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Application Note

Serstech Arx mkII for Identification of Homemade Explosives in Asymmetrical Production Laboratories

Overview

The **Serstech Arx mkII handheld Raman spectrometer** gives explosive ordnance disposal (EOD), counter-IED, CBRN, and forensic teams a rapid, field-deployable capability to **identify suspected explosive materials and residues** commonly encountered in improvised/asymmetrical production laboratories. The Arx mkII delivers non-contact, non-destructive chemical identification in seconds, enabling safer scene assessment, faster hazard characterization, and better-informed evidence-preservation decisions while minimizing personnel exposure.

Scope & safety note: This application note focuses on safe identification, operational use, and integration with EOD/forensic workflows. It does **not** provide instructions for producing explosives, nor does it give actionable synthesis details. Field operators must always follow agency SOPs and coordinate with EOD, HAZMAT, and forensic laboratories for confirmatory analysis.

How the Arx mkII Helps in Asymmetrical Lab Environments

- **Rapid identification:** Produces spectral identifications in seconds so teams can triage threats quickly and prioritize response actions.
- **Through-container capability:** Enables safe screening of solids, powders, and some liquids through many clear/opaque packaging materials—reducing need to open potentially hazardous items.
- **Non-destructive analysis:** Preserves evidence integrity for later forensic confirmation while reducing handling.
- **Robust libraries:** Includes reference spectra for explosive compounds, common energetic materials residues, propellants, and relevant industrial/household chemicals often encountered at improvised labs; libraries can be customized to reflect regional threat profiles.



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- **Metadata & chain-of-custody:** Each scan is logged with operator, time/date, GPS (if available), and full spectral data to support evidentiary requirements.
- **Rugged field design:** MIL-STD and IP ratings support use in austere environments where improvised labs are typically found.

Typical Operational Scenarios

- **Initial site assessment:** Rapidly screen containers, bottles, powders, and surfaces encountered during entry or remote assessment to determine potential explosives hazard.
- **Screening suspect components:** Identify suspect initiators, energetic residues, oxidizer traces, or propellant materials found in production areas, storage, or discard piles.
- **Evidence triage:** Prioritize items for forensic submission based on on-scene identifications, minimizing laboratory backlog.
- **Post-render-safe verification:** Assist EOD teams in confirming absence/presence of residual energetic materials after render-safe procedures (used only under appropriate EOD authority).
- **Intelligence exploitation:** Support site exploitation by rapidly cataloguing chemical materials present for follow-on technical and investigative analysis.

Recommended Field Procedures (High Level)

1. **Coordination & authority:** Always operate under the direction of EOD/CBRN team leads or the incident commander. The Arx mkII is a screening/identification tool—not a render-safe device.
2. **Scene safety & PPE:** Use appropriate PPE for suspected explosive/CBRN environments (EOD suits, chemical protective ensembles, respiratory protection as required). Maintain standoff distances and adhere to agency safety limits.
3. **Non-contact scanning:** Favor through-container scans when possible. If direct sampling is necessary, only trained EOD/forensic personnel should perform it following established SOPs.



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4. **Confirmatory workflow:** Treat Arx mkII results as presumptive identifications. Positive field IDs should be followed by laboratory confirmatory testing when legal/forensic certainty is required.
5. **Evidence control:** Tag, photograph, and document all scanned items. Export spectral records and metadata immediately to secure evidence management systems.
6. **Limitations awareness:** Be mindful of sample fluorescence, heavily mixed matrices, and degraded residues that may reduce identification confidence. Use the instrument's match quality indicators to guide interpretation.

Integration with EOD, Forensics, and Incident Systems

- **Data export & interoperability:** Use USB, Wi-Fi, or secure file transfer to move spectra into forensic case management, central databases, or intelligence systems.
- **Fleet management:** Centralized library updates and instrument health monitoring via Serstech software help maintain consistent capability across multi-unit deployments.
- **Linkage to mapping and reporting tools:** Forward geotagged results to command platforms to support operational planning and follow-on investigations.

Training & Competency

- **Targeted courses:** Provide role-based training for EOD technicians, HAZMAT officers, and evidence technicians covering instrument operation, interpretation of match scores, safety constraints, and evidence handling.
- **Scenario drills:** Incorporate live-training scenarios (non-hazardous surrogates) to reinforce rapid decision-making and coordination with response partners.
- **Refresher & library updates:** Regular refresher training and updates to spectral libraries ensure operators can recognize emerging threat signatures and maintain proficiency.

Maintenance, Quality Control & Documentation

- **Calibration & checks:** Follow manufacturer recommendations for periodic calibration and performance verification to ensure reliable spectral matches in the field.



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- **Audit trail:** Maintain exported spectral files, incident logs, and operator notes as part of the legal chain of custody.
- **Software updates:** Keep detection libraries and firmware up to date through controlled update processes—coordinate updates with lab intelligence units to avoid introducing unvetted spectra.

Limitations and Considerations

- **Presumptive nature:** Raman spectroscopy provides presumptive identifications—definitive forensic classification often requires laboratory techniques (chromatography, mass spectrometry, etc.).
- **Mixtures & coatings:** Complex mixtures, surface contaminants, or coatings may mask key spectral features and reduce confidence.
- **Fluorescence & dark materials:** Some samples may fluoresce or absorb the laser, limiting usable Raman signal. Operators should be trained to recognize these conditions and follow alternate procedures.
- **Safety dependence:** The device reduces, but does not eliminate, risk. Always balance Arx mkII use with established explosive safety protocols and EOD procedures.

Recommended Policy & SOP Elements for Agencies

- Define situations in which field identifications are acceptable for operational decisions versus those requiring laboratory confirmation.
- Establish clear handover procedures from field screening teams to EOD/forensics for render-safe operations and evidentiary processing.
- Specify data management practices ensuring secure transfer, storage, and retrieval of spectral evidence.
- Implement interagency coordination protocols for joint responses and intelligence sharing.

Conclusion

The **Serstech Arx mkII** is a force-multiplying tool for teams confronting improvised or asymmetrical explosive production sites. By providing fast, non-destructive chemical identifications with robust documentation, the Arx mkII helps EOD, HAZMAT, and forensic



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teams to make safer, faster, and more defensible decisions on scene. When used within properly designed SOPs and in coordination with confirmatory laboratory workflows, the Arx mkII significantly strengthens tactical response and investigative capability against improvised explosive threats.