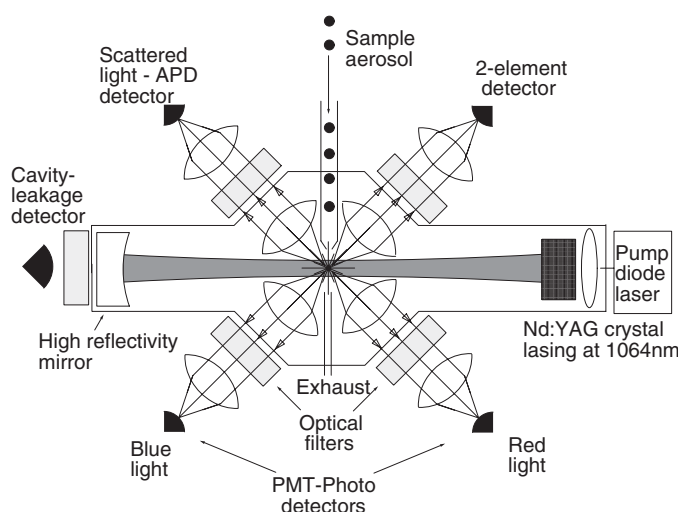


The Single-Particle Soot Photometer (SP2; Droplet Measurement Technologies) is a particle-resolved measurement of refractory black carbon (rBC). A schematic of the SP2 is shown below (Schwarz et al., 2010). Refractory black carbon is produced from the incomplete combustion of fossil fuel and biofuels, including biomass burning (e.g., wildfires and controlled burns). It is related to light absorbing carbon that therefore it is important to quantify the mass loading of rBC.

The SP2 measures soot mass on a single particle basis as a function of particle size by laser-induced incandescence. An airstream of individual particles orthogonally intersects the central portion of a continuous wave 1064 nm laser. These illuminated particles will scatter light and, if absorbing, will heat up to the point of incandescence enabling the detectable BC mass with diameters ranging between about 80 – ~600 nm. The resulting incandescence is measured via two-color photometry and particle scattering is measured via a low- and high-gain channels. The size scattering channel can measure non-absorbing aerosol diameters in the range of 180 nm – 600 nm.



The SP2 measures both scattering and incandescence from individual particles containing rBC that are illuminated with a 1064 nm (near-IR) laser beam. The incandescence intensity is proportional to the amount of rBC mass. Calibration of the incandescence intensity is provided using size selected Fullerene soot.

Schwarz, J. P., J. R. Spackman, R. S. Gao, A. E. Perring, E. Cross, T. B. Onasch, A. Ahern, W. Wrobel, P. Davidovits, J. Olfert, M. K. Dubey, C. Mazzoleni, and D. W. Fahey, (2010) The Detection Efficiency of the Single Particle Soot Photometer, *Aerosol Sci. and Tech.*, 44:612–628.