



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
Powai, Mumbai 400076.

Ref. PR No. 1000054114

Rfx No. 6100002821

Item Name: Wireless three-dimensional inertial measurement unit (IMU)-based motion capture system (Qty-1)

Sr. No.	Tender Specifications	Compliance (Yes/No)	Additional Information
1.	<p>General Description: One unit of wireless three-dimensional inertial measurement unit (IMU)-based motion capture system. The system must utilize body-worn sensors secured via adjustable straps and/or specialized garments to deliver high-fidelity, real-time kinematic data. It must be designed for rapid deployment, reliable data capture without line-of-sight restrictions, and continuous tracking.</p>		
2.	<p>a) The wireless three-dimensional inertial measurement unit (IMU)-based motion capture system should have the following hardware specifications listed below:</p> <ul style="list-style-type: none">i. Sensor Architecture: 9 Degrees of Freedom (9-DOF) Inertial Measurement Units containing a 3-axis accelerometer, 3-axis gyroscope, and 3-axis magnetometer.ii. Kinematic Accuracy: Static and dynamic accuracy for roll, pitch, and yaw/heading must be $< 1^\circ$.iii. Accelerometer Range: Dual-range or high-capacity accelerometers capable of measuring low-g and high-g impacts with a minimum dynamic range of $\pm 16g$.iv. Gyroscope Range: Minimum dynamic measuring capability of $\pm 2000^\circ/s$ to capture rapid, explosive movements.v. Magnetic Immunity: Sensors must feature built-in hardware or algorithmic immunity to ambient magnetic disturbances to ensure drift-free heading data.vi. Sampling & Output: Internal sensor sampling rate must be ≥ 1000 Hz. The processed/fused output rate for a full-body setup (17+ sensors) must be at least 60 Hz.vii. Synchronization: Ultra-low inter-tracker synchronization latency, strictly < 10		

	<p>milliseconds, to prevent temporal phase errors in joint angle calculations.</p> <ul style="list-style-type: none"> viii. Wireless Telemetry: Must support continuous, real-time wireless data transmission with an operational range between 25 meters and 50 meters. ix. Form Factor: Ultra-lightweight sensor design, strictly weighing < 20 grams per unit to avoid encumbering the subject. x. Power & Battery: Built-in rechargeable batteries delivering 8 to 12 hours of continuous operational battery life. xi. Robustness: Must be ruggedized for on-field outdoor environments, diverse weather conditions, and adaptable for subjects with mobility constraints (e.g., wheelchair users). <p>b) The wireless three-dimensional inertial measurement unit (IMU)-based motion capture system must be supplied as a complete, ready-to-use kit for one full-body subject, including necessary backup sensors and mounting hardware, as follows:</p> <ul style="list-style-type: none"> i. 18x Primary IMU Sensors (for full-body segment placement) ii. 1x Full Body Strap Set (minimum 11 individual straps) iii. 3x Specialized Mounting Garments (e.g., Lycra mounting T-shirts) iv. 1x Headband Mount & 1x Pair of Foot Patches v. 1x Pair of Gloves to mount sensors for the hands vi. 1x Wireless Receiver Station (with integrated sensor charging slots) vii. 2x Dedicated Multi-Sensor Charging Stations viii. 3x Power Adapters & 1x USB Cable ix. 1x USB Authentication Dongle (for software licensing) x. 1x Anthropometric Measurement Tape 		
3.	<p>Software specifications for data acquisition and analysis:</p> <ul style="list-style-type: none"> i. Multi-Subject Tracking: Must natively support the simultaneous capture and processing of at least 4 concurrent subjects in the same environment. ii. Anatomical Modeling: Must feature a validated biomechanical model compliant with International Society of Biomechanics (ISB) standards, incorporating at least 23 body segments and 22 joints. iii. Model Demographics: Must include separate, scientifically validated biomechanical scaling models for Male, 		

	<ul style="list-style-type: none"> iv. Female, and General demographics. 3D Kinematic Outputs: Must calculate and output continuous 3D global position, 3D velocity, 3D acceleration, 3D orientation, 3D rate of turn, and 3D rotational acceleration. v. Sensor Data Access: Software must allow direct access and visualization of raw/processed sensor data: 3D Magnetic Field, Free Acceleration, and 3D Orientation. vi. Advanced Biomechanics: Must track the 3D coordinates of the subject's Center of Mass (CoM). Must also provide scapula-humerus joint angles using at least two different Euler sequences to mathematically prevent Gimbal lock. vii. High-G Algorithm: Must utilize advanced kinematics to interpolate or calculate overall impact forces extending beyond the 16g sensor 		
4.	Warranty: The entire hardware suite must be covered under a comprehensive 2-year manufacturer's warranty.		
5.	<p>To guarantee scientific accuracy and reliability, the underlying technology must be backed by documented patents covering:</p> <ul style="list-style-type: none"> i. Inertial motion tracking systems. ii. Inertial sensor kinematic coupling and skeletal constraints. iii. Wireless IMU data compression and transmission protocols. iv. Motion tracking calibration methodologies via external units. <p>Secure wireless synchronization and communication between a master unit and sensor nodes.</p>		
6.	Installation/demonstration, support and training should be included without additional cost.		