# DETERMINATION OF SPATIAL DISTRIBUTION OF AIR POLLUTION BY DYE LASER MEASUREMENT OF DIFFERENTIAL ABSORPTION OF ELASTIC BACKSCATTER

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ABSTRACT

This paper presents the results of an analytical study of a lidar system which uses tunable organic dye lasers to accurately determine spatial distribution of molecular air pollutants. Also described will be experimental work to date on simultaneous multiwavelength output dye laser sources for this system.

Basically the scheme determines the concentration of air pollutants by measuring the differential absorption of an (at least) two wavelength lidar signal elastically backscattered by the atmosphere. Only relative measurements of the backscattered intensity at each of the two wavelengths, one on and one off the resonance absorption of the pollutant in question, are required.

The various parameters of the scheme are examined and the component elements required for a system of this type discussed, with emphasis on the dye laser source. Potential advantages of simultaneous multiwavelength outputs are described. The use of correlation spectroscopy in this context is examined. Comparisons are also made for the use of infrared probing wavelengths and sources instead of dye lasers.

Estimates of the sensitivity and accuracy of a practical dye laser system of this type, made for specific pollutants, show it to have inherent advantages over other schemes for determining pollutant spatial distribution.