LII and one-wavelength Aethalometer measurements of particulate matter in different environments

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Laser-Induced Incandescence (LII) technique is a powerful tool to measure concentration and size of soot particulate. In this work LII measurements are performed in different experimental conditions and compared with the ones derived by using a commercial aethalometer. This instrument allows to obtain the on-time concentration of optically absorbing aerosol particles by measuring the attenuation of 800 nm wavelength light through a quartz fiber filter. The filter is blackened over time with the aerosol picked up inside the instrument at controlled flows. Measurements are carried out with one second time-resolution. Absolute measurements in the ng/m^3 range are derived for the particulate concentration. As for Laser-Induced Incandescence, soot particles are sampled in a test cell, consisting of a pyrex tube. The IR beam of a Nd:YAG laser (6 Hz, 200 mJ/cm2) is properly aligned within the tube. The LII signal is detected at two wavelengths (530 nm and 700 nm) with PMT modules coupled with interference filters. A fast digital oscilloscope, triggered by the laser Q-switch pulse, is used for data acquisition and storage.

The two sets of measurements are carried out at the exhaust of a soot generator (fuelled by methane) and of a diesel engine as well as in ambient air conditions (office and laboratories). In this way, a wide range of soot load and particulate of different nature are investigated.

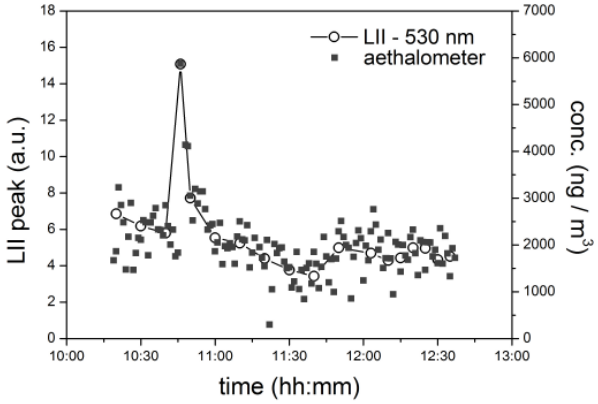

Fig. 1: *LII peak (left) and aethalometer measurements (right) versus time.*

As an example, in Fig. 1 measurements carried out in ambient air are shown versus time. Open symbols refer to the values of the LII peak at 500 nm wavelength collected about every 10 minutes. The concentration values obtained with the aethalometer are reported in closed symbols. The two sets of measurements are quite well overlapped confirming that the two techniques are sensitive to the same soot particulate and that the developed LII apparatus exhibits the high sensitivity necessary for environmental measurements.