

“Portable SERS Instrument for Detection and Identification of Chemical and Biological Contaminants in Water”

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SERS - Surface Enhanced Raman Scattering

Collaborative Program:

- OptoTech Pty Ltd
- Swinburne University of Technology
- Department of Primary Industries (DPI)

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The Opportunity

● Threat - Water Contamination with C&B Agents

- Suspected or real contamination of water supply can be extremely costly eg industry shutdown
- Existing technology not able to meet requirements for rapid identification of contaminated water supplies

● Market Profile for Field Instrumentation

- High demand; eg: US JSAWM, water authorities
- Only few competing technologies: Raman spectroscopy, chemical and biological kits and potentially SERS
- Few commercial instruments: First Defender, Streetlab
- Performance shortcomings
- High Price

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Project Goals

● Final Objective

- A portable instrument capable of detection and identification of Chemical and Biological contaminants in water
- Aim to achieve detection levels that can assure safe drinking water in the short term

● Technology

- Raman Spectroscopy
- Surface Enhanced Raman Scattering

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Desirable Features of an Early Warning System *(International Life Science Institute)*

- Provides warning in sufficient time of action
- Affordable price
- Operation requires low skills and training
- Covers all potential threats
- Is able to identify the source
- Is sensitive to quality changes to regulatory levels
- Gives minimal false positive or negative response
- Is robust
- Is reproducible and verifiable
- Allows remote operation
- Functions year-round

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Approach - Strategic Level

- Anchor the project in the user community
 - NSST
 - Australian Customs
 - Industry Assurance Advisory Group for Water Resources
- Leverage on the strengths, expertise and capabilities of the development partners
 - OptoTech Pty Ltd: system integration, engineering design, laser technology, optical systems
 - Swinburne University of Technology: SERS technology, Raman spectroscopy
 - DPI: Trace chemical analysis, supporting laboratory for water incidents, ongoing collaboration with emergency responders

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Approach - Implementation Level

- Validate the applicability of SERS technology for the detection and identification of C&B contaminants in water
- Develop a proprietary system architecture
- Develop proprietary subsystems:
 - disposable SERS probes,
 - laser systems,
 - wavelength detection module
- Develop an open system architecture to utilise off the shelf Raman libraries
- Use DPI's experience, knowledge and expertise to conduct experiments on C&B agents

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Technology

- **Disposable SERS Probes**
 - Swinburne has developed proprietary, fibre optics based, SERS technology
- **Proprietary Laser Technology**
 - OptoTech has developed proprietary laser sources at 532nm and 785nm
- **Proprietary Wavelength Detection Module**
 - Swinburne University and OptoTech are conducting a technology assessment study with the final objective of developing a proprietary wavelength detection module
 - The instrument will be Raman and SERS capable

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Resources and Contributors

- **Development Parties and Contributors**
 - OptoTech Pty Ltd
 - Swinburne University of Technology
 - Department of Primary Industries
- **Sponsors**
 - National Security Science and Technology (NSST)
 - Australian Customs
 - Nanotechnology Victoria

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Schedule

- **Concept Demonstrator**
 - December 2006
- **Product**
 - Second Quarter 2008
- **Test, Evaluation, Qualification**
 - End 2008

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Current Status

Validation of Core Technologies

- **Fibre Optics Based SERS Probes**
 - Probes manufactured by Swinburne University
 - Tests conducted on chemical agents at Swinburne University and DPI
- **Laser Systems at 532nm and 785nm**
 - Lasers manufactured by OptoTech
 - Lasers used in tests conducted at Swinburne University and DPI
- **Wavelength Selectio Module**
 - Technology assessment conducted by OptoTech and Swinburne University
 - Integration of system prototype by OptoTech and Swinburne University

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