INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

Electrical Engineering Department

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Technical Specifications: Quantum Nuova (Qty : 01)

Sr. No	Item Description	Detailed Technical Specification	Technical Compliance (Yes / No)	Additional Information (if any)
A	**Quantum Nuova.**	The model is always provided with the functionalities of diamond magnetometry, a confocal microscope and a native software		
1	**Software and Control Interface**			
A.1.1	Optical System	Integrated confocal microscope with galvanometric scanning mirrors. Laser 561 nm excitation, pulsed operation, ~10 µW at sample plane; capable of intensity modulation and auto-calibration. Long pass filter sets (≥650 nm) for NV fluorescence collection; secondary 405 nm filter for multichannel capability. Automated optical alignment system to maintain beam stability, intensity calibration, and signal-to-noise optimization.		

A.1.2	Detection Unit	Detection by single-photon avalanche photodiode (SPAD) optimized for NV fluorescence. Must include photon-counting capability with real-time data acquisition and built-in diagnostics.		
A.1.3	Core Features	Real-time T1 relaxometry with automated fitting (single and double exponential models). Nano diamond localization, intensity thresholding, and sample region-of-interest management. Dual-mode imaging: confocal and brightfield with synchronous overlay. Automated sample stage control (XYZ) with pre-set mosaic scanning and subregion scanning.		
A.1.4	Advanced Capabilities	Laser gain control with closed-loop feedback to ensure stable excitation intensity. Autocalibration system for optical path, alignment, and photon count benchmarks. Sample container surface-finding algorithm (for petri/well plates). Software update infrastructure with modular deployment and compatibility testing. User-friendly UI with data export in CSV and visualization options		

A.1.5	Sensitivity and Resolution	Sensitivity: Capable of detecting free radical concentrations at or below 10 nanomolar (10 nM). Lateral spatial resolution: ≤170 nm in confocal imaging mode. Capable of subcellular resolution, enabling measurements at the organelle level in live cells and tissues System must operate without need for external vibration isolation.		
A.1.6	Calibration and Quality Assurance	All optical and detection components must support periodic recalibration via internal routines. Calibration protocols must align with traceable standards. Optical auto diagnostics to verify fluorescence pathway integrity and SPAD efficiency.		
A.1.7	Pre-Calibrated Sample Holders	Consumable petri dishes or well plates with calibrated Nano diamonds (size distribution & photon count)		
2	**Hardware Requirements**			
A.2.1		Protocols for at least 10+ representative biological models: Immunology: J774A.1 Macrophages, Cancer: HeLa, MDA-MB-231 cells Cardiovascular: HUVECs, Fertility: Human Granulosa Cells, Microorganisms: S. aureus, BY4741 yeast, Skin: HaCaT cells,		

		Neuro: C. elegans AM141, Liver: Mouse liver tissue Lung: BEAS-2B cells integrated Diamond Magnetometry with Confocal, Brightfield Microscope and Cell Incubation System.		
A.2.2	Laser	561 nm, 50 mW.		
A.2.3	Filter	≥650 nm + 405 nm		
A.2.4	Objective	100x, NA ≥1.30		
A.2.5	Field of View (Brightfield and Confocal)	300 x 300 um		
A.2.6	Detector	SPAD		
A.2.7	Stage	Automated XYZ		
A.2.8	Dimensions	≤80 x 80 x 50 cm (main), ≤40 x 40 x 30 cm (control)		
A.2.9	Weight	≤65 kg		
A.2.10	Power	100–240 VAC		
A.2.11	Environment	10–35°C, ≤90% RH		
A.2.12	The system must include an integrated cell incubation chamber capable of maintaining stable environmental conditions for live-cell experiments.	Temperature Control (37°C ± 0.5°C), CO_2 (typically 5%), O_2 (adjustable hypoxic/normoxic levels) No vibration isolation needed		

3	**Quality Control, Certification, and Warranty**			
A.3.1	Demonstrated capability of NV-based magnetometry for quantitative free radical measurements in live-cell environments, with validated sensitivity reaching 10 nM concentrations. (High Impact Factor Publications and Patents)			
A.3.2	Demonstrate capability of measurements at organelle level (e.g. mitochondria) and cell viability over 4 hours testing.			
A.3.3	Calibration data and performance baselines reports in line with the performance			
A.3.4	Certified consumables like petridish and well plates with FND's and its report			
B	Objective lens. 100x Oil Immersion			
C	**Motorized X-Y stage.**	Motorized high throughput stage provides precision and speed for scanning large or multiple biological samples in a well plate or petri dish		
D	**Detector filter set**	Remove noise (eg. autofluorescence signal from cells/tissues) and in- crease signal to noise ratio (SNR). Includes motorized long pass filter set of 650 nm, 700 nm & 750 nm.		
E	**APD detector. Low noise**	Low noise single photon counter Avalanche Photodiode (1000 Dark count rate)		
F	**Cell incubator**	Ecosystem to prevent additional stress from the test environment. Supply includes a temperature controller (37 deg +/- 2 deg C), gas flow rate controller, microincubator & humidity controller		
G	**Year-1 Annual Maintenance Contract (AMC)**	Plan coverage includes: for 1 Year - Included spare parts - Included labor and travel - 1 preventive maintenance and		

		calibration visit per year - New user training session (1 day, at the time of annual site AMC visit) - Software patches and updates (when available) - Phone and email access to Technical Support (Monday through Friday) (*Subject to availability in your region. Please consult QT Sense sales before placing your order. Consumables are not included.)		
H	Warranty: Minimum 24months on all components			