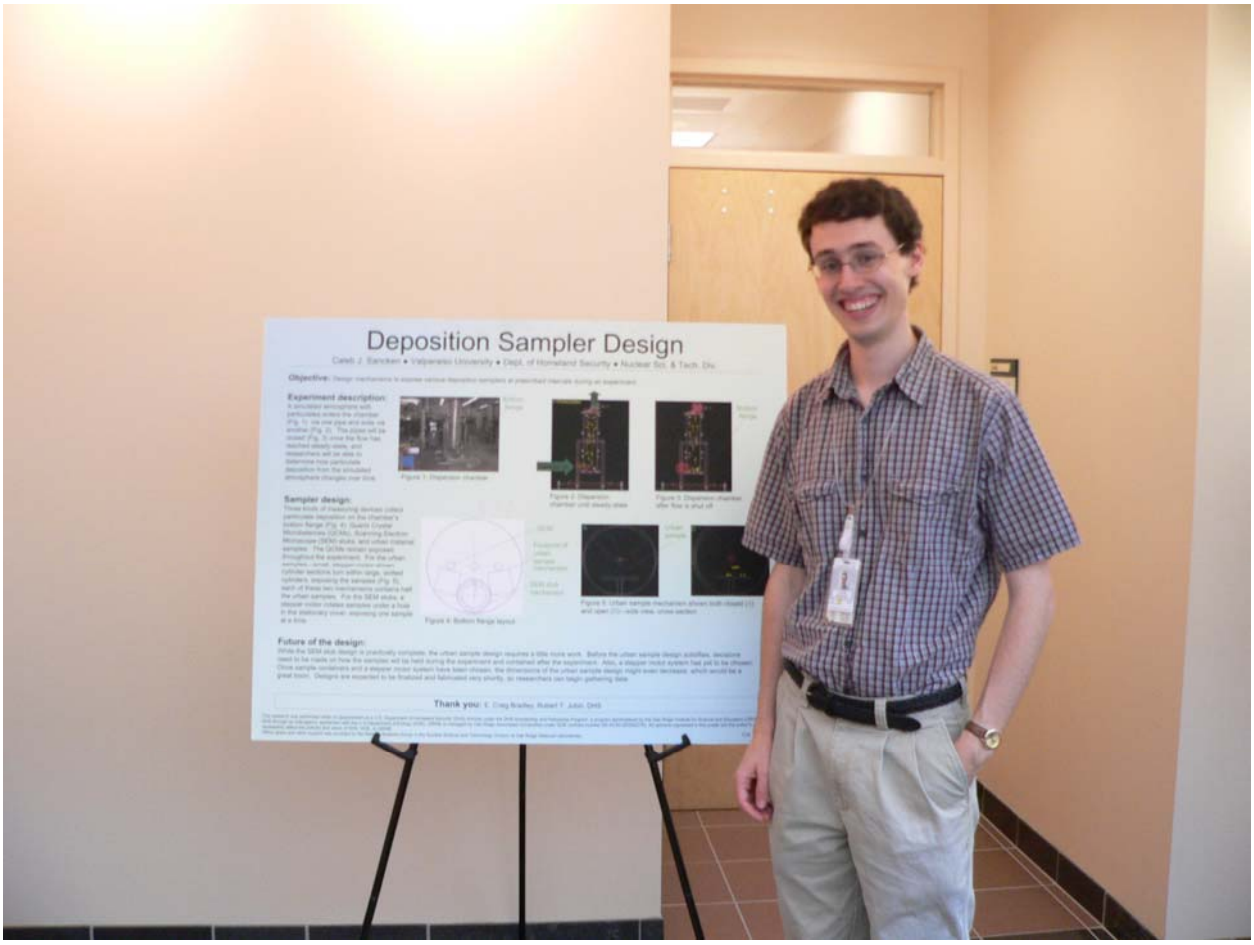
Positioning and Controlling Exposure of Measurement Devices to Determine Particle Deposition Characteristics



The objective of this project was to design parts of an experimental apparatus to characterize particle deposition. Central to the apparatus is a cylindrical chamber oriented so the circular faces are parallel with the floor. During the experiment, a simulated atmosphere with particulates will enter the chamber via one pipe and exit via another. The pipes will be closed once the flow has reached steady-state, and researchers will be able to determine how particulate deposition changes over time. The measuring devices to be placed on the bottom of the chamber are three Quartz Crystal Microbalances (QCMs), sixteen Scanning Electron Microscope (SEM) stubs, eight horizontally-mounted samples of typical urban materials, and eight vertically-mounted urban material samples. Continuously exposed during the experiment, the QCMs are placed in a line. The SEM stubs are to be exposed one at a time, and, for the urban material samples, either four horizontal-vertical pairs or all eight pairs are exposed at a time. One set of designs for the SEM stubs and urban material samples includes a stepper-motor-driven disk or cover; when samples align with a hole or holes in the cover, the samples are exposed. The advantage of these designs is that they use similar components, possibly lowering costs, and that

they have a small footprint. The disadvantage is that the urban samples' orientation may result in dissimilar deposition among the samples. Other designs for the urban materials—with the samples in linear arrays and solenoid-actuated sliding or pop-up covers for exposure—allow for more consistent orientations, but require more space and use few if any parts in common with the SEM stub design. For the final product, researchers will look for a design that not only provides the best orientation but is also small, allows for easy cleaning, produces little heat, and has low cost.

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