ANALYSIS OF LASER METHODS OF CHEMICAL CONTAMINATION CONTROL IN THE ATMOSPHERE

V. M. Zakharov, V. A. Torgovichev and E. A. Chayanova
Hydrometeorological Service of the USSR, Moscow, USSR

ABSTRACT

Current methods of the detection and measurement of aerosol and gaseous contamination of the atmosphere based on air sampling with subsequent laboratory analysis have a number of shortcomings: contactness; a long period of data collection during which thermal variations and chemical transformations may distort and actual contaminants content. Laser methods of the detection and identification of contaminants have the advantages of remote control and the capability of conducting a qualitative and quantitative analysis practically instantly.

In the report there is made an analysis of various types of laser systems based on resonant scattering which is caused by electron and vibratory transitions, on selective absorption and Raman scattering. The analysis concerns sensitivity, universality, selectivity and accuracy of measuring contaminants concentrations. A feasibility of practical use of the experimental systems at the present state of technical progress is discussed and experimental results of the detection of some contaminants are presented.

A method of Raman scattering is considered in more detail as the most universal, selective, and accurate one. In the report there is discussed the problem of lidar parameters optimization from the point of view of spectral background dependence, receivers sensitivity, and power of currently used lasers: as well as presented data on long-distance capabilities of the method at practically achieved parameters of the lidar which is being designed in the Central Aerological Observatory.