# Technology Safety Data Sheet
## Surveillance and Measurement System

## Section 1: Technology Identity

| Technology Name(s): | Emergency Contact: |
|---|---|
| Surveillance and Measurement System<br>DOE OST TMS # 2977 | Neal Yancey<br>(208) 526-5157 |
| **Manufacturer's Name and Address:** | **Information Contact:** |
| Berkeley Nucleonics Corporation<br>3060 Kerner Blvd., #2<br>San Rafael, CA 94901<br>Telephone: 1-800-234-7858<br>Website: http://www.berkeleynucleonics.com | Neal Yancey<br>Environmental Engineer, AEDL<br>Idaho National Engineering and Environmental Laboratory<br>Lockheed Martin Idaho Technologies Co.<br>P. O. Box 1625<br>Idaho Falls, ID 83415-3710<br>(208) 526-5157 |

| Date Prepared: | June 2002 | Date Revised: | Not yet revised |
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## Section 2: Technology Pictures and Diagrams

Figure 1: Complete SAMS Unit Showing the Console and the Sensor with the Ninety-Degree Handle.


Figure 2: Console Showing Data Screen and Controls.

Figure 3: Technician Connecting Sensor to the Consol.

Figure 4: Technician Demonstrating Position of Unit When it is Deployed.

## Section 3: Technology Description

The Surveillance and Measurement System (SAMS) is a product of Berkeley Nucleonics, and uses a thallium-activated sodium iodide NaI (Tl) detector to provide isotopic identification in a hand held radiation detector. This technology combines the NaI (Tl) detector with a time slicing, data compression technique resulting in shorter acquisition times, accurate isotope identification, and spectroscopic capabilities. Quadratic Compression Conversion (QCC), a data compression technique, allows the operator the ability to identify multiple isotopes in one-second intervals. Using an internal database, the SAMS can detect up to 70 radionuclides. The library is expandable to 95 radionuclides by adding an optional neutron detector. This unit comes with either a 1.5 inches x 2-inch, a 2 inch x 2 inch, or a 3 inch x 3 inch NaI (Tl) crystal.

The technician walks along the ground at a predetermined rate. Cradling the console in one arm for optimal viewing of the screen, the operator points the sensor at the ground surface with his/her arm fully extended. As the worker walks, the sensor detects the radionuclides and displays them on the screen. The SAMS is operated as other handheld detectors but is able to identify individual isotopes where the baseline handheld detectors cannot. This unit can also be used to take radiation measurements in many other conditions such as, on equipment, inside buildings, along piping, or various other situations. The analytical laboratory generally requires about 100 grams of sample, which may take as little as several minutes to as long as a few hours depending upon the medium being sampled. The SAMS provides real-time data. By using the SAMS, the technician can take fewer samples resulting in less time spent in potentially hazardous environments.

## Section 4: Safety Hazards

**Hazard Category:**

(Adapted from Appendix A to MIL-STD-882D, February 10, 2000, Department of Defense Standard Practice for System Safety.)

4 - Could result in death or permanent total disability

3 - Could result in permanent partial disability or injuries or occupational illness that may result in hospitalization of at least three persons

2 - Could result in injury or occupational illness resulting in one or more lost work days

1 - Could result in injury or illness not resulting in a lost work day

N/A - Is not applicable to this technology and poses no appreciable risk

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| **A.** | **Buried Utilities, Drums, and Tanks** | **Hazard Rating: N/A** |

This is a non-intrusive technique and, therefore, does not require any surface disturbance.

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| **B.** | **Chemical (Reactive, Corrosive, Pyrophoric, etc)** | **Hazard Rating: N/A** |

This technology does not use any chemicals. Site-specific use should be evaluated to determine any potential chemicals.

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| **C.** | **Confined Space** | **Hazard Rating: N/A** |

There are no requirements specific to this technology; however, if used in a confined space, workers should follow and meet confined space requirements.

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| **D.** | **Electrical** | **Hazard Rating: 1** |

The unit has a battery that will need to be recharged. During the recharging, consider using a Ground Fault Circuit Interrupter (GFCI) protected circuit.

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| **E.** | **Explosives** | **Hazard Rating: N/A** |

This technology does not use any explosives.

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| **F.** | **Fire Protection** | **Hazard Rating: N/A** |

There are no fire protection requirements imposed by the use of this technology. Site-specific fire protection programs should be followed.

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| **G.** | **Gas Cylinders** | **Hazard Rating: N/A** |

This technology does not use compressed gases.

| H. Ladders/Platforms | Hazard Rating: N/A |
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| This technology can be used with ladders and platforms, but it is not the primary application. | |
| **I. Lockout/Tagout** | **Hazard Rating: N/A** |
| The unit has a battery that will need to be recharged. During the recharging, consider using a GFCI protected circuit. | |
| **J. Mechanical Hazards** | **Hazard Rating: N/A** |
| There are no mechanical hazards to this technology**.** | |
| **K. Moving Vehicles** | **Hazard Rating: N/A** |
| There are no moving vehicles specific to this technology. | |
| **L. Overhead Hazards** | **Hazard Rating: N/A** |
| There are no overhead hazards specific to this technology. | |
| **M. Pressure Hazards** | **Hazard Rating: N/A** |
| There are no pressure hazards specific to this technology. | |
| **N. Slips/Trips/Falls** | **Hazard Rating: 1** |
| There is the potential of a trip and fall if the cable connecting the sensor and instrument drops to ground level, when the worker is walking, viewing the monitor with arm extended during measurement. The connecting cable should be managed to keep it at knee level or above, or consider a wireless connection. | |
| **O. Suspended Loads** | **Hazard Rating: N/A** |
| There are no suspended loads specific to this technology. | |
| **P. Trenching/Excavation** | **Hazard Rating: N/A** |
| There is no trenching or excavation specific to this technology. | |

## Section 5: Health Hazards

| A. Inhalation | Hazard Rating: N/A |
|---|---|
| There are no inhalation hazards specific to this technology; however, site-specific use will determine if any monitoring is required. | |

| B. Skin Absorption | Hazard Rating: N/A |
|---|---|
| There are no skin absorption hazards specific to this technology. | |
| **C. Noise** | **Hazard Rating: N/A** |
| This technology does not produce noise. Site-specific use, if used in a facility or near excavations, may require monitoring. | |
| **D. Heat Stress/Cold Stress** | **Hazard Rating: N/A** |
| This technology does not require personal protective equipment. Site-specific use may require the use of PPE and, therefore, heat and cold stress may be possible if outside in hot or cold weather. | |
| **E. Ergonomics** | **Hazard Rating: 2** |
| The weight of the sensor and carrying the panel when using the unit for extended periods may cause stress. The use of proper work position and managing duty time would minimize stress. | |
| **F. Ionizing Radiation** | **Hazard Rating: 1** |
| This unit is calibrated with a Cs-137 standard and user may be subjected to ten-microcurie (10µC) exposure. | |
| **G. Non-ionizing Radiation** | **Hazard Rating: N/A** |
| This unit is calibrated with a Cs-137 standard and user may be subjected to ten-microcurie (10µC) exposure. | |
| **H. Biological Hazards** | **Hazard Rating: N/A** |
| There are no biological hazards specific to this technology. | |
| **I. Other** | **Hazard Rating: N/A** |
| None. | |

## Section 6: Phase Analysis

### A. Construction/Start-up

- Turn on the unit.
- Calibrate the unit with Cs-137 standard, possible exposure to 10µC radiation.

### B. Operation

Collecting the data during measurement. There is a possibility of a trip or fall when the worker is walking, focusing on the screen, if the connecting cable drags the ground.

### C. Maintenance (Emergency and Routine)

Components are manufactured, repaired, or replaced.

### D. Shutdown (Emergency and Routine)

Turn unit off.

### E. Decontamination/Decommissioning

The technology would likely be used in facilities or areas contaminated with or containing radioactive materials which mean the SAMS base unit, detector, and detector cable could become contaminated. Workers handling equipment that was used in a contaminated area could possibly handle contaminated surfaces, resulting in exposure. Methods and procedures for equipment decontamination will need to be addressed before the operator handles the SAMS in a contaminated area.

## Section 7: Worker Protection Measures

### A. Exposure Monitoring

Radiological monitoring depends on the characteristics of the area entered and the task being performed. Radiological monitoring may include wearing radiation dosimeters, collecting air samples, frisking with radioactivity detectors and biological monitoring (bioassay, whole body counting).

### B. Worker Training

The following training would be valuable for the operators and may be required:

- Radiological Technician Training
- Operation of the SAMS
- PPE
- Employees entering and working in DOE facility radiological areas may also require additional training, and must participate in the radiological monitoring identified in the Radiation Work Permit (RWP). The level of additional training depends on the characteristics of the area entered (level of radiation or contamination) and the task performed. Training levels include Orientation Training, General Employee Radiological Training (GERT), Radiological Worker I Training (RWI), and Radiological Worker II Training (RWII).

### C. Medical Surveillance

There is no additional medical surveillance recommended to the site-specific requirements.

### D. Engineering Controls

- Consider a handle with a $270^{o}$ loop similar to a shepherds crook in place of the $90^{o}$ handle so that the arm and wrist can be maintained in an ergonomically neutral position with angle change of the sensor.
- Consider using an over shoulder strap to minimize wrist stress.
- Consider a wireless connection to eliminate cable.

## E. Administrative Controls

Radiological Work Permits provide an important tool for controlling exposures.

## F. Personal Protective Equipment

- Site-specific, radiation worker program
- Safety shoes

# Section 8: Emergency Preparedness

Site-specific requirements should be met.

# Section 9: Comments, Lessons Learned, & Special Considerations

- Display screen that is easily readable in sunlight.
- Sensor is waterproof; monitor is not as robust a design.

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