A Portable Ultrafine Particulate Sizer for *in-situ* Engine Exhaust Monitoring.

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Particulate Matter (PM) is defined by the Environmental Protection Agency (EPA) as a complex mixture of extremely small particles and liquid droplets. Particulate Matter which is smaller than 100 nanometers (nm) in aerodynamic diameter is conventionally referred to as Ultrafine Particulate matter. Ultrafine Particulate matter (UFPM) has been shown to be capable of penetrating the alveolar barrier, therefore entering the blood stream to be deposited in organs including the brain. This can lead to cardio-pulmonary inflammation, changes in blood coagulation and higher rates of morbidity and mortality [1]. One of the largest sources of UFPM is internal combustion engines which are known to generate particulate matter between roughly 30 – 500nm[2]. Therefore, *in-situ* measurement of vehicle emission could provide data to accurately monitor ultrafine particulate sources and improve emissions modeling for local and national forecasting.

Current particulate size-discriminating instruments are expensive, bulky, bench-based tools for in-laboratory analysis. The Portable Ultrafine Particulate Sizer (PUPS)† is a system nearing completion at the University of Vermont designed to demonstrate that low-cost particle sizing equipment is achievable by using existing technologies common in consumer and industrial electronics. Utilizing off-the-shelf electronic components such as data converters, flexible printed circuit boards, high-voltage regulators and motor controllers we are attempting to prove that *in-situ* particulate monitoring may one day be possible on a fleet-wide level, not just in a laboratory setting. We will be presenting the progress made on the PUPS since our previous presentation at this time last year.

1. Oberdörster, G., E. Oberdörster, and J. Oberdörster, “Nanotoxicology: An Emerging Discipline Evolving from Studies of Ultrafine particles”, Environmental Health Perspectives, 2005. **113**(7): p 823-839.
2. Morawska, L., Z. Ristovski, et al. (2008). "Ambient nano and ultrafine particles from motor vehicle emissions: Characteristics, ambient processing and implications on human exposure." **42**(35): 8113.

† Patent Pending