He-Ne 0.63 • 1.15 μm Two-wavelength Laser

Tomoyuki Yamada

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This work concerns a He-Ne laser simultaneously operated at 0.63 μm and 1.15 μm. The competition effect between the 0.63 μm and 1.15 μm lines of a He-Ne laser is studied experimentally. The result is that the 1.15 μm line is much influenced by the 0.63 μm line but the 0.63 μm line is little by the 1.15 μm line. The output coupling of the simultaneously operated laser at 0.63 μm and 1.15 μm is predicted from the above result. This prediction agreed well with the measurement of the power coupled out of exit mirror.

The mode-locking of multiwavelength laser has scarecely been investigated yet. Stable self-locking of 0.63 μm line is obtained under the simultaneous oscillation. The simultaneous self-locking of 0.63 μm and 1.15μm lines of He-Ne laser is also achieved for a few minutes at the same frequency.

The self mode-locking of 1.15 μm laser is secured by lasing only the 1.15 μm line using a laser resonator with a dispersion prism.

The utility and the problems of the self-locked laser are studied by applying the mode-locked pulse of the laser to range finding. It is found that the frequency of the mode-locked pulse is very stable for some range of cavity length. The frequency of the pulse could be varied from 161 to 169 MHz. The frequency was stable to 10^{-5}. But it is also found that various troubles are caused by moving the end mirror of the cavity.

Compromising these conditions, a unique two-wavelength laser for optical measurement will be realized by self-locking 0.63 μm and 1.15 μm lines separately using a laser resonator with a dispersion prism.