NUTRA Ocean Probe (Experimental Prototype)

1. Executive Summary

NUTRA Ocean Probe is a low-cost, modular, autonomous underwater sensor platform capable of detecting seismic activity, chemical changes, and vibrations from vessels or environmental events. It is designed for coastal deployment to monitor for early warning indicators such as tsunamis, underwater disturbances, or unauthorized vessel activity.

2. System Overview

Core Platform: Microcontroller-based system using ESP32 with Wi-Fi + Bluetooth

Form Factor: Modular 'torpedo + satellite' configuration

Deployment Depth: Up to 30 meters (MS5837-30BA sensor)

Power Supply: Li-ion battery system with TP4056 charge controller

Communications: GPS-based float module, potential LoRa/Starlink integration (future)

3. Key Sensors & Modules (Acquired)

[List intentionally omitted for NDA access]

4. Assembly Overview

Phase 1: Dry assembly and soldering of modules (on breadboard)

Phase 2: Programming logic (MacBook + Arduino IDE)

Phase 3: Housing design - pressure-resistant case (torpedo shape)

Phase 4: Float + tether + GPS module with release mechanism

Phase 5: Waterproofing with epoxy/acrylic and marine sealants

5. Field Testing Location

Site: Chalong Pier or Rawai Pier (Phuket, Thailand)

Conditions: High boat activity, fuel/oil residue, motor vibration, shallow coastal currents

Equipment: Submersible drone EVO6 for deployment/recovery

6. Data Output & Functions

Depth (MS5837)

Turbidity (TS-300B)

pH Value (Analog pH sensor)

GPS Coordinates

Acceleration/Vibration (MPU6050 + SW-420)

Visual Feed (ESP32-CAMs facing up and down)

Triggered Relay: Manual or AI-initiated float release

7. AI & Logic Controller (v1)

Basic onboard logic for:

- Threshold event detection (e.g., vibration spike + depth change)

- Timestamp + geotag logging

- Initiating GPS satellite float if criteria are met

- Low power sleep and periodic wake-up

8. Expansion Possibilities

LoRa mesh network for continuous underwater communication

Multiple probes as a distributed sensor net

Solar trickle charging for satellite module

Military & civilian dual-use (anti-submarine & tsunami alert)

9. Access Control

All detailed blueprints, codebases, and sensor calibration logic are subject to NDA. Access is provided only to signed stakeholders and approved researchers.

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