

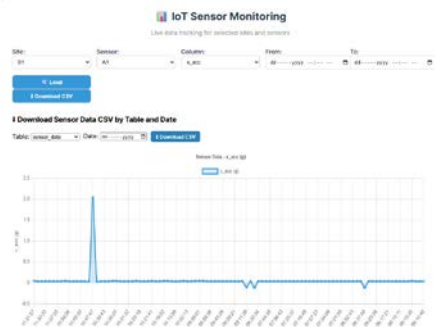


REAL-TIME TILT AND VIBRATION MONITORING SYSTEM WITH WIRELESS RECEIVER

Technology in Brief

The system consists of wireless sensor (transmitter) units, a receiver unit, and a Python-based server for real-time monitoring of vibration and tilt. Sensors measure three-axis acceleration and inclination and operate in dual modes: high-frequency (up to 10 Hz) with ~2 km range, and low-frequency with extended range up to ~5 km using LoRa communication. Designed for harsh environments (IP-67 enclosure, -20°C to 50°C), the system operates in the license-free 865–868 MHz band in India, enabling long-range communication without internet dependency. The receiver unit supports four channels (865–868 MHz), each accommodating up to 2 sensors (total 8 sensors). Data is stored locally and transmitted to a cloud server via Wi-Fi using REST APIs in JSON format for real-time visualization and analysis.

Specification	
<p>General:</p> <ul style="list-style-type: none"> LoRa Frequency support: at 865 to 868 MHz Power Source: Solar or battery Hardware: ESP32 and DTDS LoRa Modules Server: Python based Flask Server with API <p>Transmitter Unit</p> <ul style="list-style-type: none"> Operating temperature range: -25 to +40°C (tested) Operating voltage: 3 to 3.3 V Sensitivity: 0.000083 g/LSB Measurement range: ±2.4 g Tilt resolution: 0.0057° Tri axial LoRa transmission range: 10Hz for 2 KM (Tested) Rated power of sensor: 0.67W IP 67 protected <p>Receiver unit</p> <ul style="list-style-type: none"> Channel: 4 (for different frequency) Storage: 16 GB Connectivity: WiFi IoT: Support HTTP and REST API Operating voltage: 5 Volt 	<div style="text-align: center;">  <p>Receiver Unit</p> </div> <div style="text-align: center;">  <p>Transmitter Unit</p> </div> <div style="text-align: center;">  <p>Dashboard</p> </div>
End Product(s)	Tilt and Vibration Monitoring Unit, Receiver unit and Dashboard with API
License/Commercialization	NA
TRL	8
Environmental Impact	The system is energy efficient, ecofriendly, requires minimal infrastructure, supports renewable power, and aids in disaster risk reduction while operating reliably in harsh environments.
Setup - Equipment required	NA