

An Interferometric Frequency Comb Generator

R. Kimberk, C.E. Tong, H. Gibson, T.R. Hunter, S. Paine, R.W. Wilson, and R. Blundell.

*Harvard Smithsonian Center for Astrophysics
60, Garden Street
Cambridge, MA 02138*

Abstract

We have developed a scheme for generating a comb of frequencies, covering the microwave to millimeter spectral range, using a single diode laser coupled to an optical interferometer and photodetector. Frequency modulating the laser by modulating the laser bias current at a frequency of 2.15 GHz, we have observed signal output in a comb that extends beyond the 40th harmonic of the fundamental modulation. The linewidth of the electrical output is too narrow to be measured using an HP 8563E spectrum analyzer with a resolution bandwidth of 1 Hz. We have also compared the phase stability of the multiplied output with output from a classical diode frequency multiplier and believe that a phase stable output can be generated. Finally, we have developed analytical and numerical models that suggest that our scheme may be used for frequency generation through the submillimeter.