slide with immobilised Beads and Single Molecules

for alignment and performance checks

- separate samples on the surface of 2 glass cover slips

- cluster and isolated 100 nm diameter Tetraspeck beads,

suited for excitation from 532 nm

3. Polarization beamsplitter cube

- premounted in a filter cube

4. Empty filter cube (U-MBF3)

- can host a dichroic mirror

5. Filter insert

- for optics with 25 mm or 1 inch diameter

- max. optics thickness 10 mm

6. Longpass filter for fluorescence detection

- transmissive from 542 nm to 960 nm

- blocking from 380 nm to 535 nm

Accessories for Laser combining unit for the 532nm laser

1. Fibre outcoupler in LCU

- for FC/APC fibre
- incl. collimation
- mounting for beam height 50 mm

2. Polariser for the Laser Coupling Unit (LCU)

- to enhance the polarisation contrast of a single laser diode head
- recommended for the LDH-P-FA-530 series
- spectral range: 450 - 700 nm (can be smaller but should cover 532nm)

3. Laser Combining Unit

- basic version for combination of up to 5 internal lasers into one single mode fibre
- light tight box on solid bread board
- manual light attenuation via beam waist reduction and ND filters in a filter wheel
- fibre and dichroics quoted separately

4. Laser mounting

- adapter for a single laser head
- beam adjustment elements

5. Single mode fiber cable

- polarization maintaining
- length 3.0 m, cutoff < 375 nm
- MFD = 3.6 µm, NA = 0.08
- output connector FC/APC

Warranty: 5 years

Complete installation support available locally

Sr No. 170 / Reference No. : 179 (NEW)

Detailed Description of Item: RF generator with impedance matching network,

RF Power Generator 13.56 MHz, 600 Watts (Continuously working) and a Impedance Matching Network (with control panel, power supply and all suitable cables for inter connections) for operating range up to 600 Watts at 13.56 MHz with following specifications and Features (for Plasma Processing Applications like thin film deposition, sputtering and RF biasing etc.) :

(a) RF Power Generator (with common exciter circuitry provisions for phase locking of the outputs of two or more generators when coupled into the same plasma load)**:**

Frequency :13.56 ± 0.005 % MHz

Amplifier type : CLASS AB

Maximum Output Power : High Range: 0 to 600 Watts into 50 Ohms

Low Range: 0 to 60 Watts into 50 Ohms

Reflected power limit : 100W

Delivered power into mismatch : 10 % depending on the load impedance

Load impedance : 50 Ω

RF Output connector : 50 Ω, N-type (fem)

RF power regulation mode : forward power, delivered power or DC self bias

Regulation (% of set point) : +/- 1% into 50 Ohms

Harmonic Distortion : -50dBc

Spurious content : to meet or exceed FCC requirements.

Pulse operation : 10/20 Hz to 10KHz, 1-Hz Steps

Pulse duty cycle : 10/20 Hz to 10KHz, 1-Hz Steps

Output Impedance : 50 Ohms, +/-5 Ohms Nominal

Output Accuracy : +/- 2% of Reading, +/- 1 Watt

Load Mismatch : Continuous operation into any load mismatch without failure

Reflected Power limit : Automatic fold back arrangement when reflected power at

the output exceeds preset limit

Protections : Against preset reflected power, over temperature,

DC overload and RF power limit.

Input Power : 230 VAC ± 10 % , single phase, 50 Hz

Operating Temperature : up to ~ 35-40 C

Humidity : 10% to 90%

Cooling : Air

Mounting : ½-Rack Mounting

Should have the following FEATURES :

- Digital display of operation of unit.
- Provision for constant dc bias regulation with a dc bias input.
- Display of forward and reflected power, dc bias voltage, maximum available power and predetermined set point.
- Display of dc bias level, load power based on operator provided signals.
- Digital display of status reports like interlock failure, output enabled, arc detected, tuner mismatch.
- Power supply should be protected against short circuits, preset reflected power, over temperature, DC overload and RF power limit.
- Over current protection in ac input.

CONTROLS On Front Panel:

- Mains On and OFF
- LCD display for reading all operating conditions and power values
- RF output ON and OFF switches
- Display and SETPOINT switches for selecting parameters to be viewed.
- RF Power control knob for controlling forward power and load power regulation control or DC bias in the external regulation control

- Matching Control to select operation of an external matching network in either automatic or manual tune control

STATUS INDICATORS on the Front Panel :

- RF ON / RF OFF
- Mode of REGULATION
- Selected parameter values
- Tuner in Auto / Manual mode
- DC bias value when the DC bias control is used
- OUTPUT ON

QUANTITY REQUIRED : ONE NUMBER

(b) Impedance Matching Network compatible with the RF Generator @ (a), (This unit should be able to operate manually and also in automatic mode from the front panel of the generator) :

Operating frequency : 13.56 MHz

Maximum Power transfer : 600 Watts Nominal

Input Impedance to Generator : 50 Ω

Max RF load Current into the load : 30-35 A

Max RF load voltage into the load : 4.0-4.5 kV (peak)

RF input connector to Generator : 50 Ω , N type (fem)

Maximum Plasma DC self bias voltage : 0-4000 V

DC self bias monitor voltage : 0-10 V DC

RF load connector : 50 Ω, 7/16 (fem.),

Location of RF load connector : Rear panel

Cooling : Air

Output Impedance range : 5 to 40 ohm, -j30 to j80

Operating Temperature : 10^{o}C to 40^{o}C

AC Input : 230 ± 10 % V, 50 Hz, Single phase

Operating Modes : Auto and Manual (Fully automatic tuning

without user interaction and Auto or Manual

tuning via optional controller).

FEATURES :

- Tune times ~ 3-5 seconds
- Preset capability
- Capacitor maximum / minimum range adjustment so as to reduce tuning time.
- Indication of direction of tune for minimum reflected power.
- Indicator display of either RF power or capacitor position.
- Display of actual capacitor position.

QUANTITY REQUIRED : ONE NUMBER

Connecting Cables:

a. Input power connecting cable 5.0 meter length : 1 No

b. Cable for connecting RF generator to Auto / Manual matching network; 3.0 meter length : 1 No

c. Cable for connecting Matching network to the load, 1.5 meter length : 1 No

d. Cables required for various interlocks if any : 1 set

AC Input for all units should be : 230 ± 10 % V, 50 Hz, Single phase

Note:

- The RF generator and associated Matching network is initially going to be tested / used separately but subsequently in future additional generator will be connected to the same plasma chamber. For phase locking of the generators it is therefore necessary to have common exciter circuitry provision so that these generators could be coupled to same plasma chamber.
- Control Panel and its Power supply if required separately should be a part of the quotation

- All necessary cables (of sufficient length) required for connecting RF generator to Auto / Manual matching network and Matching network to the load, cables required for various interlocks, cables required for connecting another generator to the same plasma chamber through common exciter circuitry should be a part of the quotation.
- Detailed Catalogue with circuit diagrams and literature in English should be a part of the quotation.
- The supplier / their representative will be responsible for the installation of these units at the user's laboratory and maintenance of these units during the warranty period of at least 12 months from the date of installation of these units at user's laboratory.
- Essential spares should be a part of the quotation.

Sr No. 171 / Reference No. : 180 (NEW)

Detailed Description of Item:

Advanced Fully Automated Scanning Upright Research Microscope for Earth & Material Science Application under Reflected Light and Transmitted Light with Scientific Digital Camera dedicated for Polarization, and with Digital Imaging software for both 2D and 3D imaging, analysis and measurement

Salient Features

- Stage
    - Scanning stage travel range 100mm x 100 mm
    - Stage opening: 160x116 mm
- Power supply
    - 90-250 V, for Hg 50 W
    - Power Supply unit. Automatic switching power supply voltage with operating hours display, including power cord
- Objective turret
    - Motorized 6 or 7-fold objective turret
    - ~0.5 s switching time between 2 objectives
    - Easy and intuitive adjustment of parfocality

    - Fully integrated in the intelligent automation concept
    - Semi-Plan Apochromatic FLUOTAR Obectives 1.6x,2.5x,5x,10x,20x,50x,100x (Wet and Dry)
- Filter slider
    - Filter slider for IL axis Filter slider for usage in incident light axis, with 25 mm mount for insertion of different filters.
- Display
    - With new touch panel "Leica Smart Touch" for display and controlling contrast management and motorized modules.
    - Touch-Panel with increased resolution to control the microscope and xyz movements with free programmable function-keys.
- Operation
    - Motorized focus drive with two focusing knobs for motorized fine/coarse z movement. Possibility for switching between 5 different electronical coarse/fine drives.
- Dedicated for Earth & Material Science Application
- Illumination is under Reflected Light and Transmitted Light
    - LED supply unit including integrated power supply for LED illumination and control of the motorized microscope functions. Including USB cable.
    - LED lamp housing, cable long LED Lamp housing, with fixed, pre-centered LED, with focusable collector.
    - Lamp housing, for reflected light, with centrable lamp mount for Hg 100W, with focusable 4-lens collector and heat protection filter, w/o ignitor.
    - Illuminating telescope HC 2x ILLUMINATING TELESCOPE HC 2X
- Contrast Techniques: Reflected Light Bright field, Polarization and Epi-Fluorescence and Transmitted Light Bright field, Polarization
    - BF, PH, DF, POL
    - DIC (fully automatic)
    - Epi- Fluorescence: 100W Mercury power supply
    - Motorized Fluorescence Turret

- Filter cubes (Excitation)

a) UV + Violet

b) Blue

c) Green

d) Daylight filter DLF Daylight filter DLF

e) Glass yellow filter

f) Interference green filter

g) Glass blue filter

- Analyzer 180°, rotatable Analyzer 180°, rotatable, in slide bar

- High Resolution and High speed Scientific Digital Camera dedicated for Polarization,
  - Sensor 1/1.2”- CMOS
  - Resolution 20.7 Pixel
  - Exposure time 1ms to 5s
  - 30 fps @ 1920 x 1200
  - Interface USB 3
- Digital Imaging software for both 2D and 3D imaging, analysis and measurement

Software compatible with Windows X desktop.

Sr No. 172 / Reference No. : 181 (NEW)

Detailed Description of Item: Framework design and techno-commercial analysis services for assessment for sub-surface gas storage. The services work package shall involve details of data collection, sampling and coalbed methane reservoir model development and simulation, the possible design of a pilot test program, specification and analysis of potential coalbed methane development scenarios, the development of proposed full field development strategy along with economic feasibility analysis.

Based on their experience, the interested party will assist IITB in determining a framework and analytical approach for implementation of CO_2-ECBMR in potential reservoirs in India through a “bottom up” approach. Initially, a detailed plan of action will be worked out to perform a preliminary techno-economic and commercial analysis of the prospective active CBM projects as well as potential projects in India. This will also involve a description of the steps for data collection, sampling and initial ECBM model development with consequent reservoir simulation, based on the data generated through laboratory experiments of collected samples in IITB. Based

on simulated performance, pilot test design will be prepared and potential ECBM development scenarios will be outlined. Upon the design of pilot test, full field development strategy needs to be developed with an analysis of estimated ECBM economic feasibility assessing production cost and revenue for prospective sites.

The key steps that would be described in the project-specific feasibility assessment:

1. Develop inventory of potential project sites. Perform preliminary evaluation and ranking of sites based on existing data.
2. Review, update, and refine existing data on CBM wells in selected areas, as necessary and achievable.
3. Analyze CO_2 isotherm data from cores/cuttings collected from different depths of CBM reservoirs.
4. "History match" current CBM production, where available, to ensure the current characterization is consistent with historical performance.
5. For up to three of the highest ranked locations, perform multiple simulations to forecast the effects of alternative potential development strategies for ECBM.
6. Perform screening level assessment of recovery potential and project economics for up to three of the highest rank locations.
7. Propose methodology for extrapolating the results of this screening level assessment to estimate regional ECBM and associated CO_2 storage potential.

Shortly after project initiation, priority will be given on constructing a preliminary framework and analytical assessment of CO_2 ECBM potential in selected reservoirs. Further attention will be paid towards estimating the feasibility of a hub and cluster model of CO_2 sources and sinks facilitating further economic benefit. After consulting with involved parties and needful revisions of the proposed plan, a final comprehensive report will be prepared for further dissemination.

Pre-requisite: Interested party should have prior experience in the assessment of CO_2 storage and associated hydrocarbon recovery potential in at least three coal basins in India/abroad. Additionally, the participating company should have expertise in the technologies, markets, environmental and regulatory issues, and economics of the geologic sequestration of CO_2, CO_2-EOR, and ECBM. Proof of such engagements may be sought, if required.

Sr. No.173 / Reference No. 182 (NEW)

Detailed Item Description : 405nm,200mW Laser with power supply and heat sink

Mandatory Specifications:

- Technology: The Laser must be based on Optically Pumped Semiconductor Laser (OPSL) technology for better beam quality with variation of power.
- Wavelength: 405 nm
- Output Power : 200mW
- Spatial Mode: TEM_{00}
- M^2 (Beam Quality): ≤1.3
- Beam Asymmetry ≤1:1.2
- Beam Diameter at 1/e2: 0.8 ±0.1mm
- Beam Divergence (mrad, full-angle): <1
- Pointing Stability ()(over 2 hours after warm-up and ±3°C):<30 μrad
- Pointing Stability Over Temp:<5 μrad/°C
- RMS Noise (20 Hz to 20 MHz): ≤0.05 %
- Peak-to-Peak Noise: (20 Hz to 20 kHz) <0.5 %
- Long-term Power Stability(8 hrs., ±3°C): <2 %
- Warm-up Time: (minutes) (from cold start) <5
- Polarization Ratio: Minimum 100:1, Vertical ±5
- Laser Drive Modes :"CW, Analog Modulation, Digital Modulation and Computer Control

Digital Modulation

- Maximum Bandwidth (MHz): 150MHz
- Rise Time (10% to 90%) (nsec)<2
- Fall Time (90% to 10%) (nsec)<2
- Modulation Depth (extinction ratio): >1,000,000:1 at 0 Hz, >250:1 at 150 MHz

Analog Modulation

- Maximum Bandwidth (KHz): 500MHz
- Rise Time (10% to 90%) (nsec)<700
- Fall Time (90% to 10%) (nsec)<700

- Modulation Depth (extinction ratio): >1,000,000:1
- Air cooled Heat Sink should be quoted with various mounting options.

Sr. No.174 / Reference No. 183 (NEW)

Detailed Technical specifications :

Super Critical Dryer with

- Minimum of 1.25-inch Inner diameter and 1.25-inch depth sample chamber
- Flexible, high pressure compatible, Teflon lined liquid CO_2 supply hose (minimum 10 ft length).
- External CO_2 filtration system to remove particulates larger than 0.5 micron
- Static-free exhaust tubing for purge/vent/bleed/cool of exhaust (5 meters).
- Flow meter for precise control and periodic bleed of exhaust.
- Facility to program and save custom Recipes exactly to dry samples ranging from polymers to biological.
- Slow fill feature to protect the delicate samples.
- Spare chamber O-rings (5 pieces), chamber lamps (2), 5A slow-blow fuses (5 pieces).
- Liquid CO_2 tank scale with remote readout and display.
- Acetone Package Kit for 1.25" I.D. Process Chamber (Contains 3 Teflon O-Rings, 1 Backing Ring, and 1 Spanning wrench).
- Teflon O-Ring for 1.25" I.D. Chamber (minimum 20 pieces)
- Backing Ring for 1.25" I.D. Chamber (minimum 10 pieces)
- O-Ring for LCO_2 Filter Assembly Seal (minimum 10 pieces)
- External 0.5µm Particulate Line Filter Element for LCO_2 T-Filter or External Purge Line Filter (minimum 20 pieces).
- LCO_2 Filter Element (minimum 20 pieces).
- Gasket for LCO_2 tank connect (minimum 50 pieces).
- CO_2 and Alcohol sorter condenser

- Carboy container (min 2.5 L) with connectors for exhaust tubing's to collect waste Alcohol.
- Small Particle Holder (Quantity 2) along with Ultrafine S.S. mesh screen to retain particles down to 30 µm, 10 µm and 1 µm (5 units of each mesh size).
- 1" Large Capacity Holder (Quantity 1, material S.S.)
- Multiple Grid Holder (Quantity 1, 3.05 mm grid size)
- HF Compatible Chip Holders (Quantity 1, at least 5 wafers of 10mm X 10mm size)
- S.S. Coupler Connection to LCO_2 Tank
- Liquid CO_2 cylinder with min 99.8% purity (Quantity 2:- 1 for operation & 1 as back up) with associated regulators, tubing and connectors.
- Optical Microscope with 0.8X to 5.6X magnification, 7:1 Wide Zoom Ratio, working distance of at least 150 mm, with transmitted illumination facility to observe the sample before and after supercritical drying. Digital Camera attachment to observe and capture the sample images for further analysis.
- Weighing Balance with 0.1 mg accuracy with availability to weight at least 200 g and internal calibration facility to weight the sample before and after supercritical drying. Glass draft shield can be opened from three sides and removable dust and spill rings.
- 2 years of comprehensive warranty
- Installation, training and demonstration on-site.

Sr. No. 175 / Ref No.184 (NEW)

Detailed Technical specifications for Super Resolution Microscope Technical specifications for Microscope and STORM system Super-Resolution Microscope (with STORM) Imaging platform. The imaging platform should include i) Microscope with 2D and 3D STORM / PAL-M / TIRF(not quasi TIRF)modes of imaging for single molecule localization for fixed and live cellsandii) Confocal mode of imaging with deconvolution.

A. Inverted microscope (Fully Motorized)

a. System should have Bright field, Fluorescence and DIC Imaging capability.

b. System should have fully motorized beam path selection for widefield, 2D/3D SIM/ Multi Point Array Scanning, with 2D, 3D STORM/ PALM and TIRF modes of imaging. Also, the system should have Single deck or dual deck configuration for combining all these techniques

such as widefield, 2D/3D SIM/ Multi Point Array Scanning, with 2D, 3D STORM/ PALM and TIRF modes of imaging on the same platform.

c. System should have motorized Peizo/Galvo Z-axis focus drive optimal for super resolution imaging with minimum resolution/step size of 5nm or less.

d. System should have 6 position or higher motorized FL filter wheel for excitation and emission path and 6 position motorized DIC nosepiece

e. Motorised XY scanning stage for the movement of specimen using ergo joy-stick as well as total control by the software. Stage holder should be universal type capable for holding 35/60mm dishes and chambered cover-glass apart from standard slidesand multi-well plate.

f. System should include a minimum of 12v/100w halogen/LED illumination for transmitted lightwith automatic shutter having DC (direct current) to provide constant and non-fluctuating light.

g. Motorized universal condenser turret with NA 0.5 or better; motorized 6 (or better) position objective turret with 6 or more DIC slots; motorized filter turret with at least 6 positions for band pass fluorescent filters for sample visualization. Band pass filters for GFP/FITC, DAPI, TRITC/ Rhodamine/ cy3, CFP/YFPshould be quoted.

h. System should be supplied with high resolution objectives 10x, 40x/0.95NA, 60x/63x Oil (N.A1.40) and 60x/63x Water(N.A 1.27 or better) for deeper SIM Imaging and 100x oil/NA 1.49 and 100x Silicone oillens (N.A 1.3 or above)should be usable for SIM or Multi Point Array Scanning Technology and Localization imaging. System should also have 40X(NA 1.2 or above)Silicone immersion objective.[Silicone objectives should be given as optional]

i. System should be equipped with correcting spherical aberrations by using automatic collar correction system for achieving best PSF for user conveniencefor High N.A objectivefor TIRF/STORM/PALM experiments

j. Automated DIC accessories for all objectives. Band pass fluorescent filters for sample visualization should be offered.

k. The microscope system should be capable of conducting long durationlive cell imaging with image acquisition occurring at intervals of msecs to secs. The microscope should be equipped with hardware to correct for focus drift through a LED or laser (wavelength 750 nm or more) based continuous focus correction systemfor long term live cell 2D/3D SIM/Multi Point Array Scanningand 2D/3D STORM/PALM data acquisition. The system should be able to store large datasets obtained from long-term live cell imaging.

l. System should be capable to have Automatic Water dispenser for Long time live imaging with water objective.

m. System must be equipped with a complete cage enclosure with weather controlled environment including independent control for CO2, O2 (in form of air) and, humidity, N2for

hypoxia experiments. The incubator enclosure should have the following: dark or transparent panels, temperature range from ambient 25 deg C to 45 deg C. The temperature accuracy on the sample should be +/-0.3 deg C or better. The air-filtering unit for inlet air, sliding doors for easy handling and illumination inside the enclosure with suitable light should be provided.

n. DIC attachment motorized for 10x to 100x objectives with analyzer and polarizer attachment, sliders and modules for the respective objectives.

o. The system should be capable of imaging close to the cell membrane within a depth of 150 nm or less using the TIRF module.

p. High-performance (Newport, Melles Griot, Thorlabor equivalent) active vibration isolation lab tableshould be quoted

B Localisation Based Super Resolution mode(PALM/STORM)

a. The system should be capable of achieving a X-Y resolution of 30 nm or better

b. Resolution in Z should be 60nm or better

c. The system should be capable of doing localization in different modes: 2D, 3D and TIRF mode [TIRF should be fully Automated (XY and Z focus automated) and with automated critical angle search]

d. System should have capability of Live cell imaging with different format using 128x 128/ 256x 256 and 512x 512 in super-resolution mode. This should be documented on the website/brochure.

e. Data should become available as the images are being acquired. There should be image based auto focussing. Multi-channel or multi-color acquisition in a sequential mode should be possible

f. Should be capable to acquire different imaging area like 80micron x 80micron/ 40micron x 40micron/ 20micron x 20micron & 10micron x 10micron

g. The system should be able to use a wide range of available fluorescent proteins as well as organic dyes (photoactivable, photo convertible, photo switchable and photochromic) for working with the system. Photoactivation controls and processing tools for PALM / dSTORM should be available.

C. Laser unit

•All DPSS/Diode high power, long life lasers; pre-aligned having AOTF control with following lines and should be workable with both Confocal and Localization based super-resolution techniques:

•DPSS/Diode 405nm

•DPSS/Diode 445nm

•DPSS/Diode 488nm

•DPSS/Diode 561nm

•DPSS/Diode 647/640/635nm

•DPSS/Diode 514 nm

•The lasers should have appropriate power for STORM and Confocal usage.

D. Separate detection system should be capable ofepi-fluorescence and Super-Resolution techniques (Localisation based method)

Detection for Super-Resolution modules should be based on Scientific CMOS camera having effective no. of pixel 2k x 2k or better with Pixel Size of 6.5 microns x 6.5 microns and it should be capable of acquiring at a max speed of 89-95fps or better @ full frame, Q.E, should be more than 90%. Readout noise should be 1.0 e-or better with full well capacity should be 30,000 electron or better or having similar output with justificationwill be considered for Super Resolution modules. Optimal FOV of 80 μm X 80μm or better using 60X or 63X/1.40 oil objective or equivalent objective should be available.

E. Confocal and widefield (for observing the sample) module

The system should be able to switch to confocal and widefield mode without any additional hardware alignment.

a. The system should be capable of archive confocal effect using pointscanning or equivalent method with additional capability to remove out of focus light to achieve X-Y resolution of120nm nm or betterand Z resolution of 300 nmor better.

b. System should be able to achieve high speed –up to 20 fps(512X512for 1 channel--to get high temporal resolution and low phototoxicity and photobleaching to allow live cell imaging.

c. System should have high quality excitation and emission filters and dichroicmirrors

d. Laser scan head

- Confocal laser point scanning unit should be quoted. It should be capable of line-scanning in 1D and 2D (space-time) as well.

- Scanner should have laser ports to connect to above mentioned lasers and should have either low angle of incidence semrock or crystal-based dichroic for high efficient excitation laser suppression.

- Motorised and computer-controlled continuously-variable confocal pinhole with software control.

- High speed XY galvo scanner with min.180 deg scan rotation with total scan flexibilities of line, free hand curved line, XY, XYZ, XYZ t and XYZ t λcombinations.

- The laser scanner should have dual scan capability of fast volumetric regions bleaching/activation/ablation & normal scan for Imaging to conduct experiments like FRAP, FRET, FLIP, photo activation/conversion.

- Scan resolution should be at least 4K x 4K for all channels and can be selected freely down to 64x64pixels.

- Scan Zoom range 1.0x to 40x or more and should be adjustable in steps of 0.1.

- System should be capable of acquiring minimum of 6-8 fps or higher at 512x512 pixel resolution. It should also be capable of ROI-based scanning.Should also have speed of more than 20 fps @ 512X512 with more than 20 mm FOV and upto 700 fps @512X16.

- Scan field diagonal should be 20 mm or less @ up to 20 fps (512X512).

- Data acquisition and digitization capability with at least 8, 12 and 16 bit should be available.e.Detectors

- The detection unit should have dual detection capability with intensity-based confocal imaging as well as spectral confocal imaging.

- Should have minimum 4 detectors (of which at least 2 should be highly sensitive GaAsP/HyD) and a tunable spectral detector like GaAsP/HyDor equivalent with minimum 45% quantum efficiency. The system should be capable of simultaneous detection and separation of at least 4 fluorophores with built-inor separateconfocal detectors. The system should have one transmitted light PMT detector for laser scanning DIC imaging.

- The spectral dispersion of the emission light should be of latest technology with high efficient separation. The system should be capable of online separation of autofluorescence and bleed through.

- Capability for lambda-scan should be quoted.

- The system should be capable of recording emission spectra with minimum spectral resolution of 10nm of better.

F. Controlling and Analysis Software

Should meet the following parameters and requirements:

a. Basic image acquisition, Complete microscope control, Scan head control and Laser control software. Same software should be capable to control Super-Resolution microscope, confocal and wide field system

b. Saving of all instrument parameters along with the image for repeatable/reproducible imaging

c. Frame/line/lambda capturing, Z-Stack, Time series imaging capabilities

d. Multipoint Time Lapse Imaging.

E .FRET analysis

f. Co-localization analysis and 3D volume rendering

g. 3D measurement

h. Real time ratio-display

i .2 D and 3Dimage deconvolution

j. Diverse measurement and statistical processing

k. The software should have the capability to show two live windows for two cameras while performing simultaneous dual colour imaging

l. Direct streaming of data and parallel processing while streaming of data should be possible.

m. Huygens Professional deconvolution software [Optional]

n. Two licenses of the mainsoftware with all the features.

G. Workstation

a.Dual Intel Xeon Gold 6226 2.7GHz, 3.7GHz Turbo, 12C, 10.4GT/s 3UPI,

b.19.25MB Cache,HT(125W) DDR4-2933, 1TB OS SSD, 8TB Fast AcquisitionDrive (RAID-0), 20TB additional storage (RAID-10), 1300W power supply, backlitwired keyboard

c.4 × USB 3.0, 4 x USB 2.0, 2X Gigabit Ethernet, Windows 10 Professional

d.24” LCD TFT wide aspect true colour monitor 2 no. for connection to workstation to enable 2560 x 1600 pixel resolution

e.Another Identical workstation with 32 TByte storage capacity for complete offline analysis of all the imaging data should be available

H. Compatibility

a. The entire system (microscope, lasers, workstation , softwares, power requirement) must be compatible with a SIM/Multi Point Array Scanning Super Resolution System. The system (Localization Based Super Resolution technique or Confocal) should be controllable with the same software been used for the for the SIM/Multi Point Array Scanning Super Resolution System for the purpose of correlative study on the same field.

I. Power back up for the entire systema.

A suitable ONLINE UPS system (with back up for 30 min and with voltage stabilization capability) for trouble-free operation for the complete system

J. CMC

a.. Warranty should start from the day of installation + 2 yrs of CMC + 2 yrs of AMC

b. In case of downtime, the system should be attended within 48 hours of complaint.

K. Operator

a. One company trained operator should be recruited and maintained by the company onsitefor three yearsfrom the date of installation.

L. Other requirements

a. 100% CO2 and O2 cylinder with regulator, dehumidifier and two 2 ton switchable converter ACs.

b. Additional computer table for CPU and monitor and second workstation

c. The bidders should provide full details of after sales service support and detailed list of users in India over the last 3 years with contact details.

Note-Bidders must mention clearly the Room dimension/conditions required to install the above set-up.

Sr. No. 176 / Ref No.185(NEW)

Technical specifications for Super Resolution Microscope Technical specifications for SIM or Multi point Array scanning Super Resolution system

A. SIM/ Multi Point Array Scanning based Super-Resolution Module

a.The system should be based on SIM/ Multi point 2-D Array scanning Super Resolution technique with capability of X-Y resolution of ~ 100 –130nm or better.

b.Capable to resolve in Z: ~300 -350 nm or better.

c.Temporal Resolution of the system should be 200 fps (minimum) @ 2msec exposure with 1024 x 1024 resolution enabling the study of dynamic interactions in Living cells. Also, the system should reach the maximum speed of 1000 fps @ 1024x192 Pixel for capturing the very fast dynamic interaction.

d.The system should be capable of at least two colours simultaneous imaging with two sCMOS cameras of more than 90% Q.E.

e.The System should have a selectable pin hole sizes; 10 -64um, to match pin hole size to microscope objective.

f.The system should not use any intermediate magnification changer for achieving the desired resolution.

g.System should have observation modes as 2D and 3D mode along with two colours simultaneous imaging. All the changeover between different modes should beautomated. The acquired Super Resolution Data should be quantifiable in terms of intensity of individual SR Images.

e. System should be capable of performing Multi-colour Imaging with “at least two-colours Simultaneous SR Imaging” without loss of resolution in any spectral region from 405 -640 nm.

f. System should be capable to perform Long time Live cell Imaging experiments in super resolution. The System should have multi point 2-D Array for scanning all images with the same scanning beams to minimise image to image variations. B. Laser unit •The SIM/Multi Point Array Scanning Super Resolution System should be quoted with laser combiner having 405nm, 488nm, 561nm, 640 or 642nmwith High Power and should be controllable with the same software been used for the Localization Based

B. Laser unit

•The SIM/Multi Point Array Scanning Super Resolution System should be quoted with laser combiner having 405nm, 488nm, 561nm, 640 or 642nmwith High Power and should be controllable with the same software been used for the Localization Based Super Resolution technique or Confocal for the purpose of correlative study on the same field.

•The lasers should have appropriate power for SIM/Multi Point Array Scanningsystem.

C.Detection system for SIM/ Multi Point Array Scanning method(dual cameras)

Detection for Super-Resolution modules should be based on Scientific CMOS camera having effective no. of pixel 2k x 2k or better with Pixel Size of 6.5 microns x 6.5 microns and it should be capable of acquiring at a max speed of 89-95fps or better @ full frame, Q.E, should be more than 90%. Readout noise should be 1.0 e-or better with full well capacity should be 30,000 electron or better or having similar output with justification will be considered for Super Resolution modules. Optimal FOV of 80 µm X 80µm or better using 60X or 63X/1.40 oil objective or equivalent objective should be available.

D. Controlling and Analysis Software

Should meet the following parameters and requirements:

•The SIM/Multi Point Array Scanning Super Resolution System systemshould be controllable with the same software been used for (Localization Based Super Resolution technique or Confocal) for the purpose of correlative study on the same field.

E. Compatibilitya.

The entire SIM/Multi Point Array Scanning Super Resolution System system must be compatible with Localization Based Super Resolution technique or Confocal a SIM/Multi Point Array Scanning Super Resolution System.

F. Power back up for the entire systema.

A suitable ONLINE UPS system (with back up for 30 min and with voltage stabilization capability) for trouble-free operation for the complete system

G. CMC

a.. Warranty should start from the day of installation + 2 yrs of CMC + 2 yrs of AMCb. In case of downtime, the system should be attended within 48 hours of complaint.