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Technical Specification :

LATTICE LIGHT SHEET MICROSCOPE

Comprehensive light sheet microscope utilizing Bessel beam lattice sheet illumination via cylindrical lenses and high-speed SLM for multicolor imaging, annular mask array for various lightsheets, galvo mirrors to control lattice movement in X and Z, cameras in image and Fourier space to inspect the lattice and annular mask, 25x/1.1NA water immersion detection objective, 28x/0.71NA water immersion illumination objective, piezo X, Y translation stages and piezo imaging objective control. Includes Software System for Lattice LightSheet for high-speed synchronization of laser firing, SLM pattern display, galvo movements and imaging camera readout along with the ability to de-skew and view data; with offline license for analysis. Includes motorized sample chamber and annular mask wheel, LED transmitted light, LED epi path, solid state heating, beam shielding, laser safety enclosure, sample chamber and specimen holders.

1) LIGHT SHEET THICKNESS: 0.4 μ m at 50 μ m length

RESOLUTION: 230 x 230 x 370 nm (Dither) @ 1.1NA; 150 x 230 x 280nm (SIM) @ 1.1NA

SAMPLE CHAMBER: Medical grade stainless steel with environmental control system with digital control of temperature, CO₂, and humidity along with gas cylinder and regulator. Temperature Accuracy: \pm 0.1 $^{\circ}$ C in sample feedback mode, \pm 0.3 $^{\circ}$ C in chamber feedback mode.

SPECIMEN MOUNTING: Standard, horizontally-oriented 5mm round coverslip

2) ILLUMINATION & DETECTION OPTICS:

DETECTION OPTICS: 1.1NA water objective, 2.0mm WD, 62.5x total magnification

ILLUMINATION OPTICS: 0.71NA water objective, 3.7mm WD

3) LASER LINES:

Solid State Diode Laser lines of 488nm (300 mW or better), 560nm (500mW or better) and 642nm (500mW or better) with lifetime of 10,000 h or better should be offered with the system. All lasers should be connected to the system through fibre optic cable and should have fast laser switching and attenuation mechanism in pixel precise synchronization with the laser scanner for Imaging.

4) DETECTOR

- Back illuminated sCMOS Camera with Quantum efficiency: @550 nm: 95 %, Imaging device: sCMOS, Effective no. of pixels: 2304 (H) \times 2304 (V), Cell size: 6.5 μ m (H) \times 6.5 μ m (V), Readout speed: Fast scan: 89.1 frames/s (@2304 x 2304 pixels, 16 bit), Readout noise: Ultra-quiet scan: 0.7 electrons rms (Typ.), Dynamic range: 21 400:1 (Typ.), A/D converter: 16 bit, 12 bit, 8 bit, Water Cooling option includes water chiller and hose set

- A second camera with same specification as mentioned above should be supplied for fast sequential two color imaging and spectral separation. All necessary Adapters, Filters should also be supplied for smooth function of the second camera.

5) IMAGE ACQUISITION OPTIONS & SOFTWARE: Software should be capable of controlling the following:

- Motorised components of microscope, digital camera, light path settings, laser control including AOTF and Image acquisition and processing.
- Multiple sample imaging using multi-point imaging should be acquired during a single multi-view experiment for higher sample imaging throughput.
- Rapid piezo z-drive acquisitions for fastin acquisition speed.
- Alignment, Imaging, SIM, and other spatial light modulator (SLM) presets for ease of use.
- Multidimensional image acquisition with combinations of z-stack, time series, multiple viewing points.
- Data file naming and saving request option at the start of image acquisition for data storage safety.
- Files should be separated according to time, view, illumination, channel, or z-stack.
- Ability to set a Home Position for quick sample repositioning as well as a Load Position for quick sample exchange.
- Light sheet tracking for maintaining ideal sample focus over time.

Offline software licenses (02 in numbers) should be provided. The offline software should have all these features excluding Control & Data acquisition.

6) Workstation:The workstation should be fully integrated and optimized for the system, all the custom electronics, drivers, hardware configuration files and software with licenses should be pre-installed. It should have following minimum configuration to allow seamless operation.

- Dual Intel Xeon Gold 6226 2.7GHz, 3.7GHz Turbo, 12C, 10.4GT/s 3UPI, 19.25MB Cache,HT(125W) DDR4-2933, 1TB OS SSD, 8TB Fast Acquisition Drive (RAID-0), 20TB additional storage (RAID-10), 1300W power supply, backlit wired keyboard, Windows 10 Pro.
- 34" WQHD Curved Monitorincludes professional, high brilliance 34" curved monitor with 2x HDMI inputs, one DisplayPort (DP) input, one USB-C input, and 4 USB 3.0 ports. 3440 x 1440 (WQHD) resolution.
- Another identical workstation along with the monitor (same specifications as stated above) for complete offline analysis of all the imaging data should also be supplied.
- A 60TB NAS Storage Device for external storage of microscope data configured in RAID-10 10TB 3.5-inch hard drives (twelve in numbers)

7) ACTIVE ANTI-VIBRATION TABLE: Active anti-vibration Table with Compressor should be provided. Dimension: 900x1500mm

2" thick smooth laminated top with 1/4-20 tapped holes 1" on center, alphanumeric grid, sub shelf, casters, and On Trak unloading system

8) ENVIRONMENTAL CHAMBER: ACO₂ Incubator for Live Cell Imaging having temperature controller, heater and digital CO₂ gas mixer should be provided. CO₂ range: 0-18% with accuracy: ± 0.1%.Should include active humidity controller (50-95% RH, sensor resolution of 1%) and heated chamber (Temp. range:

3°C above ambient temperature – 45°C) for objective assembly. Temperature Accuracy: $\pm 0.1^\circ\text{C}$ in sample feedback mode, $\pm 0.3^\circ\text{C}$ in chamber feedback mode.

The environmental chamber should be integrated onto the stage so that all parts of stage come in thermal equilibrium with the experimental temperature and reduces any drift.

IMPORTANT TERMS AND CONDITIONS:

- System and accessories should work with 220v @50 HZ.
- The **Warranty** of the equipment should be for Three (03) Years from the date of installation.
- One trained manpower(Qualification: B.E./B.Tech/M.Sc in Engineering Physics, Physics or Electronics) with salary for a period of three (03) years should be provided. Selection of the candidate should done by a committee comprised of IITB faculty members and technical representative of the vendor. He/She should be present on-site and will be solely responsible for daily operation and maintenance of the system.
- The response time for attending a call should be within 24 hours by factory trained service engineer. A letter of commitment should be given in this regard from principal head office.
- The principal agent should be responsible for the complete installation, testing, integration of the system and training.
- The Principal Supplier should arrange for in-person training for 1st, 2nd & 3rd year for minimum of 5 days/yr.
- Latest software upgrades should be provided free of cost for 5 years.
- All operating, technical and service manuals with circuit diagrams should be provided along with the system. Tools necessary for calibration of system like calibration objectives & test samples to check the system performance etc., for fluorescence & co-localization checking should be supplied along with the system.
- The spare parts should be available for purchase/replacement for a period of ten (10) years from the date of installation of the equipment.
- Original literature with complete specifications should be given.
- Detail list of Publications, users and references should be provided.
- System should be upgradable to photomanipulation scanning unit with laser lines from 405-640 nm.