SERSTECH

SIMPLICITY - SPEED - PRECISION

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Investigators! Opioid settlement funds may be available to you to purchase the equipment described in this application note. Please contact us for assistance.

Application Note: Arx mkII Raman Spectroscopy

Enhancing Parolee Supervision With On-Site Substance Identification

Overview

Parole and probation officers face unique challenges during home inspections and field supervision visits. The discovery of unknown pills, powders, or liquids requires immediate identification to assess compliance with supervision conditions, ensure officer safety, and make informed decisions about potential violations. The Serstech Arx mkII handheld Raman spectrometer provides officers with a powerful tool for rapid, on-site substance identification without compromising safety or requiring laboratory analysis.

Arx mkII

Application Background

Community Supervision Challenges

Parole and probation officers conduct regular home visits as part of their supervision responsibilities, monitoring compliance with court-ordered conditions that often include prohibitions on drug possession and use. During these visits, officers may encounter:

- Unknown prescription medications that require verification against approved prescriptions
- Unidentified pills or capsules in unmarked containers

- White or colored powders of uncertain origin
- Suspicious liquids in various containers
- Substances that parolees claim are legal supplements or household items

Traditional approaches require officers to either:

- Make preliminary assessments based on visual inspection and experience
- Collect samples and wait days or weeks for laboratory analysis
- Conduct presumptive field tests that provide limited information
- Document findings without definitive identification

These delays can compromise supervision effectiveness, create officer safety concerns, and hinder timely intervention when violations occur.

Solution: Serstech Arx mkII Raman Spectroscopy

Technology Overview

The Serstech Arx mkII utilizes Raman spectroscopy to identify chemical substances through molecular analysis. When the device's 785 nm laser interacts with a sample, it produces a unique spectral fingerprint that can be matched against comprehensive reference libraries.

Key Features for Parolee Supervision

Patented Autofocus Technology (SharpEye)

- Automatically identifies the optimal measurement point in milliseconds
- Distinguishes between container materials and actual substances
- Minimizes interference from packaging (plastic bags, glass bottles, pill bottles)
- Enables accurate identification without opening containers, reducing officer exposure risk

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Portable and Field-Ready Design

- Weighs approximately 590g (1.3 lbs) - easily carried in a pocket or bag
- 12-hour battery life supports full-day field operations
- One-button operation allows single-handed use
- IP67 and MIL-STD-810G certified for durability in demanding field environments
- Operates in temperatures from -20°C to +50°C (-4°F to 122°F)

Comprehensive Chemical Libraries

- Narcotics library includes substances from UN Yellow and Green lists
- Covers narcotics, precursors, and psychotropic substances
- Pharmaceutical library for prescription medication verification
- Hazardous chemicals library for safety assessment
- Quarterly library updates provided at no additional cost

Enhanced Sensitivity with SERS

- Optional Surface Enhanced Raman Spectroscopy (SERS) kit
- Reduces detection limits to 200 ppm
- Critical for identifying trace amounts of fentanyl and other dangerous substances
- Simple snap-on attachment design

Typical Use Cases in Community Supervision

Scenario 1: Medication Verification

During a routine home visit, Officer Martinez discovers multiple unmarked pill bottles in a parolee's bathroom. The parolee claims they are all legitimate prescriptions but cannot locate the original labeled containers.

DIRECT SCAN OF TABLETS

Solution: Using the Arx mkII, Officer Martinez scans pills from each bottle through the clear plastic containers. Within seconds, the device identifies:

- Bottle 1: Hydrocodone - requires verification against prescription records
- Bottle 2: Ibuprofen - over-the-counter pain reliever, compliant
- Bottle 3: Alprazolam - controlled substance requiring prescription verification

This immediate identification allows the officer to focus investigation on the controlled substances while documenting the findings in real-time.

Scenario 2: Unknown Powder Detection

During an inspection, Officer Chen notices a small plastic bag containing white powder partially hidden in a kitchen drawer. The parolee claims it is protein powder for fitness training.

DIRECT SCAN OF POWDER

Solution: Without opening the bag, Officer Chen uses the Arx mkII's autofocus feature to scan through the plastic packaging. The device identifies the substance as part Tramadol, an opioid pain medication, within 15 seconds, providing immediate probable cause for violation proceedings and ensuring officer safety by avoiding direct contact with the substance.

Scenario 3: Liquid Substance Investigation

Officer Thompson conducts a home visit with a parolee on alcohol restriction. A clear liquid in an unlabeled translucent sports drink bottle is found in the refrigerator. The parolee claims it is water.

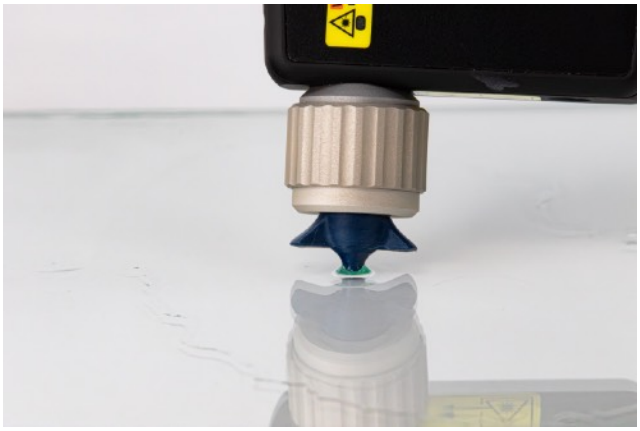
Solution: Officer Thompson uses the Arx mkII in a direct point-and-shoot mode, scanning the liquid through the translucent bottle without opening it or transferring any sample. The device's autofocus technology penetrates the container and analyzes the liquid inside. Within seconds, it identifies the substance as alcohol (40% ethanol solution), documenting a clear violation of alcohol restrictions. The completely non-destructive analysis preserves evidence for potential court proceedings while maintaining officer safety.

Scenario 4: Trace Liquid Analysis with Capillary Probe

Officer Rodriguez responds to a parolee's residence for a routine compliance check. On the kitchen counter, she notices what appears to be a few drops of clear liquid residue near an

empty shot glass. The parolee claims he was drinking water, but the officer finds the explanation suspicious given the parolee's history of GHB (gamma-hydroxybutyric acid) abuse and current prohibition on drug use.

Solution: Officer Rodriguez uses the Arx mkII's capillary probe attachment to sample the liquid residue. The capillary probe can analyze samples as small as a single droplet (10 µL). She touches the probe tip to one of the droplets on the counter, and the capillary action draws the liquid into the probe. Within seconds, the Arx mkII analyzes the sample and identifies it as GHB, a Schedule I controlled substance commonly known as "liquid ecstasy." This immediate identification provides clear evidence of a violation, even from trace amounts of liquid that might otherwise have been impossible to collect and test using traditional methods.



CAPILLARY PROBE

Scenario 5: Trace Fentanyl Detection with SERS (surface-enhanced Raman spectroscopy)

Officer Kim conducts a home inspection and discovers a small plastic bag containing white powder in a nightstand drawer. The parolee claims it contains only over-the-counter pain reliever pills that he crushed for easier consumption. Officer Kim performs an initial direct Raman scan through the bag, which identifies the powder as acetaminophen (Tylenol). However, given the parolee's history of opioid abuse and the suspicious circumstance of crushed pills, Officer Kim decides to conduct a more sensitive analysis.

SERS ACCESSORY

Solution: Officer Kim attaches the SERS (Surface Enhanced Raman Spectroscopy) kit to the Arx mkII. The SERS technology reduces the detection limit to 200 ppm, making it capable of identifying trace amounts of substances that would be masked by bulk materials in standard Raman analysis. She collects a small sample on the SERS substrate and scans again. This time, the device detects fentanyl present at trace levels within the acetaminophen powder—a deadly combination often used to stretch opioid supplies or create counterfeit pills. The SERS attachment revealed what the standard scan could not: a serious controlled substance violation and an immediate safety concern. This critical finding allows Officer Kim to take immediate action to protect the parolee from potential overdose while documenting the violation.

Scenario 6: Multi-Substance Assessment

During a compliance check at a residence with multiple occupants, Officer Davis discovers several different types of pills, powders, and a suspicious liquid, creating a complex scene requiring multiple substance identifications.

Solution: The Arx mkII's rapid analysis capability allows Officer Davis to identify all substances within minutes:

- White powder in envelope: Cocaine
- Blue pills in container: Oxycodone
- Green liquid in jar: THC tincture
- White tablets: Acetaminophen (compliant)

This comprehensive assessment enables immediate decision-making about violations, safety risks, and whether additional law enforcement response is necessary.

Operational Advantages

Enhanced Officer Safety

- Non-contact analysis through containers eliminates exposure to dangerous substances
- Rapid identification of fentanyl and other toxic drugs protects officers from accidental exposure
- Immediate hazard assessment allows appropriate safety precautions
- Reduces need for presumptive tests that require opening containers

Improved Supervision Efficiency

- Instant results eliminate waiting periods for laboratory analysis

- Immediate documentation supports timely violation proceedings
- Reduces need for follow-up visits for substance verification
- Enables real-time decisions during field supervision

Legal and Evidentiary Benefits

- Raman spectroscopy provides accurate results, non-destructively
- Device generates detailed spectral data that can be archived
- Results can be exported and attached to case files through ChemDash software
- Defensible methodology supports court proceedings

Cost-Effectiveness

- Reduces reliance on expensive laboratory analysis for routine identifications
- Single device handles multiple substance types (solids, liquids, powders)
- Five-year warranty protects investment
- No consumables required (unlike presumptive field tests)

Integration into Supervision Workflow

Pre-Visit Preparation

1. Ensure device is fully charged (12-hour battery life)
2. Confirm appropriate libraries are activated for expected substances
3. Verify device is clean and in proper working condition

During Home Inspection

1. Document location and appearance of suspicious substances
2. Use Arx mkII to scan substances through containers when possible
3. For liquids, collect small sample using included adapters
4. Record results immediately using device interface
5. Take photographs as needed for case documentation

Post-Visit Documentation

1. Transfer scan results to ChemDash software via WiFi or USB
2. Generate detailed reports with GPS location data
3. Attach spectral data to electronic case files

4. Initiate appropriate violation or intervention procedures based on findings

Technical Specifications Summary

Specification	Details
Weight	Approximately 590g (1.3 lbs)
Battery Life	12 hours continuous operation
Laser	785 nm, Class 3B, 300 mW max output
Operating Temperature	-20°C to +50°C (-4°F to 122°F)
Durability	IP67, MIL-STD-810G certified
Analysis Time	Typically ~15 seconds per sample
Connectivity	WiFi, USB, optional ATAK integration
Operation	Single-button, one-handed use
Detection Limit	Standard: substance-dependent; SERS: 200 ppm

Safety Considerations

Laser Safety

- The Arx mkII uses a Class 3B laser (300 mW at 785 nm)
- Never direct the beam toward people or into areas where others may be present
- Maintain a safety distance of 1 meter (3 feet) from the aperture during operation
- Follow EN 60825-1 safety guidelines

Substance Handling

- Minimize direct contact with unknown substances whenever possible
- Use the device's through-container analysis capability to avoid opening packages
- Wear appropriate personal protective equipment when handling potentially hazardous materials
- Follow agency protocols for evidence handling and chain of custody

Training Recommendations

For effective deployment in community supervision settings, officers should receive training in:

1. **Basic Raman Spectroscopy Principles** - Understanding how the technology identifies substances
2. **Device Operation** - Proper handling, scanning techniques, and troubleshooting
3. **Library Management** - Activating appropriate libraries and interpreting results
4. **Evidence Protocols** - Documenting findings and maintaining chain of custody
5. **Safety Procedures** - Laser safety and substance handling best practices
6. **Legal Considerations** - Fourth Amendment implications and proper use within supervision authority

Recommended Package Configuration

For parole and probation applications, the **Arx mkII Narcotics Standard Package** (Model ARX003-N-SK1) or the **Arx mkII Narcotics Pro Package** (Model ARX003-NEH-SK1) are recommended. The packages include:

Included Components:

- Arx mkII base unit
- Comprehensive narcotics library (**Arx mkII Narcotics Standard**)
- Bundled Narcotics, Explosives & Hazardous Chemicals libraries (**Arx mkII Narcotics Pro**)
- SERS kit for enhanced sensitivity to fentanyl and trace substances
- ChemDash Lite software for data management
- Standard accessories (charging cable, carrying case, adapters)
- Five-year warranty

Optional Enhancements:

- Additional library packages (Pharmaceuticals, Hazardous Chemicals)
- Small Volume Adapter for analyzing minute liquid samples (minimum 400 µL)
- Capillary Probe for analyzing spilled liquids (as little as 10 µL)
- ChemDash Pro software for advanced reporting and multi-user management

Support and Maintenance

Warranty and Support

- Five-year comprehensive warranty included with all Serstech instruments
- Quarterly library updates provided at no charge

- Technical support available through Serstech and authorized distributors

Maintenance Requirements

- Regular lens cleaning using provided lens pen or isopropanol swabs
- Periodic inspection of device exterior and charging contacts
- Battery condition monitoring
- Annual calibration verification (as per agency protocols)

Conclusion

The Serstech Arx mkII Raman spectrometer represents a significant advancement in field supervision technology for parole and probation officers. By providing rapid, accurate identification of unknown substances during home inspections and field visits, the device enhances officer safety, improves supervision effectiveness, and enables timely intervention when violations occur.

The combination of rugged design, intuitive operation, and comprehensive chemical libraries makes the Arx mkII ideally suited for the demanding requirements of community supervision. Officers can make informed decisions based on scientific identification rather than visual assessment or prolonged waiting for laboratory results.

As community corrections agencies seek to enhance supervision quality while managing growing caseloads, tools like the Arx mkII provide a force multiplier effect - improving outcomes without requiring additional personnel resources.

For More Information

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Product Documentation

- Technical data sheets available at serstech.com
- ChemDash software guides and tutorials
- Application videos and case studies

Authorized Distributors
Contact Serstech for information about authorized distributors and government procurement channels in your region.

This application note is provided for informational purposes. Agencies should consult with their legal counsel regarding appropriate use of chemical identification technology within their jurisdiction and in compliance with applicable laws.

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