ODAR

Product Concept and Vision

Our vision is to revolutionize chemical detection technology by creating the world's first integrated olfactory detection and ranging system that combines precise spatial awareness with advanced compound identification capabilities.

The OdAR System's mission is to provide industries, researchers, and safety professionals with an intuitive, portable solution that detects, identifies, and spatially locates chemical compounds in real-time, enhancing safety protocols and enabling new applications across multiple sectors.

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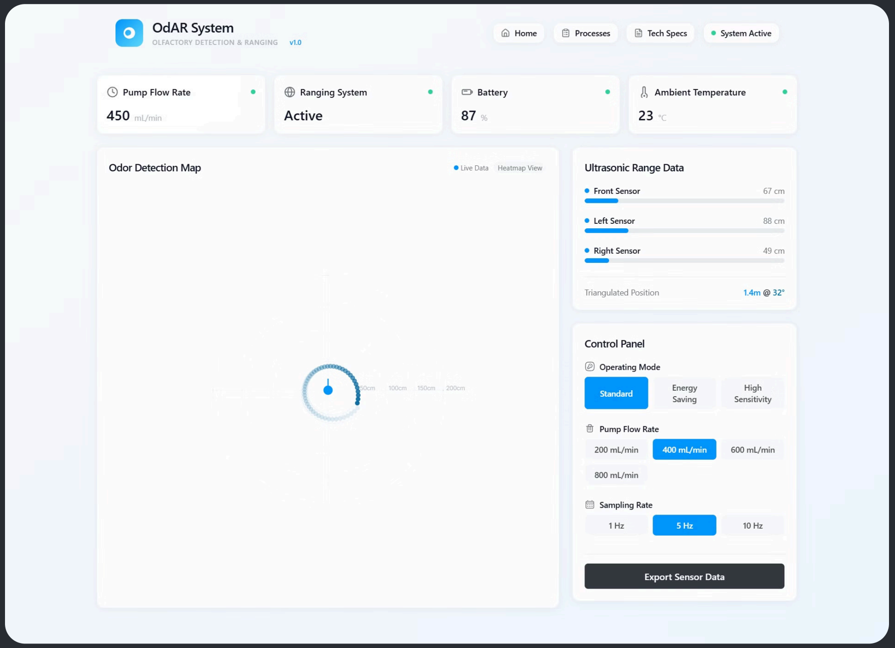
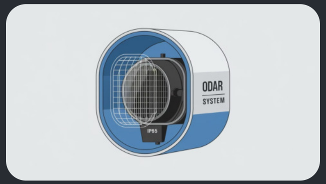
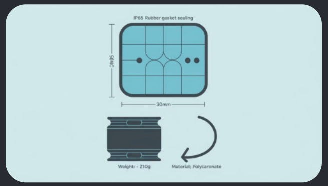
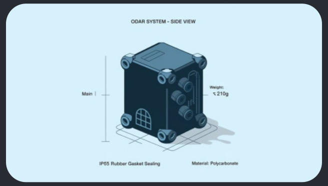








Product Description and Target Market

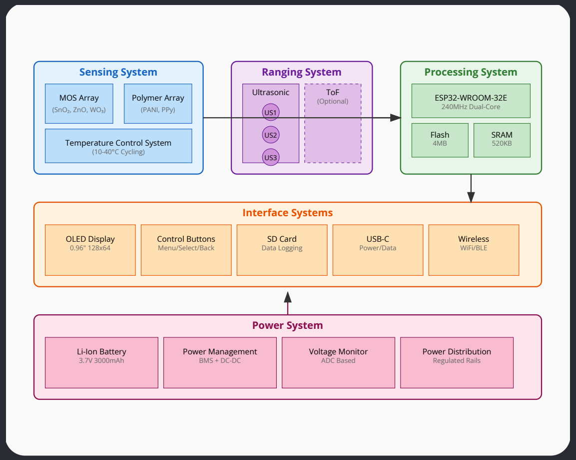
Key Components

- Hybrid sensor array with 8 specialized sensors (4 MOS, 4 conducting polymer)
- Advanced temperature-cycling system for enhanced detection
- Ultrasonic ranging system with 3D spatial awareness
- ESP32-based processing with specialized AI for compound identification
- 0.96" OLED display with intuitive user interface
- IP65-rated ruggedized enclosure for field deployment
- USB-C connectivity and wireless communication options

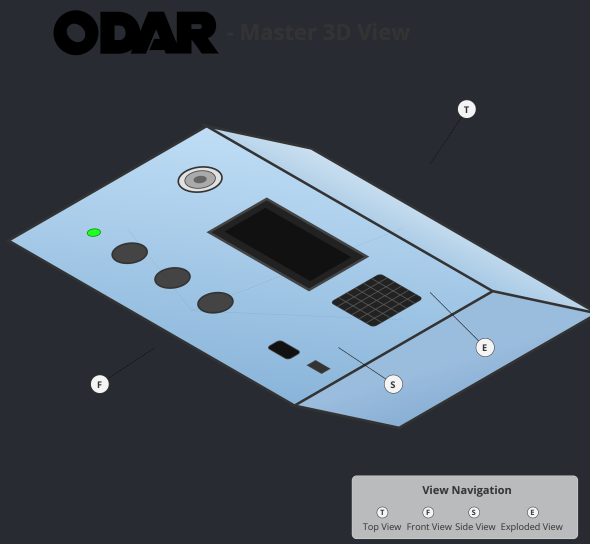
Target Markets

- Industrial safety and hazard monitoring professionals
- Environmental monitoring agencies and researchers
- Manufacturing facilities with chemical processing operations
- Emergency response and hazmat teams
- Research laboratories and educational institutions
- Security and threat detection organizations
- Indoor air quality monitoring services
- Food quality and safety industries

The OdAR (Olfactory Detection and Ranging) System is a sophisticated handheld device that seamlessly integrates advanced chemical sensing with spatial positioning technology. The system employs a hybrid sensor array consisting of metal oxide semiconductor (MOS) sensors and conducting polymer sensors, coupled with ultrasonic ranging capabilities to deliver unprecedented functionality in a compact form factor.



OdAR Systems Diagram



OdAR 3D View

Unique Selling Proposition (USP)

Combined Olfactory Detection and Spatial Ranging

The OdAR System is the first device to integrate chemical detection with precise spatial location capabilities, allowing users to not only identify compounds but also determine their source location, creating a new paradigm in chemical detection technology.

Temperature-Cycled Sensor Array

Our proprietary temperature cycling technology dramatically improves the selectivity and sensitivity of the sensor array, enabling detection capabilities that far exceed conventional fixed-temperature sensors. This approach allows for detection ranges from 5ppb to 500ppm for MOS sensors and 1-200ppm for polymer sensors.

Real-Time Compound Identification

The system utilizes a sophisticated CNN-LSTM hybrid neural network architecture that processes multi-sensor data to identify compounds with over 90% accuracy while simultaneously estimating concentration levels. This AI model runs directly on the device's ESP32 processor, providing instantaneous results without requiring cloud connectivity.

Environmental Resilience

Advanced environmental compensation algorithms adjust for temperature, humidity, and other factors that typically compromise detection accuracy in field conditions, ensuring consistent performance across diverse operating environments.

The OdAR System stands apart from conventional detection solutions through its revolutionary integration of multiple advanced technologies. Through this unique combination of capabilities, the OdAR System delivers value across multiple dimensions that no existing solution can match, creating new possibilities for safety, monitoring, and research applications where chemical detection, identification, and localization are critical requirements.

Technical Documentation

Introduction

The Olfactory Detection and Ranging (OdAR) System is a handheld, IP65-rated portable device (100mm × 60mm × 30mm) weighing approximately 210g with battery. It operates in environments from 0°C to 40°C with 20-80% relative humidity.

The system provides greater than 90% classification accuracy for target compounds, with detection ranges from low parts per billion (ppb) to 200 parts per million (ppm), response time less than 1 second, ranging accuracy of ±10cm up to 3m, and angular resolution of ±15° for source direction.

Designed for field operations, the OdAR system maintains continuous operation for up to 8 hours on a single charge of its 3000mAh Li-Po battery. The ruggedized casing withstands drops from up to 1.5m onto concrete surfaces while maintaining full operational capacity.

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Hardware Specifications

The sensor array consists of 4 Metal Oxide Semiconductor (MOS) Sensors (SnO_2, ZnO, WO_3) for detecting hydrocarbons, alcohols, and oxidizing gases with sensitivity range of 5-500 ppm and 4 Conducting Polymer (CP) Sensors (Polyaniline, Polypyrrole) for detecting Volatile Organic Compounds (VOCs) and ammonia with sensitivity range of 1-200 ppm.

The ranging system uses 3 ultrasonic sensors (HC-SR04 or equivalent) with range up to 4 meters and accuracy of ±2 cm in controlled environments.

Each MOS sensor incorporates a microheater element capable of cycling between 200°C and 400°C with ±1°C precision, enabling temperature-modulated sensing profiles. The CP sensors utilize gold interdigitated electrodes with 10μm spacing for maximum sensitivity and feature integrated humidity compensation.

Microcontroller System

The primary processor is an ESP32-WROOM-32E with dual-core 32-bit LX6 microprocessor, 240 MHz clock speed, 4MB Flash, 520KB SRAM, operating at 3.3V with multiple GPIO pins, ADC, I2C, SPI, and UART interfaces.

The data acquisition system features 12-bit ADC resolution, 10-100 Hz sampling rate, 8 channels for sensor array, 3 for ranging, with instrumentation amplifiers and anti-aliasing filters.

The processor implements power management with deep sleep mode drawing only 10μA, extending battery life during field operations. Wake-from-sleep response time is under 300ms, ensuring rapid detection capability when needed.

Connectivity

The system features built-in WiFi (802.11 b/g/n) and Bluetooth 4.2 (BLE) for wireless data transmission with a range of up to 100m in open environments. Connection security is implemented through WPA2 encryption and AES-128 for data protection.

A USB Type-C port provides wired connectivity at 480Mbps, supporting both data transfer and 5V/2A charging. The system includes an optional LoRa radio module (868/915MHz) for extended range communication up to 10km in rural environments.

User Interface

The device incorporates a 2.4" color TFT display (320×240 pixels) with capacitive touch capability and 600 nits brightness for outdoor visibility. The interface provides real-time visualization of detected compounds, concentration levels, and directional information.

User interaction is facilitated through 3 physical buttons (power, sample, menu) and haptic feedback via an integrated vibration motor. Visual alerts are supplemented by a multi-color LED indicator and a 70dB piezoelectric buzzer for audio notifications in noisy environments.

Data Storage and Management

An integrated 32GB microSD card provides local storage for up to 100,000 detection events with full sensor data. Each record contains raw sensor readings, processed classification results, environmental parameters, timestamp, and optional GPS coordinates.

The file system utilizes a proprietary database structure optimized for rapid searching and minimal power consumption. Data export is available in standard formats including CSV, JSON, and encrypted proprietary format for forensic applications requiring chain-of-custody documentation.

Testing Chamber

A custom-designed $3m^3$ sealed testing chamber enables precise calibration and performance validation of the OdAR system. The chamber features controlled atmosphere with adjustable temperature (0-50°C, ±0.5°C) and humidity (10-95% RH, ±2%).

Precision gas introduction systems allow for mixing of up to 8 different compounds simultaneously with concentration control from 1ppb to 1000ppm (±1% accuracy). Integrated air circulation and purging systems ensure uniform distribution and rapid clearing of test compounds.

Firmware

The embedded firmware is implemented in C/C++ with FreeRTOS for real-time task scheduling. The architecture includes separate modules for sensor data acquisition, signal processing, neural network inference, and communication protocols.

Over-the-air (OTA) firmware updates are supported through encrypted channels with rollback protection. The system employs watchdog timers and error handling routines to ensure continuous operation even in case of unexpected conditions or processing failures.

Hardware Specifications Continued

Temperature Control System

The system includes an LM35 precision temperature sensor, a ceramic heater (5V, low power), and a Proportional-Integral-Derivative (PID) algorithm for precise temperature regulation. It operates in a range of 10°C to 40°C for temperature cycling with control accuracy of ±0.5°C.

The temperature control module features adaptive calibration that compensates for environmental variations, ensuring consistent sensor performance across diverse operating conditions. A dual-thermistor arrangement provides redundancy and self-validation of temperature readings with a resolution of 0.1°C.

The thermal management system includes a miniature heat sink with passive cooling channels strategically positioned to dissipate heat away from sensitive components. Temperature data is logged at 1-minute intervals and can be exported for analysis of thermal performance over time.

Power Management

The battery system uses a 3.7V Li-Ion rechargeable (18650 cell) with 3000mAh capacity, providing greater than 6 hours of continuous operation. Charging is via USB-C port, taking 3-4 hours for a full charge. The system includes a Battery Management System (BMS) with overcharge, overdischarge, and thermal protection.

Power regulation includes a high-efficiency buck-boost converter, dedicated low-noise regulator for sensors, and sleep modes (deep sleep <10μA, light sleep <2.5mA). Power indicators show green when >30%, amber when 10-30%, and red when <10%.

The device implements intelligent power scaling that dynamically adjusts power consumption based on operation mode and sensor activity levels. During idle periods, non-essential components are automatically powered down, extending battery life by up to 40%. A field-replaceable battery design allows for quick swapping without tools, minimizing downtime during extended field operations.

For mission-critical applications, an optional external power input accepts 9-24V DC, enabling connection to vehicle power or auxiliary battery packs for extended deployment scenarios.

Physical Design & Enclosure

The housing is made of polycarbonate (PC) with UV stabilizers, measuring 100mm × 60mm × 30mm with an IP65 rating (dust-tight, water-resistant) and 1.0m drop resistance onto concrete. The color is light blue with gray accents, and the total weight is 210g with battery.

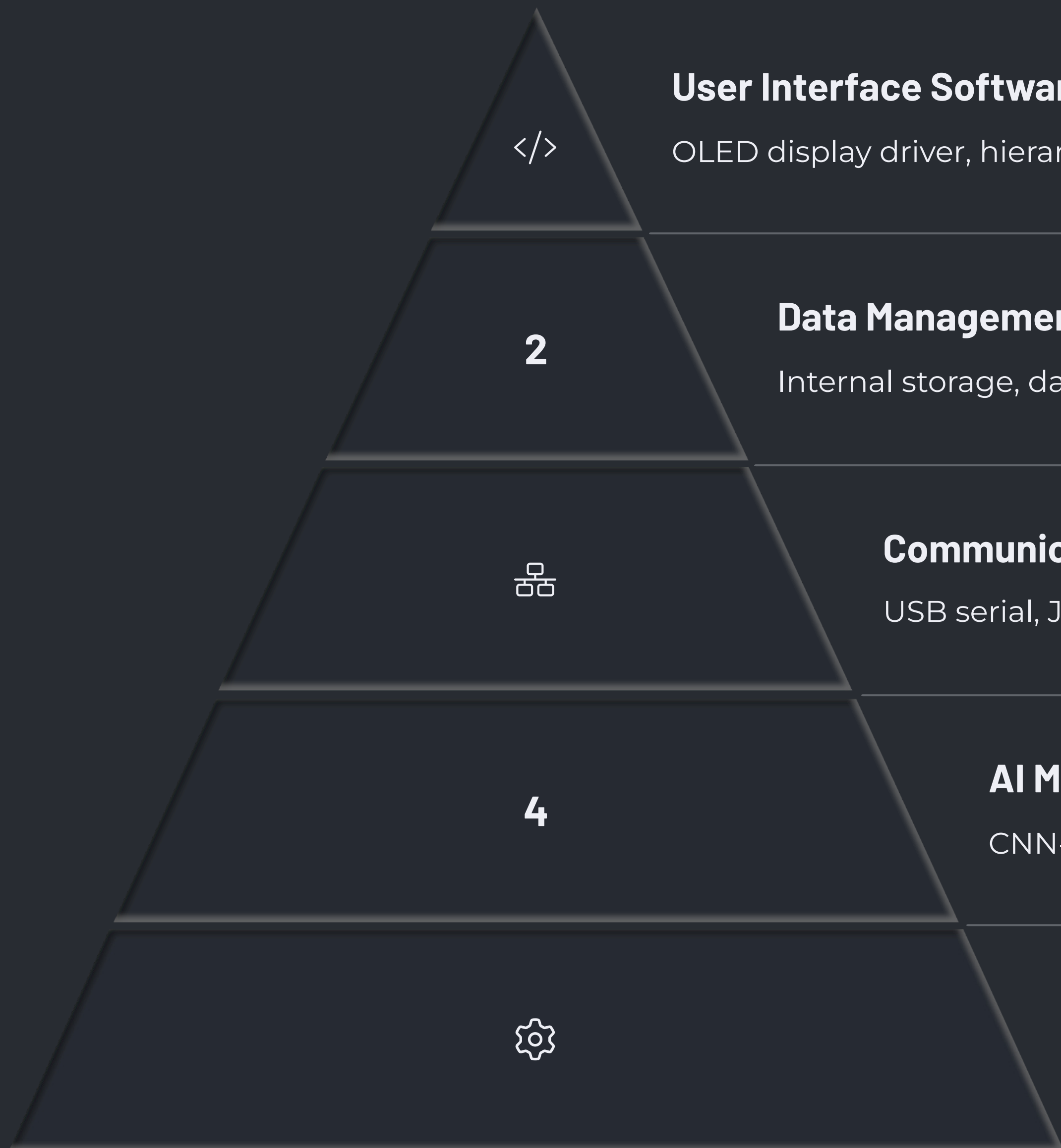
The user interface includes a 0.96" OLED display (128×64 pixels), 3 tactile buttons (Menu, Select, Back), status indicators (Power LED, operation status LED), USB-C port at the bottom, and a recessed toggle power switch on the side.

The ergonomic design features a non-slip rubberized grip area and balanced weight distribution for comfortable single-handed operation. All external ports include protective covers with silicone seals to maintain environmental protection when not in use.

The enclosure incorporates EMI/RFI shielding with conductive coating on interior surfaces, providing protection from electromagnetic interference in industrial environments. Specialized anti-static treatments prevent dust accumulation on optical surfaces and sampling ports.

Mounting options include an integrated belt clip, tripod mount with standard 1/4" thread, and magnetic attachment points for temporary placement on metallic surfaces during field operations.

Software Architecture



User Interface Software

OLED display driver, hierarchical menu system, data visualization, and alerts

Data Management

Internal storage, data formats, retrieval methods, and configuration storage

Communication Protocols

USB serial, JSON/CSV formatting, Wi-Fi, and Bluetooth capabilities

AI Model Architecture

CNN-LSTM hybrid model for sensor data analysis

Core Firmware Modules

Initialization, temperature control, data acquisition, ranging, storage, UI, and power management

The firmware structure is built on FreeRTOS with task priorities (temperature control highest, data acquisition, user interface lowest), using semaphores for shared resources, message queues for inter-task communication, and a hardware watchdog timer with 5-second timeout.

The sensor ports include a filtered grille at the front for olfactory intake, protected recesses for ranging sensors, rubber gaskets at all interfaces, and maintenance access panels to key components.

AI Model Architecture

Convolutional Neural Network (CNN) Layer

Extracts features from raw sensor data across 8 channels

Long Short-Term Memory (LSTM) Layer

Processes temporal sequences and recognizes patterns

Fully Connected Layer

Performs final classification and concentration estimation

The AI model architecture is a hybrid Convolutional Neural Network-Long Short-Term Memory (CNN-LSTM) model. The CNN layer extracts features from raw sensor data across 8 channels using a series of convolutional layers with ReLU activation to identify local patterns and spatial relationships within sensor data.

The LSTM layer processes temporal sequences and recognizes patterns using multiple LSTM cells incorporating forget gates. It analyzes sequential data and captures temporal dependencies from the feature maps sourced from the CNN layer.

The fully connected layer performs final classification and concentration estimation using one or more fully connected layers with softmax activation to map learned features to specific chemical compounds.

The model is optimized using 8-bit integer quantization for deployment on the ESP32 platform, network pruning to decrease model size and complexity, and layer fusion to enhance efficiency. It's implemented using TensorFlow Lite Micro with dynamic memory allocation and optimization techniques.

Functional Description

Detection Mode

Real-time acquisition and processing of sensor data

Ranging Mode

Activation and data acquisition from ultrasonic/ToF sensors

Calibration Mode

Sensor calibration routines and parameter adjustment

Combined Mode

Simultaneous operation of detection and ranging

The OdAR System operates in multiple modes to provide comprehensive chemical detection and spatial ranging capabilities. In Detection Mode, the system performs real-time acquisition and processing of sensor data, identifies compounds and estimates concentration using AI, displays detection results, provides alerts, and logs detection events.

In Ranging Mode, the system activates and acquires data from ultrasonic/Time-of-Flight (ToF) sensors, calculates distance and direction, displays ranging information, and logs ranging measurements.

Combined Mode enables simultaneous operation of detection and ranging, displaying both detection and ranging results with integrated data logging. Calibration Mode provides sensor calibration routines and adjustment and storage of parameters, while Configuration Mode offers user-configurable settings and options and displays system information.

Manufacturing and Production Documentation

ISO 7

Cleanroom Classification

Minimum requirement for sensor array assembly

22°C

Temperature Control

±2°C precision for manufacturing environment

45%

Humidity Control

±5% relative humidity for optimal conditions

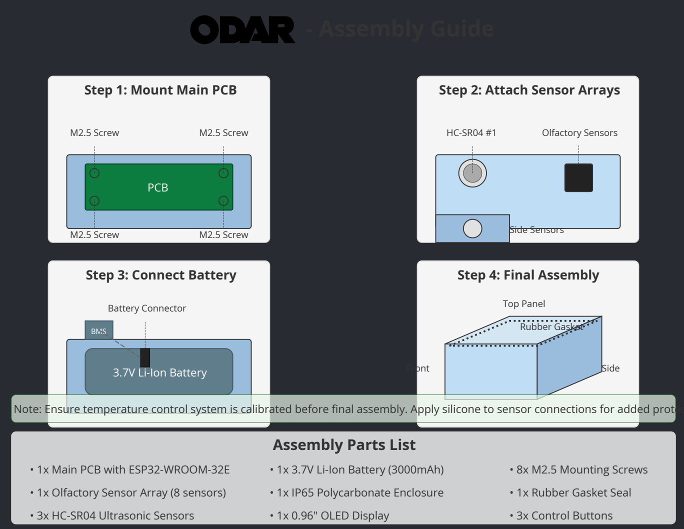
99.97%

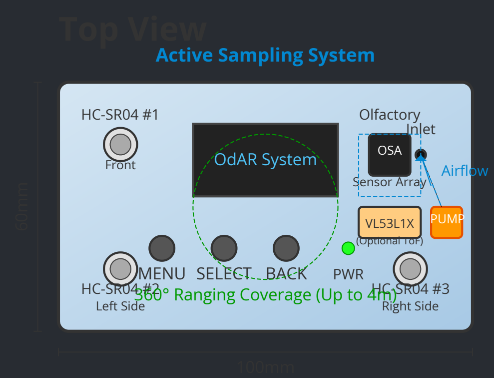
HEPA Filtration

Efficiency for particles 0.3 microns or larger

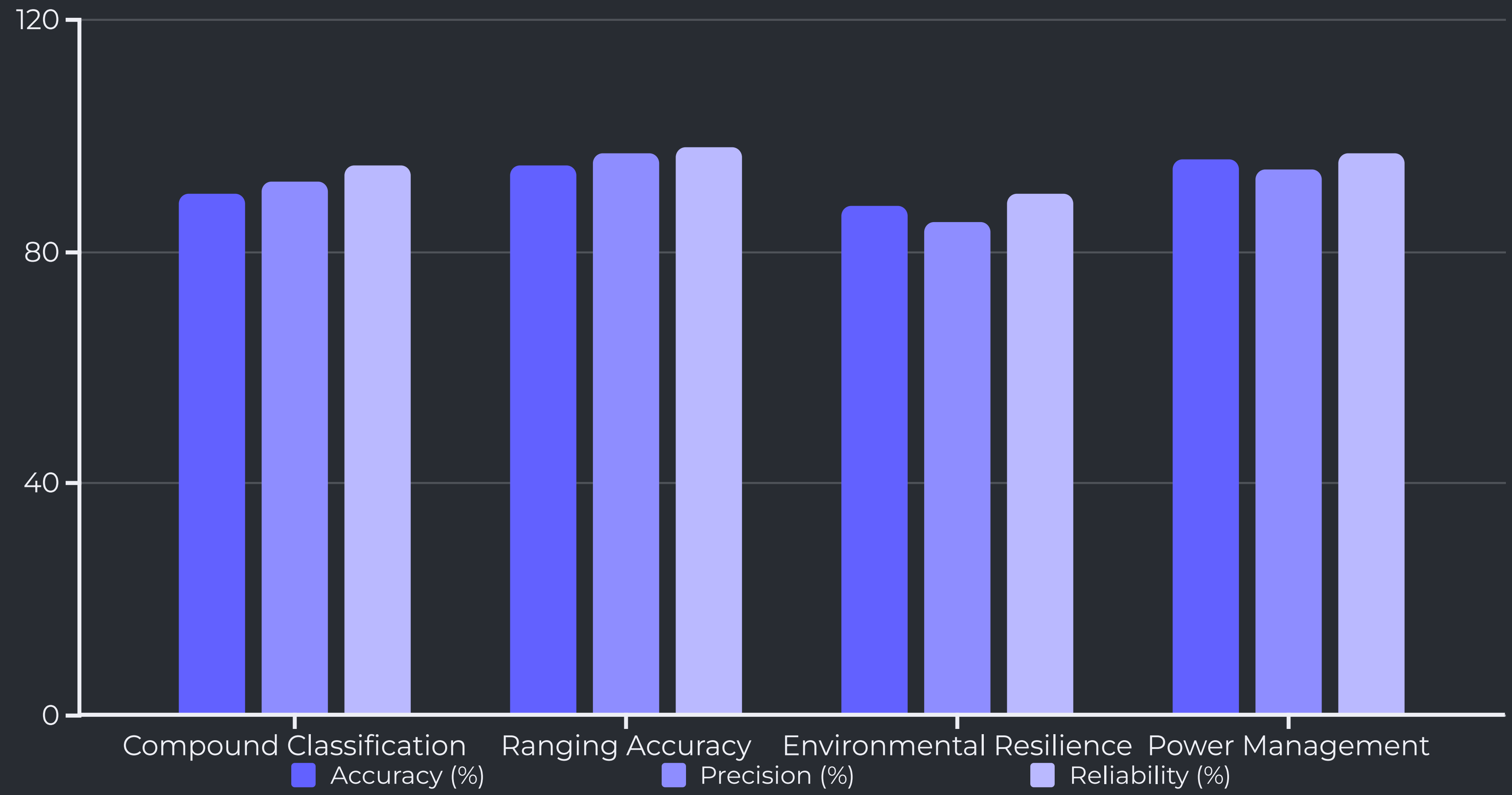
The manufacture of the OdAR system necessitates a controlled environment due to the sensitivity of the sensor array and the precision of the electronic components. A minimum ISO Class 7 (Class 10,000) cleanroom environment is required for sensor array assembly and calibration, ensuring a regulated level of airborne particulate matter and minimizing contamination that could impair sensor performance.

The manufacturing process includes comprehensive quality control systems with Standard Operating Procedures (SOPs) for each assembly step, process monitoring of key parameters, Statistical Process Control (SPC) to track and analyze process variations, and thorough performance validation through incoming inspection, in-process inspection, final inspection, functional testing, and calibration verification.





Testing and Validation

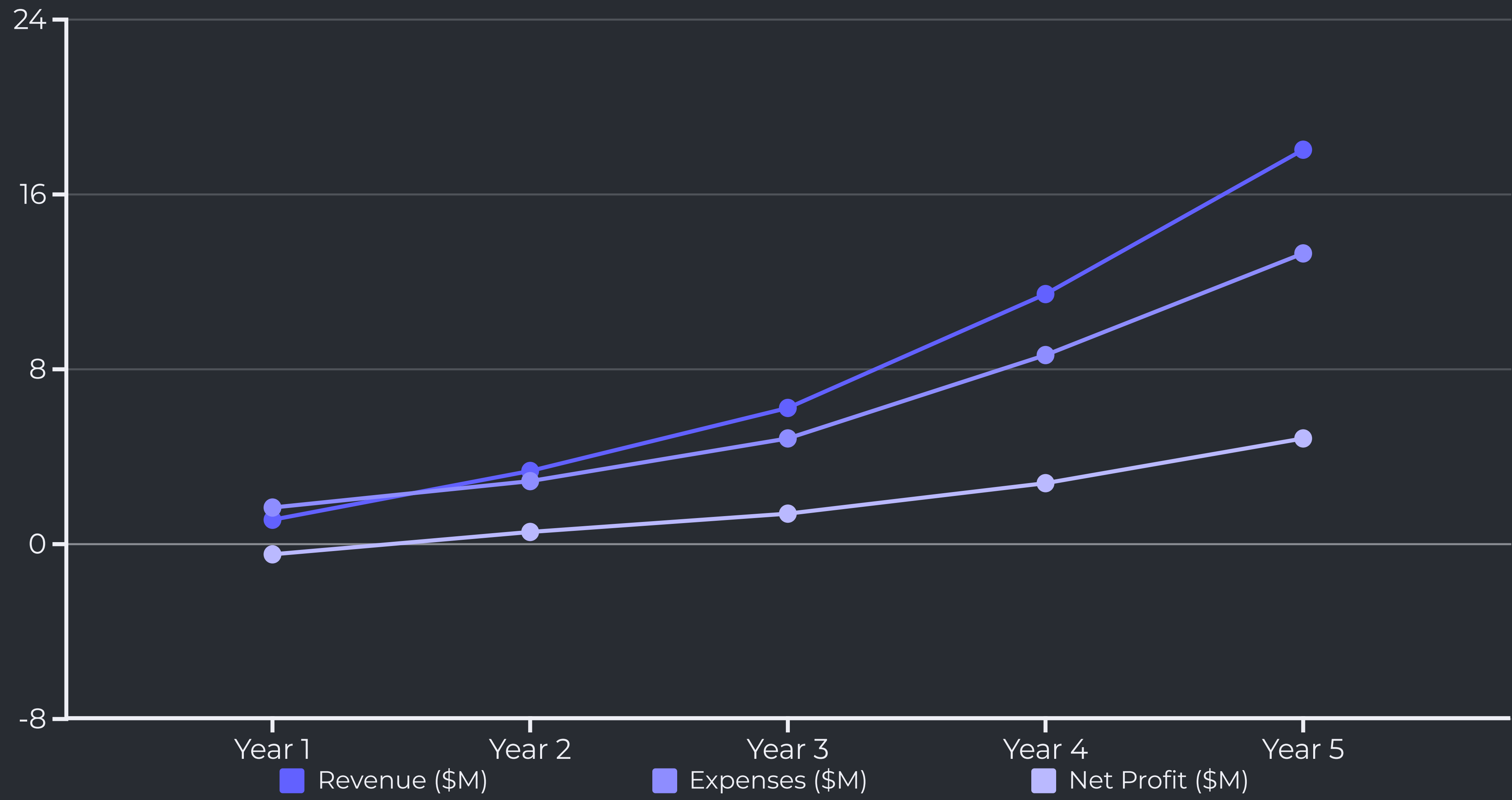


The OdAR System undergoes comprehensive testing and validation to ensure performance, reliability, and accuracy. Compound classification testing verifies the sensor array performance with a minimum classification accuracy of 90%, false positive rate below 1%, and false negative rate below 0.5% across various compound categories including Volatile Organic Compounds (VOCs), industrial chemicals, and environmental indicators.

Ranging accuracy testing validates the ultrasonic ranging system's horizontal precision (±2 cm), vertical precision (±5 cm), angular resolution (±15°), and maximum range (4 meters) under various test scenarios including static object detection, dynamic object tracking, and obstructed environment testing.

Environmental resilience testing assesses temperature performance across the operational range (-10°C to +50°C) and humidity impact (20-80% RH), while power management validation verifies battery performance, power consumption, and power management system functionality.

Financial Analysis



The OdAR System demonstrates strong financial potential with projected revenue growth from $1.115 million in Year 1 to $18.05 million by Year 5. Initial development costs include $1.5 million for R&D, $1.2 million for manufacturing setup, and $750,000 for marketing and sales, totaling $3.45 million in initial investment.

The business model includes multiple revenue streams: hardware sales (base device: $3,000), subscription services ($1,200 annually), professional services, and extended warranty and support. The system is expected to achieve profitability in Year 2 with a net profit of $520,000, growing to $4.8 million by Year 5 with a net profit margin of 26.6%.

Maintenance and Support

Maintenance Interval	Required Actions	Personnel
Daily	Visual inspection, power check, quick functional test	Operator
Weekly	Sensor port cleaning, display cleaning, battery status check, data log review	Operator
Monthly	Sensor-specific maintenance, system calibration, firmware check, enclosure inspection	Technician
6 Months	Professional service, comprehensive calibration	Service Engineer
18-24 Months	MOS sensor replacement	Certified Technician
12-18 Months	Polymer sensor replacement	Certified Technician

Regular maintenance is crucial for the reliable operation of the OdAR System. Daily maintenance includes visual inspection for physical damage, ensuring sensor ports and air intake grilles are clear of obstructions, verifying LED indicators are functioning correctly, confirming battery level is adequate, and performing a brief test to verify basic detection and ranging functions.

Weekly maintenance involves gently cleaning sensor ports and air intake grilles, cleaning the OLED display, checking battery health and charge status, and reviewing recent data logs for any unusual readings or error messages. Monthly maintenance includes following specific calibration guidelines for MOS and polymer sensors, checking sensor response and stability, verifying ultrasonic/ToF sensor alignment, performing a full system calibration, checking for firmware updates, and inspecting enclosure seals and gaskets for damage or wear.

Implementation and Deployment

Network Integration

Establish robust and reliable network connectivity based on installation requirements, define secure and efficient data transmission protocols, and leverage network connectivity for remote monitoring, control, and management of the OdAR system.

Integration with Existing Systems

Assess compatibility with existing hardware, software, and data management systems, develop and implement data exchange mechanisms, and ensure interoperability between the OdAR system and existing systems.

Testing and Validation

Conduct comprehensive testing to validate functionality within the integrated environment, evaluate performance under various operating conditions, and test integration with other systems.

Data Processing and Structuring

Acquire data from various sensors and components, combine data from multiple sensors to create a comprehensive representation of the environment, and structure the data into a format compatible with existing systems.

Deployment and Installation

Conduct a thorough site survey, install the OdAR system according to manufacturer's specifications, and perform system commissioning to verify functionality and integration.

Business and Market Analysis

Market Opportunity

The olfactory technology market projects growth from USD 1.2 billion in 2023 to USD 5.75 billion by 2032, with a CAGR between 16.8% and 33.5%. Key market drivers include increased environmental and safety regulations, growing demand for real-time monitoring and IoT integration, and expanding applications in healthcare diagnostics, agriculture, and industrial safety.

Target markets include agriculture, industrial safety, healthcare, environmental monitoring, law enforcement, research, and food and beverage industries.

Business Model and Revenue Streams

The OdAR System offers multiple revenue streams including direct hardware sales, subscription-based analytics, custom integration and consulting, and licensing opportunities. The projected ROI is 100-150% within 2-3 years, with cost savings up to 30% compared to traditional methods.

Competitive Advantage

The OdAR System provides superior performance with sensitivity and speed to detect compounds at ppb levels within <1 second, spatial awareness with 360° spatial ranging with ±2cm accuracy, and adaptability and reliability across varying environmental conditions. The system is protected by patent-pending technology ensuring market exclusivity.

Intellectual Property

Hybrid Detection and Ranging

The core innovation lies in the seamless integration of olfactory detection with spatial ranging, combining an array of chemical sensors with ultrasonic or Time-of-Flight ranging sensors to not only identify and quantify chemical compounds but also precisely locate their source.

Adaptive Environmental Compensation

The OdAR System incorporates an adaptive temperature control system that maintains the sensor array at optimal operating temperatures, ensuring consistent sensor performance across varying environmental conditions.

AI-Driven Recognition

The system utilizes AI, specifically machine learning models (MLP, CNN, LSTM), to analyze sensor data and identify chemical compounds, with the integration of ranging data into the AI model for improved source localization.

Optimized Embedded Implementation

The OdAR System is designed as a portable, embedded device with specific hardware and software optimizations for performance, power consumption, and size, allowing for practical deployment in various field applications.

Training and User Manual

PDF file

OdAR System_ Detailed Operational Instructions an...

237 KB

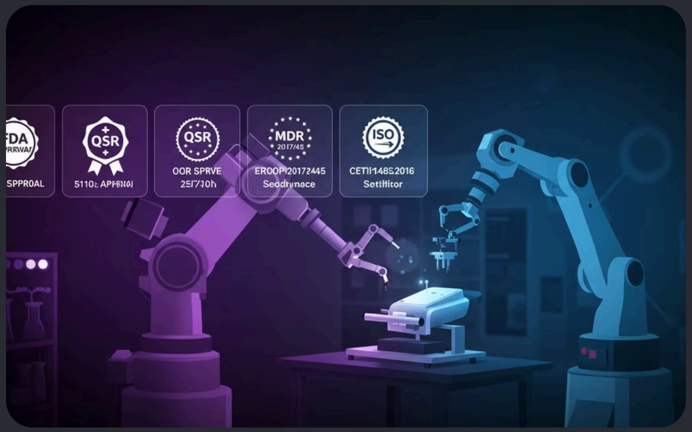
The OdAR System comes with comprehensive training resources and a detailed user manual to ensure operators can effectively utilize all system capabilities. The documentation includes device overview, getting started instructions, basic operation procedures, advanced features, maintenance protocols, troubleshooting guides, safety information, and technical specifications.

Training programs are available at multiple levels, including Operator Training (16 hours), Service Technician Certification (40 hours), and Sales Technical Training (24 hours). These programs cover system fundamentals, advanced architecture, diagnostic procedures, repair techniques, calibration methods, and demonstration skills through in-person workshops, online learning platforms, virtual simulations, and hands-on practical sessions.

Certification Requirements

Hazardous Location Certifications

The OdAR System requires Class I, Division 2 Certification (UL 121201) for North American markets and Zone 2 certification (EN 60079-0, EN 60079-15) for ATEX/IECEx requirements. These certifications ensure the device can be safely operated in potentially hazardous environments.



Medical Device Certification

For medical applications, the system may require FDA 510(k) pathway certification and compliance with Quality System Regulation (QSR), as well as European Medical Device Regulation (MDR 2017/745) requirements and ISO 13485:2016 certification.

Transportation Safety Certifications

The battery system requires UN 38.3 testing for altitude simulation, thermal testing, vibration, shock, external short circuit, impact/crush, overcharge protection, and forced discharge protection, along with IATA Dangerous Goods compliance and DOT hazardous materials requirements.

Intellectual Property Documentation

Patent Protection

Multi-sensor array architecture, CNN-LSTM neural network design, nanotubular sensor enhancement, distributed networking approach, and machine learning update mechanism

Trademark Registration

"OdAR" and "Olfactory Detection and Ranging" as product identifiers

Trade Secrets

Manufacturing processes, calibration methods, and AI training datasets

Copyright

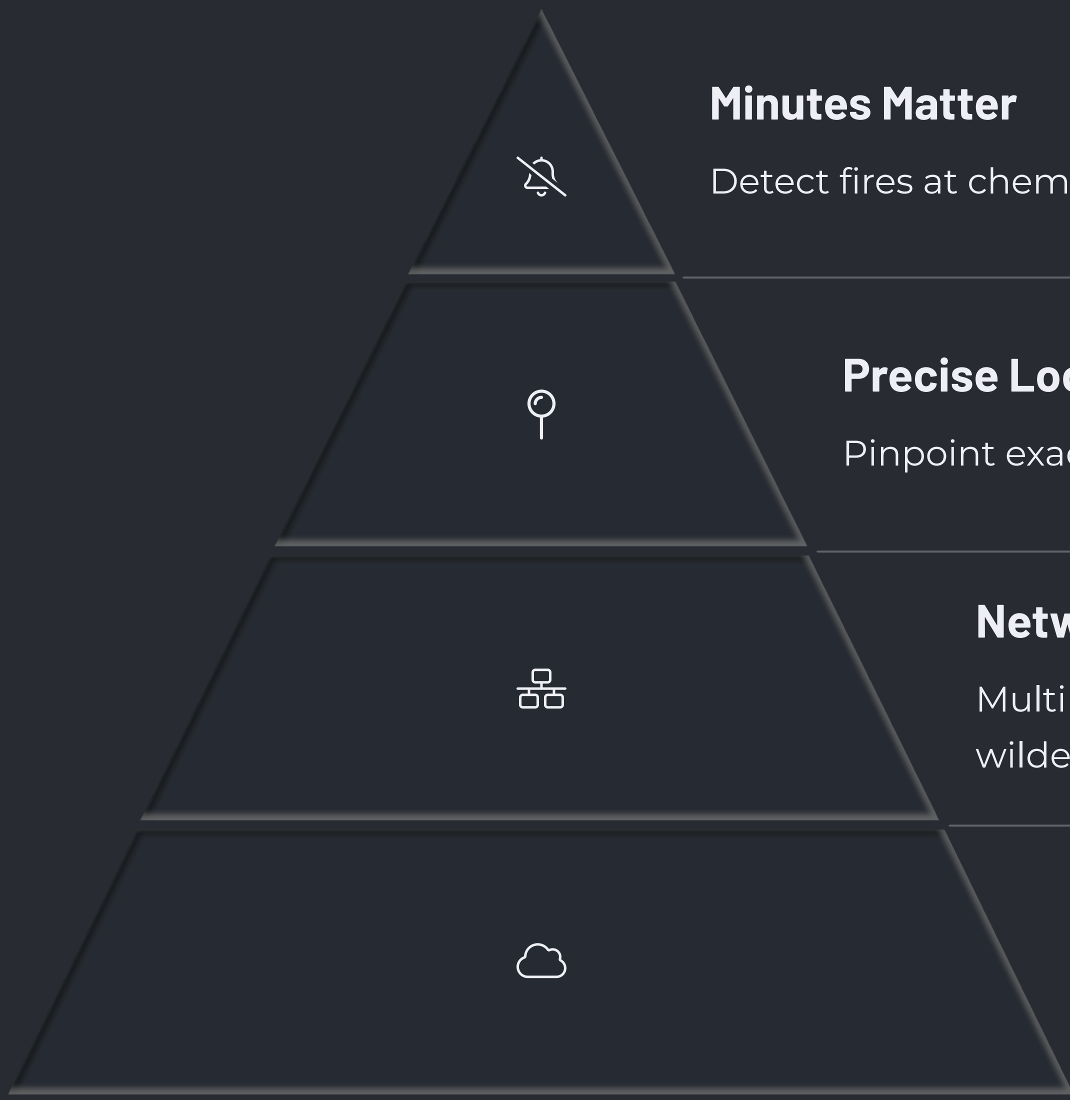
Software implementations, documentation, and training materials

The OdAR System represents a significant advancement in chemical detection technology through its innovative integration of multiple technologies. The system's novel architecture, AI implementation, nanotubular enhancement, and networked capabilities present multiple opportunities for strong intellectual property protection.

Independent claims should cover a system for simultaneous chemical detection and spatial localization, a method for detecting and localizing chemical compounds, a CNN-LSTM hybrid neural network architecture optimized for processing olfactory sensor data, a nanotubular follicle structure for enhanced chemical detection, and a system for collaborative chemical detection using multiple networked detection units.

Early Fire Detection with OdAR

Partnering with Fires.app to revolutionize wildfire detection through advanced chemical sensing technology.



Minutes Matter

Detect fires at chemical level before visible smoke appears.

Precise Localization

Pinpoint exact fire origin coordinates for rapid response.

Networked Intelligence

Multiple units create comprehensive detection grid across wilderness areas.

Real-Time Alerts

Instant notifications to Fires.app platform and emergency services.

OdAR's nanotubular follicle technology can detect combustion byproducts at parts-per-billion levels, enabling critical early intervention.

Drug, Explosive, and Health Insight

OdAR's chemical detection capabilities extend beyond fire detection to critical safety applications with unparalleled sensitivity.

Drug Detection

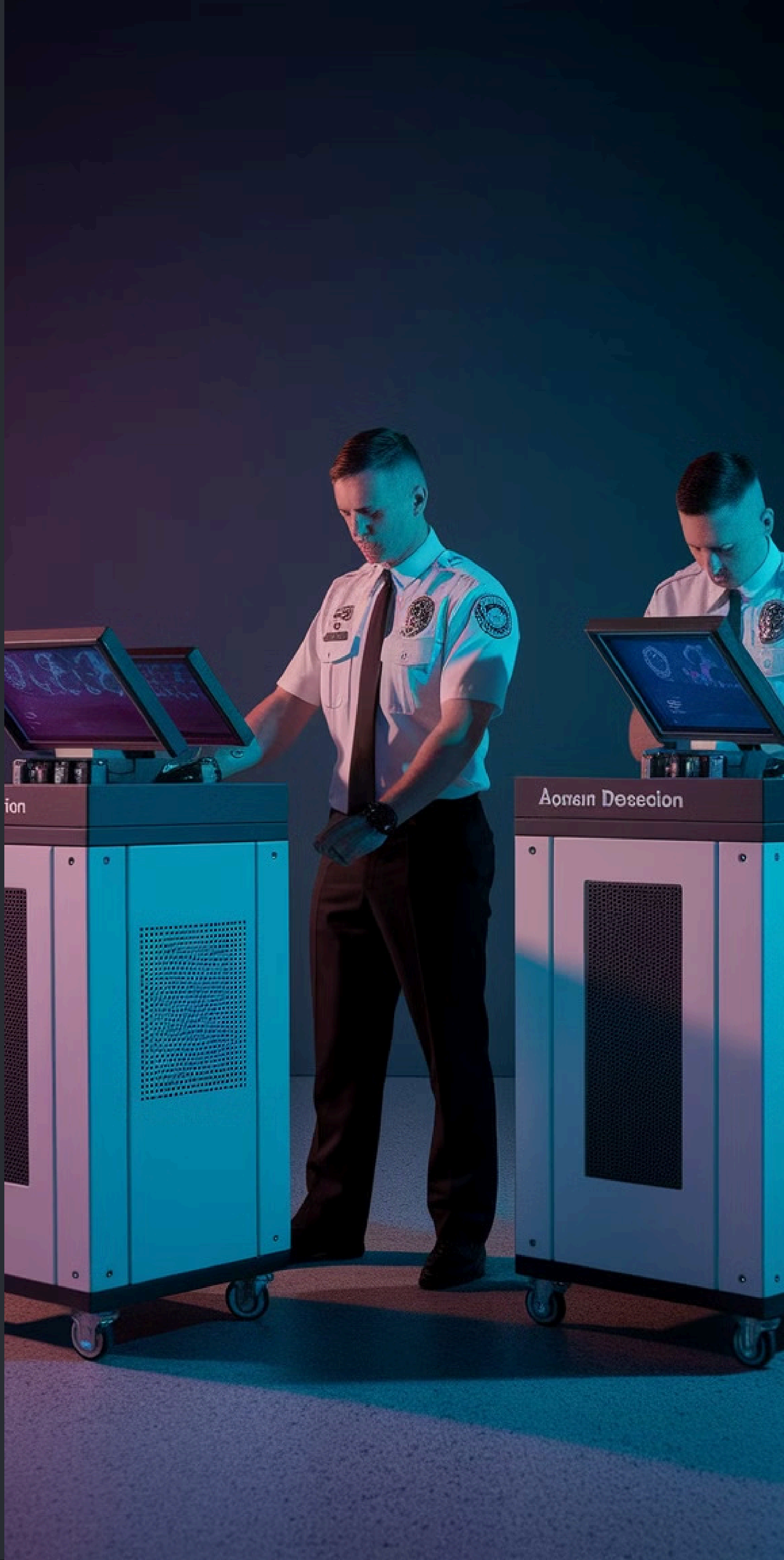
Identifies illegal substances at checkpoints with parts-per-billion accuracy, enabling non-invasive security screening.

Explosive Recognition

Detects trace explosives in public spaces before traditional methods, providing critical early warnings.

Medical Diagnostics

Analyzes breath compounds to identify biomarkers for early disease detection, creating opportunities in preventative healthcare.



Reliability and Durability Testing

Long-Term Operation Testing

12-month continuous testing under normal operating environment, simulated industrial conditions, and varying temperature and humidity cycles to monitor sensor sensitivity drift, battery performance degradation, electronic component stability, firmware and AI model consistency, and calibration accuracy maintenance.

Mechanical Durability Testing

Drop resistance verification from multiple angles (0°, 45°, 90°), surfaces (concrete, wood, metal), and heights (1.0m primary specification, 1.5m and 2.0m for extreme conditions), plus vibration resistance testing with frequency range 10-500 Hz and acceleration 2g, 5g, 10g for 4 hours per configuration across X, Y, Z orientations.

Environmental Protection Testing

IP65 compliance verification through water jet tests (30 kPa pressure, 15 minutes duration, 3 meters nozzle distance) and dust resistance evaluation using talcum powder equivalent dust (1-75 μm particle size, 8 hours exposure, 2 mg/m^3 concentration).

Blue Ocean Strategy

Creating New Market Space

The OdAR System is the first device to integrate chemical detection with precise spatial location capabilities, creating a new market rather than competing in an existing one.

Unprecedented Value

The system delivers value across multiple dimensions that no existing solution can match, providing significantly more value to customers than current alternatives.

Nanotubular Follicle Technology

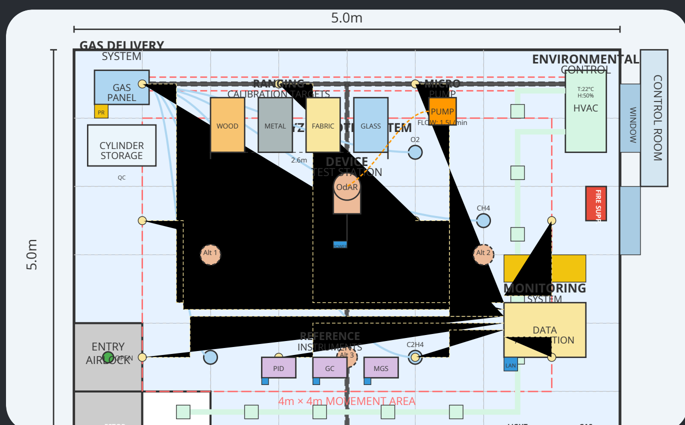
This technology represents a significant advancement in sensor technology, creating its own blue ocean within the sensor technology field with high sensitivity, selectivity, and miniaturization potential.

Breaking from Competition

By combining olfactory detection and spatial ranging, the OdAR System stands apart from conventional detection solutions, departing from existing competitive norms.

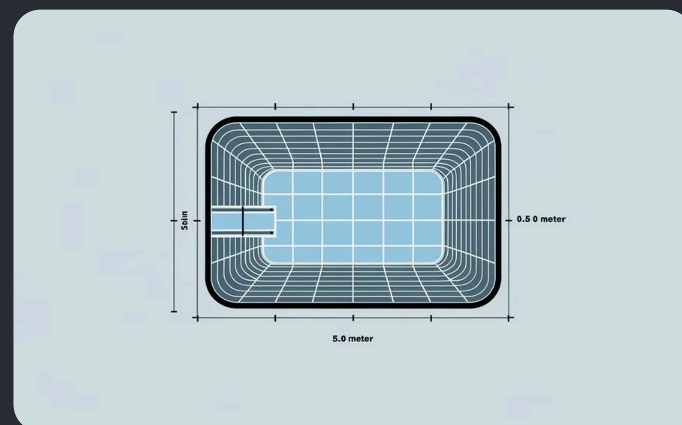
The OdAR System appears to be a "blue ocean" idea, creating a new market space by offering a unique combination of features that provide unprecedented value to customers. The nanotubular follicle technology, even by itself, could be considered a "blue ocean" idea within the context of sensor technology, representing a significant advancement that could open up entirely new markets and applications.

OdAR Testing Chamber



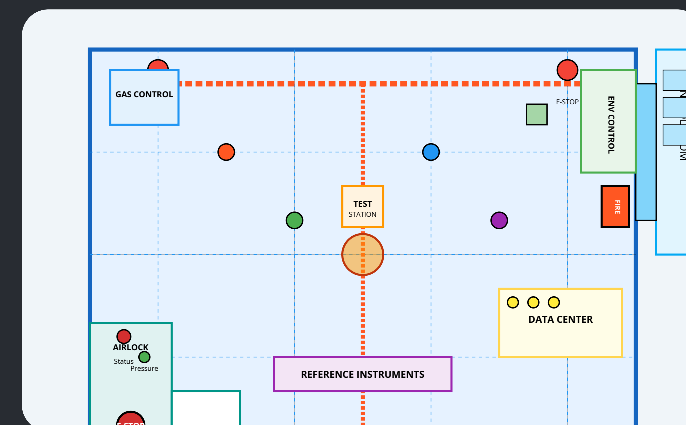
Test Chamber Blueprint

The OdAR testing chamber features non-absorptive surfaces specifically designed to prevent chemical compound adherence during detection trials.



Test Chamber View 2

Testing chamber TC-450X maintains a precisely controlled airflow rate of 0.45 m/s (±0.1 m/s) to ensure consistent distribution of test compounds throughout the space.



Layout and Systems

Chamber 7B includes specialized electromagnetic shielding that blocks external RF signals from 10 MHz to 6 GHz, preventing interference with the OdAR sensor array's sensitive measurement capabilities.