Terahertz frequency generation with monolithically integrated dual wavelength distributed Bragg reflector semiconductor laser diode

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2017

Abstract:

Optoelectronic terahertz (THz) generation techniques have helped to narrow the THz gap and have opened up a wealth of new applications for THz technology. However, the development of THz systems into mass market is a major technical challenge, which is attributed to high cost of THz hardware components including sources and detectors. Here, the authors report THz generation from a distributed Bragg reflector (DBR) semiconductor laser diode together with fibre coupled photoconducting antennas. Two fibre coupled ion-implanted gallium arsenide photoconducting antennas were employed to generate and detect THz radiation. Two DBR lasers connected with a Y-shaped waveguide structure were monolithically integrated and used to simultaneously emit two wavelengths in the range of 785 nm. These lasers were employed as pumping source for the photomixers. An optical beat frequency of 286 GHz of the dual wavelengths was obtained from optical characterisation. A corresponding THz frequency was confirmed via photomixing in a homodyne set up. By variation of the operation parameters of the laser, the difference frequency was tuned in the range between 286 GHz to 320 GHz. In summary, they report the implementation of a compact and cost effective fiber coupled Terahertz source based on a monolithically integrated dual wavelength DBR semiconductor laser diode.