FEASIBILITY OF A CW LIDAR TECHNIQUE FOR MEASUREMENT OF PULME OPACITY

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ABSTRACT

This report describes the work performed for the Enviromental Protection Agency during the initial proof-of-concept phase of a program to develop an eyesafe CW lidar for remote measurement of the opacity of smoke plumes from industrial smoke stacks. The analysis, design, construction, and evaluation of a laboratory model CW lidar were performed under SRI Project 1979 from 30 May 1972 to 30 May 1973 under EPA contract 68-02-0543 to determine the limitations and potential of the technique. The proof-of-principle experiments combine what is called an FM-CW radar technique with an argon laser. The technique involves modulating the intensity of the laser beam at a frequency that changes rapidly and linearly with time. A portion of the transmitted signal is mixed electronically with the light reflected from the targets in a device similar to a radio receiver. Each target appears at a particular frequency. By tuning the radar's receiver to these target frequencies, the researchers were able to measure both the range and the opacity of semi-transparent targets over distances of 100 to 200 meters.