A COMPARISON OF STABILITY OF SIMULTANEOUS AND ALTERNATE OSCILLATION IN THE DIFFERENTIAL ABSORPTION METHOD

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ABSTRACT

The differential absorption method has been pointed out as the most sensitive one in the remote measurement of air pollutants.[1] The output power stability of transmitting laser is a important factor to determine the capability of the laser radar system. There are four choices of laser in this method ; 1) broad band oscillation containing the required two wavelengths,[2] 2) progressive sweep of narrow line oscillation,[3] 3) simultaneous two-wavelength oscillation centered at the required one respectively and 4) alternate oscillations at the two wavelengths.[4]

Several techniques for the dye laser to emit simultaneously or alternately at the required two wavelengths have been studied. But, as a result of extensive homogeneous broadening of dye materials, a competition effect of one beam on the other is occured. This effect is especially strong in such a case of small difference wavelength as used in this method. The stability of the laser output power at each wavelength which was operated simultaneously or alternately as shown schematically in Figure 1[5] was examined. The results showed that the output power fluctuation for simultaneous oscillation was about fifty percent larger than that for single path oscillation.[6]

Simultaneous two-wavelength oscillation of laser and the signal processing at the two wavelengths at the same time is inevitably required for using back-scatterers varing with time, although the transmitting laser power is somewhat fluctuated by shots. It is advantageous, for the case where scatterers are uniformly distributed or a building is used, to use laser having a good stability of the spectrum and output power. The merits and demerits of adopting

these types of laser in this method as a whole laser radar system will be reported in detail.

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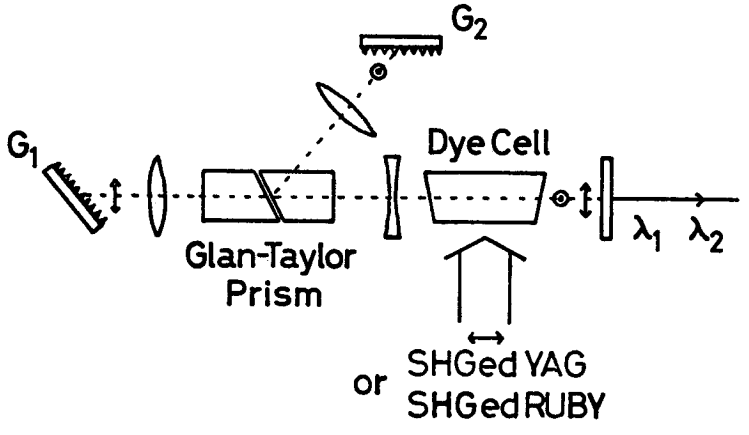

Figure 1. Schematic diagram of two-wavelength dye laser. The polarization of each radiation wave is also indicated. Single path oscillation can be operated by blocking the other path.