

# Environmental Management Science Program

**Project ID Number 60163**

## **Investigation of Techniques to Improve Continuous Air Monitors Under Conditions of High Dust Loading in Environmental Setting**

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### **Research Objective**

Improvement in understanding of the deposition of ambient dust particles on ECAM (Environmental Continuous Air Monitor) filters, reduction of the alpha-particle interference of radon progeny and other radioactive aerosols in different particle size ranges on filters, and development of ECAM's with increased sensitivity under dusty outdoor conditions.

### **Research Progress and Implications**

As of May 1, 1998 (1/2 year into the project) the research-prototype 30-cm pulsed ionization chamber (PIC) is assembled and operational with an alpha particle energy resolution of better than 45 keV for 5-MeV alpha particles. Measurements of spectral resolution for alpha particles from radon decay products have been made as a function of filter type and dust loading conditions. So far, a study of ten filter types has found that the best combination of resolution and throughput is obtained with 3.0  $\mu\text{m}$  Millipore fluoropore and 1.0  $\mu\text{m}$  Corning FNMB filters. Experiments with gypsum and Portland cement dust in the size range 1 to 20  $\mu\text{m}$  indicate significant degradation in alpha particle resolution for dust loading above about 0.5  $\text{mg cm}^{-2}$ . Study of metalized films for possible use as a PIC window indicate a minimum broadening of 5-MeV alpha particle peaks from 43 (no film) to 301 keV (with film) for AVR film type B8 (0.20  $\text{mg cm}^{-2}$  polycarbonate). A modified ECAM sampling head, equipped with an optical microscopy system feeding data to a high resolution video data capture and logging instrument, was constructed. This system will enable time-lapse study of dust build-up on ECAM filters and formation of dendrite structures that can reduce alpha-particle resolution.

### **Planned Activities**

Planned activities for the next 6 months:

- 1) Continue study of the degradation of alpha-particle resolution as a function of filter type and dust loading conditions.
- 2) Modify and test the large surface area PIC to see if it can be adapted to a design more suitable for use under outdoor conditions.
- 3) Initiate time lapse microscopic measurements of the build up of dust on ECAM filters with the newly-constructed optical imaging system.