

IX. Expected Performance & Applications

This section specifies the performance targets and potential applications for the revised OdAR System, integrating olfactory detection with ranging capabilities. Below is the complete list as presented in both variations of your original prompt:

A. Integrated System Performance Targets

- **1. Detection Performance:**
 - **Classification Accuracy:** >90% for identifying target compounds (e.g., hazardous gases, VOCs).
 - **Detection Limit:** Low ppb (parts per billion) range for primary compounds.
 - **Response Time:** <1 second for initial odor detection.
- **2. Ranging Performance:**
 - **Static Accuracy:** ±10cm at distances up to 3m using ultrasonic/ToF sensors.
 - **Dynamic Tracking:** ±20cm for sources moving at speeds up to 0.5 m/s.
 - **Angular Resolution:** ±15° for determining source direction.
- **3. Combined Performance:**
 - **Source Localization Time:** <3 seconds from initial detection to pinpointing location.
 - **Multi-Source Discrimination:** Capable of tracking up to 3 distinct sources simultaneously.
 - **Operational Duration:** >6 hours on battery with active ranging and detection.

B. Primary Applications

- **1. Safety & Security:**
 - **Hazardous Gas Leak Localization:** Identifies and locates gas leaks in industrial or residential settings.
 - **Chemical Threat Detection and Tracking:** Detects and follows chemical agents in security scenarios.
 - **Contraband Detection:** Sniffs out illicit substances in secured facilities with spatial precision.
- **2. Industrial & Environmental:**
 - **Process Monitoring with Spatial Awareness:** Tracks odor emissions in manufacturing plants.
 - **Pollution Source Identification:** Pinpoints origins of environmental contaminants.
 - **Equipment Failure Detection and Localization:** Detects and locates chemical signatures of machinery issues.
- **3. Consumer & Commercial:**
 - **Smart Home Safety Systems:** Provides precise alert locations for gas or smoke detection.

- **Food Quality Monitoring with Spatial Mapping:** Assesses freshness or spoilage with positional data.
 - **Specialized Applications:** Authenticates wine or perfume by odor profile and source tracking.
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Notes

- **Completeness:** This captures every detail from both variations for **IX. Expected Performance & Applications**. Performance targets (A) and applications (B) match the original content exactly.
- **Pump Inlet Mechanism:** Not integrated here yet, as it was added to Hardware (Section I). It could enhance performance (e.g., faster response time due to active sampling)—let me know if you want that added!
- **Format:** Detailed narrative style per Variation 1, incorporating all outline points from Variation 2.