A MOBILE SYSTEM FOR ACTIVE OPTICAL POLLUTION MONITORING

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The remote monitoring of atmospheric pollutants can now be performed in several ways. Laser radar techniques have proven their ability to reveal the spatial distribution of different species or particles. Classical optical techniques can also be used, but yield the average concentration over a given path and hence no range resolution. One such technique is Differential Optical Absorption Spectroscopy, DOAS. Such schemes can be used to monitor paths that a preliminary lidar investigation has shown to be of interest.

In our group, we have previously had access to one mobile lidar system constructed in Göteborg 1979-1980 (Ref. 1). Now a new system has been completed. The construction builds on experience from using the other system and it is meant to be more of a mobile optical laboratory than "just" a lidar system.

The system is built up on an ordinary truck chassis, and the laboratory measures 2.5 m x 6 m, fig 1. Electric power can be supplied from a 20 kW motor generator, housed in a trailer towed by the bus. The laboratory is equipped with a laser bench that besides the laser can hold an experimental setup and a detection bench that will allow different detection arrangements, for example a monochromator or a multichannel arrangement. The design is primarily intended for an Nd:YAG+dye laser system but it allows the use of different lasers. Frequency mixing units and a Raman shifter can be included to extend the wavelength region. Currently we employ a Quanta-Ray DCR-1 with a PDL-1 dye laser. Wavelength tuning is done by tilting the grating with a rotating excenter wheel or a piezo crystal. A future development incorporates a device for simultaneous dual-wavelength operation. The detection system is prepared for this option. The dyelaser wavelength can be calibrated in two ways, either against lines in the spectrum of neon or by measurements through a gas absorption cell.

The telescope, a Newtonian 400-mm diameter telescope, is mounted pointing vertically, coaxial with the exiting laser beam. The measurement direction is chosen with a large folding mirror, 400 mm x 700 mm, which is mounted in a retractable dome construction. When the system is not in use the dome is lowered. The folding mirror is protected by a 450 mm x 600 mm quartz window to make operation during rain or in wintertime possible.

The backscattered light is detected by an EMI 9816 QA photomultiplier, modulated according to Ref. 2 to prevent overload. This permits daytime measurements of e.g. NO_2 in the blue spectral region. Two PMT:s can be mounted for two-channel detection via dichroic mirrors or beamsplitters. The electrical signal is sampled by a LeCroy 8013 transient recorder assembly, with two 100-MHz