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QUARTERLY STATUS REPORT

**FAST-RESPONSE ISOTOPIC ALPHA
CONTINUOUS AIR MONITOR (CAM)**

CONTRACT NO. DE-AR26-98FT40365

**Seventh Quarterly Status Report
For the Period
April 2, 2000 - July 1, 2000**

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Project objective

The objective of this effort is to develop and test a novel Continuous Air Monitor (CAM) instrument for monitoring alpha-emitting radionuclides, using a technology that can be applied to Continuous Emission Monitoring (CEM) of thermal treatment system off gas streams. The CAM instrument will have very high alpha spectral resolution and provide real-time, on-line monitoring suitable for alerting workers of high concentrations of alpha-emitting radionuclides in the ambient air and for improved control of decontamination, dismantlement, and air emission control equipment.

Base Phase I involves the design, development, and preliminary testing of a laboratory-scale instrument. Testing will initially be conducted using naturally-occurring radon progeny in ambient air. In the Optional Phase II, the Base Phase I instrument will be critically evaluated at the Lovelace Respiratory Research Institute (LRRI) with characterized plutonium aerosols; then an improved instrument will be built and field-tested at a suitable DOE site.

Major milestones**Base Phase**

- Design criteria and specifications defined — Completed
- Prototype unit operational — Completed
- Performance of prototype unit demonstrated — Completed

Optional Phase

- Field Test Prototype
- Identify Advanced Prototype Field Test Sites
- Design and Fabricate Advanced Prototype

Accomplishments and technical progressApril 2000

May 1999, the prototype CAM instrument became operational, and initial data was taken using the instrument. Modifications to improve the prototype CAM instrument's performance that were begun during June were completed in August. This work included an improved detector mount for enhanced alignment of the detectors to the film, and an enhanced film tracking system to improve alignment of the film to both the ESP and the detectors. Several changes to the film transport system were also made to accommodate the enhanced film tracking system.

In order to improve the mechanical support of the film, a new film platen was fabricated, installed and tested last month. The new platen was designed to be wider, in order to support the film for more of its travel through the instrument. In addition, the new platen was fabricated to produce a more even surface, with end to end surface elevation difference of less than 0.008". The more even surface was desired in order to decrease the gap between the detectors and the film, in order to improve the isotopic resolution of the laboratory prototype ESP CAM instrument. As a result of the more even surface, it was possible to further reduce the detector gap. Originally, the detector gap was 0.030". Last month, the gap was successfully tested at 0.020". This month the gap was reduced to 0.015", and successfully tested.

An additional, slight incremental improvement in isotopic resolution was measured with the new 0.015" detector gap.

The project is on schedule. Base Phase I work has been completed on budget. Work has been begun at risk on an increased scope of work, involving a field test of the laboratory prototype ESP CAM and the design and fabrication of an advanced prototype ESP CAM. Measures are being negotiated with DOE NETL that should implement the increased scope of Phase I work of in the near future.

May 2000

One year ago the prototype CAM instrument became operational, and initial data was taken using the instrument. Subsequently, modifications to improve the prototype CAM instrument's performance were completed. This work included an improved detector mount for enhanced alignment of the detectors to the film, and an enhanced film tracking system to improve alignment of the film to both the ESP and the detectors. Several changes to the film transport system were also made to accommodate the enhanced film tracking system.

In order to improve the mechanical support of the film, a new film platen was fabricated, installed and tested recently. The new platen was designed to be wider, in order to support the film for more of its travel through the instrument. In addition, the new platen was fabricated to produce a more even surface, with end to end surface elevation difference of less than 0.008". The more even surface was desired in order to decrease the gap between the detectors and the film, in order to improve the isotopic resolution of the laboratory prototype ESP CAM instrument. As a result of the more even surface, it was possible to further reduce the detector gap. Originally, the detector gap was 0.030". Last month, the gap was successfully tested at 0.020". This month the gap was reduced to 0.015", and successfully tested. An additional, slight incremental improvement in isotopic resolution was measured with the new 0.015" detector gap.

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An endurance test was conducted in order to qualify the laboratory prototype ESP CAM prior to the upcoming Field Test. Figure 1 illustrates the results of the resultant 25-hour test, comparing the results of the ESP CAM system to the results of multiple conventional fixed filter analyses. Excellent agreement exists between the ESP CAM results and the fixed filter analyses. Also apparent in Figure 1 is the classic diurnal nature of radon progeny levels, with levels decreasing during the workday, followed by radon levels increasing during the overnight period. With the successful completion of this test, the ESP CAM

Figure 1 25 Hour ESP CAM Laboratory Test

system has shown that it is capable of and ready for the extended duration field test at LANL.

A preliminary general layout of the Advanced Prototype ESP CAM was partially completed this month. Until the Field Test Site arrangements are finalized, most project effort will be directed towards completing the general arrangement and detail drawings of the Advanced Prototype.

June 2000

One year ago the prototype CAM instrument became operational, and initial data was taken using the instrument. Subsequently, modifications to improve the prototype CAM instrument's performance were completed. This work included an improved detector mount for enhanced alignment of the detectors to the film, and an enhanced film tracking system to improve alignment of the film to both the ESP and the detectors. Several changes to the film transport system were also made to accommodate the enhanced film tracking system. Sequential improvements in isotopic resolution resulted from these changes. Subsequent to these modifications, a 25-hour endurance test was successfully completed

with the ESP CAM instrument. The excellent agreement between the ESP CAM results and the conventional fixed filter analyses demonstrate that the new laboratory CAM is capable of and ready for an extended duration field test.

The project is on schedule. Last month Base Phase I work was completed on budget. Work has continued at risk on an increased scope of work, involving a field test of the laboratory prototype ESP CAM and the design and fabrication of an advanced prototype ESP CAM. Measures are being negotiated with DOE NETL that should implement the increased scope of Phase I work of in the near future.

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Figure 2 Advanced ESP CAM Laboratory Prototype

An elevation view of the Advanced Prototype unit is shown above as Figure 1. Lighter-gauge aluminum is used for the structural frame, instead of stainless steel, in order to reduce the unit's weight. An alternative, more compact, linear actuator is used in this assembly, in order to produce a more compact design. A re-designed quick-release assembly for the support shafts has updated the film supply and take-up roll subassembly. Both the electrostatic precipitator and diode subassemblies have been redesigned, using the lessons learned from the previous generation laboratory unit.

Assessment of current status

The project is on schedule. Base Phase I work has been completed on budget. Work has continued at risk on an increased scope of work, involving a field test of the laboratory prototype ESP CAM and the design and fabrication of an advanced prototype ESP CAM. Measures are being negotiated with DOE NETL that should implement the increased scope of Phase I work of in the near future.

Plans for the next two months

An increase in the Scope of Work will be put into place that includes field testing the Laboratory Prototype ESP CAM.

The Laboratory Prototype will be prepared for field testing at Los Alamos National Laboratory's TA-54 LSDDP site.

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