Abstracts

A tunable cavity-locked diode laser source for terahertz photomixing

S. Matsuura, Pin Chen, G.A. Blake, J.C. Pearson and H.M. Pickett. "A tunable cavity-locked diode laser source for terahertz photomixing." 2000 Transactions on Microwave Theory and Techniques 48.3 (Mar. 2000 [T-MTT]): 380-387.

An all solid-state approach to the precise frequency synthesis and control of widely tunable terahertz radiation by differencing continuous-wave diode lasers at 850 nm is reported in this paper. The difference frequency is synthesized by three fiber-coupled external-cavity laser diodes. Two of the lasers are Pound-Drever-Hall locked to different orders of a Fabry-Perot (FP) cavity, and the third is offset-frequency locked to the second of the cavity-locked lasers using a tunable microwave oscillator. The first cavity-locked laser and the offset-locked laser produce the difference frequency, whose value is accurately determined by the sum of an integer multiple of the free spectral range of the FP cavity and the offset frequency. The dual-frequency 850-nm output of the three laser system is amplified to 500 mW through two-frequency injection seeding of a single semiconductor tapered optical amplifier. As proof of precision frequency synthesis and control of tunability, the difference frequency is converted into a terahertz wave by optical-heterodyne photomixing in low-temperature-grown GaAs and used for the spectroscopy of simple molecules. The 3-dB spectral power bandwidth of the terahertz radiation is routinely observed to be /spl lsim/1 MHz. A simple, but highly accurate, method of obtaining an absolute frequency calibration is proposed and an absolute calibration of 10/sup -7/ demonstrated using the known frequencies of carbon monoxide lines between 0.23-1.27 THz.

- Return to main document.