

NEXT GENERATION BIOLOGICAL IDENTIFICATION SYSTEM

Battelle's REBS+™ Bioidentification System represents a revolutionary change to the biological defense landscape. It collects and identifies airborne biological materials every 30 seconds, provides identification results to the network within 3 minutes, and has a limit of identification (LOI) of 5 particles per liter of air (PPL).

THE CHALLENGE

The United States faces challenges from increased adversarial access to low-cost enabling technologies for the production and deployment of weapons of mass destruction. Small scale production technology advancements increase the probability of covert WMD manufacture and deployment, either for terrorist or rogue state purposes, and reduce the observable signatures available to detect their presence.

THE SOLUTION: REBS+™ BIOIDENTIFICATION SYSTEM

The REBS+™ System is a fully automated, networkable, and adaptable bioidentification solution that can be installed in vehicles or static locations to provide a networked array of geographically distributed sensors to detect and identify biological threats and anomalies in real-time.

- **Fast:** The REBS+™ System can be configured to obtain continuous samples every 30 seconds and provides a presumptive ID to the network within 3 minutes.

The REBS+™ System was developed by applying revolutionary enhancements to the previously developed REBS™ technology which already has 10+ years of deployment history. The REBS+™ System is a fully integrated bioidentification system that samples the ambient air and uses Raman spectroscopy for identification of the collected aerosol particles.

The system has been demonstrated to have the size, weight, and power to allow integration onto mobile platforms such as SUVs, trucks, and vans, and has participated in ~15 operational field test events during its first two years of deployment.

- **Flexible:** The REBS+™ System is adaptable to emerging threats such as SARS-CoV-2. A signature for SARS-CoV-2 was developed during the beginning of the pandemic to address COVID-19 sampling. Once developed, new signatures can be pushed over the network to all systems, avoiding the need for hands-on updates.

The REBS+™ System also offers flexibility after it has identified a pathogen. Its non-destructive analysis and automatic archiving capabilities support seamless integration into high-level biosurveillance operations for confirmatory, diagnostic and attribution analyses.

- **Cost-effective:** The REBS+™ System is exceptionally cost-effective compared to other current technologies. The system does not require expensive chemicals or reagents, special handling, refrigeration, or laboratory support. Its operating costs are a fraction of a cent per sample. With its very low life cycle cost, protection zones can be expanded over larger areas.

The REBS+™ system delivers

- Rapid and autonomous identification of an ever-expanding list of airborne pathogens
- Detection of both biological and non-biological particles for anomaly detection and signature collection for emerging threats
- Near zero false positive rate
- Operation in a wide range of environmental conditions with no liquid consumables or perishable reagents
- Dramatically reduced life cycle cost through reduction of operational and sustainment expense



Though the REBS+™ System is configured by default for 30 second samples, this sampling time can be increased to achieve even lower limits of identification (below the standard 5 PPL) with a secondary effect of further reducing operational cost.

- **Simple:** The REBS+™ System is configured to automatically begin sampling and transmitting data to the network when power is applied, requiring no driver or operator intervention.



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SPECIFICATIONS

Performance

- Continuously samples and autonomously analyzes aerosolized bacteria, viruses and toxins from the ambient environment
- Takes spectral measurements of individual cells/particles
- Identifies threats via spectral comparisons to threat databases, which can be rapidly and remotely upgraded for identifying emerging pathogens
- Non-destructively archives analyzed samples for confirmatory analysis (PCR compatible)
- Adaptable sensitivity without hardware modification
- Sensitivity: LOI < 5 PPL (90% probability of identification)
- Minimum Detectable Particle Size: 1 μ m
- Sampling Interval: 30 seconds
- Time to Result: 3 minutes

Biological materials detected

Library Size: > 100 pathogen signatures available including Category A threats, with the ability to expand and tailor the library for a range of biological warfare and public health threats

Physical characteristics

- Size: 50 L
- Weight: 26 kg
- Power: < 400 W steady-state
- Vehicle DC or AC powered
- Vehicle mountable
- Operating Temperature: -20 to 55°C
- Operating Humidity: 0 to 100% RH, non-condensing
- Consumables: Cassette change every 28 days (operating 8 hrs/day, 6 days/week)

External communications

- Cellular
- Ethernet
- WiFi
- GPS
- Network Update Rate: 1 Hz
- Web interface for maintenance