

## **FREQUENCY MEASUREMENT OF THE SOLITARY ETHYL ALCOHOL LASER LINE**

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We measured the frequency, the relative polarization and the pump frequency offset of the single FIR laser line obtained by optically pumping ethyl alcohol  $C_2H_5OH$  with a cw  $CO_2$  laser.

Key Words:  $C_2H_5OH$ , laser frequency measurement, FIR laser,  $CO_2$  laser, relative polarization, pump offset frequency, ethyl alcohol.

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Ethyl alcohol ( $C_2H_5OH$ ) was shown to lase weakly on a single line when pumped by a cw  $CO_2$  laser<sup>(1)</sup>. In fact, with optimized pressure and coupling, the laser oscillated from the vapors of vodka, rum, and gin, evaporating directly from their bottles. For the measurements reported here, we pumped the molecule with radiation from the 9P(32) line of a waveguide  $CO_2$  laser one meter long and having a five mm diameter bore. The  $CO_2$  laser had an 80% reflectance flat mirror at one end of the cavity and a 150 line/mm grating at the other end.

The FIR cavity was a nearly confocal Fabry-Perot resonator consisting of a one meter long hollow copper tube five cm in diameter. The results of our measurements are summarized below. The pressure was measured with a thermocouple calibrated with methanol.

$C_2H_5OH$ Laser $\lambda(\mu m)$	Polariz. Relative to $CO_2$ Polariz.	Press (Pa)	$CO_2$ Power (W)	Measured Freq. (MHz) <sup>a</sup>	$CO_2$ Laser Freq. Offset (MHz) <sup>b</sup>
388.1		15	23.5	772 542.0	+ 9.0

a) The uncertainty in the measured frequency is  $\Delta\nu/\nu = \pm 2 \times 10^{-7}$

b) The uncertainty in the frequency offset is equal to  $\pm 3$  MHz.

#### References

1. D.A. Jennings, K.M. Evenson, and J.J. Jimenez, IEEE J. Quantum Electr. QE-11, 637 (1975).