

# DROPLET MEASUREMENT TECHNOLOGIES, INC.

## INDIVIDUAL BLACK CARBON PARTICLE MEASUREMENTS



Single Particle Soot Photometer (SP-2)

### About the Technology

The Single Particle Soot Photometer (SP-2) is a sensor that measures the optical properties of individual carbon particles. Developed by Droplet Measurement Technologies, Inc. (DMT), the SP-2 classifies black carbon particles in the atmosphere, by number, size, and by counting individual particles. Previous technology collected particles on filters and measured the reduction in light transmission through the filter, but the process was slow and took hours to make a measurement. The SP-2 measures individual particles in real time.

With the SP-2, a sample of environmental air is subjected to a high-power YAG (yttrium aluminum garnet) laser beam. The black, light absorbing, aerosol particles are identified and vaporized as they pass through the laser beam. The destruction of the soot particle produces a quantity of photons that represent the mass and composition of the particle. The larger the soot particle, the more photons are released. The concentration of carbon is then determined by counting the number of vaporized particles in a sample. Additional information on the mixing state of the carbon particles can be ascertained by measuring the peak height of the signals and the timing of the peaks.

### Military and Commercial Significance

Atmospheric carbon, like that contained in diesel smoke and power plant pollution, is a key component to the increase of radiatively important particles in the atmosphere. Carbon found in marine aerosols have a significant impact on the optical properties of the atmosphere, and the effects of carbon aerosols on both solar and infrared wave-lengths strongly influence the performance of electro-optic/infrared sensors. DMT's SP-2 offers researchers access to information on individual carbon particles that had never before been available, and provides a vehicle to acquiring new data and understanding of how and why carbon particles effect changes in the atmosphere and their affects on health, climate, and the environment. The Naval Post Graduate School has used SP-2 during research flights of the Center for Interdisciplinary Remotely-Piloted Aircraft Studies Twin Otter aircraft to measure smoke plumes from ship exhaust and forest fires.

Topic Number: N00-094  
(ONR)

SBIR Investment: \$945K  
Project Revenue: \$1.55M

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### APPLICATIONS

- Navy - Research mission flight for carbon-mapping
- NOAA Aeronomy Laboratory - High-altitude black carbon aerosol studies
- NASA: WB57 F CRAVE Program, DC-8 - SOLVE II Mission
- Boston College - Study involved the Aerodyne Mass Spectrometer
- University of Manchester, England: ACTIVE program for cloud studies

### About the Company

Droplet Measurement Technologies (DMT) was incorporated in 1987 and manufactures its own line of airborne and particle spectrometers. DMT attributes its success directly to the Navy SBIR program. The first SBIR contract resulted in the Cloud, Aerosol, and Precipitation Spectrometer (CAPS), which became the industry standard spectrometer for airborne cloud and storm research. Sales from the CAPS have given DMT the resources it needed to further its line of products, and the electronics and optics technology from SBIR funding allowed DMT to produce several complimentary products.