

## RAMAN-LIDAR MEASUREMENTS IN SIMULATED POLLUTED ATMOSPHERE

G. Kuper and D. Ebeling  
Impulsphysik GmbH, Hamburg, Germany

## ABSTRACT

Calculations dealing with the optimization of a Raman-Lidar system indicate that under certain conditions a Ruby-Laser emitter, operating in the ground mode, offers advantages over a frequency doubled system. Based on these calculations a Raman-Lidar measuring system was constructed sponsored by the German Ministry of Research.

The main part of the system consists of a measuring chamber which can be filled with predetermined mixtures of various gases allowing quantitative measurements of the ratio "measured signal versus concentration of a pollutant gas". This chamber was located 50 m in front of emitter and receiver in such a way that emitter and receiver beam could only intersect within a defined measuring volume within the chamber. The receiver electronics gave the possibility to measure either in the A-scope- or gated photon counting-technique. Automatically the background noise out of the receiver cone was subtracted for each measuring point.

Considering all influencing parameters, the results of the experiments yielded the possibility to take the theoretically calculated photon-numbers as a measure of the concentration of atmospheric pollutants. Further parameters disturbing the results are discussed.

To select the Raman frequency both the multilayer-dielectric-filter- and the monochromator-method are used. Comparison of both methods shows a better agreement between theorie and experiment for the filter method. The advantages and disadvantages of both methods are compared.

At clear daytime the limits of the conventional Raman-Lidar system are reached when the background surpasses the Raman signal within orders of magnitude. But even at nighttime or at cloudy weather conditions the Raman-Lidar is only capable to detect comparably high pollutant concentrations, e.g. in plume stacks. An extension of the conventional method determination of very low concentrations is - in the present stage of Laser technology - only possible with very high technological and financial expenses.