AUTOMATIC WAVELENGTH CONTROL OF A FLASH-LAMP PUMPED DYE LASER

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ABSTRACT

Narrow band lasers used in resonant scattering experiments must be adjusted to the required resonance line with a high degree of accuracy. It is not easy to design a tuning system with the degree of long term stability required to obviate the necessity for frequent re-tuning. This paper describes an automatic system which tunes the laser to a reference line produced by a discharge lamp. The method used is to introduce a reference line from a spectral source (sodium in our case) into the laser cavity, in such a way that it follows the same path through the tuning elements as the actual laser beam. The main tuning element is a Fabry-Perot interferometer with piezo-electric control of the plate seperation. The piezo-electric is energised with a small oscillating voltage superimposed on a D.C. potential. The sinusoidal variation in the plate separation produced by the oscillating voltage modulates the intensity of the reference beam and this modulation is detected by a photomultiplier. By comparing the oscillating output of the photomultiplier with the sinusoidal voltage applied to the piezo-electric element an error signal is obtained and used to adjust the D.C. potential via a servo-system. The servo adjusts the plate separation until the sinusoidal oscillation is centered on the desired wavelength. The oscillation is then switched off before firing the laser. The main advantages of this scheme are as follows: (i) it is not necessary to fire the laser to tune it to the required wavelength, (ii) a high resolution spectrometer is not required, (iii) re-tuning takes only a few seconds. This last advantage means that no great stability is required in the piezo-electrically controlled Fabry-Perot, since frequent re-tuning is possible.